Pilot Operating Handbook
And
Aircraft Flight Manual

DHC-6 Series 300 (Twin Otter) and Variants

(Serial Numbers 130, 210, 231 to 844)
Type Certificate A-82 (Canada)

Manufactured by Viking Air Limited
Type Certificate held by Viking Air Limited

Aircraft Serial Number _____

Aircraft Registration _____

Sections 1 through 10 inclusive of this document comprise the Pilot Operating Handbook (POH) for the DHC-6 Series 300 Twin Otter. Sections 1, 2, 3, 4, 5 and any supplement in Section 9 are Transport Canada Civil Aviation approved and constitute the approval Aircraft Flight Manual. Compliance with Section 2, Limitations, is mandatory.

Sections 0, 6, 7, 8 and 10 are not approved and are provided for information only.

This document meets General Aviation Manufacturer (GAMA) Specification No. 1, Specifications for Pilot Operating Handbook, issued February 15, 1975 and revised October 18, 1996.

PSM 1-63-1A Aircraft Flight Manual

Approved by Chief, Flight Test
Transport Canada:_____ **Date:** 10 Sep 2010

Copyright © 2006, 2010 Viking Air Limited. No part of this work may be reproduced or copied in any form or by any means without prior written permission from Viking Air Limited. Permission is granted to DHC-6 Series 300 operators to distribute copies within their company for pilot training purposes as long as no charge is made for these copies. Permission is granted to DHC-6 Series 300 operators to use excerpts from this manual in DHC-6 training materials and quick reference checklists.

Please cite the revision number of this manual anytime excerpts are reproduced in training materials or quick reference checklists.

Viking Air Limited
1959 deHavilland Way
Sidney, BC
Canada V8L 5V5

Telephone: (250) 656-7227
Fax: (250) 656-0673
USA & Canada Toll Free:
1-(800) 663-8444

Email: technical .publications
@vikingair.com

February 11, 2011

To: Distribution

Subject: PSM1-63-POH, DHC-6 Series 300 – Pilot Operating Handbook and Aircraft Flight Manual

Incorporate Revision 53 dated September 10, 2010.

1 Revision 53 is a complete rewrite of the Aircraft Flight Manual (PSM1-63-1A-DOT), the Supplementary Operating Data (PSM 1-63-1), and the Aircraft Flight Manual Supplements in GAMA Specification #1 format. PSM1-63-1ARB (Series 310) has also been incorporated into Revision 53 of the AFM.

2 Please note that Amendments 18, 19, and 20 have been incorporated into Revision 53 of PSM1-63-POH.

3 Please note that Supplements 7, 26 & 27 have been withdrawn from the approved Supplement List.

4 The following Supplements have been incorporated into the body of the Aircraft Flight Manual at Revision 53:

Supplement 4 ……Propeller Blade Latches (S.O.O. 6048)

Supplement 11……SFAR 23 Compliance

Supplement 22…… Dual AF Antennas

Supplement 23…….. Air Operable Door (S.O.O. 6169)

Supplement 29…….. FAR 36 Noise Compliance

Supplement 32…….. Engine Spark Ignition (Mod S.O.O. 6180 with Mod1849)

Supplement 33 …… Emergency Lights (Mod S.O.O. 6179)

5 Updated Log of Amendments and Approved Supplement List have been provided.

6 Update the Temporary Revisions Index.

7 Update the Record of Revisions.

Note: We recommend that all transmittal letters be kept for record purposes and inserted at the front of the manual.

Contents (Major Sections of this Handbook)

This handbook (Sections 0 through 10 inclusive) comprises the Pilot Operating Handbook (POH), which is a new Viking Air Limited publication with reference number PSM 1-63-POH.

PSM 1-63-POH includes the approved Aircraft Flight Manual and addition and unapproved Supplementary Operating Data.

PSM 1-63-POH also includes excerpts from PSM 1-6-2T (Ground Support Manual), and PSM 1-63-8 (Weight and Balance) that are of use to flight crew. These excerpts have been included in this POH to enable flight crew to easily refer to them. However, both PSM 1-6-2T and 1-63-8 continue to be produced in complete form as stand-alone publications, the content in this POH does not replace these two manuals.

Sections 1 through 5 inclusive and Section 9 of this POH comprise the approved Aircraft Flight Manual (PSM 1-63-1A).

0 INTRODUCTION
1 GENERAL
2 LIMITATIONS
3 EMERGENCY AND ABNORMAL PROCEDURES
4 NORMAL PROCEDURES
5 PERFORMANCE
6 WEIGHT AND BALANCE
7 AIRCRAFT AND SYSTEMS DESCRIPTION
8 HANDLING SERVICING AND MAINTENANCE
9 SUPPLEMENTS
10 SAFETY AND OPERATIONAL TIPS

LOG OF REVISIONS

Revisions are applicable to all Twin Otter Series 300 Flight Manuals. This Manual is valid only when it incorporates all revisions issued. The revised portion of a given page is indicated by a vertical black line in the margin. Transport Canada Approval of each revision is recorded below.

Rev. No.	Pages Affected	Subject	TCCA Approval by Date
53	All Pages	Revisions 1 to 52 incorporated Complete rewrite of Series 300 Flight Manual to adopt GAMA Specification No. 1 Pilot Operating Handbook. Sections and Titles relevant to the Approved Aircraft Flight Manual are listed below. Section 1 – General Section 2 – Limitations Section 3 – Emergency Section 4 – Normal Procedures Section 5 – Performance Section 9 – Approved Flight Manual Supplements	Chief, Flight Test for Director, National Aircraft Certification TRANSPORT CANADA 10 Sep 2010

Rev. No.	Pages Affected	Subject	TCCA Approval by Date

LOG OF REVISIONS

LOG OF AMENDMENTS

An amendment should be inserted in this Flight Manual only when the modification to which it refers is incorporated in the airplane. Each amendmnent must be inserted in the manual facing the page indicated in the footer of each amendment sheet. This manual is valid only when it contains all the amendments issued relative to the airplane modification status. Transport Canada approval of each amendment is recorded below.

Amdt No.	Pages Effected	Subject	Transport Canada Approval by/Date
1 6 Sheets	3-40, 3-41, 3-42, 3-43, 4-18, 4-19	Series 300 Flight Manual (MOT) amalgamated into Series 300 Flight Manual (DOT). (S/Ns 351, 352, 355, 357 and 358)	 June 30, 2005

Amdt No.	Pages Effected	Subject	Transport Canada Approval by/Date

LIST OF SUPPLEMENTS

Supple-ment No.	Issue Status	Subject	Remarks
1	Issue 20	De-Icing System	Complete rewrite to conform to GAMA Spec.No.1| – TC Approved10/09/10.
2	Issue 4	Honeywell H-14 Autopilot	Complete rewrite to conform to GAMA Spec.No.1 – TC Approved 19/01/11.
3	Issue 1	Oxygen System	Complete rewrite to conform to GAMA Spec.No.1 – TC Approved 19/01/11.
5	Issue 3	Intermediate Flotation Gear	Complete rewrite to conform to GAMA Spec.No.1 – TC Approved 19/01/11.
6	Issue 1	Propeller Sychronizer	Complete rewrite to conform to GAMA Spec.No.1 – TC Approved 19/01/11.
8	Issue 6	Auxiliary Wing Tanks	Complete rewrite to conform to GAMA Spec.No.1 – TC Approved 19/01/11.
10	Issue 6	Wheel-Skiplane & Spring-Skiplane Operation	Complete rewrite to conform to GAMA Spec.No.1 – TC Approved 19/01/11.
19	Issue 3	Operation with Inoperative Autofeather System	Complete rewrite to conform to GAMA Spec.No.1 – TC Approved 19/01/11.
20	Issue 4	Floatplane Operation SFAR 23	Complete rewrite to conform to GAMA Spec.No.1 – TC Approved 03/02/11.

Supple-ment No.	Issue Status	Subject	Remarks
21	Issue 4	Coloins AP-106 Flight Control System	Complete rewrite to conform to GAMA Spec.No.1 –TC Approved 19/01/11.
31	Issue 1	Maintained-Contact Start Switch (SOO 6185)	Complete rewrite to conform to GAMA Spec.No.1 –TC Approved 19/01/11.
35	Issue 3	Collins FCS-65 Flight Control System	Complete rewrite to conform to GAMA Spec.No.1 –TC Approved 19/01/11.
36	Issue 2	Transport Category Operations in Australia	Complete rewrite to conform to GAMA Spec.No.1 –TC Approved 19/01/11.
37	Issue 1	Supplemental Performance Data	TC Approved 25/06/2010 – available by special request only.

INTRODUCTION

LIST OF EFFECTIVE PAGES

SECTION	PAGE	DATE	SECTION	PAGE	DATE
0	1	10 Sep. 2010		31	10 Sep. 2010
	2	10 Sep. 2010		32	10 Sep. 2010
	3	10 Sep. 2010		33	10 Sep. 2010
	4	10 Sep. 2010		34	10 Sep. 2010
	5	10 Sep. 2010		35	10 Sep. 2010
	6	10 Sep. 2010		36	10 Sep. 2010
	7	10 Sep. 2010		37	10 Sep. 2010
	8	10 Sep. 2010		38	10 Sep. 2010
	9	10 Sep. 2010		39	10 Sep. 2010
	10	10 Sep. 2010		40	10 Sep. 2010
	11	10 Sep. 2010		41	10 Sep. 2010
	12	10 Sep. 2010		42	10 Sep. 2010
	13	10 Sep. 2010		43	10 Sep. 2010
	14	10 Sep. 2010		44	10 Sep. 2010
	15	10 Sep. 2010		45	10 Sep. 2010
	16	10 Sep. 2010		46	10 Sep. 2010
	17	10 Sep. 2010		47	10 Sep. 2010
	18	10 Sep. 2010		48	10 Sep. 2010
	19	10 Sep. 2010		49	10 Sep. 2010
	20	10 Sep. 2010		50	10 Sep. 2010
	21	10 Sep. 2010		51	10 Sep. 2010
	22	10 Sep. 2010		52	10 Sep. 2010
	23	10 Sep. 2010		53	10 Sep. 2010
	24	10 Sep. 2010		54	10 Sep. 2010
	25	10 Sep. 2010		55	10 Sep. 2010
	26	10 Sep. 2010		56	10 Sep. 2010
	27	10 Sep. 2010		57	10 Sep. 2010
	28	10 Sep. 2010		58	10 Sep. 2010
	29	10 Sep. 2010		59	10 Sep. 2010
	30	10 Sep. 2010		60	10 Sep. 2010

TABLE OF CONTENTS **PAGE**

0.1 Description and Organization of this Handbook 9
0.1.1 Contents 9
0.1.2 Introduction (PSM 1-63-POH) – Section 0 10
0.1.3 Aircraft Flight Manual (PSM 1-63-1A) – Sections 1 to 5 10
0.1.4 Weight and Balance Manual Excerpt (PSM 1-63-8) – Section 6 10
0.1.5 Aircraft and Systems Description (PSM 1-63-1) – Section 7 11
0.1.6 Ground Support Manual Excerpt (PSM 1-6-2T) – Section 8 11
0.1.7 Approved AFM Supplements (PSM 1-63-1A) – Section 9 11
0.1.8 Safety and Operational Tips – Section 10 12

0.2 Revision History 13

0.3 Amendment History 15

0.4 Engineering Orders History 16

0.5 AFM Supplements – Provided by Manufacturer 17

0.6 Supplements Provided by Others 21

0.7 Applicability of this Document 22
0.7.1 1-63-1A-ARB (United Kingdom and Overseas Territories) 22
0.7.2 1-63-1A-AUS (Australia) 23
0.7.3 1-63-1A-MOT (Ministry of Transport – 300S) 23
0.7.4 1-63-1A-M (Metric Measurements) 24
0.7.5 1-63-1A-DOT 24
0.7.6 300M 24
0.7.7 Aircraft Built for Military Customers 24
0.7.8 Summary 24

0.8 Significant Changes made at Revision 53 of the AFM 25
0.8.1 Implementation of SFAR 23 Procedures and Performance 25
0.8.1.1 Wheel Aircraft 25
0.8.1.2 Float Aircraft 25
0.8.1.3 Ski Aircraft 26
0.8.2 Incorporation of Supplement 32 (Spark Ignition) into AFM 26
0.8.3 Withdrawal of Approval for Reduced Power Take-Offs 26

TABLE OF CONTENTS **PAGE**

0.8.4 Restriction of Approval for Operation with Autofeather System Inoperative 28
0.8.5 Introduction of GAMA Format (Section Re-Organizing) 28

0.9 Symbols, Abbreviations, and Terminology 31
0.9.1 Publication Related Terminology 31
0.9.1.1 Revisions 31
0.9.1.2 Revision Procedure 31
0.9.1.3 Amendments 31
0.9.1.4 Supplements 32
0.9.1.5 Supplement Revision Procedure 32
0.9.1.6 Engineering Orders 33
0.9.1.7 Modifications 33
0.9.1.8 Standard Order Options 33
0.9.1.9 Minimum Equipment List 34
0.9.2 Notes, Cautions and Warnings 36
0.9.3 Procedures 36
0.9.3.1 Normal Procedure 36
0.9.3.2 Abnormal Procedure 37
0.9.3.3 Emergency Procedure 37
0.9.4 Metric (S.I.) Values 37
0.9.5 Blank Pages 37

0.10 General Airspeed Terminology and Symbols 38

0.11 Meteorological Terminology 42

0.12 Engine Power Terminology 44

0.13 Aircraft Performance and Flight Planning Terminology 52

0.14 Unscheduled Landing Terminology 55

0.15 Regulatory Acronyms 56

0.16 Conversion Information 58

0.17 About Viking Air Limited 59

List of Tables Page

0-1 Revision History 13
0-2 Amendment History 15
0-3 Engineering Orders History 16
0-4 AFM Supplements 17
0-5 Section Re-ordering 29

0.1 Description and Organization of this Handbook

0.1.1 Contents

Two different publications have been consolidated together in this Pilot Operating Handbook (POH), and excerpts from two additional publications are reproduced in this POH.

The entire document, Sections 1 through 10 inclusive, comprises the Pilot Operating Handbook, a new publication which has been assigned the publication number PSM 1-63-POH.

The first subsumed publication is the Supplementary Operating Data (SOD). This is publication number PSM 1-63-1. 'PSM' is an abbreviation for Product Support Manual, and '63' designates the DHC-6, 300 Series. 1 was assigned to the SOD. Sections 0, 1, 7, and 10 of this POH contain information previously published in the SOD.

The second subsumed publication is the Aircraft Flight Manual (AFM). This is publication number PSM 1-63-1A. '1A' was assigned to the AFM. Sections 1 through 5 inclusive of this POH, plus any applicable supplements in Section 9, comprise the approved Aircraft Flight Manual.

Each page of the AFM portion of this POH has the publication number printed on it, and for clarity, each page also carries the notation "TC Approved". Because the aircraft was manufactured in Canada, Transport Canada is the regulatory authority responsible for approving the contents of the AFM. Transport Canada was formerly called the Department of Transport (D.O.T.).

If an aircraft is registered in a country other than Canada, it is normal practice for the regulatory authority of the state of registration to also add their approval (by way of stamp, signature, cover letter, etc.) to the approval page of the AFM. Note that provision has been made on the approval page to fill in the serial number and the registration of the specific aircraft that this AFM applies to. AFMs are not generic, and they will differ from aircraft to aircraft as a result of different supplements and/or amendments required for equipment that has been fitted to the aircraft.

Each aircraft must be equipped with an AFM that has been customized (by way of adding and removing supplements from Section 9, and in some cases, adding amendments to Sections 2, 3, and 4) to reflect the equipment that is fitted to that particular serial number aircraft, and each approved AFM must be marked with the serial number and registration of the aircraft to which it applies on the Approval Page of the AFM. This customized binder then forms part of the basic equipment of the aircraft and must be carried on board the aircraft at all times in a location easily accessible to the pilot.

0.1.2 Introduction (PSM 1-63-POH) – Section 0

The Introduction section contains an explanation of which DHC-6 aircraft this document applies to, a description of the POH, terms used in it, how it is organized, a list of past revisions, a list of past amendments, a list of all supplements that have been provided by the manufacturer, and a list of past engineering order amendments.

0.1.3 Aircraft Flight Manual (PSM 1-63-1A) – Sections 1 to 5

The Aircraft Flight Manual (AFM) is regulatory in nature and must be obeyed. All text is written in the imperative form. No other publications, such as operator checklists, local operating procedures, company flight standards, etc. are permitted to conflict with or take priority over the AFM. It is permitted to create operator-specific or aircraft-specific quick reference checklists for daily use in the aircraft, provided that the content of these checklists does not conflict with the AFM procedures. If it is found that an aircraft is being operated in a manner that is not consistent with the directions published in the AFM, both the pilot(s) and the operator may be liable to enforcement or disciplinary action from their regulatory authority.

The layout and content of the AFM is defined by the certification regulations that were applicable to the DHC-6 at the time the aircraft was built. The main body of the AFM consists of five sections: General, Limitations, Emergency and Abnormal Procedures, Normal Procedures, and Performance. These sections are numbered 1 to 5 respectively, and the contents of these first 5 sections apply to DHC-6 aircraft SNs 130, 230, and 231 through 844. Section 9 contains approved AFM Supplements which describe optional equipment that may be fitted to aircraft within this range of serial numbers.

Page numbering within the first five sections of the AFM follows the format “a-b”, where “a” represents the section number, and “b” represents the page number. Page numbering within the AFM supplements (Section 9) follows the format “a-s-b”, where “s” represents the supplement number.

0.1.4 Weight and Balance Manual Excerpt (PSM 1-63-8) – Section 6

The information contained in the Weight and Balance section (Section 6) explains procedures to be followed to determine aircraft weight, arm, and moment.

There are two sections to the complete Weight and Balance Manual. The first section, General Weight and Balance Data, is generic and is identical for all aircraft. The contents of this first section have been reproduced in Section 6 of this POH. The second section of PSM 1-63-8, Specific Weight and Balance Data, is comprised of a detailed list of equipment fitted to each individual aircraft and the actual current and historical aircraft weighing records. The second section of PSM 1-63-8 is customized and unique to each serial number aircraft, and is not reproduced in this POH.

The complete Weight and Balance Manual PSM 1-63-8 continues to be provided as a stand-alone publication.

0.1.5 Aircraft and Systems Description (PSM 1-63-1) – Section 7

The Aircraft and Systems Description section of this POH was formerly called the Supplementary Operating Data (SOD) Manual, and later, the Operating Data Manual. It is publication number PSM 1 63-1. For clarity, and to conform to current industry norms, the contents of PSM 1-63-1 are now presented in two different sections of this POH – Section 7 (Aircraft and Systems Description), and Section 10 (Safety and Operational Tips). Unlike Sections 1 through 5 (which comprise the AFM) and Section 9 (AFM Supplements), the information in Sections 0, 7, and 10 has not been approved by Transport Canada.

0.1.6 Ground Support Manual Excerpt (PSM 1-6-2T) – Section 8

The information contained in the Handling, Servicing and Maintenance Section of this POH provides guidance and information concerning towing, storage, and protection of the aircraft as well as provision of services such as fuel and external power.

There are several sections within the complete Ground Support Manual, which is PSM 1-6-2T. The first section contains information that is of use to the pilot, and only the contents of this section have been reproduced in Section 8 of this POH. Subsequent chapters of PSM 1-6-2T are comprised of lists of special tools required to service and maintain the aircraft, and are not of value to flight crew.

The complete Ground Support Manual PSM 1-6-2T continues to be provided as a stand-alone publication.

0.1.7 Approved AFM Supplements (PSM 1-63-1A) – Section 9

The basic Series 300 DHC-6, defined by de Havilland Canada drawing C6-1000 and designated C6-1000-7, did not include any Standard Order Options (S.O.O.). Sections 1 through 5 of the AFM provide approved procedures that are applicable to all aircraft in ‘basic’ configuration – in other words, with standard landplane gear and no optional equipment installed.

Numerous options were offered to customers, such as de-icing equipment, floats, skis, wheel-skis, long range fuel tanks, air conditioning, a number of different autopilots, etc. De Havilland published a total of 36 different Transport Canada approved AFM supplements during the production run of the Series 300 DHC-6.

Only the AFM supplements that actually apply to the equipment fitted to an aircraft should be included in the AFM for that aircraft. Supplements that describe equipment that is not fitted to an aircraft should be discarded. There is no need to retain

unnecessary supplements for future reference, because supplements can be obtained upon request from Viking Air Limited.

It is likely that additional equipment (for example, GPS receivers, 406 MHz ELT transmitters, Mode S transponders, TAWS, multi-function displays, floats provided by other manufacturers such as Wipaire, etc.) has been fitted since the aircraft left the factory. It is the responsibility of the aircraft operator to ensure that a locally approved AFM supplement for each piece of equipment that has been added since the aircraft was built is provided in this POH, and filed in Section 9.

All approved AFM supplements (both manufacturer provided and aftermarket) follow the same structure. They are organized as if they were miniature flight manuals: Operating Limitations, Emergency and Abnormal Procedures, Normal Procedures, and Performance Data. If an aircraft is fitted with equipment described in an AFM supplement, the pilot must be familiar with the contents of the supplement, and apply the procedures in the supplement(s) in addition to the procedures set forth in the body text of the AFM.

0.1.8 Safety and Operational Tips – Section 10

Section 10 contains additional narrative information that expands and elaborates on procedures presented in the approved sections of the AFM. Some of this information was previously published in PSM 1-63-1.

Section 10 also contains performance charts presenting additional flight planning and performance data that was produced by de Havilland for operator convenience but was not required for certification purposes. This data is unapproved, in the sense that no regulatory authority has reviewed and approved it, but it has been checked for accuracy by de Havilland and can be considered trustworthy. The data was collected using a new aircraft equipped with new engines.

Section 10 also includes procedures that describe Maximum Performance STOL (MPS) operations. MPS procedures do not provide the minimum level of safety required by CAR 3 and SFAR 23, and may only be used by an operator when written approval has been obtained from the state of registry of the aircraft.

0.2 Revision History

Fifty-two previous revisions have been issued for the AFM since it was originally printed in August of 1970. Revision 53, released in 2010, is a complete re-write of PSM 1-63-1A that incorporates all of these revisions. For reference purposes, the details of revisions issued in the past 20 years (Revisions 42 to 53) have been provided in the revision history list below.

Table 0-1 Revision History

Revision Number	Date	Subject	Remarks
42	1991	Revised normal landing procedures	Permission to use flaps 20° for normal landings.
43	1993	Major revision of manual	Many normal and emergency procedures changed and updated, Amendments 1 to 17 incorporated into body text of manual.
44	1993	Error correction, change to approach speeds	To correct minor errors found in Revision 43. Introduction of minimum approach speeds.
45	1995	Change to placard	Change made to placard in flight compartment.
46	1998	Operations procedures in icing conditions	Changes to manual, all autopilot supplements addressing operations in icing conditions.
47	1999	Engine igniter switches	Deletion of reference to igniter switches for aircraft with electronic spark ignition system.
48	2002	Expanded procedures	Ground test procedures for some systems changed.
49	2002	Operations procedures in icing conditions	Re-issue of Supplement 1, De-icing System.
50	2002	Australian Series 320	Incorporation by amendment of procedures for Australian Series 320 aircraft.
51	2002	Error correction	Error corrections to one page of SFAR 23 Supplement 11.

Table 0-1 Revision History (continued)

Revision Number	Date	Subject	Remarks
52	2005	Series 300S aircraft	Incorporation by Amendment 21 of procedures for Series 300S aircraft (five unique serial numbers). Other minor changes.
53	2010	Total re-write and re-issue of manual	Re-organized to conform to GAMA Specification 1 and AC 25.1581.1, Series 310 Manual incorporated, SFAR 23 procedures adopted as basic, performance charts re-drawn for clarity and simplicity, obligation to use full take-off power, withdrawal of approval for reduced power take-offs, publication PSM 1-63-POH created.

0.3 Amendment History

Twenty-one amendments have been issued for the AFM since it was first printed in August of 1970.

Amendments 1 through 17 inclusive were incorporated into the body text of the AFM at the last major manual re-write, which was Revision 43, issued in 1993. Since then, four additional amendments (18 through 21 inclusive) have been published. The first three of these amendments, which addressed Series 320 differences, have been incorporated into the body text of this AFM at Revision 53.

Amendment 21 is still in effect as a stand-alone document, and is available upon request from Viking.

For reference purposes, the details of amendments 18 through 21 have been provided in the list of amendments below.

Table 0-2 Amendment History

Amendment Number	Date	Subject	Remarks
18	2002	Australian airspeed indicator	Amendment describing different markings on the airspeed indicator and limitations placard of aircraft equipped with S.O.O. 6120.
19	2005	Australian fire alarm	Amendment describing S.O.O. 6123, which only applies to Series 320 with serial numbers lower than 311.
20 R1	2005	Australian avionics	Amendment describing S.O.O. 6121.
21	2005	Series 300S	Applicable to aircraft SNs 351, 352, 355, 357 and 358 only. This amendment is available upon request from Viking.

0.4 Engineering Orders History

Three engineering orders were incorporated into the body text of the AFM in the 1970s.

Table 0-3 Engineering Orders History

Engineering Order Number	Date	Subject	Remarks
68473	1975	DC powered left hand attitude indicator	The same concept as S.O.O. 6176 (mandatory for Series 310).
68547	1975	Aft fuel quantity indicator powered by right AC bus	Only applicable to a limited number of aircraft with S.O.O. 6142 (dual inverter switches) fitted.
68715	1978	Caution label concerning center of gravity on aircraft with special purpose avionics	Only applicable to a very small number of aircraft with specialized scientific or reconnaissance avionics fitment. Label warns about exceeding forward C of G limit with empty cabin and low fuel quantity.

0.5 AFM Supplements – Provided by Manufacturer

De Havilland issued AFM supplements numbered from 1 to 35 during the production run of the Series 300 DHC-6. Supplement 36 was issued in 2002 to enable Australian operators to use the Series 300 manual. A list of supplements published appears below. Be aware that supplements themselves are subject to revision; for example, the current issue (as of 2010) of Supplement 1 is issue 20.

The list below is NOT the "Log of Supplements". The Log of Supplements that describes the supplements applicable to the aircraft for which this POH is issued, appears at the beginning of Section 9. The table below is simply a reference list of every supplement that either de Havilland or Viking has ever issued.

Table 0-4 AFM Supplements

Supplement Number	Issue Status	Subject	S.O.O., Mod, Remarks
1	Issue 20	De-Icing System	For aircraft with S.O.O. 6004, 6005, 6006, 6007, 6008 6009 or 6157, 6062, and Mods 6/1393, 6/1779 and 6/1827
2	Issue 4	Honeywell H-14 Autopilot	S.O.O. 6085. Very old electro-pneumatic autopilot
3	Issue 1	Oxygen System, Crew and Passengers	S.O.O. 6044, 6101
4	**Withdrawn**	Propeller Blade Latches	S.O.O. 6022 incorporated into the body of the basic AFM at Revision 53
5	Issue 3	Intermediate Flotation Gear	S.O.O. 6048
6	Issue 1	Woodward Propeller Synchronizer	S.O.O. 6099. A rare option
7	**Withdrawn**	Floatplane Operation CAR 3	SUPPLEMENT WITHDRAWN FROM APPROVED SUPPLEMENT LIST – Use Supplement 20
8	Issue 6	Wing Fuel Tanks	S.O.O. 6095
Supplements marked 'withdrawn' are no longer valid and must not be used.			

Table 0-4 AFM Supplements (continued)

Supplement Number	Issue Status	Subject	S.O.O., Mod, Remarks
	Original	J.B. Air Conditioner System	S.O.O. 6109, STC SA1837WE Under cabin floor near seat rows 6 and 7
10	Issue 6	Skiplane	S.O.O. 6001 (Wheel Skiplane) S.O.O. 6116 (Spring Skiplane)
11	**Withdrawn**	SFAR 23 Compliance	Incorporated into the body text of the basic AFM at Revision 53
12			Never issued
13	Issue 3	Bendix M-4C Flight Controller	E.O. 68304. Very rare
14 through 18			Never issued
19	Issue 3	Operation with inoperative autofeather system	Only permits temporary operation IAW time limitations in Minimum Equipment List
20	Issue 4	Floatplane Operation SFAR 23	S.O.O. 6082
21	Issue 4	Collins AP-106 Autopilot	S.O.O. 6162. Most common autopilot fitted
22	**Withdrawn**	Dual HF Antennas	Incorporated into the body of the basic AFM at Revision 53
23	**Withdrawn**	Air Operable Door	S.O.O. 6169. Incorporated into the body of the basic AFM at Revision 53, 2010
24	Original	Oxygen system for crew of 6 (115 cubic feet)	Rare military option
25	Original	SAR with LASR-2 radar	Rare military or maritime patrol aircraft option. Large chin mounted radome installed under nose baggage compartment
Supplements marked 'withdrawn' are no longer valid and must not be used.			

Table 0-4 AFM Supplements (continued)

Supplement Number	Issue Status	Subject	S.O.O., Mod, Remarks
26	**Withdrawn**	90% power take-off SFAR 23	SUPPLEMENT WITHDRAWN FROM APPROVED SUPPLEMENT LIST
27	**Withdrawn**	90% power take-off CAR 3	SUPPLEMENT WITHDRAWN FROM APPROVED SUPPLEMENT LIST
28	Issue 2	Water bomber operation	For state (i.e public service) registered float aircraft with E.O. 68788 only
29	**Withdrawn**	FAR 36 Noise compliance	Incorporated into the body of the basic AFM at Revision 53
30			Never issued
31	Issue 1	Maintained contact starter switch installation	S.O.O. 6185, allows one-handed starting of aircraft. Includes a 'Start ON' light
32	**Withdrawn**	Electronic spark ignition as replacement for glow plugs and ballast tubes	S.O.O. 6180, available for retrofit by Mod 6/1912. Incorporated into the body of the basic AFM at Revision 53
33	**Withdrawn**	Emergency lights in cabin	S.O.O. 6179. Aircraft will have a three position emergency light switch in the flight compartment. Incorporated into the body text of the basic AFM at Revision 53
34	Original	Oxygen system for crew of 6 (275 cubic feet)	E.O. 68958. Rare military option
35	Issue 3	Collins FCS-65 Flight Control System	S.O.O. 6188. Most modern OEM fitted autopilot
36	Issue 2	Transport Category Operations in Australia	Applicable to Series 320 aircraft on Australian register. Issued in 2002, revised in 2005
Supplements marked 'withdrawn' are no longer valid and must not be used.			

Table 0-4 AFM Supplements (continued)

Supplement Number	Issue Status	Subject	S.O.O., Mod, Remarks
37	Original	Supplemental Data for use in Evaluating Operational Performance Requirements	Issued in 2010 to provide additional performance information required to comply with new operating regulations
38	Issue D	Wipline Straight Floats	STC SA2CH (FAA) STC SA93-103 (TCCA)
39	Issue 6	Wipline Amphibious Floats	STC SA2CH (FAA) STC SA93-103 (TCCA)
Supplements marked 'withdrawn' are no longer valid and must not be used.			

Only supplements that describe equipment actually fitted to a specific aircraft should be placed in Section 9. Supplements describing equipment that is not fitted to the aircraft that this AFM refers to should be removed from Section 9 and discarded.

0.6 Supplements Provided by Others

If a modification is made to an aircraft and this modification affects the limitations, normal operating procedures, emergency operating procedures, or the performance of the aircraft, a locally approved AFM supplement must be provided. This locally approved supplement should be inserted in Section 9 of this POH, along with any previously listed de Havilland AFM supplements applicable to the aircraft this flight manual applies to.

Examples of equipment that is commonly installed after the aircraft has left the factory include GPS receivers, 406 MHz ELTs, TCAS, TAWS, satellite telephones, satellite tracking systems and other avionics upgrades, as well as any modifications to the engines or propellers fitted to the aircraft.

0.7 Applicability of this Document

This Pilot Operating Handbook provides guidance to pilots, operators and regulators of all DHC-6 Series 300 and variant aircraft, SNs 130, 210, and 231 through 844 inclusive. Variants of the DHC-6 Series 300 include the Series 310, 320, 300S, and 300M. The Series 300 was the third production series of DHC-6 aircraft and received Transport Canada type certification in April of 1969. Series 300 and variant aircraft can be identified by PT6A-27 engines in place of the PT6A-20 engines used on earlier aircraft, an increase in all-up weight to 12,500 pounds, the addition of two plug-type exits in the forward portion of the passenger cabin, and deletion of the roof exit from standard production aircraft.

In past years, numerous different DHC-6 AFMs have been published in response to requests from regulatory authorities to modify both the aircraft and the flight manual to satisfy local regulatory requirements. Revision 53 supersedes and completely replaces the following AFMs: 1 63-1A, 1-63-1A-ARB, 1-63-1A-AUS, 1-63-1A-M, 1-63-1A-MOT, and 1-63-1A-DOT. A brief description of the origin and rationale behind each of these previously issued manuals follows.

0.7.1 1-63-1A-ARB (United Kingdom and Overseas Territories)

In 1969, the United Kingdom Air Registration Board (ARB) mandated certain physical modifications to the design of the basic Series 300 aircraft to conform to the then-current requirements of both the UK Air Navigation Orders and the Colonial Air Navigation Orders. The physical modifications made to the aircraft itself consisted of changes to the design of the AC electrical system (S.O.O. 6142), installation of emergency lighting (S.O.O. 6098 or 6179), provision of generator overheat detection (S.O.O. 6031), changes to the structure surrounding the windshield (S.O.O. 6187 or 6027), provision of break-in markings on the outside of the aircraft (S.O.O. 6150), a visual indication of fuel crossfeed valve status (S.O.O. 6035), modifications to the attitude indicators (S.O.O. 6176) and other minor improvements (Mods 6/1272, 6/1435, 6/1470 or 6/1472, 6/1601 and 6/1697, all of which were subsequently incorporated into standard Series 300 aircraft). In certain cases – most notably the changes to the AC electrical system – different operating procedures are required; however, none of these physical changes affected the performance characteristics or the capabilities of the aircraft in any way.

The ARB also mandated changes in the way that certain procedures (such as a normal take-off) were carried out, and as a result of these changes, different performance data was recorded and published, and the markings on the airspeed indicator and the flight compartment limitations placard were changed (S.O.O. 6093).

Aircraft that were physically modified to meet UK ARB requirements were identified as ‘Series 310’, and were provided with a different Aircraft Flight Manual. This Series 310

AFM will no longer be maintained as a separate publication. It is now out of date and should be discarded.

Procedures applicable to the physical differences embodied in Series 310 aircraft were incorporated into the basic Series 300 AFM as 'amendments' at various times between the publication of amendment 7 in 1970 and the publication of amendment 17 in 1980. In 1993, all of these amendments were incorporated into the body text of the basic Series 300 AFM at Revision 43.

0.7.2 1-63-1A-AUS (Australia)

The Australian CAA also requested modifications to the aircraft, notably provision of an altimeter calibrated in millibars (S.O.O. 6122), additional water drains for the fuel tanks (S.O.O. 6118), relocation of the inverter switch (S.O.O. 6127), better impact protection for the baggage compartment lights (S.O.O. 6126), an audible warning when the autopilot is disconnected (S.O.O. 6121), and changes to the airspeed indicator and operating limitations placard (S.O.O. 6120).

None of these modifications affected the actual performance capability of the aircraft, although the changes to the airspeed indicator and operating limitations placard did change the limitations that the Australian CAA imposed on the aircraft. Aircraft that were modified to meet Australian CAA requirements were identified as 'Series 320', and were provided with a different flight manual.

In 2000, the Australian Civil Aviation Safety Authority (CASA) mandated a shift away from Australia-specific flight manuals for the Series 320. In 2002, amendments 18, 19, and 20 to the basic Series 300 AFM allowed Australian operators to use the basic AFM for their aircraft. These amendments have now been incorporated into the body text of the basic Series 300 AFM at Revision 53.

Supplement 36, CAO 101.4 Transport Category Operation, remains in effect and is available to Australian operators who wish to operate in accordance with this performance standard.

0.7.3 1-63-1A-MOT (Ministry of Transport – 300S)

Six specially modified 'Series 300S' aircraft (of which SNs 351, 352, 355, 357 and 358 remain in service) were built for delivery to Airtransit in Canada during the 1970s. These aircraft were equipped with enhanced systems that met the then-current requirements of FAR 25, with wing spoilers, anti-skid braking systems, and other performance enhancements. All of these aircraft were subsequently acquired by Transport Canada for their own internal use and the majority of the modifications that affected aircraft performance (for example, wing spoilers and anti-skid systems) were either removed entirely or rendered permanently inoperative.

Amendment 21 to the basic Series 300 AFM, issued in 2005, allowed operators of Series 300S aircraft to use the basic AFM for their aircraft. This amendment is available from Viking Air Limited upon request by operators of these serial numbers, and must be inserted in this flight manual for use with these serial number aircraft.

0.7.4 1-63-1A-M (Metric Measurements)

This manual provided the same information as PSM 1-63-1A, but gave measurements in metric units. It is no longer published or supported.

0.7.5 1-63-1A-DOT

This was the basic DHC-6 AFM prior to the release of this revision. The suffix 'DOT' (Department of Transport) has been deleted from the name of this newly revised document.

0.7.6 300M

Two 'Series 300M' aircraft were built for military demonstration purposes. They were eventually sold for public service (fishery patrol) use. The only physical difference that would affect aircraft performance of these aircraft was the installation of a large radome under the nose of the aircraft, and performance information specific to fitment of that radome is contained in a special AFM supplement that was provided with those aircraft. Otherwise, the basic Series 300 AFM (PSM 1-63-1A), should be used for these aircraft.

0.7.7 Aircraft Built for Military Customers

Many DHC-6 aircraft, including but not limited to aircraft UV 18 and CC 138, were built for military customers and were specially configured, or equipped as described in various Engineering Orders (E.O.) that accompanied the aircraft. As long as these aircraft remain in military service, this basic Series 300 AFM, plus any supplements, amendments, or engineering orders applicable to these aircraft, may be used at the discretion of the operator as a basis for developing military operating procedures. If these aircraft are brought onto the civil register in the future, it is the responsibility of the new owner to bring the aircraft into compliance with the type certificate for the basic Series 300 aircraft before placing it on the civil register.

0.7.8 Summary

There is now only one approved Aircraft Flight Manual for all DHC-6 aircraft SNs 130, 210 and 231 through 844, inclusive. It is contained within this new publication, the Pilot Operating Handbook, PSM 1-63-POH.

0.8 Significant Changes made at Revision 53 of the AFM

Revision 53 of the AFM, published in 2010, is a complete re-write and re-issue of the entire AFM. As a result, no page in Sections 1 through 5 inclusive of the AFM will have a revision number lower than 53.

All amendments published prior to 2008 with the single exception of Amendment 21 have been incorporated into the body text of the basic AFM at Revision 53. Therefore, no previously published amendments (green coloured sheets) with amendment numbers 20 or lower should be found filed in this AFM. Amendment 21 applies only to five unique Series 300S aircraft, SNs 351, 352, 355, 357, and 358, and has not been included in general distribution of this document. Amendment 21 is available upon request from Viking Air Limited.

Section numbering and document layout has been changed to conform to best industry practices in the General Aviation Manufacturers Association (GAMA) Specification 1 for AFM layout. Although the DHC-6 is a CAR 3 aircraft, every attempt has been made to conform to FAA Advisory Circular AC 25-1581-1, which provides guidance for construction of Part 25 transport category AFMs.

Performance data pertaining to different certification standards (CAR 3, SFAR 23, BCAR, Australian) that was previously found in many different publications has been consolidated together into Section 5 of this document. SFAR 23 standards are now used as the baseline. It is the responsibility of the operator to determine which certification standard must be complied with in the country of registration of their aircraft.

0.8.1 Implementation of SFAR 23 Procedures and Performance

0.8.1.1 Wheel Aircraft

As noted at the beginning of the limitations section, the basis of certification of Series 300 DHC-6 aircraft was initially CAR 3 and subsequently SFAR 23. Effective with this revision, SFAR 23 procedures and performance data for landplanes and floatplanes have been used as the baseline for approved procedures and operational checklists. SFAR 23 procedures and performance data provide a higher level of safety than CAR 3 procedures. Supplement 11 (SFAR 23 Compliance – landplanes) has been incorporated into the body text of the basic AFM and is therefore no longer published as a stand-alone supplement.

0.8.1.2 Float Aircraft

AFM supplement 7 “Floatplane Operation (CAR 3)” has been withdrawn. AFM Supplement 20 “Floatplane Operation (SFAR 23)” should be used for float operations when aircraft are equipped with Canadian Aircraft Products (CAP) straight floats.

Approved AFM supplements published by the float manufacturer (for example, Wipaire) should be used when the aircraft is operated on straight floats or amphibious floats provided by a manufacturer other than Canadian Aircraft Products. The information, procedures, and performance data presented in the supplements will take precedence over the AFM when alternative gear has been fitted to the aircraft by STC.

0.8.1.3 Ski Aircraft

Wheel-skiplane and spring-skiplane operations continue to be governed by AFM Supplement 10, which conforms to CAR 3 certification criteria. Procedures in Supplement 10 have been updated.

0.8.2 Incorporation of Supplement 32 (Spark Ignition) into AFM

Ballast tubes for the original design glow plug ignition system are no longer manufactured. Because many DHC-6 operators have elected to replace the original glow plug and ballast tube ignition system with electronic spark ignition by retrofitting Mod 6/1912, and because it is foreseen that the entire fleet will eventually change over to electronic spark ignition due to unavailability of new production ballast tubes, procedures for operation with spark ignition have been incorporated into the body text of the AFM, and the supplement has been withdrawn. Where operational differences exist for procedures with glow plugs and procedures with spark ignition, both procedures are presented in the AFM.

0.8.3 Withdrawal of Approval for Reduced Power Take-Offs

Two previously issued supplements which granted approval for alternate methods of operating the aircraft have been withdrawn. These are the following:

Supplement 26, Take-off with 90% take-off power (SFAR 23)

Supplement 27, Take-off with 90% take-off power (CAR 3)

These two supplements were originally published shortly after the PT6A-27 engine was introduced to service. At the time, publication of these supplements was a logical follow-on action to the earlier publication of similar 90% power take-off supplements for the Series 100 and 200 DHC-6 that were fitted with 550 HP PT6A-20 engines. There are differences between the -20 engine and the -27 engine and operational experience over the past 30 years has proved that operations with reduced take-off power on Series 300 aircraft equipped with the -27 engines does not increase engine service time between overhaul or increase engine service time between hot section inspections.

The -27 engine was developed by Pratt and Whitney to provide 680 shaft horsepower. When installed on DHC-6 aircraft, this engine is flat rated to a maximum of 620

horsepower (equivalent to 50 PSI torque). This flat rating was imposed for airframe related reasons – primarily to reduce V_{MC}. Because of this flat rating, a full power, 50 PSI torque take-off at ISA conditions will only extract 91% of the power that the engine is designed to deliver. Therefore, there is no benefit from imposing a further reduction (in effect, 90% of 91%, which is 82%) on take-off power.

Once sea level temperatures exceed 33°C, the engine will reach its thermodynamic limit prior to reaching the flat rating limit. The engine then begins to work at 100% of capacity, even though maximum calculated take-off torque may be equal to or less than 50 PSI. Under these circumstances, it is important that the pilot ensure prior to each flight that the engines are, in fact, capable of producing the rated power. At ISA +18°C or higher, all performance calculations including single engine calculations are based on the assumption that each engine will produce full calculated power for the applicable airport temperature and elevation. The pilot must confirm that each engine is capable of producing full calculated power under these conditions by referring to the take-off power setting chart (or torque calculator), determine calculated take-off torque for the prevailing ambient conditions, and then setting that torque value for take-off.

If an engine is not capable of making full calculated take-off power when operating against the thermodynamic limit (in other words, at ISA +18°C or higher), or if an engine reaches the T_5 limit or the N_G limit prior to reaching the full calculated take-off power limit, then the condition of the engine has deteriorated and the problem must be investigated and corrected before flight. If the engine cannot reach full calculated take-off power, or if the T_5 or N_G limit is reached before the full calculated take-off power limit, **the aircraft is not airworthy and it must not be flown**. The same reasoning applies when the engine is operating against the flat rating limit, for example, at lower air temperatures when calculated take-off power is limited by flat rating to 50 PSI torque.

Experience has shown that unless full calculated take-off power, as derived from the take-off power setting chart (either the flat rating limit, or the thermodynamic power limit, whichever is reached first) is used on every take-off, the pilot, maintenance technician, or aircraft operator may not be aware of the onset of problems that prevent the engine from reaching full calculated take-off power. Accident investigations have revealed that if an operator establishes an ‘across the board’ reduced power limit for normal operations pilots will typically continue to comply with the reduced power limitation during emergency conditions, often with disastrous results.

It is for these reasons that permission to make reduced power take-offs in Series 300 DHC-6 aircraft has been rescinded. The AFM now explicitly states in Section 4, Normal Procedures, that take-off torque must be determined using the power setting chart or torque calculator and then set to that value for each take-off. Lower take-off power settings are not permitted. After completion of flap retraction, pilots and operators may choose the value they wish for safe climb and cruise torque as long as it does

not exceed the values given in the climb and cruise power setting charts. There is no obligation to use maximum calculated power for climb and cruise.

0.8.4 Restriction of Approval for Operation with Autofeather System Inoperative

The autofeather system was provided as basic equipment on all Series 300 aircraft, and it is an important safety system. When the recommended modifications to the autofeather system have been embodied on the aircraft (in particular, Mod 6/1470 and Mod 6/1329, which were cut in as basic to the aircraft beginning at SN 471 and 291 respectively), the system has proven reliability. The probability of failure of the autofeather system to function when it should (following a substantial loss of thrust from an engine) has been demonstrated to be less than 1×10^{-4}, and the probability of the autofeather system feathering a satisfactorily operating engine has been demonstrated to be extremely improbable – less than 15×10^{-6}. By way of comparison, the probability of an engine actually failing at anytime during a flight (based on the same data, collected in the 1970s) is 40×10^{-6}.

Supplement 19, Operation with Autofeather System Inoperative, was published to permit short-term operation of the aircraft without a functional autofeather system until such time as parts could be ordered and the aircraft repaired. Some operators have used this supplement to justify removal of the autofeather system, or to permit operation for extended periods of time with an inoperative autofeather system. This is not the purpose of the supplement. The supplement exists to allow temporary, short-term operation of the aircraft, within the limitations imposed by the MEL, until such time that an inoperative autofeather system can be repaired.

0.8.5 Introduction of GAMA Format (Section Re-Organizing)

Previous versions of the DHC-6 AFM have had their sections organized in a format that was commonly used for Part 23 aircraft certified in the 1960s and 1970s. Effective with this revision, section numbering has been changed to conform to the General Aviation Manufacturer's Association (GAMA) Specification 1 for Pilot Operating Handbooks, Revision 2 (1996).

GAMA Specification 1 was developed by representatives of major aircraft manufacturers to ensure that Pilot Operating Handbooks are of maximum usefulness as an operating reference book for pilots, comply with government regulatory requirements where applicable, and meet industry standards for scope of material, arrangement, nomenclature and definitions. The differences in organization between previous versions of the DHC-6 Twin Otter Aircraft Flight Manual and this POH are as follows:

Table 0-5 Section Re-ordering

Section Description	Previous Twin Otter Manuals	This POH
Front Matter, Content Lists, Approvals, Logs of Changes	Front of book (prior to Introduction)	Front of book (prior to Introduction)
Introduction	Introduction	Section 0 – Introduction
General	Not Present	Section 1 – General
Limitations	Section 1	Section 2 – Limitations
Normal Operating Procedures	Section 2	Section 4 – Normal Procedures
Emergency Procedures	Section 3	Section 3 – Emergency Procedures
Abnormal Procedures	Combined with Emergency Procedures in Section 3	Combined with Emergency Procedures in Section 3
Performance Charts	Section 4	Section 5 – Performance (Certification Data)
AFM Supplements	Section 5	Section 9 – AFM Supplements
Weight and Balance	Published as a stand-alone manual, PSM 1-63-8	Section 6 – Weight and Balance
Safety of Flight Supplements	Published in a different manual, Front Matter of PSM 1-63-1	Section 10 – Safety and Operational Tips
Aircraft Description	Published in a different manual, Part 1 of PSM 1-63-1	Section 7 – Aircraft and Systems Description
All Weather Operation	Published in a different manual, Part 2 of PSM 1-63-1	Section 10 – Safety and Operational Tips
Flight Characteristics	Published in a different manual, Part 3 of PSM 1-63-1	Section 10 – Safety and Operational Tips
Maximum Performance STOL	Published in a different manual, Part 4 of PSM 1-63-1	No Longer Published

Table 0-5 Section Re-ordering (continued)

Section Description	Previous Twin Otter Manuals	This POH
Supplementary Operating and Performance Data	Published in a different manual, Part 5 of PSM 1-63-1	Section 10 – Safety and Operational Tips
Supplements to Aircraft Description	Published in a different manual, Part 6 of PSM 1-63-1	Incorporated into approved AFM Supplements, (subsection 7 of each Supplement)
Ground Support	Published as a stand-alone manual, PSM 1-6-2T	Section 8 – Handling, Servicing, and Maintenance

0.9 Symbols, Abbreviations, and Terminology

0.9.1 Publication Related Terminology

0.9.1.1 Revisions

Revisions are changes which affect all Pilot Operating Handbooks and all aircraft. They may consist of revised operating procedures, additional practices or procedures affecting personnel, aircraft, or equipment safety; revised operating limitations or performance data or corrections.

Example of a Revision:

1 Revision 39, issued in 1984, introduced a new crosswind landing technique that applied to all Series 300 DHC-6 aircraft.

2 Revision 53, issued in 2010, is a complete rewrite of the manual that applies to all Series 300 DHC-6 aircraft.

Future changes to the POH text or illustrations arising from revisions will be identified by a vertical revision bar (black line) in the outside margin of the affected page, next to the change.

0.9.1.2 Revision Procedure

To keep this POH current, revisions will be issued to the most recent registered owner of the aircraft. Revisions to the POH will consist of a Transmittal Letter, a Log of Revisions, a Log of Temporary Revisions, a List of Effective Pages, and any new or revised pages. If a supplement or amendment is revised, it will be accompanied by a new Log of Supplements or Log of Amendments.

Operators are requested to keep Viking Air Limited advised of their current postal address and the serial numbers of DHC-6 aircraft that they operate. Contact information for Viking Air Limited can be found on the last page of this section.

0.9.1.3 Amendments

Amendments introduce changes arising from the embodiment of modifications. Amendments should be inserted only in handbooks of aircraft when such modifications are fitted to that aircraft. Amendments are published on light green coloured sheets, and these sheets are then inserted in the POH opposite the page that they modify. The procedures published in the amendment then supersede and replace the procedures published in the body text of the POH. The contents of all amendments published prior to 2008, with the single exception of amendment 21, have been incorporated into the body text of this POH. If additional amendments are published in the future, first determine if the amendment applies to your specific aircraft before inserting it in the

flight manual. If the amendment does not apply to your aircraft, please discard it, do not put it in your AFM.

Example of an Amendment:

1 Amendment 6, issued in 1969, provided different procedures for testing the autofeather system of aircraft equipped with Mod 6/1329. This modification was included in all aircraft from SN 290 onwards, and could be retrofitted to earlier production aircraft.

2 Amendment 21, issued in 2005, provides different procedures and limitations for five unique aircraft that were built with modified electrical systems. Amendment 21 should only be inserted in the AFMs used in these five aircraft.

0.9.1.4 Supplements

Supplements contain procedures and performance data that pertain to optional or special order equipment. Supplements should only be inserted in Pilot Operating Handbooks of aircraft which have such installations or equipment incorporated. Supplements are filed in Section 9 of this POH.

Example of a Supplement:

1 Supplement 1 contains limitations, normal and emergency procedures, and performance data that is applicable only to aircraft fitted with surface de-icing equipment. If your aircraft is not fitted with the de-icing equipment described in this supplement, you should discard this supplement.

2 Supplement 8 contains limitations, normal and emergency procedures, and performance data that is applicable only to aircraft fitted with wing fuel tanks. If your aircraft is not fitted with wing fuel tanks as described in this supplement, you should discard this supplement.

Supplements revised during or after 2009 have been re-formatted in accordance with GAMA Specification 1. This slightly changes the sequence in which General, Limitations, Emergency and Abnormal, Normal, and Performance data appears in the supplement.

0.9.1.5 Supplement Revision Procedure

When a supplement is revised or a new supplement is issued, it will be distributed in accordance with the Revision procedure.

0.9.1.6 Engineering Orders

Engineering Orders are a method used to incorporate simple, one-time, unique modifications to a small number of aircraft. For example, if one customer ordered a coffee cup holder in their aircraft, rather than raising a Modification or creating a new Standard Order Option, the coffee cup holder would be written up and approved using an Engineering Order.

0.9.1.7 Modifications

The term 'Mod' is commonly used as an abbreviation for modification. Over the 19 year period of time that elapsed between the construction of SN 231 through SN 844, many changes and improvements were made to the aircraft by de Havilland. To comply with regulations respecting certification of aircraft, each change to the original design was documented as a uniquely numbered modification. For the DHC-6, modification numbers began at 6/1000 and, as of early 2010, have reached 6/1916. When each new aircraft left the factory, it was supplied with a document that listed what modifications were embodied into the aircraft during manufacture. Additional modifications may have been made to aircraft since they left the factory. Some of these modifications (such as the status of the autofeather system, or electrical system design) are of interest to the pilot, because the AFM will often present several different ways of carrying out a task or a procedure depending on the mod status of the aircraft. Every effort has been made to document the 'cut-in' serial number of modifications here in the AFM. To be absolutely certain whether a modification is or is not embodied on a specific aircraft, refer to the aircraft technical records.

Example of a modification: Mod 6/1475, cut in at SN 511, relocated the fuel gauges and fuel system controls to the center of the instrument panel, underneath the engine gauges. These gauges and controls had previously been located under the left pilot's flight instruments.

0.9.1.8 Standard Order Options

S.O.O. is the abbreviation for Standard Order Option. Approximately 150 different standard order options were available. These included options such as installation of equipment required for certification for flight into known icing (S.O.O. 6001), installation of equipment required to meet British ARB requirements (S.O.O. 6000), or installation of floats (S.O.O. 6082). Often, one S.O.O. number will refer to a package of other S.O.O.s. As with Mods, if the S.O.O. status of the aircraft is important to the pilot for the purpose of determining which AFM procedure to use, it will be elaborated in the AFM, but the only definitive way to determine if an option is fitted is to check the aircraft technical records.

Examples of a S.O.O:

1 S.O.O. 6095 consisted of installation of long range wing tanks and associated controls.

2 S.O.O. 6122 consisted of installation of altimeters calibrated in millibars rather than inches of mercury.

0.9.1.9 Minimum Equipment List

A Minimum Equipment List (MEL) is not included in this AFM, because it is not considered to be part of an AFM. A MEL is a document that has been approved by the regulatory authority of the state of registration of the aircraft that grants the aircraft operator relief to permit continued operation of the aircraft with certain specified items of equipment inoperative for a defined period of time until repairs can be accomplished. For example, an electrically operated aileron trim tab position indicator is provided on every DHC-6 aircraft. This indicator is basic to the design of the aircraft, and the type approval was granted on the understanding that this indicator would be present and functional at all times. If the indicator does not work the aircraft cannot be legally dispatched unless a locally approved MEL exists that provides permission for operation with an inoperative aileron trim indicator. Such permission may also impose obligations on the flight crew or maintenance staff, for example, to visually confirm that the aileron trim tab is in the neutral position prior to take-off.

MELs are developed by each individual operator based on guidance provided in a Master Minimum Equipment List (MMEL) that has been approved by the regulatory authority of the state in which the aircraft was manufactured. The operator's own unique MEL is then submitted to and approved by the regulatory authority of the state of registration of the aircraft. For Canadian manufactured aircraft such as the DHC-6, Transport Canada will approve a MMEL that has been produced by the manufacturer (or type certificate holder) of the aircraft. The MMEL for the DHC-6 Series 300 aircraft is currently at Revision 11 status (December 23, 2002) and can be downloaded free of charge from the Transport Canada website, http://www.tc.gc.ca/civilaviation/certification/menu.htm.

Occasionally a regulatory authority other than the state of manufacture may produce an approved MMEL for the guidance of operators within their jurisdiction who wish to create a MEL. The FAA has produced their own MMEL for use by operators of U.S. registered DHC-6 aircraft.

The MMEL itself cannot be used in its original format. While the MMEL is for all serial numbers and all versions of an aircraft type, the operator-specific MEL that is derived from the MMEL is tailored to the air operator's specific aircraft and operating environment and may be dependent upon the route structure, geographic location, the number of airports where spares and maintenance capability are available, and

the legislative requirements imposed by the local regulatory authority for the operation of the aircraft. The MMEL cannot address all of these individual variables, nor can standard terms such as "As required by Regulations" provide adequate guidance to pilots and maintenance technicians. It is for these reasons that the MMEL, as published, cannot be approved for use as an operator MEL.

It is beyond the scope of the introduction section of this AFM to describe the process that operators are obliged to follow to develop their own individual operator or aircraft specific MEL. The regulatory authority of the state of registration should be consulted for guidance. That notwithstanding, the following points address errors that are commonly made when an operator is constructing their own MEL:

1 The MEL should not contain references to equipment that is not installed on the operator's aircraft. The MMEL contains all OEM options and additional equipment such as TCAS or GPS. Equipment or options that are not present on the operator's specific aircraft (for example, de-icing equipment, air conditioning equipment, or generator overheat warning systems) should not appear in the operator's MEL.

2 The phrase "As required by Regulations" must not appear in a MEL. It is the responsibility of the operator to replace that phrase with specific standards that apply to their aircraft. For example, the MMEL lists various navigation components (e.g. an ADF) and notes "as required by regulations". The operator is required to clearly define, in the MEL, what the applicable regulations are, for example, "ADF – may be missing or inoperative if no portion of the flight is predicated on navigation by NDB", or, "ADF – may be missing or inoperative if two GPS receivers are installed in compliance with TSO and the databases in each are current", according to the regulations imposed on the operator by their state of registry and/or state of operation. The preceding two examples are given for illustrative purposes only and are not intended as recommendations.

3 Operators may have installed additional equipment that does not appear in the MMEL, for example, TCAS, TAWS, or a satellite telephone system. If the operator wants to be able to dispatch the aircraft with this newly-added equipment inoperative, specific conditions and procedures may need to be developed by the operator, approved by the operator's regulatory authority, and then included in the operator's MEL.

4 An inoperative piece of equipment or system described in the MEL must be placarded so as to inform the crew members of the inoperative condition(s) of the item. To the extent practicable, placards must be located as indicated in the MEL, or adjacent to the control or indicator affected. When not practical, the placard may be placed in a centralized location in the flight compartment. This location shall be in plain view of the flight crew. In all cases, the MEL must provide instructions to indicate where the placard is to be placed.If a particular component is not listed

in the MMEL – for example, the stall warning system – then that component is considered essential and it must be operational for flight. An operator MEL may not be less restrictive than the MMEL.

0.9.2 Notes, Cautions and Warnings

Specific items requiring emphasis are expanded upon and ranked in increasing order of importance in the form of a NOTE, CAUTION or WARNING.

Notes follow information that has already been presented. Warnings and Cautions precede the information, procedure or technique to which they apply.

Note: A note expands on information which has already been provided. Notes are provided to assist the reader in comprehending and applying information that has been presented in the AFM or to apply emphasis to an operating practice or condition.

CAUTION: A CAUTION PROVIDES INFORMATION TO PREVENT MISUSE OF SYSTEMS WHICH COULD DIRECTLY AFFECT THEIR FUNCTION OR SERVICEABILITY. CAUTIONS ARE INTENDED TO ALERT THE READER TO THE RISK OF DAMAGING THE AIRCRAFT OR EQUIPMENT IF A PROCEDURE OR TECHNIQUE IS NOT CAREFULLY FOLLOWED.

Cautions are shown with the symbol that follows:

WARNING: A WARNING EMPHASIZES INFORMATION OF CONSIDERABLE FLIGHT SAFETY IMPORTANCE. WARNINGS ARE INTENDED TO ALERT THE READER TO THE RISK OF PERSONAL INJURY OR LOSS OF LIFE IF A PROCEDURE OR TECHNIQUE IS NOT CAREFULLY FOLLOWED.

Warnings are shown with the symbol that follows:

0.9.3 Procedures

Section 3 of this POH provides operational procedures for foreseeable emergency and abnormal operations. Section 4 provides procedures for normal operations. A procedure is a step by step method used to accomplish a specific task. These are classified as follows:

0.9.3.1 Normal Procedure

A procedure associated with systems that are functioning in their usual manner.

0.9.3.2 Abnormal Procedure

A procedure requiring action, due to the failure of a system or a component, in order to maintain an acceptable level of airworthiness for continued safe flight and landing.

0.9.3.3 Emergency Procedure

A procedure requiring immediate action to protect the aircraft and occupants from serious harm.

The scope and content of the procedures presented in this POH are limited to actions that directly affect the aircraft and its systems. For this reason, actions such as navigation, communicating with air traffic control and other ground facilities, communicating with passengers, operation of aircraft lighting and avionics systems, and other actions that can be generally described as “airmanship” that are not specific or unique to the DHC-6 are not included in the procedures provided in this POH.

0.9.4 Metric (S.I.) Values

In many cases, metric units have been added in parentheses following Imperial units of measure. The metric units are direct conversions of the preceding Imperial unit. Conversions have been rounded to the level of precision inherent in the original Imperial value. In the event of a conversion error, the Imperial unit should be considered authoritative.

Metric conversions have not been provided for values that are only expressed in a single unit of measure by the aircraft indication system (e.g. torque, pressures in PSI).

0.9.5 Blank Pages

Pages that have been intentionally left blank will be so indicated by the statement “This Page Intentionally Left Blank”.

0.10 General Airspeed Terminology and Symbols

KCAS — **Knots Calibrated Airspeed** is indicated airspeed corrected for both pitot tube and static port position error and internal airspeed indicator instrument error, and expressed in nautical miles per hour. A chart to convert KIAS to KCAS is published in Section 5.

KIAS — **Knots Indicated Airspeed** is the speed indicated by the pointer on the airspeed indicator expressed in nautical miles per hour.

V_1 — **Decision Speed** is used in performance charts found in Section 5 of the AFM. V_1 is the highest airspeed on the ground at which, as a result of engine failure or other reasons, the pilot is assumed to have made a decision to either continue or reject the take-off. For the purpose of calculating accelerate-stop distance, it is the highest speed at which a take-off would be rejected.

V_2 — **Take-off Safety Speed** is the actual speed at 35 feet above the runway surface as demonstrated in flight during single engine take-off.

V_B — **Gust Penetration Speed** is the maximum speed recommended for flight in rough air.

V_{EF} — **Engine Failure Speed** is the speed at which the engine actually fails during the take-off roll when flight testing was conducted. During flight testing, the engine was failed exactly one second prior to V_1.

V_{FE} — **Maximum Flap Extended Speed** is the highest speed permissible with wing flaps in a specified position. There are two V_{FE} speeds published for DHC-6, one is for flight with flaps extended up to and including 10°, the other is for flight with flaps extended greater than 10°.

V_{LOF} — **Liftoff speed** is used in certain performance charts found in Section 5. It is the speed at which the aircraft actually leaves the runway surface.

V_{MO} — **Maximum Operating Speed** is the speed that may not be deliberately exceeded at any time.

V_{MC}	**Minimum Control Speed – Single Engine** is the lowest speed at which the aircraft is controllable in flight and in the take-off configuration (flaps 10° for a landplane) with one engine operating at maximum power (50 PSI of torque, 96% N_P) and the propeller of the other engine feathered. Below this speed, it is not possible to maintain control of the aircraft if maximum continuous power or maximum take-off power is set on the operating engine.
V_{NO}	**Normal Operating Limit and Maximum Structural Cruising Speed** is a unique specification used by some regulatory authorities, notably the Australian regulatory authority. In the case of the DHC-6, V_{NO} for a Series 320 aircraft is the same as V_{MO} for a Post Mod 6/1291 Series 300 aircraft.
V_{NE}	**Never Exceed Speed**. A speed that should never be exceeded due to the risk of control surface flutter or structural failure. This is a speed that the Australian regulatory authority requires be published. It is only applicable to Series 320 aircraft that are operated under the supervision of the Australian regulatory authority. These aircraft have a yellow arc on the airspeed indicator that begins where upper end of the green arc ends, and continues until the red radial line that indicates V_{NE}.
V_P	**Maneuvering Speed** is the maximum speed for maneuvers involving an approach to a stall condition, or full application of one of the primary flight controls. It is equal to the stalling speed of the aircraft at maximum allowable positive *g* load. At or below V_P, the aircraft will stall before flight loads exceed design limitations. At speeds above V_P, design flight load limitations will be exceeded before the aircraft stalls.
V_R	**Rotation Speed** is the speed at which the pilot initiates a change in the attitude of the aircraft with the intention of leaving the ground.
V_{REF}	**Landing Approach Speed** is the speed used for final approach and landing, and also the speed upon which the balked landing rate of climb and gradient of climb performance charts are based upon.
V_S	**Stalling Speed (or minimum steady flight speed)** is the lowest speed at which the aircraft is controllable.

V_{S0} **Stalling Speed (or minimum steady flight speed)** with a specified configuration at a specified weight.

V_{S1} **Stalling Speed** with a specified flap setting that is other than the landing flap setting. The applicable flap setting will be specified in the chart or table where this term appears. All references to V_{S1} in this DHC-6 manual refer to stalling speed in the take-off configuration (flaps 10°).

V_{TD} **Touchdown Speed** is 1.05 of stall speed for a specified weight and flap configuration. It will be achieved if the approach is stabilized at V_{REF} and the power levers are promptly brought back to the IDLE stop when the aircraft reaches 50 feet above the runway.

V_X **Best Angle of Climb Speed** is the speed that results in the greatest gain of altitude over a given horizontal distance forward.

NOTE

A landplane achieves best angle of climb at 87 KIAS with the flaps fully up. If, however, it is necessary to clear an obstacle immediately following take-off, flaps should be left in the 10° take-off position and the speed for best rate of climb with 10° of flap should be maintained following rotation, because the performance loss that will be encountered during flap retraction will be greater than the performance gain achieved by configuring the aircraft for best angle of climb with 0° flap.

V_Y **Best Rate of Climb Speed** is the speed which results in the greatest gain of altitude within a given period of time.

NOTE

At maximum take-off weight, a landplane with 10° of flap extended achieves best rate of climb at 80 KIAS, regardless of the number of engines operating. At maximum take-off weight, a landplane with flaps fully retracted and both engines operating achieves the best rate of climb at 100 KIAS. To achieve best rate of climb, the propellers must be set to maximum RPM (96% N_P) and maximum climb power must be calculated and set.

V_{YSE} **Best Rate of Climb Speed – One Engine Inoperative.**

NOTE

At maximum take-off weight, a landplane with only one engine operating achieves best rate of climb at 80 KIAS with 10° of flap extended. To achieve best rate of climb with only one engine operating, the propeller of the functional engine must be set to maximum RPM (96% N_P) and maximum continuous power (equivalent to maximum take-off power) must be calculated and set. The propeller of the other engine must be feathered and flaps must be set, with precision, to 10°.

0.11 Meteorological Terminology

De-ice or De-icing — The periodic shedding or removal of ice accumulations from a surface. This is accomplished by destroying the bond between the ice and the protected surface.

Freezing Drizzle — Drizzle is precipitation on the ground or aloft in the form of liquid water drops that have diameters less than 0.5 mm and greater than 0.05 mm (100 µm to 500 µm). **Freezing drizzle** exists at air temperatures less than 0°C (supercooled), remains in liquid form, and freezes upon contact with objects on the surface or airborne.

Freezing Precipitation — Freezing rain or drizzle falling through or outside a visible cloud.

Freezing Rain — Rain is precipitation on the ground or aloft in the form of liquid water drops which have diameters greater than 0.5 mm. **Freezing rain** is rain that exists at air temperatures less than 0°C (supercooled), remains in liquid form, and freezes upon contact with objects on the surface or airborne.

Icing Conditions — The presence of atmospheric moisture and temperature conducive to airplane icing.

OAT — **Outside Air Temperature** is the free static air temperature. Because the effect of ram air temperature rise is insignificant for DHC-6 aircraft performance calculations, OAT in this POH always refers to indicated OAT and total air temperature (TAT) is not considered.

Pressure Altitude — **Pressure Altitude** is the altitude read from an altimeter when the barometric subscale of the altimeter has been set to 29.92 inches of mercury (equal to 1013.2 millibars).

ISA — **International Standard Atmosphere** is an atmosphere in which:

1 the air is a dry perfect gas,

2 the temperature at sea level is 15°C (59°F),

3 the pressure at sea level is 29.92 inches of mercury (1013.2 millibars),

4 the temperature gradient from sea level upwards to the altitude where the temperature is -56.5°F is 1.98°C per 1,000 feet.

Supercooled Drops

Water drops that remain unfrozen at temperatures below 0°C. Supercooled drops exist in clouds, freezing drizzle, and freezing rain in the atmosphere. These drops may freeze on contact with aircraft surfaces.

0.12 Engine Power Terminology

Acceleration Limit

In order to provide the pilot with greater latitude in operating the engine, particularly during critical phases of flight such as a go-around, a missed approach, or an engine failure, Pratt & Whitney have published acceleration limits. Acceleration limits indicate the extent to which an engine indication can exceed the normal maximum limit, but only for a momentary, non-stabilized transient (generally interpreted to be 2 seconds or less, although the key criteria is 'non-stabilized').

For example, if the pilot rapidly advances the power lever from approach power (e.g. about 15 PSI torque) to precisely the correct lever position required to achieve go-around power (e.g. 50 PSI torque), the torque indicator may momentarily spike up to 55 or 60 PSI of torque before returning to 50 and stabilizing at 50. Provided that this exceedence of the normal limit is not intentional, and that the torque does not stabilize above 50 PSI at any time, this momentary 'acceleration exceedence' is acceptable and does not harm the engine, nor does it need to be reported. Acceleration limits are listed in Section 2 of this manual.

Beta Range

Beta Range is the propeller operational mode in which the propeller blade angle is controlled by the beta reverse valve, not by the propeller governor.

Assuming the propeller is not feathered, the pilot can determine if the propeller is in beta range by comparing the propeller speed selected using the propeller control lever to the propeller speed indicated by the N_P gauge. If the propeller speed indicated on the N_P gauge is less than the propeller speed that has been selected with the propeller lever, the propeller is in beta range.

The propellers normally operate in beta range during all ground maneuvering (other than the take-off run), and during the final portion of every approach and landing, once the propeller levers have been brought forward to the maximum RPM (96% N_P) position prior to landing.

Constant Speed Range

Constant Speed Range is the propeller operational mode in which propeller rotational speed is being controlled by the propeller governor. The propeller governor continually adjusts blade angle in order to maintain the propeller speed selected by the pilot using the propeller control lever.

The pilot can determine if the propellers are operating in constant speed mode by comparing the propeller speed selected with the propeller control lever to the propeller speed indicated on the N_P gauge. If the two speeds are the same (e.g. both 96% during take-off, or both 75% during cruise), the propeller is in the constant speed range.

The propellers normally operate in constant speed range during take-off, climb, cruise, and the descent phase of flight prior to flap extension. Once the aircraft has been slowed to less than flap extension speed and the propeller levers have been moved forward to the maximum RPM position for final approach, there is normally not enough power being supplied to the propeller to keep it turning at 96%, and the propeller transitions from constant speed range to beta range. If, however, power is subsequently applied to make a go-around, the propeller will enter constant speed range again as soon as it accelerates to the speed selected with the propeller lever.

Flameout

Flameout refers to the unintentional extinguishing of the flame in the engine combustion chamber during engine operation. Flameout of PT6A series engines is very rare, and is usually caused by an interruption in the supply of fuel being provided to the engine, or an accumulation of ice on the engine air intake screen.

Flat Rating

Flat Rating refers to the practice of artificially limiting the power output of an engine to a lower power output than the engine manufacturer designed the engine to produce.

The PT6A-27 engine installed on the DHC-6 was designed and built to produce 680 horsepower (HP), which is equivalent to 53.3 PSI of torque. De Havilland artificially limited the power output of this engine, when installed on a DHC-6, to 620 HP, which is equivalent to 50 PSI of torque, to avoid the need to enlarge and redesign the vertical stabilizer and rudder of the Series 300 aircraft to maintain effective control

with the full 680 HP capability of the engine during operations with one engine feathered and the other at full power.

This flat rating was accomplished simply by placing the red paint marking on the torque indicator at 50 PSI, rather than at 53.3 PSI. At ISA conditions, both engines are still capable of producing 53.3 PSI of torque (equal to 680 HP per engine), but using this much power is forbidden and would be quite dangerous because there is not enough rudder authority available to cope with more than 620 HP being generated by one engine if the engine on the other side fails.

Hot Start

Hot Start is an engine start that results in any of the following conditions:

1 T_5 greater than 1090°C at any time;

2 T_5 greater than 980°C (but less than 1090°C) for more than 2 seconds:

3 T_5 greater than 925°C (but less than 980°C) for more than 10 seconds:

T_5 temperatures as high as 925°C are allowed without time limitation for the entire duration of the start. Starting temperatures above 850°C are abnormal and should be investigated for cause.

Hung Start

Hung Start is an engine start attempt during which the engine fails to accelerate up to normal idle speed after having lit up.

Idle

Idle is the lowest steady-state speed that the gas generator section of the engine is designed to operate at. At ISA, idle is typically 51 to 52% N_G. Idle speed will begin to increase at pressure altitudes above 3,000 feet.

Idle Stop

Idle Stop refers to the aft-most position that the power levers can be moved to (the flight idle position) without twisting the power lever grips to overcome the mechanical barrier. It is prohibited to move the power levers aft of the mechanical barrier in flight.

N_G

N_G (or Gas Generator Speed) is the speed of the rear portion of the engine (the gas generator, sometimes referred to as the compressor) expressed as a percentage of 37,500 RPM. Gas generator speed is directly controlled with the power lever. Adjusting the power lever changes the set point of the engine fuel control unit, which is the speed governor for the gas generator.

N_P

N_P (or Propeller Speed) is the speed of the forward portion of the engine (the power section, to which the propeller is connected) expressed as a percentage of 33,000 RPM. Propeller speed is directly controlled with the PROP lever. Adjusting the PROP lever changes the set point of the propeller governor, which is the speed governor for the power section of the engine.

Maximum Climb Power

Maximum Climb Power is the maximum power approved for normal climb. There is no time restriction associated with the use of maximum climb power. Maximum climb power is calculated using a chart that is published in Section 5 of this AFM. Propeller speed during normal climb is limited to 91% for noise reduction purposes only if compliance with American FAR 36 Appendix F (Flyover Noise Limitation) is desired, otherwise, any propeller speed between 75% and 96% may be used at the discretion of the pilot. Full flat-rated climb power is available up to ISA + 6°C at sea level.

Maximum Cruise Power

Maximum Cruise Power is the maximum power approved for normal power cruise flight. There is no time restriction associated with the use of maximum cruise power. Maximum cruise power is calculated using a chart that is published in Section 5 of this AFM. For the engines fitted to the DHC-6, the chart used to calculate both maximum climb power and the chart used to calculate maximum cruise power are identical. In other words, the limitations are the same, but in practice, two calculations will be required: One for the airspeed, altitude, and temperature conditions expected at the start of the climb to cruising altitude (typically 1,000 feet above take-off elevation is used for this calculation), and another for the airspeed, altitude, and temperature conditions expected at the beginning of the cruise portion of flight, after the aircraft has finished climbing and has accelerated to cruise speed. Propeller speed during normal cruise is limited to 91% for noise reduction purposes only if compliance with American FAR 36 Appendix F (Flyover Noise Limitation) is desired,

otherwise, any propeller speed between 75% and 96% may be used at the discretion of the pilot. Full flat-rated cruise power is available up to ISA +6°C.

The difference between maximum take-off power being available up to ISA + 18°C and maximum climb and cruise power being available up to ISA + 6°C arises from the lower T_5 temperature limit (695°C) that is applicable to climb and cruise power settings.

Maximum Normal Operating Power

Maximum Normal Operating Power is a unique term that only applies when compliance with FAR 36 noise limitations is desired. It refers to power set during the climb and cruise phases of flight when propeller speed is limited to 91% in order to reduce flyover noise. There is one chart in the performance section of the AFM that can be used to calculate climb and cruise power when N_P is limited to 91%.

Maximum Take-off Power

Maximum Take-off Power (sometimes abbreviated to MTOP) is the power setting that is approved, and must be set (without any reduction applied to the figure derived from the chart or torque computer), for each take-off.

There is no time restriction published for the use of maximum take-off power; however, it is understood that maximum take-off power will not be used for a longer period of time than what is needed to complete the take-off, climb to a safe altitude (in no case less than 400 feet AGL), fully retract the flaps after reaching the safe altitude, and then transition to climb power.

Maximum take-off power is calculated using a different chart than the chart used for maximum climb and cruise power because higher limits (for example, a 725°C T_5 limit) are allowed for take-off. Maximum take-off power can only be achieved if the propellers are set to the maximum RPM (96% N_P) position.

It is mandatory to set the propellers to the maximum RPM (96% N_P) position for every take-off, and it is also mandatory to leave maximum take-off power set until the completion of flap retraction. Full flat-rated (50 PSI torque) take-off power is available up to ISA + 18°C at sea level.

Maximum Continuous Power

In the case of the PT6A-27 engine used on the DHC-6, **Maximum Continuous Power** (sometimes abbreviated to MCP) is exactly the same as Maximum Take-off Power. There are no time restrictions on maximum continuous power, but it is understood that this power setting may only be used during abnormal or emergency circumstances which require absolute maximum engine performance – for example, moderate to severe icing conditions, mountain downdrafts, or any single engine operations.

As long as these types of abnormal or emergency conditions do not happen on a frequent basis, the service life of the engine will not be affected if maximum continuous power is used for the duration of the abnormal or emergency condition. In the case of single engine operations, this may mean the full duration of the flight.

Be aware that maximum continuous power can only be achieved if the propeller of the functioning engine(s) is set to the maximum RPM (96% N_P) position. Full flat-rated maximum continuous power (620 HP) is available up to ISA + 18°C at sea level.

Maximum Power

The *command* **Maximum Power** refers to the practice of setting engine power by advancing the power levers until the first redline (Torque, T_5, or N_G) is reached. Under certain atmospheric conditions, this will result in a power setting that is even higher than Maximum Take-off Power or Maximum Continuous Power, but in no case ever higher than the first redline reached. Setting power this way is not good for engine life; however, it is sometimes necessary to do this in an emergency.

Setting maximum power by advancing the power levers until the first redline is reached is strictly limited to emergencies only, for example, an engine failure after take-off, or windshear recovery. As with other power settings that use the word “maximum”, maximum power can only be achieved if the propeller of the functioning engine(s) is set to the maximum RPM (96% N_P) position.

PSI (torque)

Engine torque is measured in pounds per square inch, which is abbreviated to **PSI**. To convert torque PSI indications for the PT6A-27 engine to foot-pounds (lb-ft), another commonly used measurement of engine power, multiply PSI by 30.57.

Propeller RPM

Propeller RPM is the rotational speed of the propeller expressed in revolutions per minute. There is a 15:1 reduction gearbox between the power turbine and the propeller. Thus, when the power turbine is operating at 75% N_P, the propeller is turning at (33,000 ÷ 15) x .75 = 1,650 RPM. The term N_P is used when propeller speed is expressed as a percentage.

RPM

Rotations (or revolutions) per minute.

Service Ceiling

The maximum density altitude at which the aircraft can maintain a climb rate of 100 feet per minute with both engines operating at maximum continuous power.

SFC

Specific Fuel Consumption is a measure of the efficiency of the engine, expressed in pounds of fuel burned (W_F) per equivalent shaft horsepower (ESHP) per hour.

SHP

Shaft Horsepower. Free turbine engines such as the PT6A series do not have a gauge or indicating device that directly displays horsepower being delivered to the propeller (in other words, horsepower coming from the shaft at the front of the engine). Shaft horsepower being produced is dependent on both torque setting and propeller speed. For the PT6A-27 engine, the calculation used to determine SHP is as follows:

$$SHP = \frac{TORQUE \times PROPELLER\ RPM}{170.85}$$

An example of a calculation for take-off power of a DHC-6 under ISA conditions is as follows:

$$618 = \frac{50 \times 2{,}112}{170.85}$$

ESHP

Equivalent Shaft Horsepower. ESHP is shaft horsepower, as explained above, with the beneficial effect of engine exhaust thrust converted to horsepower and then added. When set to maximum take-off power at ISA, the exhaust blast adds the equivalent of about 30 horsepower to the output of each engine.

STOL

Short Take-off and Landing

Torque

Torque is a measurement unit used to measure rotational force. In the context of a DHC-6, the force being applied to the propeller by the engine is measured and displayed on the torque gauge.

T_5 — **Temperature at Engine Station 5** is the temperature measured between the compressor turbine wheel and the power turbine wheel. It is sometimes referred to as interstage turbine temperature (ITT).

W_F — **Fuel Flow**, expressed in pounds per hour.

Windmilling — **Windmilling** refers to propeller rotation caused by airstream inputs, rather than engine inputs. If the aircraft is parked with the engine shut down and the propeller is not secured, it will windmill in a strong wind. If the aircraft is descending with little or no power being applied to the propeller by the engine, the force of the airstream will often contribute to maintaining propeller speed. In flight, if the propeller of a failed engine is not feathered (either manually, or by the autofeather system), it will windmill.

Zero Thrust — The absence of appreciable thrust in either direction. For training purposes, this is normally accomplished inflight by setting the engine torque to between 6 and 10 PSI. The exact power setting required to achieve zero thrust will vary depending on aircraft speed, air temperature, and pressure altitude.

0.13 Aircraft Performance and Flight Planning Terminology

Accelerate – Stop Distance

The distance required to accelerate an aircraft from a standing start, with full take-off power set prior to brake release, to a specified speed (typically the V_1 speed or the normal rotation speed if a V_1 speed is not published), then reject the take-off and bring the aircraft to a complete stop.

In the past, DHC-6 performance manuals gave distances needed to slow the aircraft to 35 knots speed, and 235 feet had to be added to allow for a complete stop. For sake of simplicity, all the information in this manual now shows distances to a complete stop only.

Accelerate – Go Distance

The distance required to accelerate an aircraft to a specified speed (typically V_1), then continue the take-off on one engine, become airborne, accelerate to a safe climb speed, and reach a specified height above ground level.

Balked Landing

For certification purposes, a **Balked Landing** consists of application of full take-off power to both engines while the aircraft is in the landing configuration (center of gravity at forward limit, flaps 37.5°, power appropriate for normal approach profile, aircraft trimmed for that configuration).

Basic Empty Weight

Weight of the aircraft, including aircraft interior fittings supplied by the factory, unusable fuel, full operating fluids (other than fuel), full oil, and any optional equipment added during or after manufacture.

Climb Gradient

The ratio of the change in height during a portion of climb compared to the horizontal distance travelled during the same time interval.

Contaminated Runway

A **Contaminated Runway** has standing water, slush, snow, compacted snow, ice, frost, drifting sand, or uncontrolled vegetation covering more than 25% of the required length and width of its surface.

Damp Runway

A runway is considered damp when the surface is not dry, but the moisture present on it does not give a shiny appearance. A damp runway is considered to be dry for the purpose of performance planning.

Datum — A reference point from which all distances used for station numbers are measured. In the case of the DHC-6 the longitudinal datum is approximately one foot (30 cm) aft of the front of the radome, or; exactly 109.32 inches (2776.7 mm) forward of the fuselage jig points on the outside of the aircraft that are abeam the flight compartment to passenger cabin bulkhead.

Dry Runway — A **Dry Runway** is neither "wet" nor "contaminated".

Demonstrated Crosswind Velocity — **Demonstrated Crosswind Velocity** is the velocity of the crosswind component for which adequate control of the aircraft during take-off and landing was demonstrated during the certification tests. The value provided (in the case of a DHC-6, 20 knots on the surface, which is equal to 27 knots at typical windsock or anemometer height) is not limiting; however, no testing by the manufacturer has been carried out at higher crosswind velocities.

g — ***g*** is acceleration force. It is the unit of measure used to express load factor.

Grass Runway — A smooth runway surface, similar to a hard runway except that it is surfaced with well maintained grass.

Hard Runway — A smooth hard surface such as, but not limited to, concrete or asphalt pavement that is suitable for take-off and landing.

Landing Distance — **Landing Distance** is measured beginning at a point 50 feet above the elevation of the runway with the aircraft established in a steady descent of 3° at an airspeed of 130% of V_{S0} or 105% of V_{MC}, whichever is higher. At 50 feet AGL, power is reduced to idle, the aircraft is landed, and wheel braking only is then used to bring it to a stop.

LEMAC — Leading Edge of Mean Aerodynamic Chord.

MAC — **Mean Aerodynamic Chord**

NMPP — NMPP is an abbreviation for **Nautical Miles Per Pound**, which is the distance that can be expected per pound of fuel burned. Be aware that all of the figures presented in the NMPP performance charts in this manual were obtained using a new aircraft that was in excellent condition. No allowance for deterioration of engine efficiency, addition of antennas, larger wheels and tires, etc. has been made, and no factors or route reserve have been added unless this is noted on the chart.

OEI — **One Engine Inoperative**, a term used in performance charts.

PPH — PPH indicates **Pounds Per Hour**, another measurement of fuel consumption.

Station — A location along the aircraft fuselage, normally described as a distance from a datum.

Take-off Distance — **Take-off Distance** is the distance required to take-off from a standing start with full take-off power set prior to brake release, and to climb to a height of 50 feet above the ground (both engines operating), or 35 feet above the ground (one engine operating).

TEMAC — **Trailing Edge of Mean Aerodynamic Chord**

Unusable Fuel — **Unusable Fuel** is the quantity of fuel that is not available for use in flight. In the case of the DHC-6, this is 23 pounds of fuel, or about 1% of total fuel quantity.

Usable Fuel — **Usable Fuel** is the other 99% of total fuel capacity that can be burned by the engines during flight. The only condition under which all usable fuel can be consumed is level flight in any flap configuration.

Weight — In this manual, the word ‘weight’ is used instead of the more precise ISO term ‘mass’ to refer to the mass of the aircraft.

Wet Runway — A **Wet Runway** has a shiny appearance due to a thin layer of water on it, but is without significant areas of standing water. A runway with greater than 0.125 of an inch (3 mm) of standing water on it is deemed to be a contaminated runway.

0.14 Unscheduled Landing Terminology

Some abnormal or emergency conditions may require the crew to land the aircraft prior to reaching their planned destination. Two different phrases are used in this POH.

Land as soon as possible –This means land without delay at the nearest aerodrome that can safely be used after giving due consideration to the runway surface, runway length, and prevailing weather conditions. Convenience of the aerodrome for crew and passengers and/or suitability of the aerodrome for servicing of the aircraft is not a consideration when choosing an aerodrome to land at. This is the highest form of urgency. Depending on the level of urgency, the pilot may wish to consider making an off-airport (precautionary) landing.

Land as soon as practical –This means land at the next available aerodrome that can safely be used after giving due consideration to passenger convenience after landing and/or the possibility of having the aircraft serviced, as well as suitability of the runway surface, runway length, and prevailing weather conditions. The pilot is allowed considerable discretion in choosing the aerodrome and the level of urgency to land will be dependent on the nature of the abnormality. This notwithstanding, fully suitable aerodromes should not be overflown. This describes a less urgent condition than “land as soon as possible”.

0.15 Regulatory Acronyms

ASTM	**American Society for Testing and Materials**
AFM	**Aircraft Flight Manual**
BCAR	**British Civil Airworthiness Requirements**, a document published by the regulatory authority of the United Kingdom that provides information explaining how to comply with United Kingdom aviation law.
CAA	**Civil Aviation Authority**, the United Kingdom regulatory authority.
CAR 3	**Civil Air Regulation 3**, a certification regulation published by the United States government in 1945, prior to the establishment of the FAA.
CAR	When used without the '3', an abbreviation for **Canadian Air Regulation**.
DCA	**Department of Civil Aviation**. This was the name of the Australian aviation regulatory authority during the 1960s and 1970s. This authority is now known as the Civil Aviation Safety Authority (CASA).
DOT	**Department of Transport**. This was the name of the Canadian regulatory authority. This authority is now known as Transport Canada.
EASA	**European Aviation Safety Agency**
EU OPS-1	Common technical requirements and administrative procedures applicable to commercial transportation by aircraft by operators in EASA member states.
FAA	**Federal Aviation Authority**, the regulatory authority of the United States of America.
FAR	**Federal Aviation Regulation**, a regulation published by the FAA.
FIKI	**Flight In Known Icing**
GNSS	**Global Navigation Satellite System**
ICAO	**International Civil Aviation Organization**

IFR	In this publication, IFR refers to the operation under **Instrument Flight Rules**, regardless of whether the weather conditions are VMC or IMC.
PERFORMANCE A	A performance specification set out in EU OPS-1
POH	**Pilot Operating Handbook**
RNP	**Required Navigation Performance**
SFAR 23	**Special Federal Aviation Regulation 23**, a certification regulation published by FAA.
TCCA	**Transport Canada – Civil Aviation**. The Canadian regulatory authority.

0.16 Conversion Information

The following formulas can be used to make measurement conversions:

GENERAL

Fahrenheit (°F) = (°C x 1.8) + 32
Celsius (°C) = (°F - 32) x 0.556
Statute Mile (sm) = Nautical Mile (nm) x 1.151
Nautical Mile (nm) = Statute Mile (sm) x 0.869
Jet Fuel (JET A) Standard Weights at 15° C (Relative Density 0.806)

One (1) Liter = 1.777 lb

One (1) U.S. Gallon (US gal) = 6.73 lb

One (1) Imperial Gallon (IMP gal) = 8.078 lb

Standard to Metric

Inches (in) = Millimetres (mm) x 0.039
Inches (in) = Centimetres (cm) x 0.393
Feet (ft) = Meters (m) x 3.281
Yards (yd) = Meters (m) x 1.094
Statute Miles (sm) = Kilometres (km) x 0.621
Nautical Miles (nm) = Kilometres (km) x 0.54
US Gallons (US gal) = Litres x 0.264
Imperial Gallons (IMP gal) = Litres x 0.22
Pounds (lb) = Kilograms (kg) x 2.205
PSI = Bar x 14.504

Metric to Standard

Millimetres (mm) = Inches (in) x 25.4
Centimetres (cm) = Inches (in) x 2.54
Meters (m) = Feet (ft) x 0.305
Meters (m) = Yards (yd) x 0.914
Kilometres (km) = Statute Miles (sm) x 1.61
Kilometres (km) = Nautical Miles (nm) x 1.852
Litres = US Gallons (US gal) x 3.785
Litres = Imperial Gallons (IMP gal) x 4.546
Kilograms (kg) = Pounds (lb) x 0.454
Bar = PSI x 0.069

0.17 About Viking Air Limited

Viking was established in Victoria, British Columbia, Canada in 1970. Company head offices, manufacturing and maintenance , repair, and overhaul facilities are located at Victoria International Airport (CYYJ) in Sidney, BC, approximately 12 nautical miles north of the City of Victoria.

Since 1983, Viking has held the exclusive rights to spare parts manufacturing and distribution for the DHC-2 Beaver and the DHC-3 Single Otter aircraft and has been a major supplier to Bombardier for the Twin Otter and DASH 7 Series product lines.

Viking acquired the type certificate and production rights to the DHC-6 aircraft from Bombardier Aerospace in January of 2006. The transfer of the Type Certificates completes a transaction first announced in May 2005, at which time Viking acquired specific assets from Bombardier's Commercial Service Centre (CSC) division, including product support responsibilities for seven de Havilland heritage aircraft.

Since that time, Viking has successfully integrated the Bombardier CSC responsibilities, expanded operations in Victoria, and opened a warehousing, distribution and new aircraft assembly facility in Calgary, Alberta. Viking now provides a complete range of services for all of de Havilland's out of production aircraft, including spare parts manufacturing and distribution, sales and customer service, technical support, maintenance, repair and overhaul, and engineering services.

Viking also owns the Type Certificates and provides support for the de Havilland Canada DHC-1 Chipmunk, DHC-2 Beaver, DHC-2T Turbo Beaver, DHC-3 Otter, DHC-4 Caribou, DHC-5 Buffalo, and DHC-7 DASH 7.

Company Contact Information

Viking Air Limited
1959 de Havilland Way
Sidney, B.C., Canada
V8L 5V5
Telephone: +1 (250) 656-7227

24 Hour AOG Support:
USA & Canada: 1 (800) 663-8444
International 1 (800) 6727–6727
Internet: www.vikingair.com
E-mail: info@vikingair.com

SECTION 1

GENERAL

LIST OF EFFECTIVE PAGES

SECTION	PAGE	DATE	SECTION	PAGE	DATE
1	1	10 Sep. 2010		8	10 Sep. 2010
	2	10 Sep. 2010		9	10 Sep. 2010
	3	10 Sep. 2010		10	10 Sep. 2010
	4	10 Sep. 2010		11	10 Sep. 2010
	5	10 Sep. 2010		12	10 Sep. 2010
	6	10 Sep. 2010		13	10 Sep. 2010
	7	10 Sep. 2010		14	10 Sep. 2010

TABLE OF CONTENTS **PAGE**

1.1 General **7**

1.2 Scope **8**

1.3 Leading Particulars **9**
1.3.1 General 9
1.3.2 Airframe 9
1.3.3 Dimensions 9
1.3.4 Wing area & Loading 9

1.4 Cabin Dimensions **10**
1.4.1 Baggage Compartment Volume 10
1.4.2 Engines 10

1.5 Aircraft Descriptive Data (Quick Reference) **11**
1.5.1 Engine 11
1.5.2 Propeller 11
1.5.3 Fuel 12
1.5.4 Oil 12
1.5.5 Maximum Weights 12
1.5.6 Cabin and Baggage Door Dimensions 13
1.5.7 Extreme Temperature Operation 13
1.5.8 Aircraft Dimensions 13

List of Tables Page

1-1 Engine Ratings 10
1-2 Fuel Tank Capacities 12

List of Figures Page

1-1 Aircraft Dimensions 14

1.1 General

This section contains basic data and information of general interest to the pilot.

1.2 Scope

This AFM includes the material required to be furnished by CAR 3 and SFAR 23 and additional information provided by the Type Certificate Holder, and constitutes the D.O.T. approved Aircraft Flight Manual. This AFM must be read and thoroughly understood by the owner and operator in order to achieve maximum utilization as an operating guide for the pilot.

1.3 Leading Particulars

1.3.1 General

AIRCRAFT TYPE & MODEL:	DHC-6 Twin Otter (Series 300)
MAXIMUM TAKE-OFF WEIGHT:	12,500 pounds (5,670 kilograms)
MAXIMUM LANDING WEIGHT:	12,300 pounds (5,579 kilograms)
NUMBER OF CREW:	1 or 2
NUMBER OF PASSENGERS:	up to 20

1.3.2 Airframe

CONFIGURATION & CONSTRUCTION: All-metal, high-wing monoplane with a fixed tricycle landing gear, equipped with steerable nose wheel.

FLIGHT CONTROLS: Conventional three-control, dual, side-by-side rudder pedal control column combination.

1.3.3 Dimensions

NOTE

Dimensions to ground line are approximate only and vary depending on aircraft configuration and loading conditions. Refer to Figure 1-1

Wing Span	65 feet	(19.8 m)
Length	51 feet, 9 inches	(15.8 m)
Cabin Height	9 feet, 8 inches	(2.95 m)
Tail Height	19 feet, 6 inches	(5.94 m)

1.3.4 Wing area & Loading

Wing Area	420 square feet	(39.02 m^2)
Wing Loading at Gross Weight	29.8 pounds per square foot	(145.5 kg/m^2)
Power Loading at Gross Weight	10.08 pounds/SHP	(6.132 kg/kW)

1.4 Cabin Dimensions

Cabin Length	18 feet, 5 inches	(5.61 m)
Cabin Width at Floor Level (Fwd of FS 239)	4 feet, 4 inches	(1.32m)
Cabin Height	4 feet, 11 inches	(1.5 m)
Cabin Volume (usable)	384 cubic feet	(10.87 m^3)
Cabin Doors (left side)	56 inches x 50 inches	(1.42m x 1.27 m)
Cabin Doors (right side)	30 inches x 45.5 inches	(76 cm x 1.16 m)

1.4.1 Baggage Compartment Volume

Extended Rear Baggage Compartment	88 cubic feet	(2.49 m^3)
Front Baggage Compartment	38 cubic feet	(1.08 m^3)

1.4.2 Engines

TYPE: Two Pratt & Whitney Aircraft of Canada Limited, PT6A-27, single-stage, free-turbine engines to Pratt & Whitney Commercial Specification No. 583. (Revised Aug. 30, 1974). Engine Type Certificate DOT E6, FAA E4EA.

Table 1-1 Engine Ratings

RATING (Sea Level, Static):	**SHP**	**kW**
Take-off (to ISA + 18°C)	620	462.3
Maximum Continuous Power (to ISA + 18°C)	620	462.3
Maximum Cruise Rating (to ISA + 6°C)	620	462.3

1.5 Aircraft Descriptive Data (Quick Reference)

Only minimal information conforming to GAMA Specification 1 is presented here. Refer to Section 7 of this POH, "Aircraft and Systems Description", for a detailed description of the aircraft and its systems.

1.5.1 Engine

Series 300 and derivative DHC-6 aircraft are fitted with two Pratt & Whitney Canada PT6A-27 engines that have been flat rated to a maximum of 620 HP, which is equivalent to 50 PSI of torque at 96% N_P. If an engine other than the PT6A-27 is fitted under a STC, a locally approved AFM supplement must be provided in Section 9 of this POH.

The PT6A series of engines are reverse flow, annular combustion, free turbine engines. The 'small' series of PT6A engines, which includes the -27, contain a compressor consisting of three axial stages and one centrifugal stage driven by a single compressor turbine wheel. The power section consists of a single power turbine driving the propeller via a 15:1 reduction gearbox. Engine limitations can be found in Section 2 of this POH, and additional descriptive information about the engine can be found in Sections 7 and 10 of this POH.

1.5.2 Propeller

The standard propeller is a hydraulically controlled, three blade, constant speed, fully reversing and fully feathering Hartzell HC-B3TN-3D. If the propeller is equipped with blade latches, the letter Y will be appended at the end of the propeller model number. The blades are Hartzell T10282H. If the blades are equipped with de-icing boots, the letter B will be appended to the blade model number. The primary propeller governor is a Woodward type 8210-004, and the propeller overspeed governor is a Woodward type 210625. The propeller is 8 feet 6 inches in diameter. At nominal aircraft weight, the distance between the lowest portion of the propeller and the ground is 5 feet. This distance will decrease slightly during braking or deceleration of a fully loaded aircraft.

Propeller blade angle measured at the 30 inch station of the blade will vary between +87° when feathered to –15° at full reverse. Idle blade angle is +11°. Blade angle in flight will vary between +20° and +35° depending on air density, selected propeller speed, and power being delivered to the propeller.

STCs have been granted for fitment of four blade propellers made by both Hartzell and McCauley. If a propeller other than the OEM Hartzell HC-B3TN-3D is fitted to the DHC-6 under authority of a STC, a locally approved AFM supplement must be provided in Section 9 of this POH. Be aware that both normal and emergency procedures change when 4 blade propellers are fitted to the aircraft. The changes in procedures can be found in the supplement for the 4 blade propeller.

1.5.3 Fuel

Specifications for fuel that may be used in the PT6A-27 engines are provided by Pratt & Whitney Canada, and can be found in the most recent revision of Pratt & Whitney Canada Engine Service Bulletin 1244. Additional information about acceptable fuels can be found in Section 2 of this POH.

The standard fuselage fuel tanks installed under the cabin floor of the DHC-6 have the following usable capacities:

Table 1-2 Fuel Tank Capacities

Tank Location	US Gallons	Imperial Gallons	Litres	Pounds/kg (Jet A or A1)
Forward Tank	181	151	686	1235 pounds / 574 kg
Rear Tank	197	164	756	1341 pounds / 608 kg

99% of the fuel is usable in flight. 23 pounds of fuel (approximately 3.5 US or 3 Imperial Gallons, or 12 litres) is unusable. An additional 12 pounds of fuel will remain trapped in the plumbing system between the fuel tanks and the engines after the fuel tanks have been drained. These 12 pounds are not considered part of the aircraft fuel tank capacity, and are include in the basic weight of the aircraft.

DHC-6 aircraft that have been modified for aerial photography or scientific observation purposes will likely have different fuel capacities due to the removal or relocation of one or more fuel cells to accommodate camera and/or sensing equipment. Refer to the supplement(s) provided with these specific aircraft for full details.

1.5.4 Oil

Specifications for oil that may be used in the PT6A-27 engines are provided by Pratt & Whitney Canada, and can be found in the most recent revision of Pratt & Whitney Canada Engine Service Bulletin 1001.

1.5.5 Maximum Weights

The maximum ramp, taxi, and take-off weight for a civil registered DHC-6 Series 300 aircraft is 12,500 pounds. A limited number of specially modified DHC-6 Series 300 aircraft were manufactured for State and Military customers and modified by an Engineering Order for operation at higher weights. Specific information pertinent to these aircraft can be found in the Engineering Orders AFM supplements that were provided with the aircraft. If these aircraft are on the civil register, they are placed in a restricted category.

Additional weight related information can be found in Section 2 (Limitations), and in Section 6 (Weight and Balance).

1.5.6 Cabin and Baggage Door Dimensions

The main cabin door opening is 56 inches wide and 50 inches high (142 by 127 cm) when both doors are open. A STC exists to modify the main cabin door opening to provide additional width.

The nose baggage door aperture on a DHC-6 equipped with a long nose (Post Mod 6/1077) is 29.7 inches (71 cm) wide, varying in height between 20.7 inches (52.5 cm) at the forward edge and 27.2 inches (64 cm) at the aft edge.

The rear baggage compartment door aperture on all Series 300 aircraft is 25.7 inches wide and 35.7 inches high (65 by 90 cm) .

The door on the right rear side of the passenger cabin is 30 inches (76 cm) wide and reaches a maximum height of 45.5 inches (115.5 cm) at the center of the door.

1.5.7 Extreme Temperature Operation

The complete aircraft, including equipment and components originally fitted at the factory, is designed for normal operation within the temperature range –40°F (–40°C) to +125 °F (+51.7°C) without modification. This is not a limitation.

1.5.8 Aircraft Dimensions

Aircraft dimensions are provided in Figure 1-1 on the following page. Dimensions are approximate and may vary based on aircraft loading. For additional dimensional information, refer to Section 8, Handling, Servicing, and Maintenance.

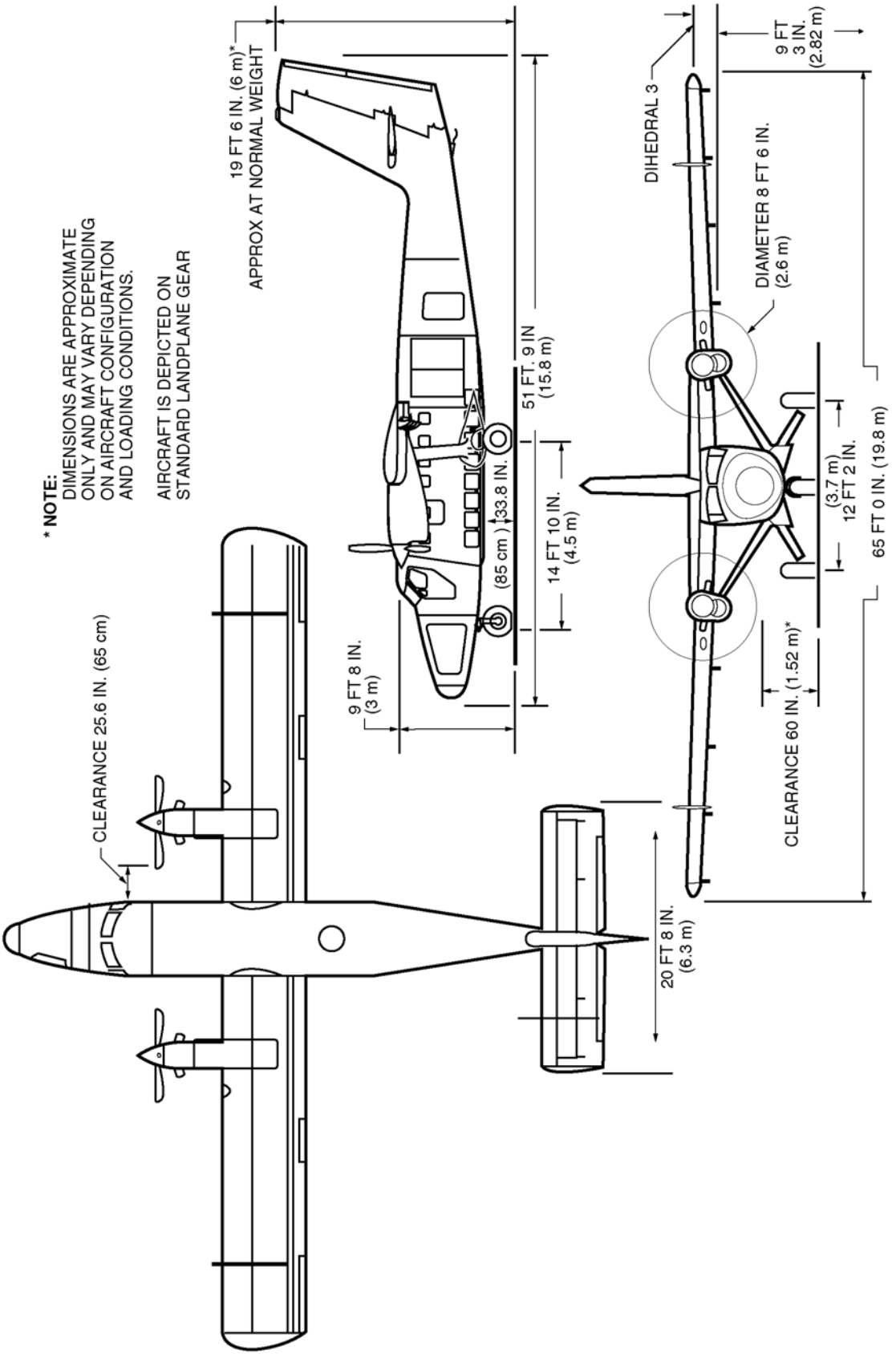


Figure 1-1 Aircraft Dimensions

SECTION 2

LIMITATIONS

LIST OF EFFECTIVE PAGES

SECTION	PAGE	DATE	SECTION	PAGE	DATE
2	1	10 Sep. 2010		19	10 Sep. 2010
	2	10 Sep. 2010		20	10 Sep. 2010
	3	10 Sep. 2010		21	10 Sep. 2010
	4	10 Sep. 2010		22	10 Sep. 2010
	5	10 Sep. 2010		23	10 Sep. 2010
	6	10 Sep. 2010		24	10 Sep. 2010
	7	10 Sep. 2010		25	10 Sep. 2010
	8	10 Sep. 2010		26	10 Sep. 2010
	9	10 Sep. 2010		27	10 Sep. 2010
	10	10 Sep. 2010		28	10 Sep. 2010
	11	10 Sep. 2010		29	10 Sep. 2010
	12	10 Sep. 2010		30	10 Sep. 2010
	13	10 Sep. 2010		31	10 Sep. 2010
	14	10 Sep. 2010		32	10 Sep. 2010
	15	10 Sep. 2010		33	10 Sep. 2010
	16	10 Sep. 2010		34	10 Sep. 2010
	17	10 Sep. 2010		35	10 Sep. 2010
	18	10 Sep. 2010		36	10 Sep. 2010

TABLE OF CONTENTS **PAGE**

2.1 Basis of Certification of this Aircraft 9

2.2 Scope 10

2.3 Airspeed Limitations 11
2.3.1 Airspeed Limitations Table 11
2.3.2 Airspeed Indicator Markings 13
2.3.2.1 CAR 3 Certification Basis 13
2.3.2.2 CAR 3 and SFAR 23 Certification Basis 14
2.3.2.3 Australian DCA Certification Basis (Except T.A.A. Deliveries) 14
2.3.2.4 Australian DCA Certification Basis (T.A.A. Deliveries) 14
2.3.2.5 British ARB Certification Basis 14

2.4 Engine Limitations 15
2.4.1 Engine Operating Limitations Table – Pratt & Whitney PT6A-27 15
2.4.1.1 Engine Operating Limitations Table Footnotes 16
2.4.2 Torquemeter Pressure – Power Calculations 17
2.4.3 Propeller Limitations – Hartzell HC–B3TN–3D or Hartzell HC–B3TN–3DY 18
2.4.4 Fuel System Specifications and Limitations 19
2.4.4.1 AVGAS Limitations 20
2.4.5 Oil Specifications and Limitations 20
2.4.6 Engine Instrument Markings 20
2.4.6.1 Torque Pressure Indicators 21
2.4.6.2 Interstage Turbine Temperature (T5) Indicator 21
2.4.6.3 Propeller Tachometer (Pre-Mod 6/1687) 21
2.4.6.4 Propeller Tachometer (Mod 6/1687) 21
2.4.6.5 Gas Generator Tachometer 22
2.4.6.6 Oil Temperature Indicator 22
2.4.6.7 Oil Pressure Indicator 22

2.5 Electrical Limitations 23
2.5.1 Generator and Loadmeter Limitations 23
2.5.2 Starter Limitations 23

2.6 Air Operable Door Limitations 24

TABLE OF CONTENTS **PAGE**

2.7 Altitude Limitations 25

2.8 Weight and Center of Gravity Limitations 26
2.8.1 Take-Off 26
2.8.2 Landing 26
2.8.3 Baggage and Freight Loading 27
2.8.3.1 Maximum Permissible Freight Compartment Loads 27
2.8.3.2 Maximum Permissible Baggage Compartment Loads 27
2.8.3.3 Maximum Permissible Floor Loading Values 28

2.9 Crew Only Cargo Operations and Limitations 29

2.10 Flap System Limitations – Landplane 30

2.11 Flight Crew Limitations 31

2.12 Maneuver Limitations 32
2.12.1 Design Flight Load Factors 32
2.12.2 Approved Maneuvers – Normal Category Operations 32

2.13 Noise Limitations (FAR 36 Compliance) 33
2.13.1 Fly-Over Noise Limitations 33
2.13.2 FAR 36 Propeller Tachometer Limitation Markings 33
2.13.3 FAR 36 Normal Operating Procedures 33

2.14 Occupancy Limitations 34

2.15 Ice Related Limitations 35

2.16 Placards 36

List of Tables Page

2-1 Airspeed Limitations 11

List of Figures Page

2-1 Engine Operating Limitations Table 15
2-2 Center of Gravity Limitations 27

2.1 Basis of Certification of this Aircraft

(a) CAR Part 3, dated May 15, 1956, including Amendments 3–1 through 3–8 plus Special Conditions for multi-engine turbine-powered aircraft dated November 6, 1964.

(b) When the aircraft is suitably modified, this Aircraft Flight Manual complies with SFAR 23 dated January 7, 1969, and SFAR 23 amendment dated December 24, 1969. All DHC-6 aircraft serial number 311 and subsequent had the modifications necessary for SFAR 23 compliance embodied when they were manufactured. The limitations contained in this section must be observed when operating the aircraft. The limitations in this section comply with the requirements of SFAR 23.

(c) For Series 310 aircraft only: DHC-6 Twin Otter – U.K. Special Conditions for certification in the Transport Category (Group C), Issue 3, dated September 10, 1970.

(d) The aircraft must be operated in accordance with the limitations in Section 2 and any additional limitations in the Supplements contained in Section 9.

2.2 Scope

Unless specified otherwise, the limitations provided in this section apply to aircraft equipped with standard landplane gear. For aircraft equipped with other gear configurations (floatplanes, skiplanes, amphibians or intermediate flotation gear), refer to the limitations section of the appropriate AFM supplement in Section 9.

Limitations associated with systems or equipment which require AFM supplements are provided in the associated supplement in Section 9.

2.3 Airspeed Limitations

The following airspeed limitations must be observed in the operation of the aircraft.

Maximum Operating Speed shall not be deliberately exceeded in any regime of flight (climb, cruise, descent) except when a higher speed has been authorized for flight test or pilot training purposes.

Airspeed limitations for aircraft equipped with standard wheels are listed in Table 2-1. The airspeed limitations in Table 2-1 apply to all weights up to and including 12,500 pound gross weight.

2.3.1 Airspeed Limitations Table

Table 2-1 Airspeed Limitations

		KNOTS	
		CAS	**IAS**
Minimum Control Speed (V_{MC})	Flaps 10°	66	64
Climb Speed – Best Angle (V_X)	Flaps 0°	89	87
Climb Speed – Best Rate (V_Y)	Flaps 0°	103	100
Climb Speed – Single Engine (V_{YSE})	Flaps 10°	82	80
Flaps Extended Speed (V_{FE})	Flaps 10°	102	100
(Pre-Mod 6/1395)	Flaps 10° to 37.5°	95	93
Flaps Extended Speed (V_{FE})	Flaps 10°	105	103
(Mod 6/1395)	Flaps 10° to 37.5°	95	93
Maximum Operating Speed (V_{MO})	Sea Level	160	156
(Pre-Mod 6/1291)	5,000 feet	155	151
	10,000 feet	150	146
	15,000 feet	145	141
	20,000 feet	130	126
	25,000 feet	115	112
Maximum Operating Speed (V_{MO}) (Mod 6/1291)	Sea Level to 6,700 feet	170	166

Table 2-1 Airspeed Limitations (continued)

		KNOTS	
		CAS	**IAS**
	10,000 feet	160	156
	15,000 feet	145	141
	20,000 feet	130	126
	25,000 feet	115	112
Maneuvering Speed (V_P), the maximum speed for maneuvers involving an approach to stall condition, or full application of the primary flight controls –			
Sea Level to 18,000 feet		136	132
Above 18,000 feet		limited by V_{MO}	
Gust Penetration Speed (V_B), the maximum speed recommended for flight in rough air –			
Sea Level to 18,000 feet		136	132
Above 18,000 feet		limited by V_{MO}	

For Series 320 (Australian) aircraft with S.O.O. 6120 incorporated:

		KNOTS
		IAS
Normal Operating Limit and Maximum Structural Cruising Speed (V_{NO})	Sea Level to 6,700 feet	166
	10,000 feet	156
	15,000 feet	141
	20,000 feet	126
	25,000 feet	112
Never Exceed Speed (V_{NE})	Sea Level	198
	6,700 feet	189
	10,000 feet	182
	15,000 feet	172

		KNOTS IAS
	20,000 feet	162
	25,000 feet	152

NOTE

Modification 6/1291 (increase in maximum speed from 156 to 166 KIAS between sea level and 6,700 feet) was incorporated as standard to all aircraft beginning with serial number 271.

Modification 6/1395 (increase in flap 0° to 10° extension speed from 100 KIAS to 103 KIAS) was incorporated as standard to all aircraft beginning with serial number 290.

The decreases in Maximum Operating Speed (V_{MO}) for all aircraft that begin at 6,700 feet are necessary to maintain an acceptable speed margin from possible control surface flutter.

Under Australian certification rules that were in effect at the time of manufacture, certain speed limitations were expressed differently (as V_{NO} and V_{NE}, rather than V_{MO}). Structurally, Series 320 aircraft are identical to Series 300 aircraft. S.O.O. 6120 provides an airspeed indicator dial face and operations limitations placard that complies with Australian certification requirements.

2.3.2 Airspeed Indicator Markings

The airspeed indicator will be marked in compliance with the certification basis of the aircraft.

2.3.2.1 CAR 3 Certification Basis

The airspeed indicator markings for the Series 300 landplane certified to CAR 3 are as follows. All values are calibrated airspeed.

Red radial lines at 66 KCAS (V_{MC}) and 160 KCAS (V_{MO}, Pre-Mod 6/1291)

A green arc extending from 74 KCAS (V_{S1}) to 160 KCAS (V_C, Pre-Mod 6/1291)

A blue radial line at 82 KCAS (V_{YSE})

A white arc from 58 KCAS (V_{S0}) to 95 KCAS (V_{FE})

2.3.2.2 CAR 3 and SFAR 23 Certification Basis

The airspeed indicator markings for the Series 300 landplane certified to CAR 3 and SFAR 23 are as follows. All values are calibrated airspeed.

Red radial lines at 66 KCAS (V_{MC}) and 170 KCAS (V_{MO}, Post-Mod 6/1291)

A green arc extending from 74 KCAS (V_{S1}) to 170 KCAS (V_C, Post-Mod 6/1291)

A blue radial line at 82 KCAS (V_{YSE})

A white arc from 58 KCAS (V_{S0}) to 95 KCAS (V_{FE})

2.3.2.3 Australian DCA Certification Basis (Except T.A.A. Deliveries)

The airspeed indicator markings for the Series 320 landplane certified to Australian airworthiness requirements, except for aircraft delivered to T.A.A., are as follows. All values are indicated airspeed.

Red radial lines at 64 KIAS (V_{MC}) and 198 KIAS (V_{NE})

A yellow arc extending from 166 KIAS (V_{NO}) to 198 KIAS (V_{NE})

A green arc extending from 74 KIAS (V_{S1}) to 166 KIAS (V_{NO})

A blue radial line at 80 KIAS (V_{YSE})

A white arc from 56 KIAS (V_{S0}) to 35 KIAS (V_{FE})

2.3.2.4 Australian DCA Certification Basis (T.A.A. Deliveries)

The airspeed indicator markings for the Series 320 landplane certified to Australian airworthiness requirements and delivered to T.A.A. are as follows. All values are indicated airspeed.

Red radial lines at 64 KIAS (V_{MC}) and 198 KIAS (V_{NE})

A blue radial line at 80 KIAS (V_{YSE})

2.3.2.5 British ARB Certification Basis

The airspeed indicator markings for the Series 310 landplane certified to British Air Registration Board airworthiness requirements as follows. The value is expressed in indicated airspeed.

A red radial line at 166 KIAS (V_{MO})

2.4 Engine Limitations

2.4.1 Engine Operating Limitations Table – Pratt & Whitney PT6A-27

POWER SETTING	OPERATING LIMITS							
	SHP	TORQUE PSI(1)	T_5 °C	N_G % (2)	N_P % (9)	OIL PRESS PSI	OIL TEMP °C(4)	
TAKE-OFF AND MAXIMUM CONTINUOUS	620 TO ISA +18°C	50	725	101.6	96(10)	80 to 100	10 to 99	
MAX CLIMB / MAX CRUISE	620 TO ISA +6°C	50	695		96(10)	80 to 100	0 to 99	
IDLE			660 (5)			40 MIN. (3)	–40 to 99	
STARTING (8)			1090 (6)				–40 MIN	
ACCELERATION		68.7 (6)	825 (6)	102.6	110		0 to 99	
MAX REVERSE (7,11)	620	50 (7)	725	101.5	91 ± 1	80 to 100	0 to 99	

Figure 2-1 Engine Operating Limitations Table

In an emergency, power may be set to the first limit reached (for example, the torque, T_5, or N_G redline). Other than in an emergency, the above chart must not be used for setting engine power. Refer to Section 5 (Performance) of the AFM for power setting graphs, and use the power setting graphs to determine power settings.

2.4.1.1 Engine Operating Limitations Table Footnotes

1 Maximum permissible sustained torque is 50 PSI at 96% N_P, which is equal to 620 horsepower. This is an airframe restriction. Unintentional, momentary pilot errors that result in torque settings between 50 and 53.3 pounds torque during two engine operations, although undesirable, are not harmful to the engine and do not need to be reported.

2 For every 10°C below –30°C ambient temperature reduce maximum allowable N_G by 2.2%.

3 Normal oil pressure in flight is 80 to 100 PSI at gas generator speeds above 72% if the oil temperature is above 60°C. Oil pressure in flight below 80 PSI is undesirable and should be tolerated only for completion of the flight, if possible at a reduced power setting. Oil pressures below 80 PSI in flight should be reported as an engine discrepancy and should be corrected before next take-off. Oil pressure in flight below 40 PSI is unsafe and requires that a landing be made as soon as possible, using the minimum power required to sustain flight, or that the engine be shut down. Oil pressures between 40 and 80 PSI are acceptable during ground operations.

4 During cold weather operations, if the pilot wants to be assured that the temperature of fuel leaving the oil-to-fuel heat exchanger is above freezing, a minimum oil temperature of 55°C is recommended.

5 At idle, if the T_5 temperature approaches the 660°C idle limit, either increase N_G or reduce engine loads (for example, turn off the generator) to stay below the idle temperature limit.

6 These values are time-limited to two seconds. These acceleration limits exist to allow for rapid application of power during abnormalities or (for example) during a balked landing or a go-around. The acceleration limits are based on the assumption that the deviation above the normal limit is momentary and non-stabilized.

7 Reverse power operations is limited to one minute.

⚠ CAUTION

WHEN GROUND RUNNING ENGINES (EXCEPT DURING MANEUVERING OR TAXIING) IN AMBIENT TEMPERATURES OF 32°C (90°F) AND ABOVE, THE AIRCRAFT MUST BE HEADED INTO WIND, AND OPERATION IN OTHER THAN FORWARD THRUST MUST BE KEPT TO A MINIMUM AND IN NO CASE EXCEED ONE MINUTE. AT TEMPERATURES BELOW 32°C, GROUND OPERATION IN REVERSE THRUST WITH AIRCRAFT HEADED INTO WIND IS LIMITED TO ONE MINUTE.

8 Starting temperature limits are not marked on the face of the T_5 gauge. Temperatures as high as 925°C are acceptable without time limitation for the entire duration of the start. Temperatures between 925°C and 980°C are acceptable provided that the temperature decreases to below 925°C within 10 seconds. Temperatures between 980°C and 1090°C are acceptable provided the temperature decreases to below 980°C within 2 seconds. Starting temperatures above 850°C should be reported and investigated for cause.

9 In the event of failure of the primary propeller governor to govern at 96%, it is acceptable to continue to use the engine as long as the propeller overspeed governor maintains the propeller speed at 101.5% or less. A landing should be made as soon as practical, and the problem must be corrected before further flight.

10 For aircraft that have Mod 6/1687 (Revised Propeller Tachometer Limitation, cut in as standard at SN 671) fitted to comply with FAR 36 noise limitation regulations during the climb and cruise phase of flight, the upper limit of the green arc will be 91% rather than 96%. Only 586 horsepower will be produced with torque set to 50 PSI and N_P set to 91%. No changes of any kind were made to the engine or propeller, only the green marking on the face of the propeller tachometer was changed. 96% N_P continues to be the only approved propeller speed for take-off and 96% N_P continues to be available if required for 'maximum continuous' operations.

11 In flight operation of the power lever aft of IDLE is prohibited.

2.4.2 Torquemeter Pressure – Power Calculations

Calculation of shaft horsepower being produced by the engine may be made as follows:

$$SHP = \frac{TORQUE \times PROPELLER\ RPM}{170.85}$$

Propeller RPM must be expressed as actual propeller RPM, not as a percentage. For example, a calculation of shaft horsepower produced with the propeller RPM set to 96% and torque set to 50 gives the following result:

$$618 = \frac{50 \times 2{,}112}{170.85}$$

2.4.3 Propeller Limitations – Hartzell HC–B3TN–3D or Hartzell HC–B3TN–3DY

WARNING

PROPELLERS MUST BE SET TO MAX RPM (96% N_P) FOR EVERY TAKE-OFF AND LANDING.

PROPELLER REVERSE THRUST (MOVEMENT OF THE POWER LEVERS AFT OF THE IDLE STOP) IS RESTRICTED TO GROUND OPERATIONS ONLY.

Take-off Setting: MAX RPM (96% N_P)

Maximum Continuous Power: MAX RPM (96% N_P)

Normal Climb Setting: Between 75% and 96% N_P, as desired by the pilot.

NOTE

See Para 2.13 for additional limitations if compliance with FAR 36 Noise Regulations is desired.

Normal Cruise Setting: Between 75% and 91% N_P, as desired by the pilot.

Landing Setting: MAX RPM (96% N_P)

NOTE

Propeller levers must be set to the MAX RPM (96% N_P) position no later than 500 feet above ground level (for visual approaches) or 500 feet above decision height or minimum descent altitude (for instrument approaches). This is essential to ensure that the pilot has full control over propeller operation via the power lever during the final phase of approach, and also essential to ensure that full power will be immediately available if needed for a balked landing, go-around, or low level windshear recovery.

Reverse: Maximum RPM 91% ± 1% N_P.

NOTE

The limitation of 91% N_P in reverse exists to prevent the propeller from entering the constant speed range once reverse has been selected. This is mechanically accomplished by the N_F governor automatically reducing fuel supply to the engine as the propeller speed approaches 91% N_P in reverse, thus this limit normally does not require monitoring by the pilot.

Technical specifications

Constant speed governor (primary governor):	Woodward Type 8210-004
Overspeed governor :	Woodward Type 210625
Diameter:	8 feet, 6 inches
Blade Angle Settings at 30 inch blade station:	+87° ±1° – feathered, +17° ±.5° – low pitch (effective), –15° ±0.5° – full reverse

2.4.4 Fuel System Specifications and Limitations

Series 300 and variant Twin Otters are equipped with model PT6A-27 engines manufactured by Pratt & Whitney Canada. The following grades of fuel may be used:

Common Product Name	Specification
Jet A, Jet A1	(ASTM–D1655, CGSB 3.23)
Jet B	(ASTM–D1655, CGSB 3.22)
JP–1	(US MIL–T–5616)
JP–4, JP–5	(US MIL–PRF–5624)
JP–8, JP–8+100	(US MIL–DTL–83133)
Arctic Diesel	(Satisfactory for alternative use only, OAT restrictions apply, review PWC SB 1244 for detailed conditions and restrictions prior to use.)

The above list is not exhaustive. Detailed specifications describing the fuels that may be used in the PT6A-27 engines is provided by Pratt & Whitney Canada, and can be

found in the most recent revision of Pratt & Whitney Canada Engine Service Bulletin 1244.

2.4.4.1 AVGAS Limitations

In an emergency when jet fuel is not available, any grade of AVGAS may be used at any mixture ratio. If AVGAS is used, the quantity added to the fuel tanks must be recorded in the aircraft technical logbook. Use of AVGAS is limited to the equivalent of 150 hours of pure AVGAS usage in any one overhaul cycle. There are no changes to operating procedures if AVGAS is used, but the following limitations apply:

1 Maximum fuel temperature and maximum ambient temperature for take-off when using AVGAS is +25° C.

2 Maximum operating altitude when using AVGAS is 15,000 feet.

NOTE

All four boost pumps must be serviceable at all times when AVGAS is being used. Take-off with an inoperative boost pump (primary or standby) is prohibited.

After use of Grade 80 aviation gasoline, the fuel system must be flushed.

2.4.5 Oil Specifications and Limitations

⚠ CAUTION

DO NOT MIX DIFFERENT VISCOSITIES OR SPECIFICATIONS OF OIL, AS THEIR DIFFERENT CHEMICAL STRUCTURE CAN MAKE THEM INCOMPATIBLE.

For a list of approved lubricating oils refer to the most recent issue of Pratt & Whitney Canada Service Bulletin No. 1001.

2.4.6 Engine Instrument Markings

Individual engine limitation markings are on the dial of each instrument. Not all applicable limits are marked on each instrument. For example, the idle temperature limit is not marked on the T_5 indicator.

2.4.6.1 Torque Pressure Indicators

Maximum (red radial)	50 PSI
Normal (green arc)	0 to 50 PSI
Acceleration (unmarked)	68.7 PSI (2 second acceleration limit)

2.4.6.2 Interstage Turbine Temperature (T_5) Indicator

Red segment	725°C to 1200°C
Caution (yellow arc)	695°C to 725°C
Normal (green arc)	400°C to 695°C
Starting (white radial)	1090°C (2 second limit)

See note 8 of Para 2.4.1.1 for further elaboration of starting temperature limits.

2.4.6.3 Propeller Tachometer (Pre-Mod 6/1687)

Maximum (red radial)	96%
Normal (green arc)	75% to 96%

See note 9 of Para 2.4.1.1 for further elaboration of propeller RPM limits.

2.4.6.4 Propeller Tachometer (Mod 6/1687)

Maximum (red radial)	96%
Normal (green arc)	75% to 91%

NOTE

Mod 6/1687, cut in as standard at SN 671, introduced a lower maximum “normal” (e.g. normal climb and cruise) propeller speed limitation marking on the face of the N_P indicator to comply with FAR Part 36 noise regulations. The upper limit of the green arc on the face of the propeller tachometer was changed from 96% to 91%. This modification was implemented beginning at serial number 671, and could be retrofitted to earlier aircraft if compliance with FAR Part 36 noise regulations was desired.

See note 9 and note 10 of Para 2.4.1.1 for further elaboration of propeller RPM limits.

2.4.6.5 Gas Generator Tachometer

Maximum (red radial)	101.5%
Normal (green arc)	50% to 101.5%

2.4.6.6 Oil Temperature Indicator

Maximum (red radial)	99°C
Normal (green arc)	10°C to 99°C
Caution (yellow arc)	–40°C to +10°C
Minimum for starting engine	–40°C

See note 4 of Para 2.4.1.1 for further elaboration of oil temperature requirement for fuel heating.

2.4.6.7 Oil Pressure Indicator

Maximum (red radial)	100 PSI
Normal (green arc)	80 PSI to 100 PSI
Caution (yellow arc)	40 PSI to 80 PSI
Minimum (red radial)	40 PSI

See note 3 of Para 2.4.1.1 for further elaboration of oil pressure limits.

2.5 Electrical Limitations

2.5.1 Generator and Loadmeter Limitations

The load limitations for each generator are as follows:

Loadmeter Reading	Condition of Flight	Minimum N_G	OAT	Reason for Limitation
Greater than 0.5	On ground	Idle N_G plus 15%	Any temperature	To keep T_5 below idle limit of 660°
0.8 maximum	On ground		Greater than 7°C	Generator cooling
1.0 maximum	On ground		7°C or less	Generator capacity
1.0 maximum	In flight		Any temperature	Generator capacity

NOTE

During single generator operation, loads may be reduced by switching off non-essential electrical services. Anti-icing systems such as windshield heat and propeller de-ice consume the greatest amount of power. External lighting and cabin lighting are the next highest consumers. If optional air conditioning (cabin cooling) has been installed, ensure that the mode switch is in the FLIGHT position after both engines have been started. This will provide automatic load shedding of the air conditioner if one generator should subsequently go offline.

2.5.2 Starter Limitations

Except in an emergency (such as an airstart), cross generator starting (starting one engine while the generator of the other running engine is on line and producing power) is prohibited.

Starter duty cycle limitations:

25 seconds ON, 1 minute OFF, then

25 seconds ON, 1 minute OFF, then

25 seconds ON, followed by a 30 minute cooling period.

2.6 Air Operable Door Limitations

Operation of the aircraft with an air operable door installed may be conducted when authorized by the regulatory authority subject to the following limitations:

1 Cabin occupancy is limited to crew members essential to the operation, and, if applicable, parachutists to be dropped during the flight.

2 Maximum operating speed is 140 KIAS with air operable door open.

3 The air operable door must be closed for take-off and landing.

4 With the air operable door open, the single engine climb capability may be less than the values presented in Section 5 (Performance Data) of the AFM. It is recommended that the air operable door be closed during single engine operations in order to achieve the performance shown in the performance graphs.

It has been demonstrated that packages up to 300 pounds (136 kilograms) or parachutists can be safely dropped in the following configuration:

Flap deflection 20°

Speed 70 KIAS

⚠ CAUTION

PRECAUTIONS MUST BE TAKEN TO ENSURE THAT THE SIZE AND BULK OF THE PACKAGE TO BE DROPPED IS SUCH THAT THERE IS NO POSSIBILITY OF IT BECOMING JAMMED IN THE DOOR FRAME, OR STRIKING THE AIRCRAFT STRUCTURE.

2.7 Altitude Limitations

Maximum Operating Altitude: 25,000 feet

Service Ceiling: 24,380 feet (both engines operating at Maximum Climb Power, Weight 12,500 pounds, atmospheric conditions ISA +15° C).

2.8 Weight and Center of Gravity Limitations

The center of gravity datum is located 109.32 inches forward of the fuselage jig points that are marked on each side of the aircraft. The MAC is 78 inches in length. LEMAC is 188.24 inches aft of the datum. TEMAC is 266.24 inches aft of the datum.

2.8.1 Take-Off

The maximum weight for take-off is 12,500 pounds (5,675 kg).

The CG limits for take-off are as follows:

FORWARD 20% MAC (203.84 ARM) at 11,600 pounds rising linearly to 25% MAC (207.74 ARM) at 12,500 pounds.

AFT 36% MAC (216.32 ARM) at all weights.

2.8.2 Landing

The maximum weight for landing is 12,300 pounds (5,584 kg).

The CG limits for landing are as follows:

FORWARD 20% MAC (203.84 ARM) at 11,000 pounds rising linearly to 25% MAC (fuselage station 207.74) at 12,300 pounds.

AFT 36% MAC (216.32 ARM) at all weights.

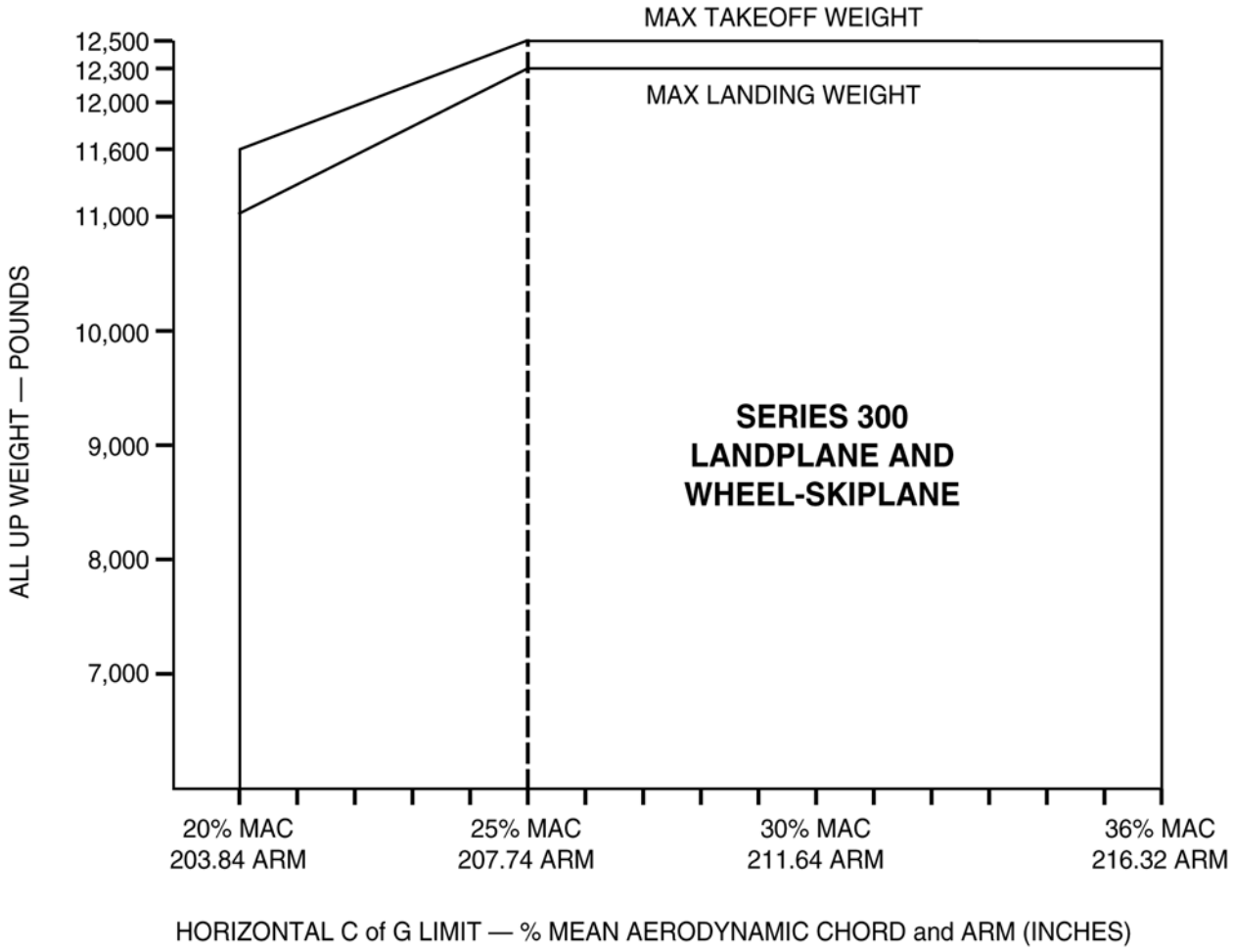


Figure 2-2 Center of Gravity Limitations

NOTE

Additional information about weight and balance calculations can be found in Section 6 of this POH.

2.8.3 Baggage and Freight Loading

2.8.3.1 Maximum Permissible Freight Compartment Loads

Compartments C1 through C11 – 1,333 pounds (605 kg) each.

2.8.3.2 Maximum Permissible Baggage Compartment Loads

Forward baggage compartment – 300 pounds (136 kg). This weight must be reduced by the weight of equipment installed forward of station 44.

Aft baggage compartment – 500 pounds (227 kg), which includes the 150 pound (68 kg) limit on the extension shelf.

If oxygen cylinders are installed on the extension shelf, the aft baggage compartment limitation is reduced to 410 pounds (186 kg), which includes the 60 pound limit on the extension shelf.

2.8.3.3 Maximum Permissible Floor Loading Values

Cabin – 200 pounds per square foot (976 kilograms per square meter)

Forward and rear baggage compartments – 100 pounds per square foot (488 kilograms per square meter)

2.9 Crew Only Cargo Operations and Limitations

The door or curtain fitted between the flight compartment and the cabin must remain open during crew only cargo operations for cabin fire detection purposes.

2.10 Flap System Limitations – Landplane

NOTE

Refer to approved AFM supplements for other gear configurations.

Approved Take-off Setting: Flaps 10°

Approved Landing Settings: For normal operations – Flaps 20° or 37.5°
During or after flight in icing conditions – Flaps 10°

20° is considered normal for landing if runway lengths and conditions permit landing with 20° flap. All the performance graphs in this manual give landing distances with flaps set at 37.5° (full deployment of flaps). To calculate landing distance with flaps set at 20°, multiply the landing distance for flaps 37.5° by 1.3 – in other words, landing distance with flaps 20° is 130% of the distance given in the charts.

To calculate landing distance with flaps set at 10°, multiply the landing distance for flaps 37.5° by 1.8 – in other words, landing distance with flaps 10° is 180% of the distance given in the charts. Landing with flaps 10° is only permitted in icing conditions, or if there is any possibility that ice may be present on any part of the aircraft. At outside air temperatures above ISA, the groundspeeds encountered when landing with flaps 10° may exceed the design speed of the nose wheel.

Enroute Climb – both engines Flaps 0°

Enroute Climb – single engine Flaps 10°

When the autopilot (if installed) is engaged, lower flaps in 5° increments and allow the autopilot to retrim the aircraft subsequent to each extension.

During certification testing, it was demonstrated that flaps could be fully extended or fully retracted from any position (e.g. flaps 0° or flaps 37.5°) without compromising aircraft control or generating excessive longitudinal control forces.

2.11 Flight Crew Limitations

Minimum Flight Crew 1 pilot in the left seat.

2.12 Maneuver Limitations

2.12.1 Design Flight Load Factors

At gross weight of 12,500 pounds, the flight load factors to which the DHC-6 airplane has been designed are:

Maneuvers	CAR Part 3, Normal Category +3.17*g* (flaps retracted) or +2.0*g* (flaps extended) to –1.5*g*
Gusts	CAR Part 4b, Transport Category +3.19*g* to –1.63*g*

2.12.2 Approved Maneuvers – Normal Category Operations

The Twin Otter is certified in the Normal Category. Accordingly, operations are limited to those maneuvers incidental to normal flying (including stalls, but not whip stalls) and turns in which the angle of bank is not in excess of 60°.

Aerobatics or even limited aerobatic maneuvers such as steep turns, spins, lazy eights and chandelles are not approved.

The type of operation is also limited according to the equipment installed. The standard Twin Otter is equipped for day and night VFR operations. Optional equipment is available to make the aircraft eligible for other types of operation such as IFR, flight in icing conditions, commercial use, passenger transport, etc., as specified by the applicable operating regulations.

Special purpose operations such as Short Take-off and Landing (STOL), water bombing, agricultural spraying and dusting, and ferry flights with supplemental fuel tanks installed must be conducted within the limits specified by the appropriate Airworthiness Authority.

2.13 Noise Limitations (FAR 36 Compliance)

When compliance with FAR 36 Appendix F is desired, the airplane operating limitations, emergency and normal operating procedures, and performance data contained in Sections 2, 3, 4 and 5 of this POH are applicable except as supplemented or modified by the paragraphs following.

2.13.1 Fly-Over Noise Limitations

With engine torque set at 50 PSI, propeller RPM must not exceed 91% during normal enroute climb and cruise. This setting is defined as 'Maximum Normal Operating Power' and is indicated by the upper limit of the green arc on the Post-Mod 6/1687 propeller tachometer. Corrected flyover noise levels measured at the referenced power settings were 77.4 dB(A).

NOTE

For airplanes registered in the United States: No determination has been made by the Federal Aviation Administration that the noise levels of this airplane are, or should be, acceptable or unacceptable for operation at, into, or out of any airport.

2.13.2 FAR 36 Propeller Tachometer Limitation Markings

Maximum (red radial) – 96% RPM
(applicable to take-off, approach, landing, single engine, and emergency operations)

Normal operating (green arc) – 75% to 91%
(applicable to climb and cruise phases of flight)

2.13.3 FAR 36 Normal Operating Procedures

Following take-off at normal take-off power settings, power must be reduced to within the 'Maximum Normal Operating Power' limits as soon as safe and practical after the aircraft has reached 400 feet above ground level and the climb is safely established.

2.14 Occupancy Limitations

22 occupants including all flight crew.

NOTE

An approved seat equipped with a seat belt must be provided for each occupant other than an infant. Operating Regulations of the state of registry or state of operation may impose more restrictive occupancy limitations than the Type Certificate.

2.15 Ice Related Limitations

For aircraft without airframe de-icing equipment which inadvertently fly into icing conditions, flap extension must not exceed 10° during or after flight in icing conditions.

For aircraft with airframe de-icing equipment, flap extension must not exceed 10° during flight in icing conditions.

Engine intake deflectors must be extended during flight in icing conditions.

Refer to AFM Supplement 1 for additional limitations applicable to aircraft fitted with de-ice equipment.

WARNING

REFER TO SECTION 10, SAFETY AND OPERATIONAL TIPS, FOR ADDITIONAL GUIDANCE CONCERNING FLIGHT IN ICING CONDITIONS, DE-ICE FLUID APPLICATION, AND ANTI-ICE FLUID APPLICATION.

2.16 Placards

The following placards are installed in the flight compartment of the aircraft:

1 An operating limitations placard containing the following:

  a A definition of the type certification category under which the aircraft must be operated and the specified limitations.

  b The kinds of operation approved for the airplane.

  c Airspeed limitations, recommended airspeeds and (for all aircraft except S.O.O. 6120, Series 320) the maximum demonstrated crosswind component.

2 A generator load limit placard which gives load limits under various conditions.

3 An engine fire instruction placard which provides a procedure to extinguish an engine fire.

4 Autopilot limitations (if installed).

5 Use of flap during or after flight in icing conditions.

6 A requirement for ballast to maintain center of gravity limits at light weights (uniquely configured aircraft only).

SECTION 3

EMERGENCY AND ABNORMAL PROCEDURES

LIST OF EFFECTIVE PAGES

SECTION	PAGE	DATE	SECTION	PAGE	DATE
3	1	10 Sep. 2010		30	10 Sep. 2010
	2	10 Sep. 2010		31	10 Sep. 2010
	3	10 Sep. 2010		32	10 Sep. 2010
	4	10 Sep. 2010		33	10 Sep. 2010
	5	10 Sep. 2010		34	10 Sep. 2010
	6	10 Sep. 2010		35	10 Sep. 2010
	7	10 Sep. 2010		36	10 Sep. 2010
	8	10 Sep. 2010		37	10 Sep. 2010
	9	10 Sep. 2010		38	10 Sep. 2010
	10	10 Sep. 2010		39	10 Sep. 2010
	11	10 Sep. 2010		40	10 Sep. 2010
	12	10 Sep. 2010		41	10 Sep. 2010
	13	10 Sep. 2010		42	10 Sep. 2010
	14	10 Sep. 2010		43	10 Sep. 2010
	15	10 Sep. 2010		44	10 Sep. 2010
	16	10 Sep. 2010		45	10 Sep. 2010
	17	10 Sep. 2010		46	10 Sep. 2010
	18	10 Sep. 2010		47	10 Sep. 2010
	19	10 Sep. 2010		48	10 Sep. 2010
	20	10 Sep. 2010		49	10 Sep. 2010
	21	10 Sep. 2010		50	10 Sep. 2010
	22	10 Sep. 2010		51	10 Sep. 2010
	23	10 Sep. 2010		52	10 Sep. 2010
	24	10 Sep. 2010		53	10 Sep. 2010
	25	10 Sep. 2010		54	10 Sep. 2010
	26	10 Sep. 2010		55	10 Sep. 2010
	27	10 Sep. 2010		56	10 Sep. 2010
	28	10 Sep. 2010		57	10 Sep. 2010
	29	10 Sep. 2010		58	10 Sep. 2010

TABLE OF CONTENTS **PAGE**

3.1 Introduction 9
3.1.1 Emergency vs. Abnormal – Definition 9
3.1.2 Procedure Titles 9
3.1.3 Presentation of Operational Checklists 9
3.1.4 Memory Items 10
3.1.5 Definitions of Ground 10
3.1.6 Circuit Breakers 10

3.2 Airspeeds for Emergency Operations 11

3.3 Engine Failure 12
3.3.1 Engine Failure Prior to Rotation 12
3.3.2 Engine Failure Airborne, Prior to VMC 12
3.3.3 Engine Failure Airborne, After VMC 12
3.3.4 Engine Failure During Flight 14
3.3.5 Normal Air Start 15

3.4 Smoke and Fire 17
3.4.1 Engine Fire on Ground 17
3.4.2 Engine Fire in Flight 17
3.4.3 Cockpit or Cabin Smoke 19
3.4.3.1 Known Source of Fire or Smoke 19
3.4.3.2 Unknown Source of Smoke or Fire 19
3.4.4 Suspected Electrical Fire 20
3.4.5 Battery Overheat 20

3.5 Emergency Descent 21
3.5.1 High Speed Emergency Descent 21
3.5.2 Low Speed Emergency Descent 21

3.6 Icing Emergencies 22
3.6.1 Inadvertent Flight in Severe Icing 22
3.6.2 Excessive Ice Accretion 22
3.6.3 De-Icing System Failure 23

3.7 Abnormal Landings 24
3.7.1 One Engine Inoperative Landing 24

TABLE OF CONTENTS **PAGE**

3.7.2 One Engine Inoperative Missed Approach (Flaps 10°) 24
3.7.3 Precautionary Landing 25
3.7.4 Forced Landing 25
3.7.5 Landing with a Flat Tire 28
3.7.5.1 Landing with a Flat Main Tire 28
3.7.5.2 Landing with a Flat Nose Wheel Tire 28
3.7.6 Flapless Landing 28
3.7.7 Ditching (Landing in Water) 29

3.8 Engine Starting Abnormalities 30
3.8.1 Clearing an Engine 30
3.8.2 No Light Up During Start 30
3.8.3 Failure to Accelerate 30
3.8.4 High T5 Temperature 31
3.8.5 Low Oil Pressure 31
3.8.6 Generator Light Fails to Illuminate Following Start 31

3.9 Stall Recovery 32

3.10 Engine Abnormalities in Flight 33
3.10.1 Engine Shutdown in Flight 33
3.10.2 Oil Pressure in Caution Range 34
3.10.3 Engine Oil Pressure Light Illuminates 34
3.10.4 Engine Flameout 34
3.10.5 Engine Overtemperature - T5 Exceeds Limit 34
3.10.6 Engine Overspeed - NG Exceeds Limit 35

3.11 Propeller Abnormalities 36
3.11.1 Propeller Overspeed - NP Exceeds Limit 36
3.11.2 Uncommanded Feathering 36
3.11.3 Propeller Reversal 37
3.11.4 Intermittent Beta Light 37
3.11.5 Steady Beta Light 38
3.11.6 Reset Props Light Illuminates 38

3.12 Electrical Abnormalities 40
3.12.1 One Generator Light Illuminated 40
3.12.2 Both Generator Lights Illuminated 40

TABLE OF CONTENTS **PAGE**

3.12.3 Total Electrical Failure 41
3.12.4 Generator Overheat Light Illuminated 41
3.12.5 400 Cycle Light Illuminated (aircraft with one inverter switch) 42
3.12.6 Left or Right 400 Cycle Light Illuminated (aircraft with two inverter switches) 42
3.12.7 Gyro Instrument Power Failure (Flag appears on gyroscopic instrument) 43
3.12.8 Cabin Emergency Lights Operation (S.O.O. 6179 only) 43

3.13 Fuel System Abnormalities 44
3.13.1 Boost Pump 1 Caution Light Illuminates 44
3.13.2 Both Boost Pump Caution Lights Illuminate – Same Tank 44
3.13.3 Fuel Low Level Light Illuminated 44
3.13.4 Fuel Transfer Failure 45

3.14 Hydraulic System Abnormalities 47
3.14.1 Low System Hydraulic Pressure 47

3.15 Instrument Abnormalities 48
3.15.1 Airspeed Miscompare, or Questionable Airspeed Indication 48

3.16 Bleed Air and Pneumatic System Abnormalities 49
3.16.1 Pneumatic Low Pressure Light Illuminates 49
3.16.2 Duct Overheat Light Illuminates 49
3.16.3 Bleed Air Temperature Indicates Above 350° 49

3.17 Flight Control Abnormalities 51
3.17.1 Aileron Trim Tab Runaway 51
3.17.2 Elevator Control Malfunction 51

3.18 Airframe Abnormalities 52
3.18.1 Doors Unlocked Light Illuminates 52

3.19 Procedures Unique to Series 300S Aircraft 53

3.20 Caution Light Summary Table 54

List of Tables Page

3-1 Landing (VREF) Speeds 24
3-2 Landing (VREF) Speeds 29
3-3 Caution Light Summary..... 54

List of Figures Page

3-1 Glide Speed Graphs (both propellers feathered) 26

3.1 Introduction

The emergency and abnormal operating procedures in this section comply with the requirements of SFAR 23.

3.1.1 Emergency vs. Abnormal – Definition

An emergency is an event that requires immediate flight crew action to protect the aircraft and the occupants from serious harm. An abnormality is an event that requires flight crew action, due to the failure of a system or component, to maintain an acceptable level of airworthiness for continued flight and eventual landing.

3.1.2 Procedure Titles

Procedure titles for equipment abnormalities have been constructed to describe the conditions or the annunciations the pilot will observe in the event of an abnormality.

3.1.3 Presentation of Operational Checklists

In the operational checklists that follow in this section, the name of a switch or control is CAPITALIZED if it exactly matches the labelling of the same switch or control in the aircraft. For example, the fuel levers of the engine are clearly marked FUEL, thus this word will be capitalized as follows:

1 FUEL lever – OFF

If a switch or control is not labelled, or if the label on the switch or control is different from the term that is commonly used to refer to that switch or control, the reference will not be capitalized. For example:

1 Power levers – IDLE

The action to be carried out by the pilot on the switch or control is also capitalized if it exactly matches the labelling of the switch or control being referenced. In the above two examples, the fuel lever has a position that is labelled OFF and the power lever has a position labelled IDLE, thus both references are capitalized. The pitot heat switch does not have a label at the on position, but it does have a label at the off position. Thus, references to operating the pitot heat switch will appear as follows:

1 PITOT HEAT switch – OFF

2 PITOT HEAT switch – ON

3.1.4 Memory Items

Procedures in the operational checklist portion of this section shown in **bold face** type are immediate action items that should be committed to memory.

3.1.5 Definitions of Ground

For aircraft fitted with floats or amphibious floats, the word 'ground' shall be read to mean 'water surface' when appropriate.

3.1.6 Circuit Breakers

If a procedure requires a circuit breaker to be "reset", this means to pull out (open) the circuit breaker, wait approximately 2 seconds, then push in (close) the circuit breaker. If the circuit breaker is found to be popped out, reset means to push in (close) the circuit breakers.

If a procedure requires the pilot to "pull" a circuit breaker, this means to pull it out (open it), and to leave it pulled out.

If a procedure requires the pilot to "check" a circuit breaker, this means to observe and note the state of the circuit breaker only, and not to take any action.

Refer to Section 10, Safety and Operational Tips, for additional guidance concerning resetting of circuit breakers.

3.2 Airspeeds for Emergency Operations

All speeds given in this section are for the landplane, at the maximum permitted weight during the phase of flight described.

V_{YSE}	Engine Failure after Take-off, Flaps at 10°:	80 KIAS
V_{MCA}	Minimum Control Speed, One Engine Inoperative:	64 KIAS
V_{SO}	Stall speed, landing configuration (Flaps 37.5°):	56 KIAS
V_{S1}	Stall speed, take-off configuration (Flaps 10°):	66 KIAS
V_S	Stall speed, flaps up:	73 KIAS
V_P	Maneuvering Speed:	
	132 KIAS from sea level to 18,000 feet.	
	Limited by Maximum Operating Speed above 18,000 feet.	
	Glide Speed (both propellers feathered) for best range:	100 KIAS
	Glide Speed (both propellers feathered) for best endurance:	77 KIAS

3.3 Engine Failure

3.3.1 Engine Failure Prior to Rotation

1 **Power levers – IDLE**

2 **Brakes – APPLY**

3.3.2 Engine Failure Airborne, Prior to V_{MC}

WARNING

UNDER NO CIRCUMSTANCE SHOULD ROTATION BE INITIATED PRIOR TO REACHING V_{MC}.

1 **Power levers – Retard as needed to maintain aircraft control.**

2 **Land straight ahead, turn only to avoid obstacles using minimal bank angle.**

NOTE

Be aware that after encountering an engine failure at a speed below V_{MC}, 'straight ahead' is unlikely to be the same as the runway heading.

3.3.3 Engine Failure Airborne, After V_{MC}

NOTE

This procedure is used prior to completion of the AFTER TAKE-OFF checklist, when the PROP AUTOFEATHER switch is selected ON.

If an engine failure occurs after V_{MC}, and a decision is made to continue the take-off:

1 **Power Levers – Set Maximum Power.**

Advance both power levers to the torque, T_5, or N_P limit, whichever is reached first.
Ensure both PROP levers are at the MAX RPM position (96% N_P).

2 **FLAP position indicator – Confirm flaps are set to 10°**

3 **Aircraft Control – Adjust pitch attitude to maintain 80 KIAS. Maintain directional control with rudder.**

4 **Propeller of inoperative engine – Confirm that the propeller has automatically feathered.**

IF THE PROPELLER OF THE AFFECTED ENGINE HAS NOT AUTOMATICALLY FEATHERED:

a **Determine if the power loss is partial or total. If the power loss is partial, it may be appropriate to leave the affected engine operating if it is contributing thrust.**

b **If the power loss is total and the propeller of the inoperative engine has not automatically feathered:**

c **Propeller of inoperative engine – FEATHER manually**

Climb to a safe altitude (typically several thousand feet AGL). If turns are necessary for obstacle clearance, limit bank angle to 15° during single engine operations to avoid negative rates of climb caused by higher wing loading during turns. When a safe altitude has been reached, carry out the following secondary actions:

5 Power lever of inoperative engine – retard to 10 PSI torque position (approximately the zero thrust position)

6 PROP lever of inoperative engine – FEATHER

7 FUEL lever of inoperative engine – OFF

8 BOOST PUMP switch for inoperative engine – OFF

9 GENERATOR switch of inoperative engine – OFF

10 BLEED AIR switch of inoperative engine – OFF

11 FUEL OFF emergency shut-off switch of inoperative engine – OFF

12 PROP AUTOFEATHER switch – OFF

13 Check the generator load on the operative engine and reduce electrical consumption if necessary to stay within the in-flight limitation of 1.0 on the loadmeter.

14 Use fuel as necessary to stay within center of gravity limits for the remainder of the flight.

NOTE

After this checklist has been completed, it is recommended that the power lever of the inoperative engine be moved forward to match the position of the power lever of the operative engine, and that the two power levers then be kept together and moved together for the remainder of the flight.

15 Complete the AFTER TAKEOFF checklist (Section 4.11)

3.3.4 Engine Failure During Flight

If an engine failure occurs after the AFTER TAKE-OFF checklist has been completed and the PROP AUTOFEATHER switch has been selected off, proceed as follows.

1 **Set Maximum Power:**

Advance both power levers to the torque, T_5, or N_G limit, whichever is reached first.

Ensure the PROP lever of the operating engine is at the MAX RPM position (96% N_P).

2 **Aircraft Control – Adjust pitch attitude to maintain altitude. Maintain directional control with rudder.**

3 **Power lever of inoperative engine – Retard to 10 PSI torque position (approximately the zero thrust position).**

4 **PROP lever of inoperative engine – FEATHER**

5 **FUEL lever of inoperative engine – OFF**

6 Trim aircraft as required. Flaps may be left retracted, or extended to 10° if necessary.

NOTE

At maximum take-off weight, the DHC-6 will maintain level flight with flaps up at approximately 110 to 120 KIAS at altitudes below 10,000 feet when one engine is inoperative and feathered and the other engine is set to maximum continuous power. If any attempt to climb is made and airspeed drops below 103 KIAS, flaps 10° should be set to configure the aircraft for best single engine climb performance.

7 Compute and, if necessary, set Maximum Continuous Power.

8 BOOST PUMP switch for inoperative engine – OFF

NOTE

The BOOST PUMP 1 and BOOST PUMP 2 caution lights for the affected fuel tank should illuminate when the BOOST PUMP switch is selected off. If they do not illuminate, consider the possibility of a simultaneous failure of the number 1 boost pump pressure switch and the boost pump changeover system.

9 GENERATOR switch of inoperative engine – OFF

10 BLEED AIR switch of inoperative engine – OFF

11 FUEL OFF emergency shut-off switch of inoperative engine – OFF

12 Check generator load on operative engine and reduce electrical consumption if necessary to stay within the in-flight limitation of 1.0 on the loadmeter.

13 Use fuel as necessary to stay within center of gravity limits for the remainder of the flight.

NOTE

After this checklist has been completed, it is recommended that the power lever of the inoperative engine be moved forward to match the position of the power lever of the operative engine, and that the two power levers then be kept together and moved together for the remainder of the flight.

3.3.5 Normal Air Start

1 Power lever of inoperative engine – IDLE

2 PROP lever of inoperative engine – FEATHER

3 FUEL lever of inoperative engine – OFF

4 FUEL OFF emergency shut-off switch of inoperative engine – NORMAL

5 BOOST PUMP switch for inoperative engine – On

6 GENERATOR switch of inoperative engine – OFF

7 IGNITION switch – NORMAL

8 ENG IGNITER switch inoperative engine (if installed) – BOTH

9 START switch – proceed in accordance with the normal procedures for starting an engine, as follows:

a START switch – Select LEFT or RIGHT as required

b Allow the gas generator speed to stabilize. Confirm that oil pressure begins to rise. As soon as the gas generator speed has stabilized, move the applicable engine FUEL lever to ON without further delay.

c Light-up – Check that engine accelerates to idle RPM (typically 52% N_G at ISA) and that the T_5 temperature during the start process does not exceed the starting limits.

d START switch – Release when N_G has reached idle speed. Confirm oil pressure is satisfactory.

⚠ CAUTION

THE AIRCRAFT WILL YAW CONSIDERABLY AS SOON AS THE PROPELLER IS MOVED OUT OF THE FEATHER POSITION IN THE FOLLOWING STEP OF THIS CHECKLIST. DO NOT UNFEATHER THE PROPELLER UNTIL THE PILOT IS PREPARED TO COMPLETE STEPS 10, 11, AND 12 IN ONE CONTINUOUS UNINTERRUPTED PROCESS.

10 PROP lever – Move to minimum governing position until unfeathered, and then select desired N_P

11 Power lever – Advance to desired power setting

12 Retrim aircraft as required.

13 GENERATOR switch – ON

3.4 Smoke and Fire

3.4.1 Engine Fire on Ground

1 **Bring the aircraft to a complete stop**

2 **PARKING BRAKE – Set**

3 **FIRE BELL MUTE switch – lift up to mute bell**

Follow the ENGINE FIRE INSTRUCTIONS that are printed on the placard above the fire handles:

4 Power levers **(both engines)** – IDLE

5 PROP levers **(both engines)** – FEATHER

6 FUEL levers **(both engines)** – OFF

7 FUEL OFF emergency switch **(affected engine only)** – OFF

8 FIRE PULL handle **(affected engine only)** – Pull to discharge extinguisher

9 BOOST PUMP switches **(both engines)** – OFF

10 **Evacuate aircraft.** (May not always be appropriate for floatplanes unless at the dock.)

When electrical power is no longer needed for communication or illumination of the aircraft and the evacuation has been completed:

11 DC MASTER switch – OFF

Consideration should be given to leaving the DC MASTER switch and the aircraft cabin and exterior lighting on at night after evacuation has been completed. This will enable emergency response crews to more easily locate the aircraft and assist the occupants.

3.4.2 Engine Fire in Flight

1 **FIRE BELL MUTE switch – lift up to mute bell.**

2 **Set Maximum Power on the unaffected engine. Advance the unaffected engine power lever to the torque, T_5, or N_G limit, whichever is reached first. Ensure the PROP lever of the unaffected engine is at the MAX RPM position (96% N_P).**

Follow the ENGINE FIRE INSTRUCTIONS that are printed on the placard above the fire handles for the affected engine:

3 Power lever (affected engine) – retard to 10 PSI torque position (approximately the zero thrust position)

4 PROP lever (affected engine) – FEATHER

5 FUEL lever (affected engine) – OFF

6 FUEL OFF emergency shut-off switch (affected engine) – OFF

7 FIRE PULL handle (affected engine) – Pull to discharge extinguisher

8 BOOST PUMP switch (affected engine) – OFF

9 Trim aircraft as required. Flaps may be left retracted, or extended to 10° if necessary.

NOTE

At maximum take-off weight, the DHC-6 will maintain level flight with flaps up at approximately 110 to 120 KIAS at altitudes below 10,000 feet, when one engine is inoperative and feathered and the other engine is set to maximum continuous power. If any attempt to climb is made and airspeed drops below 103 KIAS, flaps 10° should be set to configure the aircraft for best single engine climb performance.

10 Compute and, if necessary, set Maximum Continuous Power.

11 GENERATOR switch of inoperative engine – OFF

12 BLEED AIR switch of inoperative engine – OFF

13 Check generator load on operative engine and reduce electrical consumption if necessary to stay within the in-flight limitation of 1.0 on the loadmeter.

14 Use fuel as necessary to stay within center of gravity limits for the remainder of the flight.

NOTE

After this checklist has been completed, it is recommended that the power lever of the inoperative engine be moved forward to match the position of the power lever of the operative engine, and that the two power levers then be kept together and moved together for the remainder of the flight.

3.4.3 Cockpit or Cabin Smoke

WARNING

IN THE EVENT OF SMOKE OR FIRE, PREPARE TO LAND THE AIRCRAFT WITHOUT DELAY WHILE COMPLETING FIRE SUPPRESSION AND/OR SMOKE EVACUATION PROCEDURES. IF IT CANNOT BE VISUALLY VERIFIED THAT THE FIRE HAS BEEN COMPLETELY EXTINGUISHED, WHETHER THE SMOKE HAS CLEARED OR NOT, LAND AS SOON AS POSSIBLE.

3.4.3.1 Known Source of Fire or Smoke

1 If required, evacuate passengers from affected area.

2 Extinguish the fire with the portable fire extinguisher.

3.4.3.2 Unknown Source of Smoke or Fire

NOTE

The following procedure has been constructed to preserve pneumatic pressure for operation of de-ice boots and other pneumatic powered services. If pneumatic pressure is not required, both bleed air switches may be turned off at the same time in step 1, and steps 2, 3, and 4 may be disregarded.

1 LEFT BLEED switch – OFF

WAIT UP TO ONE MINUTE, IF NO IMPROVEMENT:

2 LEFT BLEED switch – ON

3 RIGHT BLEED switch – OFF

WAIT UP TO ONE MINUTE, IF NO IMPROVEMENT:

4 RIGHT BLEED switch – ON

5 Land as soon as possible.

3.4.4 Suspected Electrical Fire

If an electrical fire is suspected, it may be possible to control the problem by selecting electrical services – OFF one at a time and observing whether there is an improvement between each selection. This action must not compromise or delay a landing as soon as possible.

3.4.5 Battery Overheat

Battery overheat is indicated by either illumination of the red 150° light on the battery temperature monitor, or an indication of over 150° on the temperature gauge. The temperatures are in degrees Fahrenheit.

1 EXTERNAL/BATTERY switch – OFF

IF BATTERY TEMPERATURE CONTINUES TO RISE:

2 Land as soon as possible.

NOTE

After any indication of battery overheat, maintenance action must be carried out before further flight.

3.5 Emergency Descent

3.5.1 High Speed Emergency Descent

1 Power levers – IDLE

2 PROP levers – MAX RPM (96% N_P)

3 Airspeed – V_{MO} (approximately 12° nose down)

4 Begin recovery 300 feet above desired altitude.

3.5.2 Low Speed Emergency Descent

1 Power levers – IDLE

2 PROP levers – MAX RPM (96% N_P)

3 FLAPS – Select full flap (37.5°) once V_{FE} is reached

4 Airspeed – maintain 93 KIAS (approximately 22° nose down)

5 Begin recovery 300 feet above desired altitude.

3.6 Icing Emergencies

3.6.1 Inadvertent Flight in Severe Icing

1 Autopilot (if installed) – disconnect immediately. Be prepared for a possible roll force requirement by firmly holding the control wheel prior to disconnecting the autopilot.

2 IGNITION switch – Manual

3 IGNITER switches (if installed) – BOTH

4 INTAKE DEFLECTORS – EXTEND

5 PROP Levers – MAX RPM

6 Power Levers – Maximum Continuous Power

7 All installed de-icing equipment, including PITOT HEAT– ON

8 Airspeed – Minimum 125 KIAS, avoid aggressive maneuvering.

9 Exit severe icing conditions – turn back or change altitude as required to obtain an outside air temperature that is less conducive to icing.

10 Notify Air Traffic Control of the severe icing conditions.

WHEN CLEAR OF SEVERE ICING CONDITIONS:

11 Power and PROP Levers – As required

12 Airspeed – As required

13 Autopilot (if installed) – may be used as desired

14 IGNITION switch – NORMAL

15 All installed de-icing equipment – as required

3.6.2 Excessive Ice Accretion

If the rate of ice accretion is such that cruising speed at a constant power setting is reduced by 10 or more KIAS with all de-icing systems operating, alternative action should be taken to avoid further exposure to icing.

3.6.3 De-Icing System Failure

If one of the de-icing systems components become inoperative (excluding the electrically operated engine intake anti-icing boots), descent or other avoidance of icing conditions should be attempted.

If further exposure to icing conditions cannot be avoided, a landing should be made as soon as possible using procedures for "Approach and landing in icing conditions".

3.7 Abnormal Landings

3.7.1 One Engine Inoperative Landing

The procedure for landing with one engine inoperative is as follows:

1 Approach Flaps – 10°

2 Minimum approach airspeed – 80 KIAS (all weights). 90 KIAS is recommended.

3 PROP lever of operating engine – MAX RPM

WHEN LANDING IS ASSURED:

4 Select landing flaps if desired. Single engine landings with flaps 37.5° are not recommended.

5 Minimum airspeed – 1.3 times stall speed for selected flap setting or V_{MC}, whichever is greater. Refer to Table 3-1.

Table 3-1 Landing (V_{REF}) Speeds

FLAP ANGLE	1.3 V_S KIAS					
	12,300 LB	11,500 LB	10,500 LB	9,500 LB	8,500 LB	7,500 LB
10°	85	83	79	75	71	67
20°	80	77	73	70	66	62
37.5°	74	70	67	64	60	57

NOTE

Use of reverse thrust during single engine landings is not recommended.

3.7.2 One Engine Inoperative Missed Approach (Flaps 10°)

A missed approach (also referred to as a go-around or a balked landing) on one engine must not be attempted if the airspeed is below 80 KIAS. A missed approach on one engine should not be attempted once more than 10° of flap has been selected.

1 Set Maximum Power on the unaffected engine. Advance the unaffected engine power lever to the torque, T_5, or N_G limit, whichever is reached first. Ensure the PROP lever of the unaffected engine is at the MAX RPM position (96% N_P).

2 Airspeed (flap 10°) – Climb at 80 KIAS.

3 Maintain heading by applying rudder and, if necessary, lowering the wing on the side of the operating engine up to 5°.

3.7.3 Precautionary Landing

1 Proceed in accordance with the instructions for a normal full flap landing.

2 Touchdown on the main wheels, and keep the nose wheel off the ground as long as possible by applying full aft movement to the control column.

3 Maintain directional control with rudder.

4 Avoid the use of zero thrust or reverse thrust on soft or rough surfaces.

3.7.4 Forced Landing

1 Procedures and speeds for a forced landing (landing with both engines inoperative and both propellers feathered) are identical to procedures and speeds for a normal full flap (flap 37.5°) degree landing. The following additional procedures apply.

2 Refer to glide speed graphs to determine appropriate power off, propellers feathered glide speed.

3 BOOST PUMP switches – both OFF

4 FUEL OFF emergency shut-off switches – both OFF

5 Touchdown on the main wheels, and keep the nose wheel off the ground as long as possible by applying full aft movement to the control column.

6 Maintain directional control with rudder.

7 DC MASTER switch – OFF after aircraft has come to a full stop.

POWER-OFF GLIDE SPEED FOR MAXIMUM RANGE

(LANDPLANE)

GLIDE RANGE

1. –8.18% GRADIENT AT CORRECT SPEED FOR WEIGHT
2. APPROXIMATELY 2 NM PER 1,000 FEET ALTITUDE

ASSOCIATED CONDITIONS

1. FLAPS RETRACTED
2. POWER OFF GLIDE, BOTH PROPELLERS FEATHERED

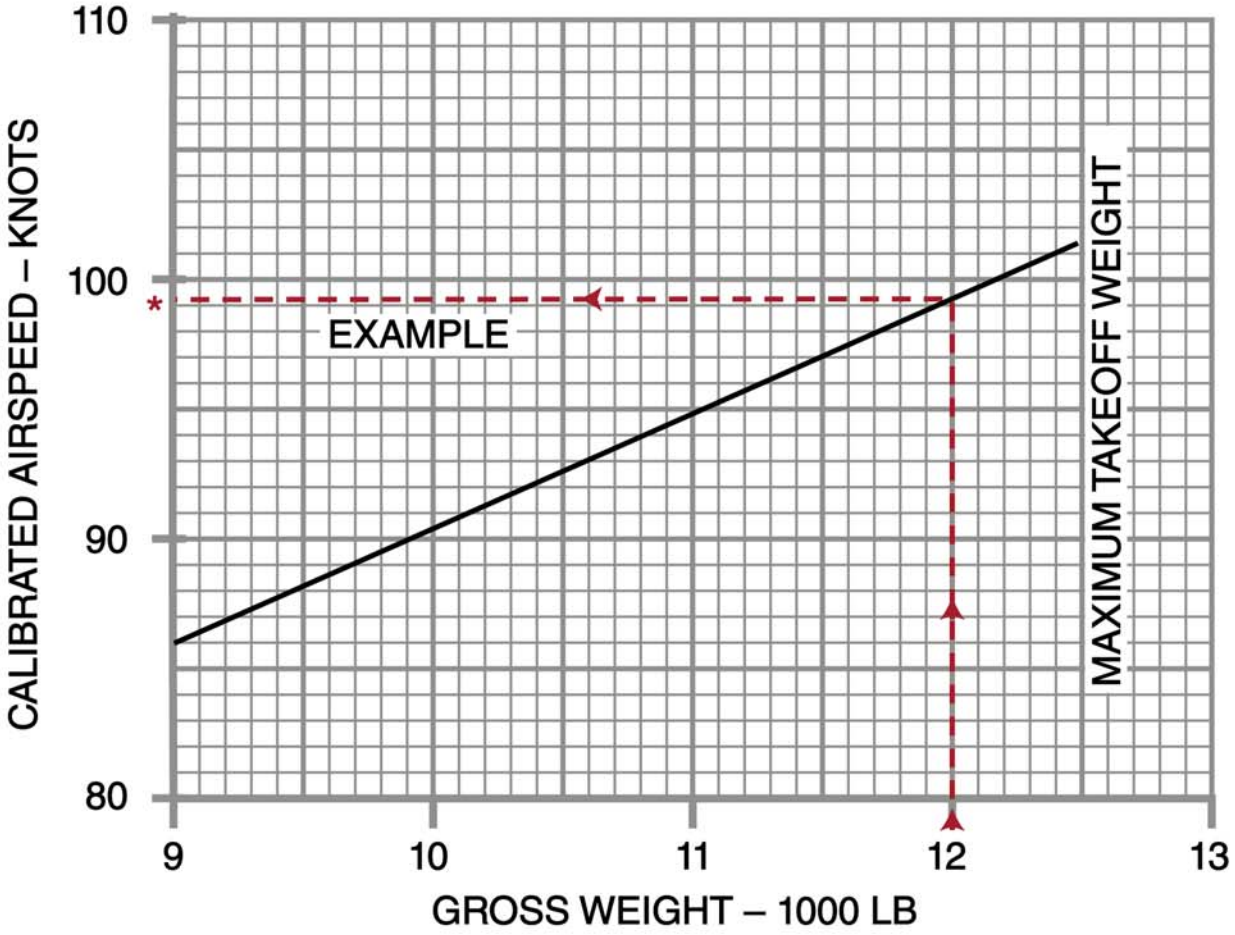


Figure 3-1 Glide Speed Graphs (both propellers feathered) (Sheet 1 of 2)

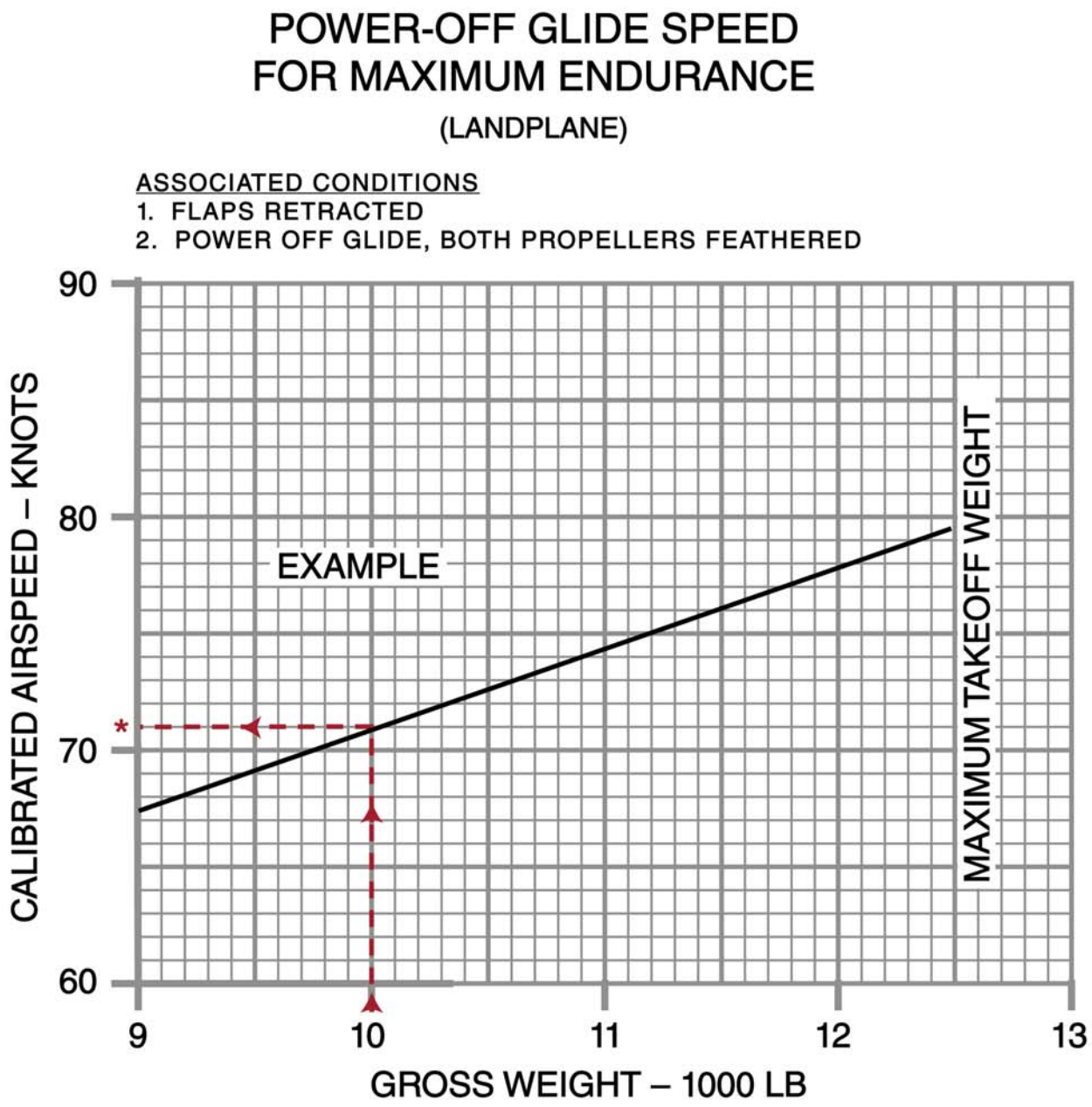


Figure 3-1 Glide Speed Graphs (both propellers feathered) (Sheet 2 of 2)

3.7.5 Landing with a Flat Tire

3.7.5.1 Landing with a Flat Main Tire

1 Carry out a normal full flap (flap 37.5°) degree landing.

2 Touchdown in a wings-level attitude, and reduce weight on the affected main wheel by applying aileron to lift the wing on the affected side. The aircraft will yaw towards the flat mainwheel as soon as the affected wheel begins to bear weight.

3 Maintain directional control with rudder and, if necessary, aileron. Use nose wheel steering only if full rudder and aileron deflection is insufficient to maintain directional control.

4 Apply braking as required on the unaffected mainwheel only. Do not apply braking to the wheel with the flat tire.

3.7.5.2 Landing with a Flat Nose Wheel Tire

1 Carry out a normal full flap (flap 37.5°) degree landing.

2 Touchdown on the main wheels, and keep the nose wheel off the ground as long as possible by applying full aft movement to the control column. Continue to keep elevator full aft until the aircraft comes to a full stop.

3 Maintain directional control with rudder and, if necessary, aileron.

4 Avoid the use of nose wheel steering unless it is absolutely necessary to remain on the runway.

5 Avoid use of wheel braking or reverse thrust unless it is absolutely necessary. If runway length permits, allow the aircraft to roll to a stop.

3.7.6 Flapless Landing

WARNING

TO AVOID THE RISK OF DESCENDING BELOW A NOMINAL 3° APPROACH PROFILE, PARTICULARLY DURING THE FINAL STAGES OF APPROACH, USE OF A RUNWAY SERVED BY VASI, PAPI, OR ILS GLIDESLOPE IS RECOMMENDED. FLAPLESS LANDINGS ARE AN ABNORMAL PROCEDURE AND ARE NOT APPROVED FOR NORMAL OPERATIONS.

Landing distance required will be at least double the distance published for landing with flap 37.5°.

1 Carry out a normal approach and landing, using the speeds in the V_{REF} table.

Table 3-2 Landing (V_{REF}) Speeds

FLAP ANGLE	1.3 V_S KIAS					
	12,300 LB	11,500 LB	10,500 LB	9,500 LB	8,500 LB	7,500 LB
0°	94	90	86	82	77	72

2 Touch down on the main wheels, and keep the nose wheel off the ground until the airspeed has decreased below 60 KIAS. Use rudder and, if necessary, aileron for directional control above 60 KIAS.

IF RUNWAY LENGTH IS MINIMAL:

3 Apply reverse thrust and maximum wheel braking immediately after touchdown.

NOTE

Reverse thrust is most effective at speeds greater than 60 KIAS.

3.7.7 Ditching (Landing in Water)

Refer to the Safety and Operational Tips (Section 10) for discussion of ditching.

3.8 Engine Starting Abnormalities

3.8.1 Clearing an Engine

If it is necessary to ensure all unburned fuel is removed from the engine combustion section following an unsuccessful start attempt, proceed as follows:

1 IGN Circuit breaker (affected engine) – Pull out

2 FUEL lever (affected engine) – OFF

3 Power lever (affected engine) – IDLE

4 START switch (affected engine) – Hold LEFT or RIGHT (as appropriate) for 10 seconds.

IF THERE IS A FIRE IN THE AFFECTED ENGINE, CONTINUE AS FOLLOWS:

5 FUEL OFF emergency shut-off switch (affected engine) – OFF

6 BOOST PUMP (affected engine) – OFF

7 FIRE PULL handle (affected engine) – Pull

Shut down the opposite side engine if it is running, evacuate the aircraft, and apply the portable fire extinguisher into the exhaust stub of the affected engine if necessary.

3.8.2 No Light Up During Start

If the engine fails to light up within 10 seconds of introducing fuel, proceed as follows:

1 FUEL lever (affected engine) – OFF

2 START switch (affected engine) – continue to motor engine for 10 seconds.

3 Perform ‘Clearing an Engine’ checklist Para 3.8.1 before next start attempt.

3.8.3 Failure to Accelerate

If the engine fails to light up within 10 seconds of introducing fuel, proceed as follows:

1 FUEL lever (affected engine) – OFF

2 START switch (affected engine) – continue to motor engine for 10 seconds.

3.8.4 High T_5 Temperature

If the T_5 temperature exceeds starting limits during the start procedure, proceed as follows:

1 FUEL lever (affected engine) – OFF

2 START switch (affected engine) – continue to motor engine for 10 seconds.

3.8.5 Low Oil Pressure

If oil pressure is less than 40 PSI at the end of the start procedure, shut down the engine.

3.8.6 Generator Light Fails to Illuminate Following Start

WARNING

THIS PROCEDURE SHOULD ONLY BE CARRIED OUT IF THE AIRCRAFT IS ON THE GROUND.

If the GENERATOR light of the engine being started fails to illuminate when the start switch is released at the end of the start procedure, proceed as follows:

1 Generator switch (affected engine) – OFF

If the GENERATOR light of the affected engine illuminates, this is the end of the procedure.

IF THE GENERATOR LIGHT DOES NOT ILLUMINATE, CONTINUE AS FOLLOWS:

2 BUS TIE switch – OPEN

3 MASTER switch – OFF

4 Shut down the aircraft following normal procedures.

3.9 Stall Recovery

At the first indication of a stall (stall light illuminates, stall horn sounds, wing drop/lateral instability, or stall buffet detected accompanied by an increase in rate of descent and/or excessively low airspeed):

1 Autopilot (if in use) – DISENGAGE

2 Attitude

a REDUCE PITCH ATTITUDE

b If in a turn – ROLL WINGS LEVEL

WARNING

DO NOT PUSH THE CONTROL COLUMN FULLY FORWARD. EITHER RELAX BACK PRESSURE ON THE CONTROL COLUMN, OR, MOVE THE CONTROL COLUMN FORWARD UNTIL THE DESIRED PITCH ATTITUDE IS ACHIEVED.

3 Power Levers – SET MAXIMUM POWER

Advance both power levers to the torque, T_5, or N_P limit, whichever is reached first.

Ensure both PROP levers are at the MAX RPM position (96% N_P).

4 Airspeed – Increase to V_{REF} appropriate to weight and flap configuration.

NOTE

If the aircraft pitch and roll attitudes at the time the stall (or stall warning) is recognized are within the limits of normal flight operations, steps 2 and 3 of this procedure should be initiated at the same time. If the aircraft is in an unusual pitch or roll attitude at the time the stall (or stall warning) is recognized, step 2 should be initiated first, followed by step 3.

Loss of altitude can be expected during stall recovery.

3.10 Engine Abnormalities in Flight

3.10.1 Engine Shutdown in Flight

1 Increase power and propeller speed on the operating engine as required prior to shutting down affected engine.

If additional power is required from the operating engine, move the PROP lever of the operating engine to the MAX RPM (96% N_P) position.

2 Power lever (affected engine) – retard to 10 PSI torque (approximately the zero thrust position)

3 PROP lever (affected engine) – FEATHER

4 Aircraft Control – Adjust pitch attitude to maintain altitude. Maintain directional control with rudder. Trim aircraft as necessary.

5 FUEL lever (affected engine) – OFF

NOTE

At maximum take-off weight, the DHC-6 will maintain level flight with flaps up at approximately 10 to 120 KIAS at altitudes below 10,000 feet when one engine is inoperative and feathered and the other engine is set to maximum continuous power. If any attempt to climb is made and airspeed drops below 103 KIAS, flaps 10° should be set to configure the aircraft for best single engine climb performance.

6 Compute and, if necessary, set Maximum Continuous Power.

7 BOOST PUMP switch for inoperative engine – OFF

8 GENERATOR switch of inoperative engine – OFF

9 BLEED AIR switch of inoperative engine – OFF

10 FUEL OFF emergency shut-off switch of inoperative engine – OFF

11 Check generator load on operative engine and reduce electrical consumption if necessary to stay within the in-flight limitation of 1.0 on the loadmeter.

12 Use fuel as necessary to stay within center of gravity limits for the remainder of the flight.

NOTE

After this checklist has been completed, it is recommended that the power lever of the inoperative engine be moved forward to match the position of the power lever of the operative engine, and that the two power levers then be kept together and moved together for the remainder of the flight.

3.10.2 Oil Pressure in Caution Range

Oil pressure less than 80 PSI at or above 72% N_G:

1 Power lever (affected engine) – reduce N_G to 70% or less.

3.10.3 Engine Oil Pressure Light Illuminates

1 Confirm low oil pressure condition exists by referring to OIL PRESSURE gauge for the same engine.

IF OIL PRESSURE ON OIL PRESSURE GAUGE IS LESS THAN 40 PSI:

2 Shut down the affected engine

3 Complete the ‘Engine Shutdown in Flight’ checklist Para 3.10.1.

3.10.4 Engine Flameout

If the engine flames out during flight, as indicated by a sudden and substantial loss of thrust from the affected engine and engine instrument indications that are similar to a normal shutdown, complete the ‘Engine Failure During Flight’ checklist Para 3.3.4.

If the cause of the flameout can be corrected (for example, if the flameout was caused by improper fuel management or failure to extend the intake deflectors in conditions of visible moisture at temperatures of +5°C or less), an airstart may be attempted. Refer to the ‘Normal Airstart’ checklist Para 3.3.5.

3.10.5 Engine Overtemperature - T_5 Exceeds Limit

If the T_5 temperature exceeds the take-off or maximum continuous limit (725°) or climb and cruise limit (695°), as appropriate to the condition of flight, proceed as follows:

1 Power lever (affected engine) – reduce N_G until acceptable T_5 temperature is achieved.

IF AN ACCEPTABLE T_5 TEMPERATURE CANNOT BE ACHIEVED:

2 Shut down the affected engine.

3 Complete the ‘Engine Shutdown in Flight’ checklist Para 3.10.1

3.10.6 Engine Overspeed - N_G Exceeds Limit

If the N_G exceeds the normal operating limit (101.5% at temperatures above –30°C), proceed as follows:

1 Power lever (affected engine) – reduce N_G until acceptable N_G is achieved.

IF AN ACCEPTABLE N^G CANNOT BE ACHIEVED:

2 Shut down the affected engine.

3 Complete the ‘Engine Shutdown in Flight’ checklist Para 3.10.1.

3.11 Propeller Abnormalities

3.11.1 Propeller Overspeed - N_P Exceeds Limit

IF N_P EXCEEDS 96% BUT IS AT OR BELOW 101.5%:

1 Move opposite side (unaffected engine) PROP lever forward to MAX RPM (96%) to reduce N_P mismatch.

2 Land as soon as practical.

IF N_P EXCEEDS 101.5%:

1 Shut down affected engine.

2 Complete the 'Engine Shutdown in Flight' checklist Para 3.10.1.

3.11.2 Uncommanded Feathering

1 **Advance the unaffected engine power lever to the torque, T_5, or N_G limit, whichever is reached first. Ensure the PROP lever of the unaffected engine is at the MAX RPM position (96% N_P).**

2 **Aircraft Control – Adjust pitch attitude to maintain altitude. Maintain directional control with rudder.**

3 **Power lever of affected engine – IDLE**

4 Trim aircraft as required. Flaps may be left retracted, or extended to 10° if necessary.

NOTE

At maximum take-off weight, the DHC-6 will maintain level flight with flaps up at approximately 110 to 120 KIAS at altitudes below 10,000 feet when one engine is inoperative and feathered and the other engine is set to maximum continuous power. If any attempt to climb is made and airspeed drops below 103 KIAS, flaps 10° should be set to configure the aircraft for best single engine climb performance.

5 Compute and, if necessary, set Maximum Continuous Power on the operating engine.

If the affected engine operating parameters are within limits, an attempt may be made to determine the cause of the uncommanded feathering. Proceed as follows:

6 Check the BETA light for the affected engine. If it is illuminated, complete the 'Steady Beta Light' checklist Para 3.11.5.

7 If the autofeather system is selected ON (evidenced by illumination of the green autofeather SELECT light), turn the autofeather system off.

8 If neither of these actions resolves the problem, shut down the engine in accordance with the instructions provided in 'Engine Shutdown in Flight' Para 3.10.1.

3.11.3 Propeller Reversal

IF PROPELLER BLADE LATCHES (MOD 6/1303) ARE NOT FITTED:

1 Complete the 'Engine Shutdown in Flight' checklist Para 3.10.1.

IF PROPELLER BLADE LATCHES (MOD 6/1303) ARE FITTED:

1 Power lever (affected engine) – IDLE

2 Propeller lever (affected engine) – minimum governing position (75% N_P)

3 Do not shut down the affected engine.

4 If the malfunction occurs during final approach with more than 10° flap selected, continue the approach and do not retract the flaps. Do not attempt a go-around.

3.11.4 Intermittent Beta Light

An intermittent propeller beta range light indicates that the propeller is being prevented from going into the reverse range in flight by the beta back-up system. This may be accompanied by a light buffet and easily controllable yaw and wing-down trim change towards the side of the propeller malfunction.
Proceed as follows:

1 PROP levers (both) – move aft to minimum governing position (75% N_P)

2 Power levers (both) – advance sufficiently to increase propeller speed to 75% N_P. This will transfer control of the propeller to the primary governor. The propeller beta range light will stop flashing.

3 Carry out a normal approach and landing using standard procedures and speeds, except: do not move the PROP levers forward to MAX RPM for landing. Leave both PROP levers at minimum governing (75% N_P) until the landing has been completed.

4 During final approach and landing, maintain symmetric power on both engines, and then reduce both power levers to IDLE at touchdown. Expect the propeller beta range light to begin to flash again when N_P decreases below 75%.

5 Reverse thrust will not be available during landing due to the mechanical interlock, because the PROP levers will be in the minimum governing (75% N_P) position.

6 Do not twist the power lever grips at any time.

7 After landing, the affected engine may be used for taxi if desired. The power lever grips must not be twisted during taxi. The affected engine may also be shut down if desired, after which zero thrust or reverse may be used on the opposite side (unaffected) engine.

3.11.5 Steady Beta Light

If the propeller beta range light illuminates steadily, torque will rise and N_P will fall. The propeller will eventually feather. The action to be taken depends on the phase of flight.

ON GROUND:

1 Repair before flight.

DURING CRUISE FLIGHT:

1 Verify that the propeller beta range light is illuminated steadily and not slowly flashing.

2 Power lever (affected engine) – retard, if necessary, to prevent overtorque.

3 BETA SYS circuit breaker – pull circuit breaker out

4 Power lever (affected engine) – as required

5 Normal power may be used to complete the flight. Normal procedures should be followed for approach and landing. Reverse may be used after landing, if desired.

DURING APPROACH OR LANDING:

1 Do not pull the BETA SYS circuit breaker.

2 Power lever (affected engine) – retard if necessary to prevent overtorque

3 Carry out a single engine landing.

3.11.6 Reset Props Light Illuminates

DURING FINAL APPROACH:

1 **PROP levers – move forward to MAX RPM (96% N_P)**

ON GROUND – BOTH ENGINES RUNNING:

1 PROP levers – move forward to MAX RPM (96% N_P)

OTHER PHASES OF FLIGHT:

No action is necessary.

3.12 Electrical Abnormalities

3.12.1 One Generator Light Illuminated

1 GENERATOR switch (affected engine) – OFF

2 GENERATOR switch (affected engine) – RESET once

3 GENERATOR light (affected engine) – Check light is out

IF GENERATOR DOES NOT RESET:

4 INVERTER switch – SELECT NO. 1 (applicable to aircraft with single inverter switch only)

5 BUS TIE switch – OPEN

6 GENERATOR switch (affected engine) – RESET once

7 GENERATOR light (affected engine) – Check light is out

8 DC Loadmeter – Check generator loads

IF GENERATOR DOES NOT RESET:

9 GENERATOR switch (affected engine) – OFF

10 BUS TIE switch – NORMAL

11 DC Loadmeter – Check generator load

3.12.2 Both Generator Lights Illuminated

1 INVERTER switch – SELECT NO. 1 (applicable to aircraft with single inverter switch only)

2 BUS TIE switch – OPEN

3 GENERATOR switches (2) – Both OFF

4 GENERATOR switches (2) – Reset individually, maximum 2 attempts each.

5 DC Loadmeter – CHECK to determine which generator(s) are producing power

6 If both generators reset, leave BUS TIE switch open.

IF ONE GENERATOR DOES NOT RESET:

7 GENERATOR switch (malfunctioning system) – OFF

8 BUS TIE switch – NORMAL

9 DC Loadmeter – Check

3.12.3 Total Electrical Failure

In the event of a complete loss of electrical power, proceed as follows:

1 BUS TIE switch – OPEN

2 GENERATOR switches – Both OFF

3 GENERATOR switches – RESET individually, max two attempts

4 DC LOADMETER – check to determine which generator(s) are producing power

5 INVERTER switch – Select NO. 1 or NO. 2 to match operating generator

6 If both generators reset, leave BUS TIE switch OPEN

IF ONE GENERATOR DOES NOT RESET:

7 GENERATOR switch (malfunctioning system) – OFF

8 BUS TIE switch – NORMAL

9 Reverse Current Circuit Breaker (Pre Mod 6/1651) – Reset if necessary

10 DC Loadmeter – CHECK

3.12.4 Generator Overheat Light Illuminated

1 GENERATOR switch (affected engine) – OFF

2 DC Loadmeter – Check generator load

IF THE GENERATOR OVERHEAT LIGHT GOES OUT WITHIN 3 MINUTES

3 Do not reset the affected generator.

IF THE GENERATOR OVERHEAT LIGHT DOES NOT GO OUT WITHIN 3 MINUTES:

4 Shut down the affected engine, or, if it is not safe or practical to shut down the engine;

5 Visually monitor the engine cowling for evidence of fire at the top rear of the cowling near the access panel used to access the engine oil dipstick. Be prepared for the possibility of an engine fire warning due to overheat of the fire sensor located near the generator. If a fire warning occurs, complete the 'Engine Fire in Flight' checklist Para 3.4.2.

3.12.5 400 Cycle Light Illuminated (aircraft with one inverter switch)

The most likely cause of the 400 cycle light illuminating in flight of failure of the selected inverter.

1 INVERTER switch – Select other inverter.

IF THIS DOES NOT SOLVE THE PROBLEM:

2 INVERTER 1 Circuit breaker (right hand overhead panel) – check and reset if necessary

3 INVERTER 2 Circuit breaker (right hand overhead panel) – check and reset if necessary

4 INVR 2 CONT Circuit breaker (left main panel) – check and reset if necessary

IF THE 400 CYCLE REMAINS ILLUMINATED, BUT 400 CYCLE POWER APPEARS TO BE PRESENT:

5 400 ~ FAIL fuse (panel behind left pilot's head) – check for presence of blown fuse.

3.12.6 Left or Right 400 Cycle Light Illuminated (aircraft with two inverter switches)

NOTE

For aircraft with S.O.O. 6142 (dual inverter switches for Series 310, 320) installed, and for Series 300S aircraft.

1 Affected INVERTER switch – OFF

If the 400 CYCLE caution light goes out, the instruments and services of the affected bus are lost. This is the end of the checklist. The affected INVERTER switch must not be moved to the EMER position.

IF THE 400 CYCLE CAUTION LIGHT REMAINS ILLUMINATED:

2 Affected INVERTER switch – EMER

3 Check that the 400 CYCLE caution light goes out, and the instruments and services of the affected bus are functioning normally.

3.12.7 Gyro Instrument Power Failure (Flag appears on gyroscopic instrument)

If the gyro instrument power supply should fail or become inadequate as indicated by appearance of the red ‘power failure’ flags within the instrument, and the failure is not caused by an inverter failure:

1 Check DIR GYRO or ART HORIZ (as applicable) fuses for affected side.

FOR AIRCRAFT WITH S.O.O. 6176 (DC POWERED ATITUDE INDICATOR):

1 Check PILOT ART HORIZ Circuit breaker (main panel).

See the amplified procedures in Section 10 for additional system description.

3.12.8 Cabin Emergency Lights Operation (S.O.O. 6179 only)

If a failure of the main 28 volt DC power supply occurs when the LIGHTING EMER switch is selected to ARM, the cabin emergency lights illuminate automatically. When DC power is reinstated the emergency lights will go out and revert to their "armed" condition. No pilot action is necessary.

3.13 Fuel System Abnormalities

3.13.1 Boost Pump 1 Caution Light Illuminates

1 BST PUMP 1 circuit breaker for affected pump (FWD or AFT, as appropriate) – pull circuit breaker.

NOTE

If the BOOST PUMP 1 caution light illuminates, but the BOOST PUMP 2 caution light does not illuminate, this indicates that the automatic changeover system has functioned as designed and automatically energized the number 2 boost pump in the affected tank. It is neither necessary or desirable to lift up the STDBY BOOST PUMP EMER switch on the affected side. It is normal for the BOOST PUMP 2 caution light to flicker on momentarily (for less than one second) at the moment the changeover takes place.

3.13.2 Both Boost Pump Caution Lights Illuminate – Same Tank

NOTE

It is normal for both boost pump caution lights to illuminate whenever the fuel tank selector rotary switch is turned to supply both engines from the opposite side tank. The caution lights will go out when the fuel tank selector rotary switch is returned to the center (NORM) position.

1 STDBY BOOST PUMP EMER switch (affected side) – lift up to on position

2 BST PUMP 1 circuit breaker for affected pump (FWD or AFT, as appropriate) – pull circuit breaker

IF BOTH BOOST PUMP CAUTION LIGHTS REMAIN ILLUMINATED:

3 FUEL SELECTOR rotary switch – select opposite side (unaffected) tank

4 For fuel planning purposes, consider the fuel in the affected tank to be unusable.

3.13.3 Fuel Low Level Light Illuminated

The most probable cause of a FUEL LOW LEVEL light illuminating is low fuel quantity in the affected tank. The FWD FUEL LOW LEVEL light will illuminate when approximately 75 pounds of fuel remains in the forward tank. The AFT FUEL LOW LEVEL light will illuminate when approximately 110 pounds of fuel remains in the aft tank.

If a FUEL LOW LEVEL light illuminates and the corresponding fuel gauge indicates 300 pounds or more of fuel in the affected tank, refer to the procedure provided in Fuel Transfer Failure, Para 3.13.4.

1 FUEL SELECTOR rotary switch – select opposite side (unaffected) tank.

2 Continue flight and land as soon as practical with FUEL SELECTOR rotary switch set to the unaffected tank.

3 For fuel planning purposes, consider the fuel in the affected tank to be unusable.

IF FUEL LOW LEVEL LIGHT IN UNAFFECTED TANK SUBSEQUENTLY ILLUMINATES:

4 FUEL SELECTOR rotary switch – NORM (center position).

5 If there is fuel present in one or both wing tanks, select the appropriate WING TANK switch to the ENGINE position.

6 Land as soon as possible, but in no case later than 15 minutes after illumination of both FUEL LOW LEVEL lights, using only the minimum power necessary to continue flight.

7 Maintain as level an attitude as possible for the remainder of the flight to enable all fuel to be consumed.

3.13.4 Fuel Transfer Failure

Illumination of a FUEL LOW LEVEL caution light in flight with 300 or more pounds of fuel remaining in the affected tank indicates a probable failure of the fuel transfer system. Proceed as follows:

1 FUEL SELECTOR rotary switch – select opposite side (unaffected) tank.

2 STDBY BOOST PUMP EMER Switch (affected side) – lift up to on position

3 Continue flight and land as soon as practical with FUEL SELECTOR rotary switch set to the unaffected tank.

4 For fuel planning purposes, consider the fuel in the affected tank to be unusable.

IF FUEL IN THE AFFECTED TANK MUST BE USED IN ORDER TO REACH THE NEAREST AERODROME:

5 FUEL SELECTOR rotary switch – as required.

6 Avoid extreme or prolonged nose up or nose down attitudes.

3.14 Hydraulic System Abnormalities

3.14.1 Low System Hydraulic Pressure

If lower than normal pressure is observed on the system hydraulic pressure gauge (the right hand side pressure gauge):

1 Use hydraulic hand pump to pressurize system. 30 to 40 strokes are needed to produce 1,500 PSI.

IF HYDRAULIC PRESSURE CAN BE MAINTAINED WITH THE HAND PUMP:

2 Ensure that hydraulic system pressure is maintained at or above 1,500 PSI at all times following flap extension. After landing, nose wheel steering should be used with caution. Large movements of the nose wheel steering tiller may deplete the hydraulic system pressure faster than the pilot can operate the pump.

3 HYD PUMP Circuit breaker – Check, but do not reset in flight.

IF HYDRAULIC PRESSURE CAN NOT BE MAINTAINED WITH THE HAND PUMP:

4 HYD PUMP Circuit breaker – Pull

5 Prepare for:

a Flapless Landing (Refer to Para 3.7.6 ‘Flapless Landing’ for procedure).

b Limited wheel braking if the brake system is pressurized, or;

c No wheel braking if the brake system is not pressurized.

d Use of zero thrust or slow application of reverse to stop the aircraft.

e No nose wheel steering after landing.

3.15 Instrument Abnormalities

3.15.1 Airspeed Miscompare, or Questionable Airspeed Indication

Each airspeed indicator is supplied with dynamic (pitot) pressure by its own individual pitot tube. In the event of a miscompare between instruments or questionable indications on both instruments:

1 PITOT HEAT switch – ON

2 PITOT HEAT Circuit breakers – Check

3 Consider the possibility of a problem with the static pressure system.

4 Consult independent sources of groundspeed information such as:

a GPS receivers

b Air Traffic Control Services

3.16 Bleed Air and Pneumatic System Abnormalities

3.16.1 Pneumatic Low Pressure Light Illuminates

A PNEUMATIC LOW PRESS caution light is fitted to all aircraft equipped with surface de-ice boots. It is normal for this light to illuminate when the BLEED AIR switches are off, or at engine speeds less than 70% N_G when the BLEED AIR switches are ON. The PNEUMATIC LOW PRESS caution light will illuminate when pneumatic pressure is insufficient to reliably inflate the surface de-ice boots.

If the PNEUMATIC LOW PRESS caution light illuminates during flight in icing conditions:

1 BLEED AIR switches (both) – ON

2 CABIN HEAT mode switch – AUTO or OFF

3 Increase engine N_G to above 70%.

IF THE PNEUMATIC LOW PRESS CAUTION LIGHT DOES NOT GO OUT:

4 Exit icing conditions immediately.

3.16.2 Duct Overheat Light Illuminates

The DUCT OVERHEAT caution light will illuminate when the air temperature in the heating system plenum (directly below the floor between the two pilot seats) exceeds a safe value. The cause is almost always a lack of outside air flowing through the heating system.

1 RAM AIR lever – fully OPEN

2 TEMP CONTROL or MANUAL COOL/WARM switch – reduce cabin temperature set point

IF ON GROUND:

3 VENT FAN – ON

3.16.3 Bleed Air Temperature Indicates Above 350°

NOTE

Applicable only to aircraft with serial numbers between 311 and 410 equipped with Mod 6/1266 (circular colour-coded bleed air temperature gauge below right pilot instrument panel)

1 BLEED AIR switch (affected side) – OFF

2 Avoid icing conditions

NOTE

Momentary, transient indications above 350° (within the yellow band) are acceptable.

3.17 Flight Control Abnormalities

3.17.1 Aileron Trim Tab Runaway

1 If necessary, reduce speed to relieve control forces.

IF TRIM TAB CAN BE OPERATED BY PRESSING ROCKER SWITCH:

2 AILERON TRIM switch – Press in appropriate direction

WHEN CONTROL FORCE IS RELIEVED:

3 AIL TRIM ACT circuit breaker (main panel) – pull

3.17.2 Elevator Control Malfunction

WARNING

AIRCRAFT LONGITUDINAL RESPONSE TO ELEVATOR TRIM CONTROL AND POWER CHANGES WILL BE REDUCED. AVOID LARGE AND/OR RAPID CHANGES IN TRIM AND POWER.

If movement of the control column does not produce a corresponding change in pitch attitude, longitudinal control can be managed by using the elevator trim. Engine power should be used to control vertical speed and airspeed.

Flaps should be extended or retracted cautiously, in increments of 5° or less.

Application of power will usually result in a nose-up pitching moment, and reduction of power will usually result in a nose-down pitching moment.

Extension of flap will usually result in a nose-up pitching moment, and retraction of flap will usually result in a nose-down pitching moment.

3.18 Airframe Abnormalities

3.18.1 Doors Unlocked Light Illuminates

IF ON GROUND:

1 Stop aircraft and apply parking brake.

2 Attempt to secure the affected door from within the aircraft.

3 If it is necessary to exit the aircraft to secure the door, shut down the engine on the affected side before leaving the aircraft, and exit and re-enter the aircraft only from the side with the inoperative engine.

IF IN FLIGHT:

1 SEAT BELT sign – ON

2 Do not attempt to secure the door.

3 If appropriate, move passengers away from affected door.

3.19 Procedures Unique to Series 300S Aircraft

Amendment 21, which consists of 6 pages, contains changes to emergency and abnormal procedures (particularly electrical system procedures) that are unique to the Series 300S aircraft. There are only 5 Series 300S aircraft remaining in service, they are aircraft SNs 351, 352, 355, 357, and 358.

Operators of aircraft with these SNs should contact Viking Air Limited to obtain a copy of Amendment 21 to the AFM. This amendment was published in June of 2005 and revised in 2010.

3.20 Caution Light Summary Table

Table 3-3 Caution Light Summary

Caution Light Indication	Probable Cause	Action	Remarks
400 CYCLE	Inverter failure	'400 Cycle Light Illuminated' abnormal checklist	For aircraft with one inverter switch only.
AFT FUEL LOW LEVEL	Minimal fuel in aft tank	'Fuel Low Level Light Illuminated' abnormal checklist	
AUTOFEATHER SELECT	Autofeather system has been selected on	No action needed	This is an advisory light only.
AUTOFEATHER ARMED	Autofeather system is armed	No action needed	This is an advisory light only.
BATTERY OVERHEAT 150°	Battery is too hot	'Battery Overheat' emergency checklist	Light is often not functional on aircraft equipped with a lead acid battery.
BACK UP DISARMED (refers to beta backup system)	Power levers moved forward rapidly after use of heavy reverse	No action needed	This is normal and acceptable if the light goes out after one or two seconds.
BOOST PUMP 1 AFT PRESS	Failure of aft boost pump 1	'Boost Pump 1 Caution Light Illuminates' abnormal checklist	
BOOST PUMP 2 AFT PRESS	Failure of aft boost pump 2	'Both Boost Pump Caution Lights Illuminate' abnormal checklist	Boost pump 2 caution light will normally not illuminate alone.
BOOST PUMP 1 FWD PRESS	Failure of forward boost pump 1	'Boost Pump 1 Caution Light Illuminates' abnormal checklist	

Table 3-3 Caution Light Summary (continued)

Caution Light Indication	Probable Cause	Action	Remarks
BOOST PUMP 2 FWD PRESS	Failure of forward boost pump 2	'Both Boost Pump Caution Lights Illuminate' abnormal checklist	Boost pump 2 caution light will normally not illuminate alone.
DOORS UNLOCKED	One of the following doors not latched: nose baggage, forward main cabin door, aft main cabin door, right rear cabin door, rear baggage compartment door.	'Doors Unlocked Caution Light' abnormal checklist	Flight compartment doors and cabin plug type exits are not connected to this warning light.
DUCT OVERHEAT	Cabin temperature control settings are not appropriate for OAT, or; cabin heat was set to AUTO when aircraft was on ground.	'Duct Overheat Light Illuminates' abnormal checklist	Problem is usually caused by RAM AIR lever not sufficiently open when heating system is in use.
FWD FUEL LOW LEVEL	Minimal fuel in forward tank	'Fuel Low Level Light Illuminated' abnormal checklist	
FIRE PULL	Overheat of a fire sensor in affected engine	'Engine Fire' emergency checklist appropriate to phase of flight	Will be accompanied by loud bell.

Table 3-3 Caution Light Summary (continued)

Caution Light Indication	Probable Cause	Action	Remarks
HYD PUMP C/BKR OPEN	HYD PUMP circuit breaker has been pulled out	If on ground, press HYD PUMP circuit breaker in to re-establish power	HYD PUMP circuit breaker should never be pulled by the pilot except during a hydraulic system abnormality.
L 400 CYCLE	Left inverter failure	'Left or Right 400 Cycle Light Illuminated' abnormal checklist	For aircraft with two inverter switches only.
L BETA	Left propeller less than +9° blade angle	Appropriate 'Beta Light' checklist if power lever has not been moved into reverse range	Normal if on ground and power lever has been moved to reverse range.
L ENGINE OIL PRESSURE	Low oil pressure in left engine	'Engine Oil Pressure Light Illuminates' abnormal checklist	
L GENERATOR	Left generator relay is open	'One Generator Light Illuminated' abnormal checklist	
L GENERATOR OVERHEAT	Left generator is hot	'Generator Overheat Light Illuminated' abnormal checklist	Not all aircraft are equipped with a generator overheat light.
PNEUMATIC LOW PRESS	Bleed air switches off, engine at low speed, cabin heater using too much bleed air.	'Pneumatic Low Pressure Light Illuminates' abnormal checklist	Normal in most cases, checklist only needed if light illuminates when de-ice boots are being used. Not all aircraft are equipped with this light.
PWR LVR TEST	Button pushed when power levers are not aft of idle position.	No action required	Illumination of button indicates system passes function test.

Table 3-3 Caution Light Summary (continued)

Caution Light Indication	Probable Cause	Action	Remarks
RESET PROPS	PROP levers not fully forward at low engine power settings	'Reset Props Light Illuminates' checklist. This checklist contains memory items	May be disregarded during enroute descents only.
R 400 CYCLE	Right inverter failure	'Left or Right 400 Cycle Light Illuminated' abnormal checklist	For aircraft with two inverter switches only.
R BETA	Right propeller less than +9° blade angle	Appropriate 'Beta Light' checklist if power lever has not been moved into reverse range	Normal if on ground and power lever has been moved to reverse.
R ENGINE OIL PRESSURE	Low oil pressure in right engine	'Engine Oil Pressure Light Illuminates' abnormal checklist	
R GENERATOR	Right generator relay is open	'One Generator Light Illuminated' abnormal checklist	
R GENERATOR OVERHEAT	Right generator is hot	'Generator Overheat Light Illuminated' abnormal checklist	Not all aircraft are equipped with a generator overheat light.
STALL	High angle of attack	Refer to "Abnormal Airspeed Recovery" Para 3.9	Normal during final stages of landing flare if published V_{TD} is achieved with precision.
SOLID HORIZONTAL BAR (to the right of the RESET PROPS caution light)	Caution light test switch has been moved to TEST position	No action required	All 18 caution lights must illuminate when tested, all unused positions must illuminate and show a solid horizontal line.

The following caution lights are fitted to Series 300S aircraft only (aircraft SNs 351, 352, 355, 357 and 358:

Caution Light Indication	Probable Cause	Action	Remarks
CHECK FIRE DETN	Electrical problem within fire detection circuit	Operate FIRE DETECTION TEST switch to identify defective circuit	
SMOKE R BAGGAGE	Smoke in rear baggage compartment	Refer to paragraph 3.4.3 and 3.4.3.1	

Avionics system annunciator lights (for example, radar altimeter, autopilot, GPS system, etc.) are explained in either the avionics manufacturer provided pilot manual or the aircraft flight manual supplement that must be present on board the aircraft when these systems have been installed.

SECTION 4

NORMAL PROCEDURES

LIST OF EFFECTIVE PAGES

SECTION	PAGE	DATE	SECTION	PAGE	DATE
4	1	10 Sep. 2010		27	10 Sep. 2010
	2	10 Sep. 2010		28	10 Sep. 2010
	3	10 Sep. 2010		29	10 Sep. 2010
	4	10 Sep. 2010		30	10 Sep. 2010
	5	10 Sep. 2010		31	10 Sep. 2010
	6	10 Sep. 2010		32	10 Sep. 2010
	7	10 Sep. 2010		33	10 Sep. 2010
	8	10 Sep. 2010		34	10 Sep. 2010
	9	10 Sep. 2010		35	10 Sep. 2010
	10	10 Sep. 2010		36	10 Sep. 2010
	11	10 Sep. 2010		37	10 Sep. 2010
	12	10 Sep. 2010		38	10 Sep. 2010
	13	10 Sep. 2010		39	10 Sep. 2010
	14	10 Sep. 2010		40	10 Sep. 2010
	15	10 Sep. 2010		41	10 Sep. 2010
	16	10 Sep. 2010		42	10 Sep. 2010
	17	10 Sep. 2010		43	10 Sep. 2010
	18	10 Sep. 2010		44	10 Sep. 2010
	19	10 Sep. 2010		45	10 Sep. 2010
	20	10 Sep. 2010		46	10 Sep. 2010
	21	10 Sep. 2010		47	10 Sep. 2010
	22	10 Sep. 2010		48	10 Sep. 2010
	23	10 Sep. 2010		49	10 Sep. 2010
	24	10 Sep. 2010		50	10 Sep. 2010
	25	10 Sep. 2010		51	10 Sep. 2010
	26	10 Sep. 2010		52	10 Sep. 2010

TABLE OF CONTENTS **PAGE**

4.1 Introduction 9

4.2 Scope 10

4.3 Speeds for Normal Operations 11

4.4 Preparation and Inspection 12
4.4.1 Before Entering Aircraft 12
4.4.2 Preflight Inspections 12
4.4.3 Exterior Check 12
4.4.4 Fuel Dipstick 17
4.4.5 Cockpit Preparation 17
4.4.6 Cabin Preparation 20

4.5 Before Starting Engines 21

4.6 Starting Engines 22
4.6.1 External Power Start 22
4.6.2 Battery Power Start 23
4.6.3 Battery Start of Cold Soaked Engines 24

4.7 After Start (Pre-Taxi) 26

4.8 System Functional Checks 27
4.8.1 Propeller and Autofeather Test 27
4.8.1.1 (Pre Mod 6/1329 and 6/1470) 27
4.8.1.2 (Post Mod 6/1329 New Autofeather Pressure Switches) 27
4.8.1.3 (Post Mod 6/1470 Autofeather System Improved Reliability and Mod 6/1329) 28
4.8.2 Overspeed Governor Test – Post Mod 6/1323 29
4.8.3 Overspeed Governor Test – Pre Mod 6/1323 30
4.8.4 Beta Back-Up System Test – Post Mod 6/1492 31
4.8.5 Beta Back-Up System Test – Pre Mod 6/1492 31
4.8.6 Reset Props Caution Light Test 31
4.8.7 Electrical Test 32
4.8.8 Bleed/Pneumatic System Test 32
4.8.9 Intake Deflectors Test 32

TABLE OF CONTENTS **PAGE**

4.8.10 Battery Temperature Monitor Test 33

4.9 Before Take-Off 34

4.10 Take-Off 36
4.10.1 Crosswind Take-Offs 37
4.10.2 Take-Off with Type III Anti-Ice Fluid Applied 38

4.11 After Take-Off 39

4.12 Cruise 40

4.13 Descent 41

4.14 Approach 42

4.15 Final Approach, or When Joining the Traffic Pattern 43

4.16 Landing 44
4.16.1 Crosswind Landings 45

4.17 Go Around (Balked Landing) 46

4.18 After Landing 47

4.19 Shutdown 48

4.20 Flight in Icing Conditions 50
4.20.1 General 50
4.20.2 Landing Speed and Configuration after Flight in Icing Conditions 51
4.20.3 Flight Characteristics with Ice Accumulations 51
4.20.4 Operation of Intake Deflectors 51

List of Tables Page

4-1 Landing (VREF) Speeds 44
4-2 Go-around Speeds 46
4-3 Landing (VREF) Speeds for Flaps 10° 51

List of Figures Page

4-1 Rotation Speeds SFAR 23 37

4.1 Introduction

Operators are encouraged to develop their own ‘quick reference’ normal checklists based on the procedures provided in this manual. The sequence of individual checklist items should not be changed when operator-specific quick reference checklists are developed. For example, turning off the autofeather system is listed as the last item in the After Take-off checklist, and it should remain the last item in any operator-specific ‘quick reference’ After Take-off checklist.

The normal operating procedures in this section comply with the requirements of SFAR 23.

4.2 Scope

This section provides normal operating procedures. Normal procedures are used when systems are functioning in their usual manner.

Because the focus of this manual is on providing technical guidance that is specific or unique to the DHC-6, no attempt has been made to include in the checklists standard 'airmanship' practices that are applicable to any flight such as confirming that the area is clear around the aircraft, observation of traffic, operation of exterior lighting required for flight, operation of avionics equipment such as communication or navigation equipment, or operation of safety systems such as TAWS, TCAS, weather radar, and so forth.

4.3 Speeds for Normal Operations

All speeds are given for the landplane at maximum permitted weight in the phase of flight described.

Normal Take-off (flaps 10°)	Rotation at 75 KIAS, Initial Climb to 400 feet AGL at 80 KIAS
Normal Climb Speed	100 KIAS with flaps up
Best Rate of Climb	100 KIAS with flaps up
Best Angle of Climb	87 KIAS with flaps up
Enroute Descent	Flaps up, speed limited by V_{MO}
Initial Approach	With flaps up, no less than 94 KIAS With flaps 10°, no less than 85 KIAS
Final Approach	With flaps 20°, 80 KIAS With flaps 37.5°, 74 KIAS

4.4 Preparation and Inspection

4.4.1 Before Entering Aircraft

It is assumed that before entering the airplane, the take-off, enroute, and anticipated landing weight and balance have been determined, cargo is secure and loading is within the weight and balance limitations specified in Section 2 of the AFM. It is further assumed that the take-off, enroute, and landing performance – including single engine performance during all phases of flight – has been calculated and found satisfactory.

4.4.2 Preflight Inspections

Preflight inspections must be carried out before the first flight of the day, or, if maintenance has been performed, before the next flight. Conduct a thorough walkaround as detailed below.

Visually check the exterior of the airplane for condition, security (particularly access panels), and any sign of damage. Check for any liquids on the ground or on the airplane that may indicate engine, hydraulic, fuel, or battery system failure or malfunction. A tall ladder will be required to check wing tank fuel caps on aircraft equipped with wing fuel tanks. Engine oil level is normally checked within 10 minutes of engine shutdown.

4.4.3 Exterior Check

LEFT FORWARD FUSELAGE

1 Left Cockpit Door – Unlocked

2 Pitot Heads and Static – Vents Covers Removed

3 Ram Air Intake – Check Unobstructed

4 Hydraulic Compartment Door – Secured

5 Crew Oxygen Pressure (if installed) – Check

6 Nose Baggage Compartment Door – Secured

NOSE WHEEL

1 Tire – Pressure and Condition

2 Shock Strut – Extension, No Leaks

3 Torque Link and Connecting Pin – In Place and Secure

4 Taxi Light – Check Condition of Bulb and Wiring

RIGHT FORWARD FUSELAGE

1 Radome – Check Condition

2 Pitot Heads and Static Vents – Covers Removed

3 Right Cockpit Door – Unlocked

4 Hydraulic Compartment Door – Secured

RIGHT MAIN GEAR

1 Tire – Pressure and Condition

2 Brake Lines – Check for Leakage

3 Fairings – Check

RIGHT FUSELAGE

1 Wing Strut – Check Undamaged

2 Right Emergency Exit – Secure

3 Cabin Windows – Check

4 Antennas below Fuselage – Check for Damage

5 Fuel Drains – Drain, Check for Water and Visible Contaminants

NOTE

Do not turn boost pumps on prior to draining fuel from fuselage tanks.

RIGHT INNER WING

1 Leading Edge Access Panel – Check

2 Wing and Flap Undersurface – Check

RIGHT ENGINE

1 Propeller Blades, Spinner – Check for Damage, Secure Mounting

2 Air Inlet, Air Exit Ducts – Check Unobstructed

3 Exhaust Stubs – Check

4 Cowling and All Access Panels – Check Security

5 Fire Extinguisher Discs – Check for Discharge

6 Fuel Drains – Drain, Check for Water and Visible Contaminants

NOTE

Boost pumps must be selected ON prior to draining fuel from the fuel drains located at the rear of each engine nacelle.

RIGHT OUTER WING

1 Wing and Flap Undersurface – Check Clean and Undamaged

2 Wing Leading Edge – Check Clean, Undamaged

3 Landing Light – Check Clean and Lens Secure

4 Stall Strip and Fence – Check

5 Fuel Vent and Lightning Protection Tunnel – Check

6 Navigation Light – Check for Damage

7 Static Wicks and Bonding Straps – Check All are Present, Secure, Good Condition

8 Aileron and Geared Tab – Check

RIGHT AFT FUSELAGE

1 Right Rear Cabin Door – Unlocked

EMPENNAGE

1 Right Vortex Generators – Check

2 Vertical Stabilizer Leading Edge – Check

3 Right Horizontal Stabilizer – Check Clean and Undamaged

4 Elevator Flap Interconnect Tab – Check

5 Static Wicks and Bonding Straps – Check All are Present, Secure, Good Condition

6 Tail Bumper – Check

7 Antennas – Check for Damage

8 Rotating Beacon – Check

9 Elevator Trim Tab – Check

10 Left Horizontal Stabilizer – Check Clean and Undamaged

11 Left Vortex Generators – Check

LEFT AFT FUSELAGE

1 Jury Strut – Installed or Stowed, As Required

2 Baggage Compartment Door – Secure, Unlocked

3 Baggage Compartment – Contents Secure, tied down as required

4 Passenger Oxygen Pressure (if installed) – Check

5 External Power Receptacle – Secure or Ground Power Connected

6 Aft Fuel Cap – Cap Secure

LEFT MAIN GEAR

1 Tire – Pressure and Condition

2 Brake Lines – Check for Leakage

3 Fairings – Check

LEFT OUTER WING

1 Wing and Flap Undersurface – Check Clean, Undamaged

2 Wing Leading Edge – Check Clean, Undamaged

3 Landing Light – Check Clean and Lens Secure

4 Stall Strip and Fence – Check (stall strip is installed on rightwing of floatplanes)

5 Stall Warning Vanes – Check Clean, no Deformation

6 Fuel Vent and Lightning Protection Tunnel – Check

7 Navigation Light – Check for Damage

8 Static Wicks and Bonding Straps – Check All are Present, Secure, Good Condition

9 Aileron and Trim Tab – Check

LEFT ENGINE

1 Propeller Blades, Spinner – Check for Damage, Secure Mounting

2 Air Inlet, Air Exit Ducts – Check Unobstructed

3 Exhaust Stubs – Check

4 Cowling and All Access Panels – Check Security

5 Fire Extinguisher Discs – Check for Discharge

6 Fuel Drains – Drain, Check for Water and Visible Contaminants

LEFT INNER WING

1 Leading Edge Access Panel – Check

2 Wing and Flap Undersurface – Check Clean and Undamaged

LEFT FUSELAGE

1 Wing Strut – Check Undamaged

2 Left Emergency Exit – Secure

3 Cabin Windows – Check

4 Forward Fuel Cap – Cap Secure

⚠ WARNING

IT IS ESSENTIAL IN COLD WEATHER TO REMOVE EVEN SMALL ACCUMULATIONS OF FROST, ICE, OR SNOW FROM ALL WING, TAIL, CONTROL SURFACES, PROPELLERS, SPINNERS, AND THE ENGINE AIR INLETS. USE CAUTION WHEN CLEANING THE HORIZONTAL STABILIZER TO AVOID DAMAGING THE VORTEX GENERATORS. MAKE SURE THE CONTROL SURFACES CONTAIN NO INTERNAL ACCUMULATION OF ICE OR SNOW.

Prior to any flight in icing conditions, check that the pitot tubes and stall vanes are warm to the touch after turning on the pitot heat for 30 seconds and then turning pitot heat off. Make sure that the pitot covers are removed before turning pitot heat on.

4.4.4 Fuel Dipstick

A fuel dipstick is available to physically check the contents of the fuselage fuel tanks. The fuel dipstick is calibrated in either pounds or kilograms of fuel, depending on the dipstick specification, and the weight markings correspond to the weight of Jet A or A1 fuel. To check fuel contents with the dipstick, proceed as follows:

1 Ensure that the aircraft is level fore and aft and side to side.

2 Allow sufficient time for the fuel levels in the individual fuel cells to stabilize. To obtain the most accurate reading, the fuel quantity should be checked using the dipstick after the aircraft has been parked overnight. If the aircraft has been recently refuelled, allow 15 minutes after completion of refuelling for individual cell contents to stabilize.

3 Insert the dipstick into the fuel cap filler neck so that the flange near the handle of the dipstick contacts both the upper and lower surface of the circular ring that the fuel cap attaches to.

4 Withdraw the dipstick and read the fuel level on the appropriate side of dipstick in accordance with instruction on the dipstick. One side of the dipstick is marked for forward fuel tank contents, the other side is marked for aft fuel tank contents.

4.4.5 Cockpit Preparation

1 Pilot Operating Handbook and other required documents – Available in the aircraft.

2 Parking Brake – On

3 Control Locks – Remove and stow

4 RAM AIR lever – As required

5 PILOT STATIC selector – NORM

6 Electrical loads (lighting, de-ice, unnecessary avionics etc.) – OFF

7 Circuit Breakers – In

WARNING

ENSURE THAT THE HYD PUMP CIRCUIT BREAKER IS IN PRIOR TO TURNING ON AIRCRAFT POWER. THE HYD PUMP CIRCUIT BREAKER SHOULD NOT BE PULLED OUT EXCEPT IN THE EVENT OF A HYDRAULIC SYSTEM ABNORMALITY.

8 EXTERNAL/BATTERY Switch – As required

9 DC MASTER Switch – MASTER (lower 'on' position)

FOR AIRCRAFT WITH S.O.O. 6179 (EMERGENCY LIGHTS WITH FLIGHT COMPARTMENT SWITCH) EMBODIED:

After selection of the DC MASTER switch to MASTER, complete the following checks:

a LIGHTING EMER switch – ARM. Check charging indicator lights on the emergency light cases are on.

b LIGHTING EMER switch – TEST. Check emergency lights come on.

c LIGHTING EMER switch – ARM. Check emergency lights go out.

10 IGNITION Switch – NORMAL

11 ENG IGNITER Switches – BOTH (aircraft equipped with spark ignition will not have ENG IGNITER switches)

12 GENERATOR Switches – OFF. Check that the L and R GENERATOR caution lights are illuminated.

13 BUS TIE Switch – NORMAL

14 CAUTION LT TEST Switch – TEST. Check that the 18 caution lights on either side of the magnetic compass illuminate, the three beta system lights illuminate, the stall warning light illuminates, the red battery temperature warning light illuminates (if Mod 6/1479, Battery Temperature Indicator, is fitted), the green beta back-up power lever microswitch illuminates (Mod 6/1492), and the autofeather SEL and ARM lights illuminate. Check also that the stall warning horn sounds.

15 NO SMOKING / FASTEN BELT Switches – On

16 BLEED AIR Switches – OFF

17 Power Levers – IDLE

18 PROP Levers – FEATHER (see expanded procedures in Section 10 for discussion of cold weather starting).

FOR AIRCRAFT WITH PROPELLER BLADE LATCHES, IF STARTING ENGINES WITH THE PROPELLER BLADE LATCHES ENGAGED (ZERO THRUST POSITION):

a Check that propeller blades have not feathered.

b Power levers – Zero thrust reference marks aligned.

⚠ CAUTION

WITH ENGINES STOPPED AND PROPELLER BLADE LATCHES ENGAGED, NO ATTEMPT MUST BE MADE TO MOVE POWER LEVERS FORWARD TO IDLE OR MORE THAN 1.25 INCHES AFT OF IDLE.

NOTE

After starting the engines with latches engaged, a momentary movement of the power levers toward reverse should be made to ensure the latches disengage. Resistance to forward movement of the power levers indicates failure of latches to withdraw. If this occurs the power levers must not be forced ahead or damage to the mechanism may occur.

19 FUEL Levers – OFF

20 FIRE DETECTION Switch – TEST. Check that each end of the two FIRE PULL handles illuminates (2 bulbs in each handle) and the fire bell rings. Ensure that the FIRE BELL MUTE switch is in the down position with the guard lowered.

21 FUEL OFF Emergency Shut-off Switches – NORMAL

22 PROP AUTOFEATHER Switch – OFF

23 FUEL SELECTOR Knob – NORMAL (center position)

24 INVERTER switch – NO. 1 or NO. 2

The inverters should receive approximately equal operating use by alternating the INVERTER switch from day to day, except for aircraft with S.O.O. 6142 (Dual Inverter Switches) installed, in which case: INVERTERS R BUS and L BUS switches – NORM

25 Once every 24 hours (typically prior to the first flight of the day) complete the following expanded system tests:

a Fuel Quantity IND TEST Pushbutton – Press, note that fuel indicator needles move towards empty, release, note that fuel quantity indicator needles return to correct indication. It is not necessary to hold the pushbutton until the fuel indicator needles reach zero.

b Complete fuel boost pump and changeover system tests as follows:

(1) STBY BOOST PUMP EMER AFT and STBY BOOST PUMP EMER FWD switches – Lift up to unmarked position. Check BOOST PUMP 2 AFT PRESS and BOOST PUMP 2 FWD PRESS caution lights out.

(2) STBY BOOST PUMP EMER AFT and STBY BOOST PUMP EMER FWD switches – Move down to unmarked off position. Check BOOST PUMP 2 AFT PRESS and BOOT PUMP 2 FWD PRESS caution lights illuminate.

(3) AFT BOOST pump and FWD BOOST pump switches – TEST. Check BOOST PUMP 2 AFT PRESS and BOOST PUMP 2 FWD PRESS caution lights out.

(4) AFT BOOST and FWD BOOST switches – AFT BOOST and FWD BOOST. Check BOOST PUMP 1 AFT PRESS and BOOST PUMP 2 AFT PRESS and BOOST PUMP 1 FWD PRESS and BOOST PUMP 2 FWD PRESS caution lights out.

(5) If a fuel crossfeed valve position indicator (S.O.O. 6035) is installed, confirm that the indicator shows CL with the FUEL SELECTOR at NORM and OPEN with the FUEL SELECTOR at BOTH ON AFT or BOTH ON FWD.

4.4.6 Cabin Preparation

Prior to the first flight of the day, and subsequent to any change of pilot during the day, complete the following checklist:

1 Fire Extinguishers – Charged and Secure

2 First Aid Kit – Sealed and Secure

3 All 6 exit doors – Unobstructed and Secure

4 Left Rear Cabin Door – Locking Pins Secure

5 Cabin Furnishings – Checked

6 Passenger Safety Briefing Cards – Present

7 All Interior Lights – Check for Proper Function (if required for night operations)

8 Cabin Emergency Lights (if installed) – Check for Proper Function

4.5 Before Starting Engines

WARNING

ENGINE START IS PROHIBITED IF THE HYDRAULIC OIL PUMP CIRCUIT BREAKER IS PULLED OUT OR IF THE ELECTRICALLY POWERED HYDRAULIC OIL PUMP IS INOPERATIVE.

1 Exterior Check Checklist – Completed

2 Cockpit Preparation Checklist – Completed

3 Cabin Preparation Checklist – Completed

4 Preflight Weight and Balance Checks – Completed

5 Passenger Briefing – Complete

6 HYD OIL PUMP Circuit Breaker – visually confirm that the circuit breaker is not pulled out.

7 Hydraulic Pressures – Check that both are above 1,300 PSI (1,500 PSI is typical)

8 Fuel Quantity – Sufficient for planned flight

9 AFT BOOST and FWD BOOST switches – AFT BOOST and FWD BOOST. Check that all four BOOST PUMP caution lights are out.

10 Red Anti-Collision Beacon Switch – On. (This switch may be labelled BEACON or ANTI-COLL).

4.6 Starting Engines

4.6.1 External Power Start

A 28 volt, negative ground external power source with a minimum of 800 ampere capacity and a maximum of 1,700 ampere capacity may be used.

1 EXTERNAL / BATTERY Switch – EXTERNAL

2 VOLTMETER – Confirm presence of 28 volt external power.

3 START switch – Select LEFT or RIGHT as required. When external power is used for starting, the right engine is normally started first so as to minimize wind blast directed to the ground crew on the left side of the aircraft.

⚠ CAUTION

DO NOT MOVE THE ENGINE FUEL LEVER TO ON BEFORE STABILIZED N_G IS REACHED. THE MINIMUM STABILIZED N_G NEEDED TO INTRODUCE FUEL IS 12%. DO NOT SELECT FUEL ON IF 12% N_G CANNOT BE ACHIEVED.

4 Allow the gas generator speed to stabilize. Confirm that oil pressure begins to rise. As soon as the gas generator speed has stabilized, move the applicable engine FUEL lever to ON without further delay.

5 Light-up – Check that engine accelerates to idle RPM (typically 52% N_G at ISA) and that the T_5 temperature during the start process does not exceed the starting limits.

6 START switch – Release when N_G has reached idle speed. Check that the appropriate L GENERATOR or R GENERATOR caution light illuminates when the start switch is released. Confirm oil pressure is satisfactory.

7 Repeat process for opposite side engine.

8 EXTERNAL/BATTERY switch – BATTERY

9 Disconnect external power.

10 PROP levers – MAX RPM

11 Power levers – If a significant electrical load is anticipated when the generators will be brought online, advance to idle N_G +15%.

12 GENERATOR switches – Individually RESET and release to ON. Check L GENERATOR and R GENERATOR caution lights extinguish. Monitor T_5 temperature (idle limit of 660°).

13 Generator IND SELECT switch – L GEN and R GEN. Check generator load is below 0.5 on each side.

14 Power levers – Idle

4.6.2 Battery Power Start

The process for starting the engines using the aircraft battery is exactly the same as the process for starting the engine using an external power source, except that the EXTERNAL / BATTERY switch is selected to the BATTERY position and the voltmeter should indicate 24 volts. The gas generator of the first engine being started will normally stabilize between 16 and 18% N_G (this is not a limitation). The gas generator of the second engine being started will normally stabilize 1% lower than the first engine due to depletion of the battery charge.

NOTE

It is neither necessary or desirable to recharge the battery between engine starts unless the gas generator of the first engine started stabilized below 16% N_G.

Only if it is necessary to recharge the battery between starts, proceed as follows:

PROCEDURE FOR RECHARGING BATTERY BETWEEN STARTS:

1 PROP lever (operating engine) – Full INCREASE

2 Power lever (operating engine) – Advance to idle N_G + 15%.

3 GENERATOR switch (operating engine) – RESET and release to ON. Check appropriate L GENERATOR or R GENERATOR caution light out.

4 Observe battery charge current (loadmeter reading with switch in center position) until battery charge current load is .4 or less.

5 GENERATOR switch of operating engine – OFF. Check L GENERATOR or R GENERATOR caution light illuminates.

6 Power lever (operating engine) – As desired

7 Repeat the starting procedure for second engine.

8 Power levers – If a significant electrical load is anticipated when the generators will be brought online, advance to idle N_G + 15%.

9 GENERATOR switches – Individually RESET and release to ON. Check L GENERATOR and R GENERATOR caution lights out. Monitor T_5 temperature (idle limit of 660°).

10 Generator IND SELECT switch – L GEN and R GEN. Check generator load is below .5 on each side.

11 Power levers – Idle

4.6.3 Battery Start of Cold Soaked Engines

This procedure may be used when the engine and/or the battery has been cold-soaked to temperatures below –30°C or –20°F.

1 START switch – Select LEFT or RIGHT as desired, and engage starter for 5 seconds. Do not introduce fuel. Release switch after 5 seconds.

2 Wait approximately one minute, then start the engine using the normal battery start procedures.

3 Allow the engine to idle until oil temperature reaches 0°C. Do not increase the engine speed above idle until the oil temperature reaches 0°C.

4 Once the oil temperature has reached 0°C, advance the power lever to idle N_G plus 15%.

5 GENERATOR switch – RESET and release to ON. Check appropriate L GENERATOR or R GENERATOR caution light goes out.

6 Wait until battery charge current load is 0.4 or less.

7 GENERATOR switch (operating engine) – OFF. Check L GENERATOR or R GENERATOR caution light illuminates.

8 Power lever (operating engine) – As desired.

9 Repeat steps 1 through 4 for the second engine, including the 5 second dry motoring and one minute wait.

10 Power levers – Advance to idle N_G +15%.

11 GENERATOR switches – Individually RESET and release to ON. Check L GENERATOR and R GENERATOR caution lights go out.

12 IND SELECT switch – L GEN and R GEN. Check generator load is below 0.5 on each side.

13 Power levers – Idle

4.7 After Start (Pre-Taxi)

1 Doors – Secure. Check that the DOORS UNLOCKED caution light is out.

2 EXTERNAL/BATTERY switch – BATTERY

3 External power – Disconnected

4 Hydraulic pressures – Between 1300 to 1600 PSI (1225 to 1625 PSI Post Mod 6/1570)

5 Chocks – Remove

6 BLEED AIR switches – ON if cabin heat or surface de-ice is required.

7 PROP levers – Full INCREASE

8 Crew Seats, Seat Belts, Shoulder Harnesses – Check Secure

9 Brakes – Off. Check operation of nose wheel steering and brakes, and correct function of electrically operated hydraulic pump motor.

4.8 System Functional Checks

Prior to beginning any engine related checks, ensure that the oil pressures are satisfactory and the oil temperatures are above 10°C. The aircraft should be headed into wind for engine and system checks.

4.8.1 Propeller and Autofeather Test

There are three different test procedures, depending on the modification status of the aircraft. The procedures are not interchangeable. Be certain to use the procedure that is applicable to your aircraft. The autofeather system test should be carried out weekly, and recorded in the aircraft technical log.

4.8.1.1 (Pre Mod 6/1329 and 6/1470)

Only for aircraft with a serial number below 290 that have not been modified.

1 Power levers – IDLE

2 Feather and unfeather each propeller once.

3 Reverse each propeller once. It is sufficient to move the power lever to the zero thrust position; an increase in N_G in reverse is not required.

4 PROP AUTO FEATHER switch – ON. Check SEL light illuminates.

5 Power levers – Advance to 20 PSI torque.

6 AUTO FEATH TEST switch – TEST (lift and hold switch). Check ARM light illuminates.

7 Left power lever – Retard quickly to idle. Observe ARM light goes out. Check respective propeller feathers.

8 AUTO FEATH TEST switch – OFF (release switch). Check propeller unfeathers.

9 Repeat steps 5 to 8 above for the right engine.

10 PROP AUTO FEATHER switch – OFF. Check that the SEL light goes out.

4.8.1.2 (Post Mod 6/1329 New Autofeather Pressure Switches)

Mod 6/1329 became standard equipment on all aircraft built beginning at SN 290, and could be retrofitted to earlier production aircraft.

1 Power levers – IDLE

2 Feather and unfeather each propeller once.

3 Reverse each propeller once. It is sufficient to move the power lever to the zero thrust position; an increase in N_G in reverse is not required.

4 PROP AUTO FEATHER switch – ON. Check that the SEL light comes on.

5 AUTO FEATH TEST switch – TEST (lift and hold switch).

6 Left power lever – Advance to 20 – 25 PSI torque. Check that the ARM light is out.

7 Right power lever – Advance to 20 – 25 PSI torque. Check that the ARM light comes on.

8 Left power lever – IDLE. Check arm light out and left propeller starts to feather.

9 Right power lever – IDLE. Check right propeller does not feather.

10 AUTO FEATH TEST switch – OFF (release switch). Check left propeller unfeathers.

11 Repeat steps 5 through 10, transposing the left and right power levers to test auto feathering of right propeller.

12 Power levers – Advance slowly to 88 – 90% N_G. ARM light should illuminate. The N_G at which the ARM light illuminates may vary somewhat from 88 – 90% N_G if the aircraft is at a significantly higher or lower density altitude than ISA conditions.

13 Retard and advance each power lever in turn, checking that the ARM light goes out when each power lever is retarded.

14 Power levers – IDLE

15 PROP AUTO FEATHER switch – OFF. Check that the SEL light goes out.

4.8.1.3 (Post Mod 6/1470 Autofeather System Improved Reliability and Mod 6/1329)

Mod 6/1470 became standard equipment on all aircraft built beginning at SN 471, and provides the same two second delay functionality as S.O.O. 6137. Mod 6/1470 can be retrofitted to all earlier production aircraft. If Mod 6/1470 has been retrofitted to aircraft with a serial number below 290, it can be assumed that Mod 6/1329 has also been retrofitted.

1 Power levers – IDLE

2 Feather and unfeather each propeller once.

3 Reverse each propeller once. It is sufficient to move the power lever to the zero thrust position, an increase in N_G in reverse is not required.

4 PROP AUTO FEATHER switch – ON. Check that the SEL light comes on.

5 Power levers – Advance to approximately 30 PSI torque.

6 AUTO FEATH TEST switch – TEST (lift and hold switch). Check that the ARM light comes on.

7 Left power lever – Retard sharply to IDLE. Check that the ARM light goes out and the left propeller feathers approximately 2 seconds after torque decreases below 12 PSI torque.

8 Right power lever – IDLE. Check that the left propeller unfeathers.

9 AUTO FEATH TEST switch – OFF (release switch).

10 Repeat steps 3 through 9, transposing the left and right power levers to test auto feathering of right propeller.

11 Power levers – Advance to approximately 30 PSI torque.

12 Left power lever – Advance to 88% N_G. Check that the ARM light does not come on

13 Right power lever – Advance to 88% N_G. Check that the ARM light comes on.

14 Left power lever – Retard below 88% N_G. Check that the ARM light goes out.

15 Right power lever – Retard below 88% N_G. Check that the ARM light remains out.

16 PROP AUTO FEATHER switch – OFF. Check that the SEL light goes out.

4.8.2 Overspeed Governor Test – Post Mod 6/1323

Mod 6/1323 (Propeller Overspeed Speed Test Switch operates both sides test function when lifted) became standard equipment on all aircraft built beginning at SN 311. If lifting the propeller overspeed switch tests both propellers at the same time, then this mod is present.

⚠ CAUTION

ENSURE THAT THE PROP O/SPEED TEST SWITCH IS NOT SELECTED OR RELEASED WHEN EITHER POWER LEVER IS FORWARD OF IDLE.

1 Power levers – IDLE

2 PROP O/SPEED TEST switch – Lift and hold switch.

3 Power levers – Advance to greater than 20 PSI torque.

4 With PROP O/SPEED TEST switch selected, the propellers should govern at 70% at approximately 20 PSI torque for standard day at sea level varying slightly with temperature changes.

5 Power levers – IDLE

6 PROP O/SPEED TEST switch – Release switch

NOTE

The overspeed governor check must be performed daily.

4.8.3 Overspeed Governor Test – Pre Mod 6/1323

Only applicable to aircraft below SN 311 that have a three position overspeed governor switch that requires that each propeller be tested independently.

⚠ CAUTION

ENSURE THAT THE PROP O/SPEED TEST SWITCH IS NOT SELECTED OR RELEASED WHEN EITHER POWER LEVER IS FORWARD OF IDLE.

1 Power levers – IDLE

2 PROP O/SPEED TEST switch – Move to LEFT position and hold.

3 Left power lever – Advance. Check that the left propeller governs at 70% N_P.

4 With PROP O/SPEED TEST switch selected, the propellers should govern at 70% at approximately 20 PSI torque for standard day at sea level varying slightly with temperature changes.

5 Left power lever – IDLE

6 PROP O/SPEED TEST switch – Release

7 Repeat procedure for right engine.

NOTE

The overspeed governor check must be performed daily.

4.8.4 Beta Back-Up System Test – Post Mod 6/1492

Mod 6/1492 introduced the small green illuminated pushbutton that is used to confirm the correct function of the microswitch above the power levers. It became standard equipment on all aircraft built beginning at SN 451.

1 PROP levers – Full INCREASE

2 Left power lever – Retard until the left BETA RANGE indicator light illuminates.

3 BETA RANGE TEST switch – TEST. Check left BETA RANGE indicator light and BETA BACKUP DISARMED caution light illuminate and go out for two cycles.

4 BETA RANGE TEST switch – Off

5 Left power lever – IDLE

6 Repeat steps 2 to 5 for right engine.

7 Power levers – IDLE

8 PWR LEV TEST switch – Press. Check that PWR LEV TEST switch light illuminates.

9 PWR LEV TEST switch – release

4.8.5 Beta Back-Up System Test – Pre Mod 6/1492

1 PROP levers – Full INCREASE

2 Left power lever – Retard until beta light illuminates.

3 BETA RANGE TEST SWITCH – TEST. Check left BETA RANGE and BETA BACKUP indicator lights illuminate and go out for two cycles.

4 BETA RANGE TEST SWITCH – Off

5 Left power lever – IDLE

6 Repeat check for right engine.

4.8.6 Reset Props Caution Light Test

1 Power levers – Advance to idle N_G + 15%.

2 PROP levers – Retard. RESET PROPS caution light illuminates.

3 PROP levers – Full increase. Check RESET PROPS caution light out.

4.8.7 Electrical Test

1 BUS TIE switch – NORMAL

2 Power levers – Advance to idle N_G + 15%. Check oil pressure, torque pressure, directional gyro and attitude indicators operate normally.

3 Select other inverter – Recheck the instruments described in Step 2.

4.8.8 Bleed/Pneumatic System Test

For aircraft with surface de-ice boots only:

1 Select de-icing system mode switch to OFF.

2 Ensure both BLEED AIR switches are OFF.

3 Confirm PNEUMATIC LOW PRESS caution light is illuminated.

4 Power levers – Advance to idle N_G + 15%.

5 BLEED AIR – LEFT switch – ON. Check PNEUMATIC LOW PRESS caution light goes out.

6 BLEED AIR – LEFT switch – OFF. Check PNEUMATIC LOW PRESS caution light illuminates.

7 BLEED AIR – RIGHT switch – ON. Check PNEUMATIC LOW PRESS caution light goes out.

8 BLEED AIR – LEFT switch – OFF. Check PNEUMATIC LOW PRESS caution light illuminates.

9 Power levers – Idle

4.8.9 Intake Deflectors Test

1 Power levers – Set 80% N_G

NOTE

When selecting EXTEND, the INTAKE DEFLECTOR switch should be held for 3 to 5 seconds after EXT is indicated. When selecting RETRACT, do not hold the switch.

2 INTAKE DEFLECTOR switch – EXTEND/RETRACT. Check appropriate indications on engine instrument panel.

NOTE

A minimum of 80% N_G is required to extend the intake deflectors.

4.8.10 Battery Temperature Monitor Test

For aircraft with Mod 6/1479 (battery temperature monitor for Ni-Cad main battery) incorporated. Mod 6/1479 became standard equipment on all aircraft built beginning at SN 406. If a lead-acid battery has subsequently been installed in the aircraft, the temperature monitoring system is not required.

1 BATTERY TEMPERATURE monitor TEST switch – Press and hold. Check that the 150° warning light comes on when the indicator pointer reaches 150°.

The test switch should be released either as soon as the warning light illuminates or before the indicator reaches 170°.

NOTE

The temperatures are degrees Fahrenheit.

4.9 Before Take-Off

1 Trims – Set. The elevator trim pointer should be aligned with the forward (lower) edge of the take-off range mark with aft center of gravity and to the aft (upper) edge of the take-off range mark with forward center of gravity. The rudder trim pointer should be aligned with the take-off index. Once the neutral aileron trim position has been determined and verified in flight, it is not normally adjusted.

2 PROP levers – Full INCREASE (MAX RPM)

3 PROP AUTO FEATHER switch – On. Check that the SEL light is illuminated.

4 Fuel Quantity – Sufficient for planned flight.

5 FUEL SELECTOR – NORM

6 Crossfeed valve indicator (S.O.O. 6035, if installed) – CL

7 FLAPS selector lever – 10°. Check flap indicator confirms flaps set to 10°

8 Compasses – Aligned

9 BLEED AIR Switches – ON if ice protection or cabin heat is required, otherwise OFF.

10 Ice protection, including intake deflectors – As required. Pitot Heat must be ON and intake deflectors must be extended when operating in visible moisture at temperatures below +5°C.

11 Cabin heat – As required

12 Altimeters – Set

13 Flight controls – Check that the control locks have been removed and properly stowed. Check elevator, ailerons and rudder are free and operate each control through the full range of travel.

14 Instruments – Check

15 Caution lights – Check that all are extinguished. The PNEUMATIC LOW PRESS light, if installed, will remain on if the BLEED AIR switches are at the OFF position, and will go out as power is increased if the BLEED AIR switches are at the ON position.

16 ANTI-COLL (strobe light) switch (if applicable) – On

17 Parking brake – Off

18 BATTERY TEMPERATURE – Check

4.10 Take-Off

1 Line up on the runway and slowly roll forward a short distance until certain that the nose wheel is centered. Then, stop and apply brakes.

2 Advance the power levers until 85% N_G is reached, then pause for at least 5 seconds at this power setting until all engine indications – particularly the T_5 temperature indications – have stabilized.

NOTE

Pausing for at least five seconds at 85% N_G allows time for the engine compressor bleed valves to close and allows the pilot the opportunity to confirm (by observing the engine temperatures) that both compressor bleed valves have closed. This procedure also establishes airflow over the vertical stabilizer and rudder prior to brake release, which facilitates effective directional control of the aircraft by rudder pedal input during the early stages of the take-off roll.

WARNING

IT IS MANDATORY TO SET FULL CALCULATED TAKE-OFF POWER AS DERIVED FROM THE POWER SETTING CHART FOR EVERY TAKE-OFF, REGARDLESS OF AIRCRAFT WEIGHT OR RUNWAY LENGTH. REDUCED POWER TAKE-OFFS ARE PROHIBITED.

IT IS MANDATORY TO PAUSE FOR AT LEAST 5 SECONDS AT 85% N_G PRIOR TO SETTING FULL CALCULATED TAKE-OFF POWER.

IF EITHER ENGINE IS NOT CAPABLE OF ACHIEVING FULL CALCULATED TAKE-OFF POWER, OR IF EITHER ENGINE REACHES THE T_5 LIMIT OR THE N_G LIMIT PRIOR TO REACHING THE FULL CALCULATED TAKE-OFF POWER TORQUE VALUE, THEN THE CONDITION OF THE ENGINE HAS DETERIORATED AND THE PROBLEM MUST BE INVESTIGATED AND CORRECTED BEFORE FLIGHT.

IF EITHER ENGINE CANNOT ACHIEVE THE FULL CALCULATED TAKE-OFF POWER TORQUE VALUE AS PUBLISHED IN THE TAKE-OFF POWER SETTING CHART, OR IF THE T_5 OR N_G LIMIT IS REACHED BEFORE THE FULL CALCULATED TAKE-OFF POWER TORQUE VALUE IS REACHED, THE ENGINE IS NOT AIRWORTHY AND THE AIRCRAFT MUST NOT BE FLOWN.

3 Power levers – Advance smoothly to the full calculated take-off power setting (Figure 5-7). Check that the autofeather ARM light illuminates.

If a maximum performance take-off is desired, do not release the brakes until full take-off power has been set. It is not mandatory to set full calculated take-off power prior to brake release if sufficient runway and clearway is available to allow for a gradual increase in power from 85% N_G to full calculated take-off power following brake release. As airspeed increases, torque pressure will increase with a constant power lever setting. Adjust the power levers as required to avoid exceeding the calculated take-off power setting.

4 Maintain directional control with rudder.

5 Rotation IAS – As indicated in figure below.

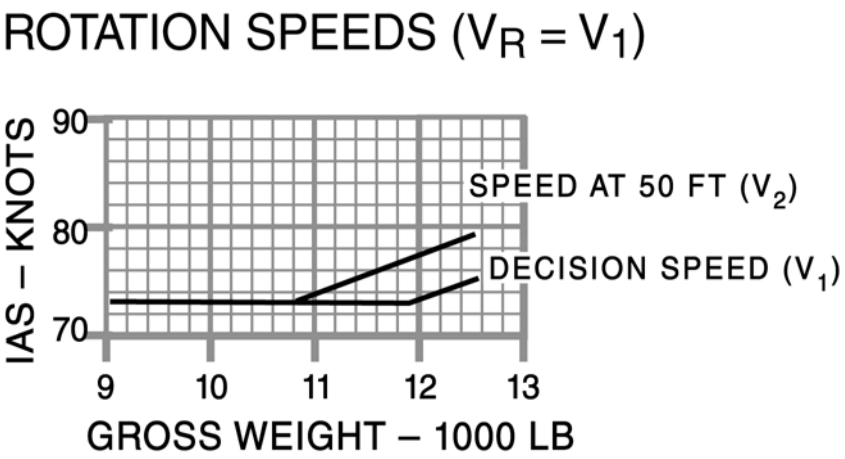


Figure 4-1 Rotation Speeds SFAR 23

6 Speed at 50 feet – 80 KIAS (all weights), or, according to Figure 4-1 if maximum performance is required.

7 Climb to a minimum of 400 feet AGL at 80 KIAS (all weights) prior to retracting flaps.

8 Do not reduce power from the take-off power setting until flap retraction is complete.

4.10.1 Crosswind Take-Offs

Take-off has been performed in crosswind components of up to 20 knots measured at 6 feet, which is equivalent to 27 knots at a tower height of 50 feet. This is the maximum experienced during crosswind trials and is not considered a limitation. Some application of “into wind” aileron will assist in maintaining wings level during the ground roll.

4.10.2 Take-Off with Type III Anti-Ice Fluid Applied

WARNING

TAKE-OFF GROUND ROLL WILL INCREASE SLIGHTLY AND TOTAL TAKE-OFF DISTANCE REQUIRED TO CLEAR A 50 FOOT OBSTACLE WILL INCREASE SIGNIFICANTLY IF THIS PROCEDURE IS FOLLOWED.

Follow the same procedures given for a normal take-off Para 4.10, except:

1 Rotation speed – 80 KIAS (all weights). Rotate gently, avoid a rapid rotation.

2 Speed at 50 feet – 90 KIAS (all weights)

3 Climb to a minimum of 400 feet AGL at 90 KIAS (all weights) prior to retracting flaps.

4.11 After Take-Off

WARNING

DO NOT RETRACT FLAPS BEFORE REACHING 400 FEET ABOVE GROUND LEVEL. DO NOT REDUCE POWER FROM THE TAKE-OFF POWER SETTING UNTIL THE FLAPS HAVE FULLY RETRACTED.

When clear of obstacles and at least 400 feet above ground level:

1 Flaps – UP

2 Airspeed – Transition to 100 KIAS for best rate of climb, or 87 KIAS for best angle of climb.

CAUTION

WHEN DECREASING POWER FROM TAKE-OFF POWER TO CLIMB POWER, REDUCE ENGINE TORQUE BEFORE REDUCING PROPELLER RPM.

3 Power – After flaps have fully retracted, set climb power when safe to do so. Lower power settings may be selected if desired.

4 Nose wheel steering lever – Centered. Align with index marks if required.

5 NO SMOKING/FASTEN BELT switches – As required

6 VENT FAN – OFF

7 PROP AUTO FEATHER switch – OFF. Check SEL and ARM lights out.

NOTE

Propellers may be feathered manually whether the autofeather system is ON or OFF.

4.12 Cruise

1 Airspeed – Allow aircraft to accelerate in level flight to desired cruise speed.

2 Power – Reduce to cruise power setting. Lower power settings may be selected if desired.

3 Fuel – Manage as required. If wing tank fuel is required to complete the flight, it must be consumed prior to the point of no return.

4.13 Descent

1 Power – As desired

2 NO SMOKING/FASTEN BELT switches – On

3 Altimeters – Set

4.14 Approach

1 FUEL SELECTOR – NORM. Check that all four BOOST PUMP caution lights are out.

2 Crossfeed Valve Indicator (S.O.O. 6035, if installed) – CL

3 Wing Tank Fuel Switches – OFF

4 Hydraulics – Check system and brake pressures.

5 Nose Wheel Steering Lever – Centered. Align with index marks if required.

6 Minimum Approach Airspeeds (valid for all weights at or below 12,300 pounds):

Flap 0° – 94 KIAS

Flap 10° – 85 KIAS

NOTE

Do not select autofeather ON for approach or landing.

4.15 Final Approach, or When Joining the Traffic Pattern

1 FLAPS – Select 10° when below 103 KIAS (100 KIAS for Pre-Mod 6/1395).

2 PROP levers – Advance to full INCREASE following flap extension, or when the RESET PROPS caution light illuminates, whichever occurs first.

Prop levers must be set to the full INCREASE position prior to reaching 500 feet AGL (for visual approaches) or prior to reaching 500 feet above minima (for instrument approaches).

4.16 Landing

1 Flaps – Select 20° or 37.5°.

For all normal operations where landing distance permits, 20° flap is recommended. To determine the landing distance required with flap set to 20°, multiply the landing distance for flap 37.5° by 1.3.

Minimum V_{REF} airspeed – 1.3 times stall speed as appropriate to flap angle and weight according to Table 4-1.

Table 4-1 Landing (V_{REF}) Speeds

FLAP ANGLE	1.3 V_S KIAS					
	12,300 LB	11,500 LB	10,500 LB	9,500 LB	8,500 LB	7,500 LB
20°	80	77	73	70	66	62
37.5°	74	70	67	64	60	57

2 PROP Levers – Check full INCREASE (96% N_P). Confirm RESET PROPS caution light is out.

3 When crossing runway threshold at 50 feet AGL: Power Levers – IDLE

4 Touchdown – On main wheels.

5 Brakes – Apply as required after nose wheel contact.

WARNING

REVERSE POWER CANNOT BE APPLIED UNLESS THE PROP LEVERS ARE AT FULL INCREASE (MAX RPM). DURING THE USE OF REVERSE, ENGINE POWER MAY INCREASE ASYMMETRICALLY.

6 Zero Thrust or Reverse Power – As required

7 Nose Wheel Steering Lever – Use as required. Coarse application of rudder should be used as the primary control for heading until the aircraft has decelerated to taxi speed.

NOTE

The shortest landing distances and the best quality landings are achieved when the V_{REF} in Table 4-1 is maintained with precision and the power levers are brought sharply back to idle when crossing the runway threshold at 50 feet AGL. Do not carry power into the flare as this will greatly increase both the touchdown speed and the landing distance required.

4.16.1 Crosswind Landings

With flap set to 37.5°, crosswind landings have been demonstrated in a maximum crosswind component of 20 knots measured at 6 feet, which is equivalent to 27 knots at 50 feet. This was the maximum encountered during crosswind landing trials, and is not considered limiting. In strong crosswinds, landing with flaps at 20° rather than 37.5° is recommended to reduce the crosswind component (as a percentage of airspeed) at touchdown.

The preferred crosswind technique requires that the upwind wing be lowered during the approach with sufficient opposite rudder applied to align the aircraft with the runway. As airspeed decreases during the flare and rollout, both of these control applications must be increased. The nose wheel should be held on the ground during the ground roll, along with “into wind” aileron. Directional control should be maintained with rudder only unless it becomes absolutely necessary to use nose wheel steering.

4.17 Go Around (Balked Landing)

If possible, the decision to go around should be made before flaps have been extended beyond 10°. If flaps are set to 10° and the propeller levers are at the full INCREASE position, aircraft performance and handling during the go-around maneuver will be very similar to aircraft performance and handling during a normal take-off.

1 Power Levers – Advance to take-off power setting. Ensure that the propellers are at the full INCREASE position.

2 Flaps – Select 10°

3 Minimum Airspeed – 1.3 times stall speed with flap 10° as shown in Table 4-2.

Table 4-2 Go-around Speeds

FLAP ANGLE	1.3 V_S KIAS					
	12,300 LB	11,500 LB	10,500 LB	9,500 LB	8,500 LB	7,500 LB
10°	85	83	79	75	71	67

When clear of obstacles with positive climb rate:

4 Flaps – Select 0°

WARNING

WITH FLAP FULLY EXTENDED AT 37.5°, ANY PITCH ATTITUDE IN THE GO–AROUND MANEUVER GREATER THAN 0° (LEVEL FLIGHT ATTITUDE) MAY CAUSE A RAPID DECREASE IN AIRSPEED AND POSSIBLE STALL.

DURING FLAP RETRACTION:

5 Airspeed – Increase to 87 KIAS (the best angle of climb speed for flaps 0°).

With flaps fully extended at 37.5°, the pitch attitude required for initial climb at the beginning of the go-around maneuver will be no higher than 0° (level flight attitude). If flaps are extended beyond 10° when the decision is made to initiate a go-around, flaps should be immediately selected to 10° as soon as go-around power has been applied.

4.18 After Landing

1 Flaps – UP

2 Unnecessary Electrical Equipment – Off

3 De-ice Equipment – Off if not required for taxi.

4 ANTI-COLL (strobe) switch (if applicable) – Off

4.19 Shutdown

1 Parking brake – Apply

2 Power lever – IDLE. For aircraft with Mod 6/1303 (propeller blade latches): If propeller blade latches are to be engaged, align power levers with zero thrust reference lines prior to, or immediately following the selection of FUEL levers to OFF. The latches will not engage until the propeller RPM had decreased below 30%.

3 PROP levers – FULL INCREASE (if propeller latches are to be engaged) or FEATHER (if propeller latches are not to be engaged).

4 BLEED AIR Switches – OFF

5 All radio and electrical equipment – OFF

6 T_5 Temperature – Stable and below 660°

7 GENERATORS Switches – OFF

8 FUEL Levers – OFF

9 BEACON or ANTI-COLL (red flashing light) Switch – OFF

10 NO SMOKING/FASTEN SEAT BELT Switches – OFF

11 AFT BOOST Pump and FWD BOOST Pump Switches – OFF

12 LIGHTING EMERG switch – DISARM, then release to TEST

13 DC MASTER Switch – OFF

14 EXTERNAL/BATTERY Switch – OFF

15 Control Locks – Installed

⚠ CAUTION

BE CERTAIN THAT THE RUDDER IS CENTERED PRIOR TO LIFTING THE SMALL DOOR IN THE FLIGHT COMPARTMENT FLOOR THAT ACTIVATES THE RUDDER LOCK. AFTER INSTALLING THE VERTICAL STRUT THAT HOLDS THE DOOR IN THE LIFTED POSITION, CHECK TO ENSURE THAT THE RUDDER IS LOCKED IN THE CENTER (NEUTRAL) POSITION.

16 Propeller Restraining Straps – Installed

17 Chocks, covers, and Aircraft Tie-down – As required

4.20 Flight in Icing Conditions

Ice may form in conditions of visible moisture at temperatures below +5°C OAT.

4.20.1 General

WARNING

1 DURING OR AFTER INADVERTENT FLIGHT IN ICING CONDITIONS, FLAP EXTENSION MUST BE LIMITED TO NOT MORE THAN 10° ON AIRPLANES NOT EQUIPPED WITH AIRFRAME DE-ICING EQUIPMENT. REFER TO TABLE 4-3 FOR LANDING SPEEDS WITH FLAPS 10°.

2 FOR ALL AIRCRAFT, FOLLOWING EXPOSURE TO ANY ICING CONDITIONS IN FLIGHT, FLAP EXTENSION TO THE FINAL SETTING FOR LANDING MUST BE ACCOMPLISHED PRIOR TO DESCENDING BELOW 500 FEET AGL. THE SPEEDS LISTED IN TABLE 4-3 MUST BE MAINTAINED. THESE SPEEDS MAY BE INCREASED BY A MAXIMUM OF 5 KNOTS TO OFFSET CONDITIONS OF TURBULENCE. HIGHER SPEEDS INCREASE THE RISK OF ICE CONTAMINATED TAILPLANE STALL (ICTS).

3 LANDING DISTANCE REQUIRED WITH FLAPS SET AT 10° IS APPROXIMATELY 1.8 TIMES THE LANDING DISTANCE WITH FLAPS 37.5°.

4 AN ACCUMULATION OF ICE ON THE AIRPLANE MAY CHANGE THE STALL CHARACTERISTICS, STALL SPEED, OR WARNING MARGIN PROVIDED BY THE STALL WARNING DEVICE. THEREFORE, WHEN THE AIRPLANE HAS ACCUMULATED A SIGNIFICANT AMOUNT OF ICE, AN AIRSPEED MARGIN OF 1.3 TIMES THE NORMAL STALL SPEED APPROPRIATE TO WEIGHT SHOULD BE MAINTAINED.

The airplane must not be flown into known or forecast icing conditions unless it is equipped with approved means for de-icing. A list of the equipment required for flight in known or forecast icing conditions is provided in Section 10 of this manual and in Section 9, Supplement 1.

4.20.2 Landing Speed and Configuration after Flight in Icing Conditions

Table 4-3 Landing (V_{REF}) Speeds for Flaps 10°

FLAP ANGLE	1.3 V_S KIAS					
	12,300 LB	11,500 LB	10,500 LB	9,500 LB	8,500 LB	7,500 LB
10°	85	83	79	75	71	67

4.20.3 Flight Characteristics with Ice Accumulations

Longitudinal control at large flap extension angles during landing approach may be affected by accumulations of ice on the horizontal stabilizer leading edges, particularly if airspeed is excessively high. This can result in a pronounced nose down pitch.

Therefore, after any inadvertent exposure to icing in flight (for aircraft not equipped with de-icing equipment), or during approach and landing in icing conditions (for aircraft equipped with de-icing equipment) flap angles must not exceed 10°, and approach airspeed should be maintained at the value provided in Table 4-3 as appropriate to weight.

4.20.4 Operation of Intake Deflectors

When selecting EXTEND, the INTAKE DEFLECTOR switch should be held for 3 to 5 seconds after EXT is indicated. When selecting RETRACT, do not hold the switch.

The intake deflectors are normally left in the retracted (up) position due to the possibility of a reduction in engine power (approximately 3% maximum) at temperatures above ISA when they are extended. However, for flight in icing conditions, they must be extended to ensure continued engine operation.

In the event of a malfunction the deflectors will remain at their last selected position. If a failure occurs that prevents extension of one or both of the deflectors, icing conditions must be avoided.

A minimum of 80% N_G is required to extend the intake deflectors. Intake deflectors will normally retract at idle N_G; however, if difficulty is encountered retracting the deflectors, increasing N_G to 80% before retracting the deflectors may assist with retraction.

SECTION 5

PERFORMANCE

LIST OF EFFECTIVE PAGES

SECTION	PAGE	DATE	SECTION	PAGE	DATE
5	1	10 Sep. 2010		31	10 Sep. 2010
	2	10 Sep. 2010		32	10 Sep. 2010
	3	10 Sep. 2010		33	10 Sep. 2010
	4	10 Sep. 2010		34	10 Sep. 2010
	5	10 Sep. 2010		35	10 Sep. 2010
	6	10 Sep. 2010		36	10 Sep. 2010
	7	10 Sep. 2010		37	10 Sep. 2010
	8	10 Sep. 2010		38	10 Sep. 2010
	9	10 Sep. 2010		39	10 Sep. 2010
	10	10 Sep. 2010		40	10 Sep. 2010
	11	10 Sep. 2010		41	10 Sep. 2010
	12	10 Sep. 2010		42	10 Sep. 2010
	13	10 Sep. 2010		43	10 Sep. 2010
	14	10 Sep. 2010		44	10 Sep. 2010
	15	10 Sep. 2010		45	10 Sep. 2010
	16	10 Sep. 2010		46	10 Sep. 2010
	17	10 Sep. 2010		47	10 Sep. 2010
	18	10 Sep. 2010		48	10 Sep. 2010
	19	10 Sep. 2010		49	10 Sep. 2010
	20	10 Sep. 2010		50	10 Sep. 2010
	21	10 Sep. 2010		51	10 Sep. 2010
	22	10 Sep. 2010		52	10 Sep. 2010
	23	10 Sep. 2010		53	10 Sep. 2010
	24	10 Sep. 2010		54	10 Sep. 2010
	25	10 Sep. 2010		55	10 Sep. 2010
	26	10 Sep. 2010		56	10 Sep. 2010
	27	10 Sep. 2010		57	10 Sep. 2010
	28	10 Sep. 2010		58	10 Sep. 2010
	29	10 Sep. 2010		59	10 Sep. 2010
	30	10 Sep. 2010		60	10 Sep. 2010

SECTION	PAGE	DATE	SECTION	PAGE	DATE
	61	10 Sep. 2010		93	10 Sep. 2010
	62	10 Sep. 2010		94	10 Sep. 2010
	63	10 Sep. 2010		95	10 Sep. 2010
	64	10 Sep. 2010		96	10 Sep. 2010
	65	10 Sep. 2010		97	10 Sep. 2010
	66	10 Sep. 2010		98	10 Sep. 2010
	67	10 Sep. 2010		99	10 Sep. 2010
	68	10 Sep. 2010		100	10 Sep. 2010
	69	10 Sep. 2010		101	10 Sep. 2010
	70	10 Sep. 2010		102	10 Sep. 2010
	71	10 Sep. 2010		103	10 Sep. 2010
	72	10 Sep. 2010		104	10 Sep. 2010
	73	10 Sep. 2010		105	10 Sep. 2010
	74	10 Sep. 2010		106	10 Sep. 2010
	75	10 Sep. 2010		107	10 Sep. 2010
	76	10 Sep. 2010		108	10 Sep. 2010
	77	10 Sep. 2010		109	10 Sep. 2010
	78	10 Sep. 2010		110	10 Sep. 2010
	79	10 Sep. 2010		111	10 Sep. 2010
	80	10 Sep. 2010		112	10 Sep. 2010
	81	10 Sep. 2010		113	10 Sep. 2010
	82	10 Sep. 2010		114	10 Sep. 2010
	83	10 Sep. 2010		115	10 Sep. 2010
	84	10 Sep. 2010		116	10 Sep. 2010
	85	10 Sep. 2010		117	10 Sep. 2010
	86	10 Sep. 2010		118	10 Sep. 2010
	87	10 Sep. 2010		119	10 Sep. 2010
	88	10 Sep. 2010		120	10 Sep. 2010
	89	10 Sep. 2010		121	10 Sep. 2010
	90	10 Sep. 2010		122	10 Sep. 2010
	91	10 Sep. 2010		123	10 Sep. 2010
	92	10 Sep. 2010		124	10 Sep. 2010

SECTION	PAGE	DATE	SECTION	PAGE	DATE
	125	10 Sep. 2010		127	10 Sep. 2010
	126	10 Sep. 2010		128	10 Sep. 2010

TABLE OF CONTENTS **PAGE**

5.1 General 11
5.1.1 Certification Data 11
5.1.1.1 Supplemental Certification Data 11
5.1.2 Advisory Data 11
5.1.3 Basis of Certification of the DHC-6 Series 300 12
5.1.3.1 CAR 3 12
5.1.3.2 SFAR 23 12

5.2 Conventions and Practices Used in Presentation of Performance Data 13
5.2.1 Assumptions and Conditions Common to all Charts 13
5.2.1.1 Flap Settings 13
5.2.1.2 Engine Performance 13
5.2.1.3 Runway Surface Conditions 14
5.2.1.4 Headwinds 14
5.2.1.5 Tailwinds 14
5.2.1.6 Effect of Intake Deflectors 14
5.2.2 Landing Distance Adjustments for Different Flap Settings 15

5.3 Key Performance Metrics 16
5.3.1 Cruise Speed at Maximum Cruise Power, KTAS 16
5.3.2 Payload – Range 16
5.3.3 Maximum Range 16
5.3.4 Maximum Endurance 16
5.3.5 Stalling Speeds 17
5.3.6 Take-Off Distance 17
5.3.7 Accelerate-Stop Distance 17
5.3.8 Landing Distance 17
5.3.9 Enroute Rate of Climb 17
5.3.10 Ceiling 17

5.4 Overview of Performance Calculation 19
5.4.1 Maximum Permissible Operational Weights 19
5.4.1.1 Maximum Take-Off Weight 19
5.4.1.2 Maximum Landing Weight 19
5.4.1.3 Determination of Performance Loss in a Steady Turn 20
5.4.1.4 Single Engine Missed Approach Climb 20

TABLE OF CONTENTS **PAGE**

5.5 Temperature Conversion 21

5.6 Wind Component 24

5.7 Airspeed Position Error Correction – Ground 26

5.8 Altimeter Position Error Correction – Flight 28

5.9 Airspeed Position Error Correction – Flight 30

5.10 Stalling Speed – Propellers Feathered 34

5.11 Take-Off Power Setting 38

5.12 Maximum Continuous Power Setting 42

5.13 Maximum Climb Power Setting 46

5.14 Maximum Climb and Cruise Power – 91% NP 50

5.15 Maximum Cruise Power Setting 54

5.16 Maximum Take-Off Weight – Single Engine Climb with Feathered Propeller 58

5.17 Maximum Take-Off Weight – Single Engine Climb with Windmilling Propeller 62

5.18 Take-Off Distance to 50 Feet, Both Engines Operating 66

5.19 Take-Off Ground Roll 70

5.20 Accelerate-Stop Distance 74

5.21 Take-Off Distance to Liftoff Speed – Engine Failure at V1 78

5.22 Take-Off Distance to 35 Feet – Engine Failure at V1 82

TABLE OF CONTENTS **PAGE**

5.23 Take-Off Rate of Climb, Both Engines Operating 86

5.24 Take-Off Gradient of Climb, Both Engines Operating 90

5.25 Take-Off Rate of Climb – Single Engine, Propeller Feathered 94

5.26 Take-Off Gradient of Climb – Single Engine, Propeller Feathered 98

5.27 Take-Off Rate of Climb – Single Engine, Propeller Windmilling 102

5.28 Take-Off Gradient of Climb – Single Engine, Propeller Windmilling..106

5.29 Enroute Rate of Climb – Single Engine, Propeller Feathered 110

5.30 Enroute Gradient of Climb – Single Engine, Propeller Feathered.....114

5.31 Maximum Permissible Landing Weight.....118

5.32 Balked Landing Rate of Climb 119

5.33 Balked Landing Gradient of Climb.....122

5.34 Landing Distance from 50 feet AGL to Full Stop 126

List of Tables Page

5-1 Engine Power Ratings 14
5-2 Effect of Intake Deflectors 15
5-3 Stalling Speeds..... 17

List of Figures Page

5-1 Temperature Conversion Chart 23
5-2 Wind Component 25
5-3 Airspeed Position Error Correction – Ground 27
5-4 Altimeter Position Error Correction – Flight 29

List of Figures Page

5-5 Airspeed Position Error Correction – Flight 33
5-6 Stalling Speed – Propellers Feathered 37
5-7 Take-Off Power Setting..... 41
5-8 Maximum Continuous Power Setting 45
5-9 Maximum Climb Power Setting..... 49
5-10 Maximum Climb and Cruise Power – 91% NP..... 53
5-11 Maximum Cruise Power Setting..... 57
5-12 Maximum Take-Off Weight – OEI Take-Off Climb with Feathered Propeller 61
5-13 Maximum Take-Off Weight – OEI Take-Off Climb with Windmilling Propeller 65
5-14 Take-Off Distance to 50 Feet, Both Engines Operating 69
5-15 Take-Off Ground Roll..... 73
5-16 Accelerate-Stop Distance (to full stop)..... 77
5-17 Take-Off Distance to Liftoff Speed – Engine Failure at V1 81
5-18 Take-Off Distance to 35 Feet – Engine Failure at V1 85
5-19 Take-Off Rate of Climb, Both Engines Operating..... 89
5-20 Take-Off Gradient of Climb, Both Engines Operating..... 93
5-21 Take-Off Rate of Climb – Single Engine, Propeller Feathered 97
5-22 Take-Off Gradient of Climb – Single Engine, Propeller Feathered 101
5-23 Take-Off Rate of Climb – Single Engine, Propeller Windmilling 105
5-24 Take-Off Gradient of Climb – Single Engine, Propeller Windmilling 109
5-25 Enroute Rate of Climb – Single Engine, Propeller Feathered.....113
5-26 Enroute Gradient of Climb – Single Engine, Propeller Feathered.....117
5-27 Balked Landing Rate of Climb.....121
5-28 Balked Landing Gradient of Climb.....125
5-29 Landing Distance from 50 feet AGL to Full Stop.....129

5.1 General

Performance data in this section is presented to enable the pilot to know what to expect from the aircraft under various conditions, and to enable planning of flights. Unless noted in an individual chart, no factoring (allowance for equipment degradation or pilot error) had been applied to any of this performance data.

Performance data can be divided into two types: certification data, which includes supplemental certification data; and advisory data.

5.1.1 Certification Data

Certification data is performance data that was collected in accordance with specific regulatory requirements for the purpose of certification of the aircraft.

Certification data is used by the pilot, dispatcher, or operator to make planning and operational decisions prior to dispatching the aircraft. Certification data defines the most limiting regulatory condition. Other data, such as advisory data, may only be used if it is more limiting than certification data.

Certification data is published in this section (Section 5) of the approved AFM. Unless noted otherwise, performance data in this section applies to aircraft equipped with standard landplane gear only.

5.1.1.1 Supplemental Certification Data

Supplemental certification data is performance data that was collected in accordance with specific regulatory requirements for the purpose of certification of the aircraft either in configurations other than the standard landplane (e.g. floats, skis, intermediate flotation gear), or for operation in a manner that differs from the procedures set out in Sections 4 and 5 of the approved AFM.

Supplemental certification data is used in addition to, or in place of, certification data contained in Section 5. For example, the pilot, dispatcher, or operator uses performance data from an appropriate supplement to make planning and operational decisions prior to dispatching an aircraft equipped with gear other than standard landplane gear.

Supplemental certification data is published in each of the individual supplements contained in Section 9 of the AFM.

5.1.2 Advisory Data

Advisory data is additional performance data that has been collected and published by the manufacturer, above and beyond the minimum requirements for data published for certification purposes.

Advisory data may be used by the pilot, dispatcher, or operator to assist in making informed flight operations decisions after it has been determined that the flight can be dispatched in compliance with the certification data. Advisory data may be used in addition to, but not as a replacement for, certification data.

Advisory data is published in Section 10 of the POH, “Safety and Operational Tips.”

5.1.3 Basis of Certification of the DHC-6 Series 300

The DHC-6 Series 300 has been certified in accordance with several different standards.

5.1.3.1 CAR 3

The DHC-6 was first certified to the standards of Civil Air Regulation (CAR) Part 3, dated May 15, 1956, including Amendments 3-1 through 3-8 plus Special Conditions for multi-engine turbine-powered aircraft dated November 6, 1964.

5.1.3.2 SFAR 23

Subsequently, the DHC-6 was certified to the standards of Special Federal Aviation Regulation (SFAR) 23 dated January 7, 1969, and Amendment SFAR 23–1 dated December 24, 1969. In order to meet the requirements of SFAR 23 at Amendment 1, some physical changes to the aircraft were required. These changes did not affect aircraft performance. The changes included wiring modifications, installation of door handle guards, specifications calling for additional audible alerts such as stall horns and fire bells, and improvements in cabin exit provisions. These physical changes were cut in as standard to all DHC-6 aircraft beginning with SN 311, and could be retrofitted to earlier production Series 300 aircraft.

In addition, changes were made to the AFM, notably to performance data provided in the AFM. Although the performance characteristics of the pre and post SN 311 aircraft are identical, SFAR 23 required that the manufacturer present more precise instructions in the normal, emergency and abnormal operating procedures sections of the AFM, and present additional information (such as accelerate-stop distances) in the performance section of the AFM.

To enable operators to achieve the higher level of safety provided by SFAR 23, de Havilland published Supplement 11 – “SFAR 23 Compliance” in 1971. This revised (Revision 53) AFM incorporates all of the SFAR 23 performance data previously contained in Supplement 11 into the main body of the normal, emergency and abnormal procedures sections of the AFM into this performance section of the AFM.

The original CAR 3 performance charts have not been used and are no longer published. Because all Supplement 11 data has now been incorporated into the main body of the AFM, Supplement 11 is no longer published.

5.2 Conventions and Practices Used in Presentation of Performance Data

All distances have been expressed in nautical miles (for large distances), or in feet (for small distances).

Only pressure altitude has been used whenever any reference to altitude is made in a chart. Each chart will have an entry point that allows the pilot to adjust to the prevailing temperature.

Distances presented with references to “Take-off Power” always assume that full calculated take-off power is used. Landing distances presented always assume that maximum wheel braking effort is used on a dry, level, hard surface. No credit has been taken for use of zero thrust or reverse thrust in any chart.

An arrow (—>) is used to indicate the entry point to a chart, and also to indicate the direction in which lines making up the calculation progress. An asterisk (*) is used on examples to indicate the exit point from a chart.

5.2.1 Assumptions and Conditions Common to all Charts

5.2.1.1 Flap Settings

Flap Settings will be as follows:	
Take-off	10°
Take-off climb (prior to 400’ AGL or obstacle clearance, whichever comes later)	10°
Enroute climb with two engines	0°
Any form of climb with one engine	10°
Landing	37.5°

5.2.1.2 Engine Performance

The aircraft is equipped with two Pratt & Whitney Canada PT6A-27 engines and two Hartzell HC-3BTN-DY blade propellers. All values that follow are based on 96% N_P and ISA conditions. The values below reflect the flat rating that has been applied to this 680 SHP engine.

Table 5-1 Engine Power Ratings

Power Rating	SHP	ESHP	SFC	Note
		(lb/ESHP/hr)		
Take-off Power	620	652	0.612	Note 1
Maximum Continuous Power	620	652	0.612	Note 1
Maximum Climb Power	620	652	0.612	Note 2
Maximum Cruise Power	620	652	0.612	Note 2

NOTE

1 620 SHP Take-off Power and Maximum Continuous Power is available to ISA +18°C at sea level.

2 620 SHP Maximum Climb Power and Maximum Cruise Power is available to ISA +6°C at sea level.

5.2.1.3 Runway Surface Conditions

Unless otherwise specified, all performance data presented in this section was collected using a runway with a dry, level, hard surface.

5.2.1.4 Headwinds

For operation in headwinds exceeding 20 knots, the take-off and landing data appropriate to 20 knots should be used.

5.2.1.5 Tailwinds

Landing or taking off with a tailwind component of greater than 10 knots is prohibited.

5.2.1.6 Effect of Intake Deflectors

Extension of engine intake deflectors will only affect take-off and climb performance when the torque setting is less than 50 PSI. Extension of engine intake deflectors has no effect on landing performance.

The effect of extending the engine intake deflectors at power settings of maximum Take-off Power, maximum continuous power, and Maximum Climb Power, when those settings are calculated to be less than 50 PSI, is as follows:

Table 5-2 Effect of Intake Deflectors

	Single Engine Operation	Two Engine Operation
Loss in rate of climb	15 FPM	30 FPM
Loss in gradient of climb	.002 (0.2%)	.004 (0.4%)
Loss in operating ceiling	400 feet	400 feet

5.2.2 Landing Distance Adjustments for Different Flap Settings

All landing charts give distances for landing with full flap (37.5°). Landing with 20° flap is permitted when sufficient runway is available. Landing with 10° flap is only permitted during or subsequent to exposure to icing conditions. Landing with 0° flap is an unapproved, abnormal maneuver that is only permitted in the event of a malfunction of the flap system.

To adjust the published landing distances for flaps 37.5° to suit other flap settings, proceed as follows:

For landing with flaps 20°, multiply calculated distance by 1.3 (130%).

For landing with flaps 10°, multiply calculated distance by 1.8 (180%).

For landing with flaps 0°, multiply calculated distance by 2.3 (230%).

5.3 Key Performance Metrics

Some key performance data for a standard landplane, at maximum gross weight and standard atmosphere conditions unless otherwise stated, are presented below for reference purposes. For additional information, refer to the performance charts in this section.

5.3.1 Cruise Speed at Maximum Cruise Power, KTAS

Sea Level	170 KTAS (Note 1)
5,000 feet	181 KTAS
10,000 feet	182 KTAS

NOTE

1 Maximum cruise speed at sea level is limited by V_{MO}. Refer to Section 2 (Limitations) for V_{MO}.

5.3.2 Payload – Range

Payload for 100 nautical mile range	4,420 pounds
Payload for 400 nautical mile range	3,400 pounds

Payload may be less than above if optional equipment is fitted to the aircraft, thus increasing the empty weight. Values given are based on an operational empty weight of 7,320 pounds, cruise at 10,000 feet at maximum cruise power, and fuel reserve for 45 minutes at long range cruise power.

5.3.3 Maximum Range

722 nautical miles, with zero payload, cruise at 10,000 feet at long range cruise power, and fuel reserve for 45 minutes at long range cruise power.

5.3.4 Maximum Endurance

6.85 hours, based on maximum endurance speed at 10,000 feet, fuel reserve for 45 minutes at maximum endurance, gross weight equal to operational empty weight (7,320 pounds) plus full fuel (2,457 pounds, equal to 315 imperial gallons) and 1,000 pounds of payload.

5.3.5 Stalling Speeds

At the maximum gross weight and with the center of gravity at the most forward position, level flight, power set for zero thrust, stalling speeds (KIAS) are as follows:

Table 5-3 Stalling Speeds

Phase of Flight	Engines Operating	Flap Setting	Stalling Speed (KIAS)
Enroute	2 engines	0°	73
Enroute	1 engine	10°	66
Take-off	2 engines	10°	66
Landing	2 engines	37.5°	56

5.3.6 Take-Off Distance

The two engine take-off distance to clear a 50 foot obstacle at maximum take-off weight is 1,490 feet (Sea Level, ISA, MTOW, No Wind).

5.3.7 Accelerate-Stop Distance

The accelerate stop distance (to a full stop) is 2,320 feet (Sea Level, ISA, MTOW, No Wind). This includes a one second allowance for recognition of the engine failure at V_1, and an additional one second allowance prior to initiation of braking.

5.3.8 Landing Distance

The landing distance from an obstacle height of 50 feet at maximum landing weight is 1,510 feet (Sea Level, ISA, MLW, No Wind).

5.3.9 Enroute Rate of Climb

At maximum take-off weight (Sea Level, ISA):	
Both engines at maximum climb power	1,600 FPM
One engine at maximum continuous power	340 FPM

5.3.10 Ceiling

Both engines at maximum climb power (ISA, 12,500 pounds):	
Service Ceiling (100 FPM rate of climb)	26,700 feet (Note 1)
Absolute Ceiling (0 FPM rate of climb)	27,900 feet (Note 1)

Note: Maximum altitude limitation is 25,000 feet.

One engine at maximum continuous power (ISA, 12,500 pounds):

Service Ceiling (100 FPM rate of climb)	11,600 feet
Absolute Ceiling (0 FPM rate of climb)	14,600 feet

5.4 Overview of Performance Calculation

5.4.1 Maximum Permissible Operational Weights

5.4.1.1 Maximum Take-Off Weight

The maximum take-off weight must not exceed the most restrictive of the following limitations or requirements:

1 STRUCTURAL LIMITATIONS

The structural weight limitation of 12,500 pounds. Note that there is no allowance for maximum ramp weight for the DHC-6. The maximum ramp weight is also 12,500 pounds.

2 CLIMB REQUIREMENTS

The single engine rate of climb must be positive.

The chart 'Maximum Take-Off Weight – Single Engine Climb with Feathered Propeller' may be consulted to quickly determine the maximum weight that will permit compliance with the minimum enroute climb requirements.

If any obstacles are present beyond the runway, the single engine take-off gradient of climb must be sufficient to enable meeting obstacle clearance requirements.

3 RUNWAY LENGTH REQUIREMENTS

Sufficient runway and/or clearway to meet the all-engine take-off distance requirement (Take-Off Distance to 50 Feet, Both Engines Operating), the accelerate-stop distance requirement, and the accelerate-go (Take-Off Distance to 35 Feet – Engine Failure at V_1) requirement must be available.

5.4.1.2 Maximum Landing Weight

The maximum landing weight must not exceed the most restrictive of the following limitations or requirements:

1 STRUCTURAL LIMITATIONS

The structural landing weight limitation of 12,300 pounds.

2 CLIMB REQUIREMENTS

The single engine take-off gradient of climb should also be considered, to enable meeting obstacle clearance requirements if a single-engine missed approach is carried out at the destination.

3 RUNWAY LENGTH REQUIREMENTS

Sufficient runway to meet the 'Landing Distance from 50 feet AGL to Full Stop' must be available at the destination.

5.4.1.3 Determination of Performance Loss in a Steady Turn

If the obstacle clearance calculations require a lateral change in direction to be made after take-off in order to avoid an obstacle, the aircraft may be banked up to an angle of 15 degrees. The decrease in climb gradient during a steady turn of 15° of bank with 10° of flap extended is 0.006. To apply this correction when using the performance charts, deduct .006 (0.6%) from the calculated gradient of climb for the duration of the turn. For bank angles of less than 15°, the decrease in climb gradient may be considered to be proportional to bank angle.

5.4.1.4 Single Engine Missed Approach Climb

Operating procedures published in Section 3.7.2 (One Engine Inoperative Missed Approach, Flaps 10 degrees) state that a missed approach should not be attempted if flaps have been extended beyond 10 degrees.

Provided that flaps are set to 10 degrees and the propeller of the inoperative engine is feathered, WAT limitations for a single engine missed approach can be determined by consulting Figure 5.12 (Maximum Take-Off Weight, One Engine Inoperative Take-Off Climb with Feathered Propeller) and rate and gradient climb charts for single engine take-off climb with a feathered propeller.

5.5 Temperature Conversion

Interpretive Guidance

This chart enables conversion of temperature from Fahrenheit to Celsius and vice-versa.

Example Calculation (dotted line)

Determine the value of +32° Fahrenheit in Celsius.

1 Enter the chart from the left side (vertical axis), at the Fahrenheit temperature (+32°), and proceed horizontally right to the reference line.

2 Proceed down from the reference line and read the equivalent temperature value in Celsius (0°).

Summary of Example Calculation

+32° Fahrenheit is equal to 0° Celsius.

NOTE

To convert in the opposite direction, from Celsius to Fahrenheit, enter the chart from the bottom (horizontal axis) and proceed upwards to the reference line, then proceed left to exit at degrees Fahrenheit.

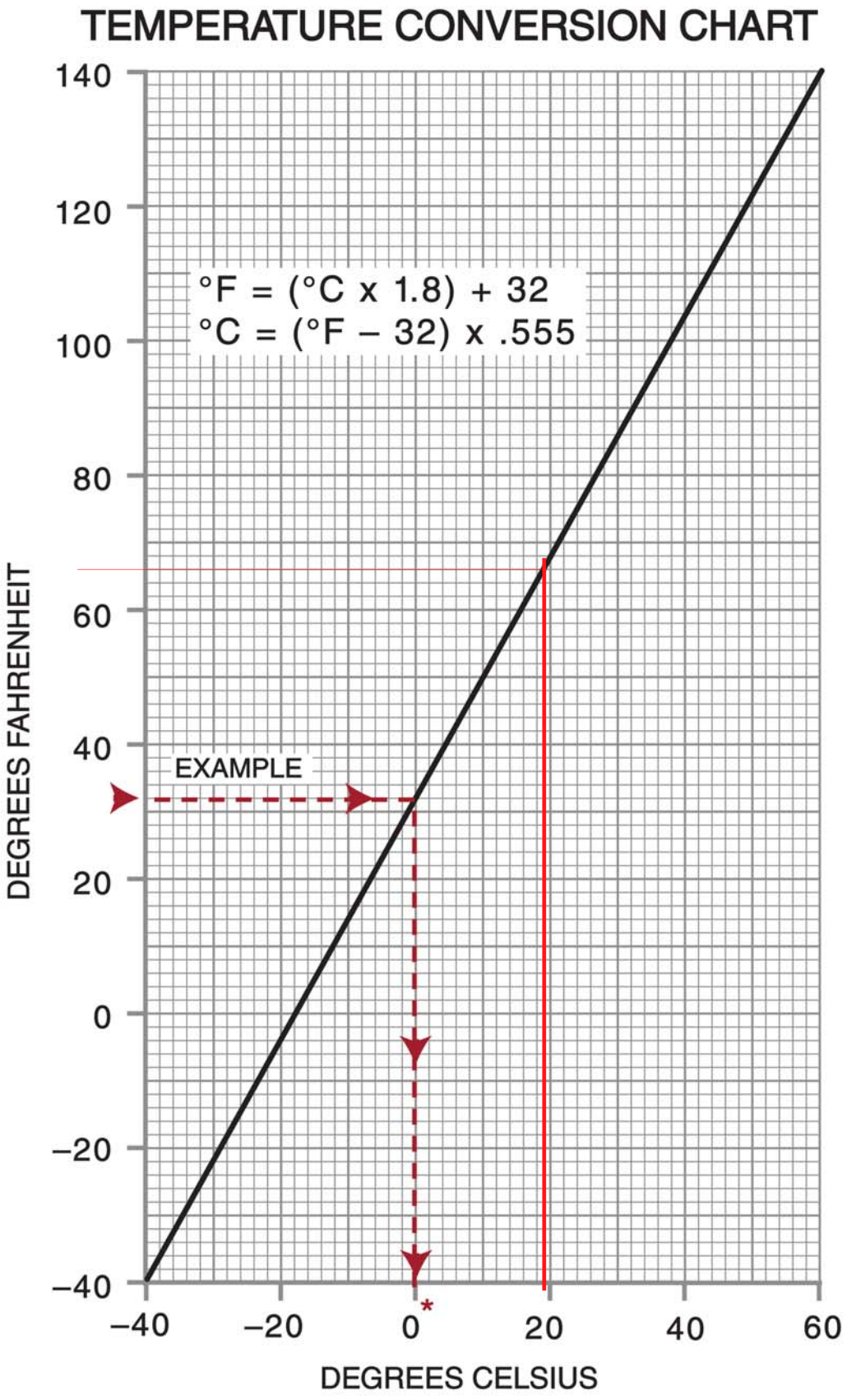


Figure 5-1 Temperature Conversion Chart

5.6 Wind Component

Interpretive Guidance

This chart enables conversion of reported wind speed and direction into headwind or tailwind component and crosswind component.

Example Calculation (dotted lines)

Determine the crosswind component and the headwind component. The reported wind speed is 23 knots from a direction that is 55° offset from the runway heading.

1 Blue (diagonal and circular) Example Lines:

The blue example lines (the circular and diagonal example lines) define the wind speed and wind direction relative to the runway heading.

Enter the chart at the reported wind speed on the vertical axis, and at the direction relative to the runway on the perimeter of the chart, and note the point at which reported wind speed and wind offset direction meet.

2 Red (vertical and horizontal) Example Lines:

The red example lines (horizontal and vertical example lines) define the headwind and crosswind components of the wind.

From the point established in Step 1, move horizontally left to determine the effective headwind component, and move down to the 90° reference line to determine the effective crosswind component.

Summary of Example Calculation

The reported wind is 23 knots velocity from a direction that is 55° offset from the runway. The headwind component is 13 knots and the crosswind component is 19 knots.

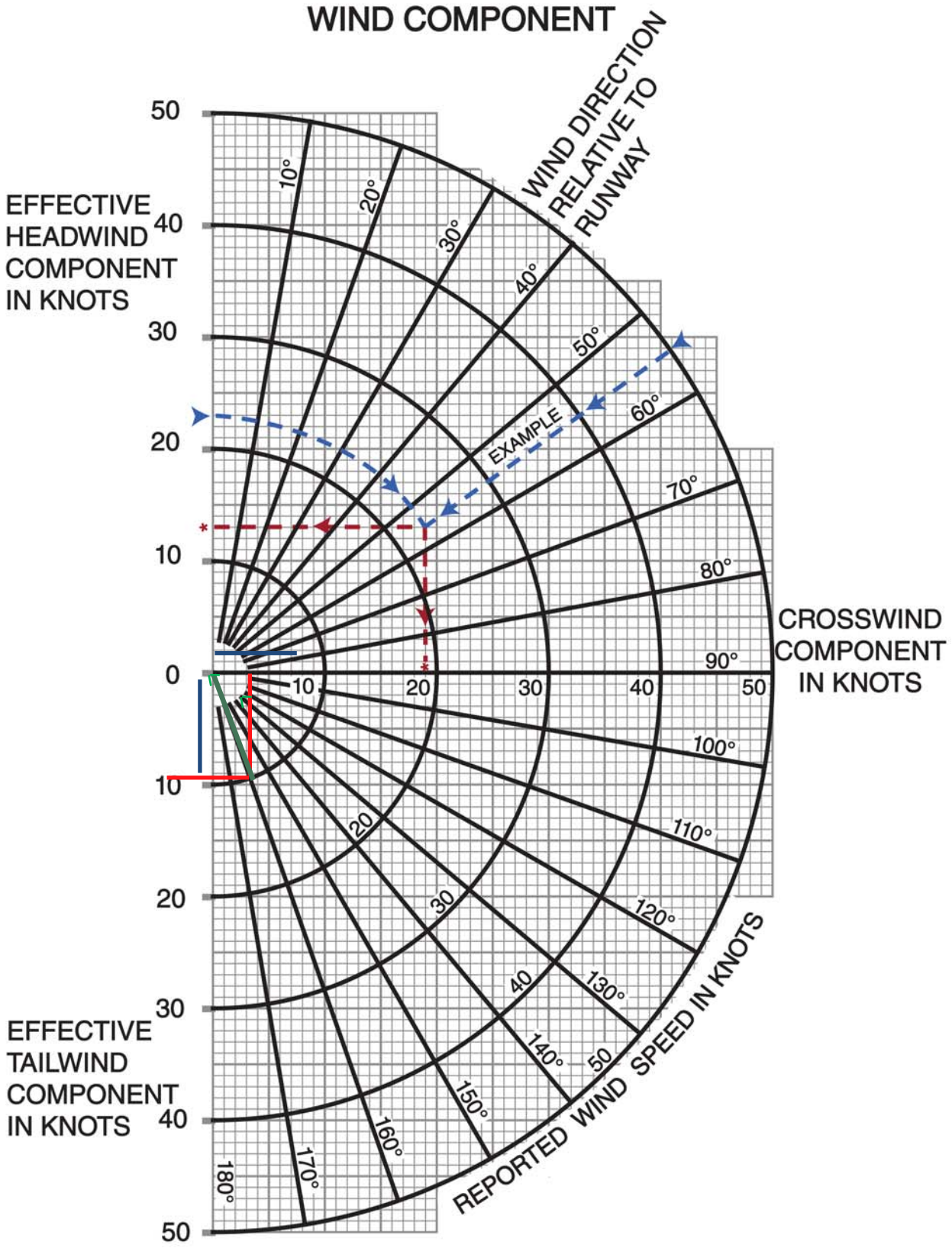


Figure 5-2 Wind Component

5.7 Airspeed Position Error Correction – Ground

Conditions associated with this chart

Both main wheels and the nose wheel are on ground. Flaps 10°, both engines at take-off power.

This chart is valid for all gear configurations.

The vertical axis of the chart, marked △ Velocity (knots), represents the difference between calibrated airspeed (CAS) and indicated airspeed (IAS). The triangle symbol △ represents 'difference.'

Interpretive Guidance

This chart enables correction of the airspeed displayed on the airspeed indicator due to errors caused by the location of the sources of pitot and static air pressure used by the airspeed indicators.

This chart is only valid when the aircraft is being operated on the ground (e.g. take-off roll) and flaps are set to 10°. For indicated airspeed error correction in flight, use the chart "Airspeed Position Error Correction – Flight."

Example Calculation (dotted lines)

Determine the amount of the airspeed position error that exists at 60 knots indicated airspeed during the take-off roll, and correct the indicated airspeed (IAS) to calibrated airspeed (CAS).

1 Enter the chart from the bottom (IAS axis) at 60 knots indicated airspeed.

2 Stop at the curved black reference line, and turn left. Exit the chart at the left side (delta velocity axis). Read the value of –1 from the vertical axis of the chart.

3 Subtract one knot from the indicated airspeed of 60 knots to yield the calibrated airspeed, which is 59 knots.

Summary of Example Calculation

At 60 knots indicated airspeed ground operations, negative one knot must be added to the indicated airspeed (in other words, one knot must be subtracted from the indicated airspeed) to correct for position error and yield a calibrated airspeed of 59 knots.

NOTE

During the ground roll, at all indicated speeds less than 83 knots, the calibrated airspeed will be slightly less than the indicated airspeed.

AIRSPEED POSITION ERROR CORRECTION
GROUND
ALL GEAR CONFIGURATIONS

$$\Delta V = CAS - IAS$$
$$CAS = IAS + \Delta V$$

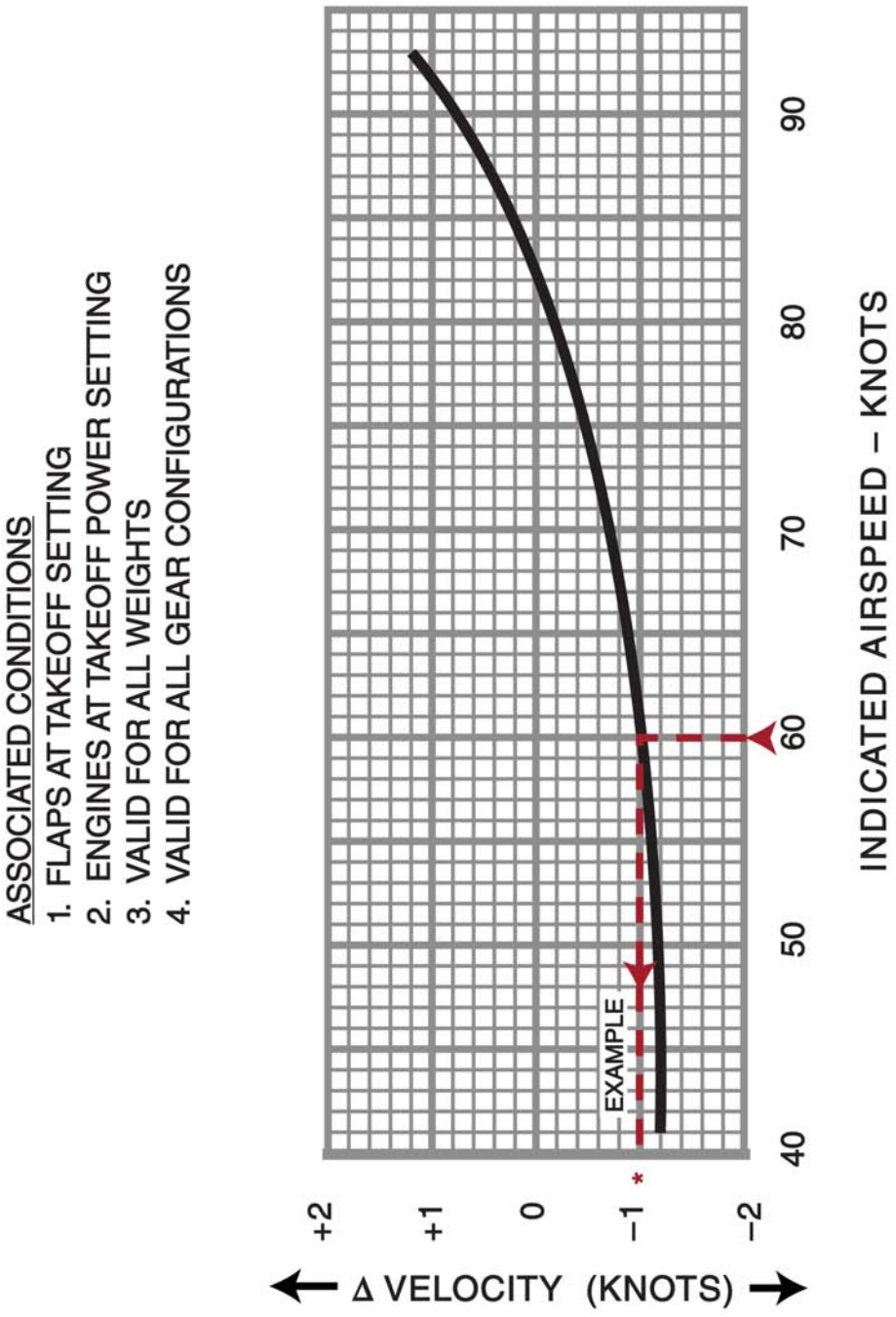


Figure 5-3 Airspeed Position Error Correction – Ground

5.8 Altimeter Position Error Correction – Flight

Conditions associated with this chart

Co-ordinated flight (no slip or skid). Power for level flight at selected speed.

This chart is valid for all gear configurations.

Interpretive Guidance

This chart enables correction of altitude displayed on the pressure altimeter due to errors caused by the location of the source of static air pressure used by the pressure altimeters.

This chart is only valid when flaps are fully retracted. When flaps are extended any amount, the maximum error in altimeter reading is 30 feet at any altitude.

Example Calculation (dotted lines)

Determine the amount of the altimeter position error and the correct altitude of the aircraft. The aircraft is flying at an indicated airspeed of 130 knots and an indicated altitude of 5,000 feet.

1 Enter the chart from the bottom (indicated airspeed axis) at 130 knots indicated airspeed.

2 Using interpolation between the sea level and 10,000 foot lines, stop at the point that approximates 5,000 feet indicated altitude.

3 Move horizontally to the left, exiting the chart at the altimeter correction axis, to determine the amount that needs to be added to the indicated altitude to give a corrected altitude.

Summary of Example Calculation

At 130 knots indicated airspeed at an indicated altitude of 5,000 feet, 50 feet must be added to the altimeter reading to yield a corrected altitude of 5,050 feet.

NOTE

This chart will only correct for errors caused by the position of the static source. Other calculations that are not documented in this AFM may be required to correct for errors caused by temperature differences from ISA.

ALTIMETER POSITION ERROR CORRECTION
FLIGHT

ALL GEAR CONFIGURATIONS

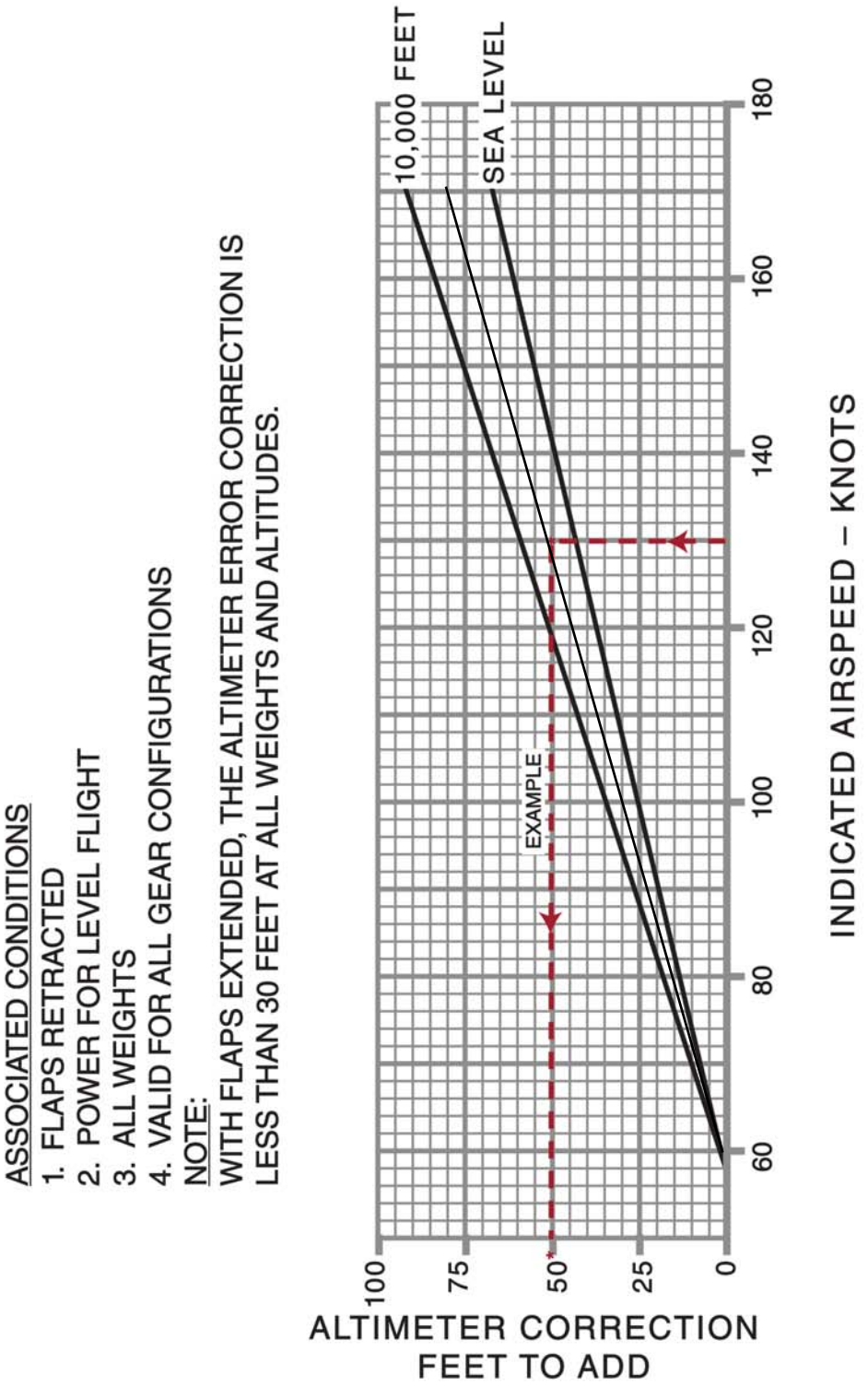


Figure 5-4 Altimeter Position Error Correction – Flight

5.9 Airspeed Position Error Correction – Flight

Conditions associated with this chart

Co-ordinated flight (no slip or skid).

Interpretive Guidance

This chart enables correction of airspeed displayed on the airspeed indicator due to errors caused by the location of the sources of pitot and static air pressure used by the airspeed indicators. This chart is only valid when the aircraft is being operated in flight. The chart is valid for all possible gear configurations (floats, skis, intermediate flotation gear, etc.).

The vertical axis of the chart, marked Δ Velocity (knots), represents the difference between calibrated airspeed (CAS) and indicated airspeed (IAS). The triangle symbol Δ represents 'difference.'

Example Calculation (dotted lines)

Determine the amount of the airspeed position error that exists in flight at 64 knots indicated airspeed with flaps set to 10° and power set to maintain level flight, and correct the indicated airspeed to calibrated airspeed.

1 Enter the chart from the bottom (the indicated airspeed axis) at 64 knots indicated airspeed.

2 Continue upwards until finding the curved black reference line that is appropriate for flaps 10°, and then move left. Read the value of (approximately) 2 knots from the 'Δ velocity' given on the vertical axis of the chart.

3 Add 2 knots to the indicated airspeed of 64 knots to yield the calibrated airspeed, which is 66 knots.

Summary of Example Calculation

At 64 knots indicated airspeed with flaps 10° and power to maintain level flight, 2 knots must be added to the indicated airspeed to correct for position error and yield a calibrated airspeed of 66 knots.

NOTE

In flight, indicated airspeed will always be lower than calibrated airspeed. In other words, the airspeed indicator will always indicate less than the actual airspeed. The amount of the error varies between an average of 2 knots with flaps extended to a maximum of 4 knots with flaps retracted. The amount of error is slightly less at lower aircraft weights.

AIRSPEED POSITION ERROR CORRECTION
FLIGHT
ALL GEAR CONFIGURATIONS

$\Delta V = CAS - IAS$ (KNOTS)
$CAS = IAS + \Delta V$ (KNOTS)

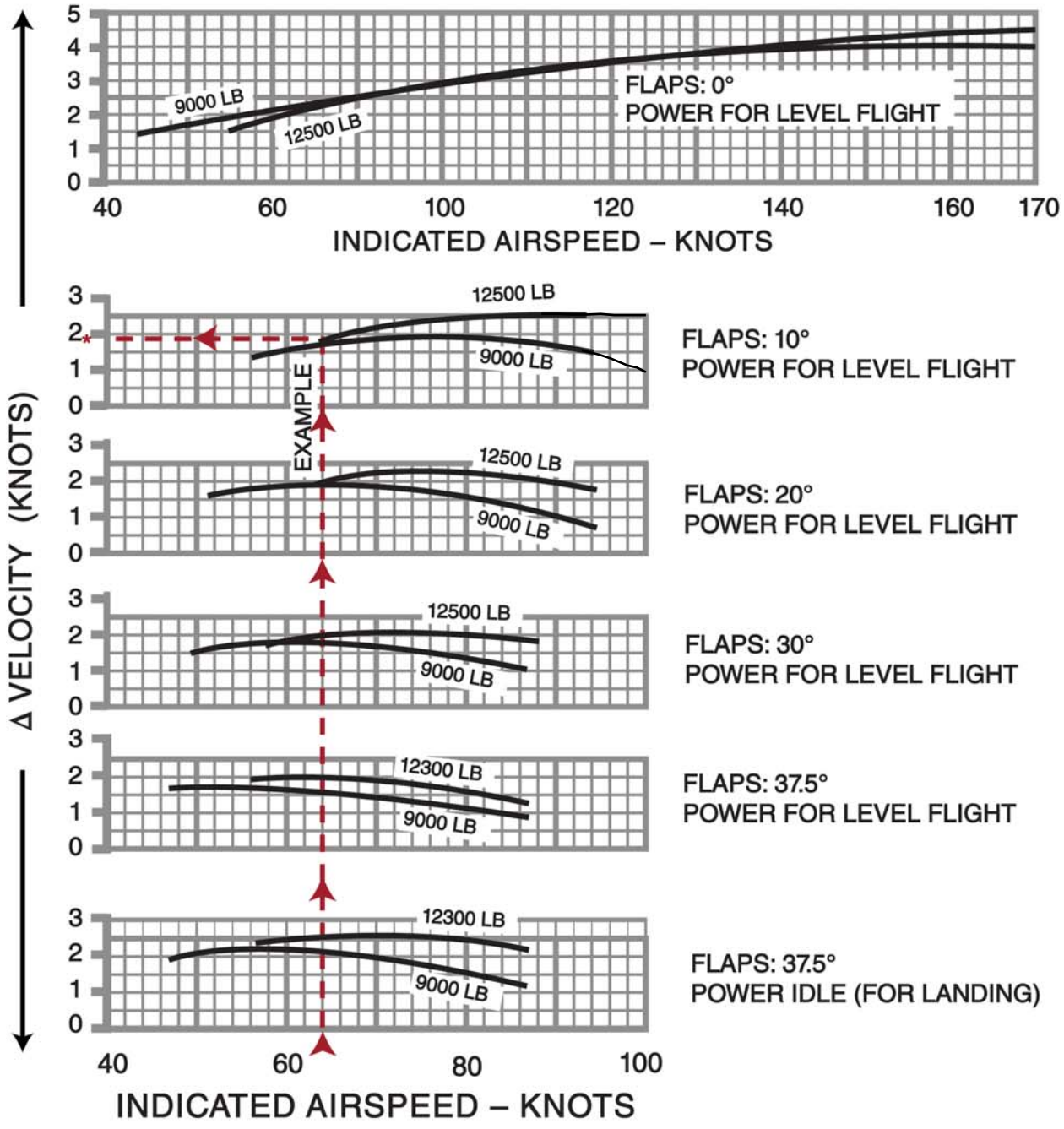


Figure 5-5 Airspeed Position Error Correction – Flight

5.10 Stalling Speed – Propellers Feathered

Conditions associated with this chart

Center of Gravity at forward limit (the most unfavourable condition for stalls).

Engines idling and both propellers feathered.

All gear configurations produced by de Havilland Canada (standard landplane, intermediate flotation gear, skiplane, wheel-skiplane, CAP straight floats).

Interpretive Guidance

This chart presents the stalling speed of the aircraft. It will only be accurate under the conditions described above. During slow flight at high power settings, the stalling speed will decrease due to propeller slipstream over the wing and horizontal stabilizer. When the power levers are at the idle position and the propellers are not feathered, the stalling speed will be higher than what is shown on the chart due to the turbulence created by the windmilling propellers.

It is possible to approximate the conditions associated with this chart (for training purposes, and to verify calibration of the stall warning system) by setting the power levers to a zero thrust, zero drag position. This is equal to approximately 8 to 10 pounds of torque, or approximately one inch forward of the power lever idle stop. Slightly less torque may be needed if the propellers are at 75% N_P and slightly more torque may be needed if the propellers are at 96% N_P.

Example Calculation (dotted line)

Determine the stalling speed of the aircraft under the following conditions: 11,250 pounds weight, flaps set to 10°, in a coordinated 35° banked turn.

1 Enter the chart from the bottom (at the aircraft gross weight axis) at 11,250 pounds and proceed upwards to the selected flap setting (10°).

2 Proceed right to the reference line, then proceed up between the guidelines until the desired angle of bank is reached (35°).

3 Proceed horizontally right to exit the chart at the far right (stalling speed axis) to determine the stall speed (70.5 knots CAS).

The following step is not shown in the example calculation, but is required to obtain a precise result for use in flight:

4 Refer to the airspeed position error correction (flight) chart to convert the CAS result to IAS.

Summary of Example Calculation

At 11,250 pounds weight and a flap setting of 10°, in a 35° co-ordinated banked turn, the aircraft will stall at 70.5 knots CAS with both propellers feathered and the center of gravity at the forward limit.

NOTE

Altitude loss during stall recovery can vary between 200 and 500 feet.

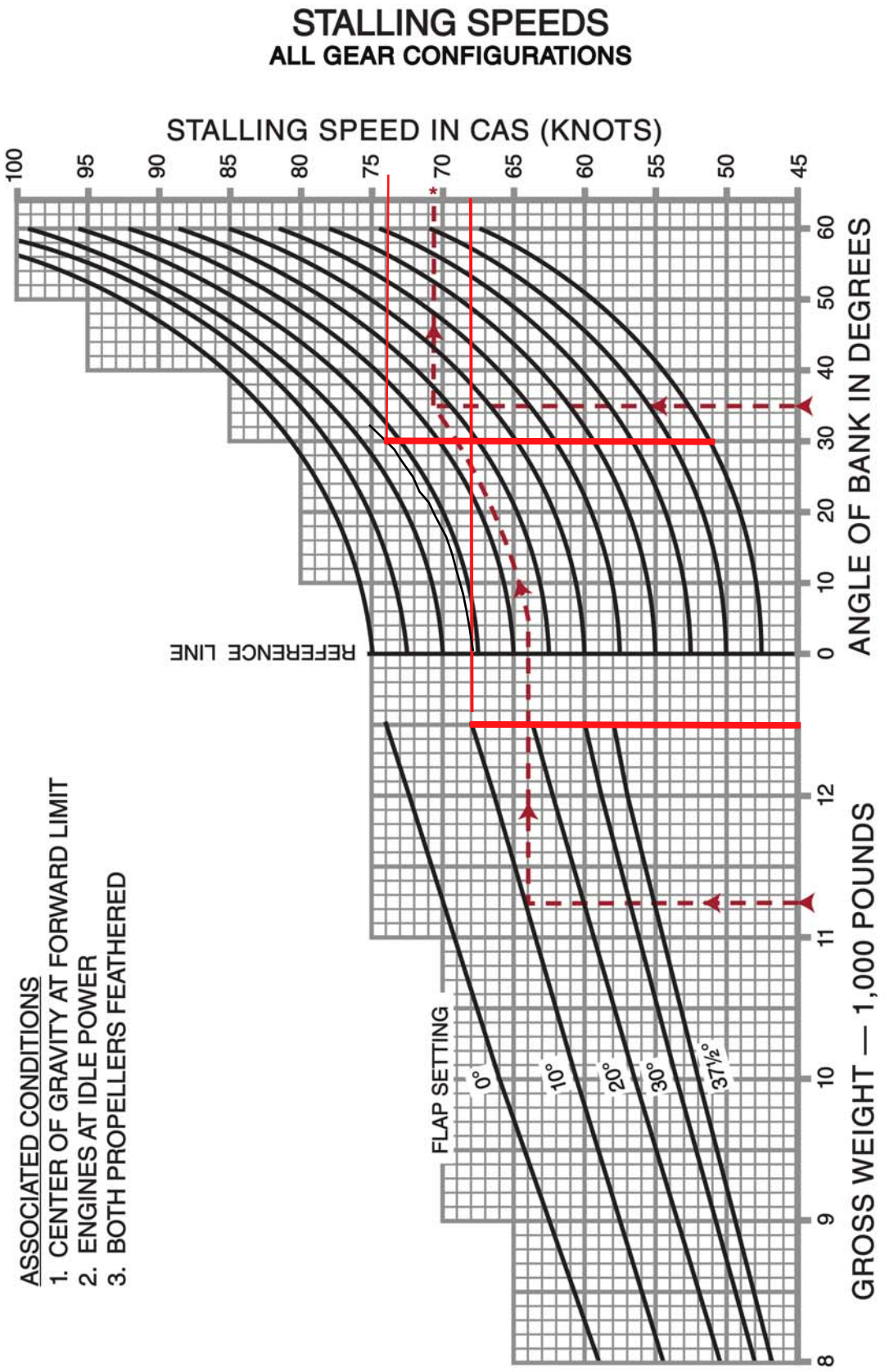


Figure 5-6 Stalling Speed – Propellers Feathered

5.11 Take-Off Power Setting

Conditions associated with this chart

1 Propeller speed is always set to 96% N_P (the maximum RPM position) for take-off.

2 T_5 temperature must not exceed 725°F (the Take-off and Maximum Continuous Limit).

Interpretive Guidance

This chart is used to calculate the Take-off Power that must be set for every take-off. The chart is constructed to allow for the effect of intake deflectors lowered and/or bleed air extraction for cabin heat and de-ice turned on.

Take-offs must be made with full calculated Take-off Power. Reduced power take-offs are prohibited.

Example Calculation (dotted line)

Determine the static (zero airspeed) Take-off Power setting at 6,000 feet pressure altitude and +20°C with intake deflectors extended and bleed air off. Determine the Take-off Power setting at rotation speed for the same conditions.

1 Enter the chart at the prevailing outside air temperature (20°C) and proceed upwards to the airport pressure altitude (6,000 feet).

2 Proceed right to the first reference line, and then to the desired airspeed. In this example, full static Take-off Power is being calculated, therefore the airspeed used is 0 (prior to brake release).

3 Proceed right to the second reference line, then follow the guidelines diagonally downwards until the appropriate operating condition (in this case, intake deflectors extended, but bleed air off) is reached. This is rating index 2.

4 Proceed right to exit the chart at the engine torque pressure setting of 42 pounds torque.

5 By using the same OAT and pressure altitude but performing the calculation using a typical rotation speed of approximately 75 knots, the result is power setting (at rotation speed) of 43 pounds torque.

Summary of Example Calculation

At 20°C OAT and 6,000 feet pressure altitude, with intake deflectors extended and bleed air off, the engines must achieve 42 pounds torque at 0 knots airspeed. This is referred

to as 'static power'. Setting full static power prior to brake release is required for a maximum performance take-off, when the pilot wishes to achieve the take-off distances presented in other charts in this manual. It is not obligatory to set full static Take-off Power prior to brake release if sufficient additional runway is available to allow for more gradual application of power and more gradual acceleration. For every take-off, full calculated Take-off Power must be set and achieved (at the very latest) prior to reaching 40 knots.

WARNING

IT IS OBLIGATORY TO SET FULL CALCULATED TAKE-OFF POWER, AS DERIVED FROM THE POWER SETTING CHART, FOR EVERY TAKE-OFF REGARDLESS OF AIRCRAFT WEIGHT OR RUNWAY LENGTH. REDUCED POWER TAKE-OFFS ARE PROHIBITED.

WARNING

IF EITHER ENGINE CANNOT PRODUCE FULL CALCULATED TAKE-OFF POWER, OR, IF EITHER ENGINE REACHES THE T_5 LIMIT OR THE N_G LIMIT PRIOR TO REACHING THE FULL CALCULATED TAKE-OFF POWER TORQUE VALUE, THEN THE CONDITION OF THE ENGINE HAS DETERIORATED AND THE PROBLEM MUST BE INVESTIGATED AND CORRECTED BEFORE FLIGHT.

WARNING

IF EITHER ENGINE CANNOT PRODUCE FULL CALCULATED TAKE-OFF POWER TORQUE, AS DERIVED FROM THE TAKE-OFF POWER SETTING CHART, OR, IF THE T_5 OR N_G LIMIT IS REACHED BEFORE THE FULL CALCULATED TAKE-OFF POWER TORQUE VALUE IS REACHED, THE ENGINE IS NOT AIRWORTHY AND THE AIRCRAFT MUST NOT BE FLOWN.

NOTE

This chart may also be used to calculate go-around (missed approach) power.

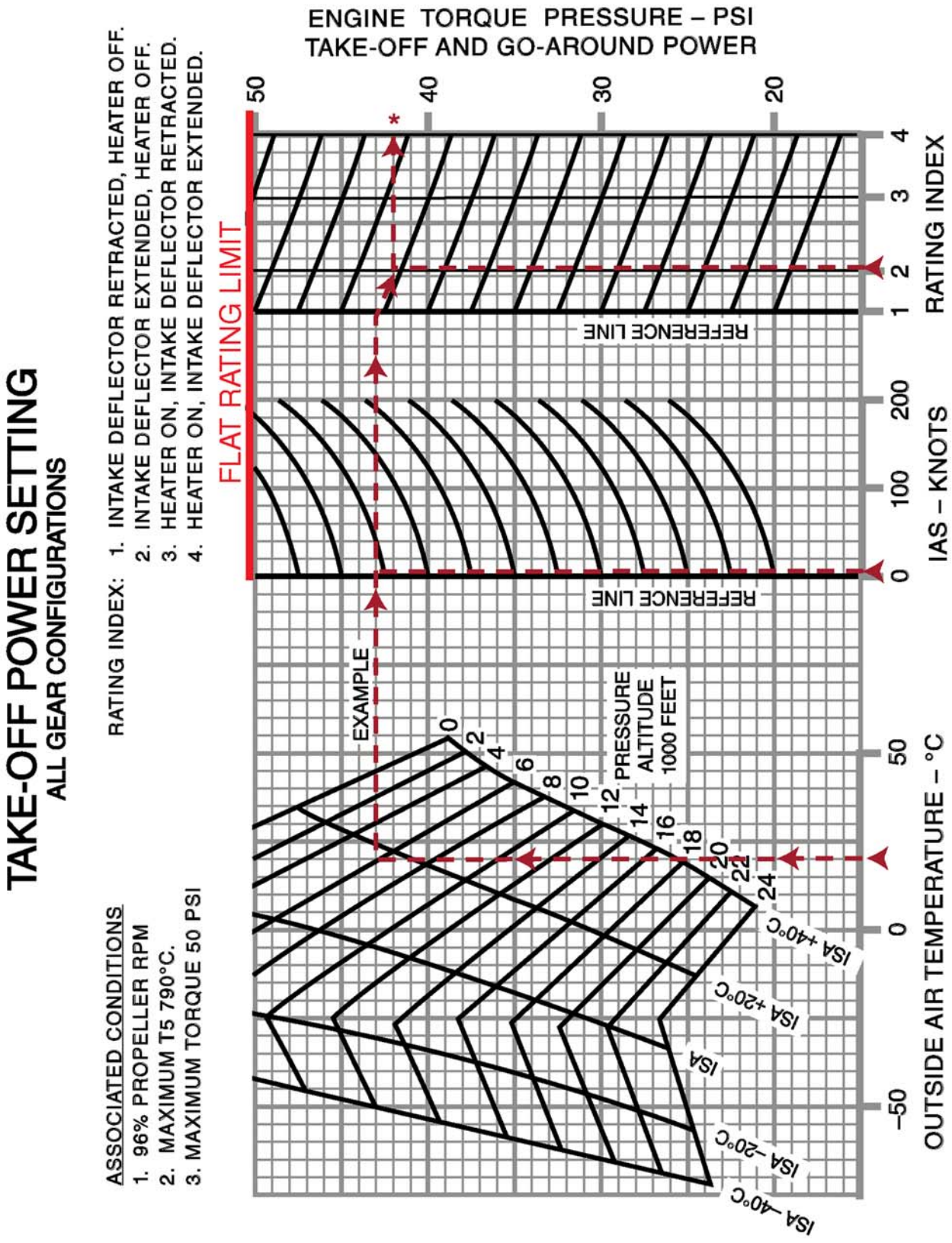


Figure 5-7 Take-Off Power Setting

5.12 Maximum Continuous Power Setting

Conditions associated with this chart

1 Propeller speed is always set to 96% N_P (the maximum RPM position) when Maximum Continuous Power is required.

2 T_5 temperature must not exceed 725° (the Take-off and Maximum Continuous Limit).

Interpretive Guidance

This chart is used to calculate Maximum Continuous Power Setting, which is a power setting available to the pilot during abnormal and emergency conditions (see the definition of engine power setting terms in Section 1 for further elaboration). The chart is constructed to allow for the effect of intake deflectors lowered and/or bleed air extraction for cabin heat and de-ice turned on.

Maximum Continuous Power Setting can only be achieved when the propeller is set to 96% N_P, therefore, no provision is made in this chart for other propeller speeds.

Example Calculation (dotted line)

Determine the maximum continuous power setting (the power setting used for emergency and abnormal conditions) for 10,000 feet pressure altitude, –15°C OAT, and 100 knots indicated airspeed with intake deflectors retracted and bleed air on.

1 Enter the chart at the prevailing outside air temperature (–15°C) and proceed upwards to the pressure altitude the aircraft is flying at (10,000 feet).

2 Proceed right to the reference line, and then follow the guidelines diagonally upwards to the current (or desired) indicated airspeed. In this example, the indicated airspeed is 100 knots.

3 Proceed right to the reference line, then follow the guidelines diagonally downwards until the appropriate operating condition (in this case, intake deflectors retracted, but bleed air for cabin heating on) is reached. This is rating index 3.

4 Proceed right to exit the chart at the engine torque pressure setting of 46 pounds torque.

Summary of Example Calculation

At –15°C OAT and 10,000 feet pressure altitude, with intake deflectors retracted and bleed air on, at an indicated airspeed of 100 knots, Maximum Continuous Power Setting is 46 pounds of torque.

⚠ CAUTION

MAXIMUM CONTINUOUS POWER SETTING SHOULD ONLY BE USED DURING ABNORMAL AND EMERGENCY CONDITIONS.

NOTE

The Maximum Continuous Power Setting chart is identical to the Take-off Power setting chart.

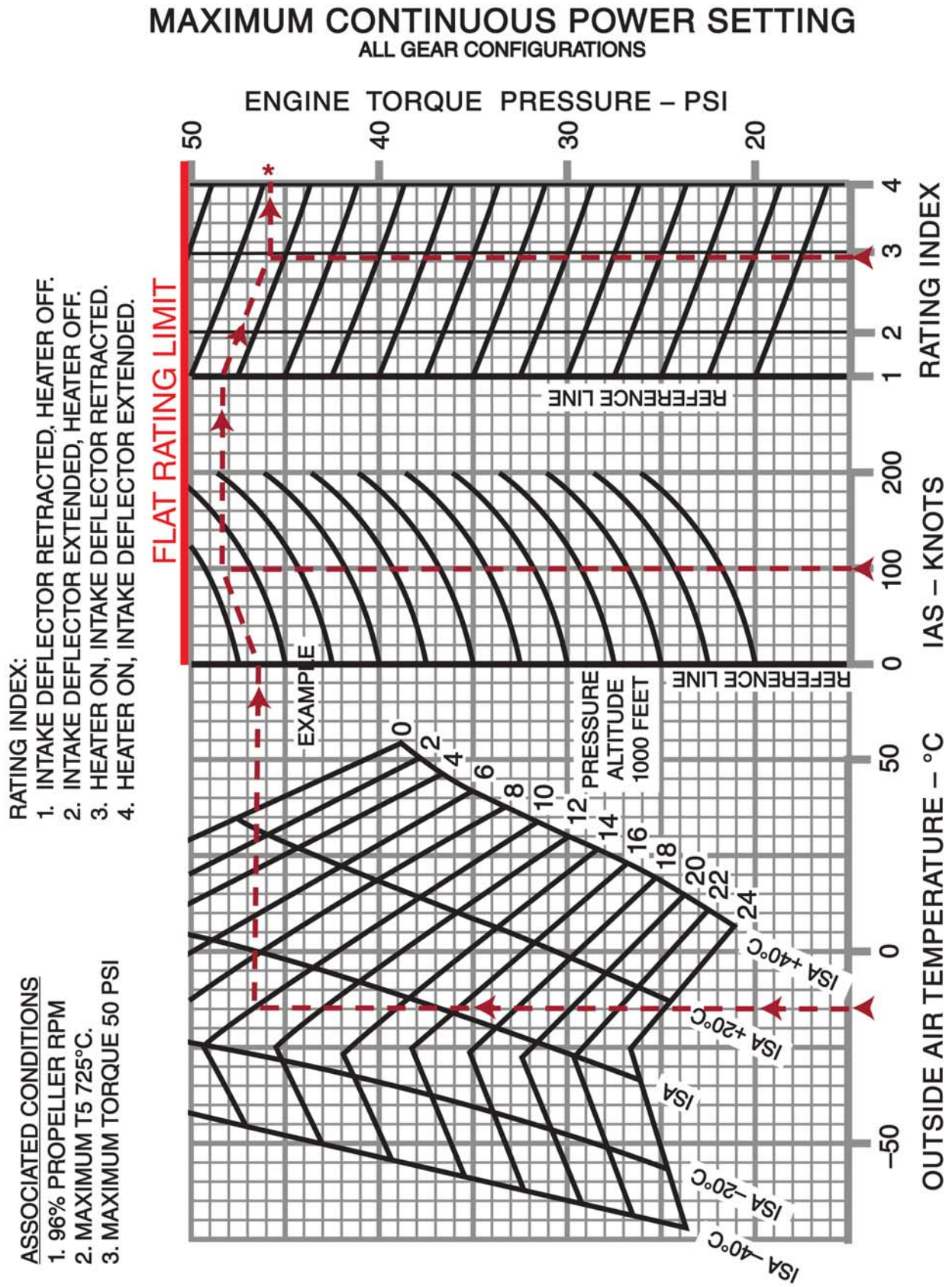


Figure 5-8 Maximum Continuous Power Setting

5.13 Maximum Climb Power Setting

Conditions associated with this chart

1 Propeller speed 96% N_P or less (normally less than 96% is used for climb).

2 T_5 temperature must not exceed 695° (the Climb and Cruise limit).

Interpretive Guidance

This chart is used to calculate Maximum Climb Power. Maximum Climb Power is calculated using a more restrictive power setting criteria than Take-off Power. The T_5 temperature limit is lower than what is allowed for take-off.

The chart is constructed to allow for the effect of intake deflectors lowered and/or bleed air extraction for cabin heat and de-ice turned on. The chart also allows calculation of Maximum Climb Power at any propeller speed between 75% N_P and 96% N_P to suit the prevailing operational requirements.

A lower torque value than the maximum calculated may be used for climb if desired.

Example Calculation (dotted line)

Determine the Maximum Climb Power setting for a climb beginning at 1,000 feet pressure altitude, OAT +30°C, and airspeed of 100 knots, with N_P set to 84%, intake deflectors retracted and bleed air off.

1 Enter the chart at the prevailing outside air temperature (+30°C) and proceed upwards to the pressure altitude at which the climb will begin (1,000 feet).

2 Proceed right to the reference line, and then follow the guidelines diagonally upwards to the indicated airspeed that will be used for the climb (100 knots).

3 Proceed right to the reference line, then follow the guidelines diagonally downwards until the appropriate operating condition (in this case, intake deflectors retracted and bleed air off) is reached. This is rating index 1. No adjustment is required for rating index 1.

4 Proceed right to the reference line, then follow the guidelines diagonally upwards until the desired propeller speed (84% N_P) is reached.

5 Proceed right to exit the chart at the engine torque pressure setting of 48.5 pounds torque.

Summary of Example Calculation

At +30°C OAT, commencing climb at 1,000 feet pressure altitude, with intake deflectors retracted and bleed air off, at an indicated airspeed of 100 knots and a propeller speed of 84% N_P, Maximum Climb Power is 48.5 pounds of torque.

NOTE

It is not obligatory to use maximum calculated climb power. Any climb power setting up to and including the maximum calculated value may be used at the discretion of the pilot. The engine must be able to produce maximum calculated climb power. If maximum calculated climb power cannot be achieved without exceeding the 695° climb and cruise T_5 temperature limit, the engine is not airworthy and the aircraft must not be flown.

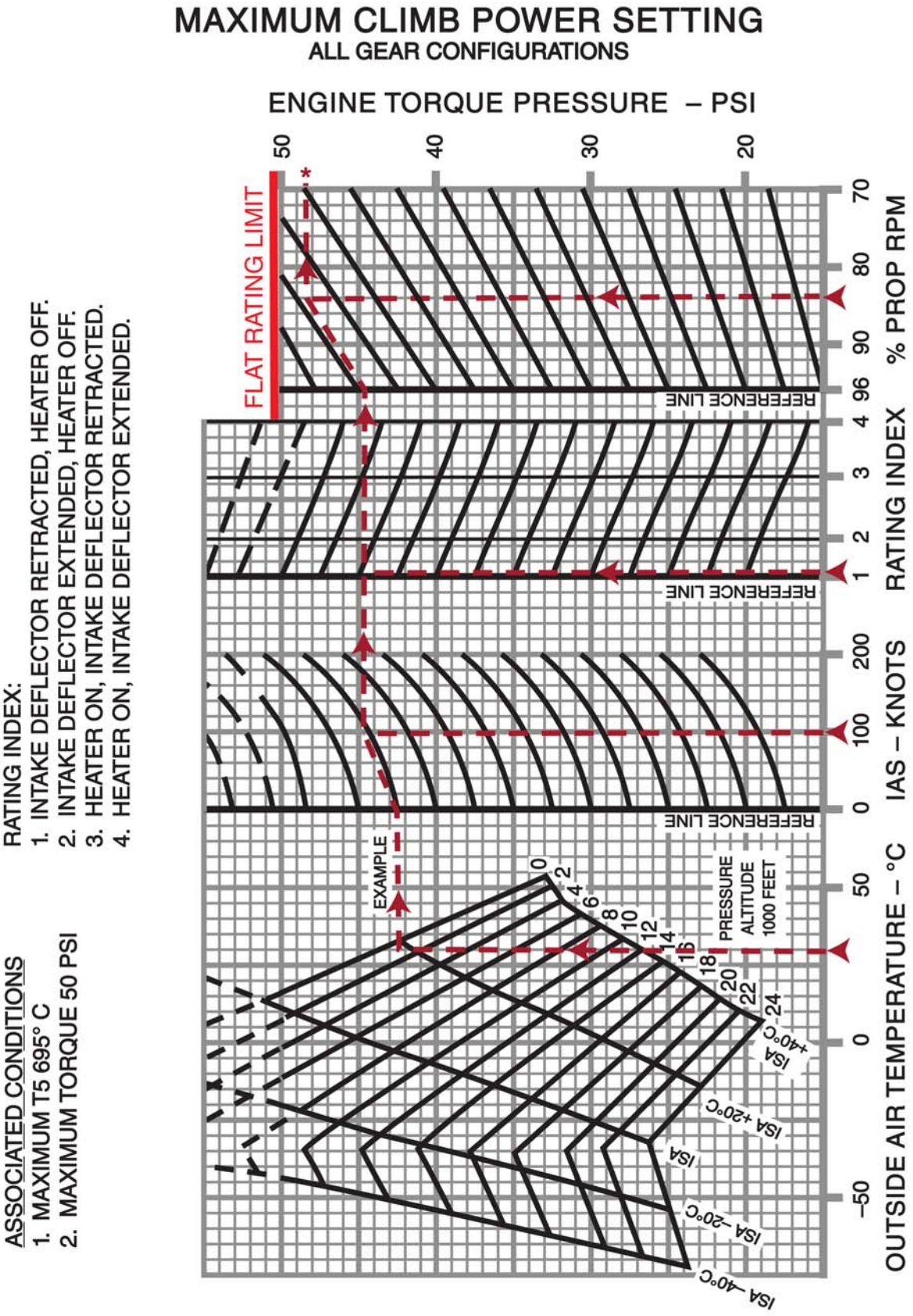


Figure 5-9 Maximum Climb Power Setting

5.14 Maximum Climb and Cruise Power – 91% N_P

Conditions associated with this chart

1 Propeller speed 91% N_P (for compliance with FAR 36 enroute climb noise requirements). If lower propeller speeds are desired, use the “Maximum Climb Power Setting” chart.

2 T_5 temperature must not exceed 695° (Climb and Cruise Limit).

Interpretive Guidance

This chart is provided for operators who wish to limit enroute climb and cruise propeller speed to 91% in order to comply with FAR 36 noise regulations. Note that 96% N_P is always used for the take-off and initial portion of the take-off climb prior to the completion of flap retraction.

Example Calculation (dotted line)

Determine the Maximum Climb or Cruise Power setting for 91% N_P, +15°C OAT, 2,000 feet pressure altitude, 100 knots indicated airspeed, with the intake deflector retracted and the heater off.

1 Enter the chart at the prevailing outside air temperature (15°C) and proceed upwards to the pressure altitude at which the climb or cruise will begin (2,000 feet).

2 Proceed right to the first reference line, and then follow the guidelines diagonally upwards to the indicated airspeed that will be used for the climb (100 knots).

3 Proceed right to the second reference line. The reference line corresponds with rating index 0, which is intake deflectors retracted and heater off. Therefore no adjustment is made here.

4 Proceed right to exit the chart at 51.5 pounds torque. This calculated value exceeds the flat rating torque limit of the engine, which is 50 PSI. Correct the result of the calculation by reducing it to 50 PSI.

Summary of Example Calculation

At 15°C OAT, commencing climb or cruise at 2,000 feet pressure altitude, with intake deflectors extended and bleed air off, at an indicated airspeed of 100 knots and a propeller speed of 91% N_P, Maximum Climb or Cruise Power is 50 pounds of torque.

It is noteworthy that the flat rating torque limit (the redline) of 50 PSI is what ultimately determined the maximum power setting in this example. This absolute torque limit of 50 PSI was exceeded after completing step 2 in the example. However, had rating

index 4 been used, the final result would have been less than the flat rating torque limit of 50 PSI. Whenever the final calculated value (the result after Step 4 of the example) exceeds the flat rating torque limit of 50 PSI, the result must be corrected by reducing it to 50 PSI.

NOTE

Any propeller speed may be used for climb. 91% is the maximum N_P permitted during climb if compliance with FAR 36 noise restrictions is required.

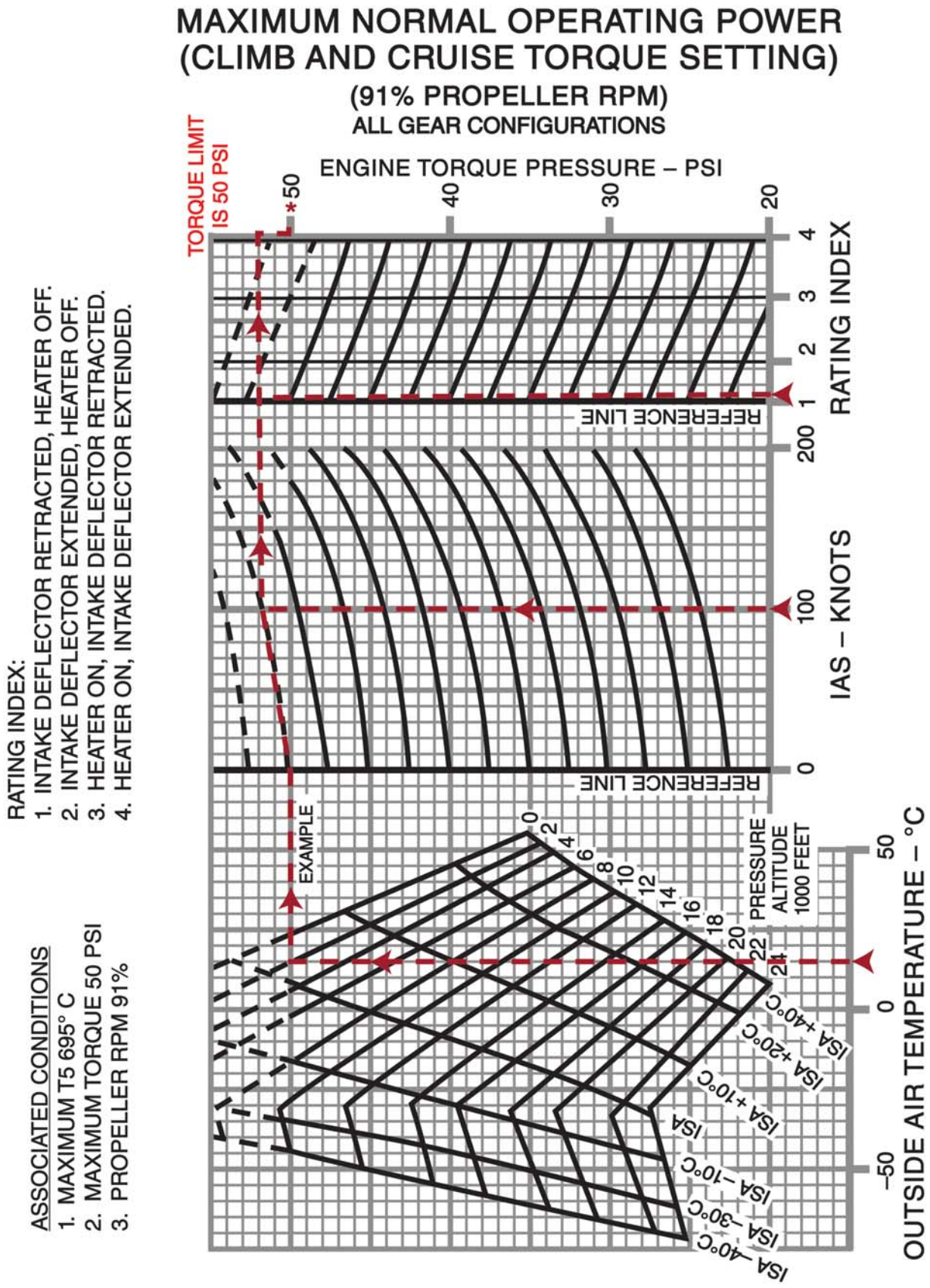


Figure 5-10 Maximum Climb and Cruise Power – 91% N_P

5.15 Maximum Cruise Power Setting

Conditions associated with this chart

1 Propeller speed 96% N_P or less (normally 75% is used for cruise, although higher N_P settings are permitted if desired).

2 T_5 temperature must not exceed 695° (Climb and Cruise Limit).

Interpretive Guidance

This chart is used to calculate Maximum Cruise Power. The chart is identical to the chart used to calculate Maximum Climb Power.

A lower torque value than the maximum calculated may be used for cruise if desired.

Example Calculation (dotted line)

Determine the maximum allowable cruise power setting for flight at 10,000 feet pressure altitude, OAT of –15°C, airspeed of 130 knots indicated, N_P set to 75%, with intake deflectors retracted and bleed air on.

1 Enter the chart at the prevailing outside air temperature (–15°C) and proceed upwards to the pressure altitude at which the cruise portion of flight will be conducted (10,000 feet).

2 Proceed right to the reference line, and then follow the guidelines diagonally upwards to the indicated airspeed the aircraft will cruise at (130 knots).

3 Proceed right to the reference line, then follow the guidelines diagonally downwards until the appropriate operating condition (in this case, intake deflectors retracted, but bleed air for cabin heating on) is reached. This is rating index 3.

4 Proceed right to the reference line, then follow the guidelines diagonally upwards until the desired propeller speed (75% N_P) is reached.

5 Proceed right to exit the chart at the Maximum Cruise Power setting of 50 pounds torque.

Summary of Example Calculation

At –15°C OAT, cruising at 10,000 feet pressure altitude, with intake deflectors retracted and bleed air on, at an indicated airspeed of 130 knots and a propeller speed of 75% N_P, Maximum Cruise Power is 50 pounds of torque.

NOTE

Any propeller speed may be used for cruise. 75% N_P is normally used for cruise because it provides optimum fuel consumption and the lowest cabin noise level.

The Maximum Cruise Power chart is identical to the Maximum Climb Power chart.

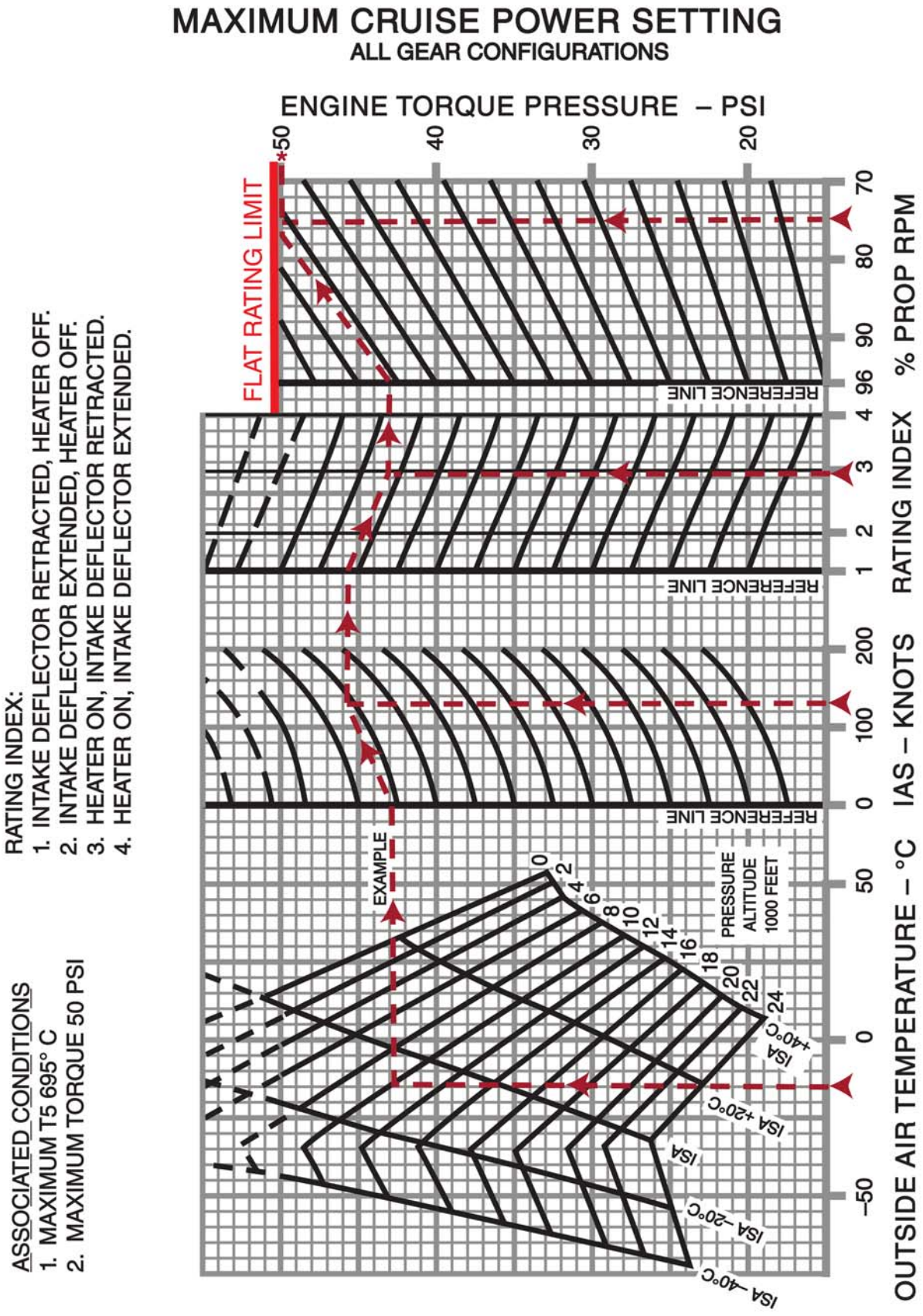


Figure 5-11 Maximum Cruise Power Setting

5.16 Maximum Take-Off Weight – Single Engine Climb with Feathered Propeller

Conditions associated with this chart

Flaps set at take-off position (10°), intake deflectors retracted (see note below if deflectors are extended), one engine inoperative with the propeller feathered, the other engine set to Take-off Power (see “Take-off Power Setting” chart for that value), speed according to chart inset. Standard landplane gear only.

Interpretive Guidance

This chart is used to determine the maximum allowable take-off weight necessary to ensure a positive rate of climb at Take-off Power for an aircraft with one engine inoperative (OEI) and the propeller of that engine feathered. This chart may only be used if the autofeather system is installed, operational, and selected ON prior to take-off.

Example Calculation (dotted line)

Determine the maximum allowable take-off weight from an aerodrome with a pressure altitude of 10,000 feet and a temperature of ISA +24°C (equal to a free air temperature of +19°C at 10,000 feet pressure altitude). Then, determine the best single engine climb speed for that weight.

1 Enter the chart from the left side at the prevailing OAT (ISA +24°C). Move to the right until reaching the reference line for the aerodrome pressure altitude (10,000 feet).

2 Move down from the pressure altitude to determine the maximum allowable take-off weight (12,100 pounds).

3 Enter the smaller inset chart from the bottom at the calculated weight (12,100 pounds) and proceed upward to the reference line. Then proceed right to determine best single engine rate of climb for that weight (77 knots).

Summary of Example Calculation

At an OAT of ISA +24°C and aerodrome pressure altitude of 10,000 feet (equal to a free air temperature of +19°C at 10,000 feet pressure altitude), the maximum allowable take-off weight to meet the single engine take-off climb requirements of SFAR 23 is 12,100 pounds. Best single engine rate of climb speed for that weight, in the take-off configuration, is 77 KIAS.

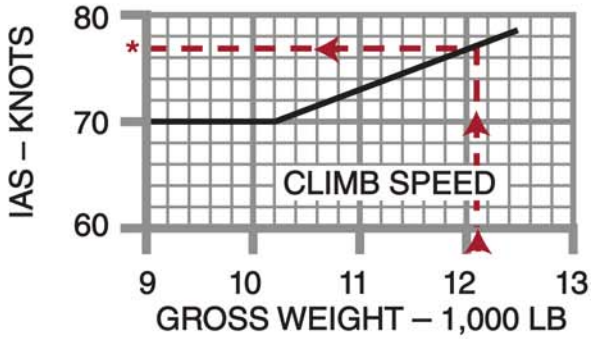
NOTE

If intake deflectors are extended, add 3°C to actual airfield temperature and use that value (in this example, it would be ISA +27°C) to enter the chart. In this example, if intake deflectors were extended, the maximum take-off weight would be 11,900 pounds and the best single engine rate of climb speed for that weight, in the take-off configuration, is 76 KIAS.

MAXIMUM PERMISSIBLE TAKE-OFF WEIGHT BASED ON ONE ENGINE INOPERATIVE CLIMB

LANDPLANE

WITH INTAKE DEFLECTORS EXTENDED, ENTER CHART WITH TEMPERATURE INCREASED BY 3°C



ASSOCIATED CONDITIONS

1. FLAPS 10°
2. OPERATING ENGINE AT TAKEOFF POWER
3. PROPELLER OF INOPERATIVE ENGINE FEATHERED
4. INTAKE DEFLECTORS RETRACTED

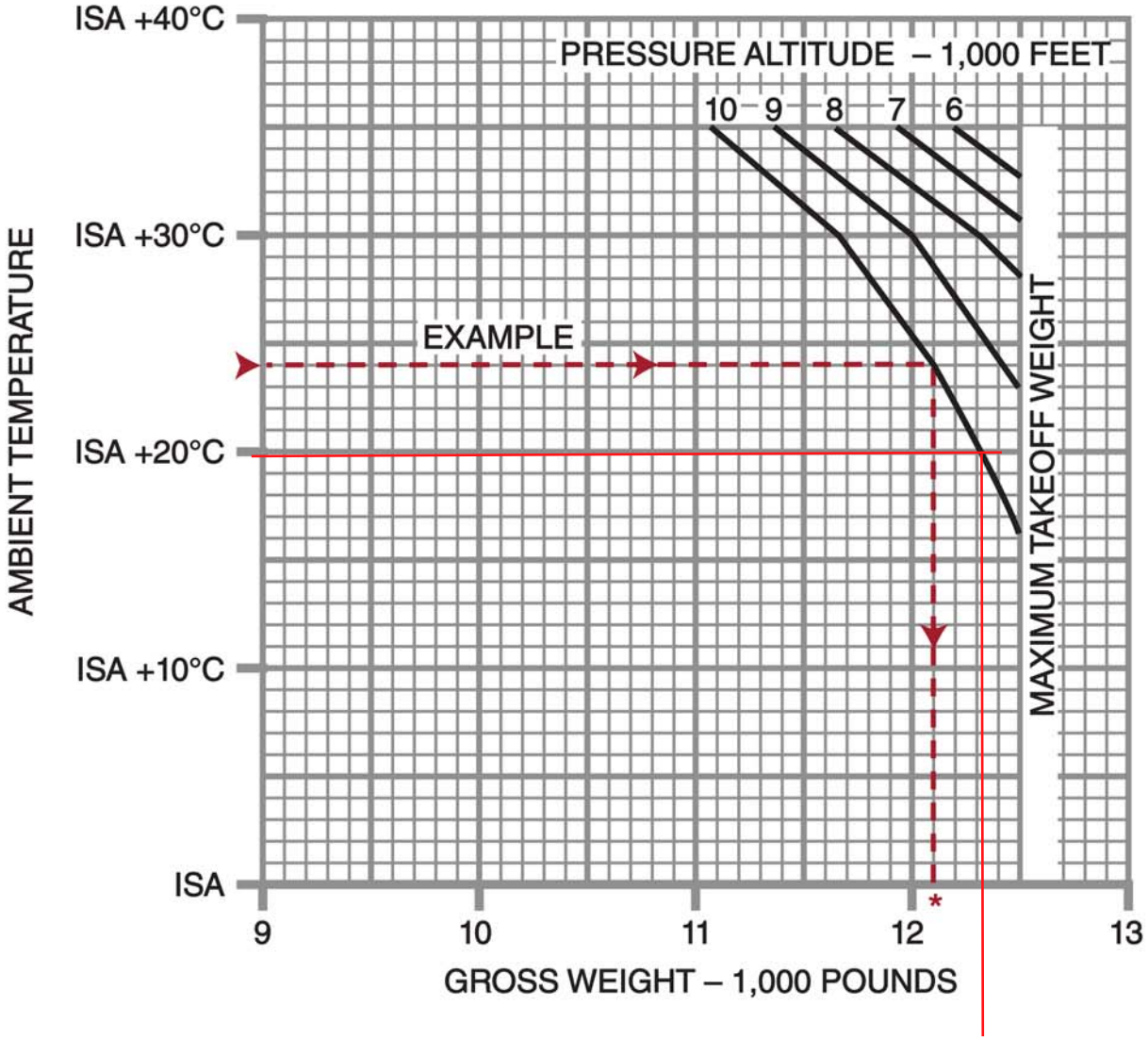


Figure 5-12 Maximum Take-Off Weight – OEI Take-Off Climb with Feathered Propeller

5.17 Maximum Take-Off Weight – Single Engine Climb with Windmilling Propeller

Conditions associated with this chart

Flaps set at take-off position (10°), intake deflectors retracted (see note below if deflectors are extended), one engine inoperative with the propeller windmilling (not feathered), the other engine set to Take-off Power (see "Take-off Power Setting" chart for that value). Standard landplane gear only.

Interpretive Guidance

This chart is used to determine the maximum allowable take-off weight necessary to ensure a positive rate of climb at Take-off Power for an aircraft with one engine inoperative (OEI) and the propeller of that engine windmilling (not feathered). This chart is used and is limiting if the autofeather system is inoperative.

Example Calculation (dotted line)

Determine the maximum allowable take-off weight that would permit a positive rate of climb with one engine inoperative and the propeller of that engine windmilling from an airport with a pressure altitude of 5,000 feet and an air temperature of ISA +20°C (equal to a free air temperature of +25°C at 5,000 feet pressure altitude).

1 Enter the chart from the left at the OAT of ISA +20°C and proceed horizontally until reaching the pressure altitude of 5,000 feet.

2 Proceed down from the pressure altitude to determine the maximum allowable take-off weight that would ensure a positive rate of climb with a windmilling propeller (11,400 pounds).

Summary of Example Calculation

At a pressure altitude of 5,000 feet and an air temperature of ISA +20°C (equal to a free air temperature of +25°C at 5,000 feet pressure altitude), the maximum take-off weight that would allow a positive rate of climb with one engine inoperative and the propeller windmilling is 11,400 pounds.

WARNING

V_{MC} RISES TO 68 KNOTS IAS WHEN THE PROPELLER IS NOT FEATHERED. THE V_{MC} OF 64 KNOTS IAS THAT IS PUBLISHED ELSEWHERE IN THIS POH ASSUMES THAT THE AUTOFEATHER SYSTEM IS INSTALLED, FUNCTIONAL, AND BEING USED FOR EVERY TAKE-OFF.

NOTE

If intake deflectors are extended, add 3°C to actual airfield temperature and use that value (in this example, it would be ISA +23°C) to enter the chart. In this example, if intake deflectors were extended, the maximum take-off weight would be 11,100 pounds.

MAXIMUM PERMISSIBLE TAKEOFF WEIGHT BASED ON ONE ENGINE INOPERATIVE TAKE-OFF CLIMB (PROPELLER WINDMILLING)

ASSOCIATED CONDITIONS — LANDPLANE

1. FLAPS 10°
2. OPERATING ENGINE AT TAKEOFF POWER
3. PROPELLER OF INOPERATIVE ENGINE NOT FEATHERED
4. INTAKE DEFLECTORS RETRACTED
5. CLIMB SPEED: THE GREATER OF 1.1 VMC OR 1.2 VS1
6. VMC WITH WINDMILLING PROPELLER = 68 KIAS

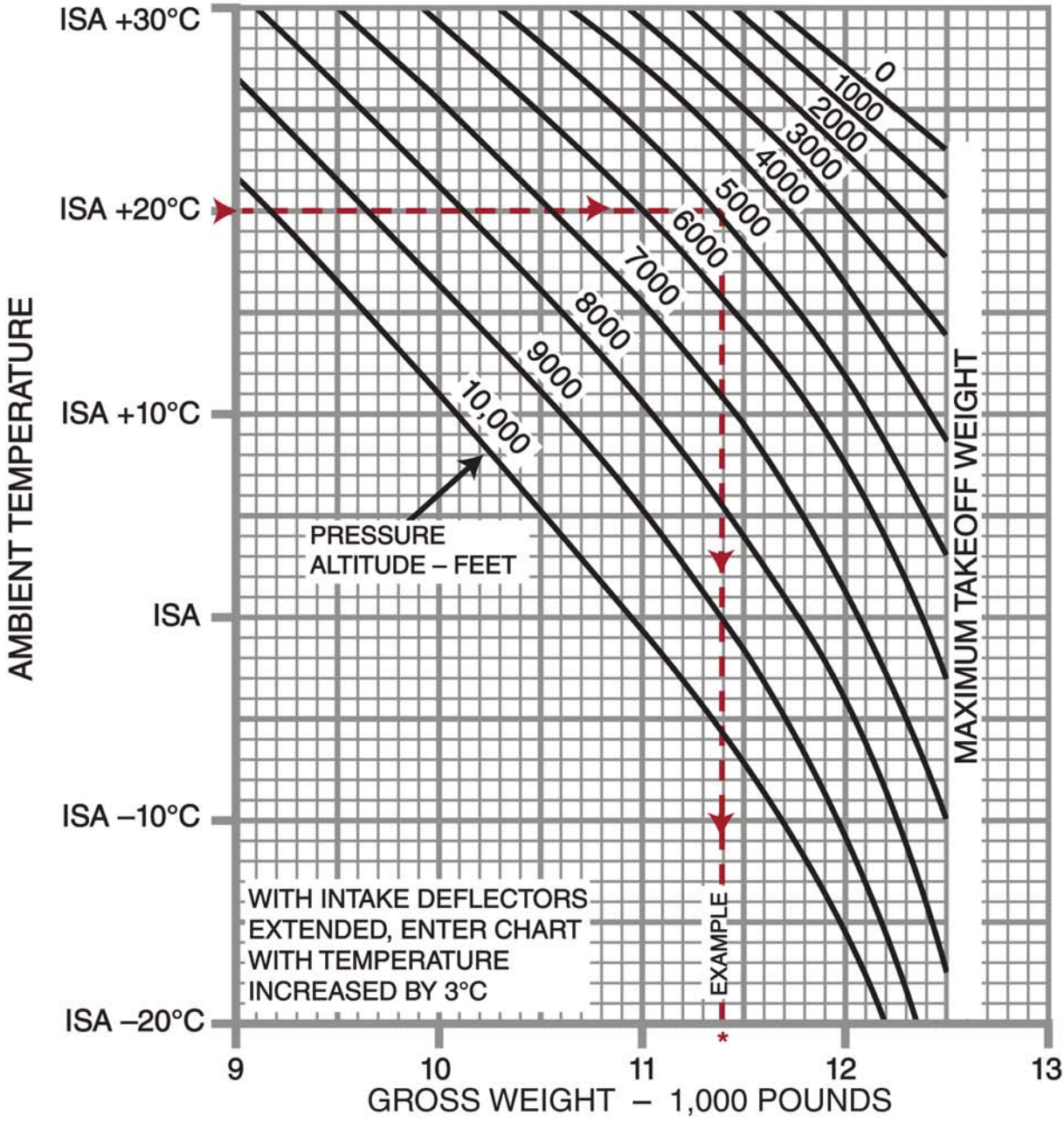


Figure 5-13 Maximum Take-Off Weight – OEI Take-Off Climb with Windmilling Propeller

5.18 Take-Off Distance to 50 Feet, Both Engines Operating

Conditions associated with this chart

Flaps set at take-off position (10°), intake deflectors retracted (see note below if deflectors are extended), both engines set to Take-off Power prior to brake release, propeller speed 96% (see "Take-off Power Setting" chart for that value), speed according to chart inset; dry, hard, level aerodrome surface. Distances are for actual winds and are not factored. Standard landplane gear only.

Interpretive Guidance

The distances have been calculated using the procedure and technique specified in SFAR 23 and are consistent with the procedures given for a maximum performance take-off in Section 4 of this AFM. It is not obligatory to set full Take-off Power prior to brake release if sufficient runway is available to allow full Take-off Power to be set more gradually once the aircraft begins moving; however, the distance calculated when using this chart will only be achieved if full Take-off Power is set prior to brake release.

This chart may only be used if the autofeather system is installed, operational, and selected ON prior to take-off.

Example Calculation (dotted line)

Determine total distance to 50 feet AGL from an airport with a temperature of +18°C and pressure altitude of 2,000 feet, for an aircraft weighing 10,500 pounds, with a headwind component of 15 knots.

1 Enter the chart from the lower left at the OAT (+18°C) for the aerodrome. Continue upward until reaching the appropriate reference line for the aerodrome pressure altitude (2,000 feet).

2 From the pressure altitude reference line, move right to the gross weight (12,500 pound) reference line, then move diagonally down between the guidelines until reaching a point that corresponds with the aircraft weight (in this case, 10,500 pounds).

3 Continue horizontally right until reaching the zero wind reference line. Then, move diagonally downwards until reaching the headwind component (15 knots). Move horizontally to the right edge of the chart and read the total distance to 50 feet (900 feet).

4 Using the inset chart, enter from the bottom and go upwards to determine V_1 and V_2 for the 10,500 pound take-off weight.

Summary of Example Calculation

With an OAT of +18°C, pressure altitude of 2,000 feet, weight of 10,500 pounds, and headwind component of 15 knots, the DHC-6 will require 900 feet total distance from brake release to 50 feet above ground if a maximum performance take-off is conducted in accordance with the instructions in Section 4 of this AFM. V_1 and V_2 are both 73 knots. V_R is assumed to be equal to V_1.

NOTE

A maximum performance take-off requires that full Take-off Power be set on both engines prior to brake release. To achieve chart performance, V_2 must be maintained to 50 feet. Higher speeds than the calculated V_1 or V_2 will result in longer distances.

If intake deflectors are extended and take-off torque is less than 50 PSI, increase the distance by 2.5%.

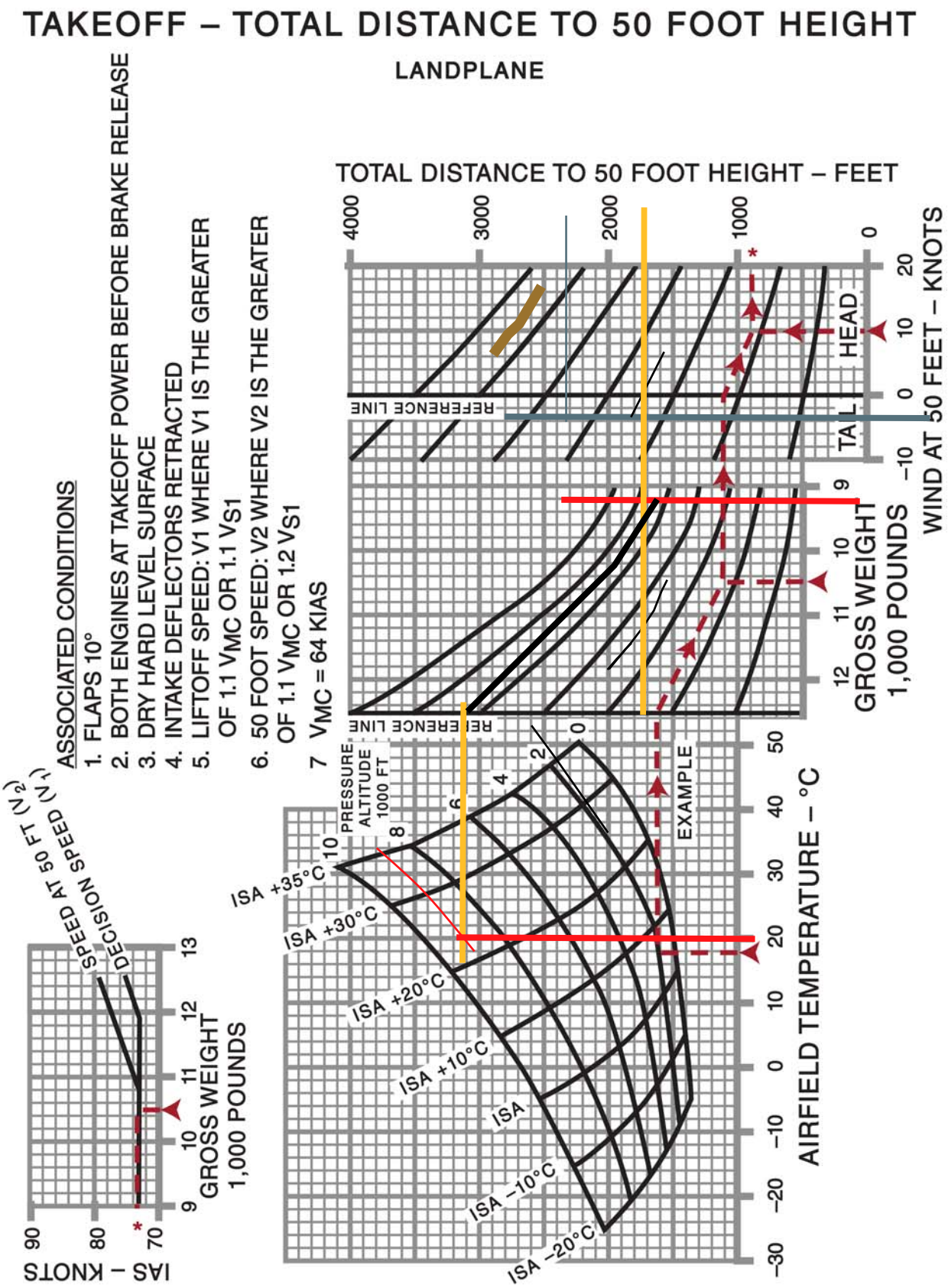


Figure 5-14 Take-Off Distance to 50 Feet, Both Engines Operating

5.19 Take-Off Ground Roll

Conditions associated with this chart

Flaps set at take-off position (10°), intake deflectors retracted (see note below if deflectors are extended), both engines set to Take-off Power prior to brake release, propeller speed 96% (see “Take-Off Power Setting” chart for that value), liftoff speed according to chart inset; dry, hard, level aerodrome surface. Distances are for actual winds and are not factored. Standard landplane gear only.

Interpretive Guidance

The distances have been calculated using the procedure and technique specified in SFAR 23 and are consistent with the procedures given for a maximum performance take-off in Section 4 of this AFM. It is not obligatory to set full Take-off Power prior to brake release if sufficient runway is available to allow Take-off Power to be set more gradually once the aircraft begins moving; however, the distance calculated when using this chart will only be achieved if full Take-off Power is set prior to brake release.

Example Calculation (dotted line)

Determine total take-off ground roll from an airport with a temperature of +29°C and pressure altitude of 1,000 feet, for an aircraft weighing 12,500 pounds, with a headwind component of 6 knots.

1 Enter the chart from the lower left at the OAT (+29°C) for the aerodrome. Continue upward until reaching the appropriate reference line for the aerodrome pressure altitude (1,000 feet).

2 From the pressure altitude reference line, move right to the gross weight (12,500 pound) reference line, then continue moving right until reaching the zero wind reference line.

3 From the zero wind reference line, move diagonally downwards until reaching the headwind component (6 knots). Move horizontally to the right edge of the chart and read the take-off ground roll distance (975 feet).

4 Using the inset chart, enter from the bottom and go upwards to determine V_1 and V_{LOF} for the 12,500 pound take-off weight. Both speeds are 75 knots indicated airspeed.

Summary of Example Calculation

With an OAT of +29°C, pressure altitude of 1,000 feet, weight of 12,500 pounds, and headwind component of 6 knots, the DHC-6 will require 975 feet total ground roll from

brake release to liftoff if a maximum performance take-off is conducted in accordance with the instructions in Section 4 of this AFM. V_{LOF} and V_1 are both 75 knots.

NOTE

A maximum performance take-off requires that full Take-off Power be set on both engines prior to brake release. Setting full Take-off Power more gradually after brake release will result in longer take-off distances. Higher rotation speeds than the calculated V_{LOF} will also result in longer distances.

If intake deflectors are extended and take-off torque is less than 50 PSI, increase distances by 2.5%.

For practical purposes, V_{LOF} can be considered to have the same meaning as V_R.

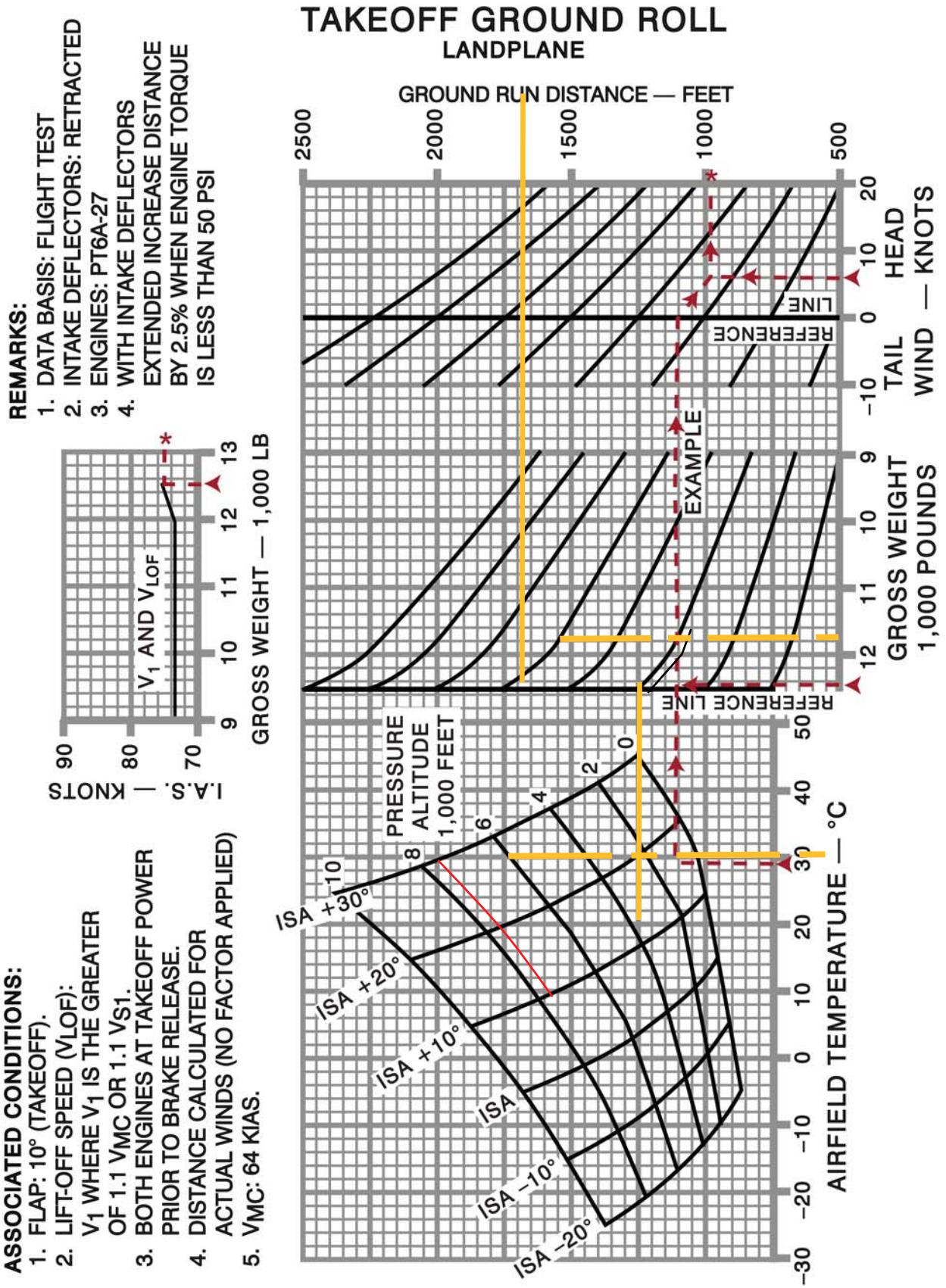


Figure 5-15 Take-Off Ground Roll

5.20 Accelerate-Stop Distance

Conditions associated with this chart

Flaps set at take-off position (10°), intake deflectors retracted (see note below if deflectors are extended), both engines set to Take-off Power prior to brake release, propeller speed 96% (see "Take-off Power Setting" chart for that value), V_1 speed according to chart inset; dry, hard, level aerodrome surface. Engine failed at V_1 and then goes into autofeather, remaining engine reduced to idle power. A one second allowance is granted for recognition of the engine failure at V_1, and an additional one second allowance is granted prior to initiation of maximum braking.

Distances are for actual winds and are not factored. Standard landplane gear only.

Interpretive Guidance

The distances have been calculated using the procedure and technique specified in SFAR 23 and are consistent with the procedures given for a maximum performance take-off in Section 4 of this AFM.

This chart enables determination of the Accelerate-Stop distance, which defines the minimum required Accelerate-Stop Distance Available (ASDA). ASDA consists of Take-off Run Available (TORA) + any stopway available. At cold temperatures and light weights, Accelerate-Stop distance required will normally be greater than "Take-Off distance to Liftoff Speed – Engine Failure at V_1 Figure 5-17.

This chart may only be used if the autofeather system is installed, operational, and selected ON prior to take-off.

Example Calculation (dotted line)

Determine total accelerate-stop distance at a sea level airport with a temperature of +35°C, for an aircraft weighing 10,500 pounds, with a tailwind component of 8 knots.

1 Enter the chart vertically from the OAT (+35°C) at the lower left. Proceed upward until reaching the airport pressure altitude (0 feet). Continue horizontally right until reaching the gross weight reference line. Continue diagonally down between the guidelines until reaching the aircraft weight (10,500 pounds).

2 Proceed horizontally right until reaching the zero wind reference line. Move diagonally left (back) up the guidelines until reaching the tailwind component of 8 knots. Exit horizontally right to determine total accelerate-stop distance of 2,400 feet.

3 Enter the chart inset from the bottom at the aircraft weight of 10,500 pounds. Proceed upwards until reaching the V_1 line. Proceed horizontally right to determine V_1 (73 KIAS).

Summary of Example Calculation

With an OAT of +35°C, pressure altitude of 0 feet (sea level), weight of 10,500 pounds, and tailwind component of 8 knots, 2,400 feet total accelerate-stop distance is needed if a maximum performance take-off is initiated in accordance with the instructions in Section 4 of this AFM, the left engine fails at 73 KIAS, and the take-off is then rejected with maximum braking applied.

NOTE

A maximum performance take-off requires that full Take-off Power be set on both engines prior to brake release. Setting full Take-off Power more gradually after brake release will increase the accelerate-stop distance required.

If intake deflectors are extended and take-off torque is less than 50 PSI, increase total accelerate-stop distance by 1%.

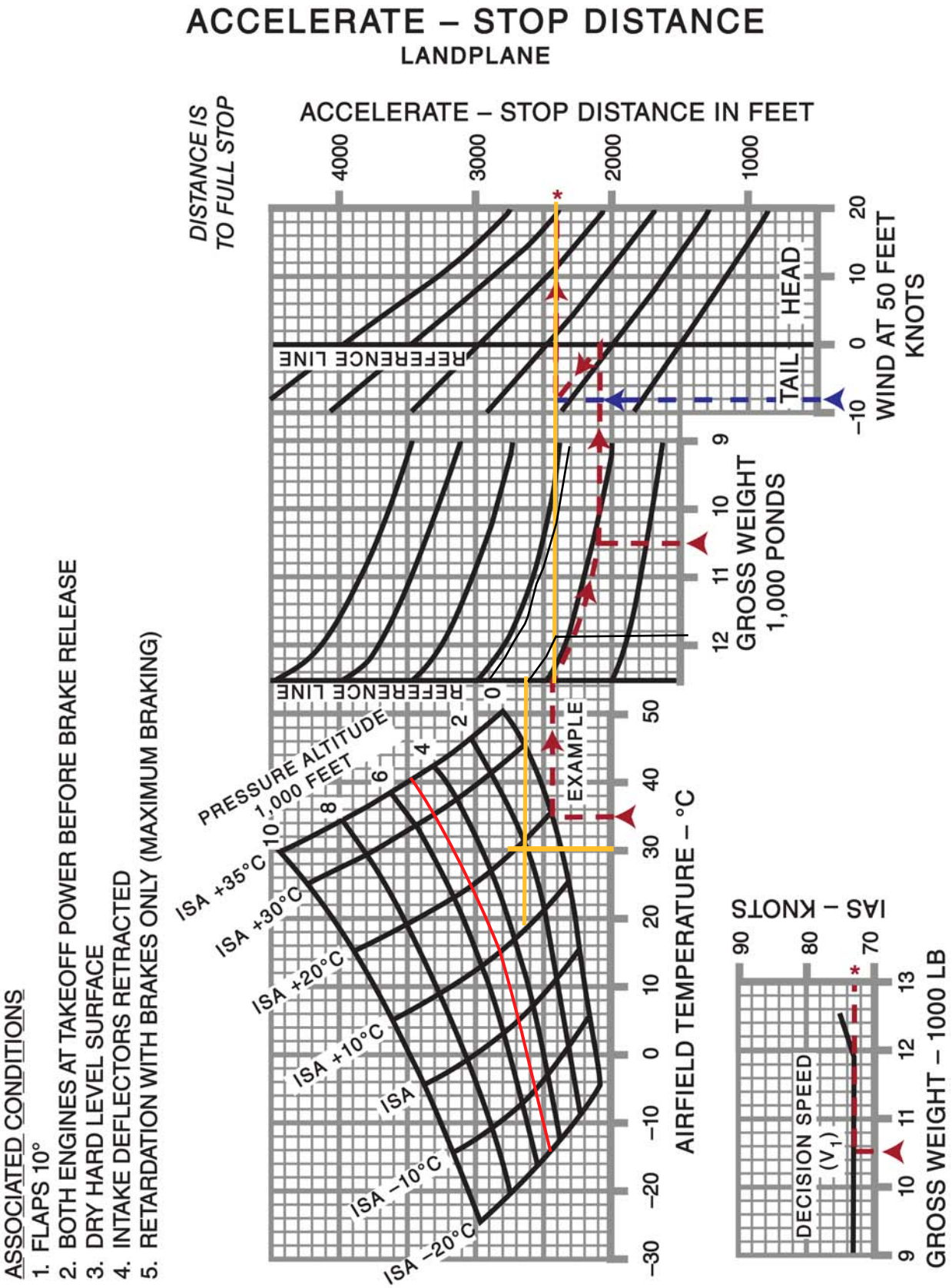


Figure 5-16 Accelerate-Stop Distance (to full stop)

5.21 Take-Off Distance to Liftoff Speed – Engine Failure at V_1

Conditions associated with this chart

Flaps set at take-off position (10°), intake deflectors retracted, both engines set to Take-off Power prior to brake release, propeller speed 96% (see "Take-Off Power Setting" chart for that value), speeds according to chart inset; dry, hard, level aerodrome surface. Engine failed at V_{EF} and then goes into autofeather, functioning engine remains at Take-off Power and take-off is continued. Rotation initiated at V_1 and aircraft becomes airborne at V_{LOF}. Distances are for actual winds and are not factored. Standard landplane gear only.

Interpretive Guidance

The distances have been calculated using the procedure and technique specified in SFAR 23 and are consistent with the procedures given for a maximum performance take-off in Section 4 of this AFM. An engine failure that occurs at 73 knots would be recognized at 75 knots, and a rotation initiated at 75 knots would result in liftoff at 78 knots. The differences allow for acceleration of the aircraft during the time it takes for the pilot to recognise the engine failure, and acceleration of the aircraft between the time rotation is initiated and the aircraft becomes airborne.

This chart enables determination of the ground only portion of the Accelerate-Go distance, which defines the minimum requires Take-off Run Available (TORA). At warm temperatures and heavy weights, Accelerate-Go distance will normally be greater than "Accelerate-Stop Distance" Figure 5-16.

This chart may only be used if the autofeather system is installed, operational, and selected ON prior to take-off.

Example Calculation (dotted line)

Determine total take-off distance to liftoff speed at an airport with a temperature of +29°C and pressure altitude of 800 feet, for an aircraft weighing 12,500 pounds, with a headwind component of 6 knots, assuming that an engine fails at 73 knots and the propeller of that engine is subsequently feathered by the autofeather system.

1 Enter the chart vertically from the OAT (+29°C) at the lower left. Proceed upward until reaching the airport pressure altitude (800 feet). Continue horizontally right until reaching the gross weight reference line. Continue diagonally upwards between the guidelines until reaching the aircraft weight (12,500 pounds).

2 Proceed horizontally right until reaching the zero wind reference line. Continue diagonally down between the guidelines until reaching the headwind component of 6 knots. Exit horizontally right to determine total take-off distance to liftoff speed of 1,400 feet.

3 Enter the chart inset from the bottom at the aircraft weight of 12,500 pounds. Proceed upwards until reaching the three lines. Proceed horizontally left to determine V_1 (75 knots).

Summary of Example Calculation

With an OAT of +29°C, pressure altitude of 800 feet, weight of 12,500 pounds, and headwind component of 6 knots, the DHC-6 will require 1,400 feet total take-off distance to liftoff speed, if a maximum performance take-off is conducted in accordance with the instructions in Section 4 of this AFM, an engine fails at 73 knots (equivalent to one second prior to V_1), and the take-off is continued with the propeller of the failed engine feathered.

NOTE

A maximum performance take-off requires that full Take-off Power be set on both engines prior to brake release. Setting full Take-off Power after brake release will increase the total take-off distance to liftoff speed.

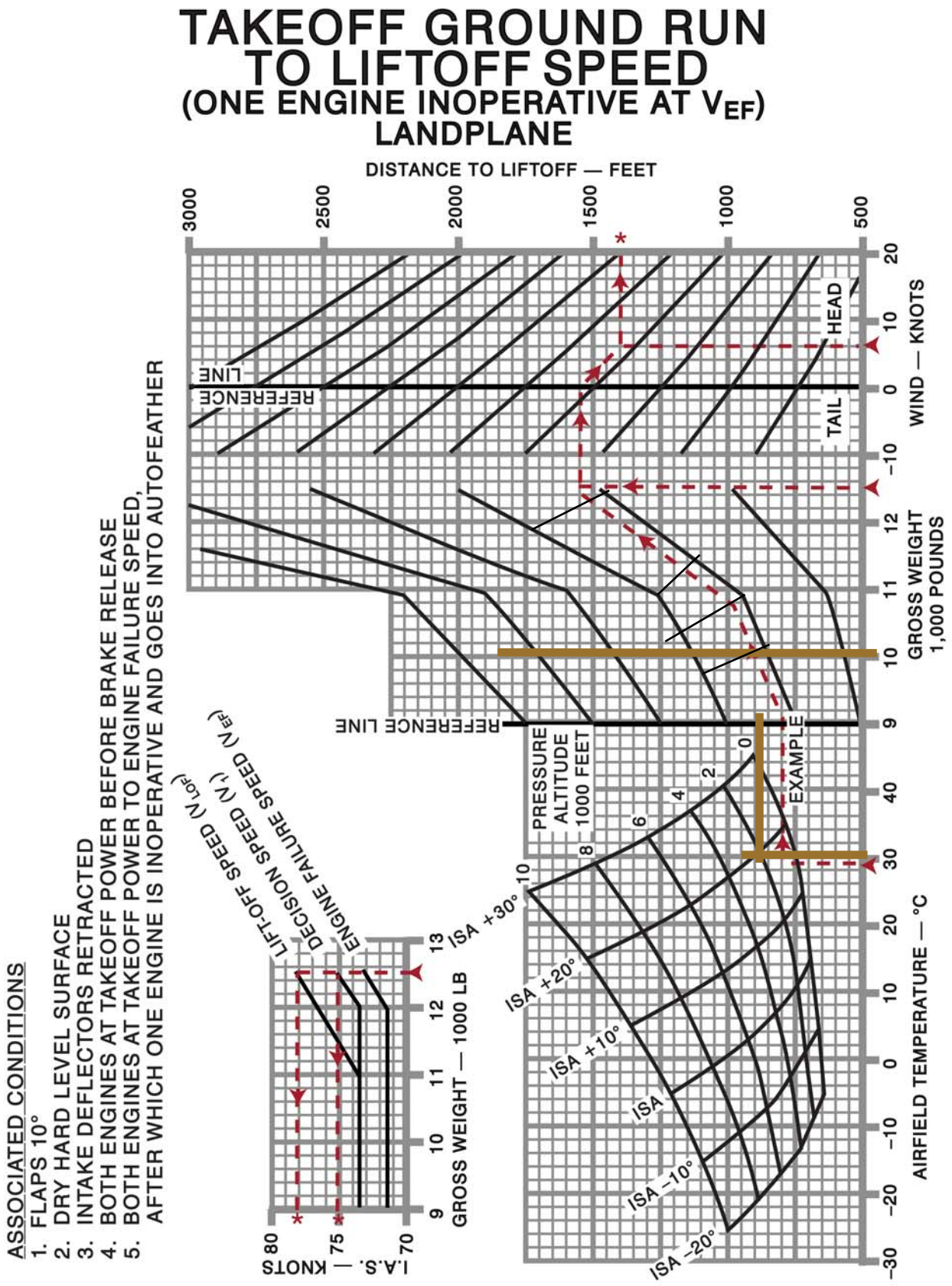


Figure 5-17 Take-Off Distance to Liftoff Speed – Engine Failure at V_1

5.22 Take-Off Distance to 35 Feet – Engine Failure at V_1

Conditions associated with this chart

Flaps set at take-off position (10°), intake deflectors retracted, both engines set to Take-off Power prior to brake release, propeller speed 96% (see "Take-Off Power Setting" chart for that value), V_1 speed according to chart inset; dry, hard, level aerodrome surface. Engine failed at V_{EF} and then goes into autofeather, functioning engine remains at Take-off Power and take-off is continued. Rotation initiated at V_1 and aircraft becomes airborne at V_{LOF} and climbs to 35 feet at V_2. Distances are for actual winds and are not factored. Standard landplane gear only.

Interpretive Guidance

The distances have been calculated using the procedure and technique specified in SFAR 23 and are consistent with the procedures given for a maximum performance take-off in Section 4 of this AFM.

This chart enables determination of both the ground and flight components of the Accelerate-Go distance, which defines the minimum required Take-off Distance Available (TODA). TODA means TORA + any clearway available. A stopway may form the first part of a clearway. TODA will almost always be longer than ASDA or TORA at any weight or temperature.

This chart may only be used if the autofeather system is installed, operational, and selected ON prior to take-off.

Example Calculation (dotted line)

Determine total take-off distance to 35 feet AGL at an airport with a temperature of +28°C and pressure altitude of 2,000 feet, for an aircraft weighing 12,500 pounds, with a tailwind component of 4 knots, assuming that an engine fails at 73 KIAS and the propeller of that engine is subsequently feathered by the autofeather system.

1 Enter the chart vertically from the OAT (+28°C) at the lower left. Proceed upward until reaching the airport pressure altitude (2,000 feet). Continue horizontally right until reaching the gross weight reference line. Continue diagonally up between the guidelines until reaching the aircraft weight (12,500 pounds).

2 Proceed horizontally right until reaching the zero wind reference line. Move diagonally left (back) up the guidelines until reaching the tailwind component of 4 knots. Exit horizontally right to determine total take-off distance to 35 feet AGL of 3,600 feet.

3 Enter the chart inset from the bottom at the aircraft weight of 12,500 pounds. Proceed upwards until reaching the four lines. Proceed horizontally left to determine V_1, V_{LOF}, and V_2.

Summary of Example Calculation

With an OAT of +28°C, pressure altitude of 2,000 feet, weight of 12,500 pounds, and tailwind component of 4 knots, the DHC-6 will require 3,600 feet total take-off distance to reach 35 feet AGL, if a maximum performance take-off is conducted in accordance with the instructions in Section 4 of this AFM, an engine fails at 73 KIAS, and the take-off is continued with the propeller of the failed engine feathered.

To reach an altitude of 50 feet AGL, 4,212 feet total take-off distance will be required (3,600 x 1.17).

NOTE

A maximum performance take-off requires that full Take-off Power be set on both engines prior to brake release. Setting full Take-off Power after brake release will increase the total take-off distance to 35 feet AGL.

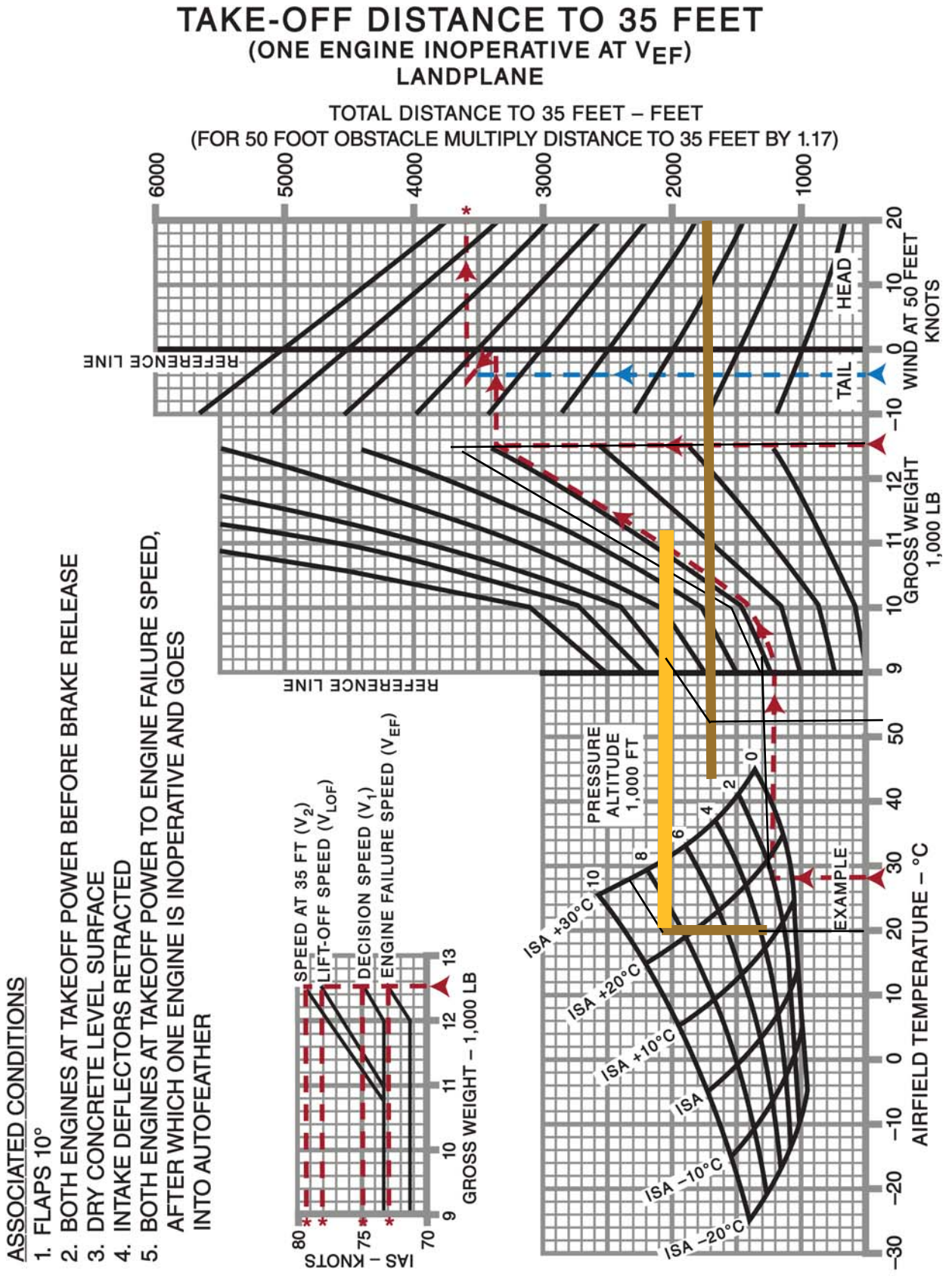


Figure 5-18 Take-Off Distance to 35 Feet – Engine Failure at V_1

5.23 Take-Off Rate of Climb, Both Engines Operating

Conditions associated with this chart

Flaps set at take-off position (10°), intake deflectors retracted (see note below if deflectors are extended), both engines set to Take-off Power, propeller speed 96% (see "Take-Off Power Setting" chart for that value), climb speed according to chart inset. Standard landplane gear only.

Interpretive Guidance

This chart provides the initial gross take-off rate of climb in feet per minute when both engines are set to Take-off Power and the aircraft speed is maintained at the value determined from the inset chart.

Example Calculation (dotted line)

Determine take-off rate of climb at an air temperature of +13°C, pressure altitude of 6,000 feet, and aircraft weight of 10,700 pounds.

1 Enter the chart from the lower left at the outside air temperature (+13°C). Continue vertically up until reaching the pressure altitude (6,000 feet). Proceed horizontally right until reaching the gross weight reference line.

2 Proceed diagonally up and to the right between the guidelines until reaching the aircraft weight (10,700 pounds). Exit horizontally right to determine take-off rate of climb (1,590 feet per minute).

3 Enter the inset chart from the bottom at the aircraft weight (10,700 pounds). Proceed right from the reference line to exit at the best rate of climb speed for the take-off configuration, which is 74 knots.

Summary of Example Calculation

At an air temperature of 13°C, pressure altitude of 6,000 feet, and aircraft weight of 10,700 pounds, the take-off rate of climb will be 1,590 feet per minute at 74 KIAS.

NOTE

This chart assumes use of Take-off Power, which is normally used until flap retraction is completed. Flap retraction is initiated either upon reaching 400 feet AGL or after clearing all obstacles in the take-off area, whichever comes later.

The calculated take-off rate of climb will only be achieved if the initial climb speed (determined from the inset chart) is maintained.

If intake deflectors are extended and Take-off Power is less than 50 PSI, deduct 30 feet per minute from the value derived from this chart.

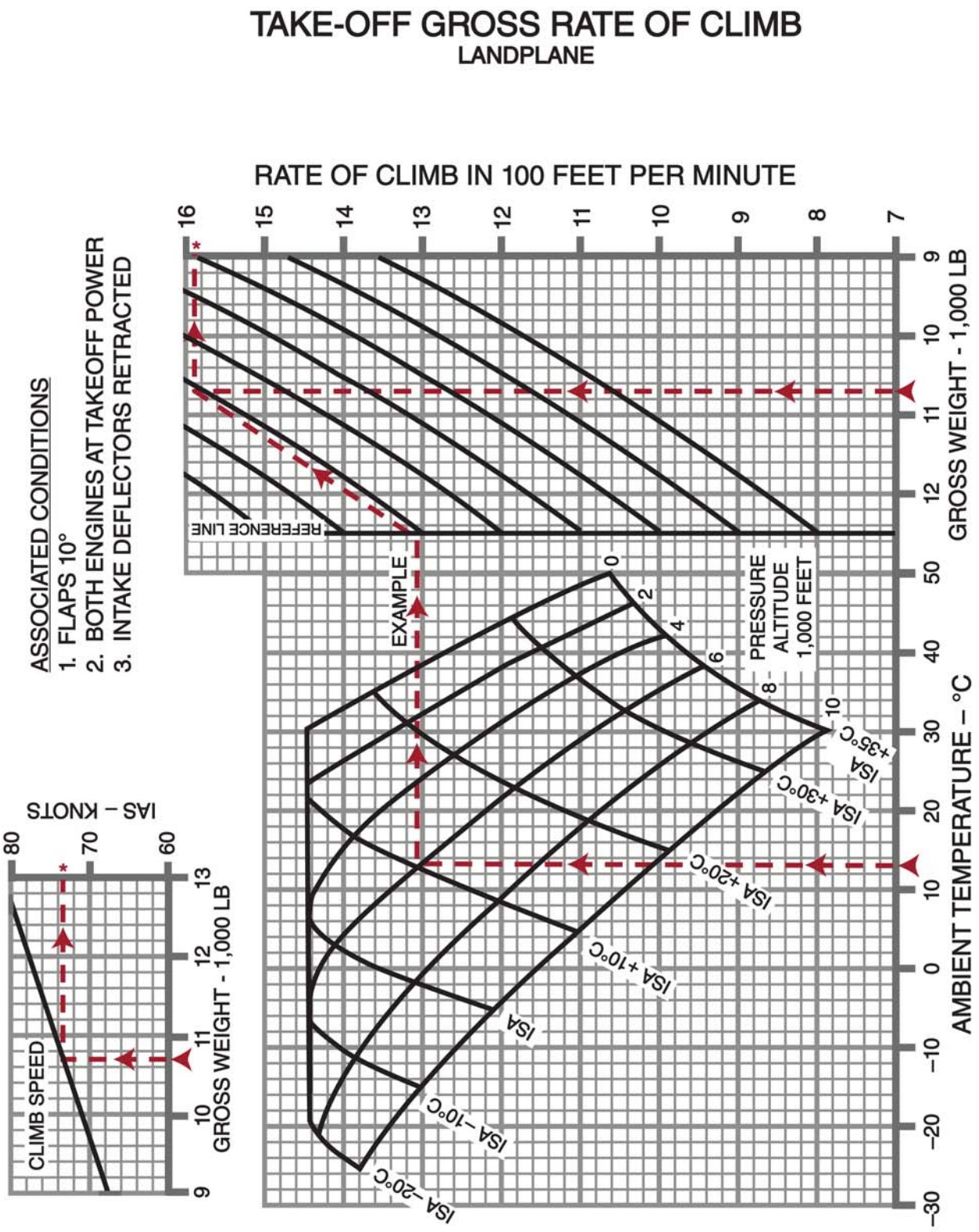


Figure 5-19 Take-Off Rate of Climb, Both Engines Operating

5.24 Take-Off Gradient of Climb, Both Engines Operating

Conditions associated with this chart

Flaps set at take-off position (10°), intake deflectors retracted (see note below if deflectors are extended), both engines set to Take-off Power, propeller speed 96% (see "Take-Off Power Setting" chart for that value), climb speed according to chart inset. Standard landplane gear only.

Interpretive Guidance

This chart provides initial gross take-off climb gradient when both engines are set to Take-off Power and the aircraft speed is maintained at the value determined from the inset chart. The gradient is expressed as a ratio of vertical distance gained to horizontal distance travelled.

Example Calculation (dotted line)

Determine take-off climb gradient at an air temperature of +13°C, pressure altitude of 6,000 feet, and aircraft weight of 10,700 pounds.

1 Enter the chart from the lower left at the outside air temperature (+13°C). Continue vertically up until reaching the pressure altitude (6,000 feet). Proceed horizontally right until reaching the gross weight reference line.

2 Proceed diagonally up and to the right between the guidelines until reaching the aircraft weight (10,700 pounds). Exit horizontally right to determine take-off climb gradient ratio (0.185, or 18.5%).

3 Enter the inset chart from the bottom at the aircraft weight (10,700 pounds). Proceed right from the reference line to exit at the best rate of climb speed for the take-off configuration, which is 74 KIAS.

Summary of Example Calculation

At an air temperature of 13°C, pressure altitude of 6,000 feet, and aircraft weight of 10,700 pounds, the take-off climb gradient will be 0.185 (18.5%) at 74 KIAS. The aircraft will climb 185 feet for every 1,000 feet of forward travel.

NOTE

This chart assumes use of Take-off Power, which is normally used until flap retraction is completed. Flap retraction is initiated either upon reaching 400 feet AGL or after clearing all obstacles in the take-off area, whichever comes later.

The calculated gradient of climb will only be achieved if the initial climb speed (determined from the inset chart) is maintained.

If intake deflectors are extended and Take-off Power is less than 50 PSI, deduct 0.004 (approximately half a percent) from the value derived from this chart.

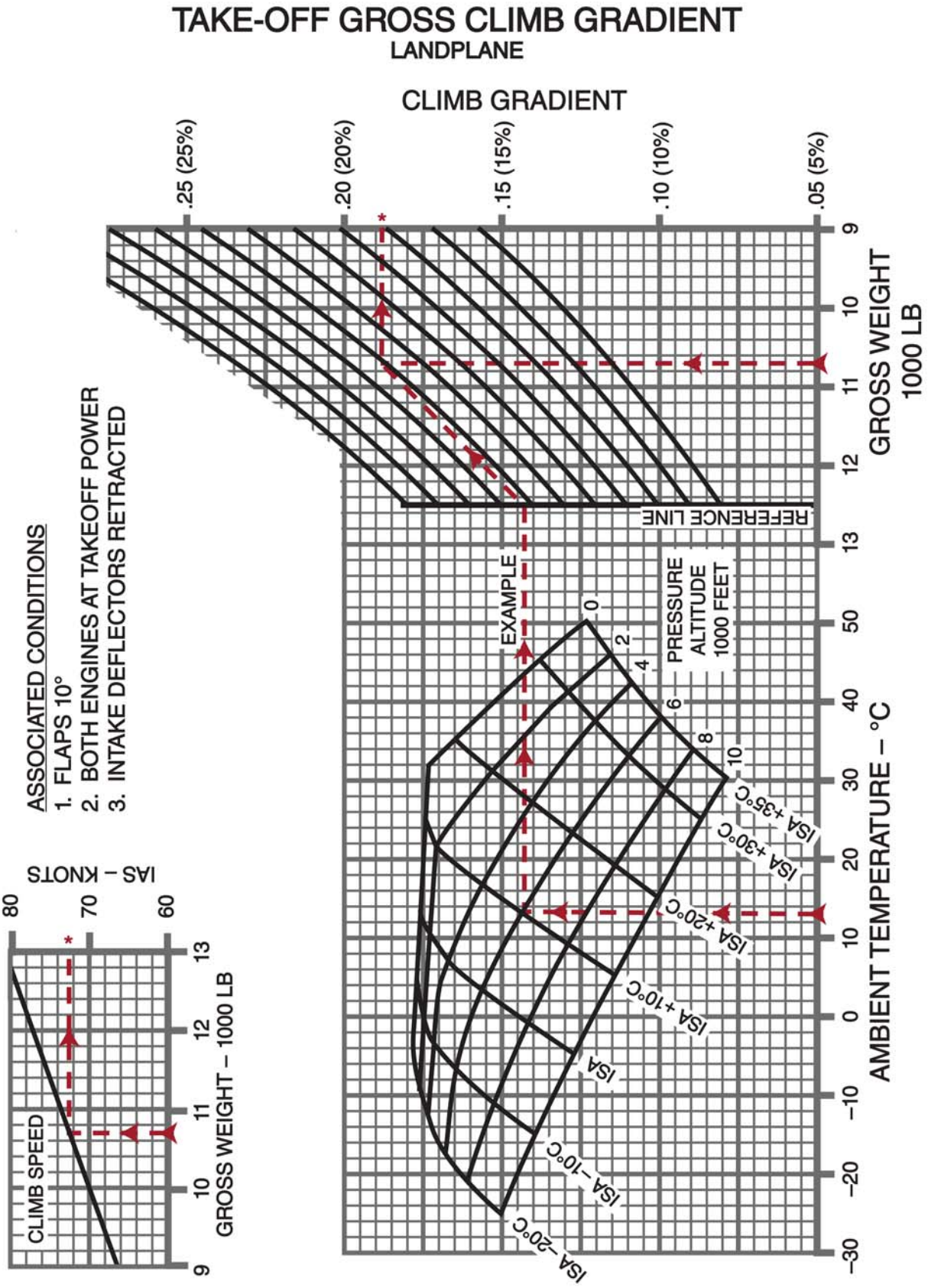


Figure 5-20 Take-Off Gradient of Climb, Both Engines Operating

5.25 Take-Off Rate of Climb – Single Engine, Propeller Feathered

Conditions associated with this chart

Flaps set at take-off position (10°), intake deflectors retracted (see note below if deflectors are extended), one engine set to Take-off Power, propeller speed 96% (see "Take-Off Power Setting" chart for that value), one engine inoperative with propeller feathered, climb speed according to chart inset. Standard landplane gear only.

Interpretive Guidance

This chart provides initial gross rate of climb in feet per minute when one engine is set to Take-off Power, the other engine is inoperative and feathered, and the aircraft speed is maintained at the value determined from the inset chart.

This chart may only be used if the autofeather system is installed, operational, and selected ON prior to take-off.

Example Calculation (dotted line)

Determine take-off rate of climb with one engine inoperative (OEI) at an air temperature of +28°C, pressure altitude of 2,000 feet, and aircraft weight of 12,500 pounds.

1 Enter the chart from the lower left at the outside air temperature (+28°C). Continue vertically up until reaching the pressure altitude (2,000 feet). Proceed horizontally right until reaching the gross weight reference line.

2 Proceed diagonally up and to the right between the guidelines until reaching the aircraft weight (12,500 pounds). Exit horizontally right to determine take-off rate of climb with one engine inoperative (300 feet per minute).

3 Enter the inset chart from the bottom at the aircraft weight (12,500 pounds). Proceed right from the reference line to exit at the best rate of climb speed for the take-off configuration, which is 80 KIAS.

Summary of Example Calculation

At an air temperature of +28°C, pressure altitude of 2,000 feet, and aircraft weight of 12,500 pounds, the take-off rate of climb will be 295 feet per minute at 80 KIAS.

NOTE

This chart assumes use of Take-off Power on the operating engine.

The calculated rate of climb will only be achieved if the climb speed (determined from the inset chart) is maintained.

If intake deflectors are extended and torque is less than 50 PSI, deduct 15 feet per minute from the value derived from this chart.

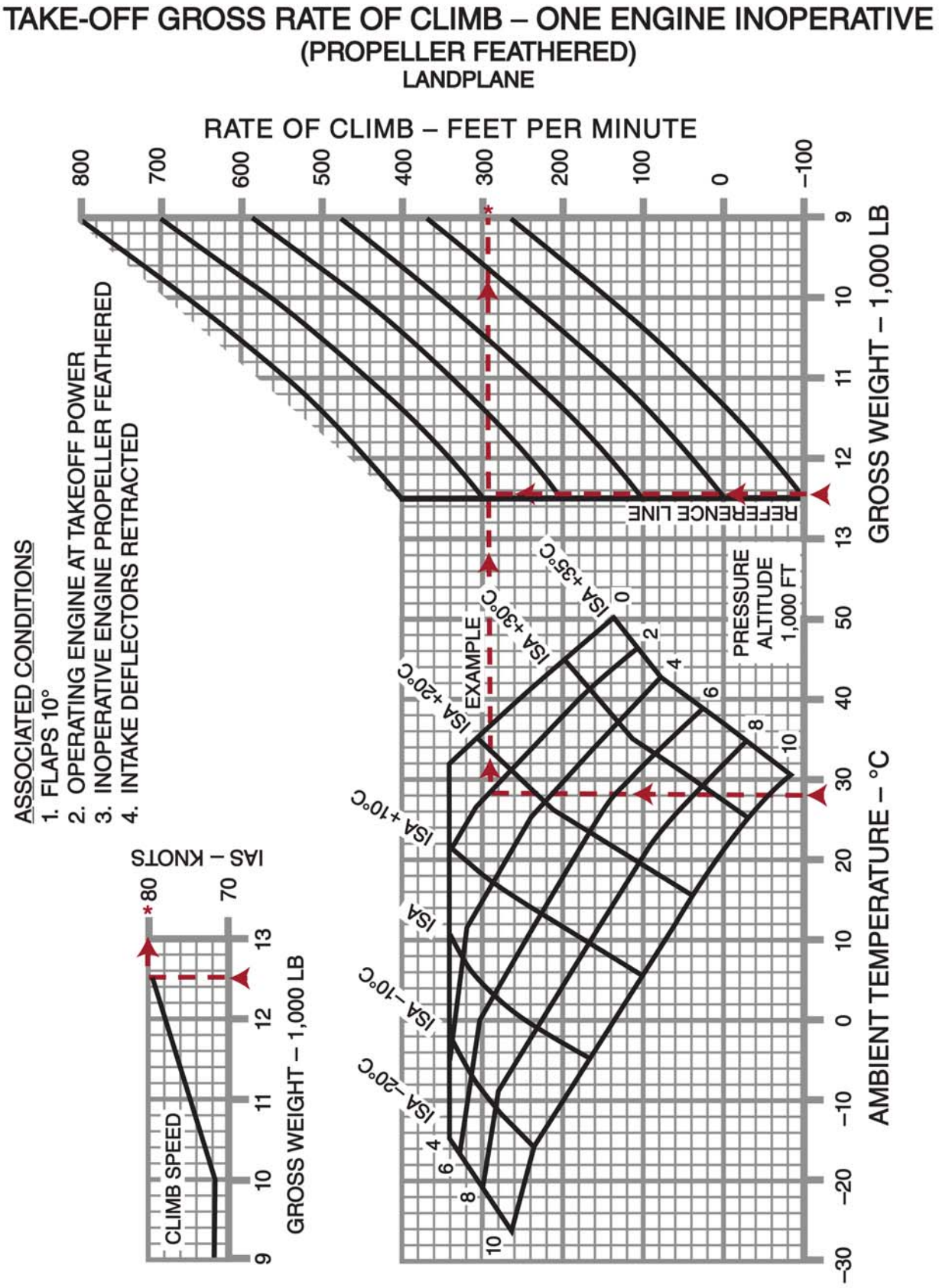


Figure 5-21 Take-Off Rate of Climb – Single Engine, Propeller Feathered

5.26 Take-Off Gradient of Climb – Single Engine, Propeller Feathered

Conditions associated with this chart

Flaps set at take-off position (10°), intake deflectors retracted (see note below if deflectors are extended), one engine set to Take-off Power, propeller speed 96% (see "Take-Off Power Setting" chart for that value), one engine inoperative with propeller feathered, climb speed according to chart inset. Standard landplane gear only.

Interpretive Guidance

This chart provides initial gross climb gradient when one engine is set to Take-off Power, the other engine is inoperative and feathered, and the aircraft speed is maintained at the value determined from the inset chart. The gradient is expressed as a ratio of vertical distance gained to horizontal distance travelled.

This chart may only be used if the autofeather system is installed, operational, and selected ON prior to take-off.

Example Calculation (dotted line)

Determine take-off climb gradient with one engine inoperative (OEI) at an air temperature of +13°C, pressure altitude of 6,000 feet, and aircraft weight of 10,500 pounds.

1 Enter the chart from the lower left at the outside air temperature (+13°C). Continue vertically up until reaching the pressure altitude (6,000 feet). Proceed horizontally right until reaching the gross weight reference line.

2 Proceed diagonally up and to the right between the guidelines until reaching the aircraft weight (10,500 pounds). Exit horizontally right to determine take-off climb gradient with one engine inoperative (0.051).

3 Enter the inset chart from the bottom at the aircraft weight (10,500 pounds). Proceed right from the reference line to exit at the best gradient of climb speed for the take-off configuration, which is 75 KIAS.

Summary of Example Calculation

At an air temperature of 13°C, pressure altitude of 6,000 feet, and aircraft weight of 10,500 pounds, the take-off climb gradient will be 0.051 (5.1%) at 75 KIAS. The aircraft will climb 51 feet for every 1,000 feet of forward travel.

NOTE

This chart assumes use of Take-off Power on the operating engine.

The calculated gradient of climb will only be achieved if the climb speed (determined from the inset chart) is maintained with precision.

If intake deflectors are extended and torque is less than 50 PSI, deduct 0.002 (two-tenths of one percent) from the value derived from this chart.

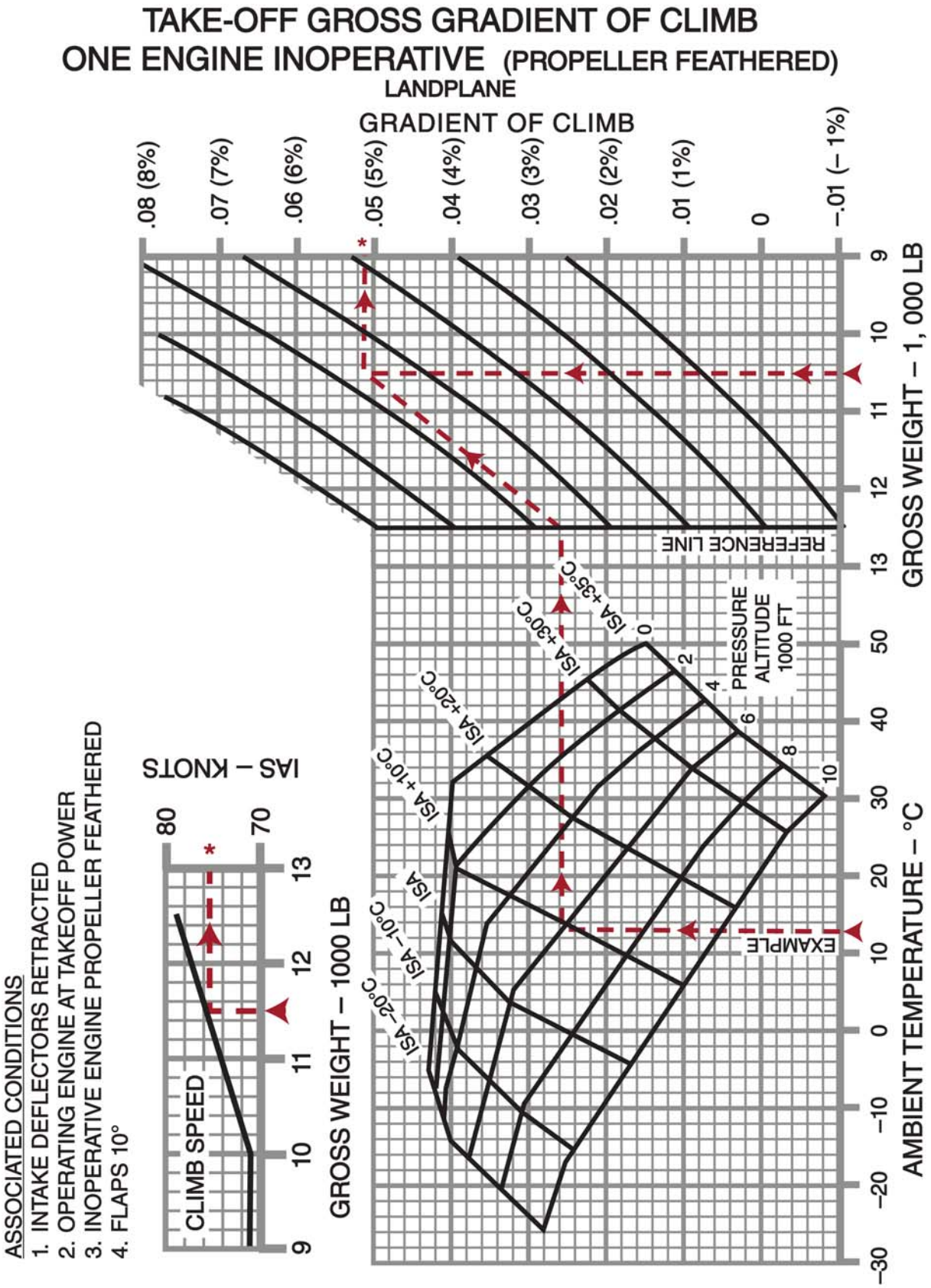


Figure 5-22 Take-Off Gradient of Climb – Single Engine, Propeller Feathered

5.27 Take-Off Rate of Climb – Single Engine, Propeller Windmilling

Conditions associated with this chart

Flaps set at take-off position (10°), intake deflectors retracted (see Note if deflectors are extended), one engine set to Take-off Power, propeller speed 96% (see “Take-Off Power Setting” chart for that value), one engine inoperative with propeller windmilling (not feathered), climb speed according to chart inset. Standard landplane gear only.

Interpretive Guidance

This chart provides initial gross rate of climb in feet per minute when one engine is set to Take-off Power, the other engine is inoperative and not feathered, and the aircraft speed is maintained at the value determined from the inset chart. This chart is used and is limiting if the autofeather system is inoperative.

Example Calculation (dotted line)

Determine take-off rate of climb with one engine inoperative (OEI) and the propeller of that engine windmilling at an air temperature of +18°C, pressure altitude of 6,000 feet, and aircraft weight of 11,400 pounds.

1 Enter the chart from the lower left at the outside air temperature (+18°C). Continue vertically up until reaching the pressure altitude (6,000 feet). Proceed horizontally right until reaching the gross weight reference line.

2 Proceed diagonally up and to the right between the guidelines until reaching the aircraft weight (11,400 pounds). Exit horizontally right to determine take-off rate of climb with one engine inoperative and the propeller windmilling (30 feet per minute).

3 Enter the inset chart from the bottom at the aircraft weight (11,400 pounds). Proceed right from the reference line to exit at the best rate of climb speed for the take-off configuration, which is 76 KIAS.

Summary of Example Calculation

At an air temperature of 18°C, pressure altitude of 6,000 feet, and aircraft weight of 11,400 pounds, the take-off rate of climb will be 30 feet per minute at 76 KIAS.

WARNING

V_{MC} RISES TO 68 KNOTS IAS IF THE PROPELLER IS NOT FEATHERED. THE V_{MC} OF 64 KNOTS IAS THAT IS PUBLISHED ELSEWHERE IN THIS MANUAL ASSUMES THAT THE AUTOFEATHER SYSTEM IS INSTALLED, FUNCTIONAL, AND BEING USED FOR EVERY TAKE-OFF.

NOTE

This chart assumes use of Take-off Power on the operating engine.

The calculated rate of climb will only be achieved if the climb speed (determined from the inset chart) is maintained.

If intake deflectors are extended and Take-off Power is less than 50 PSI, deduct 15 feet per minute from the value derived from this chart.

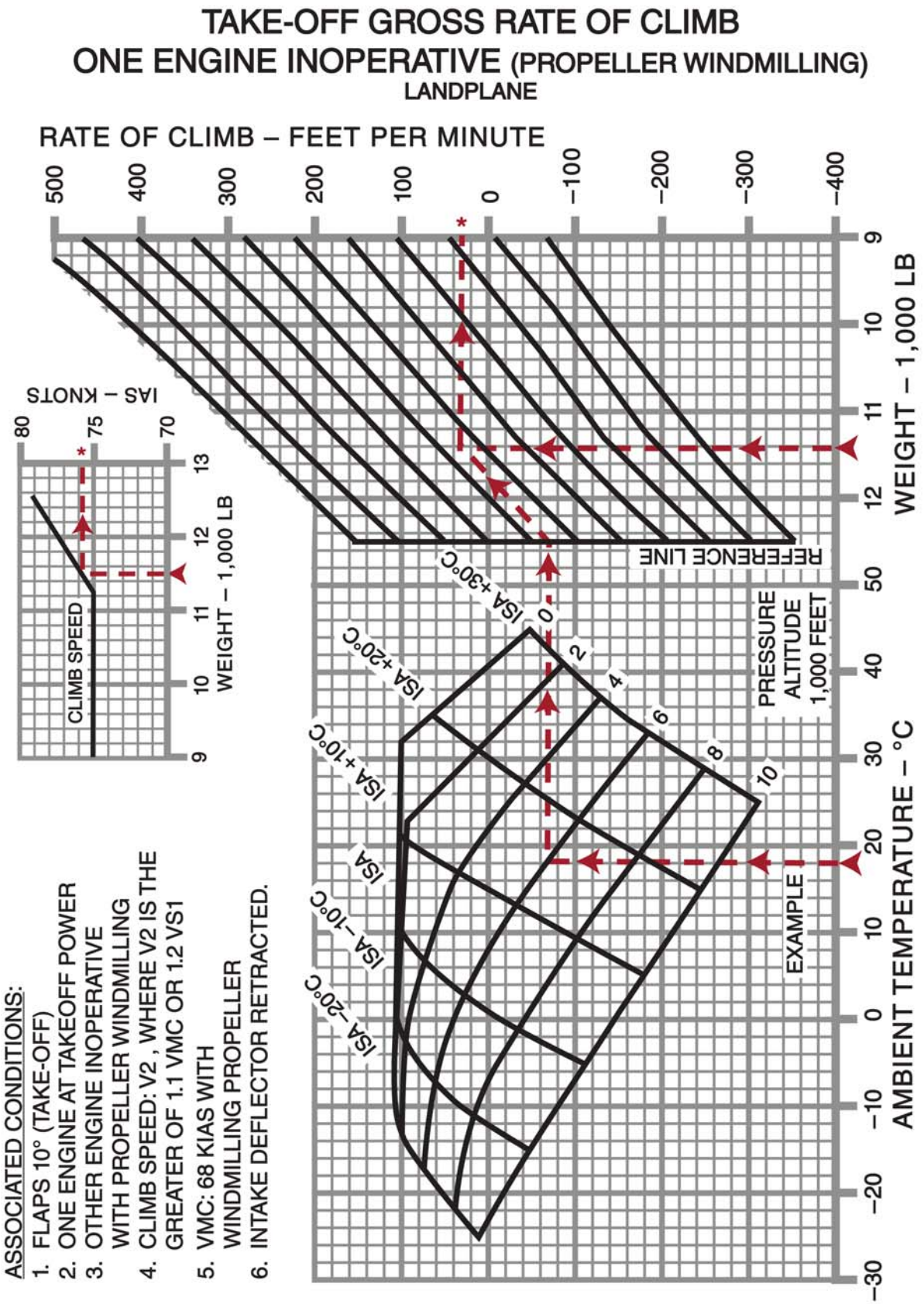


Figure 5-23 Take-Off Rate of Climb – Single Engine, Propeller Windmilling

5.28 Take-Off Gradient of Climb – Single Engine, Propeller Windmilling

Conditions associated with this chart

Flaps set at take-off position (10°), intake deflectors retracted (see note below if deflectors are extended), one engine set to Take-off Power, propeller speed 96% (see "Take-Off Power Setting" chart for that value), one engine inoperative with propeller windmilling (not feathered), climb speed according to chart inset. Standard landplane gear only.

Interpretive Guidance

This chart provides initial gross climb gradient when one engine is set to Take-off Power, the other engine is inoperative and not feathered, and the aircraft speed is maintained at the value determined from the inset chart. The gradient is expressed as a ratio of vertical distance gained to horizontal distance travelled. This chart is used and is limiting if the autofeather system is inoperative.

Example Calculation (dotted line)

Determine the take-off gradient of climb with a propeller windmilling from an aerodrome with a pressure altitude of 5,000 feet, a temperature of +34°C, and aircraft weight of 11,800 pounds. Then determine the best single engine climb speed for that weight.

1 Enter the chart from the bottom at the prevailing OAT (+34°C). Move upwards until reaching the reference line for the aerodrome pressure altitude (5,000 feet).

2 Move horizontally right from the pressure altitude to the reference line for gross weight, then move diagonally upward until reaching the aircraft weight (11,800 pounds). Then move horizontally right to determine the climb gradient –0.01 (–1%).

3 Enter the smaller inset chart from the bottom at the calculated weight (11,400 pounds) and proceed upward to the reference line. Then proceed left to determine best single engine gradient of climb speed for that weight (76 KIAS).

Summary of Example Calculation

At an air temperature of +34°C, pressure altitude of 5,000 feet, and aircraft weight of 11,800 pounds, the initial take-off climb gradient will be –0.01 (–1%) at 76 KIAS.

The aircraft is incapable of climbing at this weight under these atmospheric conditions, and will descend 10 feet for every 1,000 feet of forward travel. *This is an unacceptable result,* and the take-off weight must be reduced to a weight at which a positive climb gradient can be achieved.

To determine the aircraft weight that permits a positive climb gradient, continue upwards along the guidelines (as described in Step 2) until reaching a point at which the climb gradient is positive. For the temperature and altitude used in this example, this would mean reducing take-off weight to 10,900 pounds or less.

WARNING

V_{MC} RISES TO 68 KNOTS IAS IF THE PROPELLER IS NOT FEATHERED. THE V_{MC} OF 64 KNOTS IAS THAT IS PUBLISHED ELSEWHERE IN THIS MANUAL ASSUMES THAT THE AUTOFEATHER SYSTEM IS INSTALLED, FUNCTIONAL, AND BEING USED FOR EVERY TAKE-OFF.

NOTE

This chart assumes use of Maximum Continuous Power on the operating engine.

The calculated gradient of climb will only be achieved if the climb speed (determined from the inset chart) is maintained.

If intake deflectors are extended and Take-off Power is less than 50 PSI, deduct 0.002 from the value derived from this chart.

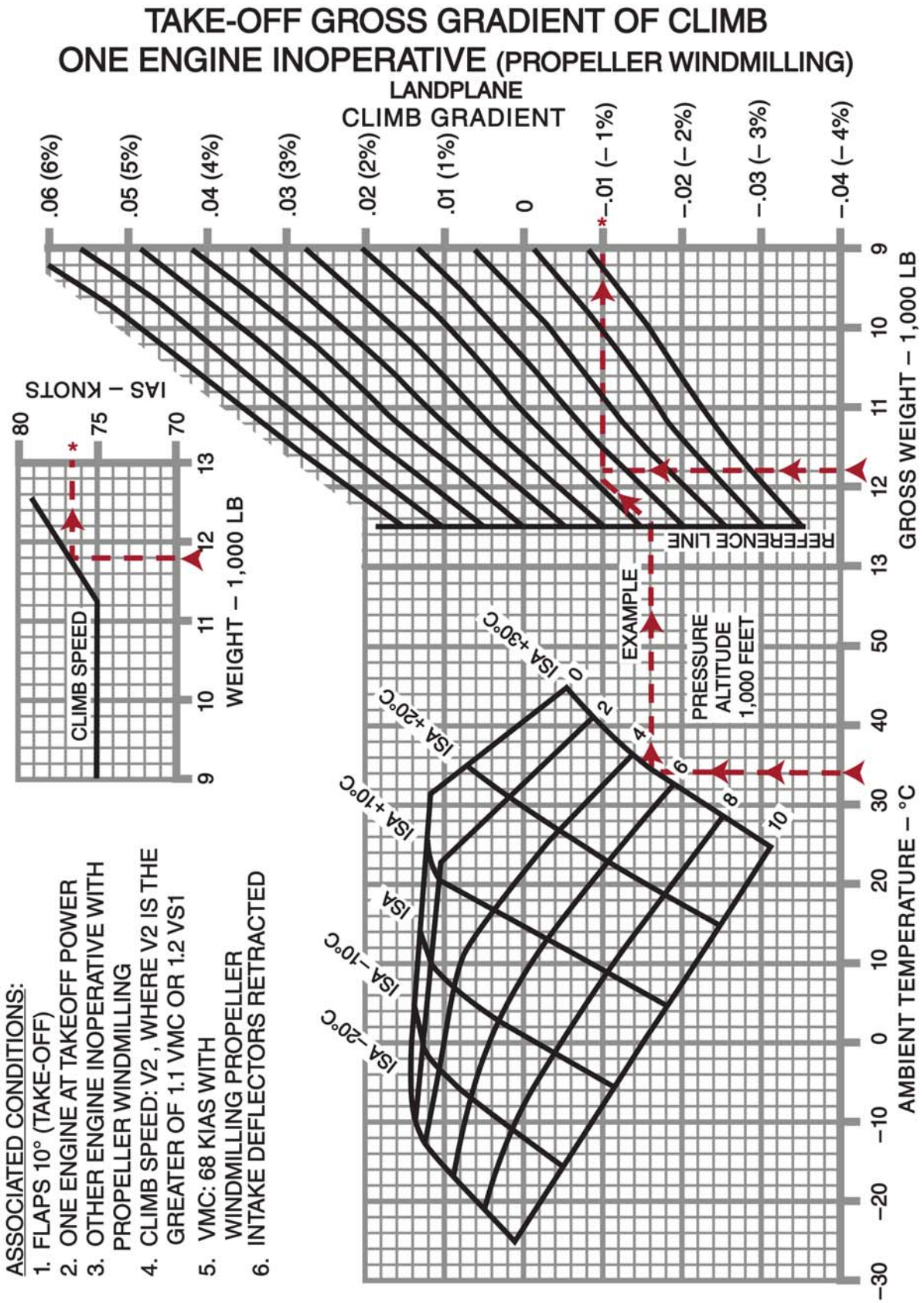


Figure 5-24 Take-Off Gradient of Climb – Single Engine, Propeller Windmilling

5.29 Enroute Rate of Climb – Single Engine, Propeller Feathered

Conditions associated with this chart

Flaps set at take-off position (10°), intake deflectors retracted (see note below if deflectors are extended), one engine set to Maximum Continuous Power (see "Maximum Continuous Power Setting" chart), propeller speed 96%, one engine inoperative with propeller feathered, climb speed according to chart inset. Standard landplane gear only.

Interpretive Guidance

This chart provides enroute gross rate of climb in feet per minute when one engine is set to Maximum Continuous Power, the other engine is inoperative and feathered, and the aircraft speed is maintained at the value determined from the inset chart.

Because the result of the Maximum Continuous Power calculation (the power setting allowed for single engine flight) for the DHC-6 happens to be identical to the result of the Maximum Take-off Power calculation, the results of the calculation for Enroute Rate of Climb – Single Engine, Propeller Feathered are identical to the results of the calculation for Take-off Rate of Climb – Single Engine, Propeller Feathered.

Example Calculation (dotted line)

Determine enroute rate of climb with one engine inoperative (OEI) and the propeller of that engine feathered, at an air temperature of +28°C, pressure altitude of 2,000 feet, and aircraft weight of 12,500 pounds.

1 Enter the chart from the lower left at the outside air temperature (+28°C). Continue vertically up until reaching the pressure altitude (2,000 feet). Proceed horizontally right until reaching the gross weight reference line.

2 Proceed diagonally up and to the right between the guidelines until reaching the aircraft weight (12,500 pounds). Exit horizontally right to determine take-off rate of climb with one engine inoperative and the propeller feathered (295 feet per minute).

3 Enter the inset chart from the bottom at the aircraft weight (12,500 pounds). Proceed right from the reference line to exit at the best rate of climb speed for the take-off configuration, which is 80 KIAS.

Summary of Example Calculation

At an air temperature of +28°C, pressure altitude of 2,000 feet, and aircraft weight of 12,500 pounds, the enroute rate of climb will be 295 feet per minute at 80 KIAS.

NOTE

This chart assumes use of Maximum Continuous Power (equal to Take-off Power) on the operating engine.

The calculated rate of climb will only be achieved if the climb speed (determined from the inset chart) is maintained.

If intake deflectors are extended and Take-off Power is less than 50 PSI, deduct 15 feet per minute from the value derived from this chart.

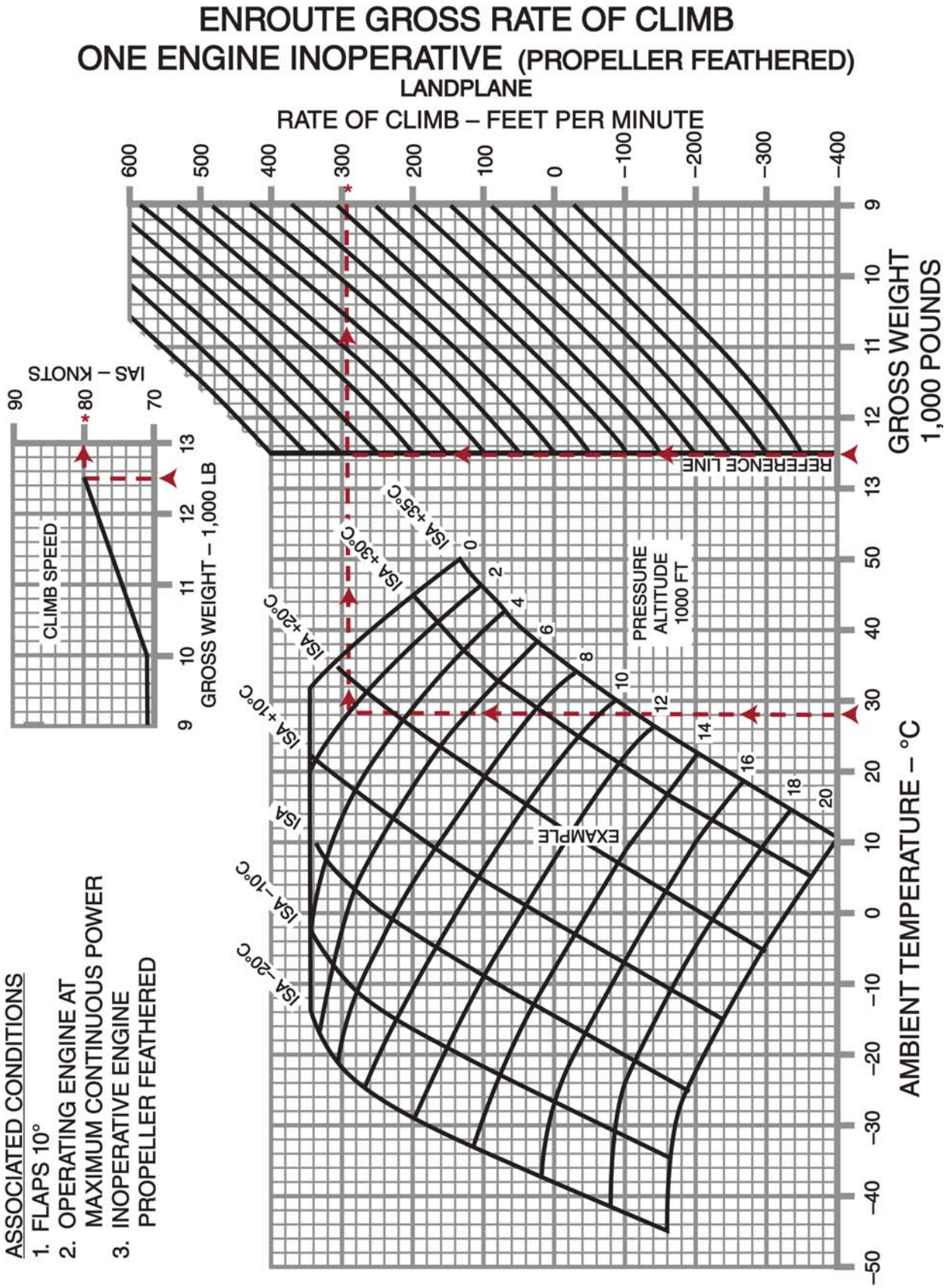


Figure 5-25 Enroute Rate of Climb – Single Engine, Propeller Feathered

5.30 Enroute Gradient of Climb – Single Engine, Propeller Feathered

Conditions associated with this chart

Flaps set at take-off position (10°), intake deflectors retracted (see note below if deflectors are extended), one engine set to Maximum Continuous Power (see "Maximum Continuous Power Setting" chart for that value), propeller speed 96%, one engine inoperative with propeller feathered, climb speed according to chart inset. Standard landplane gear only.

Interpretive Guidance

This chart provides enroute gross climb gradient when one engine is set to Maximum Continuous Power, the other engine is inoperative and feathered, and the aircraft speed is maintained at the value determined from the inset chart. The gradient is expressed as a ratio of vertical distance gained to horizontal distance travelled.

Because the result of the Maximum Continuous Power calculation (the power setting allowed for single engine flight) for the DHC-6 happens to be identical to the result of the Maximum Take-off Power calculation, the results of the calculation for Enroute Gradient of Climb – Single Engine, Propeller Feathered are identical to the results of the calculation for Take-Off Gradient of Climb – Single Engine, Propeller Feathered.

Example Calculation (dotted line)

Determine the enroute gradient of climb with a propeller feathered from an aerodrome with a pressure altitude of 6,000 feet, a temperature of +13°C, and aircraft weight of 10,500 pounds. Then, determine the best single engine climb speed for that weight.

1 Enter the chart from the bottom at the prevailing OAT (+13°C). Move upwards until reaching the reference line for the aerodrome pressure altitude (6,000 feet).

2 Move horizontally right from the pressure altitude to the reference line for gross weight, then move diagonally upward until reaching the aircraft weight (10,500 pounds). Then, move horizontally right to determine the climb gradient (0.51, or 5.1%)

3 Enter the smaller inset chart from the bottom at the calculated weight (10,500 pounds) and proceed upward to the reference line. Then proceed left to determine best single engine gradient of climb speed for that weight (76 KIAS).

Summary of Example Calculation

At an air temperature of +13°C, pressure altitude of 6,000 feet, and aircraft weight of 10,500 pounds, the initial enroute climb gradient will be 0.051 (5%) at 76 KIAS. The aircraft will climb 51 feet for every 1,000 feet of forward travel.

NOTE

This chart assumes use of Maximum Continuous Power (equal to Take-off Power) on the operating engine.

The calculated gradient of climb will only be achieved if the climb speed (determined from the inset chart) is maintained with precision.

If intake deflectors are extended and Take-off Power is less than 50 PSI, deduct 0.002 (two-tenths of one percent) from the value derived from this chart.

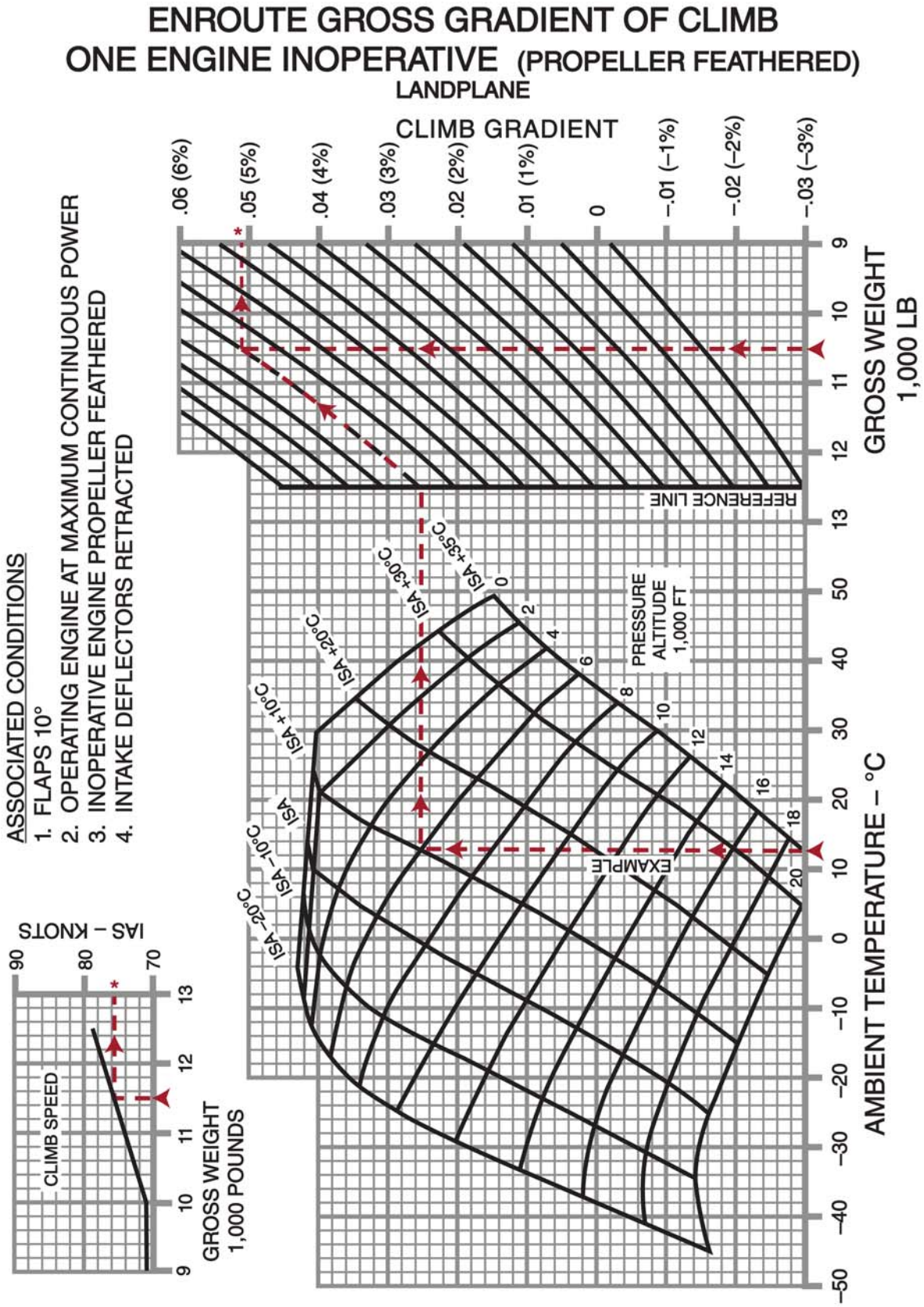


Figure 5-26 Enroute Gradient of Climb – Single Engine, Propeller Feathered

5.31 Maximum Permissible Landing Weight

When equipped with standard landplane gear, the balked landing climb requirement of SFAR 23 can be met at the maximum landing weight under all conditions up to 10,000 feet pressure altitude and ISA +30°C, with intake deflectors extended or retracted. Therefore, there is no landing weight limitation that arises from performance requirements. No chart has been provided.

The maximum landing weight for a landplane or skiplane is 12,300 pounds. This is a structural limitation related to the ability of the main gear to absorb shock loads, not a performance limitation.

5.32 Balked Landing Rate of Climb

Conditions associated with this chart

Flaps fully extended (37.5°), intake deflectors retracted (see note below if deflectors are extended), both engines set to Take-off Power, propeller speed 96% (see “Take-off Power Setting” chart for that value), climb speed according to chart inset. Standard landplane gear only.

Interpretive Guidance

This chart provides gross rate of climb information with the aircraft in the landing configuration (flaps fully extended, propellers set to 96% N_P).

Example Calculation (dotted line)

Determine balked landing rate of climb at +12°C air temperature, 6,000 foot pressure altitude, and 10,500 pound landing weight.

1 Enter the chart from the bottom at the air temperature (+12°C) and proceed upward to the pressure altitude (6,000 feet). From there, proceed horizontally right to the gross weight reference line. Then proceed diagonally upwards along the guidelines until reaching the aircraft weight (10,500 pounds). Then proceed horizontally right to exit at the rate of climb.

2 Using the inset chart, enter the chart vertically at the bottom at the aircraft weight (10,500 pounds) and continue upwards to the reference line, then proceed horizontally right to determine the initial climb speed (67 KIAS) for the aircraft in the flaps 37.5° configuration

Summary of Example Calculation

At +12°C air temperature, 6,000 foot pressure altitude, and 10,500 pound landing weight, the initial rate of climb with flaps fully extended will be 1,090 feet per minute, at a climb speed of 67 KIAS.

WARNING

THIS CHART ASSUMES USE OF TAKE-OFF POWER FOR THE BALKED LANDING. PROPELLER SPEED MUST BE 96%.

⚠ CAUTION

IF A BALKED LANDING IS INITIATED WITH FLAPS LESS THAN FULLY EXTENDED, THE INITIAL RATE OF CLIMB MAY BE GREATER THAN THAT SHOWN ON THE CHART. AS FLAPS ARE RETRACTED DURING THE BALKED LANDING MANEUVER, CLIMB SPEED SHOULD BE PROGRESSIVELY INCREASED UNTIL REACHING V_X (BEST ANGLE) OF CLIMB. WHEN ALL OBSTACLES HAVE BEEN CLEARED, CLIMB SPEED SHOULD BE INCREASED TO V_Y (BEST RATE) OF CLIMB. SEE SECTION 2 (LIMITATIONS) FOR V_X AND V_Y SPEEDS.

NOTE

With intake deflectors extended and torque settings less than 50 PSI, reduce rate of climb shown by 30 feet per minute.

BALKED LANDING RATE OF CLIMB
LANDPLANE

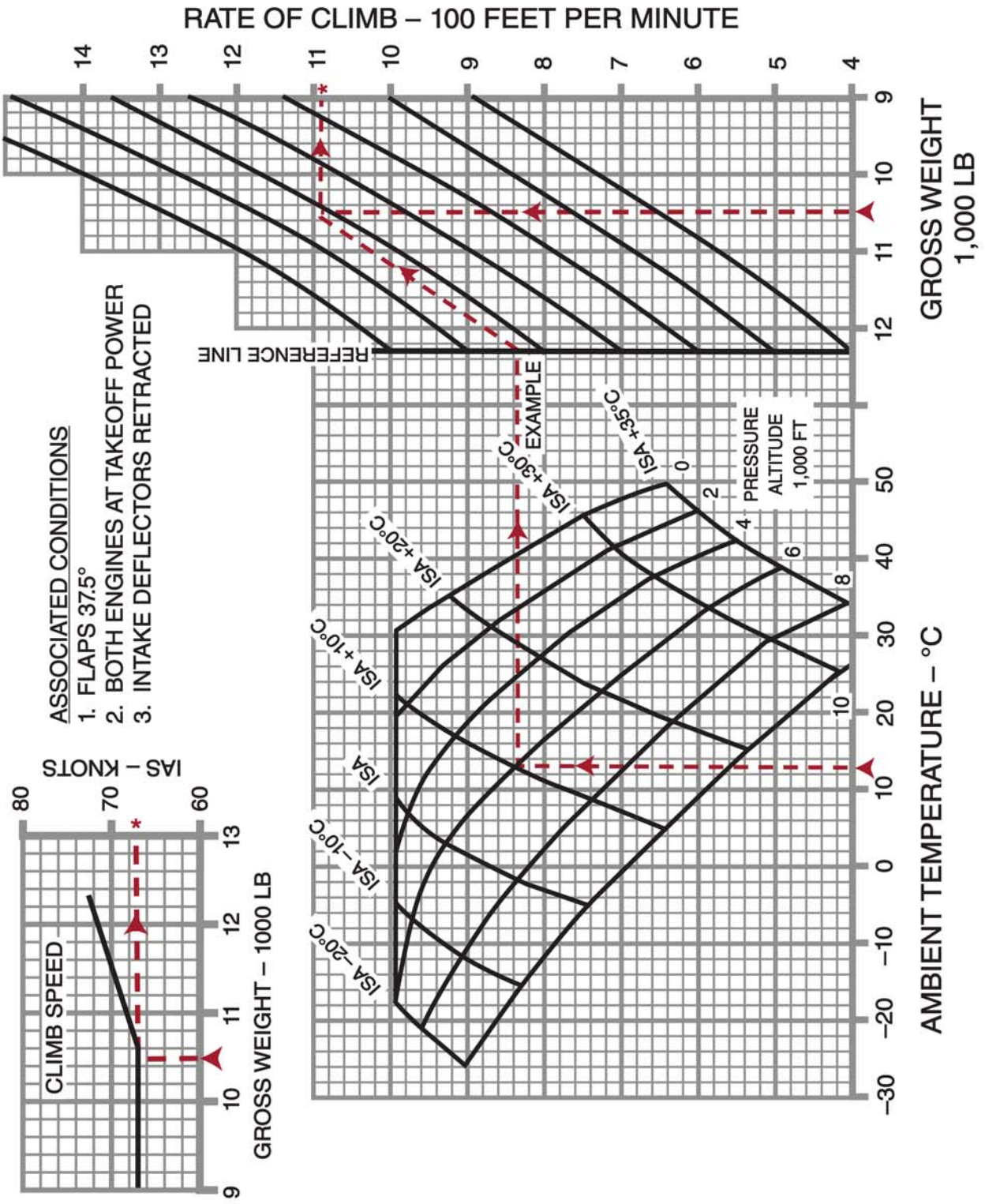


Figure 5-27 Balked Landing Rate of Climb

5.33 Balked Landing Gradient of Climb

Conditions associated with this chart

Flaps fully extended (37.5°), intake deflectors retracted (see note below if deflectors are extended), both engines set to Take-off Power, propeller speed 96% (see “Take-off Power Setting” chart for that value), climb speed according to chart inset. Standard landplane gear only.

Interpretive Guidance

This chart provides gross climb gradient information with the aircraft in the landing configuration (flaps fully extended, propellers set to 96% N_P).

Example Calculation (dotted line)

Determine balked landing climb gradient at +13°C air temperature, 6,000 foot pressure altitude, and 10,500 pound landing weight.

1 Enter the chart from the bottom at the air temperature (+13°C) and proceed upward to the pressure altitude (6,000 feet). From there, proceed horizontally right to the gross weight reference line. Then proceed diagonally upwards along the guidelines until reaching the aircraft weight (10,500 pounds). Then proceed horizontally right to exit at the climb gradient (0.14).

2 Using the inset chart, enter the chart vertically at the bottom at the aircraft weight (10,500 pounds) and continue upwards to the reference line, then proceed horizontally right to determine the initial climb speed (67 KIAS) for the aircraft in the flaps 37.5° configuration

Summary of Example Calculation

At +13°C air temperature, 6,000 foot pressure altitude, and 10,500 pound landing weight, the initial climb gradient with flaps fully extended will be 0.14 (14%), at a climb speed of 67 KIAS. The aircraft will climb 140 feet for every 1,000 feet of forward travel.

WARNING

THIS CHART ASSUMES USE OF TAKE-OFF POWER FOR THE BALKED LANDING. PROPELLER SPEED MUST BE 96%.

WARNING

AS FLAPS ARE RETRACTED DURING THE BALKED LANDING MANEUVER, CLIMB SPEED SHOULD BE PROGRESSIVELY INCREASED UNTIL REACHING V_X (BEST ANGLE) OF CLIMB. WHEN ALL OBSTACLES HAVE BEEN CLEARED, CLIMB SPEED SHOULD BE INCREASED TO V_Y (BEST RATE) OF CLIMB. SEE SECTION 2 (LIMITATIONS) FOR V_X AND V_Y SPEEDS.

CAUTION

IF A BALKED LANDING IS INITIATED WITH FLAPS LESS THAN FULLY EXTENDED, THE INITIAL CLIMB GRADIENT MAY BE SLIGHTLY LESS THAN THAT SHOWN ON THE CHART – THIS IS DUE TO THE HIGHER AIRCRAFT FORWARD SPEED DURING THE CLIMB.

NOTE

With intake deflectors extended and torque settings less than 50 PSI, reduce climb gradient shown by 0.004.

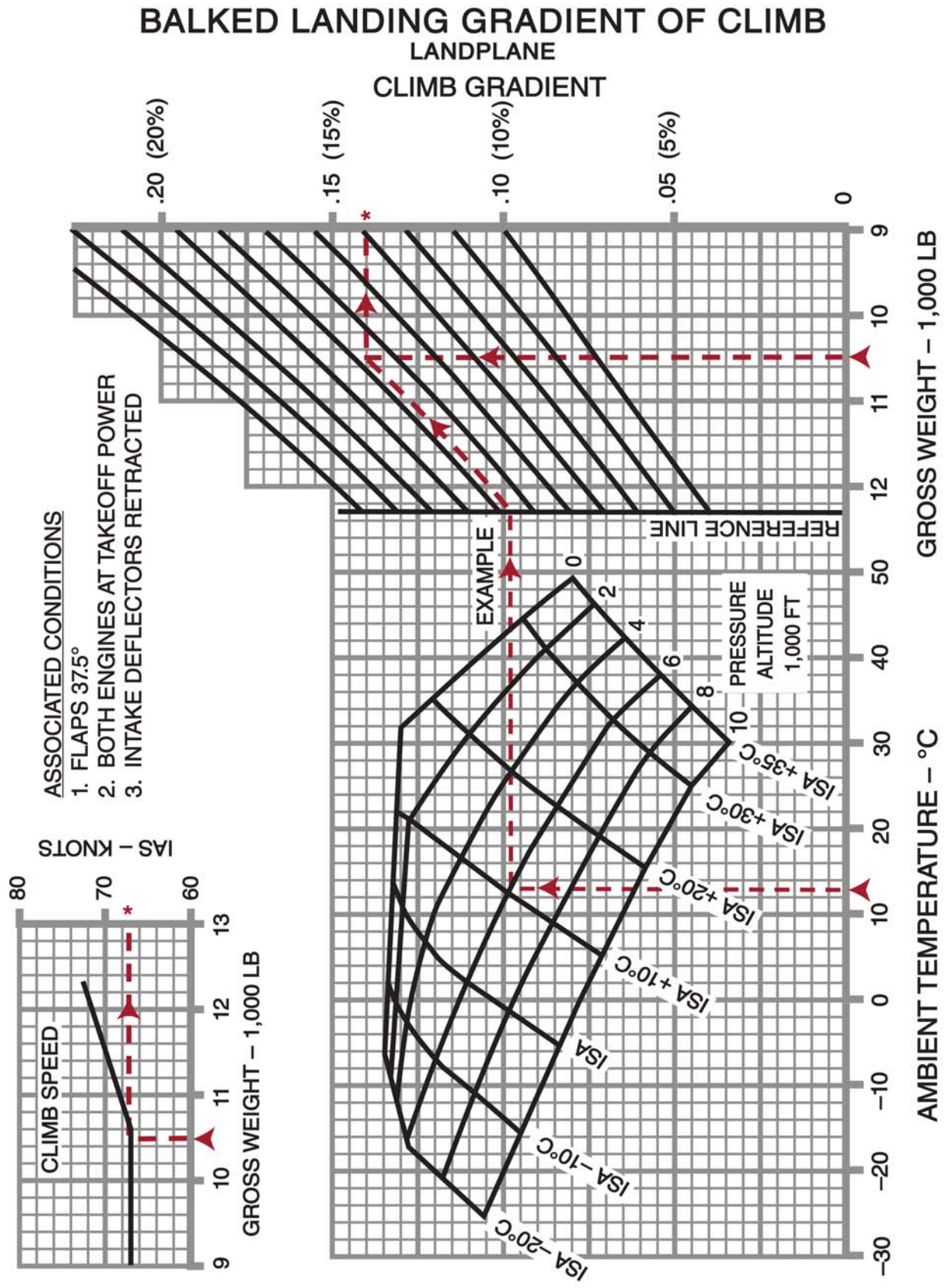


Figure 5-28 Balked Landing Gradient of Climb

5.34 Landing Distance from 50 feet AGL to Full Stop

Conditions associated with this chart

Flaps fully extended (37.5°), intake deflectors retracted or extended, propeller speed 96% , power as required to maintain a 3° approach angle to 50 feet, then power promptly reduced to IDLE at 50 feet AGL. Speed at 50 feet according to inset chart. Dry, hard, level airfield. Retardation by brakes alone. Maximum brake effort used for stopping. Standard landplane gear only.

Interpretive Guidance

The distances have been calculated using the procedure and technique specified in SFAR 23 and are consistent with the procedures given for a normal landing in Section 4 of this AFM.

Example Calculation (dotted line)

Calculate total landing distance from 50 feet AGL to a full stop at an airfield when the temperature is +8°C, the airfield pressure altitude is 4,000 feet, the landing weight is 10,500 pounds, and the headwind component is 15 knots. Determine correct speed at 50 feet AGL.

1 Enter the chart at the bottom at the air temperature (+8°C) and proceed upward until reaching the airfield pressure altitude (4,000 feet). Proceed horizontally right until reaching the gross weight reference line, then proceed diagonally down between the guidelines until reaching the landing weight (10,500 pounds).

2 Proceed horizontally right until reaching the zero wind reference line, then proceed diagonally down until reaching the headwind component (15 knots). Proceed horizontally right to exit the chart at the total distance required (1,050 feet).

3 Enter the inset chart from the bottom at the aircraft landing weight (10,500 pounds), proceed up to the reference line, then proceed horizontally right to exit at the recommended speed at 50 feet (71 KIAS).

Summary of Example Calculation

At a temperature of +8°C, airfield pressure altitude of 4,000 feet, with a headwind component of 15 knots, the aircraft configured with full flap extended and at a speed of 71 KIAS at 50 feet AGL, the total distance from 50 feet AGL to a full stop on a dry, hard, level surface will be 1,050 feet if maximum braking is used.

NOTE

The chart presumes that the ‘speed at 50 feet’ will be achieved, power will be sharply reduced to IDLE at 50 feet AGL, and maximum brake effort will be used.

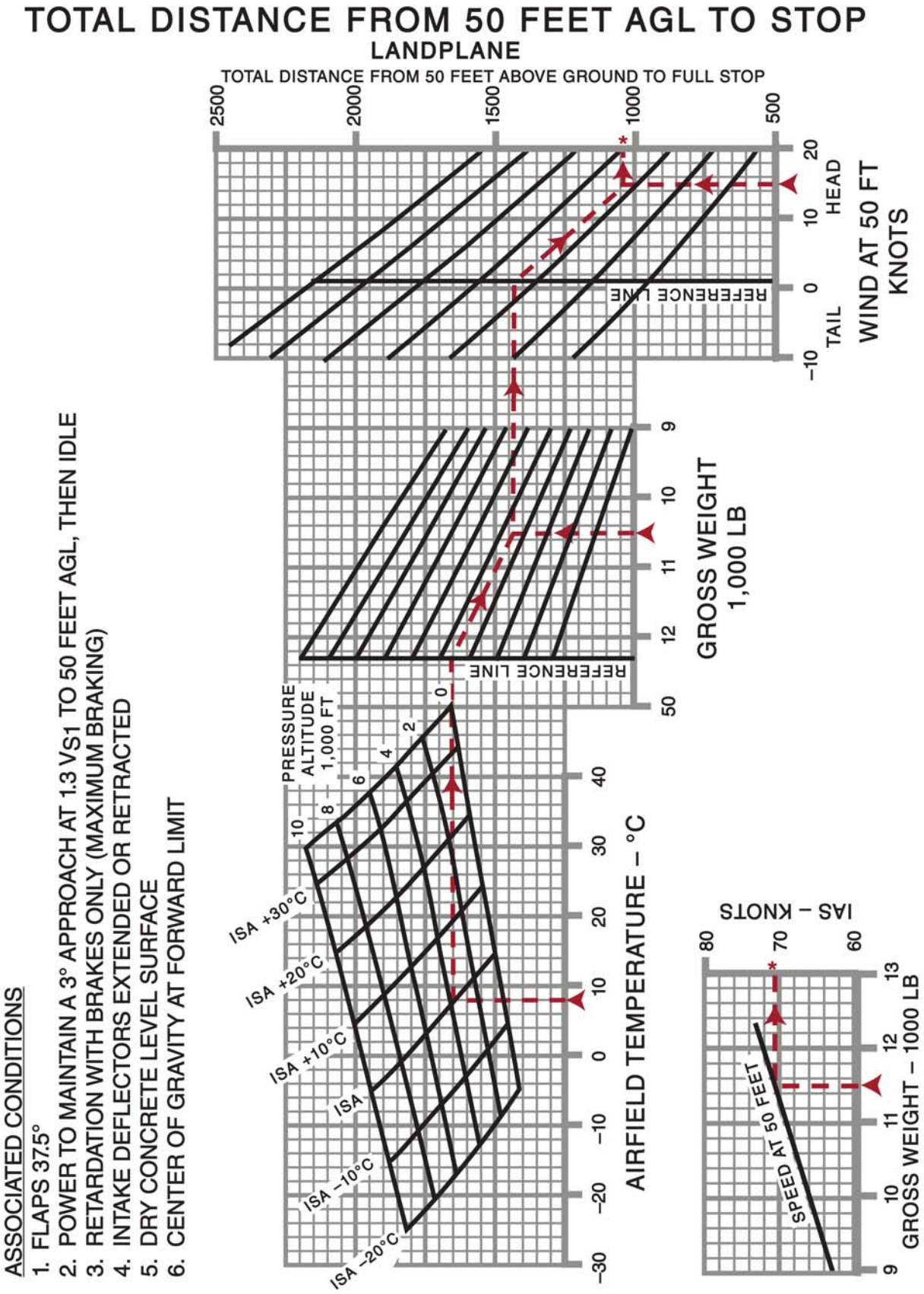


Figure 5-29 Landing Distance from 50 feet AGL to Full Stop

SECTION 6

WEIGHT AND BALANCE

LIST OF EFFECTIVE PAGES

SECTION	PAGE	DATE	SECTION	PAGE	DATE
6	1	10 Sep. 2010		19	10 Sep. 2010
	2	10 Sep. 2010		20	10 Sep. 2010
	3	10 Sep. 2010		21	10 Sep. 2010
	4	10 Sep. 2010		22	10 Sep. 2010
	5	10 Sep. 2010		23	10 Sep. 2010
	6	10 Sep. 2010		24	10 Sep. 2010
	7	10 Sep. 2010		25	10 Sep. 2010
	8	10 Sep. 2010		26	10 Sep. 2010
	9	10 Sep. 2010		27	10 Sep. 2010
	10	10 Sep. 2010		28	10 Sep. 2010
	11	10 Sep. 2010		29	10 Sep. 2010
	12	10 Sep. 2010		30	10 Sep. 2010
	13	10 Sep. 2010		31	10 Sep. 2010
	14	10 Sep. 2010		32	10 Sep. 2010
	15	10 Sep. 2010		33	10 Sep. 2010
	16	10 Sep. 2010		34	10 Sep. 2010
	17	10 Sep. 2010		35	10 Sep. 2010
	18	10 Sep. 2010		36	10 Sep. 2010

TABLE OF CONTENTS **PAGE**

6.1 Weight and Balance Limitations 7
6.1.1 Take-Off Weight Limitations 7
6.1.2 Landing Weight Limitations 7

6.2 Weight Definitions 8
6.2.1 Standard Basic Weight 8
6.2.2 Basic Weight 8
6.2.3 Operational Load 8
6.2.4 Payload 8
6.2.5 All-up Weight (A.U.W.) 8
6.2.6 Horizontal Arm 8

6.3 Aircraft Weight and Balance Data 9

6.4 Preparation for Flight 10

6.5 Center of Gravity (C.G.) 11

6.6 Freight Loading 12

6.7 Maximum Package Size 13

6.8 Compartment Definitions 14

6.9 Reweighing Aircraft 15

6.10 To Check Aircraft Loading 16

6.11 Loading Calculations 17

List of Figures Page

6-1 18
6-2 19
6-3 20
6-4 21

List of Figures Page

6-5 Balance Diagram..... 22
6-6 Cargo compartment & Standard Seating — 20 Passengers..... 23
6-7 Cargo Compartment & Alternate Utility Seating — 13/14 Passengers.. 24
6-8 Floor Loading and Tie-down Locations..... 25
6-9 Personal Table – Commuter – 20 Passengers..... 28
6-10 Personnel Table – Utility – 13 to 20 Passengers..... 29
6-11 Baggage Compartment Table..... 30
6-12 Cargo Compartment Freight Table..... 31
6-13 Usable Fuel Table..... 32
6-14 Wing Long Range Fuel Table..... 33
6-15 Center of Gravity Limits - Landplane, Wheel-skiplane and Floatplane.. 34
6-16 Safe Moments Table – Landplane and Wheel-skiplane..... 35
6-17 Safe Moments Table – Floatplane..... 36

6.1 Weight and Balance Limitations

The Design Gross Weight of the aircraft is 12,500 lb. In the interests of airworthiness it is essential that the weight and balance limits for the aircraft be adhered to in accordance with the recommendations and information given in the following paragraphs, tables and diagrams.

6.1.1 Take-Off Weight Limitations

The All-up Weight must not exceed the figures stated below for the various configurations.

1 Landplane – The take-off weight must not exceed 12,500 lb.

2 Floatplane – The take-off weight must not exceed 12,500 lb.

3 Wheel-Skiplane – The take-off weight must not exceed 12,500 lb.

6.1.2 Landing Weight Limitations

1 Landplane – The landing weight must not exceed 12,300 lb.

2 Floatplane – The landing weight must not exceed 12,500 lb.

3 Wheel-Skiplane – The landing weight must not exceed 12,300 lb.

6.2 Weight Definitions

6.2.1 Standard Basic Weight

The Standard Basic Weight is the weight of the aircraft including all standard equipment supplied with the aircraft. This weight is used for reference purposes only and is not generally representative of an operational aircraft, which would have avionics and possible special order equipment installed. Trapped and unusable fuel and full oil are included in the Standard Basic Weight. Standard Basic Weight will always be considered as the landplane configuration, other forms of alighting gear being considered as special order equipment. See Basic Weight below.

6.2.2 Basic Weight

Basic Weight is the Standard Basic Weight as defined above plus all other equipment, both fixed and removable, which is additional to the standard configuration, i.e. avionics, airframe and propeller de-icing, complete external paint etc. Such equipment is identified for the subject aircraft by a check mark on the Equipment Check List.

6.2.3 Operational Load

The Operational Load comprises crew, fuel and payload weights.

6.2.4 Payload

Payload consists only of passengers, baggage and cargo. The aircraft payload capabilities will obviously vary with flight range requirements.

6.2.5 All-up Weight (A.U.W.)

The All-up Weight is the sum of the Basic Weight plus Operational Load and must not exceed the limits stated in Para 6.1.1 for the applicable aircraft configuration.

6.2.6 Horizontal Arm

This term for the Twin Otter is synonymous with Aircraft Station. Horizontal Arm 0 or Aircraft Station 0 is located 109.32 inches forward of the fuselage jig points which are marked on either side of the fuselage. With the short nose structure configuration Station 0 is approximately 6 inches forward of the tip of the nose fairing and with the standard extended nose Station 0 is approximately 21 inches aft of the tip of the nose fairing.

6.3 Aircraft Weight and Balance Data

This data consists of an Equipment Check List, Weighing Record and a Basic Weight Change Record. The Equipment Check List indicates with a check mark in the appropriate column the equipment that was in the aircraft in the "As Weighed" and "Basic Weight" configurations. If the equipment is changed then the Basic Weight changes also. All equipment changes to the aircraft should be recorded on the Basic Weight Change Record, so that an up-to-date record of the weight is available at all times. Similarly if the configuration of the aircraft is altered at any time, e.g. changing from wheel landing gear to floats, such alterations must be recorded in the Basic Weight Change Record. The obligation that all changes must be recorded applies also to modifications of all types, e.g. repair to damage suffered in service. In these cases all parts removed from or added to the aircraft must be separately weighed and their locations measured so that the Basic "Weight Change Record" can be correctly updated. The Balance Diagram Figure 6-5 may be used to determine the approximate arms of any equipment, or modifications not listed on the Equipment Check List. When de Havilland modifications are incorporated, the Weight & Balance Change will be found on the appropriate Modification Bulletin.

6.4 Preparation for Flight

The A.U.W. should be computed for the conditions at the beginning and end of the flight, using the current Basic Weight from the Basic Weight Change Record, and the Operational Load Diagrams. The resulting A.U.W. and Total Moment must fall within the limits shown on the appropriate chart for the aircraft configuration. To arrive at the condition at the end of the flight subtract from the A.U.W. and Total Moment, the weights and moments of fuel used during the flight, to ensure that the aircraft center of gravity (represented by the Safe Moments Table) does not fall outside the prescribed limits. See also Para 6.10 and Para 6.11.

6.5 Center of Gravity (C.G.)

For CG Limits see the appropriate diagram Figure 6-15 for the particular configuration under consideration. The limiting CG Limits locations are shown both as Aircraft Horizontal Stations and as percentages of the Mean Aerodynamic Chord.

6.6 Freight Loading

The cabin floor loading is 200 lb per sq ft overall; this is equivalent to 800 lb per ft run. The front and rear baggage compartment floor loading must not exceed 100 lb/sq ft. The maximum weights shown per compartment on the Cargo Compartment Freight Table Figure 6-12 are limited by the 200 lb/sq ft overall loading. Whether such quantities can actually be loaded into these compartments, for the configuration to be flown, can only be determined by individually checking the particular complete aircraft loading concerned. However, under no circumstances must the loads shown for the designed compartments be exceeded.

⚠ CAUTION

IF THERE IS ANY DOUBT THAT A CONCENTRATED LOAD MAY EXCEED THE 200 POUNDS PER SQUARE FOOT LIMIT THEN SHORING SHOULD BE USED.

6.7 Maximum Package Size

See figure 7-11 in Aircraft and Systems Description, Section 7 of this POH.

6.8 Compartment Definitions

(See Figure 1-1):

Front Baggage Compartment	Area forward of bulkhead station 60. The load here should be limited to 200 lb for the short nose, and 300 lb for the standard extended nose. This is additional to any radio that may already be installed in this area. A standard extended nose will have a weight restriction when weather radar is installed. Refer to Figure 6-11.
Flight Compartment	From aircraft station 60 to the sloping bulkhead at station 111 approximately.
Cabin Compartment	From the sloping bulkhead aft to bulkhead station 332. This area has been subdivided into eleven 20-inch sections designated C-1 to C-11. Limits of compartments C-1 to C-11 are marked on the lower air distribution ducts.
Rear Baggage Compartment	Area between cabin rear bulkhead station 332 and aft bulkhead station 376 with extension shelf from station 376 to station 406. The load on the shelf must not exceed l50 lb. The total weight in the baggage compartment must not exceed 500 lb. When a toilet or other special installation is installed in this compartment a weight restriction will be imposed. Refer to Figure 6-11.

6.9 Reweighing Aircraft

If alterations have resulted in an estimated 2% change to the empty weight or if five years have elapsed since the last weighing then it is a requirement that the aircraft be reweighed. Local or military regulations may differ from those stated above. The actual method of weighing will be at the discretion of the operator or his agent; platform scales may be used beneath the wheels or electronic sensing devices at the fuselage jacking points. For locations of jacking points, jig points and stations of the standard nose and main wheels see Figure 6-5. Irrespective of the weighing method chosen, the following points should be noted.

1 The basic weight condition is established with flaps up, controls locked in the neutral position, all doors and hatches closed, full oil, trapped fuel only in the aircraft and the hydraulic system full.

2 The aircraft should be weighed with all fuel drained. Drain from the two tank drain points in the manifold fairing at approximately stations 185 and 214, with the aircraft level. Drain the collector tanks by attaching a one inch hose to the drain valves at stations 188 and 211 approximately.

3 The aircraft should NEVER be weighed with partially filled fuel tanks, since it is impossible to establish an accurate weight for the fuel aboard.

4 If it is impossible for the aircraft to be drained, a weighing with full fuel is permissible (though this is not advised). The tanks have been calibrated and their volume is known with some accuracy, see Figure 6-13. If a weighing is made with full fuel then the specific gravity of the fuel must be measured at the time of weighing so that, knowing the volume, an accurate weight of fuel aboard can be established.

NOTE

Fuel gauge recordings are not accurate enough to be used when establishing the Aircraft Basic Weight.

5 On piston engine aircraft full oil is not normally included as part of the Basic Weight. However, for turboprop aircraft, the oil quantity is relatively small, and no appreciable amount is used during normal flights, thus loading calculations etc. can be simplified by always considering full oil as part of the Aircraft Basic Weight for the Twin Otter.

6 For levelling the aircraft, prior to weighing, use a clinometer and levelling bar laid on the extruded floor channels. Work through the open door, ensuring that no load is inadvertently applied during the levelling process. Aircraft attitude can be adjusted by varying nose and main tire pressures or nose gear strut pressure, if platform scales are being used.

6.10 To Check Aircraft Loading

Prior to flight all loadings of this aircraft must be checked to ensure that weight and CG locations do not fall outside the prescribed limits. A valid Weight and Balance Loading Form should be available for every loading flown. The Basic Weight and Basic Moment will be found on the Basic Weight Change Record.

6.10.1 Add to the Basic Weight and Basic Moment:

1. Pilot(s) and Passenger(s) }
2. Freight and Baggage } Weights and Moments
3. Fuel }

6.10.2 Make sure that:

1 The Take-off Weight, less any fuel consumed for warm-up and taxi, does not exceed the limits stated for the applicable configuration.

2 The Total Moment value is within the Safe Moment limits.

3 Available take-off distance permits take-off at this weight.

4 The landing weight does not exceed the applicable limits.

6.11 Loading Calculations

On the following pages will be found charts showing the weights and moments of crew, fuel and payload, permissible CG limitations etc. Two sample loadings have been made for a high density passenger version and for a freight version using the weight and moment charts.

It is appreciated that for operational use this method though accurate is tedious, and loading trim sheets have been devised to speed the process of checking the loading. The same sample loadings are also shown on the trim sheets. Pads of these trim sheets will be included with the Weight and Balance Handbook.

DHC-6—TWIN OTTER
WEIGHT & BALANCE LOADING MANIFEST

SERIAL NO:	REGISTRATION NO:	LOADING COMPUTED BY:
511	HB-LOM	MICHAEL MOORE

FLIGHT NO:	FROM / TO	PILOT'S SIGNATURE:	DATE:
RED-07	FROM LUENA TO KUITO	M. MOORE	MAR 29, 1991

LIMITATIONS: FOR WEIGHT & CG LIMITS SEE HANDBOOK

REF	ITEM		WEIGHT LB	MOMENT / 100 LB IN.	
1	BASIC AIRPLANE (from Wt. Change Record)		6850	14728	
2	Crew No. 2		340	324	
3	OPERATIONAL WEIGHT EMPTY		7190	15052	
4	Fuel in Fwd Tank		500	875	
5	Fuel in Aft Tank		500	1124	
6	GROSS WEIGHT LESS PAYLOAD		8190	17051	
7	Passengers Row 1	3	495	669	
8	Passengers Row 2	3	495	816	
9	Passengers Row 3	3	495	966	
10	Passengers Row 4	3	495	1113	
11	Passengers Row 5	3	495	1263	
12	Passengers Row 6	2	330	930	
13	Passengers Row 7	3	495	1584	
14					
15					
16					
17	Fwd Baggage Compartment		300	75	
18	Aft Baggage Compartment		500	1770	
19	Cargo Compartment C-1				
20	Cargo Compartment C-2				
21	Cargo Compartment C-3				
22	Cargo Compartment C-4				
23	Cargo Compartment C-5				
24	Cargo Compartment C-6				
25	Cargo Compartment C-7				
26	Cargo Compartment C-8				
27	Cargo Compartment C-9				
28	Cargo Compartment C-10				
29	Cargo Compartment C-11				
30	GROSS WEIGHT AT ENG. START-UP		12290	26237	
31	Fuel Consumed Warm-Up & Taxi				
32	GROSS WEIGHT AT TAKE-OFF		12290	26237	
33	Position of CG at Take-Off in % MAC		32.4%		
34	Fuel Consumed During Flight		400	802	
35	ESTIMATED LANDING CONDITION		11890	25435	
36	Position of CG at Landing in % MAC		32.9%		

SAMPLE

Figure 6-1

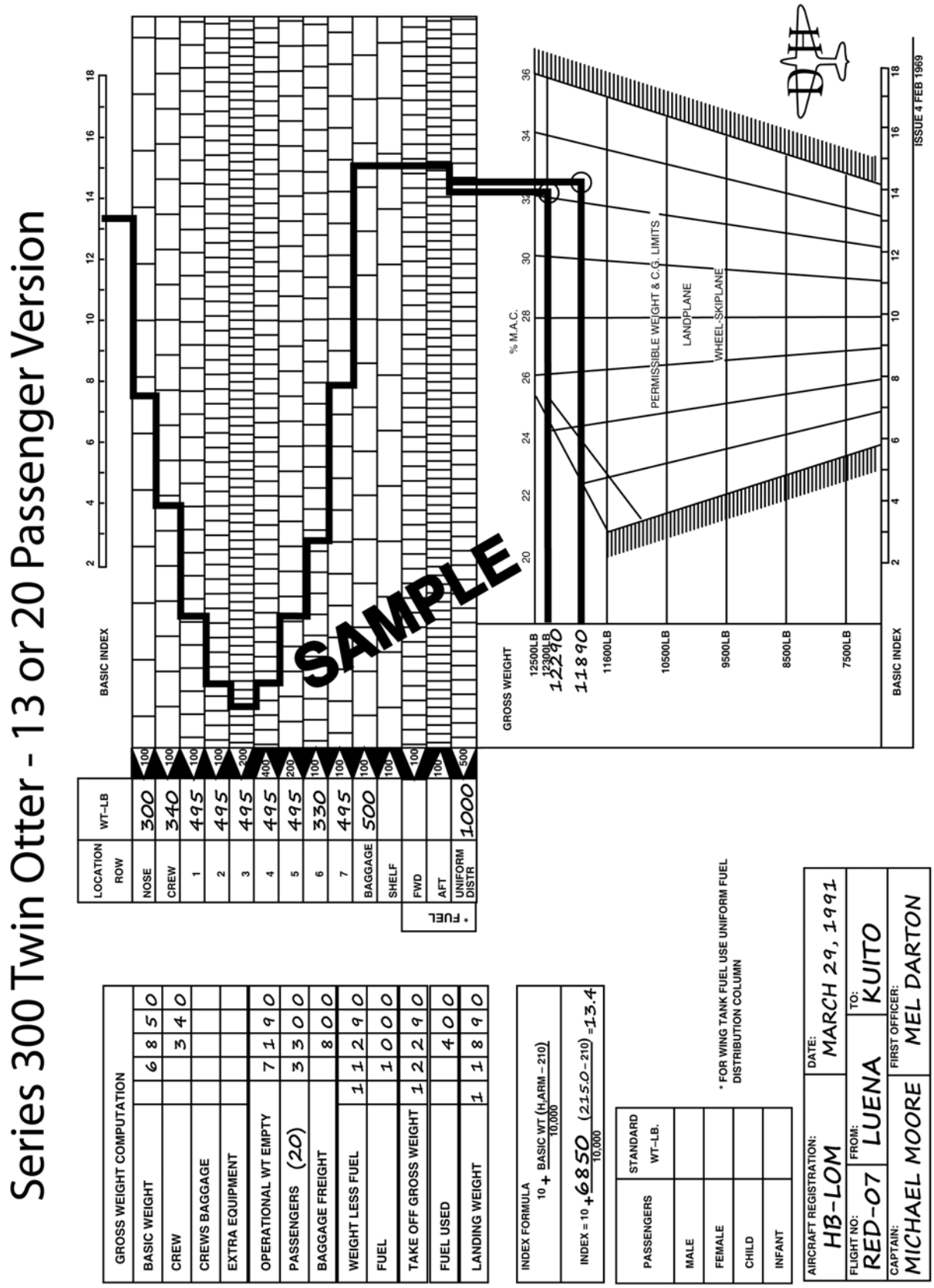

Series 300 Twin Otter - 13 or 20 Passenger Version
SAMPLE
BASIC INDEX
LOCATION
ROW
WT-LB
NOSE 300
CREW 340
1 495
2 495
3 495
4 495
5 495
6 330
7 495
BAGGAGE 500
SHELF
FWD
AFT
UNIFORM DISTR 1000
* FUEL
GROSS WEIGHT COMPUTATION
BASIC WEIGHT 6850
CREW 340
CREWS BAGGAGE
EXTRA EQUIPMENT
OPERATIONAL WT EMPTY 7190
PASSENGERS (20) 3300
BAGGAGE FREIGHT 800
WEIGHT LESS FUEL 11290
FUEL 1000
TAKE OFF GROSS WEIGHT 12290
FUEL USED 400
LANDING WEIGHT 11890
INDEX FORMULA
10 + BASIC WT (H.ARM - 210) / 10,000
INDEX = 10 + 6850 (2150-210) / 10,000 = 13.4
PASSENGERS
STANDARD WT-LB.
MALE
FEMALE
CHILD
INFANT
* FOR WING TANK FUEL USE UNIFORM FUEL DISTRIBUTION COLUMN
AIRCRAFT REGISTRATION: HB-LOM
DATE: MARCH 29, 1991
FLIGHT NO: RED-07
FROM: LUENA
TO: KUITO
CAPTAIN: MICHAEL MOORE
FIRST OFFICER: MEL DARTON
% M.A.C.
GROSS WEIGHT
12500LB
12300LB
12290
11890
11600LB
10500LB
9500LB
8500LB
7500LB
PERMISSIBLE WEIGHT & C.G. LIMITS
LANDPLANE
WHEEL-SKIPLANE
BASIC INDEX
ISSUE 4 FEB 1969

Figure 6-2

DHC-6—TWIN OTTER
WEIGHT & BALANCE LOADING MANIFEST

SERIAL NO:	REGISTRATION NO:	LOADING COMPUTED BY:
844	C-FDHC	MICHAEL MOORE

FLIGHT NO:	FROM / TO	PILOT'S SIGNATURE:	DATE:
567	FROM DOWNSVIEW TO BUTTONVILLE	JAY MAGUIRE	MAR 1, 2009

LIMITATIONS: FOR WEIGHT & CG LIMITS SEE HANDBOOK

REF	ITEM	WEIGHT LB	MOMENT / 100 LB IN.	
1	BASIC AIRPLANE (from Wt. Change Record)	6500	13975	
2	Crew No. (2)	340	324	
3	OPERATIONAL WEIGHT EMPTY	6840	14299	
4	Fuel in Fwd Tank } FULL	2457	4985	
5	Fuel in Aft Tank }			
6	GROSS WEIGHT LESS PAYLOAD	9297	19284	
7	Passengers Row 1			
8	Passengers Row 2			
9	Passengers Row 3			
10	Passengers Row 4			
11	Passengers Row 5			
12	Passengers Row 6			
13	Passengers Row 7			
14				
15				
16				
17	Fwd Baggage Compartment	250	63	
18	Aft Baggage Compartment	500	1770	
19	Cargo Compartment C-1			
20	Cargo Compartment C-2	200	244	
21	Cargo Compartment C-3	353	572	
22	Cargo Compartment C-4	250	455	
23	Cargo Compartment C-5	400	808	
24	Cargo Compartment C-6	400	888	
25	Cargo Compartment C-7	350	847	
26	Cargo Compartment C-8	300	786	
27	Cargo Compartment C-9	200	564	
28	Cargo Compartment C-10			
29	Cargo Compartment C-11			
30	GROSS WEIGHT AT ENG. START-UP	12500	26281	
31	Fuel Consumed Warm-Up & Taxi			
32	GROSS WEIGHT AT TAKE-OFF	12500	26281	
33	Position of CG at Take-Off in % MAC	28.2%		
34	Fuel Consumed During Flight	1500	3007	
35	ESTIMATED LANDING CONDITION	11000	23274	
36	Position of CG at Landing in % MAC	29.9%		

SAMPLE

Figure 6-3

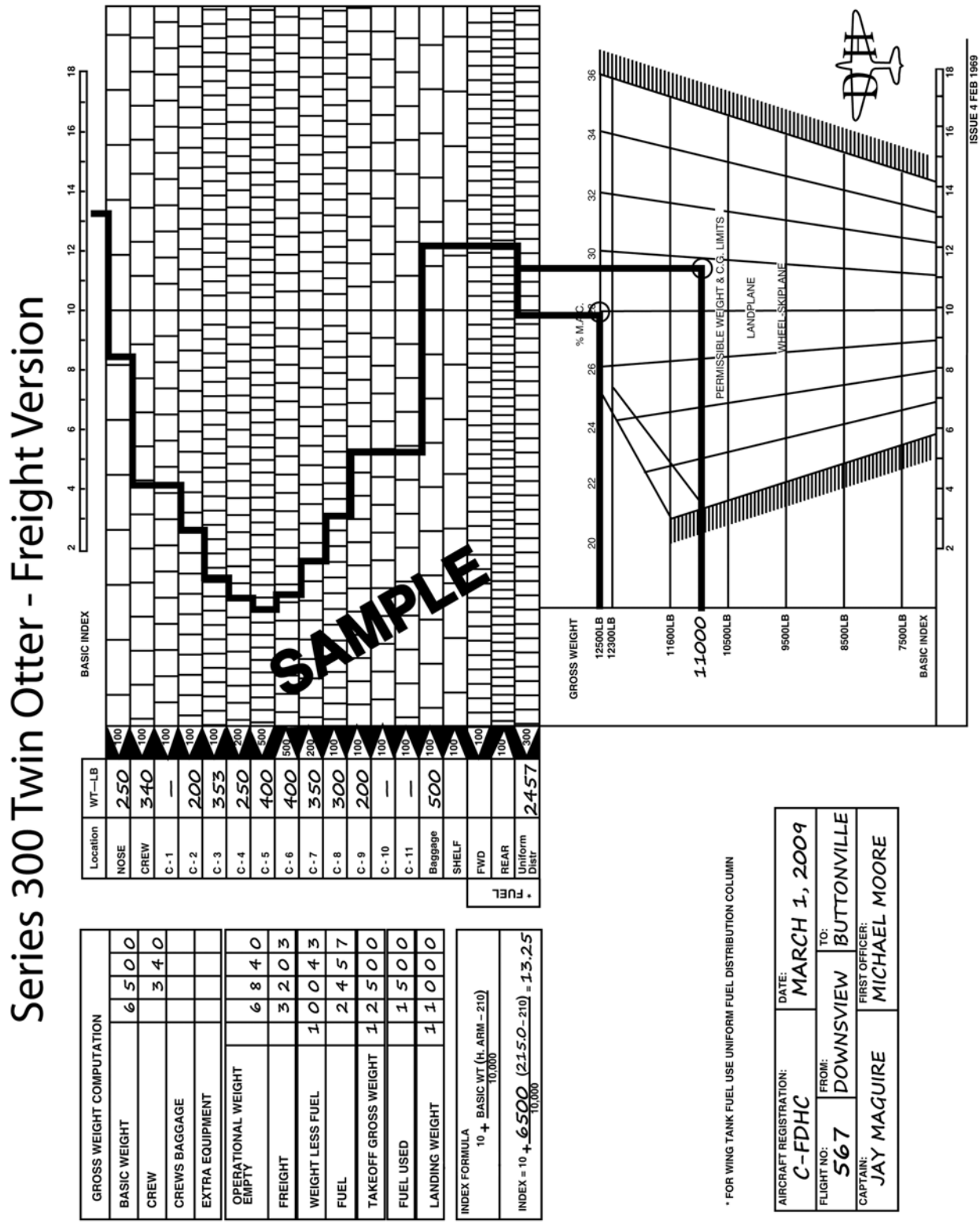

Series 300 Twin Otter - Freight Version
SAMPLE
BASIC INDEX
GROSS WEIGHT COMPUTATION
BASIC WEIGHT 6500
CREW 340
CREWS BAGGAGE
EXTRA EQUIPMENT
OPERATIONAL WEIGHT EMPTY 6840
FREIGHT 3203
WEIGHT LESS FUEL 10043
FUEL 2457
TAKEOFF GROSS WEIGHT 12500
FUEL USED 1500
LANDING WEIGHT 11000
INDEX FORMULA
INDEX = 10 + BASIC WT (H. ARM – 210) / 10,000
INDEX = 10 + 6500 (215.0 – 210) / 10,000 = 13.25
Location WT—LB
NOSE 250
CREW 340
C-1 —
C-2 200
C-3 353
C-4 250
C-5 400
C-6 400
C-7 350
C-8 300
C-9 200
C-10 —
C-11 —
Baggage 500
SHELF
FUEL FWD
REAR
Uniform Distr
2457
% M.A.C.
GROSS WEIGHT
12500LB
12300LB
11600LB
11000
10500LB
9500LB
8500LB
7500LB
BASIC INDEX
PERMISSIBLE WEIGHT & C.G. LIMITS
LANDPLANE
WHEEL-SKIPLANE
* FOR WING TANK FUEL USE UNIFORM FUEL DISTRIBUTION COLUMN
AIRCRAFT REGISTRATION: C-FDHC
DATE: MARCH 1, 2009
FLIGHT NO: 567
FROM: DOWNSVIEW
TO: BUTTONVILLE
CAPTAIN: JAY MAGUIRE
FIRST OFFICER: MICHAEL MOORE
ISSUE 4 FEB 1969

Figure 6-4

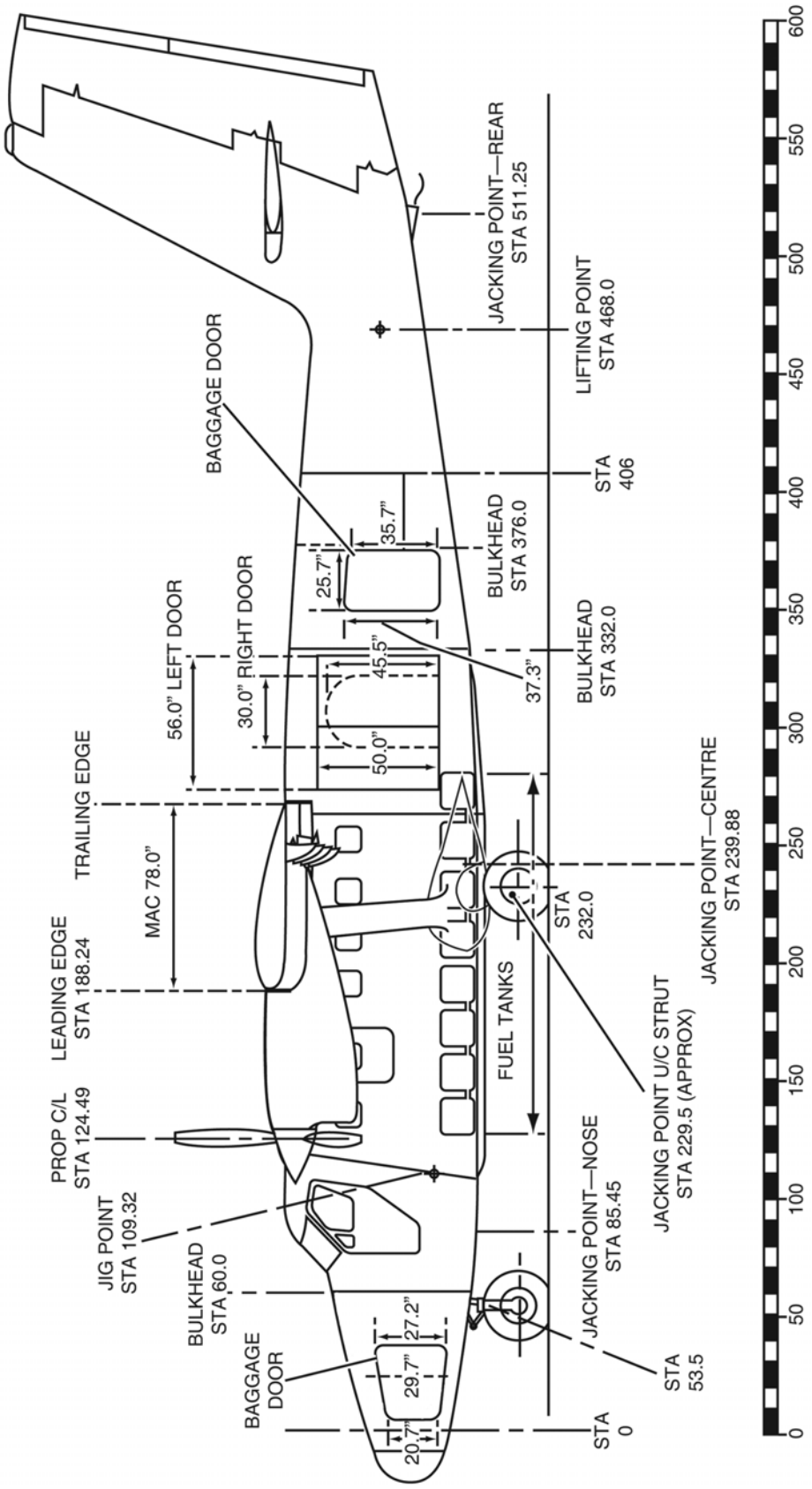


Figure 6-5 Balance Diagram

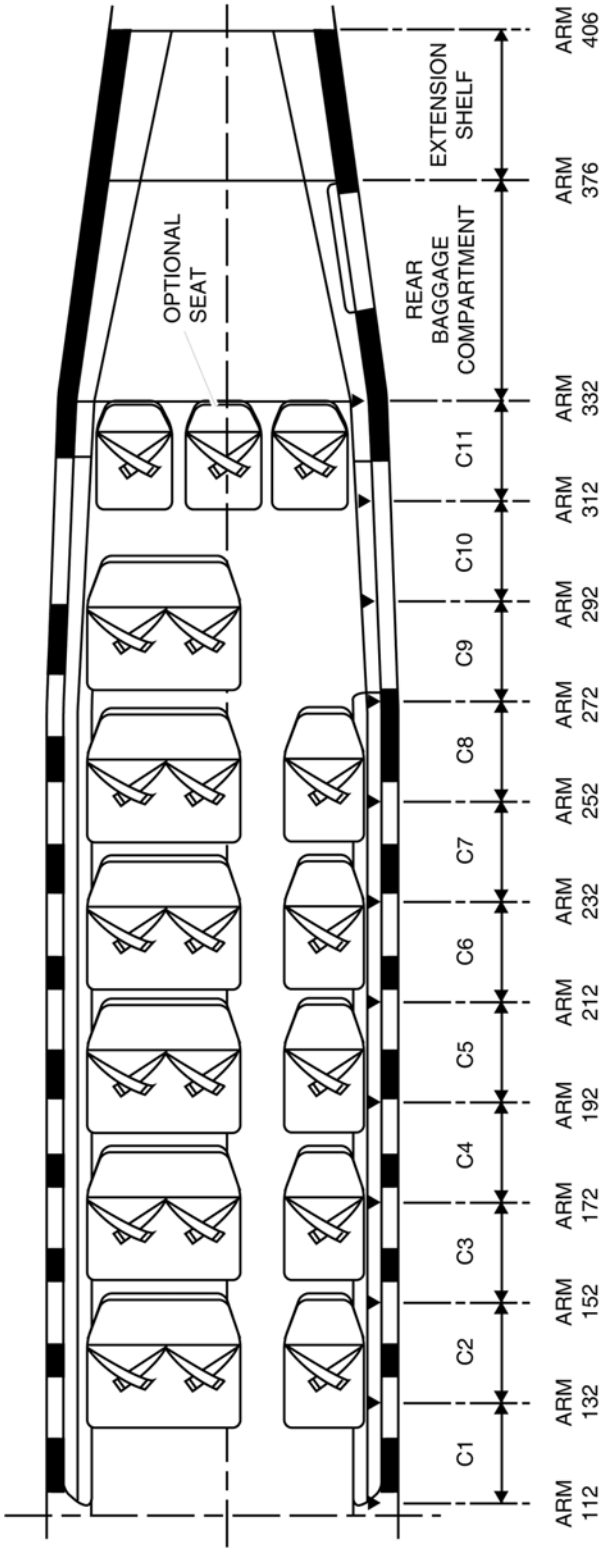


Figure 6-6 Cargo compartment & Standard Seating — 20 Passengers

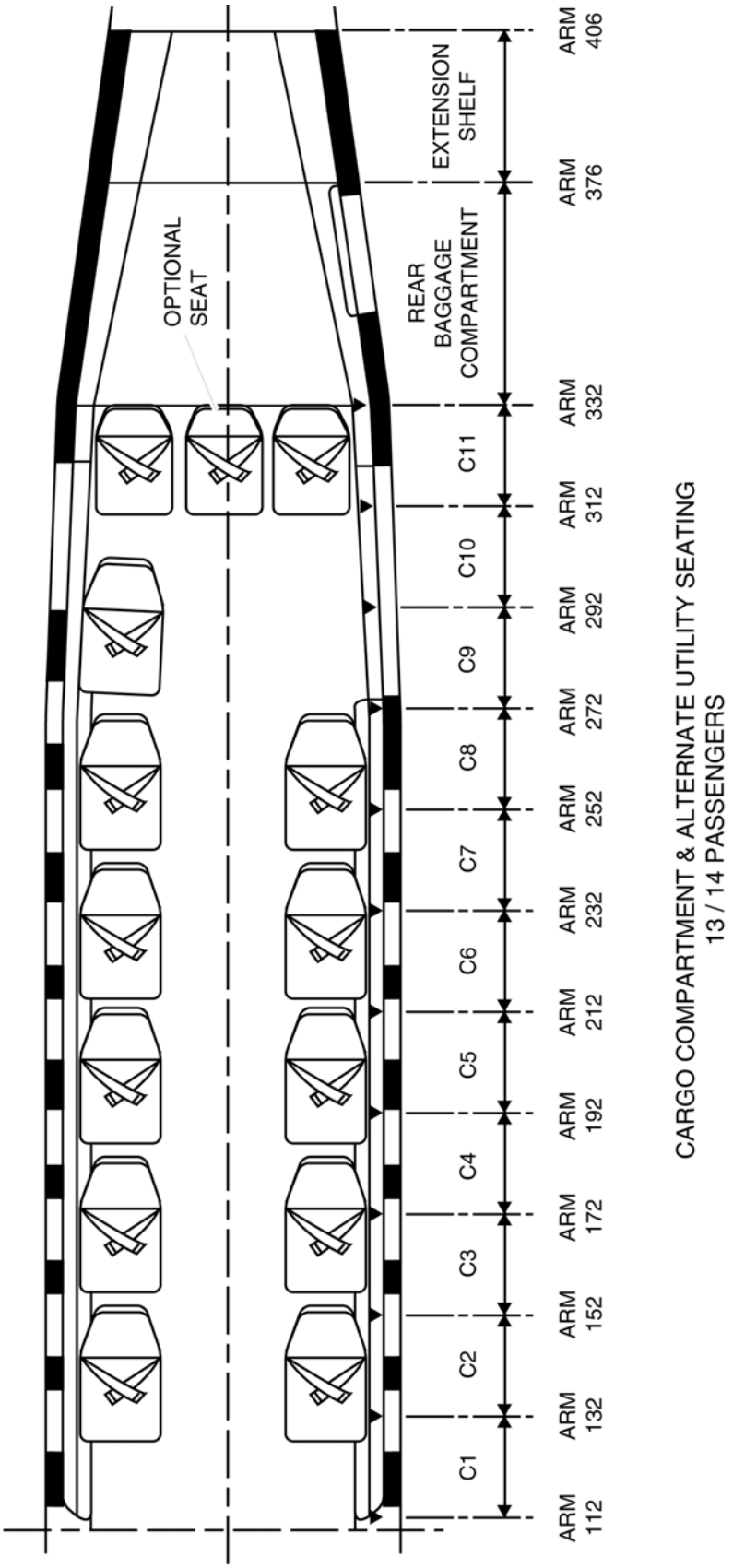


Figure 6-7 Cargo Compartment & Alternate Utility Seating — 13/14 Passengers

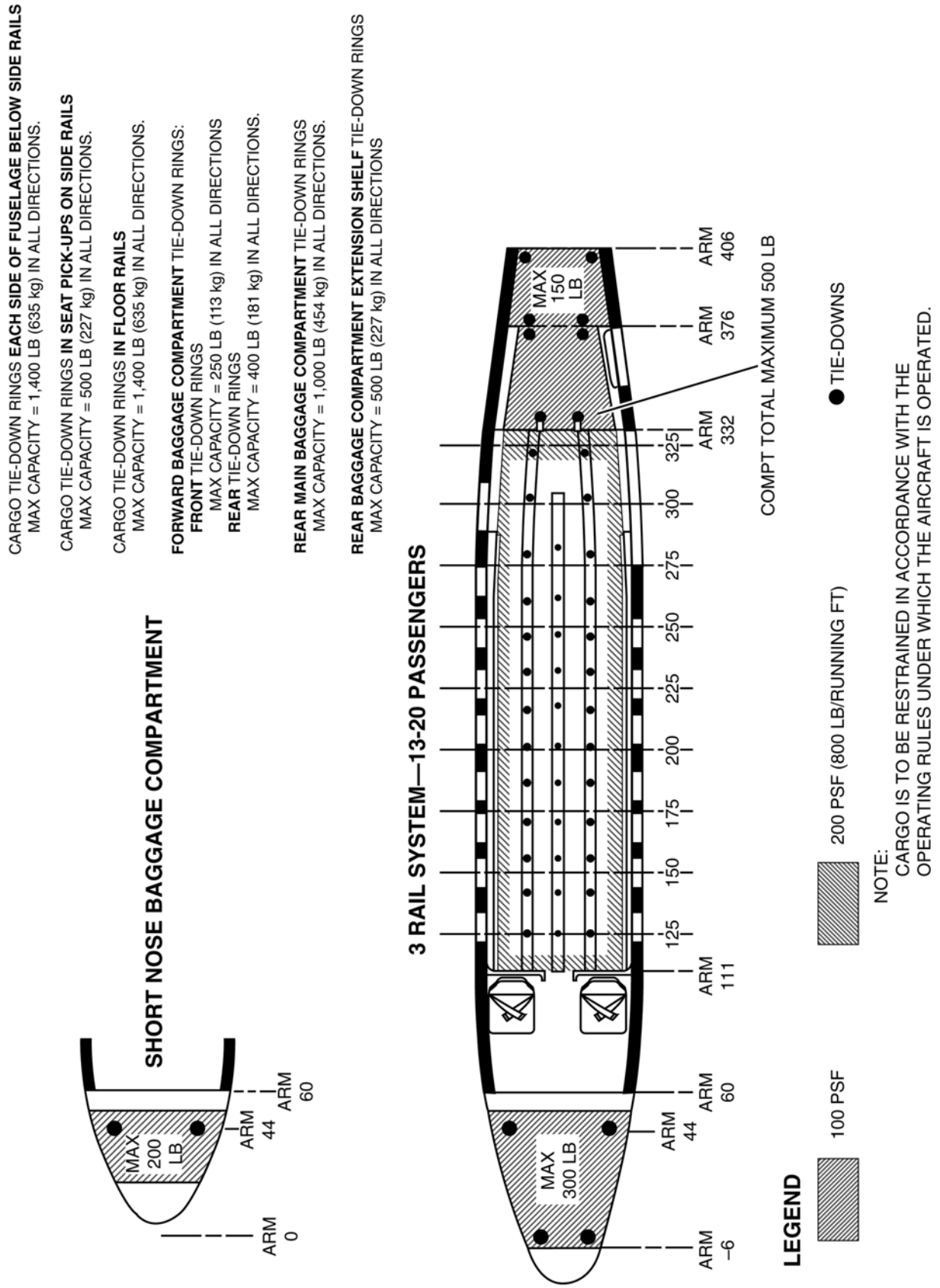


Figure 6-8 Floor Loading and Tie-down Locations (Sheet 1 of 3)

TIE-DOWN DATA FLOOR RAILS WITHOUT DOUGLAS TRACK MAX CAPACITY = 1,400 LB IN ALL DIRECTIONS			
LOCATIONS			
3 RAIL SYSTEM 13-20 PASSENGERS			
LH CENTER AND RH	**LH AND RH**		
ARM 126.78 ARM 141.68 ARM 156.78 ARM 171.68 ARM 186.78 ARM 201.68 ARM 216.78 ARM 231.68 ARM 245.82 ARM 260.72 ARM 280.62	ARM 301.19 ARM 321.98		
CABIN SIDE RAILS WITHOUT DOUGLAS TRACK			
TIE-DOWN RING C6FF1872 WITH FITTING C6FS2551 IN FUSELAGE SIDE FRAMES MAX CAPACITY = 1,400 LB IN ALL DIRECTIONS	TIE-DOWN RING C6FF1872 IN SEAT PICK-UPS. MAX CAPACITY = 500 LB IN ALL DIRECTIONS. MIN PITCH = 14.0 IN.		
LOCATIONS LH AND RH SIDES	**LH AND RH SIDES**	**LH SIDE**	**RH SIDE**
ARM 143.45 ARM 161.85 ARM 180.25 ARM 200.15 ARM 219.0 ARM 261.5	ARM 125.28 ARM 126.78 ARM 140.18 ARM 141.68 ARM 155.28 ARM 156.78 ARM 170.18 ARM 171.68 ARM 185.28 ARM 186.78 ARM 200.18 ARM 201.68 ARM 215.28 ARM 216.78 ARM 230.18 ARM 231.68	ARM 244.32 ARM 245.82 ARM 259.22 ARM 260.72	ARM 242.28 ARM 244.32 ARM 245.82 ARM 256.21 ARM 259.22 ARM 260.72 ARM 271.64 ARM 273.14 ARM 275.18 ARM 286.54 ARM 288.04 ARM 289.10

Figure 6-8 Floor Loading and Tie-down Locations (Sheet 2 of 3)

TIE-DOWN DATA FLOOR AND CABIN SIDE RAILS—WITH DOUGLAS TRACK INSTALLED
FLOOR USING COMMERCIAL SUPPLIED RINGS—MAX CAPACITY = 2,000 LB IN ALL DIRECTIONS, RINGS NOT LESS THAN 20 IN. APART
SIDE RAILS USING COMMERCIALLY SUPPLIED RINGS—MAX CAPACITY = 500 LB IN ALL DIRECTIONS, RINGS NOT LESS THAN 20 IN. APART

BULKHEAD ARM 332—FORWARD FACE (SEATS NOT INSTALLED)	
UTILITY VERSION (DOORWAY IN BULKHEAD)	**COMMUTER VERSION (SEAT BEAM INSTALLED)**
OUTBOARD SEAT BELT TIE-DOWNS (2) MAX CAPACITY = 1,000 LB EACH—SIDE LOADS PROHIBITED.	ANY COMBINATION OF UP TO 6 RINGS MAY BE INSTALLED. MAX CAPACITY = 1,000 LB EACH IN ALL DIRECTIONS.
INBOARD SEAT BELT TIE-DOWNS (2) MAX CAPACITY = 1,400 LB EACH IN ALL DIRECTIONS.	

FORWARD BAGGAGE COMPARTMENT MAX CAPACITY IN ALL DIRECTIONS	
LH AND RH SIDE	
ARM –6.0 ARM 44.0	250 LB 400 LB

AFT BAGGAGE COMPARTMENT.
(ARM 332.0 TO ARM 376.0 FWD) MAX CAPACITY = 1,000 LB IN ALL DIRECTIONS
ARM = 332.0 ARM = 376.0 FWD

SPECIAL ORDER SHORT NOSE ONLY FWD BAGGAGE COMPARTMENT MAX CAPACITY = 500 LB IN ALL DIRECTIONS	
LH SIDE	**RH SIDE**
ARM 23.65 ARM 50.9	ARM 23.65 ARM 41.85

BAGGAGE COMPARTMENT EXTENSION
MAX CAPACITY = 500 LB IN ALL DIRECTIONS
ARM = 376.0 AFT ARM = 406.0

NOTE:

In cases where Douglas Track is installed which also allows access to the fixed tie-down positions, the use of both Douglas Track tie-downs and the fixed tie-down positions is not allowed simultaneously unless correct spacing is adhered to.

Figure 6-8 Floor Loading and Tie-down Locations (Sheet 3 of 3)

PERSONNEL TABLE - 20 PASSENGER COMMUTER SEATING				
POSITION		**WT— LB***	**ARM—IN.**	**MOMENT LB IN.* / 100**
CREW'S SEATS				
PILOT		170	95	162
COPILOT		170	95	162
FWD-FACING PASSENGER'S SEATS				
ROW 1	LEFT	165	135	223
	RIGHT	165	135	223
	RIGHT	165	135	223
ROW 2	LEFT	165	165	272
	RIGHT	165	165	272
	RIGHT	165	165	272
ROW 3	LEFT	165	195	322
	RIGHT	165	195	322
	RIGHT	165	195	322
ROW 4	LEFT	165	225	371
	RIGHT	165	225	371
	RIGHT	165	225	371
ROW 5	LEFT	165	254	419
	RIGHT	165	254	419
	RIGHT	165	254	419
ROW 6	RIGHT	165	281	464
	RIGHT	165	281	464
REAR-MOUNTED SEATS	LEFT	165	320	528
	CENTER	165	320	528
	RIGHT	165	320	528

*Above figures should be re-evaluated if the personnel to be on board vary appreciably from the standard 165 lb.
**Passenger weights shown are airlines average male.

Figure 6-9 Personal Table – Commuter – 20 Passengers

PERSONNEL TABLE - 13 OR 20 PASSENGER UTILITY SEATING				
POSITION		**WT— LB**	**ARM—IN.**	**MOMENT LB IN.* / 100**
CREW'S SEATS				
PILOT		170	95	162
COPILOT		170	95	162
FWD-FACING PASSENGER'S SEATS				
ROW 1	LEFT	165	135	223
	RIGHT	165	135	223
	RIGHT	165	135	223
ROW 2	LEFT	165	165	272
	RIGHT	165	165	272
	RIGHT	165	165	272
ROW 3	LEFT	165	195	322
	RIGHT	165	195	322
	RIGHT	165	195	322
ROW 4	LEFT	165	225	371
	RIGHT	165	225	371
	RIGHT	165	225	371
ROW 5	LEFT	165	254	419
	RIGHT	165	254	419
	RIGHT	165	254	419
ROW 6	RIGHT	165	281	464
	RIGHT	165	281	464
ROW 7	LEFT	165	322	531
	RIGHT	165	322	531
	CENTER	165	322	531

*Above figures should be re-evaluated if the personnel to be on board vary appreciably from the standard 165 lb.
**Passenger weights shown are airlines average male.

Figure 6-10 Personnel Table – Utility – 13 to 20 Passengers

BAGGAGE COMPARTMENT TABLE				
	MOMENT/100 LB IN.			
BAGGAGE WT— LB	S.O.O FORWARD COMPT SHORT NOSE H. ARM = 41.0 IN.	FORWARD COMPT LONG NOSE H. ARM = 25.0 IN.	REAR COMPT H. ARM = 354.0 IN.	EXTENSION SHELF H. ARM = 391.0 IN.
25	10	6	89	98
50	21	13	177	196
75	31	19	266	293
100	41	25	354	391
125	51	31	443	489
150	62	38	531	587
175	72	44	620	
200	82	50	702	
225		56	797	
250		63	885	
275		69	974	
300		75	1062	
325			1151	
350			1239	
375			1328	
400			1416	
425			1505	
450			1593	
475			1682	
500			1770	

Weight limitations for both front and rear baggage compartments vary dependent upon installations of avionics, oxygen systems, etc. For limitations of individual aircraft, see labels permanently installed in the baggage compartments.

ANY MODIFICATION AFT OF STA. 332 REQUIRING WEIGHT AND BALANCE CHANGES WILL AFFECT THE REAR FUSELAGE STRENGTH. THIS MAY REQUIRE A CHANGE TO THE REAR BAGGAGE COMPARTMENT WEIGHT LIMITATIONS. THEREFORE VIKING AIR LTD. MUST BE INFORMED OF THESE MODIFICATIONS SO THAT THE WEIGHT LIMIT LABEL CAN BE RE-EVALUATED

Figure 6-11 Baggage Compartment Table

CARGO COMPARTMENT FREIGHT TABLE						
CARGO WEIGHT—LB	MOMENT/100 LB IN.					
	COMPT C1 ARM 122 IN.	COMPT C2 ARM 142 IN.	COMPT C3 ARM 162 IN.	COMPT C4 ARM 182 IN.	COMPT C5 ARM 202 IN.	COMPT C6 ARM 222 IN.
100	122	142	162	182	202	222
200	244	248	324	364	404	444
300	366	426	486	546	606	666
400	488	568	648	728	808	888
500	610	710	810	910	1,010	1,110
600	732	852	972	1,092	1,212	1,332
700	854	994	1,134	1,274	1,414	1,554
800	976	1,136	1,296	1,456	1,616	1,776
900	1,098	1,278	1,458	1,638	1,818	1,998
1,000	1,220	1,420	1,620	1,820	2,020	2,220
1,100	1,342	1,562	1,782	2,002	2,222	2,442
1,200	1,464	1,704	1,944	2,184	2,424	2,664
1,333 MAX	1,626	1,892	2,158	2,424	2,690	2,958
	COMPT C7 ARM 242 IN.	COMPT C8 ARM 262 IN.	COMPT C9 ARM 282 IN.	COMPT C10 ARM 302 IN.	COMPT C11 ARM 322 IN.	
100	242	262	282	302	322	
200	484	524	564	604	644	
300	726	786	846	906	966	
400	968	1,048	1,128	1,208	1,288	
500	1,210	1,310	1,410	1,510	1,610	
600	1,452	1,572	1,692	1,812	1,932	
700	1,694	1,834	1,974	2,114	2,254	
800	1,936	2,096	2,256	2,416	2,576	
900	2,178	2,358	2,538	2,718	2,898	
1,000	2,420	2,620	2,820	3,020	3,220	
1,100	2,662	2,882	3,102	3,322	3,542	
1,200	2,904	3,144	3,384	3,624	3,864	
1,333 MAX	3,224	3,490	3,756	4,022	4,290	

Figure 6-12 Cargo Compartment Freight Table

USABLE FUEL TABLE

NORMAL OPERATION—FRONT AND REAR TANKS COMBINED ARM = *200.5 **202.9

U.S. GAL	IMP GAL	WT— LB	MOMENT LB IN. / 100	U.S. GAL	IMP GAL	WT— LB	MOMENT LB IN. / 100
14.6	12.2	100	201 *	190.2	158.5	1,300	2,606 *
29.3	24.4	200	401	204.8	170.7	1,400	2,807
43.9	36.6	300	602	219.5	182.9	1,500	3,007
58.6	48.8	400	802	234.1	195.1	1,600	3,208
73.2	61.0	500	1,002	248.8	207.3	1,700	3,409
87.8	73.2	600	1,203	263.4	219.5	1,800	3,609
102.5	85.4	700	1,404	278.0	231.7	1,900	3,810
117.1	97.6	800	1,604	292.7	243.9	2,000	4,010
131.8	109.8	900	1,805	307.3	256.1	2,100	4,210
146.4	122.0	1,000	2,005	322.0	268.3	2,200	4,411
160.9	134.1	1,100	2,206	336.6	280.5	2,300	4,611 *
175.6	146.3	1,200	2,406 *	346.2	288.5	2,366	4,744 ***
				362.2	301.8	2,475	4,962 *
				378.0	315.0	2,583	5,241 **
FRONT TANK				**REAR TANK**			
14.6	12.2	100	191	14.6	12.2	100	210
29.3	24.4	200	381	29.3	24.2	200	419
43.9	36.6	300	570	43.9	36.6	300	629
58.6	48.8	400	723	58.6	48.8	400	874
73.2	61.0	500	875	73.2	61.0	500	1,124
87.8	73.2	600	1,028	87.8	73.2	600	1,376
102.5	85.4	700	1,182	102.5	85.4	700	1,625
117.1	97.6	800	1,334	117.1	97.6	800	1,874
131.8	109.8	900	1,489	131.8	109.8	900	2,123
146.4	122.0	1,000	1,642	146.4	122.0	1,000	2,373
160.9	134.1	1,100	1,795	160.9	134.1	1,100	2,621
169.2	141.0	1,156	1,866***	175.6	146.3	1,200	2,872
175.6	146.3	1,200	1,952	177.0	147.5	1,210	2,895 ***
181.2	151.0	1,238	2,011	196.8	164.0	1,345	3,228

JP-1 FUEL = 8.2 LB/IMP GAL 1 IMP GAL = 1.2 U.S. GAL

CONVERSION FACTORS:
JP-4 FUEL (7.8 LB/IMP GAL) MULTIPLY $\frac{\text{MOMENT}}{100}$ BY 0.95
JP-5 FUEL (8.3 LB/IMP GAL) MULTIPLY $\frac{\text{MOMENT}}{100}$ BY 1.01
AVGAS (7.2 LB/IMP GAL) MULTIPLY $\frac{\text{MOMENT}}{100}$ BY 0.88

} VALUES QUOTED ARE AVERAGES AT 15.5°C (60°F)

NOTE:

* This fuel CG position is true for equal weights of fuel in each tank.

** With full tanks the fuel CG is at Arm 202.9. It is recommended that, once cruise conditions have been achieved, fuel levels in the front and rear tanks be equalized by crossfeeding.

*** Maximum capacity with pressure refueling method: If normal full capacity is required, tank must be topped up using gravity fillers.

Figure 6-13 Usable Fuel Table

WING LONG RANGE FUEL TANKS							
LEFT WING				RIGHT WING			
IMP GAL	U.S. GAL	WT— LB	MOMENT LB IN. / 100	IMP GAL	U.S. GAL	WT— LB	MOMENT LB IN. / 100
10	12.0	82	167	10	12.0	82	167
20	24.0	164	333	20	24.0	164	333
30	36.0	246	500	30	36.0	246	500
37	44.4	303.4	617	37	44.4	303.4	617

Figure 6-14 Wing Long Range Fuel Table

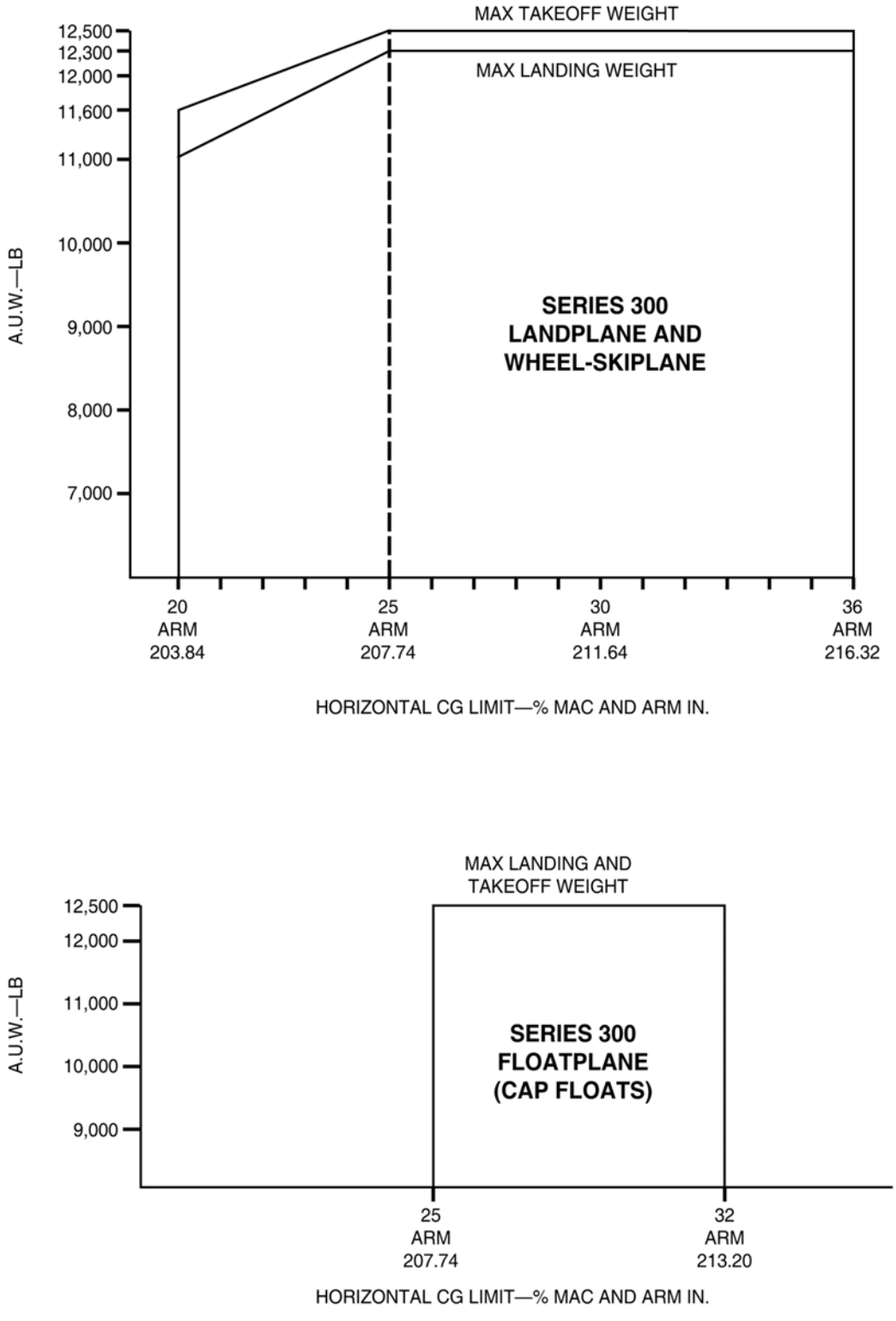


Figure 6-15 Center of Gravity Limits - Landplane, Wheel-skiplane and Floatplane

SAFE MOMENTS TABLE

GROSS WEIGHT LB	LANDPLANE AND WHEEL-SKIPLANE MOMENT/100 LB IN.		GROSS WEIGHT LB	LANDPLANE AND WHEEL-SKIPLANE MOMENT/100 LB IN.		
	FWD CG LIMIT	AFT CG LIMIT		FWD CG LIMIT		AFT CG LIMIT
				TAKE-OFF	LAND	
7,000	14,269	15,142	10,000	20,384		21,632
7,100	14,473	15,359	10,100	20,588		21,848
7,200	14,676	15,575	10,200	20,792		22,065
7,300	14,880	15,791	10,300	20,996		22,281
7,400	15,084	16,008	10,400	21,199		22,497
7,500	15,288	16,224	10,500	21,403		22,714
7,600	15,492	16,440	10,600	21,607		22,930
7,700	15,696	16,656	10,700	21,811		23,146
7,800	15,900	16,873	10,800	22,015		23,363
7,900	16,103	17,089	10,900	22,219		23,579
8,000	16,307	17,306	11,000	22,422		23,795
8,100	16,511	17,522				
8,200	16,715	17,738				
8,300	16,919	17,954				
8,400	17,123	18,170				
8,500	17,326	18,387	11,100	22,626	22,655	24,012
8,600	17,530	18,604	11,200	22,830	22,859	24,228
8,700	17,734	18,820	11,300	23,034	23,122	24,444
8,800	17,938	19,036	11,400	23,238	23,356	24,660
8,900	18,142	19,252	11,500	23,442	23,591	24,877
9,000	18,346	19,469	11,600	23,645	23,826	25,093
9,100	18,549	19,685	11,700	23,900	24,062	25,309
9,200	18,753	19,901	11,800	24,155	24,299	25,526
9,300	18,957	20,118	11,900	24,412	24,535	25,742
9,400	19,161	20,334	12,000	24,668	24,773	25,958
9,500	19,365	20,550	12,100	24,926	25,011	26,174
9,600	19,569	20,767	12,200	25,186	25,249	26,391
9,700	19,772	20,983	12,300*	25,445	25,488	26,607
9,800	19,976	21,199	12,400	25,705		26,824
9,900	20,180	21,416	12,500	25,968		27,040

*MAXIMUM LANDING WEIGHT

Figure 6-16 Safe Moments Table – Landplane and Wheel-skiplane

SAFE MOMENTS TABLE - FLOATPLANE					
GROSS WEIGHT LB	MOMENT/100 LB IN.		GROSS WEIGHT LB	MOMENT/100 LB IN.	
	25% MAC H. ARM 207.74 IN.	32% MAC H. ARM 213.2 IN.		25% MAC H. ARM 207.74 IN.	32% MAC H. ARM 213.2 IN.
7,000	14,542	14,924	10,000	20,774	21,320
7,100	14,750	15,137	10,100	20,982	21,533
7,200	14,957	15,350	10,200	21,189	21,746
7,300	15,165	15,564	10,300	21,397	21,960
7,400	15,373	15,777	10,400	21,605	22,173
7,500	15,581	15,990	10,500	21,813	22,386
7,600	15,788	16,203	10,600	22,020	22,599
7,700	15,996	16,416	10,700	22,228	22,812
7,800	16,204	16,630	10,800	22,436	23,026
7,900	16,411	16,843	10,900	22,644	23,239
8,000	16,619	17,056	11,000	22,851	23,452
8,100	16,827	17,269	11,100	23,059	23,665
8,200	17,035	17,482	11,200	23,267	23,878
8,300	17,242	17,696	11,300	23,475	24,092
8,400	17,450	17,909	11,400	23,682	24,304
8,500	17,658	18,122	11,500	23,890	24,518
8,600	17,866	18,335	11,600	24,098	24,731
8,700	18,073	18,548	11,700	24,306	24,944
8,800	18,281	18,762	11,800	24,513	25,158
8,900	18,489	18,975	11,900	24,721	25,371
9,000	18,697	19,188	12,000	24,929	25,584
9,100	18,904	19,401	12,100	25,137	25,797
9,200	19,112	19,614	12,200	25,344	26,010
9,300	19,320	19,828	12,300	25,552	26,224
9,400	19,528	20,041	12,400	25,760	26,437
9,500	19,735	20,254	12,500	25,968	26,650
9,600	18,934	20,467			
9,700	20,151	20,680			
9,800	20,359	20,894			
9,900	20,566	21,107			

Figure 6-17 Safe Moments Table – Floatplane

SECTION 7

AIRCRAFT AND SYSTEMS DESCRIPTION

LIST OF EFFECTIVE PAGES

SECTION	PAGE	DATE	SECTION	PAGE	DATE
7	1	10 Sep. 2010		31	10 Sep. 2010
	2	10 Sep. 2010		32	10 Sep. 2010
	3	10 Sep. 2010		33	10 Sep. 2010
	4	10 Sep. 2010		34	10 Sep. 2010
	5	10 Sep. 2010		35	10 Sep. 2010
	6	10 Sep. 2010		36	10 Sep. 2010
	7	10 Sep. 2010		37	10 Sep. 2010
	8	10 Sep. 2010		38	10 Sep. 2010
	9	10 Sep. 2010		39	10 Sep. 2010
	10	10 Sep. 2010		40	10 Sep. 2010
	11	10 Sep. 2010		41	10 Sep. 2010
	12	10 Sep. 2010		42	10 Sep. 2010
	13	10 Sep. 2010		43	10 Sep. 2010
	14	10 Sep. 2010		44	10 Sep. 2010
	15	10 Sep. 2010		45	10 Sep. 2010
	16	10 Sep. 2010		46	10 Sep. 2010
	17	10 Sep. 2010		47	10 Sep. 2010
	18	10 Sep. 2010		48	10 Sep. 2010
	19	10 Sep. 2010		49	10 Sep. 2010
	20	10 Sep. 2010		50	10 Sep. 2010
	21	10 Sep. 2010		51	10 Sep. 2010
	22	10 Sep. 2010		52	10 Sep. 2010
	23	10 Sep. 2010		53	10 Sep. 2010
	24	10 Sep. 2010		54	10 Sep. 2010
	25	10 Sep. 2010		55	10 Sep. 2010
	26	10 Sep. 2010		56	10 Sep. 2010
	27	10 Sep. 2010		57	10 Sep. 2010
	28	10 Sep. 2010		58	10 Sep. 2010
	29	10 Sep. 2010		59	10 Sep. 2010
	30	10 Sep. 2010		60	10 Sep. 2010

SECTION	PAGE	DATE	SECTION	PAGE	DATE
	61	10 Sep. 2010		93	10 Sep. 2010
	62	10 Sep. 2010		94	10 Sep. 2010
	63	10 Sep. 2010		95	10 Sep. 2010
	64	10 Sep. 2010		96	10 Sep. 2010
	65	10 Sep. 2010		97	10 Sep. 2010
	66	10 Sep. 2010		98	10 Sep. 2010
	67	10 Sep. 2010		99	10 Sep. 2010
	68	10 Sep. 2010		100	10 Sep. 2010
	69	10 Sep. 2010		101	10 Sep. 2010
	70	10 Sep. 2010		102	10 Sep. 2010
	71	10 Sep. 2010		103	10 Sep. 2010
	72	10 Sep. 2010		104	10 Sep. 2010
	73	10 Sep. 2010		105	10 Sep. 2010
	74	10 Sep. 2010		106	10 Sep. 2010
	75	10 Sep. 2010		107	10 Sep. 2010
	76	10 Sep. 2010		108	10 Sep. 2010
	77	10 Sep. 2010		109	10 Sep. 2010
	78	10 Sep. 2010		110	10 Sep. 2010
	79	10 Sep. 2010		111	10 Sep. 2010
	80	10 Sep. 2010		112	10 Sep. 2010
	81	10 Sep. 2010		113	10 Sep. 2010
	82	10 Sep. 2010		114	10 Sep. 2010
	83	10 Sep. 2010		115	10 Sep. 2010
	84	10 Sep. 2010		116	10 Sep. 2010
	85	10 Sep. 2010		117	10 Sep. 2010
	86	10 Sep. 2010		118	10 Sep. 2010
	87	10 Sep. 2010		119	10 Sep. 2010
	88	10 Sep. 2010		120	10 Sep. 2010
	89	10 Sep. 2010		121	10 Sep. 2010
	90	10 Sep. 2010		122	10 Sep. 2010
	91	10 Sep. 2010		123	10 Sep. 2010
	92	10 Sep. 2010		124	10 Sep. 2010

SECTION	PAGE	DATE	SECTION	PAGE	DATE
	125	10 Sep. 2010		137	10 Sep. 2010
	126	10 Sep. 2010		138	10 Sep. 2010
	127	10 Sep. 2010		139	10 Sep. 2010
	128	10 Sep. 2010		140	10 Sep. 2010
	129	10 Sep. 2010		141	10 Sep. 2010
	130	10 Sep. 2010		142	10 Sep. 2010
	131	10 Sep. 2010		143	10 Sep. 2010
	132	10 Sep. 2010		144	10 Sep. 2010
	133	10 Sep. 2010		145	10 Sep. 2010
	134	10 Sep. 2010		146	10 Sep. 2010
	135	10 Sep. 2010		147	10 Sep. 2010
	136	10 Sep. 2010		148	10 Sep. 2010

TABLE OF CONTENTS **PAGE**

7.1 Dimensions **17**

7.2 Overview **19**

7.3 Structural **21**
7.3.1 Nose Section 23
7.3.2 Flight Compartment Section 23
7.3.3 Forward and Rear Cabin Sections 23
7.3.4 Rear Fuselage Section 26

7.4 Wings **27**
7.4.1 Wing Construction 27

7.5 Nacelles **28**
7.5.1 General 28
7.5.2 Cowlings 28
7.5.3 Air Intake Deflector 28
7.5.4 Engine Mounts 28
7.5.5 Firewalls and Fireseals 28
7.5.6 Drains 29

7.6 Empennage **30**
7.6.1 Horizontal Stabilizer 30
7.6.2 Elevator 30
7.6.3 Vertical Stabilizer 30
7.6.4 Rudder 30

7.7 Cabin **33**
7.7.1 Doors 33
7.7.1.1 Flight Compartment Doors 33
7.7.1.2 Cabin Doors 33
7.7.1.3 Cabin/Flight Compartment Interconnecting Door 36
7.7.1.4 Baggage Compartment Doors 36
7.7.1.5 Doors Unlocked Caution Light 36
7.7.2 Seating 37
7.7.2.1 Flight Compartment Seats 37
7.7.2.2 Passenger Seating Arrangement 38

TABLE OF CONTENTS **PAGE**

7.7.2.3 Passenger Seats 41
7.7.3 Cargo and Baggage Loading 41
7.7.3.1 Cargo Tie-Down Rings 43
7.7.3.2 Loading Jury Strut 43
7.7.4 Emergency Equipment 43
7.7.4.1 First Aid Kit 43
7.7.4.2 Portable Fire Extinguisher 43
7.7.4.3 Emergency Exits 43
7.7.5 Miscellaneous Cabin Equipment 43
7.7.5.1 Cabin Entrance Ladder 43
7.7.5.2 Toilet 44
7.7.5.3 Wardrobe 44

7.8 Electrical System 46
7.8.1 Battery 46
7.8.1.1 Battery Temperature Monitor 50
7.8.2 Auxiliary Battery 51
7.8.3 External Power Receptacle 51
7.8.4 DC Master Switch 51
7.8.5 External/Battery Switch 51
7.8.6 Bus Tie Switch 52
7.8.7 Starter-Generators 53
7.8.8 Generator Switches 53
7.8.9 Generator Caution Lights 53
7.8.10 Generator Overheat Caution Lights 53
7.8.11 DC Voltmeter 54
7.8.12 DC Loadmeter 54
7.8.12.1 Indicator Selector Switch 54
7.8.13 Inverters 54
7.8.13.1 Inverter Switch 55

7.9 Interior Lighting System 58
7.9.1 Flight Compartment Dome Light 58
7.9.2 Flight Compartment Utility Lights 58
7.9.3 Panel Lighting 58
7.9.3.1 Left Flight Instrument, Engine Instrument, and Emergency Panel Lights 58
7.9.3.2 Overhead Console and Trim Console Lights 58

TABLE OF CONTENTS **PAGE**

7.9.3.3 Right Flight Instrument and Radio Panel Lights 59
7.9.4 General Cabin Lights 59
7.9.5 Passenger Reading Lights 59
7.9.6 Entrance Lights 59
7.9.7 Cabin Signs 59
7.9.8 Forward Baggage Compartment Lights 60
7.9.9 Rear Baggage Compartment Lights 60
7.9.10 Emergency Lighting 60
7.9.10.1 Early Production Aircraft 60
7.9.10.2 Later Production Aircraft 60

7.10 Exterior Lighting System 62
7.10.1 Position Lights 62
7.10.2 Anti-Collision Lights 62
7.10.3 Landing Lights 62
7.10.4 Taxi Light 62
7.10.5 Wing Inspection Lights 63

7.11 Caution Light Panel 64
7.11.1 Caution Light Test and Intensity Switch 66
7.11.2 Stall Warning System 66

7.12 Fuel System 67
7.12.1 Fuel Tank Selector 67
7.12.2 Boost Pump Switches 67
7.12.3 Boost Pump Pressure Caution Lights 70
7.12.4 Standby Boost Pump Emergency Switches 72
7.12.5 Fuel Crossfeed 72
7.12.5.1 Fuel Crossfeed Valve Position Indicator 72
7.12.6 Fuel Quantity Measurement 72
7.12.7 Fuel Emergency Shut-off Switches 73
7.12.8 Fuel Low Level Caution Lights 73
7.12.9 Fuel Quantity Indicator Test Switch 73
7.12.10 Fuel Heaters 73
7.12.11 Fuel Control Sensor Tube Heaters 73
7.12.12 Wing Fuel Tanks 74
7.12.12.1 Wing Fuel Tank Control Panel 75
7.12.13 Ferry Fuel System 76

TABLE OF CONTENTS **PAGE**

7.13 Engines 79
7.13.1 Engine Wash System 79
7.13.2 Engine/Propeller Controls 80
7.13.2.1 Power Levers 80
7.13.2.2 Friction Control Knobs 81
7.13.2.3 Fuel Control System 81
7.13.2.4 Engine Fuel Levers 82
7.13.3 Ignition System 83
7.13.3.1 Glow Plug Ignition 83
7.13.3.2 Engine Igniter Switches (Glow Plug Ignition Only) 83
7.13.3.3 Spark Ignition 83
7.13.3.4 Ignition Switch 83
7.13.4 Starting System 84
7.13.4.1 Start Switch 84
7.13.4.2 Maintained-Contact Engine Start Switch 84
7.13.5 Oil System 85
7.13.5.1 Low Oil Pressure Caution Light 85
7.13.6 Engine Instruments 85
7.13.6.1 Oil Pressure Indicators 86
7.13.6.2 Torque Pressure Indicators 86
7.13.6.3 Oil Temperature Indicators 86
7.13.6.4 Propeller Tachometers 86
7.13.6.5 Turbine Temperature Indicators 86
7.13.6.6 Gas Generator Tachometers 87
7.13.6.7 Fuel Flow Indicators 87
7.13.6.8 Fuel Quantity Indicators 87

7.14 Propellers 88
7.14.1 Propeller Levers 88
7.14.2 Propeller Governor 89
7.14.3 Propeller Beta Range 90
7.14.4 Propeller Beta Back-Up System 91
7.14.4.1 Beta Range Indicator Lights 92
7.14.4.2 Beta Back-Up Disarmed Caution Light 92
7.14.4.3 Beta Back-Up Test Switch 92
7.14.4.4 Power Lever Operated Beta Back-Up Microswitch Test Switch and Light 92

TABLE OF CONTENTS **PAGE**

7.14.5 Reset Props Caution Light 93
7.14.6 Propeller Overspeed Governor 93
7.14.6.1 Propeller Overspeed Governor Test Switch 93
7.14.7 Propeller NF Governor 94
7.14.8 Propeller Autofeather System 94
7.14.8.1 Propeller Autofeather Switch 95
7.14.8.2 Propeller Autofeather Indicator 95
7.14.8.3 Propeller Autofeather Test Switch 95
7.14.9 Propeller Blade Latches 96
7.14.10 Propeller Synchronizer 96

7.15 Fire Detecting and Extinguishing Systems 97
7.15.1 Fire Detection System 98
7.15.2 Fire Extinguisher Operating Handles 100
7.15.3 Fire Extinguisher Indicating Discs 100
7.15.4 Fire Detection Test Switch 100
7.15.5 Fire Warning Bell Mute Switch 101
7.15.6 Hand-Operated Fire Extinguishers 101

7.16 Bleed Air and Pneumatic System 102
7.16.1 Bleed Air Switches 103
7.16.2 Pneumatic Low Pressure Caution Light 103
7.16.3 Bleed Air Temperature Control 103
7.16.3.1 Bleed Air Temperature Indicator 103

7.17 Ice and Rain Protection 105
7.17.1 Windshield Wiper System 105
7.17.2 Windshield Washer System 105
7.17.3 Engine Intake Deflectors 105
7.17.4 Intake Deflector Switch 107
7.17.5 Intake Deflector Indicators 107
7.17.6 Optional De-Icing Systems 108
7.17.7 Wing and Tail De-Icing 108
7.17.7.1 Wing and Tail De-Icing Switches 110
7.17.7.2 Tailplane De-Icing Boot Indicator Lights 110
7.17.7.3 Distributor Valve Heaters 110
7.17.8 Propeller De-Icing 112
7.17.9 Engine Intake Anti-Ice 112

TABLE OF CONTENTS **PAGE**

7.17.10 Windshield Heating System....112

7.18 Heating and Ventilating System....114
7.18.1 Flight Compartment Fans....114
7.18.2 Ram Air Lever....115
7.18.3 Ventilation Fan....115
7.18.4 Cabin Air Control Knob....115
7.18.5 Heating Control Switch....115
7.18.5.1 Manual Control....115
7.18.5.2 Automatic Control....116
7.18.6 Manual Control Switch....117
7.18.7 Temperature Control Knob....118
7.18.8 Duct Overheat Caution Light....118
7.18.9 Venting....118
7.18.10 Air Conditioning System....119
7.18.10.1 Air Conditioning System Switches....120
7.18.10.2 Operation....120

7.19 Hydraulic System....122
7.19.1 Electric Hydraulic Pump....123
7.19.2 Emergency Hand Pump....124
7.19.3 Hydraulic System Pressure Indicator....124
7.19.4 Hydraulic Brake Pressure Indicator....124

7.20 Landing Gear....126
7.20.1 Conventional Landplane....126
7.20.2 Nose Wheel Steering....126
7.20.3 Wheels and Tires....127
7.20.4 Wheel Brake System....127
7.20.5 Parking Brake....127
7.20.6 Intermediate Flotation Gear....128
7.20.7 Floatplane....129
7.20.7.1 Description....129
7.20.7.2 Optional Equipment....130
7.20.8 Spring Skiplane....130
7.20.9 Wheel Skiplane....131
7.20.9.1 Main Ski Units....131
7.20.9.2 Nose Ski Unit....132

TABLE OF CONTENTS **PAGE**

7.20.9.3 Ski Position Selector Lever....132
7.20.9.4 Ski Position Indicator Lights....132

7.21 Flight Controls....134
7.21.1 Control Column....134
7.21.2 Rudder Pedals....134
7.21.3 Elevator Trim....134
7.21.4 Flap/Elevator Interconnect Trim....135
7.21.5 Rudder Trim....135
7.21.6 Rudder Geared Tab....135
7.21.7 Aileron Trim....136
7.21.8 Aileron Geared Tabs....136
7.21.9 Flight Control Locks....136

7.22 Wing Flap System....139
7.22.1 Flap Selector Lever....140
7.22.2 Flap Position Indicator....140

7.23 Flight Instruments....141
7.23.1 Flight Instrument Panel....141
7.23.2 Pitot Static System....141
7.23.2.1 Pilot Static Emergency Selector....143
7.23.3 Pitot Heat Switch....143
7.23.4 Airspeed Indicator....143
7.23.5 Altimeter....143
7.23.6 Vertical Speed Indicator....143
7.23.7 Turn and Slip Indicator....143
7.23.8 Directional Indicator....144
7.23.9 Attitude Indicator....144
7.23.10 Magnetic Standby Compass....144

7.24 Miscellaneous Instruments....145
7.24.1 Clock....145
7.24.2 Outside Air Temperature Gauge....145
7.24.3 AIM 400EL/800EEL Compass Systems....145
7.24.3.1 Flux Detector....145
7.24.3.2 Slaved Gyro Magnetic Indicator....145
7.24.3.3 Annunciator....146

TABLE OF CONTENTS **PAGE**

7.24.3.4 Slaving Switch 146

7.25 Radio Systems 147

7.26 Autopilot Systems 149
7.26.1 H-14 Autopilot 149
7.26.2 Bendix M-4C Flight Controller 149
7.26.3 Collins AP-106 Autopilot 149
7.26.4 Collins FCS-65 Autopilot 149

7.27 Oxygen Systems 150
7.27.1 Crew Oxygen System 150

List of Figures Page

7-1 Aircraft Dimensions 18
7-2 Cutaway Illustration 20
7-3 Station Numbers 22
7-4 Cabin Dimensions 25
7-5 Tie-Down Points 31
7-6 Aircraft Doors 32
7-7 Cabin Door Closure Details 35
7-8 Pilot Seats 37
7-9 Seat Rail Systems 39
7-10 Cabin Seating Configurations 40
7-11 Package Size Limitations for Cabin Cargo 42
7-12 Servicing Points 45
7-13 Electrical Load Distribution 47
7-14 Electrical Schematic - Reverse Current Circuit Breaker (Up To SN 630) 48
7-15 Electrical Schematic with Current Limiters (SN 631 and up) 49
7-16 Battery Temperature Sensors 50
7-17 Electrical Distribution Box with Current Limiters 52
7-18 AC Electrical Schematic - Series 300 55
7-19 Series 300 AC Fuse Panel (SN 311 and up) 56
7-20 Series 310 AC Fuse Panel 57
7-21 Caution Light Panel - Series 300 65
7-22 Fuselage Fuel Storage 69

List of Figures Page

7-23 Fuel System Schematic 71
7-24 Wing Fuel Tank Components 74
7-25 Ferry Fuel System (non-quick-disconnect) 78
7-26 Engine Airflow 79
7-27 Zero Thrust Markings (for floatplanes) 81
7-28 Engine Fuel Flow Schematic 82
7-29 Range of Propeller Blade Angle 90
7-30 Fire System Components 97
7-31 Fire Detection and Extinguishing Schematic 99
7-32 Pneumatic System Components 102
7-33 Engine Air Intake Airflow - Deflector Extended 106
7-34 Intake Deflector Components 107
7-35 Surface De-Ice System Components 109
7-36 Surface De-Ice Schematic 111
7-37 Heating and Ventilation Air Distribution 114
7-38 Automatic Heating Control Components 117
7-39 Cabin Heating System Components 119
7-40 Air Conditioning System Components (Factory Installation) 120
7-41 Hydraulic Power Pack 123
7-42 Hydraulic System Schematic 125
7-43 Main and Nose Landing Gear 126
7-44 Brake Hydraulic System 128
7-45 Floatplane (CAP floats) 129
7-46 Spring Ski Gear 131
7-47 Wheel Skis 132
7-48 Wheel Ski Control and Indication 133
7-49 Flight Control Surfaces 135
7-50 Flight Control Lock System — Pre Modification 137
7-51 Modification History - Control Lock 138
7-52 Wing Flap Components 139
7-53 Pitot Static System Schematic 142
7-54 Avionic Component Locations (typical) 148

7.1 Dimensions

The principal Dimensions of this aircraft are shown in Figure 7-1.

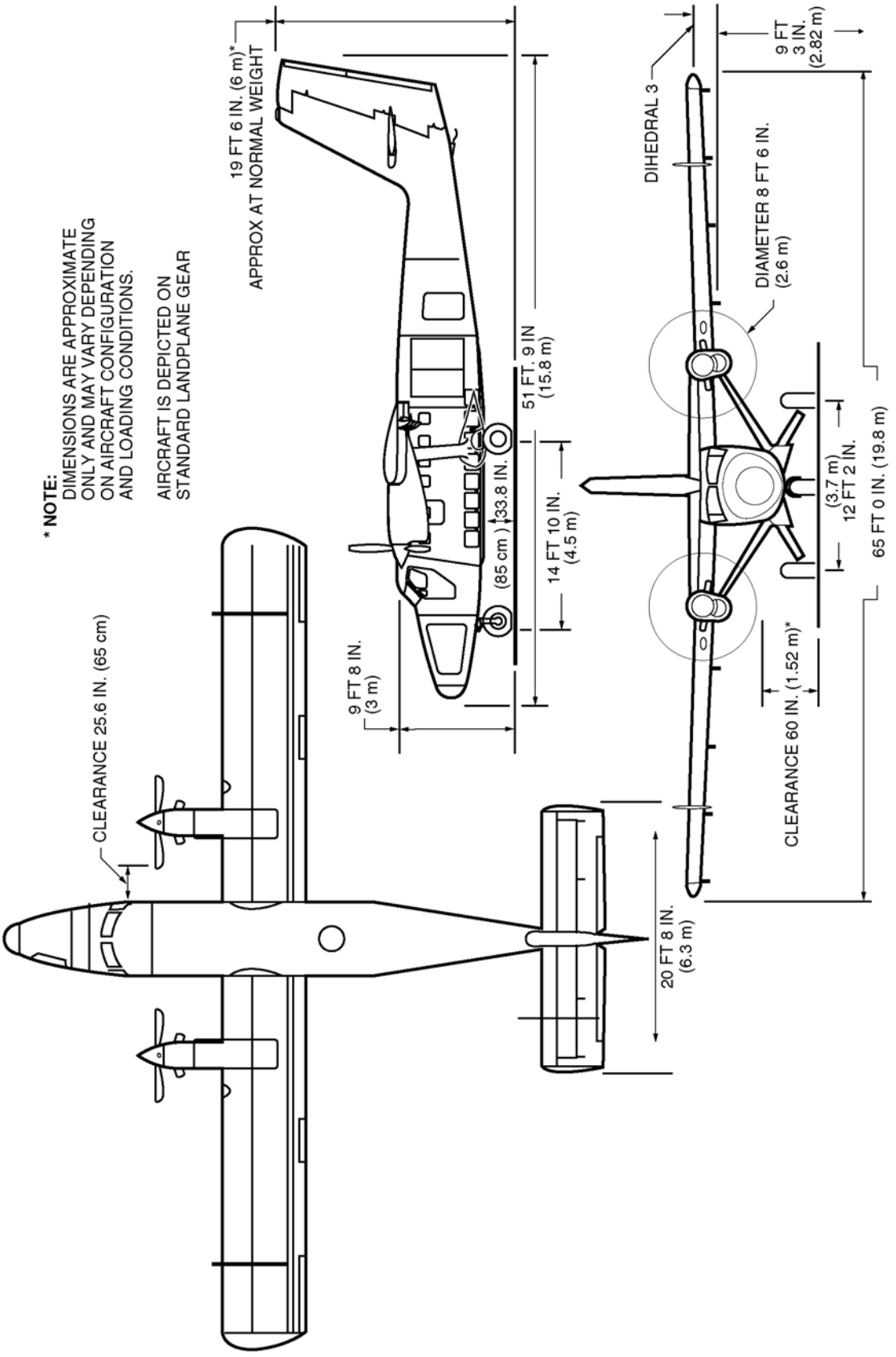


Figure 7-1 Aircraft Dimensions

7.2 Overview

The de Havilland DHC-6 Series 300 Twin Otter aircraft is an all-metal, high wing monoplane, powered by two wing-mounted turboprop engines, each driving a three-bladed, reversible pitch, fully feathering propeller. The aircraft carries a pilot, co-pilot, and up to 20 passengers, depending upon the seating configuration. The Twin Otter can be equipped for cargo transportation, ambulance duties, supply dropping, aerial survey operations and fire-fighting. The aircraft can be adapted for operations on wheel skis, spring skis, straight floats (which necessitates the installation of a short nose if Canadian Aircraft Products floats are used), amphibious floats, and intermediate flotation gear for soft field operation. Optional installations available include wing fuel tanks, anti-icing and de-icing systems, crew and passenger oxygen systems, autopilot, air conditioning, and various radio, navigation and communication systems.

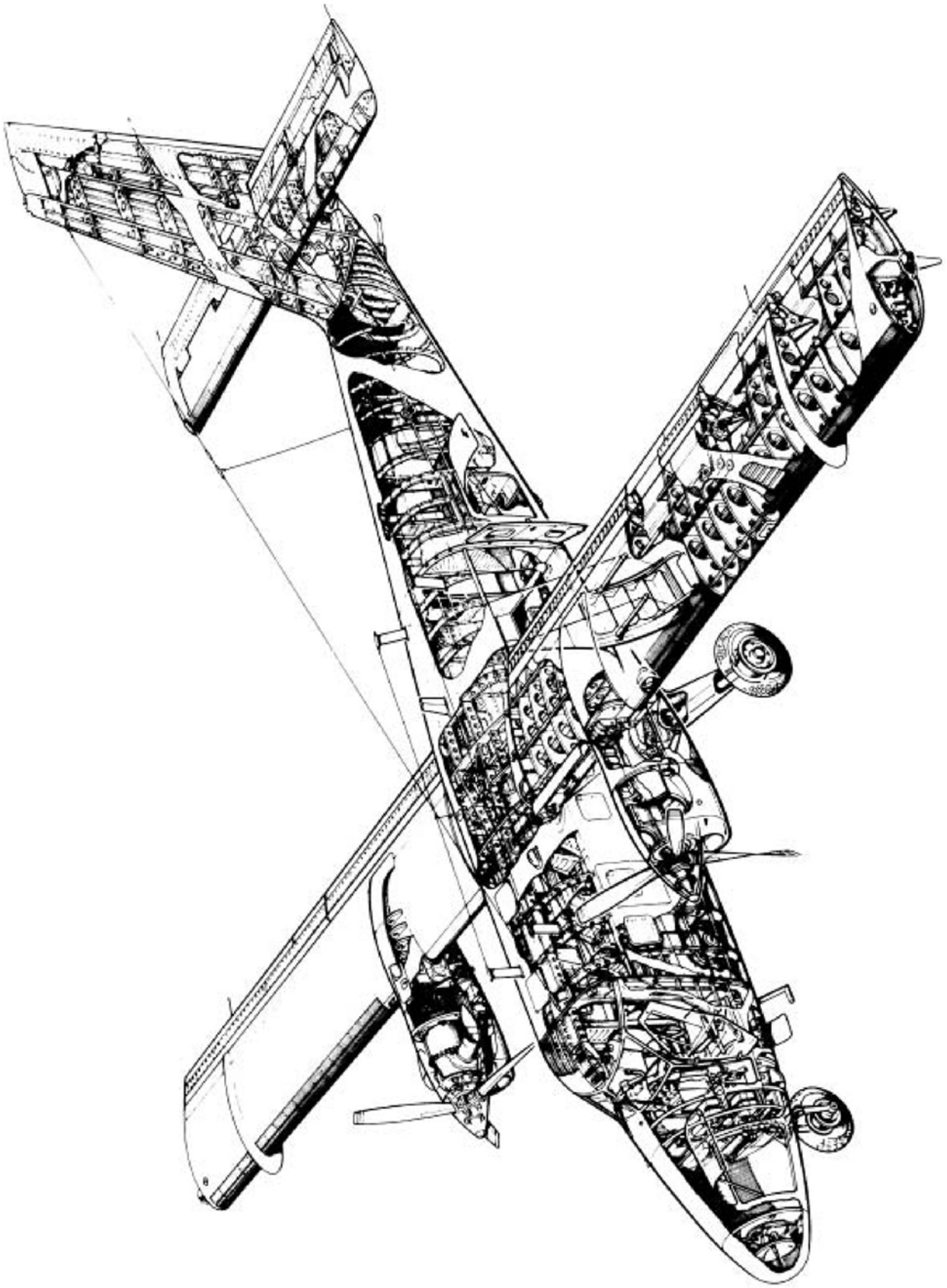


Figure 7-2 Cutaway Illustration

7.3 Structural

The fuselage primary structure is, except for the conical nose section, made of all metal conventional construction with frames, stringers, and skin of aluminum alloy. It comprises five permanently attached sections: the nose section (stations –21 to 60); flight compartment (stations 60 to 111); fuselage front cabin (stations 111 to 262); fuselage rear cabin (stations 262 to 332); and rear fuselage (stations 332 to 535).

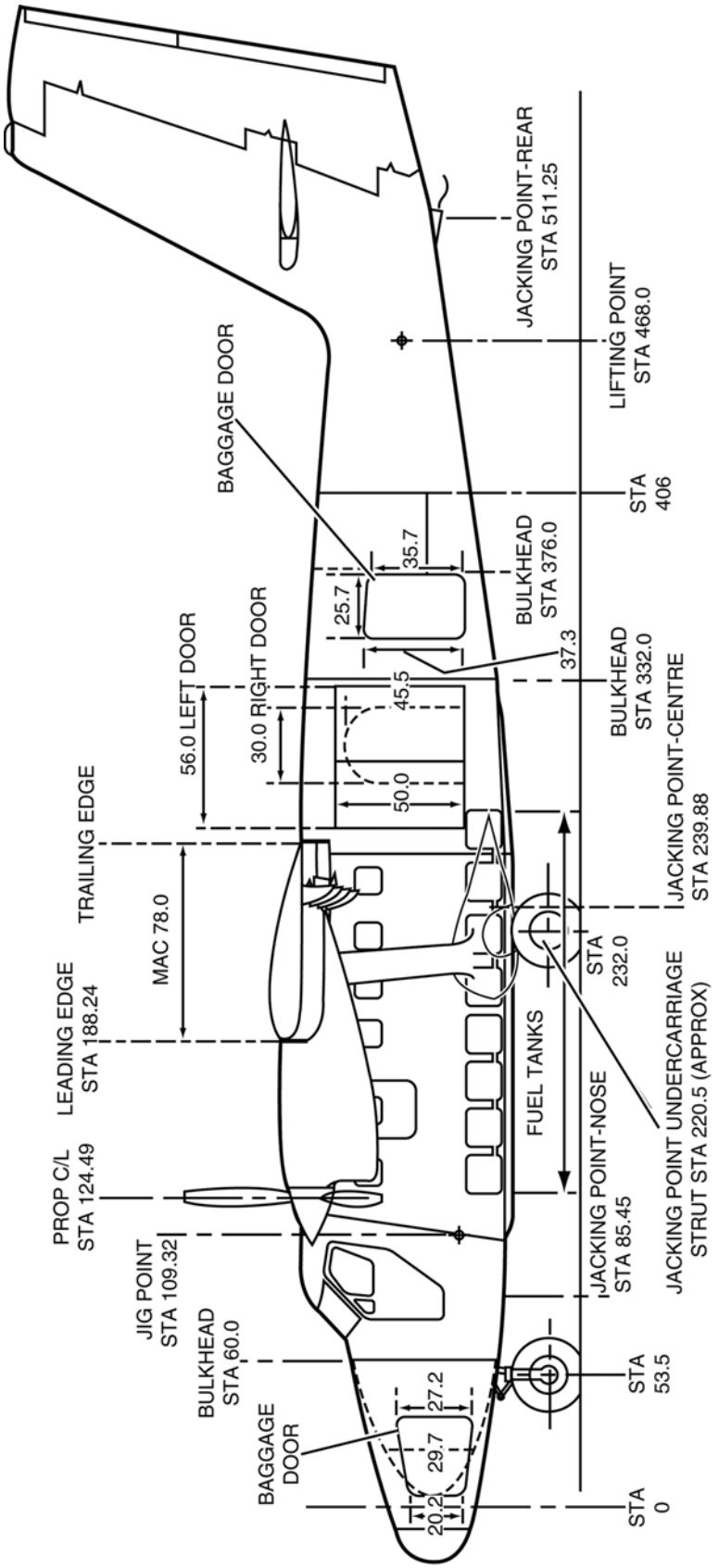


Figure 7-3 Station Numbers

7.3.1 Nose Section

The nose section, manufactured in three sections, consists of nose cap, center, and rear sections. The nose cap can be replaced by a radome. The center conical section is a moulded balsa wood and fibreglass lay-up and forms the nose baggage compartment. The center section is secured to the conventional skin/frame rear section, which is attached to the flight compartment front bulkhead. Lightning protection is provided in the form of bonding strips, connected to the nose cap, and grounded at the rear section forward frame to allow for electrical discharge. Additional bonding strips are provided externally between the baggage compartment access door hinge and sill, and the rear section frame. The upward and outward opening nose baggage compartment access door, located on the left side of the nose section, incorporates a stay to hold the door open and two latches, the forward of which can be locked externally by key.

7.3.2 Flight Compartment Section

The flight compartment extends from the forward bulkhead (station 60) aft to a flight compartment/cabin bulkhead (station 111) and consists of a conventional skin/stringer frame and bulkhead structure. Two forward, outward opening, pilot doors, one on the left and one on the right, are provided for external access to the flight compartment. Access to the flight compartment from the cabin is provided by a central doorway in the flight compartment/cabin bulkhead. A step and handgrip are installed to aid access through each pilot's door. External, hinged access panels are provided at the bottom, one on each side of the flight compartment section, to allow access for the maintenance of the hydraulic, heating, ventilation, and flight control system components that are located under the flight compartment floor. The nose landing gear, with its associated nose wheel steering components, is secured to the forward face of the flight compartment front bulkhead.

7.3.3 Forward and Rear Cabin Sections

The fuselage forward section extends from the flight compartment/cabin bulkhead (station 111) to a frame (station 262) forward of the left door surround, and the rear section to a cabin/rear baggage compartment bulkhead (station 332). These sections form one main cabin section.

The cabin section consists of floor, side and roof panel assemblies. The roof panels are stiffened by longitudinal stringers, except for the center portion which is a balsa wood core sandwich panel. Each side panel includes a door frame at the aft end, 50 inches high and 56 inches wide in the left side panel, and 45.5 inches high and 30 inches wide in the right side panel. The left cabin entrance door is in two sections, the aft section is a dual cargo door, locked and unlocked from within, and the forward half is a quickly detachable airstair door complete with handrails. The airstair door can be locked and unlocked externally. Two plug-type emergency exits, one in each side panel at the forward end of the cabin, are provided. Eight acrylic plastic windows are

installed on the right side of the cabin; one in the forward escape door, one in the right cabin door, and six in the side panel. Seven similar windows are installed on the left side of the cabin; one in the forward emergency exit, one in the rear cargo door, and five in the side panel.

The floor structure consists of 11 transverse frames, skins and longitudinal stringers which form a grid with continuous flanges in the fore and aft direction. Eight of the compartments formed by the transverse frames are cavities for fuel tanks. The tops of the frames forming the tank cavities are skinned over with a light gauge clad sheet which forms a barrier between the tanks and the cabin, and also carries the shear loads from the seats and/or cargo tie-downs under forward crash loads. Three heavy extrusions run the full length of the cabin section, attaching to the top cap of each transverse frame.

Two of the transverse frames are of a heavy construction to support the main landing gear. The front heavy frame is also provided with a single lug pick-up each side for the attachment of the left and right wing lift struts. The rearmost of these frames is joined at floor level to a heavier frame. The cabin flooring has a capacity of 200 pounds per square foot static load when uniformly distributed. The floor and cabin side walls are fitted with rails to accommodate passenger seats. The complete main cabin has a total usable volume of 384 cubic feet.

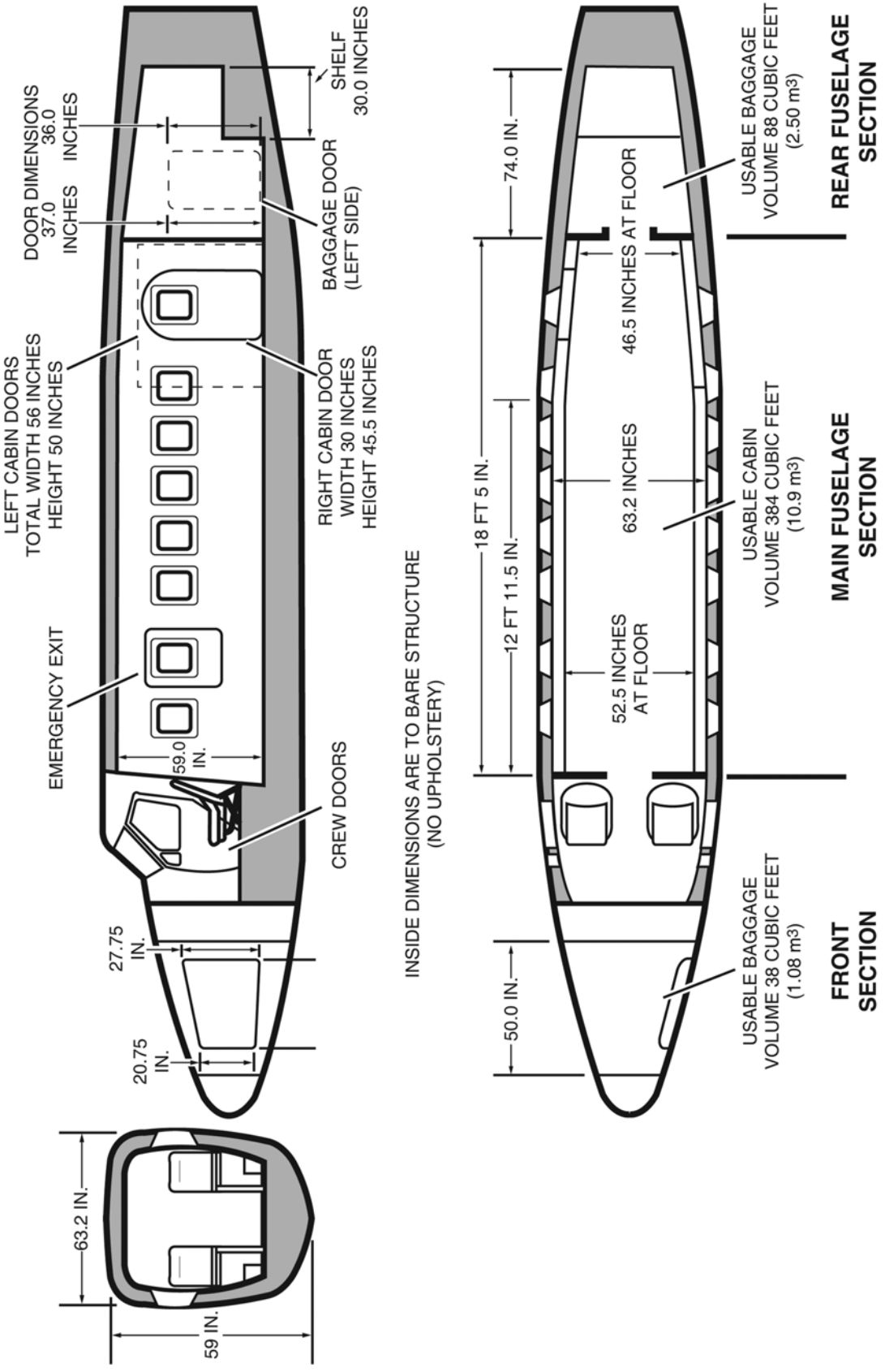


Figure 7-4 Cabin Dimensions

7.3.4 Rear Fuselage Section

The rear fuselage section, which contains the rear baggage compartment, extends aft from the bulkhead dividing it from the cabin section to the rudder hinge line in a gradual taper. This section is of a conventional frame, skin, and stringer construction from the baggage compartment to the vertical stabilizer front spar bulkhead. The section between the vertical stabilizer front and rear spars is modified monocoque (stringers), and the top surface carries the suitable hard points for mounting the vertical and horizontal stabilizers.

7.4 Wings

The wing consists of left and right mainplanes, rectangular in planform and of constant section. Each mainplane is attached to the fuselage structure, at roof level, by two bolts through fork and lug fittings at the front and rear spars, and is supported by a lift strut having single bolt attachments at each end. A double-slotted, full-span flap/aileron system is installed at each mainplane trailing edge.

7.4.1 Wing Construction

Each mainplane structure is a box of constant section, manufactured from high strength aluminum alloy, and consists of main and rear spars, a short front spar at the root end, and top and bottom skin panels. The top skin panels consist of spanwise skin sheets, clad on the outer surface, and tapered in thickness on the inner surface by chemical milling. The sheets are anodized, and stiffened by spanwise corrugations of semi-circular section which are attached by riveting. The lower skin panels consist of skin sheets, clad both sides with spanwise extruded tee-stringers which are attached by riveting. Stability of the top and bottom skin panels is accomplished by providing ribs of conventional design which are adequate to accept concentrated loads and conduct them to the box structure. Both main-plane leading edges are hinged between the fuselage and nacelle to permit access for servicing. Access is also provided to the mainplane interior for the maintenance of flap and aileron control systems.

Five hinge arms are provided on each mainplane rear spar to carry the flap/aileron system.

The wing tips, which are removable for servicing and maintenance, have internal lightning protection bonding strips which are secured to each wing structure to provide a ground for electrical discharge. Electrical wiring to each wing tip is routed through conduit tubing for protection.

7.5 Nacelles

7.5.1 General

The two tractor-type, normal rotation, turbo-propeller engines are installed in wing-mounted nacelles, located forward and slightly below each mainplane. Each nacelle, in addition to enclosing the engine, its related components, engine and propeller controls, provides sufficient space for the oil cooling and fire extinguishing systems. The nacelles are of a conventional skin/frame aluminum alloy construction except for the firewalls and fireseals which are of stainless steel. The upper aft section of each nacelle forms the engine support structure. Access to the nacelle components is provided by a forward top cowl and a lower hinged cowl, both of which can be removed with ease. Access to the engine oil tank filler, filter and controls is also provided in the upper rear section of the nacelle.

7.5.2 Cowlings

The upper and lower cowls fasten to each other and the nacelle structure with flush-mounted, quarter-turn fasteners and latches. The upper cowl is equipped with a rearward facing duct which provides an air outlet for engine compartment ventilation. The lower cowl contains the intakes for the engine compressor and engine cooling air, oil cooler and oil cooler bypass ducts, and air exit duct door. A cylindrical screen in the air inlet throat prevents ingestion of all large foreign objects.

7.5.3 Air Intake Deflector

An air intake deflector system is installed in each engine lower cowl to prevent the entry of snow and rain. The deflector is a louvered plate hinged at the forward end of the intake roof, operated electro-pneumatically utilizing air from the aircraft bleed-air system. In situations where sand and dust are particularly severe, the deflectors may also be utilized to reduce the amount of foreign matter ingested by the engine.

7.5.4 Engine Mounts

Each engine is supported in its nacelle at three points, secured at each point by an attachment bolt. Engine vibration is dampened by vibration isolators, secured to the engine combustion casing, through which the attachment bolts pass. Each engine mount consists of the front frame of the nacelle structure and three fittings which are riveted to the frame. The vibration isolators are of a resilient rubber block type, resistant to deterioration caused by contaminating fluids such as fuel, oil, etc.

7.5.5 Firewalls and Fireseals

The main firewall in each nacelle is located at the aft end of the engine, and extends the full depth and width of the nacelle. The sides and the area of the mainplane D-nose,

forward of the main firewall is also protected against fire. Two fireseals are fitted to the engine, one forward of, and the other to the rear of the engine compressor intake. Each fireseal is manufactured in two semi-circular sections which are bolted to the engine fireseal flange, and to each other, to form a complete fireseal between the engine and the cowlings. The fire seals also provide location and support for all lines, controls and ducts which pass from one engine fire zone to another.

7.5.6 Drains

The area surrounding the power plant installation is purged of flammable vapours by the cooling airflow within the nacelle, but to prevent the accumulation of liquids capable of creating a fire hazard, a drain system is provided. Drain lines from the combustion chamber, starter-generator seal, and fuel pump seal are routed to a drain directly overboard, or, in later production aircraft, to a collector can. The start control valve and fuel unit purge valve drain back to the fuel tank.

7.6 Empennage

The tail group is comprised of a horizontal stabilizer, elevator, vertical stabilizer, and rudder.

7.6.1 Horizontal Stabilizer

The horizontal stabilizer is a one-piece unit consisting of front and rear full span spars and full span top and bottom skin/stringer panels. The stringers are top-hat sections that are adhesive bonded to the skin, and the spars are connected by conventionally designed ribs. Each spar carries two fittings, adjacent to the aircraft centerline, for bolting the horizontal stabilizer to the fuselage. Hinge arms extending rearward from the rear spar carry the elevator.

7.6.2 Elevator

The elevator consists of left-hand and right-hand units, joined at the aircraft centerline by bolted torque tubes. Each elevator unit is of a conventional all-metal construction, comprising two spanwise spars with intersecting chordwise ribs, covered with swaged skin panels to provide torsional strength. The elevator is aerodynamically and mass balanced to meet flutter criteria, mass balancing being achieved by attaching lead weights to the outboard horns. The left elevator unit incorporates a pilot-operated trim tab, and the right elevator unit a wing flap/elevator interconnect tab.

7.6.3 Vertical Stabilizer

The vertical stabilizer is of conventional form, consisting of front and rear spars connected by ribs and covered by vertical skin/stringer panels. Fittings are provided on the bottom of each spar for bolted attachment to the rear fuselage. The rear spar is provided with two hinge brackets for rudder attachment (a third rudder hinge attachment is located on the rear fuselage structure). For lightning protection purposes, the vertical stabilizer cap is provided internally with a bonding strip which allows for electrical discharge. Electrical wiring within the vertical stabilizer is routed through conduit tubing for protection.

7.6.4 Rudder

The rudder consists of a main spar and ribs covered with swaged skin panels (with swages running fore and aft). Three hinge brackets are provided on the front face of the spar for the attachment of the rudder to the vertical stabilizer rear spar and rear fuselage structure. The leading edge of the rudder is faired with a symmetrical D-shaped nose. The rudder is aerodynamically and mass balanced as required to meet control force and flutter criteria, mass balancing being achieved by attaching lead weights to the rib of the rudder horn. Two tabs are provided on the rudder trailing edge, the upper trim

tab being operated manually by the pilot, and the lower, a variable mechanically-geared assist tab.

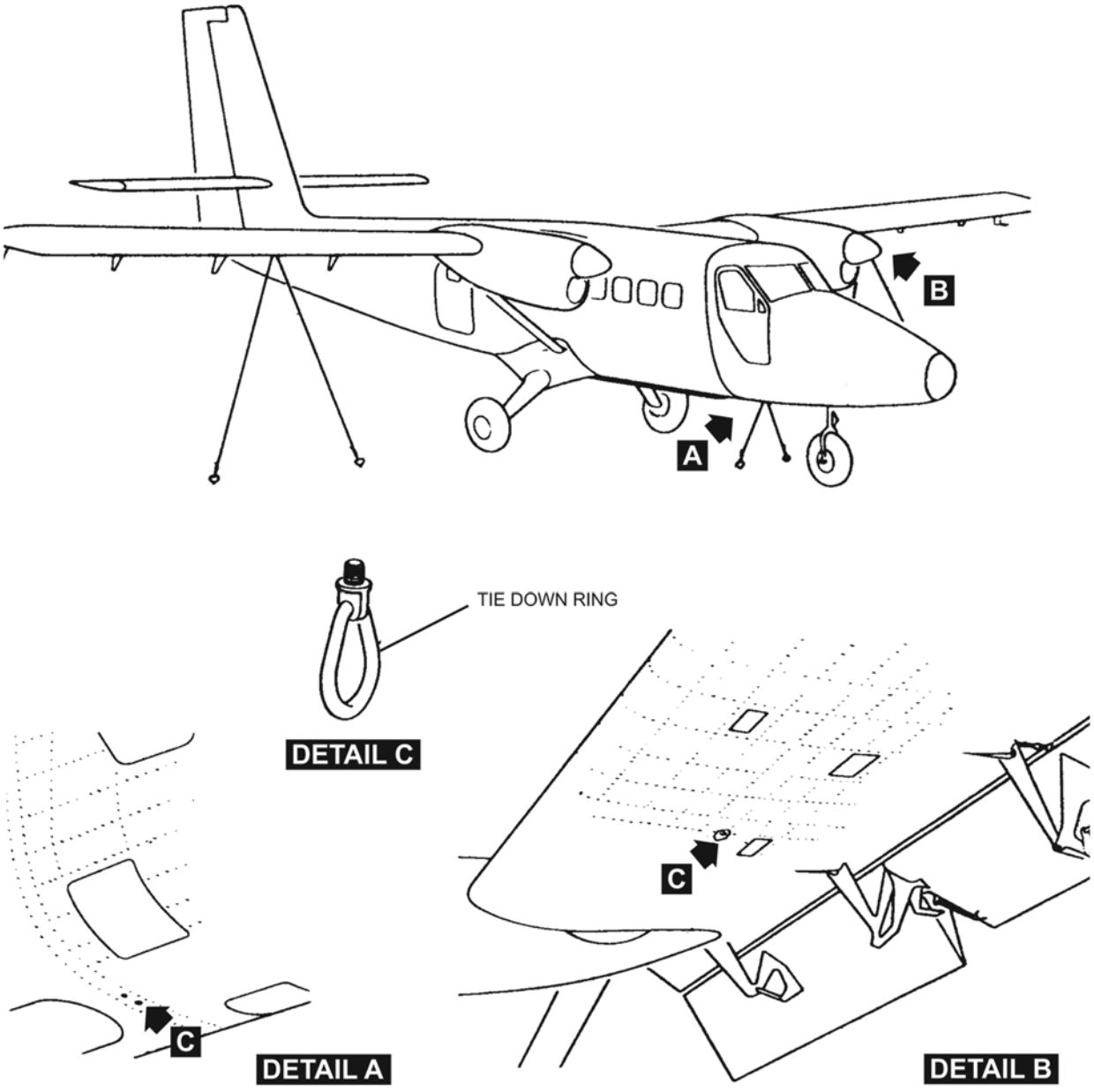


Figure 7-5 Tie-Down Points

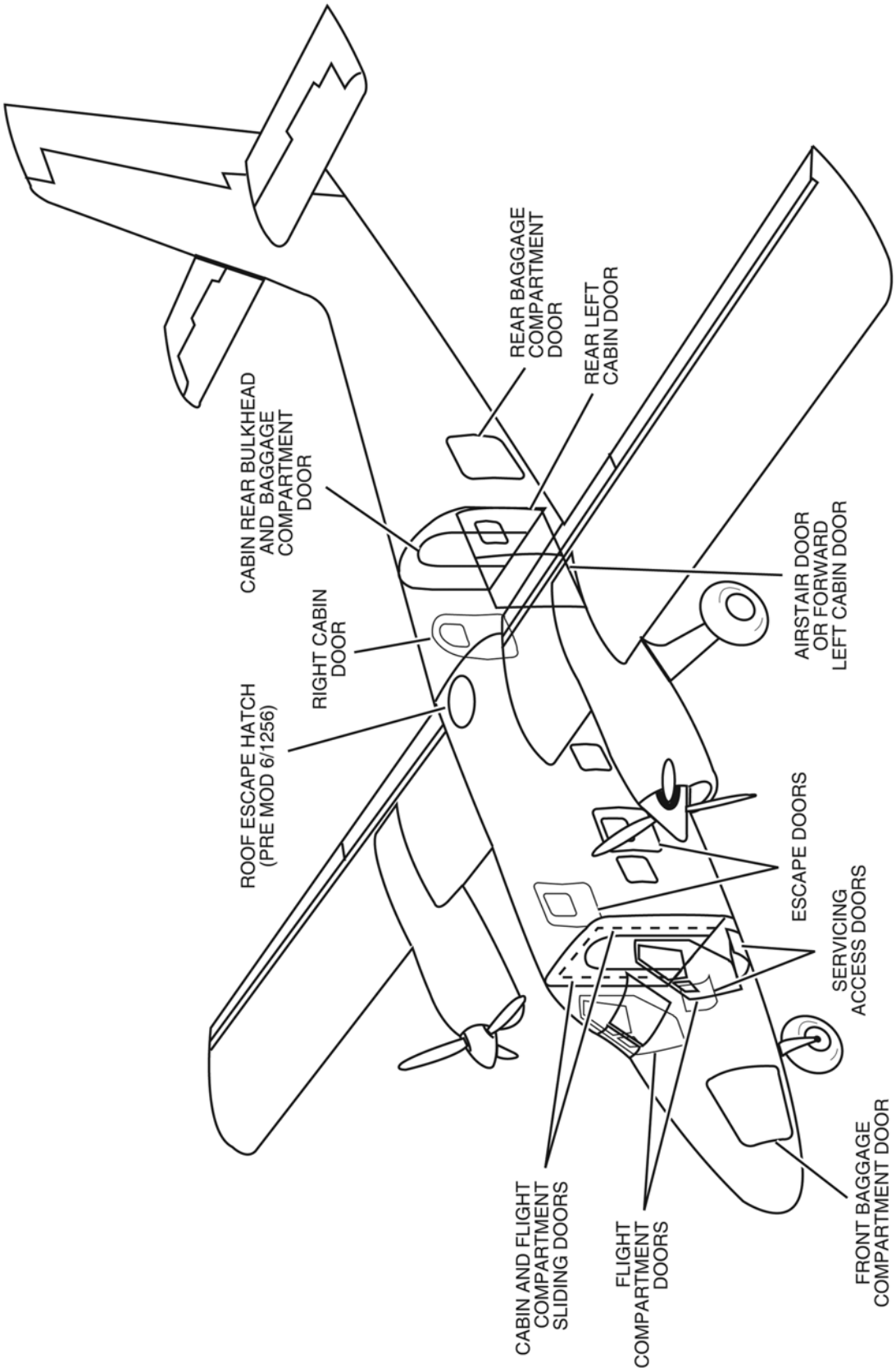


Figure 7-6 Aircraft Doors

7.7 Cabin

7.7.1 Doors

For normal entrance and exit the aircraft has two flight compartment doors, one on each side of the flight compartment, a single cabin door on the right side of the cabin, and double doors on the left side of the cabin. The forward of the two left-side double doors is an airstair door. By special order this can be replaced by a side-hinged door section more suited to cargo operations.

The two flight compartment doors, the two baggage compartment doors, the right hand cabin door and the forward portion of the left hand cabin door are fitted with key locks. The same key pattern is used for all doors on all aircraft.

7.7.1.1 Flight Compartment Doors

The flight compartment doors are hinged at their forward edges and latched by handles on the inside and outside. The outside handle incorporates a key-operated lock. A sliding window in each door can be adjusted to any position and be secured by a cam type latch. A map storage pocket is provided on each door.

7.7.1.2 Cabin Doors

A single door is installed on the right side of the cabin and double doors on the left side, of which the forward section is an airstair door. The right door is hinged at its forward edge and is latched by internal and external door handles, the latter incorporating a key-operated lock. Inspection windows on the inside and outside of the door beside the door handles allows visual checking of the security of the door when closed, by means of red witness marks on the latch mechanism inside the door. The right door is also equipped with a fixed window, a door stay, and on special order, a hand operated fire extinguisher.

The airstair door section of the double doors occupies the forward position and is hinged to the sill so that it opens outward and downward; it is supported by two cables and a post assembly on each side of the door. The cables and posts also serve as the handrails. A latch mechanism, securing the door in its closed position, is operated by a handle on the inside and outside of the door, the latter of which incorporates a key operated lock. A guard is installed over the internal handle to prevent inadvertent operation and is appropriately labelled to indicate the location of the exit handle. Inspection windows are provided both on the inside and outside of the door, beside the door handles, through which the security of the door, when closed, can be verified by means of witness marks on the latch mechanism inside the door. The door is equipped with a retractable lower step and a quick-release hinge to permit removal of the door for ease of cargo loading.

The aft section of the double doors is hinged at its aft edge and is secured in the closed position by bolts at the top and bottom of the forward edge. In its fully open position it lies against the rear fuselage where it can be secured by an attached elastic cord restraint.

By special order a forward cargo door section can be installed in place of the airstair door. It is hinged at its forward edge and latched by means of internal and external door handles. The external door handle can be key locked. Inspection windows for latch mechanism checking are provided, similar to those on the right cabin door. The door is equipped with stowage for a passenger ladder and a door stay.

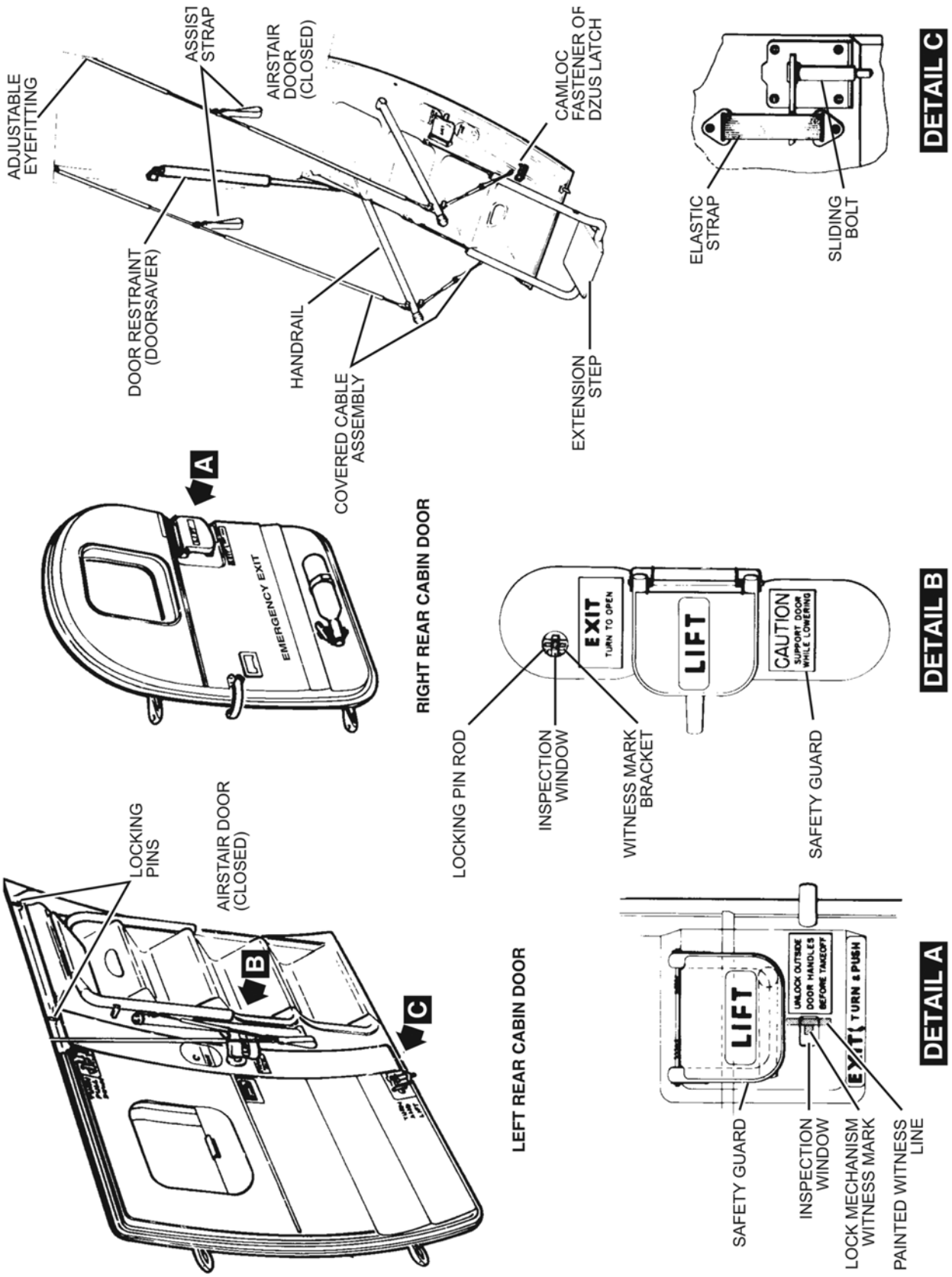


Figure 7-7 Cabin Door Closure Details

7.7.1.3 Cabin/Flight Compartment Interconnecting Door

A sliding door is installed on the cabin/flight compartment bulkhead on commuter type aircraft. A magnetic latch retains the door in the open or closed position.

7.7.1.4 Baggage Compartment Doors

7.7.1.4.1 Rear Baggage Compartment Exterior Door

The rear baggage compartment exterior door on the left side of the fuselage is hinged at its top edge and opens upward and outward, and can be supported in the open position by a door stay. The door handle has an integral key lock. The rear baggage compartment door is included in the DOORS UNLOCKED caution lights circuit.

7.7.1.4.2 Rear Baggage Compartment Interior Door

A fabric covered door assembly is installed on the cabin rear bulkhead for access to the rear baggage compartment on utility aircraft. On commuter aircraft a removable panel located in the rear bulkhead directly above the center rear seat can be removed to provide access to the rear baggage compartment. When S.O.O. 6143 is incorporated on utility aircraft, two baggage restraint panels and elastic cord retainers are provided to prevent forward movement of baggage in the rear baggage compartment up to a loading of 9 *g*. The restraint panels are installed against the aft face of the bulkhead, one above the other, with the elastic cords retaining them in position by engagement with brackets on each side of the doorway. When S.O.O. 6166 is incorporated a door assembly is installed at station 376 which closes off the aft section of the baggage compartment. This door assembly is a United Kingdom CAA requirement when passenger oxygen bottles are installed.

7.7.1.4.3 Forward Baggage Compartment Exterior Door

The forward baggage compartment door on the left side of the nose is hinged at its top edge and opens upward and outward and can be supported in the open position by a door stay. The door is secured in the closed position by two recessed latch assemblies. The forward latch can be key-locked. This baggage compartment door is included in the DOORS UNLOCKED caution light circuit.

7.7.1.5 Doors Unlocked Caution Light

A DOORS UNLOCKED caution light is included on the caution lights panel, to provide visual indication of an open or improperly closed door. The caution light circuit incorporates microswitches actuated by the airstair door (or forward left cabin door), right cabin door, forward baggage compartment door, and the rear baggage compartment door. The doors unlocked caution light is powered from the right DC bus through a DOORS UNLOCKED circuit breaker on the overhead circuit breaker panel.

7.7.2 Seating

7.7.2.1 Flight Compartment Seats

A seat with a loose cushion is provided on each side of the flight compartment, the left seat for the pilot and the right seat for the co-pilot or a passenger. Each seat is adjustable fore and aft by means of a lever on the left side at floor level, which withdraws locking pins from the seat horizontal tube structure, to allow the seat to be moved to any one of four positions and be relocked. Vertical adjustment of each seat is by means of a lever at the left side of the seatpan which withdraws locking pins from the seat vertical tube structure, to allow the seat to be moved vertically to any one of five positions and be relocked. Each seat is equipped with a lap-type safety belt. A shoulder harness and inertia reel were fitted as standard equipment beginning at SN 531. The inertia reel will lock automatically under a deceleration load of 2 to 3 *g*.

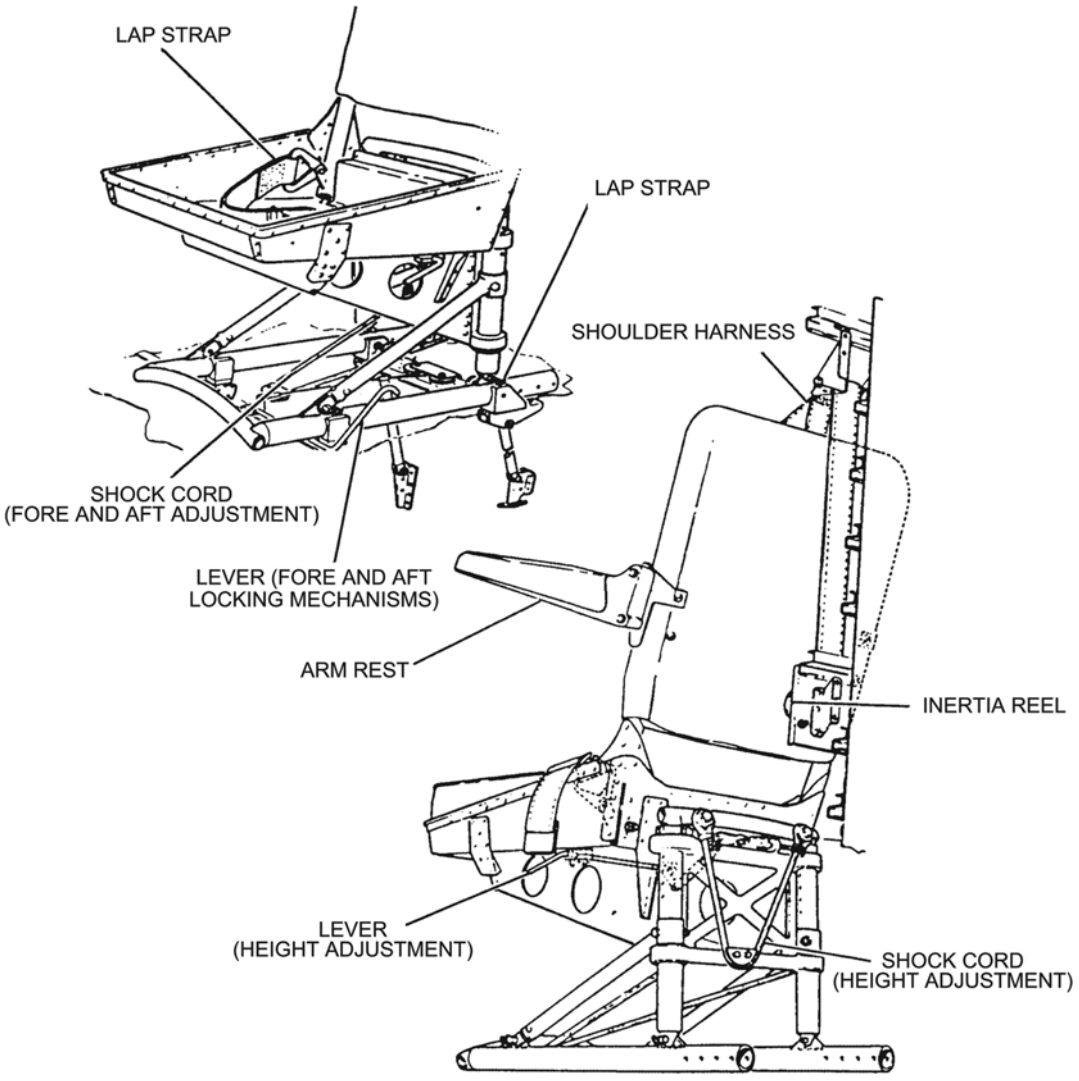


Figure 7-8 Pilot Seats

7.7.2.2 Passenger Seating Arrangement

Passenger seats are arranged in any one of several configurations depending upon the system of floor rails installed. A two floor rail system is standard and accommodates 20 commuter seats. The alternative is a three rail system which can accommodate variations in types of seat and number of seats, ranging from 13 to 20. The rail systems and seating configurations are as follows:

1 A basic two rail system and attached track for the installation of 20 commuter type seats, consisting of 6 double seats on the right of the cabin, 5 single seats on the left, and 3 seats at the rear of the cabin.

2 An alternative three rail system with attached track for the installation of 18 or 19 commuter type seats, consisting of 4 double seats and 2 or 3 single side facing seats on the right of the cabin, 5 single seats on the left, and 3 seats at the rear of the cabin.

3 The three rail system, without track, for the installation of 20 utility type seats arranged as in Para 7.7.2.

4 The three rail system, without track, for the installation of 13 or 14 utility type seats, consisting of 6 single seats on the right of the cabin, 5 on the left, and 2 or 3 seats at the rear of the cabin.

Any of the above configurations can be adapted to suit a lesser number of cabin seats, or for mixed passenger and cargo operation.

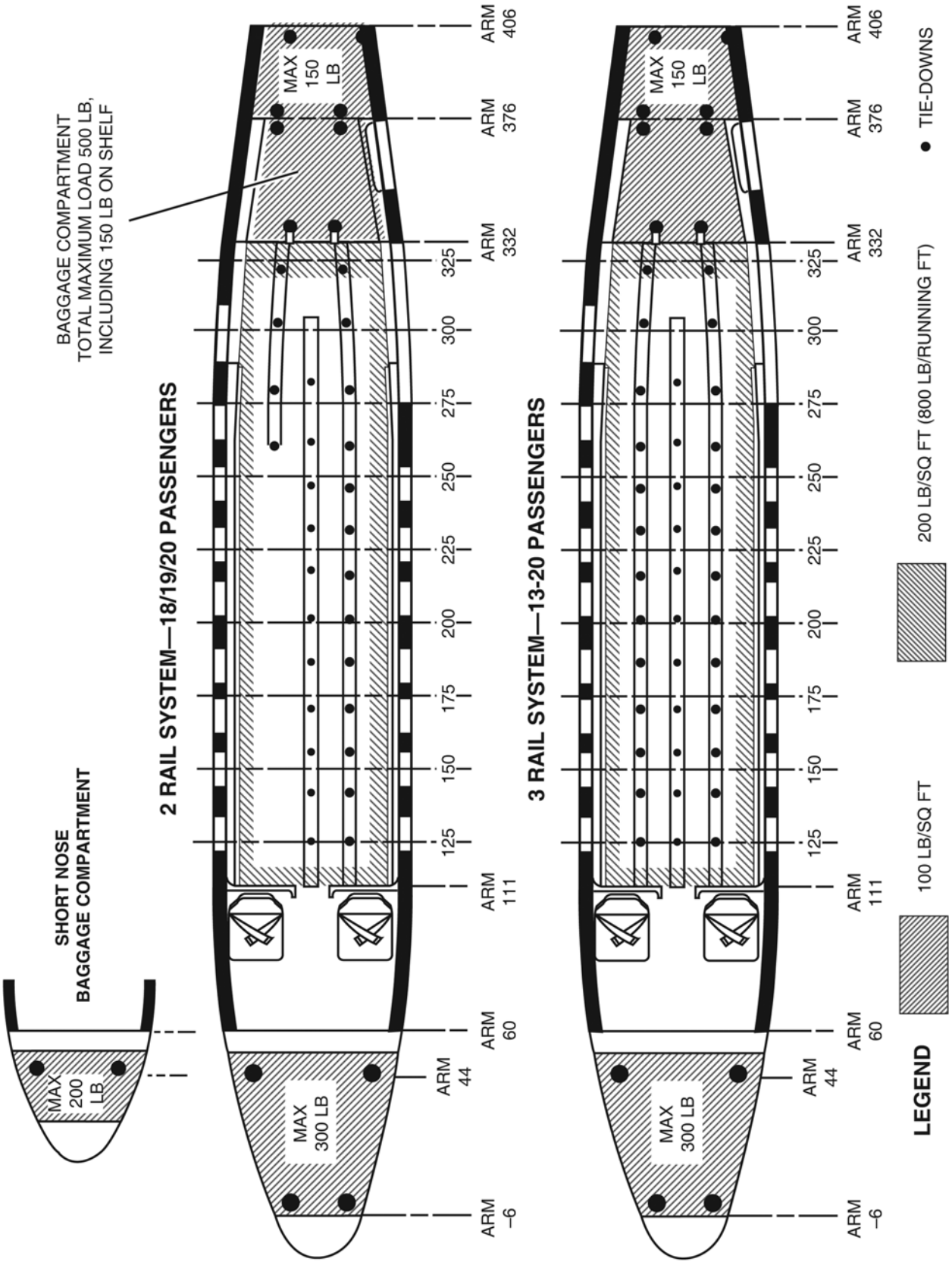


Figure 7-9 Seat Rail Systems

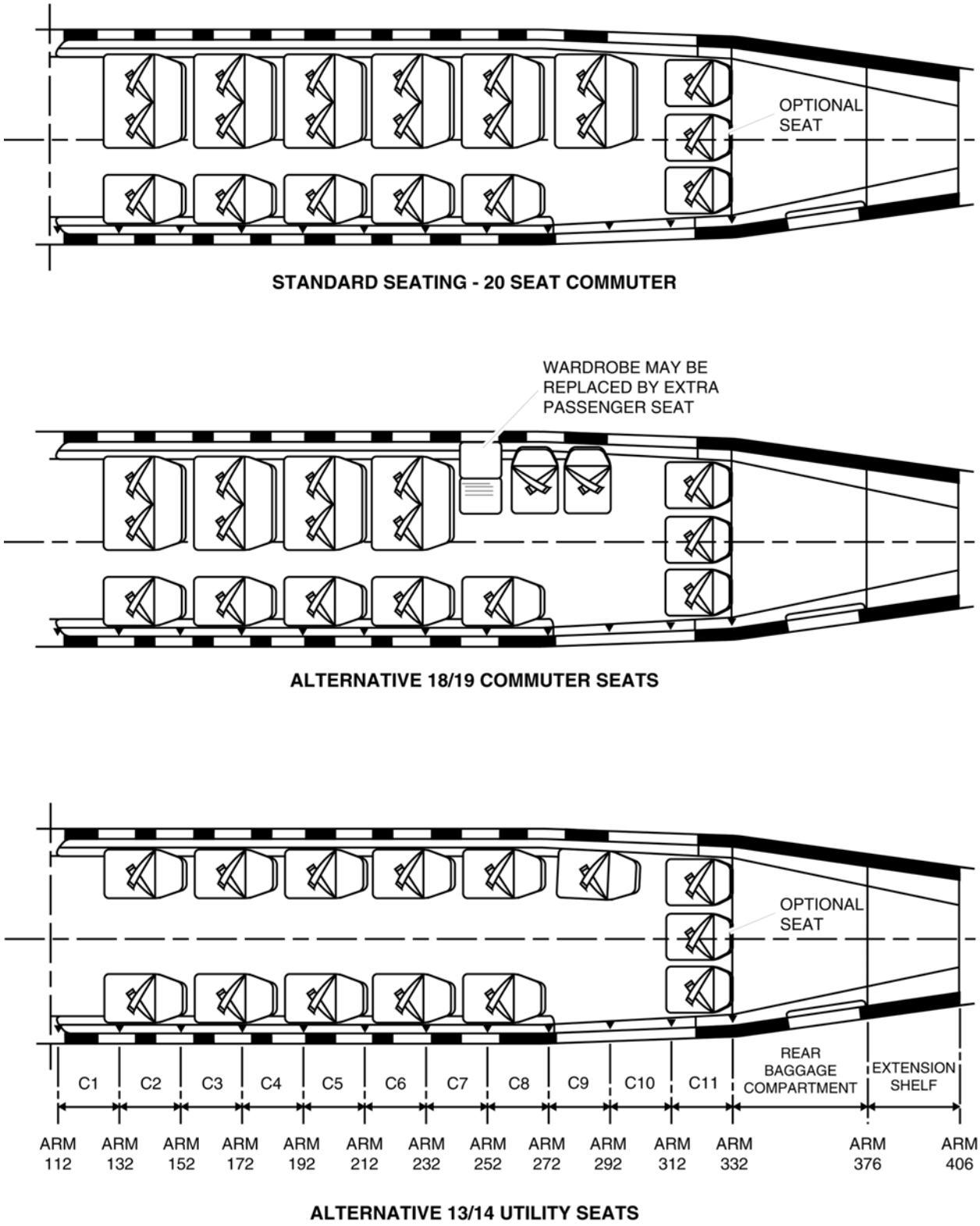


Figure 7-10 Cabin Seating Configurations

7.7.2.3 Passenger Seats

All passenger seats can be easily removed and installed when necessary for the transportation of cargo. Utility seats can be quickly folded and stowed against the cabin walls or cabin rear bulkhead. The outboard sides of all forward facing utility seats, except the rearmost, are attached to fittings on the side rails, and swivel about them to the stowed position where they are retained by straps. A folding leg assembly on the inboard side of each of these seats is secured to the floor by engagement with receptacles in the floor rail and locked in position by a device on the rear leg. The rear seats are supported by fittings on the cabin rear bulkhead and swivel about them to the stowed position. Commuter type seats are secured to tracks attached to the floor rails and cabin side rails; these seats are not stowable. For ease of movement in the cabin and to comply with SFAR 23 certification regulations, the backs of all seats fold forward. All passenger seats are equipped with lap type safety belts.

7.7.3 Cargo and Baggage Loading

The main cabin floor is stressed to carry loads of 200 pounds per square foot and the forward and rear baggage compartments are stressed to carry 100 pounds per square foot.

The front and rear baggage compartments have usable volumes of 38 and 88 cubic feet respectively. A maximum load of 300 pounds can be carried in the forward (nose) baggage compartment; however, the weight of avionics equipment installed forward of station 44 (in practice, this means equipment installed in the radome) must be included in the 300 pound calculation. 500 pounds can be carried in the rear baggage compartment, of which a maximum of 150 pounds may be loaded on the rear baggage compartment aft shelf extension. Baggage tie-down rings are provided in each baggage compartment.

The main cabin door (left rear door) aperture is 50 inches high and 56 inches wide. A graph is provided that defines the length/width relationship of objects that can be loaded into the cabin through this door.

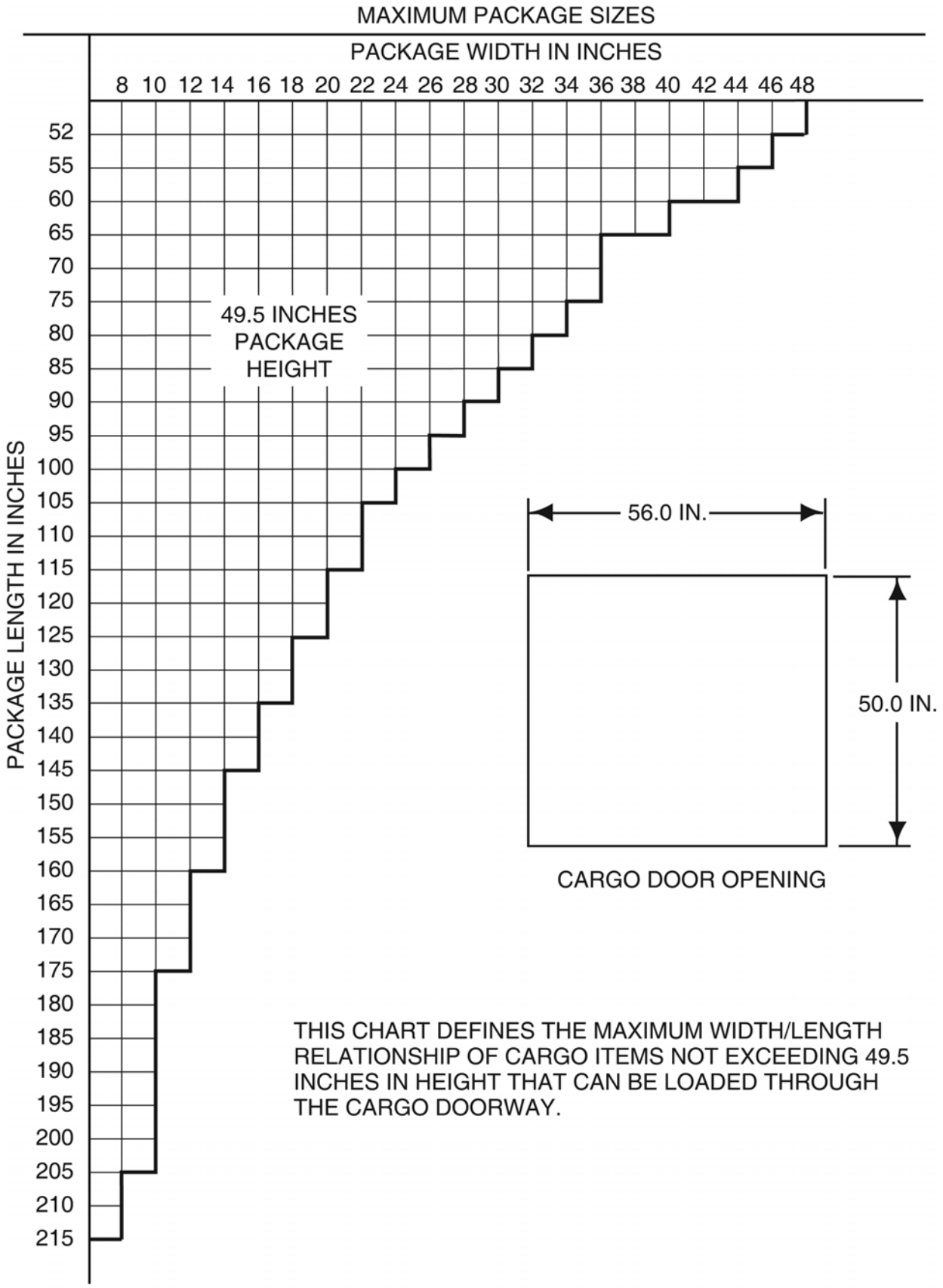


Figure 7-11 Package Size Limitations for Cabin Cargo

7.7.3.1 Cargo Tie-Down Rings

Anchor nuts in the floor rails, seat side rails and the beam on the cabin rear bulkhead are used for attaching tie-down rings when cargo is to be carried in the cabin. When Douglas track is installed on existing floor and side rails, special commercially-supplied tie-down rings must be used. Four tie-down rings are installed in the forward baggage compartment and four in the rear baggage compartment.

Refer to the Weight and Balance section of this POH for additional information about limitations applicable to the various cargo tie-down points.

7.7.3.2 Loading Jury Strut

A loading jury strut is supplied with the aircraft for use when loading heavy cargo items. The strut is attached to the aircraft by engagement of its upper end with an adapter on the underside of the fuselage below the rear baggage compartment door. It will normally be clear of the ground but during loading it may support the aircraft by contact with the ground. After completion of loading, it should again be clear of the ground.

7.7.4 Emergency Equipment

7.7.4.1 First Aid Kit

A first aid kit can be mounted on the cabin wall aft of the right cabin door or on the divider panel immediately forward of the left cabin doors.

7.7.4.2 Portable Fire Extinguisher

A hand fire extinguisher is located on the flight compartment bulkhead behind the co-pilot seat. By special order, a hand fire extinguisher can also be installed on the inside of the right cabin door.

7.7.4.3 Emergency Exits

Two plug-type emergency exits are provided in the cabin, one on each side of the cabin at the forward end. Each is secured in the closed position by two plates on the lower edge of the door and by the hatch release mechanism on the upper edge of the door; each is jettisoned by detaching the cover over the release mechanism, pulling down the release handle (which then becomes detached), and then pushing the door outward.

7.7.5 Miscellaneous Cabin Equipment

7.7.5.1 Cabin Entrance Ladder

On aircraft not equipped with an airstair door, a removable cabin entrance ladder is supplied which is stowed on the forward section of the left cabin door when not in use. When in use, the ladder is installed with the hooks at the upper end inserted in

slots in the door sill and the fully extended hinged support assembly resting against the fuselage below the doorway. The support assembly has a rubber bumper pad to prevent damage to the fuselage skin. In its stowed position, the ladder is retained on the left cabin door by a pocket at the bottom of the door, brackets at the top, and a strap at the center which passes over the step and hooks to a plate on the door.

7.7.5.2 Toilet

By special order a chemical toilet, waste container, toilet roll holder and tissue dispenser can be installed in the rear baggage compartment. A toilet vent pipe is connected to a venturi type outlet in the roof.

7.7.5.3 Wardrobe

A wardrobe can be installed in place of the forward side-facing seat in commuter aircraft. The wardrobe is equipped with a curtain and coat hangers.

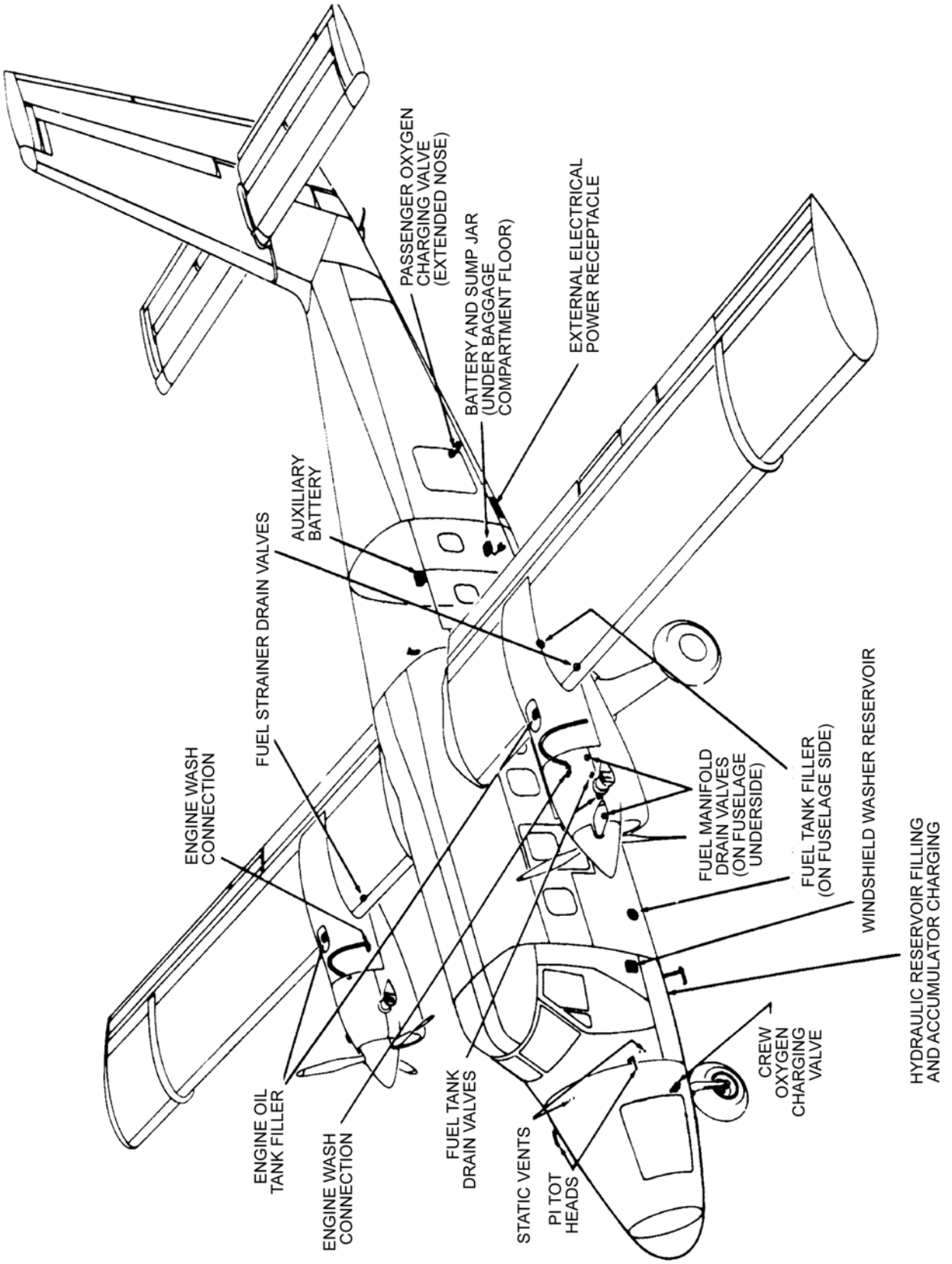


Figure 7-12 Servicing Points

7.8 Electrical System

The electrical system is a 28-volt, direct current, single wire installation with the airframe used as ground return. Primary DC power is supplied by two engine-driven starter-generators. A 40-amp-hour battery provides power when the generators are inoperative. Either one of two static inverters provide 115 volt and 26 volt alternating current. Electrical power is distributed through a multiple bus system consisting of left, right, hot battery, battery/external power, and auxiliary battery DC buses, and two AC buses.

From the left and right DC buses power is distributed through main circuit breakers in the main distribution box located in the cabin roof to supply DC circuits through individual system circuit breakers. When Mod 6/1274 (cut in as standard at SN 311) is incorporated, sets of 3 left bus and right bus in-series bus feed circuit breakers on auxiliary panels beside the main and overhead circuit breaker panels and on the avionics circuit breaker panel provide protection to the bus feed lines.

The left generator is connected to the left DC bus and the right generator to the right DC bus, but both buses can be powered from either generator through a bus tie relay which is controlled by a BUS TIE switch. An external power receptacle is provided for connection to a 28 volt DC ground supply for engine starting and maintenance purposes.

The AC circuits are protected by individual fuses.

7.8.1 Battery

The main battery is normally a 24 volt, 40 amp-hour nickel-cadmium type located beneath the floor of the rear baggage compartment. Alternative batteries which may have been installed in early production aircraft include a 36 amp-hour lead acid type, or a 22 amp-hour nickel-cadmium type. The main battery supplies power to the electrical system when the DC MASTER switch is selected to MASTER, and the EXTERNAL/BATTERY switch is selected to BATTERY, with the starter-generators inoperative. It also supplies power independently through a hot battery bus to the entrance lights and forward and rear baggage compartment lights.

Battery and external power is supplied to the left DC bus through a reverse current circuit breaker or a set of current limiters. The current limiters (Mod 6/1651) replaced the reverse current circuit breaker beginning with SN 631.

Since production of the Series 300 Twin Otter ended in 1988, it has become common for operators to replace nickel-cadmium batteries with lead-acid batteries if the cold weather starting capabilities of nickel-cadmium batteries are not required.

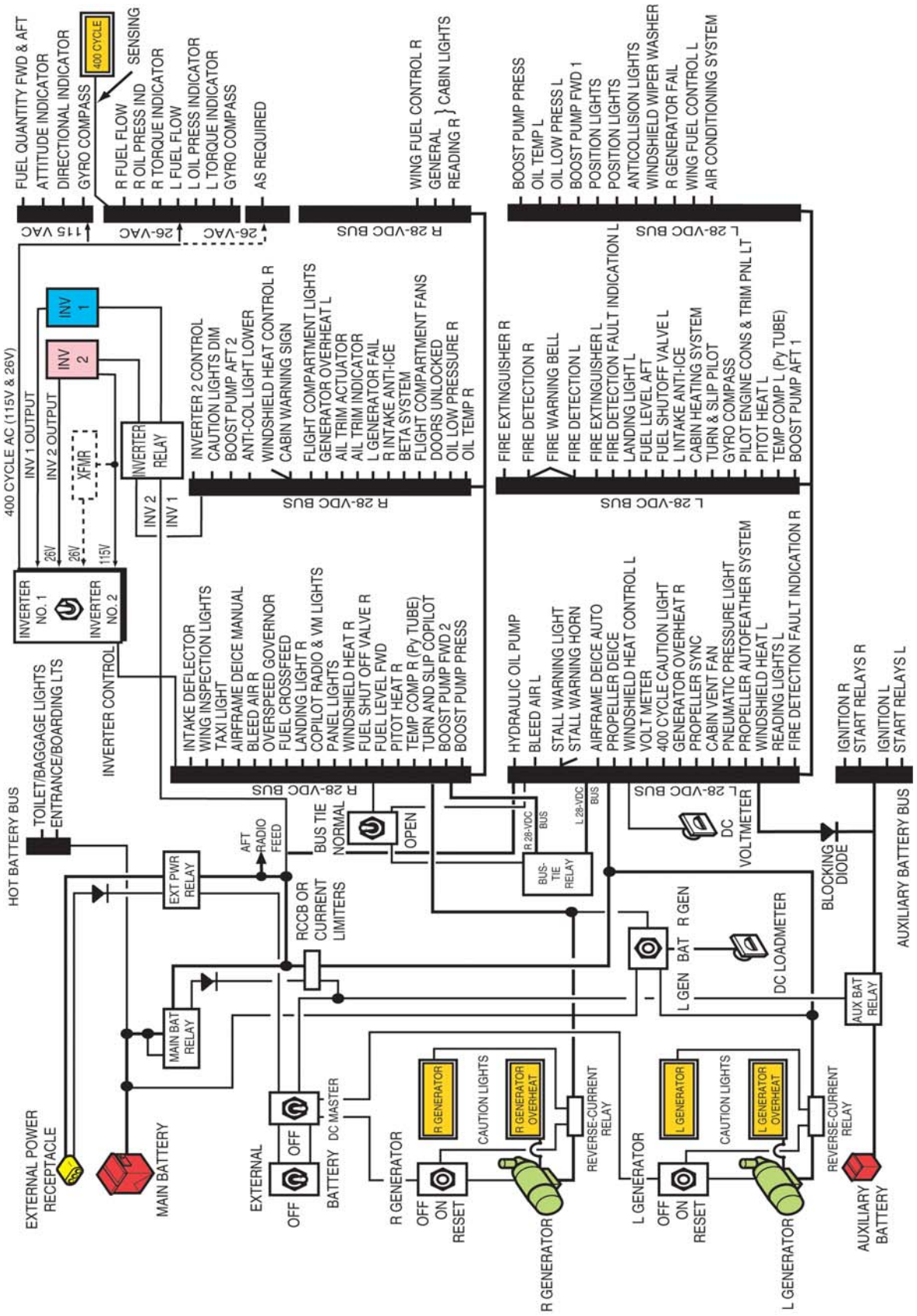


Figure 7-13 Electrical Load Distribution

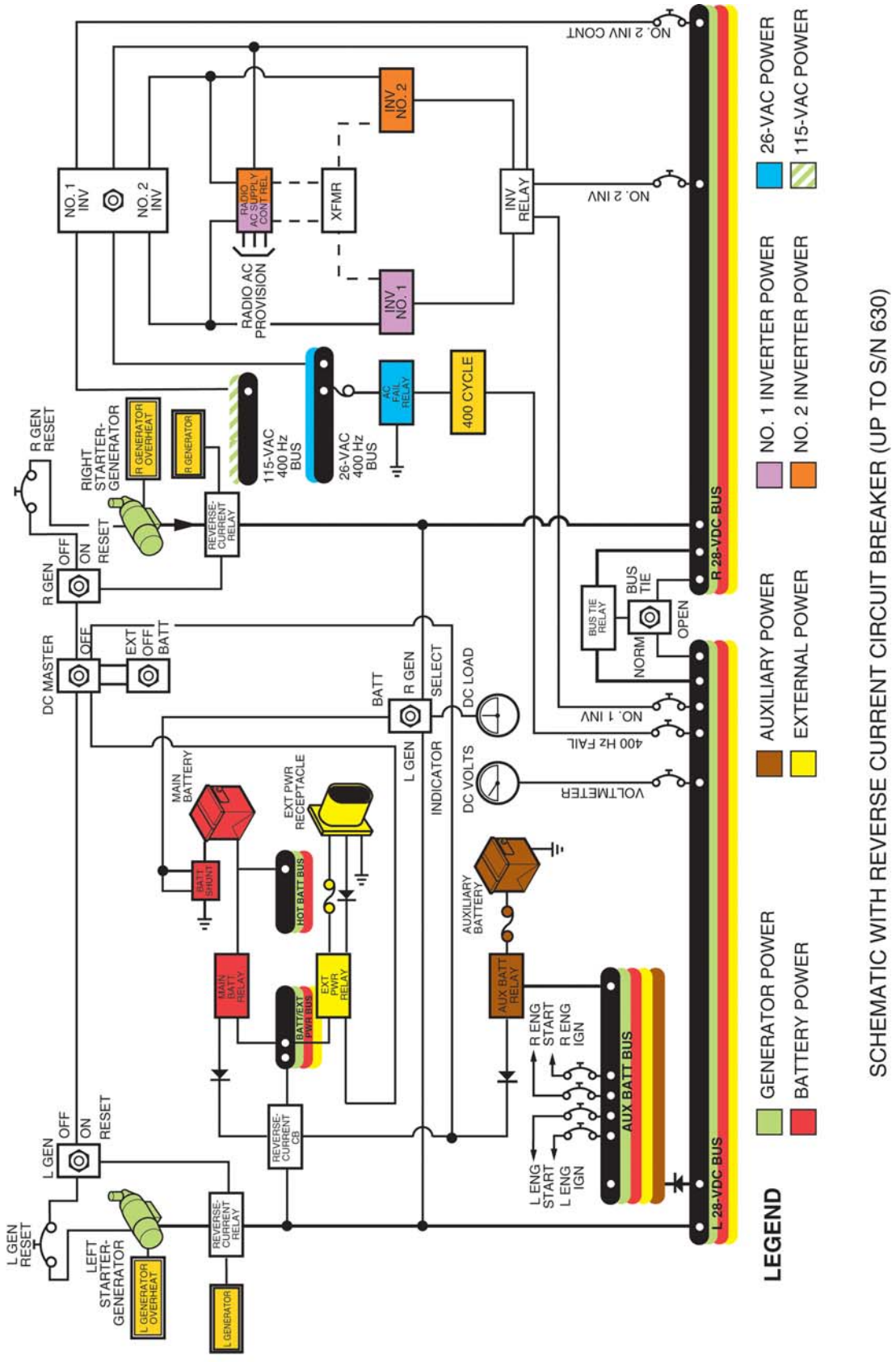


Figure 7-14 Electrical Schematic - Reverse Current Circuit Breaker (Up To SN 630)

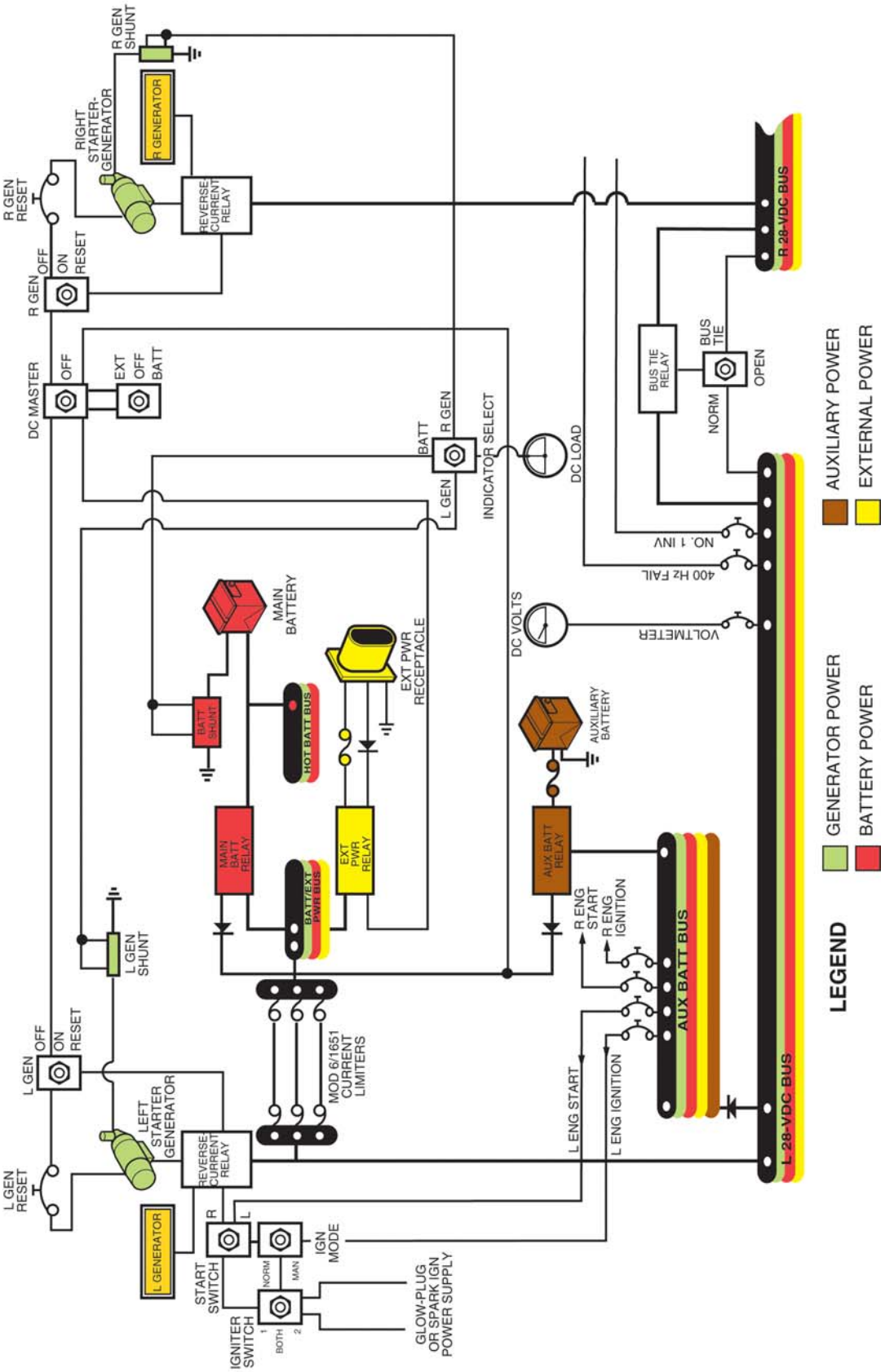


Figure 7-15 Electrical Schematic with Current Limiters (SN 631 and up)

7.8.1.1 Battery Temperature Monitor

A battery temperature monitor (Mod 6/1479, cut in as standard equipment at SN 406) provides a continuous battery temperature indication and warning of a high temperature condition. This enables action to be taken to disconnect the battery from the charging source and prevent its further subjection to overheat, thus minimizing the possibility of premature degradation or failure of the battery. The monitor consists of two sensors mounted on the battery intercell connectors which are connected to a red warning light and a temperature indicator installed on a panel below the right side instrument panel.

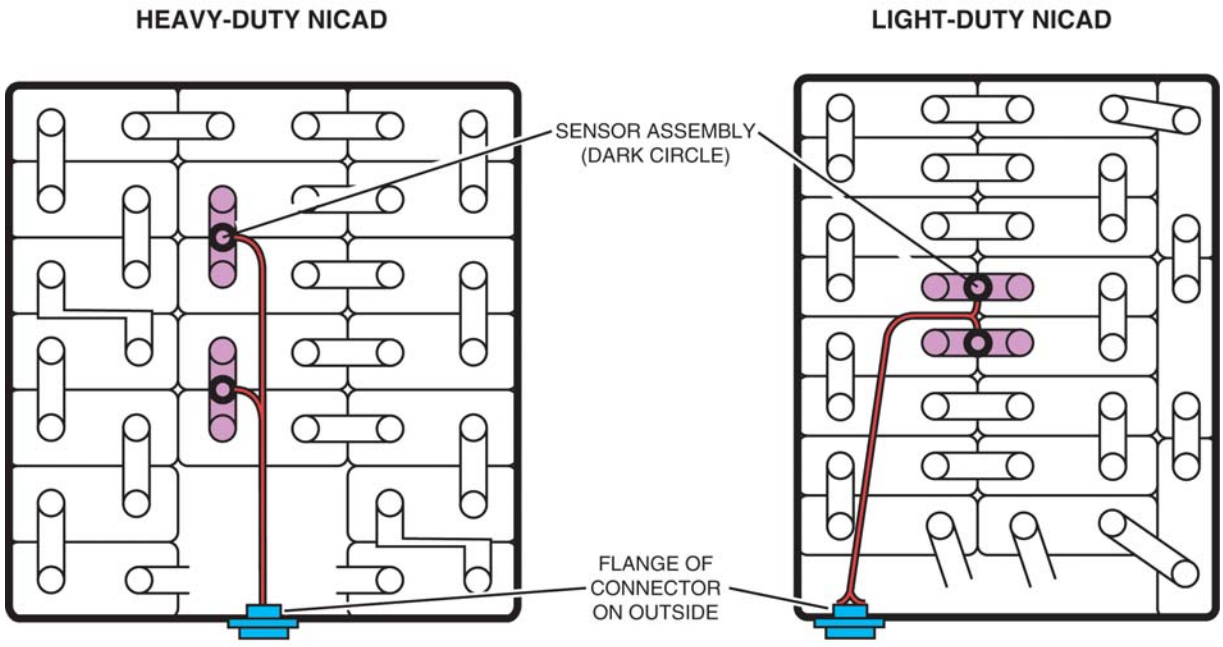


Figure 7-16 Battery Temperature Sensors

The battery temperature monitor has a push-button test feature which, through an integral sensor heater, provides a simulated overheat condition for verifying the correct function of both the red warning light and pointer indicator. The red warning light is connected to the caution lights dimming control circuit. The battery temperature monitor is powered from the left DC bus through a BATT O/HEAT circuit breaker on the main or overhead breaker panel. The individual sensor circuits are entirely independent of each other so that failure of one does not affect the other. They are protected by LAMP and IND circuit breakers on the battery temperature monitor panel.

The battery temperature monitor must be functional when a nickel cadmium main battery is installed in the aircraft. It is normally removed or placarded inoperative when a lead acid battery is installed.

The battery temperature warning light on the battery temperature monitor panel is labelled 150°, and when illuminated, indicates a battery temperature exceeding 150°F

as detected by a sensor mounted on the battery intercell connectors. The battery temperature indicator is labelled BATT TEMP and has a moving pointer and a graduated scale ranging from 60° to 180°F with the scale expanded in the 120° to 180°F segment. Colour coded bands (green, yellow and red) on the dial refer to normal, cautionary, and danger temperature ranges. The indicator pointer is connected to a second independent sensor on the battery intercell connectors.

7.8.2 Auxiliary Battery

A 24 volt, 3.6 ampere-hour nickel cadmium auxiliary battery is installed either beneath the floor of the rear baggage compartment aft of the main battery or, more commonly, on the rear baggage compartment forward bulkhead. The auxiliary battery provides an independent source of power for the engine start control relays and ignition (glow plug or spark igniter) system to ensure dependable engine starting during cold weather conditions. It does not supply power to the starter-generators or to any other aircraft systems.

7.8.3 External Power Receptacle

An external power receptacle is located on the fuselage left side aft of the cargo doors; it is covered by a spring-loaded access panel. When external power is connected, the EXTERNAL/BATTERY switch is at EXTERNAL, and DC MASTER switch is at DC MASTER, the external power relay is energized (provided the generators are not operating) which connects the external power to the left and right DC buses (provided the BUS TIE switch is at NORMAL). If a generator is brought on line while the EXTERNAL/BATTERY switch is at EXTERNAL, the external power relay will open automatically to disconnect external power from the aircraft.

7.8.4 DC Master Switch

A two-position DC MASTER switch is located on the overhead console. The switch has a center off position labelled OFF and an on position labelled DC MASTER. This switch controls the power supply to all buses, except the main battery bus, in conjunction with the EXTERNAL/BATTERY switch and the BUS TIE switch; when the DC MASTER switch is at OFF, no power is supplied to these buses regardless of the position of the EXTERNAL/BATTERY switch. At DC MASTER position, the switch connects power from an external power source or the battery, (as determined by the EXTERNAL/BATTERY switch position) to left and right buses or to the left bus only (as determined by the BUS TIE switch position), or from the generators to their respective buses.

7.8.5 External/Battery Switch

A three-position EXTERNAL/BATTERY switch, located on the overhead console has positions labelled EXTERNAL, OFF, and BATTERY. It connects the various sources of

electrical supply to the buses dependent upon the position of the DC MASTER switch. At EXTERNAL, the switch connects an applied external power source to the system and isolates the battery. At BATTERY, the battery powers the electrical system if the generators are inoperative or their voltage output is less than that of the battery. One or both generators may be connected to the system at BATTERY position if the generator voltage output exceeds that of the battery.

7.8.6 Bus Tie Switch

A BUS TIE switch labelled BUS TIE located on the overhead console is a two-position type with markings NORMAL and OPEN. The primary function of the switch is to connect the operating source of power to both left and right DC buses. At NORMAL with generators not operating, the switch connects an applied external power source or the battery to both left and right DC buses. With both generators operating, NORMAL position parallels their output, and the combined left and right bus and battery loads are shared equally between them. With one generator operating, NORMAL position connects it to both DC buses and its output is distributed between them. At OPEN position, power from an applied external power source or from the battery is supplied only to the left DC bus. With generators operating at OPEN position, the left generator supplies the left DC bus and the battery, and the right generator supplies the right DC bus.

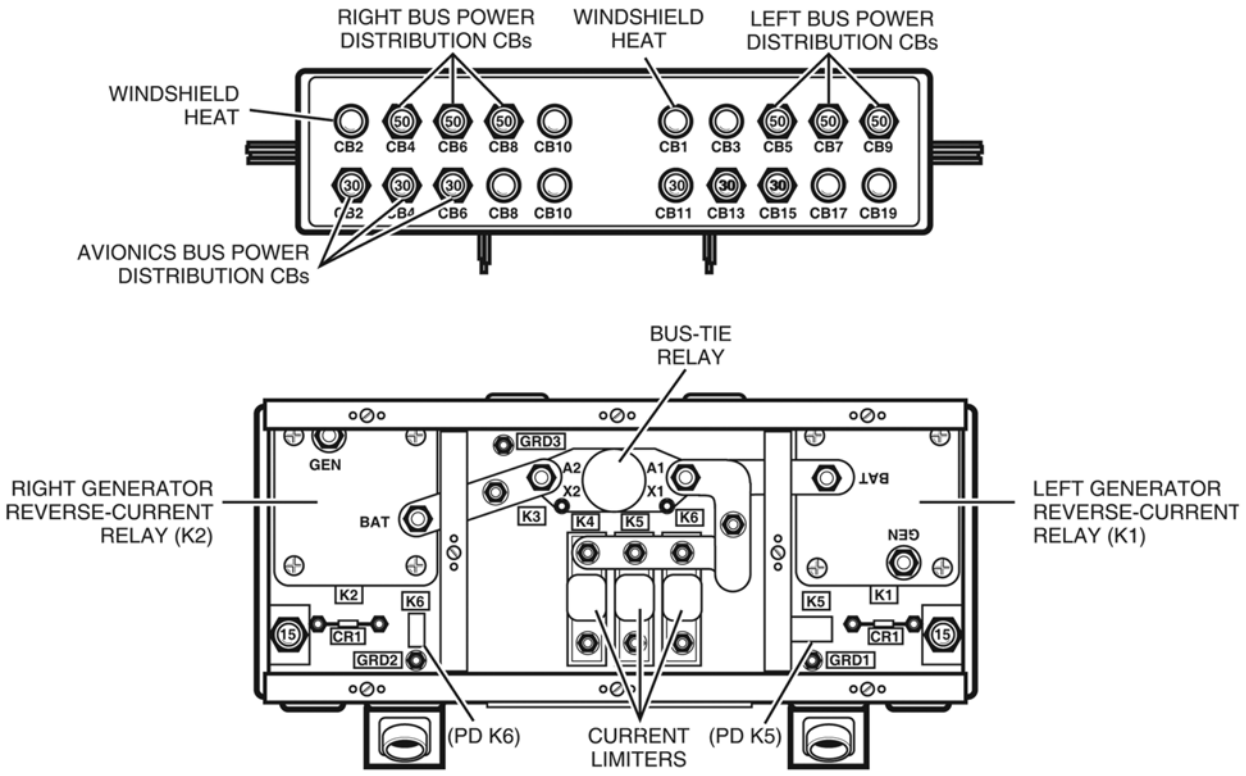


Figure 7-17 Electrical Distribution Box with Current Limiters

7.8.7 Starter-Generators

A starter-generator is mounted on the accessory gearbox of each engine. These function as a direct drive starter during engine start, and as a DC generator driven by the engine once the engine is running. The starter-generators each have a nominal regulated output of 28.5 volts at 200 amperes. Following engine start, a generator begins generating power when the generator switch is selected to RESET and released to ON. The field circuits of the starter-generators are protected by GEN CONTROL circuit breakers on the overhead circuit breaker panel. The generator reset circuits are protected by GEN RESET circuit breakers, each of which is inside its respective engine nacelle top cowling.

7.8.8 Generator Switches

Two switches labelled GENERATOR, and LEFT and RIGHT, are located on the overhead console. Each is a three position switch with positions labelled OFF, ON, and RESET. The ON position connects the applicable generator output to the electrical system through a reverse current relay and a voltage regulator. Undervoltage or overvoltage conditions de-energize the generator field relay to disconnect the generator from the system; before reconnection can take place, the applicable generator switch must be held momentarily at the spring loaded RESET position to restore the generator field circuit, and then released to ON.

7.8.9 Generator Caution Lights

Two generator caution lights, one for each generator, are included on the caution lights panel; they are labelled L GENERATOR and R GENERATOR. Each light, when illuminated, indicates that the relay that connects that generator to the bus is open. The light will go out when the generator switch is moved to the RESET position and released, or if the START switch is engaged. If the caution light remains on, a malfunction is indicated and the appropriate operational checklist should be consulted.

The left generator caution light circuit is powered from the right DC bus and protected by an L GEN FAIL circuit breaker. The right generator caution light circuit is powered from the left DC bus and protected by an R GEN FAIL circuit breaker. Both circuit breakers are on the main circuit breaker panel.

7.8.10 Generator Overheat Caution Lights

By special order, generator overheat caution lights can be installed on the caution lights panel to provide warning of an overheated generator. These caution lights are labelled L GENERATOR OVERHEAT and R GENERATOR OVERHEAT. The left caution light is powered from the right DC bus and the right caution light is powered from the left DC bus. The circuits are protected by GEN O/HEAT L and R circuit breakers on the overhead circuit breaker panel.

7.8.11 DC Voltmeter

A DC voltmeter is mounted to the right of the fire emergency panel. The voltmeter dial is labelled DC VOLTS and has a scale graduated in 1 volt increments from 0 to 30, with numerals at 10 volt intervals. It is connected to the left DC bus and indicates the voltage at the bus supplied from any of the power sources. It is protected by a circuit breaker labelled VM on the main circuit breaker panel.

7.8.12 DC Loadmeter

The DC loadmeter is located next to the DC voltmeter to the right of the fire emergency panel. The loadmeter dial is labelled DC LOAD and has a scale graduated in units of .1 over a range of –1.0 to +1.0, with numerals at .4, .8, and 1.0 on each side of a central 0. This instrument registers battery charge or discharge or loading on either generator, in accordance with the selection made on the adjacent indicator selector switch. The value of the battery charge or generator loading is expressed in units of +.1. A unit of .1 represents 10 amperes for battery readings and 20 amperes for generator readings.

When the generators are operating and the BUS TIE switch is at NORMAL, the loadmeter should indicate approximately equal generator loadings (within 20 amperes, or .1 reading, of each other). If the BUS TIE switch is in the OPEN position, the left bus will show a higher load than the right bus.

7.8.12.1 Indicator Selector Switch

An indicator selector switch is located to the right of the DC loadmeter. It is a three-position switch labelled IND SELECT, with positions labelled L GEN, BAT, and R GEN. The switch is spring-loaded to the BAT position, L GEN and R GEN being momentary on positions.

If the switch is left in the center position, the loadmeter displays battery charge or discharge. If the switch is moved to the spring-loaded left or right positions, the loadmeter displays the selected generator load. The switch does not affect or control the reading displayed on the voltmeter.

7.8.13 Inverters

Two 400 cycle, single-phase, static inverters with 115 volt and 26 volt outputs are installed in the rear fuselage. They are labelled NO. 1 and NO. 2. Number 1 inverter is supplied with 28 volts DC from the battery/external power bus through an INVERTER 1 circuit breaker on the overhead circuit breaker panel, and number 2 inverter with 28 volts DC from the right DC bus through an INVERTER 2 circuit breaker on the overhead circuit breaker panel controlled by an INVR 2 CONT circuit breaker on the main circuit breaker panel.

The two inverters provide separate sources of 400 cycle power for the 26 volt AC and 115 volt AC operated instruments. The inverters should receive approximately equal operational use, and alternate selection should therefore be made each day. The non-operating inverter always remains as a standby in the event of failure of the flight selected inverter. A caution light labelled 400 CYCLE illuminates if an inverter failure occurs. The caution light circuit is protected by a 400 ~ FAIL circuit breaker on the main circuit breaker panel, and the 28 volt AC 400 cycle sensing line is protected by a 1 ampere 400 ~ FAIL fuse on the fuse panel.

When S.O.O. 6142 (dual inverter switches, standard on Series 310 aircraft) is incorporated, the two inverters normally operate simultaneously. The left inverter normally supplies the left AC bus, which powers the left directional gyro, left attitude indicator, and fuel quantity, fuel flow, oil pressure and torque pressure indicators. The right inverter normally supplies the right AC bus, which powers the right directional gyro and attitude indicator. Certain radio installations may also be powered from the AC buses. Each inverter has its own caution light. A malfunction of the AC system is indicated by the illumination of the L 400 CYCLE or R 400 CYCLE caution light.

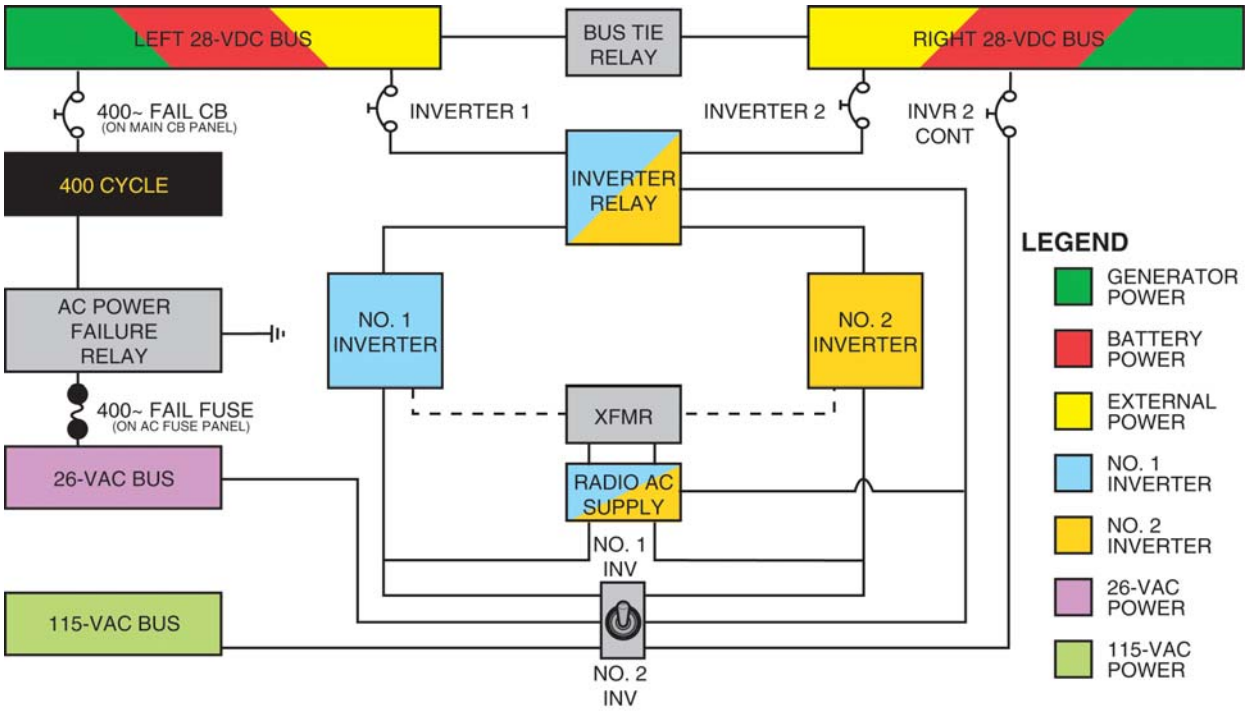


Figure 7-18 AC Electrical Schematic - Series 300

7.8.13.1 Inverter Switch

A two-position switch labelled INVERTER with positions NO. 1 and NO. 2 is located on the overhead console, (or on the overhead fuse panel, Post-Mod 6/1274, which was cut in as standard at SN 311); it provides for the selection of either of the two inverters. Both inverters are powered by their respective DC buses through the inverter control

relay. When number 2 inverter is selected it is energized through a circuit breaker labelled INVR 2 CONT on the main circuit breaker panel.

When S.O.O. 6142 is incorporated, two switches under the label INVERTERS on the fuse panel control the 400 cycle AC buses. The two switches are labelled L BUS and R BUS and each switch has three positions labelled NORM, OFF, and EMER. Each switch should normally be selected to the NORM position.

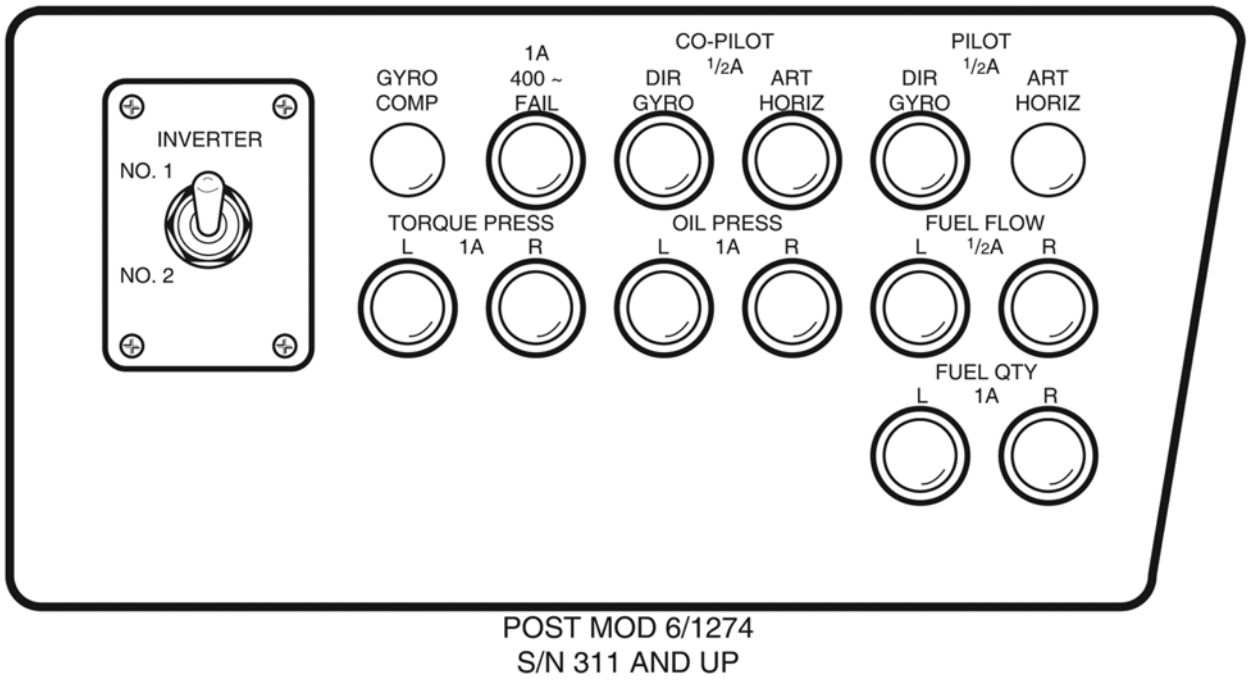
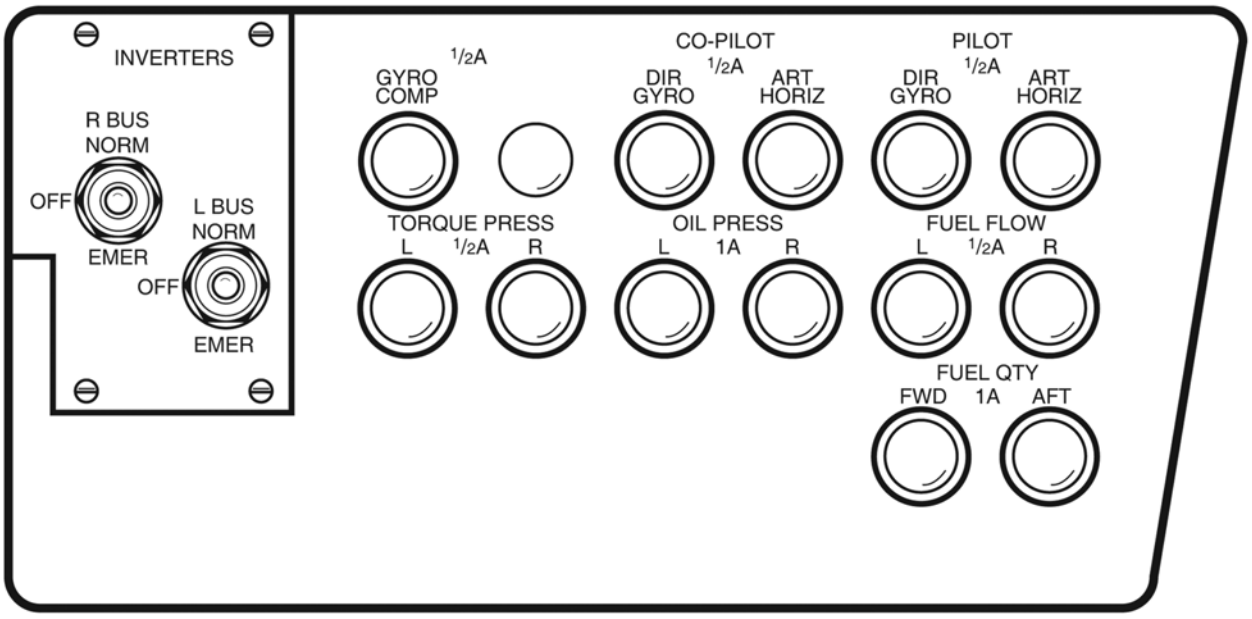


Figure 7-19 Series 300 AC Fuse Panel (SN 311 and up)



S.O.O. 6142 - SERIES 310

Figure 7-20 Series 310 AC Fuse Panel

7.9 Interior Lighting System

The interior lighting system consists of six general cabin lights, two flight compartment utility lights, a flight compartment dome light, twenty passenger reading lights, an entrance light, forward and aft baggage compartment lights, and cabin sign lights. An airstair door light on the fuselage exterior is in circuit with the entrance light.

7.9.1 Flight Compartment Dome Light

A flight compartment dome light is installed on the right of the overhead console. The light is powered from the right DC bus through the FLT COMP LT circuit breaker on the circuit breaker panel and is controlled by an integral rotary or pushbutton switch.

7.9.2 Flight Compartment Utility Lights

Two flight compartment utility lights are mounted in quick-release clips, one above each flight compartment door. Alternatively they can be mounted on the bulkhead behind the pilot seats. The lights are controlled by a two-position switch labelled FLIGHT COMPT on the overhead console, and by a rheostat switch on the case of each light. The circuit is powered from the right DC bus and is protected by the FLT COMP LT circuit breaker on the main circuit breaker panel.

7.9.3 Panel Lighting

White panel lighting is provided for the flight instrument and engine instrument panels, trim controls, overhead console, fire emergency panel and DC loadmeter panel. Post lights illuminate the flight instrument panel; edge lights illuminate the engine instrument panel, overhead console, emergency panel, trim controls, DC meter panel and the flap indicator. The hydraulic pressure gauges are illuminated by eyebrow lights.

7.9.3.1 Left Flight Instrument, Engine Instrument, and Emergency Panel Lights

The left flight instrument panel, engine instrument panel, emergency panel, and left radio panel, the brake hydraulic and left oxygen gauges, and the magnetic standby compass are illuminated by lights powered from the left DC bus and controlled by a dimmer control labelled PLT ENG INST & EMER PNL LIGHTS in the flight compartment roof. A PLT ENG CONS & TRIM PNL LT circuit breaker on the main circuit breaker panel protects the circuits.

7.9.3.2 Overhead Console and Trim Console Lights

The overhead console, trim console, intake deflector, and flap position indicators are illuminated by lights powered from the left DC bus and controlled by a CONSOLE FLAP

& PNL LTS dimmer control in the flight compartment roof. The PLT ENG CONS and TRIM PNL LT circuit breakers on the main circuit breaker panel protect the circuits.

7.9.3.3 Right Flight Instrument and Radio Panel Lights

The right flight instrument panel, the radio panel, right oxygen gauges, hydraulic system gauge, DC meters, and de-icing gauges (when installed) are illuminated by lights powered from the right DC bus, and controlled by a COPLT RADIO & VA PNL LTS dimmer control in the flight compartment roof. A COPLT RAD & VA PNL LT circuit breaker on the circuit breaker panel protects the circuits.

7.9.4 General Cabin Lights

Six general cabin lights are installed centrally in the cabin roof. They are controlled from a three-position switch labelled GENERAL on the overhead console; the switch positions are labelled DIM, OFF and BRIGHT. The circuit is powered from the right DC bus through the CABIN LTS GENERAL circuit breaker on the overhead circuit breaker panel.

7.9.5 Passenger Reading Lights

Twenty passenger reading lights, six on the left and fourteen on the right, are integral with the cove ventilating ducts in the cabin walls. The lights are controlled from a two-position switch labelled READING on the overhead console. A switch beside each light provides passenger control over individual lights. The circuits are powered from the right DC bus and protected by the READING circuit breakers on the overhead circuit breaker panel.

7.9.6 Entrance Lights

The entrance lights consist of a threshold floodlight recessed in the cabin roof and an airstair door floodlight located on the fuselage exterior forward of the door. The lights are controlled by either of two switches; one on the overhead console labelled ENTRANCE and the other (a rocker type switch) on the fascia immediately forward of the door and labelled BOARDING LIGHTS. The entrance lights circuit is powered from the hot battery bus through the COMPT LTS circuit breaker on the rear bulkhead circuit breaker panel.

7.9.7 Cabin Signs

Two cabin signs labelled NO SMOKING and FASTEN SEAT BELT are installed in the cabin to the right of the cabin/flight compartment doorway. They are illuminated by lights controlled by switches labelled NO SMOKING and FASTEN BELT on the overhead console. The circuits are powered from the right DC bus through the FLT COMP LT circuit breaker on the circuit breaker panel.

7.9.8 Forward Baggage Compartment Lights

The forward baggage compartment light is operated by a light switch integrated into the forward nose baggage door latch. When the short nose is installed it is operated by the nose door limit switch. The light is powered from the battery bus through the COMPT LTS circuit breaker on the rear bulkhead hot battery bus circuit breaker panel.

7.9.9 Rear Baggage Compartment Lights

The rear baggage compartment is illuminated by two dome lights which are operated by both a limit switch activated by the exterior baggage door latching pins and by a switch (labelled BAGGAGE COMP LT) on the aft face of the baggage compartment forward bulkhead. The lights are powered from the hot battery bus through the COMPT LTS circuit breaker on the rear bulkhead (station 336) circuit breaker panel.

7.9.10 Emergency Lighting

7.9.10.1 Early Production Aircraft

By special order (S.O.O. 6098) two emergency lights can be installed in the roof of the cabin. These lights are dry cell operated and controlled by a PUSH ON, PUSH & PULL TO RESET integral switch. The lights will provide automatic illumination under abnormal landing conditions which would trip the inertia switch at a positive or negative acceleration between 2 and 4 *g*. Each light is retained in position by a ball click mechanism and bayonet catch in a circular retaining ring and, if required in an emergency, can be removed for use as a handheld light.

7.9.10.2 Later Production Aircraft

By special order (S.O.O. 6179), two emergency lights are installed in the airplane for automatic operation in the event of failure of the 28 volt DC power supply. Both lights are located in the cabin roof, one at fuselage station 162 and the other at fuselage station 295. Each light has a single incandescent lamp powered by two nickel-cadmium batteries which are on continuous charge whenever the main 28 volt DC system is energized. Two charging indicator lights on the face of each light illuminate whenever current flows through the batteries.

A single switch (labelled EMER) on the LIGHTING panel on the overhead console controls both emergency lights. The switch has three positions marked ARM, TEST, and DISARM. ARM position (lever locked) is normally selected for flight to both arm the lights for automatic operation should a power failure occur, and to trickle charge the batteries. The TEST position interrupts the aircraft input voltage, testing the monitoring circuit, batteries and lamp. DISARM position (momentary on position) prevents the power control circuit in the unit from energizing the lamp by battery power and should be selected before switching off the DC MASTER switch.

The emergency lights circuit is powered from the left 28 volt DC bus and is protected by a circuit breaker labelled EMER LTS on the overhead circuit breaker panel.

7.10 Exterior Lighting System

The exterior lighting system consists of position lights, landing lights, and an anti-collision light. A lower anti-collision light and strobe lights can also be installed on special order. All exterior lights are powered from the left or right DC buses.

7.10.1 Position Lights

The position (navigation) lights consist of red and green wing tip lights and a white taillight. The lights are controlled by a switch labelled POSN on the overhead console. The circuit is powered from the left DC bus and protected by a POSN LTS circuit breaker on the main circuit breaker panel.

7.10.2 Anti-Collision Lights

By special order, two white strobe type anti-collision lights can be fitted as part of the position light assembly installed in each wing tip. Mod 6/1513 at SN 470 introduced these as basic to the aircraft. A red rotating anti-collision beacon light is mounted on the top of the vertical stabilizer. The white strobe lights are controlled by a switch labelled ANTI COLL on the overhead console; the circuit is powered from the left DC bus and is protected by the ANTI COLL LT circuit breaker on the main circuit breaker panel. The red rotating anti-collision beacon light is controlled by a switch labelled BEACON on the overhead console; the circuit is powered from the left DC bus and is protected by the BEACON LT circuit breaker on the overhead circuit breaker panel. By special order a lower rotating anti-collision beacon light can be mounted on the underside of the rear fuselage. It is controlled by the BEACON switch on the overhead console; the circuit is powered from the right DC bus protected by the ANTI COLL LT LOWER circuit breaker on the overhead circuit breaker panel. On earlier aircraft, without strobe lights, the rotating red anti-collision beacon light is controlled by the ANTI COLL switch on the overhead console.

7.10.3 Landing Lights

Two 250 watt landing lights are installed, one in each wing leading edge outboard of the engine. The lights are controlled by two switches labelled LANDING LIGHTS, LEFT, and RIGHT, on the overhead console, and the circuits are powered from the left and right DC buses and protected by LDG LT L and LDG LT R circuit breakers on the main circuit breaker panel.

7.10.4 Taxi Light

By special order a 100 watt taxi light can be installed on the nose wheel fork. The light is controlled by a switch labelled TAXI on the overhead console and the circuits are

powered from the right DC bus and protected by a TAXI LT circuit breaker on the main circuit breaker panel. The taxi light became standard equipment from SN 531 onwards.

7.10.5 Wing Inspection Lights

By special order (standard equipment when surface de-ice boots are installed) two 40 watt wing inspection lights are installed, one on the outboard side of each engine nacelle. The lights illuminate the leading edges of the wings and are controlled by a switch labelled WING INSP LT on the overhead console. The circuit is powered from the right DC bus and protected by a WING INSP LT circuit breaker on the main circuit breaker panel.

7.11 Caution Light Panel

A panel of 18 individual caution lights is installed above the emergency panel, arranged in three rows on each side of the magnetic standby compass. Each caution light has an amber inscription on a black background and when illuminated indicates a malfunction or abnormal condition to the service or component indicated on it. The caution lights are powered from the 28 volt left or right DC bus through circuit breakers in the individual caution light circuits.

Some caution lights are optional and are only provided by special order (for example, the Generator Overheat lights) or when other optional equipment is ordered (for example, the Pneumatic Low Pressure light is part of the surface de-ice system, and dual inverter caution lights are part of S.O.O. 6142).

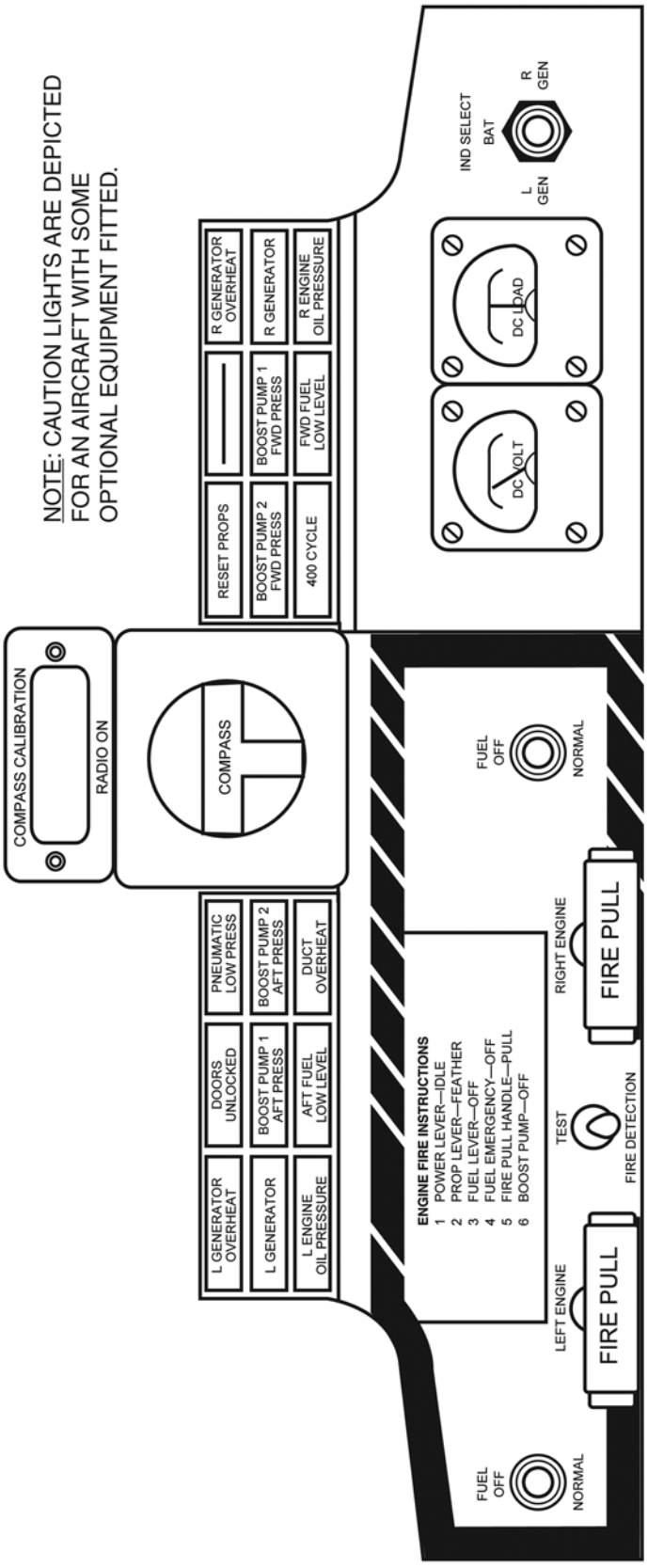


Figure 7-21 Caution Light Panel - Series 300

7.11.1 Caution Light Test and Intensity Switch

A three-position switch labelled CAUTION LT with positions DIM, BRT, and TEST is located on the overhead console. DIM and BRT positions provide alternative levels of lighting brilliance for all 18 caution lights, the beta range lights, the beta back-up disarmed light, the autofeather indicator lights, and the stall warning light, and if applicable the wheel-ski position indicator lights. The momentary TEST position of the switch permits a simultaneous check of all the aforesaid lights plus the stall warning horn. The test and intensity circuit is protected by a CAUT LT TEST circuit breaker on the main circuit breaker panel.

7.11.2 Stall Warning System

The stall warning system consists of two lift detecting vanes and switches (which are connected in parallel) in the left wing leading edge, in circuit with a warning light. The light has the inscription STALL and is located on the flight instrument panel. Beginning at SN 311 (Mod 6/1277), a stall warning horn was installed on the bulkhead behind the right pilot seat to operate in conjunction with the stall warning light and provide an audible indication of an approaching stall.

The two vanes are set at slightly different levels in the wing leading edge to ensure the complete effectiveness of the stall warning system at all flap settings and aircraft attitudes. The lower vane is operative over the full flap range of 0° to 37.5°, but the upper vane is effective only with flaps extended. From 0° to 12° (±2°) flap settings the upper vane is rendered electrically inoperative by a microswitch actuated by the flap mechanism. In operation, as a stall condition is approached, the stagnation point moves from above the affected vane to below it and causes it to deflect upward sufficiently to actuate its switch and complete the circuit to the warning light.

The stall warning activates at 4 to 9 KIAS above stall speed. Correction of the near stall condition by the pilot causes the vane to move in the opposite direction and de-energize the electrical circuit.

The stall warning light and stall warning horn are connected to the caution lights test circuit, and may be checked by operation of the CAUTION LT switch to TEST position. The stall warning system is powered from the left DC bus and is protected by a STALL WARN circuit breaker on the main circuit breaker panel. The detector vanes are heated to prevent condensation; the heaters are controlled by the pitot heat switch.

7.12 Fuel System

Fuel is contained in forward and aft fuselage tanks located in the lower fuselage beneath the cabin floor. A filler neck and cap for each tank is provided on the left side of the fuselage. Each tank consists of four interconnected flexible rubber cells, one of which is a collector cell into which fuel is transferred from the other cells through a boost pump operated ejector. The fuel is delivered by boost pumps to the engines. All cells are vented to atmosphere in a manner that ensures positive pressure in the tank. Each collector cell contains two boost pumps, a float switch, and a level control valve.

The forward tank feeds the right engine and comprises cells 1 through 4, cell 4 being the collector cell. The aft tank feeds the left engine and comprises cells 5 through 8, cell 5 being the collector cell. The forward tank holds 152 Imperial gallons (183 US gallons, or 691 litres) of fuel, and the aft tank 166 Imperial gallons (200 US gallons, or 755 litres).

At +15°C and midrange density according to ASTM D-1655 specification for JET-A or JET-A1 fuel, the gross gravimetric capacity of the two fuselage tanks is 2,574 pounds (1,167 kg), and the usable gravimetric capacity is 2,548 pounds (1,156 kg).

7.12.1 Fuel Tank Selector

The fuel tank selector on the instrument panel is labelled FUEL SELECTOR. It is a rotary knob with three marked positions: BOTH ON FWD, NORM, and BOTH ON AFT. At the NORM position the forward and aft tanks supply the right and left engines respectively, the crossfeed valve being closed; the number 1 boost pump in each tank is energized when its related switch is on; the number 2 boost pump remains inoperative. At BOTH ON FWD or BOTH ON AFT the crossfeed valve is opened, the boost pump of the non-selected tank is automatically de-energized and both boost pumps in the selected tank energized, the boost pump switch selection being overridden. The crossfeed valve circuit is powered from the right DC bus and protected by a FUEL XFEED circuit breaker on the main circuit breaker panel. Up to SN 510, the fuel selector panel was located below the flight instruments on the left side of the instrument panel. Beginning with SN 511 the fuel selector panel was relocated to the center of the instrument panel below the engine instruments.

7.12.2 Boost Pump Switches

Two boost pump switches are located one on each side of the fuel selector. The switches are three-position type and are labelled AFT BOOST and FWD BOOST. The upper of the three switch positions, which is not labelled, is the on position. The other switch positions are labelled OFF and TEST, the latter being a momentary spring-loaded position. Each switch controls the number 1 boost pump in its respective tank, and both switches should be on at all times during normal flight operations. Control of the number 2 boost pump in each tank is by means of an automatic electrical changeover

sequence which is initiated by the failure of the number 1 boost pump. Independent operation of the number 2 boost pumps is possible by using the standby emergency switches. The boost pumps are powered from the left and right DC buses and protected by circuit breakers on the main circuit breaker panel labelled BST PUMP AFT 1, BST PUMP AFT 2, BST PUMP FWD 1, and BST PUMP FWD 2.

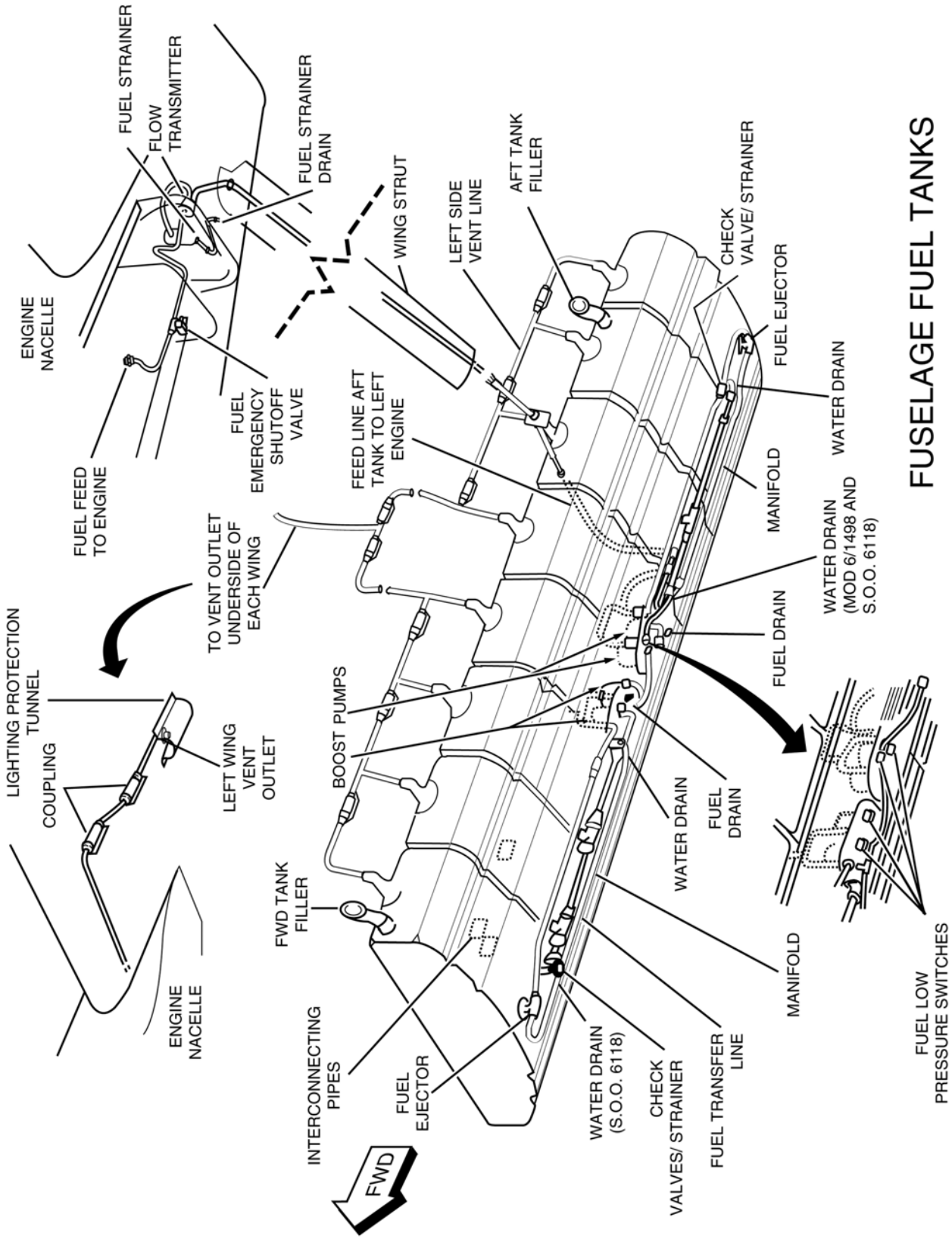


Figure 7-22 Fuselage Fuel Storage

7.12.3 Boost Pump Pressure Caution Lights

Four boost pump pressure caution lights on the caution lights panel are labelled BOOST PUMP 1 AFT PRESS, BOOST PUMP 2 AFT PRESS, BOOST PUMP 1 FWD PRESS and BOOST PUMP 2 FWD PRESS. Each caution light is controlled by a pressure switch in the delivery line of the corresponding boost pump. If fuel pressure downstream of the pump falls below 2 PSI the switch closes and the caution light illuminates. During normal operation pressure from the number 1 boost pump in each tank actuates number 1 fuel pressure switch which extinguishes number 1 boost pump caution light, and through an electrical sequence, renders number 2 pump and number 2 boost pump caution light inoperative.

If a number 1 pump should fail, the caution light of the affected pump will illuminate and the number 2 pump in that tank will switch on automatically to maintain fuel pressure to the engine. Subsequent failure of the number 2 pump will cause the number 2 caution light to illuminate. Concurrent failure of a number 1 boost pump and failure of its associated pressure switch to detect the low pressure condition would prevent automatic changeover to the number 2 pump and also prevent illumination of both number 1 and number 2 boost pump caution lights. Although such a dual failure is highly improbable, this could result in an engine flame-out caused by low fuel supply pressure without any boost pump caution light indication.

Correct function of the low pressure switches can be confirmed by turning the boost pump switch off during the pre-flight inspection and observing that the two associated boost pump low pressure cautions lights illuminate.

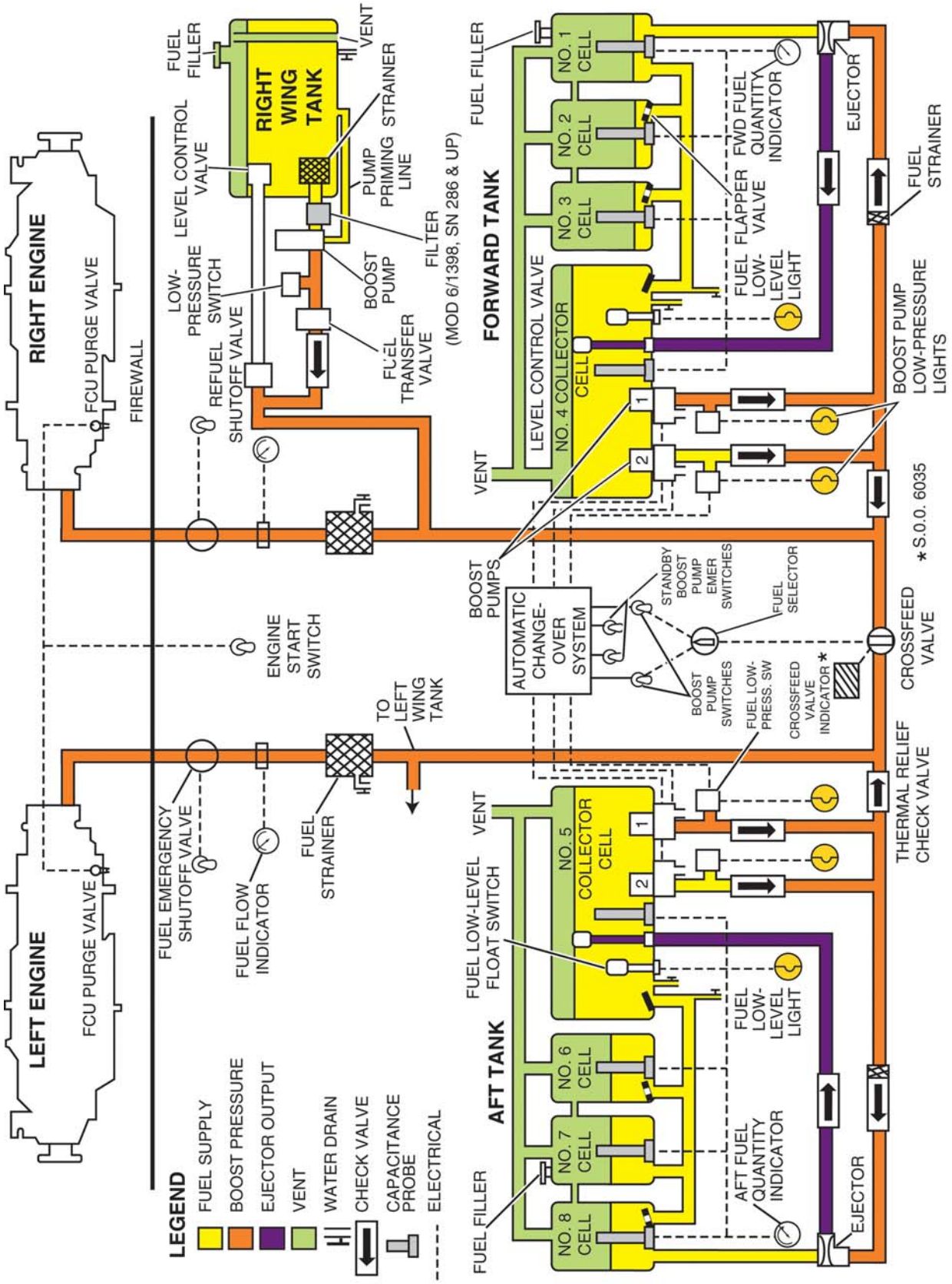


Figure 7-23 Fuel System Schematic

7.12.4 Standby Boost Pump Emergency Switches

Two lever lock switches labelled STBY BOOST PUMP EMER and individually identified AFT and FWD are located beside the fuel selector. Each is a two-position switch, and when moved to the up position it energizes its related number 2 boost pump independently of the automatic changeover system or the position of the FUEL SELECTOR control.

7.12.5 Fuel Crossfeed

Normally the forward tank supplies the right engine and the aft tank supplies the left engine, but crossfeeding is possible so that one tank can feed both engines and even the opposite engine if the normally supplied engine is shut-down. It is not possible to transfer fuel between the two tanks. Crossfeeding takes place via a crossfeed valve which is controlled by the fuel selector rotary switch in the flight compartment. Fuel supply to the engines is controlled by fuel levers on the overhead console, each lever being connected to a fuel cut-off valve on its engine. A check valve, strainer, flowmeter, and emergency shut-off valve are included in the supply line to each engine. An automatic purge valve for eliminating trapped air from the fuel control unit during the engine starting cycle is installed in each engine nacelle.

7.12.5.1 Fuel Crossfeed Valve Position Indicator

A fuel crossfeed valve indicator can be installed on special order (S.O.O. 6035) to provide a visual indication of the fuel crossfeed valve position. The indicator displays the symbol CL when the valve is closed (fuel selector at NORM), and OPEN when the valve is open (fuel selector at BOTH ON AFT or BOTH ON FWD). When the fuel crossfeed and position indicating system is de-energized or the valve is in transit, the indicator displays black and white diagonal stripes.

7.12.6 Fuel Quantity Measurement

A capacitance type fuel quantity indicating system provides indication of the weight of the fuel in each tank. The summed indications of four capacitor probes (one in each cell) are displayed in pounds on the fuel quantity indicator for each tank. Fuel low level caution lights are also provided.

A fuel dipstick (drawing C6G1088-1) is available to physically check quantity in the fuselage tanks. Prior to using the dipstick, the aircraft must be parked on a level surface and a suitable period of time (not less than 15 minutes following refuelling, or, ideally 12 hours after boost pumps have been shut-down if maximum accuracy is desired) must have passed to allow fuel levels to equalize between the four cells that comprise a tank.

7.12.7 Fuel Emergency Shut-off Switches

Two fuel emergency shut-off switches, one for each engine, are located on the fire emergency panel; each is labelled FUEL with labelled OFF and NORMAL positions. The switches are powered through circuit breakers on the main circuit breaker panel labelled FUEL SOV L and FUEL SOV R. Each switch controls a firewall shut-off valve for its engine. Under normal operating conditions each switch remains at NORMAL and is only moved to OFF to shut-off the engine fuel supply in certain emergency conditions.

7.12.8 Fuel Low Level Caution Lights

Two fuel low level caution lights are located on the caution lights panel and are labelled FWD FUEL LOW LEVEL and AFT FUEL LOW LEVEL. Each light is controlled by a float switch in the related tank when a predetermined low fuel level is reached. In level flight the low level trigger point is 75 pounds usable fuel remaining for the forward tank and 110 pounds usable fuel remaining for the aft tank. The circuits are supplied through two circuit breakers on the main circuit breaker panel labelled FUEL L LEVEL AFT and FUEL L LEVEL FWD.

7.12.9 Fuel Quantity Indicator Test Switch

A fuel quantity indicator test switch is located beside the fuel selector. The switch is a push button labelled IND TEST. When the switch is pressed the pointers of both fuel quantity indicators are de-energized and should fall to zero. When the button is released the pointers are energized and should resume correct fuel quantity indication. Movement of the fuel indicators confirms the presence of 115 volt AC power at the indicators.

7.12.10 Fuel Heaters

A fuel heater is installed on each engine to prevent ice crystals from forming in the engine fuel control unit during cold temperature operations. The fuel heater is a heat exchanger with the engine oil providing the heat source. It is operable only when the engine is running, and is controlled automatically by a temperature control valve which governs the oil flow through the heater. The temperature control valve is set to deliver fuel to the engine at about 35°C if sufficient heat is available from the engine oil. Oil temperature must be equal or greater than +55°C to ensure that fuel temperature is raised above the freezing point by the heater, however, this is not an operating limitation.

7.12.11 Fuel Control Sensor Tube Heaters

Electrical heater elements are installed in each engine to maintain the temperature of the enrichment pressure line between the compressor tap and the fuel control unit and the governor pressure line between the propeller governor and the fuel control unit. These heaters are powered from the left and right DC buses through TEMP COMP HTR

L and R circuit breakers on the main circuit breaker panel. The heaters are energized whenever power is supplied to the DC buses. No pilot action is required.

7.12.12 Wing Fuel Tanks

The aircraft can be equipped with an integral fuel tank in each wing (S.O.O. 6095) to increase flight endurance by approximately one hour. Each wing tank has a nominal gravimetric capacity of 300 pounds of Jet A or A1 fuel, and volumetric capacity of 37 Imperial gallons (44 US gallons, or 168 litres). The tanks are located in the forward portion of each wing, just inboard of each wing tip.

Contained in each tank is a level control valve, a strainer, a fuel transmitter, a vent pipe, and a filler cap. Mounted outside each tank on the wing outboard nose rib is a fuel pump, a pressure switch, a fuel transfer valve and a refuel shut-off valve. Two switches control the fuel supply from the wing tanks to the engines, and when appropriately selected (with the fuel tank selector at NORM) the left wing tank supplies the left engine and the right wing tank supplies the right engine. The wing fuel system is operated from the right and left DC buses through WING FUEL CONTROL R and WING FUEL CONTROL L circuit breakers on the overhead circuit breaker panel. The entire wing fuel system, including the gauges, is DC powered.

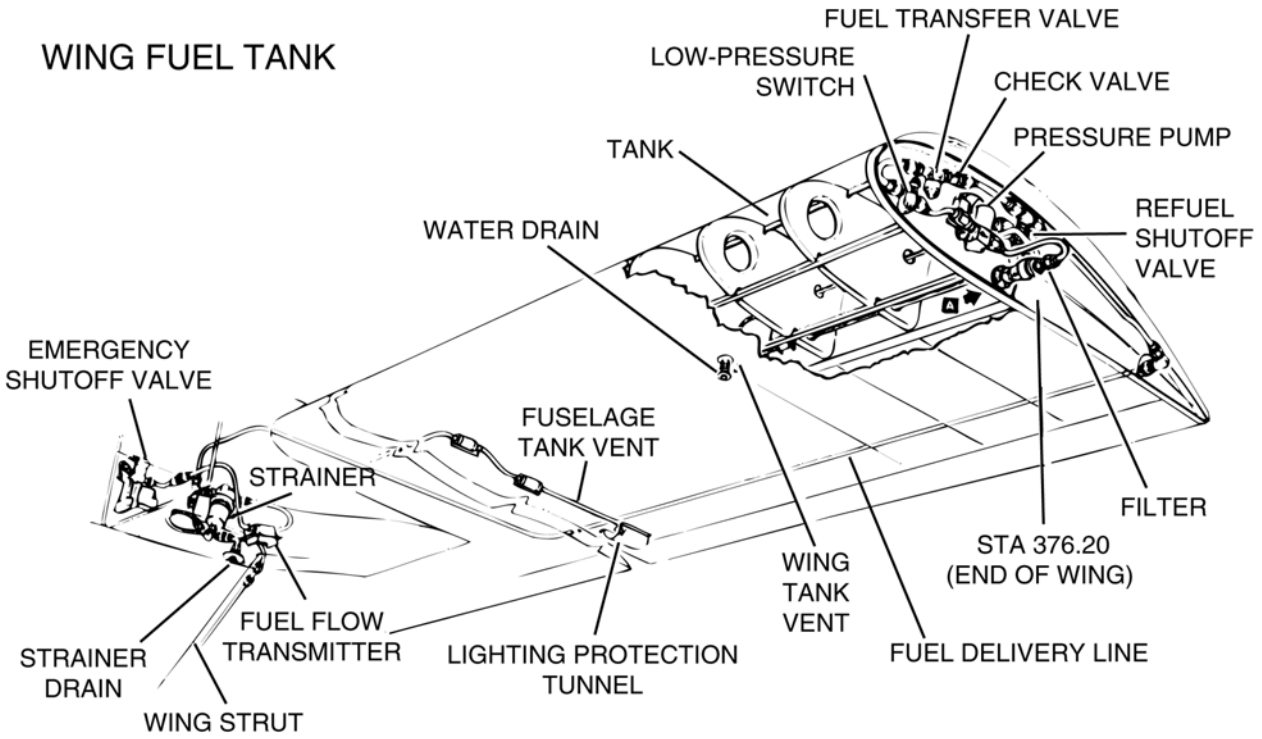


Figure 7-24 Wing Fuel Tank Components

Fuel quantity indicators labelled L WING TANK and R WING TANK, have a graduated scale marked E, 1/4, 1/2, 3/4, and F. A label below each indicator is marked F = 287 LBS. When Mod 6/1627 (cut in as standard at SN 541) is incorporated, each label is marked F = 37 IMP GALS = 44 US GALS. 287 pounds was used for the full indication pre Mod 6/1627 because this is the lowest possible fuel weight if the JET A or A1 fuel in use is at the lowest limit of ASTM specification D1655 for fuel density. The float-type fuel level sensors used in the wing tanks do not compensate for density variation. At the midrange of the density specification, a full wing tank will contain 300 pounds of fuel.

A drain valve for each wing tank is provided on the bottom of the wing.

When the aircraft is fitted with spring skis or wheel skis and a landing on snow or ice is planned, the wing tanks must be less than half full before landing on snow or ice surfaces. There is no similar landing restriction for wheel or floatplanes.

Because there is only one fuel boost pump for each wing tank, wing tank fuel must be consumed prior to the point of no return if completion of the flight is dependent on using the fuel in the wing tanks.

Unusable fuel in the wing tanks is negligible, approximately 1 pint (0.5 litres) per tank.

7.12.12.1 Wing Fuel Tank Control Panel

The location of the wing fuel tank controls and gauges varies. Prior to SN 311, the controls were located on the left side lower sub panel. Effective with SN 311 (Mod 6/1421), the controls were relocated to the console between the left pilot's rudder pedals. Effective with SN 771 (Mod 6/1723), the switches and gauges were consolidated together on the center pedestal below the instrument panel.

The wing fuel tank control panel is labelled WING FUEL TANKS. Mounted on the panel are two lever lock switches marked REFUEL at the down position, OFF at the center lock position, and L ENGINE (left switch) and R ENGINE (right switch) at the up position. The OFF position de-energizes the system and L ENGINE and R ENGINE positions energize the respective wing tank fuel pumps. Press-to-test amber caution lights marked PUMP FAIL L TANK and PUMP FAIL R TANK are located below their respective switches.

The REFUEL position of the switches opens the refuel shut-off valve. The main (fuselage) boost pump switches must then be moved to the on (up) position in order to pump fuel from the fuselage tanks to the wing tanks. If the fuselage tank fuel selector is in the NORM position, the forward main tank will refill the right wing tank and the rear main tank will refill the left wing tank. Refuelling of the wing tanks in this manner must only be conducted when the aircraft is on the ground. When the fuselage boost pumps are on and the wing tank switch is in the REFUEL position, very little fuel will be supplied to the ejector in the fuselage fuel system, and it is possible that the collector

cell will empty rapidly. The wing tanks must not be refuelled in flight. It is acceptable to refuel wing tanks during taxi after landing, but it is not permitted to refuel wing tanks during taxi prior to take-off.

It takes between 15 and 20 minutes to fill empty wing tanks by pumping fuel to them from the fuselage tanks. An external power source should be connected, or alternatively, one engine may be left running to provide electrical power during fuel transfer operations.

Wing tanks can also be conventionally refuelled through the filler caps located on the top of each wing.

7.12.13 Ferry Fuel System

A ferry fuel system can be installed in the Twin Otter to contain additional fuel to supplement main tank fuel and permit flights of extended duration. Two basic installations are available and minor variations of these occur dependent upon the type of floor fittings installed in the cabin. A non-quick-disconnect installation requires adaptation of the existing tank venting system to accommodate the ferry fuel system. A quick-disconnect installation can be readily connected to pre-installed ferry system couplings in the existing tank venting system.

When a ferry fuel system is installed, each flight with the system in use must be authorized by the appropriate airworthiness authority – this will always include the state of registration of the aircraft and may also include states to be overflown during the ferry flight.

The ferry fuel system consists of a minimum of four to a maximum of nine interconnected 45 Imperial gallon steel drums mounted in wooden cradles and secured to cabin floor tie-down rings with webbing straps. Fuel from the drums is delivered by gravity feed to the main tanks below the cabin through shut-off valves. Regardless of the number of drums used, the fuel feed and vent piping arrangement for the particular non-quick-disconnect or quick-disconnect installation remains the same. All drums are interconnected by a common filling and delivery fuel line which carries fuel to all drums when filling and delivers fuel to the main tanks during transfer operations.

Two manually-operated shut-off valves in the line control the delivery of fuel to the number 1 cell in the forward main tank and to the number 8 cell in the aft main tank. Fuel enters these cells through the existing cell vent pipes. The drums are filled through a filler neck assembly which is connected to the common filling and delivery fuel line and is attached to drum number 6 when 6, 7, 8, or 9 drums are installed, and to drum number 4 when 4 or 5 drums are installed. This always locates the filler neck adjacent to the right emergency exit hatch for convenience when refuelling.

In the non-quick-disconnect installation, a common vent line interconnects all drums and the filler neck with the existing vent lines of all main tank cells except number 1 and

number 8. In the quick-disconnect installation, the drums are vented independently of the main tank cells by a line which interconnects all drums and the filler neck and is then connected to the existing main tank vent outlet. Based on 42 usable Imperial gallons per drum, the total contents of the ferry fuel system can vary between 168 Imperial (equivalent to 202 U.S.) gallons (1,310 pounds) with four drums and 378 Imperial (equivalent to 454 U.S.) gallons (2,948 pounds) with nine drums.

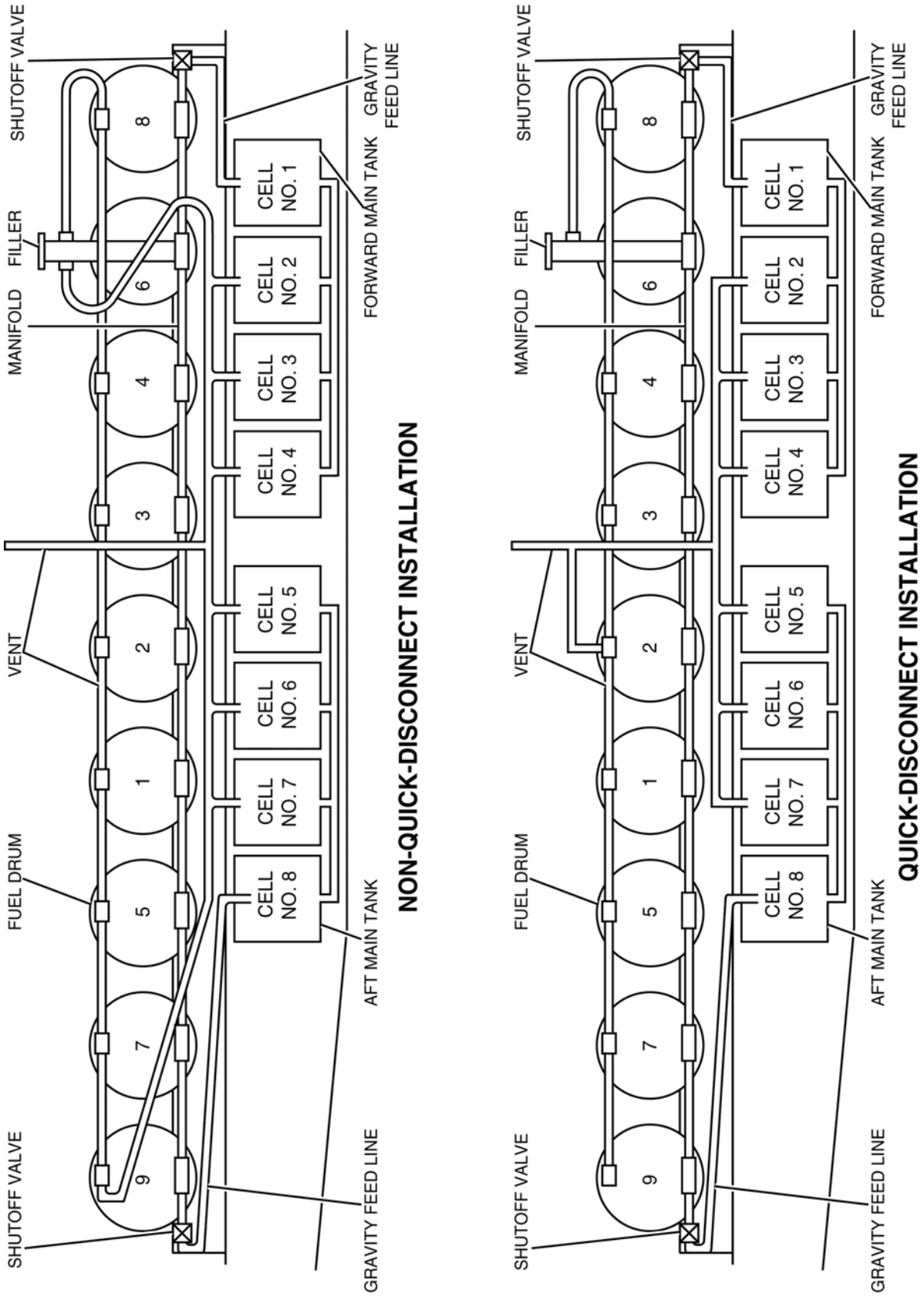


Figure 7-25 Ferry Fuel System (non-quick-disconnect)

7.13 Engines

The engines consist of two Pratt & Whitney Canada Limited PT6A-27 prime movers, each housed in a wing nacelle. Each engine has two independent turbines, one driving the engine compressor, fuel pump and accessory gearbox, and the other driving the propeller through a reduction gearing. A starter generator and a gas generator tachometer are mounted on the accessory gearbox. Retractable intake deflectors for ice and snow protection are installed in the engine air inlet ducts. On some aircraft a spray ring for engine compressor washing is installed inside each engine nacelle. The engines are capable of producing 680 shaft horsepower (53.3 PSI torque) each, but have been flat rated to 620 horsepower (50 PSI torque) when installed on the Twin Otter.

The engines are of reverse flow, annular combustion, free turbine design. Combustion air enters at the rear of the engine and exhaust gases exit at the front.

The left engine is the critical engine.

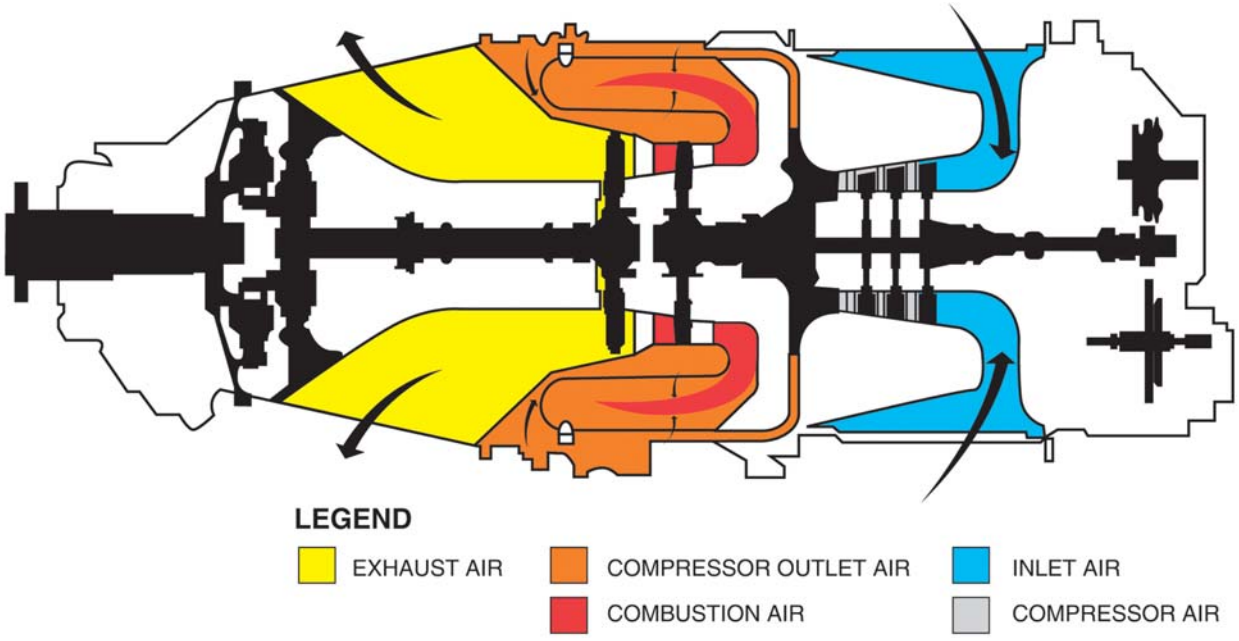


Figure 7-26 Engine Airflow

7.13.1 Engine Wash System

The optional engine wash spray ring installed in each engine nacelle provides for engine compressor washing when operating in atmospheric conditions of high salt content or industrial pollution. The installation in each nacelle consists of a pipe assembly (the spray ring) attached to the nacelle structure and partially encircling the upper portion of the engine air intake. Perforations in the pipe face inward to direct cleansing agent

into the engine air intake. A capped connector in the pipe assembly, which protrudes through the inboard side of the nacelle, provides for the connection of a hose and pumping apparatus when a washing operation is to be carried out.

7.13.2 Engine/Propeller Controls

The engine and propeller controls are mounted in the overhead console in the flight compartment, and consist of power levers, propeller levers, and engine fuel levers. Friction control knobs for the power and propeller levers are also installed.

7.13.2.1 Power Levers

The power levers move in slots in a quadrant labelled THROTTLE, with position markings MAX, IDLE, and MAX to denote the limits in the engine forward and reverse power ranges and the idle speed position. The reverse range is labelled REVERSE. Each power lever controls engine gas generator speed in the forward and reverse power ranges and propeller blade angle in the beta range.

A cable and pulley system and mechanical linkage connects each power lever to the fuel control unit power shaft and to the fuel governing section of the propeller governor (through the beta feedback linkage) on its related engine. To prevent inadvertent selection of reverse, a mechanical stop mechanism is provided in each power lever quadrant which is effective at the IDLE position; it is overridden by twisting the grip of the power lever to disengage the stop, and then moving the lever into the reverse range.

A microswitch, operated by either power lever, is in circuit with the propeller beta back-up electrical circuit. A second microswitch, operated by the right power lever only, is connected to the propeller reset caution light circuit. An interlock mechanism, operated by the propeller lever quadrants, prevents the power levers from being moved aft beyond the idle stop if both propeller levers are positioned at less than 91% N_P. Individual movement of either propeller lever above 91% N_P disengages the interlock mechanism.

The power levers are used to control the compressor rotation speed (N_G) and to control the propeller blade angle once they have been moved aft of the idle stop. The power levers are connected to a cam box located on the rear portion of the engine. The cam box transmits power lever movement to the fuel control unit (FCU) which controls fuel flow to the engine, therefore N_G. In forward flight at power settings high enough to allow the propellers to reach the governing speed that they have been set to, the power lever controls N_G speed only.

When propeller blade latches are installed a reference line is marked on each power lever and a similar line marked across the power lever quadrant facilitates exact positioning of the power levers for zero thrust engine starting and stopping. Propeller blade latches are required for floatplane operations.

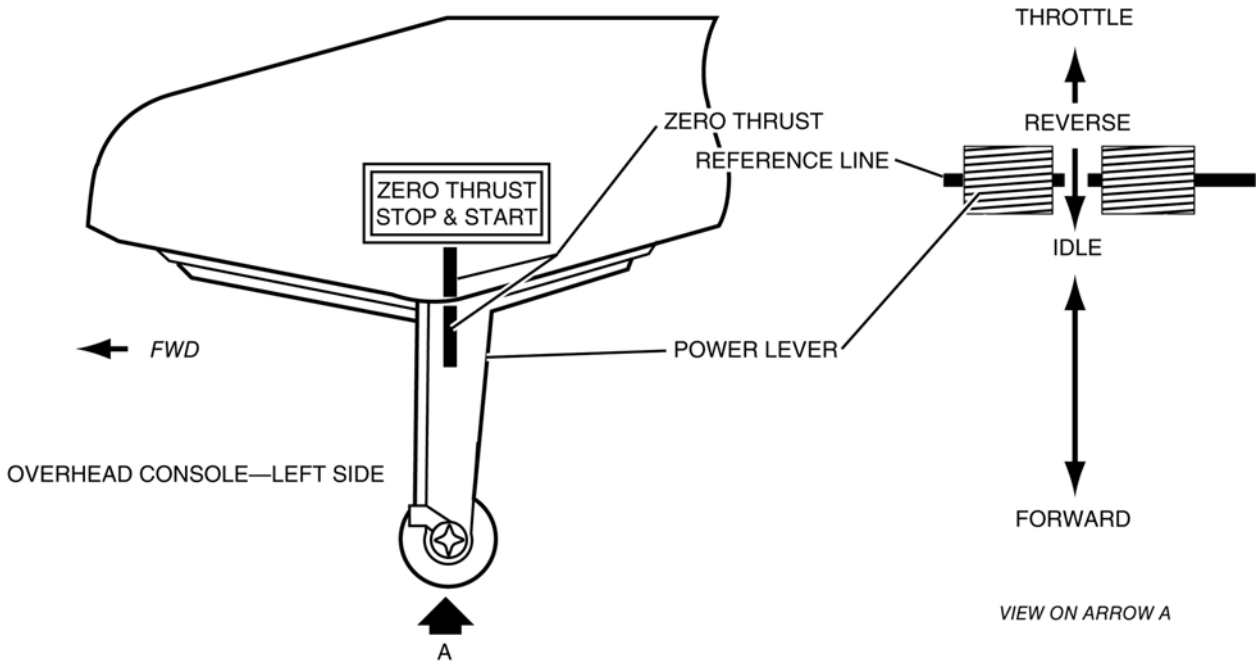


Figure 7-27 Zero Thrust Markings (for floatplanes)

7.13.2.2 Friction Control Knobs

Two friction control knobs, one for the power levers and one for the propeller levers, are located immediately aft of their respective levers. Each knob is labelled FRICTION and is marked with an arrow to indicate the direction of rotation for increased friction.

7.13.2.3 Fuel Control System

Each engine fuel control system consists of an engine-driven high pressure fuel pump; a fuel control unit which determines the proper fuel schedule for engine steady state operation and acceleration in response to power lever selection; fourteen fuel nozzles through which fuel is delivered to the combustion chamber; a fuel shut-off valve which controls fuel delivery to the fuel manifold and is operated by the fuel lever; a temperature compensator which modifies the fuel control unit acceleration schedule for variations in compressor inlet temperature; an automatic dump valve which expels residual fuel into a collector tank after engine shutdown; and a fuel governing mechanism in the propeller governor which limits propeller speed in the beta range by reducing fuel flow at the fuel control unit, and also limits N_G in the event of failure of the propeller governor and the overspeed governor. Control of the engine fuel control system is by pulley and cable systems which connect the power lever and fuel lever to the fuel control unit and fuel cut-off and dump valve respectively.

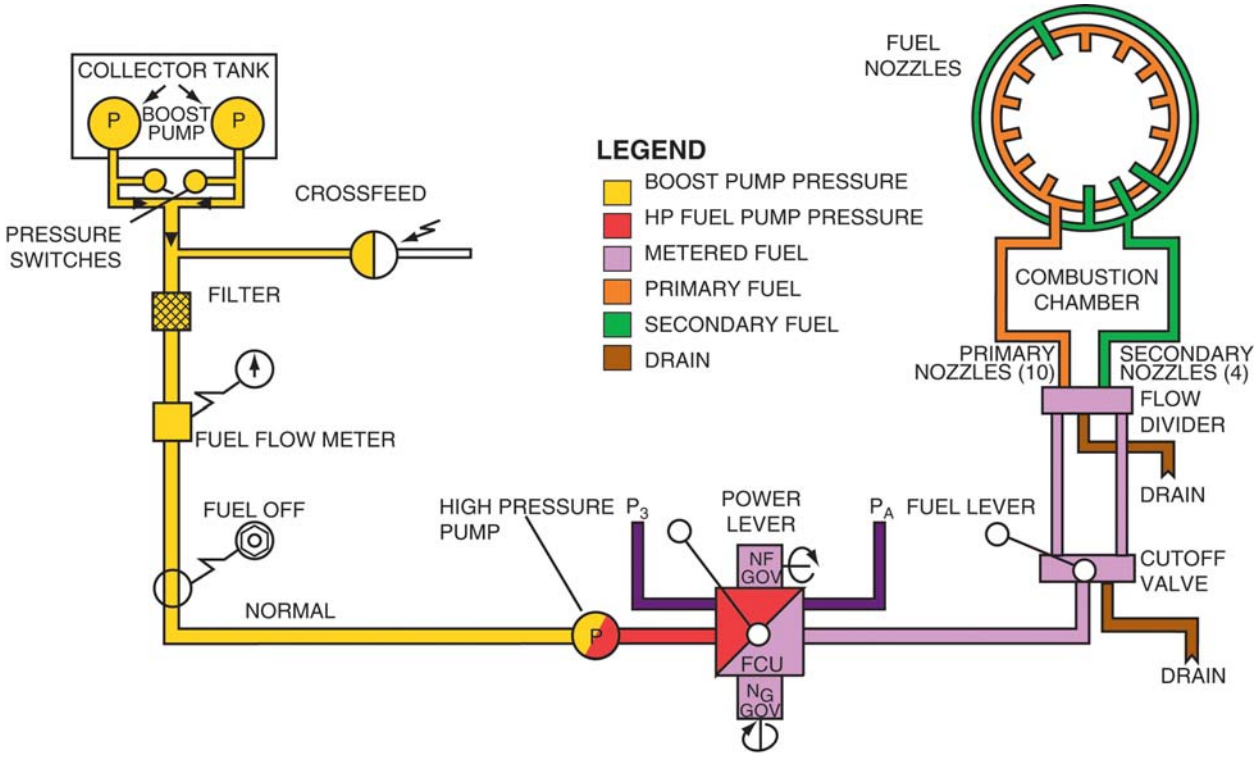


Figure 7-28 Engine Fuel Flow Schematic

7.13.2.4 Engine Fuel Levers

The fuel levers move in slots in a quadrant in the overhead console. The quadrant is labelled FUEL with the lever extreme positions labelled ON and OFF. Each lever is connected to the engine fuel shut-off valve which controls the delivery of fuel to the engine. A spring-loaded detent acting upon the fuel lever positively ensures it remains at the OFF or ON position. When an engine is shutdown, its fuel lever remains at the OFF position so that fuel will not be fed to the combustion chamber if the starter switch for the engine is inadvertently operated. Beginning with SN 475, a clear plastic guard was installed to prevent inadvertent movement of the fuel levers from the ON position. The guard is a spring-loaded hinged clip which covers the lever grips and prevents lever movement without first depressing the guard to disengage it.

When starting the engine, the fuel lever is moved forward to the ON position once the appropriate N_G is reached. This allows fuel to be sent to the combustion chamber. The OFF position stops fuel flow to the combustion chamber and causes the engine to shutdown.

7.13.3 Ignition System

7.13.3.1 Glow Plug Ignition

The ignition system for each engine consists of a current regulator, two glow plug-type igniters, an igniter selector switch, two shielded cables, an ignition switch, and an ignition relay. Power is supplied though push-to-reset circuit breakers on the main circuit breaker panel labelled IGN L or IGN R.

7.13.3.2 Engine Igniter Switches (Glow Plug Ignition Only)

Two engine glow plug switches labelled ENG IGNITER and individually identified L and R are located on the overhead console. Each is a three-position switch with positions NO. 1, BOTH, and NO. 2. The NO. 1 and NO. 2 positions provide for the selection of either of the two glow plugs on the related engine during glow plug maintenance or checking procedures; the BOTH position is the normal position for daily operations and provides for selection of both glow plugs simultaneously.

The selected glow plugs are energized simultaneously when the ignition switch is moved to MANUAL, or individually when the ignition switch is moved to NORMAL and the START switch is operated LEFT or RIGHT according to the ignition requirement. The BOTH selection with the ignition switch at NORMAL will energize both glow plugs in the engine being started.

7.13.3.3 Spark Ignition

When S.O.O. 6180 or Mod 6/1912 (post-production retrofit) is incorporated, two spark igniter plugs are installed in each engine (in conjunction with an ignition exciter unit) in place of the normal glow plug igniters to provide superior engine start performance and longer igniter plug life. With Mod 6/1849 (deletion of the two engine igniter switches and plugging of the switch holes) embodied, the left engine and right engine spark igniters are powered directly from the auxiliary battery bus through their respective ignition relays. Both igniters of each engine are energized simultaneously during engine start and both igniters of both engines are energized simultaneously when continuous (MANUAL) ignition is selected. When dry motoring the left or right engine, the appropriate circuit breaker IGN L or IGN R may be pulled, the same as the dry motoring procedures for engines equipped with glow plugs.

7.13.3.4 Ignition Switch

The ignition switch, which is common to both engines, is located on the overhead console. The switch is labelled IGNITION with positions MANUAL and NORMAL and is guarded in NORMAL. When the switch is selected to NORMAL, the ignition circuit of each engine is integrated with its respective starting system so that when the START switch is moved to the required engine start position (LEFT or RIGHT), current is supplied to the relevant igniter. When the ignition switch is selected to MANUAL,

current is supplied to the igniters of both engines simultaneously, independently of the starting systems.

The MANUAL position should be selected during flight in extreme turbulence or flight in severe icing conditions. The left and right engine spark igniters are powered directly from the auxiliary battery bus through their respective ignition relays. Both igniters of each engine are energized simultaneously during engine start and when continuous (MANUAL) ignition is selected.

The starter will not operate if the START switch is engaged and the ignition switch is in the MANUAL position.

7.13.4 Starting System

The starting system for each engine consists of a starter generator, a START switch (common to both engines), and two starter relays. When the DC MASTER switch is on and the START switch is selected for an engine, power is supplied to the starter-generator, which rotates the gas generator turbine at sufficient speed to allow for engine light-up. When light-up occurs and the engine has accelerated to idle speed and the switch is released, the starter relays de-energize the starter circuit, and when the generator is switched on the starter generator produces DC power for the aircraft electrical system power for the starting systems is supplied through two circuit breakers on the main circuit breaker panel, labelled START L and START R.

7.13.4.1 Start Switch

The three-position START switch is located on the overhead console. It is labelled START and has a center OFF position and momentary on LEFT and RIGHT positions. When the switch is held to LEFT or RIGHT, electrical power is supplied to the relevant starter-generator relay. With the ignition switch at NORMAL, the START switch also energizes the ignition system and opens the fuel purge valve of the selected engine.

If the START switch is released during a start cycle, the starter system will be de-energized and the engine will run down. The switch should not be operated again until the rundown is complete.

7.13.4.2 Maintained-Contact Engine Start Switch

When Mod S.O.O. 6185 (an uncommon option) is incorporated, a “maintained-contact” engine START switch is installed in place of the normal START switch (which must be held when selected) to facilitate engine starting with one pilot aboard. The maintained contact START switch is lever locked to its center off position to preclude inadvertent selection to its LEFT or RIGHT position. An associated advisory light labelled START ON, immediately aft of the engine start panel, illuminates while LEFT or RIGHT is

selected by the START switch, and indicates the requirement to select the switch to its center off position when the start cycle for the applicable engine is complete.

7.13.5 Oil System

Each engine oil system is integral with the engine and incorporates an oil pump, filter, and tank. An oil cooler is installed on the underside of the engine and is enveloped by the engine lower cowling which directs the airflow through the cooler. Oil flow through the core of the cooler is controlled by a regulator which diverts the oil through a bypass until normal operating temperature is reached; it also ensures oil circulation in the event of restricted or blocked flow through the cooler. Heated oil is used as a medium for raising the temperature of the fuel prior to its delivery to the engine. This is accomplished by piping oil through a fuel heater mounted on the engine upper casing.

For oil pressure indication a pressure transmitter is installed in the engine accessory gearcase and is connected to the oil pressure indicator; a pressure switch is also installed in a line tapped into the accessory gear case end and this is connected to the low oil pressure caution light.

For oil temperature indication, a resistance bulb is installed in the accessory gear case and connected to the oil temperature indicator.

Each engine oil tank has a capacity of 1.9 Imperial (2.3 U.S.) gallons of which 1.3 Imperial (1.5 U.S.) gallons is usable. The oil tank filler neck is accessible at the engine accessory gear case.

7.13.5.1 Low Oil Pressure Caution Light

Two caution lights labelled L ENGINE OIL PRESSURE and R ENGINE OIL PRESSURE are mounted on the caution lights panel. Each light is connected to a pressure switch which senses oil pressure in its respective engine accessory gear case. The light illuminates when oil pressure decreases to 40 – 42 PSI and goes out when it increases to 44 – 46 PSI. The caution lights are powered from the left and right DC buses and protected by circuit breakers labelled OIL LOW PRESS L and OIL LOW PRESS R on the main circuit breaker panel.

7.13.6 Engine Instruments

The engine instruments are located on the engine instrument panel, to the right of the left flight instrument panel. Duplicate sets of instruments are provided for the left and right engines. Each set consists of the following instruments: oil pressure indicator, torque pressure indicator, oil temperature indicator, propeller tachometer, turbine temperature indicator, gas generator tachometer, and fuel flow indicator. An intake deflector indicator for each engine is also included on the engine instrument panel. Two

fuel quantity indicators are installed on the instrument panel. For engine instrument limitation markings, refer to the limitations section of the Aircraft Flight Manual.

7.13.6.1 Oil Pressure Indicators

Each of the oil pressure indicators is labelled OIL PRESS PSI and has a scale graduated in units of 5 PSI, from 0 to 120 PSI, with numerals at 20 PSI intervals. Each indicator is operated by an oil pressure transmitter on its engine accessory case and is powered from the 400 cycle, 26 volt AC supply. The electrical circuits are protected by OIL PRESS L and OIL PRESS R fuses on the main fuse panel.

7.13.6.2 Torque Pressure Indicators

Each of the torque pressure indicators is labelled TORQUE PRESS PSI and has a graduated scale of 1 PSI increments from 0 to 65 with numerals at 10 PSI intervals. Each instrument is operated by signals from a torque pressure transmitter on the related engine reduction gearbox. Power from the 400 cycle, 26 volt AC supply is connected to the indicator circuits, and they are protected by TORQUE PRESS L and TORQUE PRESS R fuses on the fuse panel.

7.13.6.3 Oil Temperature Indicators

The oil temperature indicators are labelled OIL TEMP, with scales graduated from –50° C to +150° C in increments of 10°, with numerals at 50° intervals. Each indicator is connected to a resistance bulb in its engine accessory case which acts as the temperature sensing element. The indicator circuits are powered from the 28 volt DC supply and are protected by OIL TEMP L and OIL TEMP R circuit breakers on the main circuit breaker panel.

7.13.6.4 Propeller Tachometers

The two propeller tachometers are labelled PERCENT PROP RPM and have a scale graduated in increments of 2% from 0% to 100%, with numerals at 10% intervals. A small dial and pointer on the left side of the main dial has graduations numbered 0 to 9, and indicates units of 1% to permit more precise readings. Each tachometer is operated by a tachometer generator mounted on a pad on the corresponding propeller reduction gearbox.

7.13.6.5 Turbine Temperature Indicators

Each of the turbine temperature indicators is labelled T_5°C x 100 and has a scale ranging from 100° to 1,200° with an expanded portion from 550° to 800°. Over the expanded range the scale is graduated in 10° increments with numerals at 100° intervals. Each indicator indicates the temperature sensed by thermocouples in an area downstream of the compressor turbine. The colour markings on the face of the instrument apply to take-off, climb, cruise and reverse operations only, they do

not correspond with starting temperature limits. For more information, refer to the Limitations Section of the Aircraft Flight Manual. The idle temperature limit and the acceleration temperature limit are not marked on the face of the gauge.

7.13.6.6 Gas Generator Tachometers

The gas generator tachometers are labelled PERCENT GG RPM and have a scale graduated in increments of 2% from 0% to 100%, with numerals at 10% intervals. A small dial and pointer on the left side of the main dial has graduations numbered 0 to 9, and indicates units of 1% to permit more precise readings of gas generator speed. Each indicator is operated electrically by a tachometer generator driven by the accessory case scavenge pump.

7.13.6.7 Fuel Flow Indicators

The fuel flow indicators are labelled FUEL FLOW PPH x 100, with a scale graduated from 60 to 500 PPH in increments of 20 pounds, and numerals 1 to 5 at 100 pound intervals. Each indicator indicates the rate of fuel flow to its engine in pounds per hour, and is powered from the 400 cycle, 26 volt AC supply. The indicator circuits are protected by FUEL FLOW L and FUEL FLOW R fuses on the fuse panel. These are advisory gauges only and do not have any limitations associated with them.

7.13.6.8 Fuel Quantity Indicators

The two fuel quantity indicators are located on the instrument panel and identified AFT and FWD. Both indicators denote fuel contents of their respective tanks in pounds and each indicator dial is labelled FUEL QUANTITY LBS x 100. The aft indicator has scale markings ranging from 0 to 1425 pounds in increments of 25 pounds with even numerals from 0 to 14 at 200 pound intervals. The FWD indicator has scale markings ranging from 0 to 1400 in increments of 25 pounds with even numerals at 200 pound intervals from 0 to 12. Each indicator reflects the mean value of the fuel levels detected by four capacitance type probes in its associated fuel tank. The fuel quantity indicators are powered from the 400 cycle, 115 volt AC bus through FUEL QTY FWD and AFT fuses on the fuse panel behind the left pilot.

7.14 Propellers

The two propellers are Hartzell HC-B3TN-3D, metal, counterweight, three-bladed, fully feathering, reversible, and speed governed units. Each propeller is 8 feet 6 inches in diameter and has a blade angle range of –15° (full reverse) to +87° (feathered), and a low pitch pickup setting of +17°. Each is controlled in the constant speed range and when feathered by the propeller lever through a propeller governor on the propeller reduction gearbox. The power lever is connected to the propeller reverse cam mechanism for control of the propeller in the beta (+17° to –15°) range. Each propeller system incorporates a propeller overspeed governor, an automatic feathering system and an electrically operated beta back-up system; the latter to prevent either propeller from going below idle blade angle of +11° unless this has been deliberately selected by the pilot. Propeller blade latches (when installed, used only for floatplanes) permit engine starting and stopping with propeller blades at the zero thrust position.

The rotation speed of each propeller is indicated on a propeller tachometer on the engine instrument panel. By special order (S.O.O. 6099) a propeller synchronizing system can be installed.

7.14.1 Propeller Levers

Two propeller levers are located side by side in the overhead console, and they move in slots in a quadrant labelled PROP RPM. Each slot has FEATHER and INCREASE markings. Each lever is connected through a cable and pulley system and mechanical linkage to its corresponding propeller governor. To prevent inadvertent propeller feathering, a gate stop is built into the quadrant for each lever; when feathering, the appropriate gate stop is overridden by pushing up on the lever and then continuing the movement aft. A propeller lever/power lever interlock mechanism is installed to prevent aft movement of the power levers beyond the idle stop if both propeller levers are positioned at less than 91% N_P. Individual movement of either propeller lever forward, above 91% N_P, disengages the interlock lever.

The propeller levers are connected to the speed setting lever on the top of the propeller governor. The propeller lever is used for two purposes: first, to control the propeller speed (N_P) when the propeller is operating in the governing mode (for example, take-off, climb, and cruise), and second, to allow the pilot to feather a propeller on the ground prior to shutdown of the engine, or to feather a propeller during flight, in the event of an in-flight shutdown.

Just as the power lever controls engine compressor rotation speed (N_G), the propeller lever controls engine power section rotation speed (N_P).

7.14.2 Propeller Governor

The propeller governor (sometimes referred to as a constant speed unit, or CSU), is mounted on the propeller reduction gearbox front case. It combines the functions of constant speed governor, a beta valve, and a fuel governor (N_F governor). As constant speed governor, it regulates propeller speed by varying the propeller blade angle to keep the propeller speed at the value selected by the pilot using the propeller levers. Changing conditions of flight, such as increased or decreased power settings, climb or descent, or increased or decreased airspeed require the propeller governor to change blade angle in order to maintain the selected propeller speed.

The beta valve controls the propeller blade angle in the beta range. When the power being delivered to the propeller is insufficient to rotate the propeller at the speed which the pilot has selected using the propeller lever, the propeller governor reduces blade angle in order to cause propeller speed to increase to the set point. There is a practical limit to how fine the blade angle can be allowed to go during normal forward thrust or idle power operations. That limit is set during the propeller rigging process at +11° and is referred to as 'idle blade angle.' As propeller blade angle decreases through +17°, the beta valve slowly begins to close, and when blade angle reaches +11°, an equilibrium is reached between oil flow through the beta valve and oil leakage out of the propeller system.

The propeller blade then 'idles' at +11°, and propeller blade angle will not decrease further unless the pilot twists the power lever grips and moves the power levers aft of the idle stop. The idle blade angle is the same regardless of whether the aircraft is in flight or on the ground.

The transition from constant speed governor control of the propeller (referred to as 'on-speed' operation) to beta valve control of the propeller (referred to as 'underspeeding', or 'beta range') takes place automatically and is normally not detected by the pilot or passengers. The transition occurs at the exact moment when the propeller reaches the governing speed set using the propeller lever (for example, when take-off power is applied), or at the exact moment when the propeller is no longer able to achieve the speed set using the propeller lever (for example, during approach, once propeller levers have been moved fully forward and the power levers have been moved aft to a low power setting for stabilized final approach).

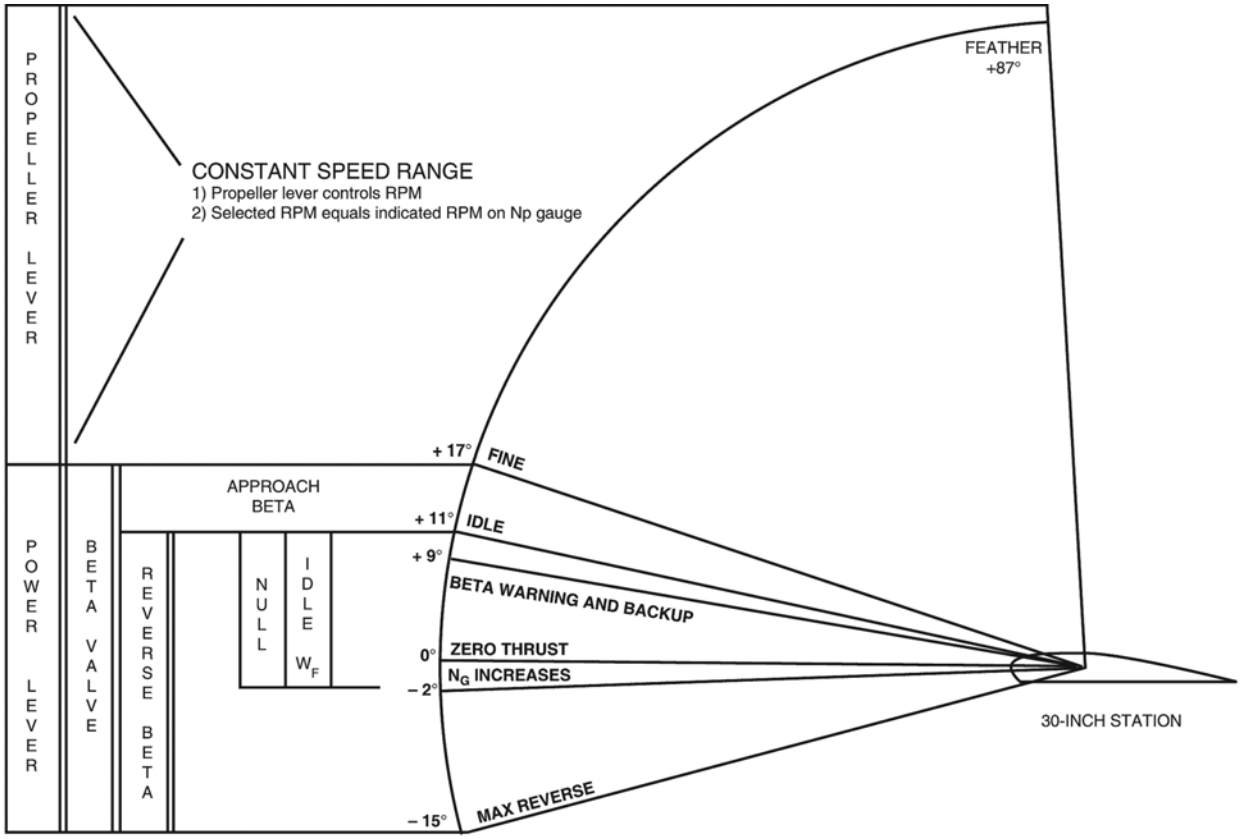


Figure 7-29 Range of Propeller Blade Angle

If the propeller speed observed on the N_P gauge is the same as the propeller speed that has been selected with the propeller levers (for example, 96% during take-off, or 75% during cruise), the propeller is operating in the constant speed range and is under the control of the propeller governor. The propeller governor varies blade angle in order to maintain a constant RPM.

If the propeller speed observed on the N_P gauge is less than the speed that has been selected with the propeller levers (for example, 44% at idle power on the ground, or below 96% at the low power settings that are used during final approach after the propeller levers have been moved forward to 96%), the propeller is operating in beta range and is under the control of the beta valve. The beta valve varies blade angle in response to movement of the power lever by the pilot.

The term ‘hydraulic low pitch stop’ is sometimes used to refer to the beta valve that is mounted on the forward face of the propeller governor.

7.14.3 Propeller Beta Range

The propeller beta range is that segment in the overall operating range of the propeller in which propeller blade angle is directly controlled by the power lever. It extends

from +17° in the forward thrust range to –15° in the reverse thrust range. The area between +17° and +11° is a transition area; the beta valve first begins to move at +17°, and equilibrium (idle blade angle) is achieved at +11°. Propeller blade angle will not decrease below +11° unless the power levers are twisted and moved aft of the idle stop.

7.14.4 Propeller Beta Back-Up System

The propeller beta back-up system prevents the blades of either propeller from being driven into reverse blade angles in the event of failure of the beta valve or of the mechanical linkages associated with the beta valve. The installation consists of an electrically operated beta back-up shut-off valve mounted on the forward face of the propeller governor (directly beside the mechanically operated beta valve), a position sensing microswitch below the propeller that is actuated by the propeller slip ring, a single power lever-operated microswitch, a test switch and various electrical relays.

If a mechanical failure of the beta valve occurs and the propeller blades are driven into the beta range by governor oil pressure, a propeller position sensing switch is actuated by a linkage from the propeller slip ring as the blade angle decreases to +9°. The electrically operated beta back-up shut-off valve is then energized closed and this cuts off the oil supply to the propeller, thus preventing the propeller blade angle from decreasing further into the beta range.

Actuation of the propeller position sensing switch simultaneously energizes the circuit to the appropriate BETA RANGE indicator light. The propeller blades will then cycle slowly between +9° and +11° as the blades are alternately coarsened by the feathering springs and counterweights as the oil supply is shut-off, then driven again to finer blade angles (less than +11°) by oil pressure as the beta back-up shut-off valve is de-energized. The indicator light on the instrument panel comes on and goes out as the propeller position sensing switch is contacted by the oscillating propeller slip ring. This cycling will continue until operation is resumed in the constant speed range by advancing the power lever. Advancing the power lever increases the rotation speed of the propeller and hands control back to the propeller governor.

On aircraft with Mod 6/1831 (by post-production retrofit only) installed, the propeller position sensing switches are replaced with magnetic proximity sensors. The operating concepts are the same.

When the pilot twists the power lever handgrips to overcome the mechanical stop and allow the power levers to be moved aft of the IDLE stop, the power lever-operated microswitch is opened to interrupt and disarm the circuits to both beta back-up solenoids (made by their respective position sensing switches) and the electrically operated beta back-up shut-off valves are no longer supplied with power. Each propeller position sensing switch continues; however, to energize its BETA RANGE indicator light while the propeller blades are in the beta range.

The beta back-up system is powered from the right DC bus and is protected by the BETA SYS circuit breaker on the main circuit breaker panel.

7.14.4.1 Beta Range Indicator Lights

Two indicator lights labelled BETA RANGE L and R are located on the left instrument panel. Each light illuminates when the blade angles of its associated propeller decrease to +9° in the beta range, and the beta switch (the propeller position sensing switch) is actuated by the propeller slip ring, thus energizing the circuit to the indicator light. The beta range indicator lights are included in the brightness control and test circuits of the caution lights test and intensity switch.

7.14.4.2 Beta Back-Up Disarmed Caution Light

An amber caution light labelled BETA BACKUP DISARMED is located on the left flight instrument panel to the left of the BETA RANGE indicator lights. The light illuminates to indicate that the beta back-up system is inoperative. The beta back-up disarmed caution light is included in the brightness control and test circuits of the caution lights test and intensity switch.

The beta back-up system will automatically disarm itself momentarily when the power levers are rapidly brought forward, out of the reverse position, but the propeller blades have not yet returned to greater than +9° blade angle. This is a normal condition and usually lasts for less than one second. The BETA BACKUP DISARMED caution light does not indicate a failure of the system nor does it indicate that power has been removed from the system. It indicates that the back-up function has been temporarily suspended until both propeller blades reach a blade angle of +9° or greater.

7.14.4.3 Beta Back-Up Test Switch

A two-position, momentary-on switch labelled BETA RANGE TEST is located on the left side of the sub-panel. The switch is connected to the beta back-up system and permits an individual or simultaneous check of each propeller beta back-up system on the ground. When operated to its ON position the switch bypasses the power lever grip switch. Thus, when the switch is lifted and the power levers are twisted and moved aft of the IDLE position, the propeller blade angle will cycle as in an actual failure for the duration of the test; at the same time the BETA RANGE indicator lights and the BETA BACKUP DISARMED caution light illuminate intermittently.

7.14.4.4 Power Lever Operated Beta Back-Up Microswitch Test Switch and Light

When Mod 6/1492 (cut in as standard equipment at SN 451) is incorporated, a pushbutton with integral green light is installed to provide a check that the power lever operated beta back-up microswitch contacts are closed when the left power lever is forward of IDLE. This check, together with the beta back-up system check (operation

of the BETA RANGE TEST switch), confirms the integrity of the entire beta back-up system electrical circuit. The combined pushbutton and light unit is labelled PWR LEV TEST and is located on the left sub panel below the BETA RANGE TEST switch. The light bulb is connected to the caution lights test circuit. It is not necessary to move the power levers to carry out the test. If the green light illuminates when the button is pushed anytime the power levers are at or forward of the IDLE position, the system passes the test.

7.14.5 Reset Props Caution Light

A caution light labelled RESET PROPS is installed on the caution lights panel and illuminates if the power levers are retarded below the 75% N_G position with the propeller levers set at 91% N_P or less. This caution light indicates the need to move the propeller levers forward to full INCREASE in order to put the propeller governor into an underspeed condition and provide the pilot with direct control of propeller blade angle via the power levers. The RESET PROPS caution light electrical circuit is energized through two microswitches connected in series, one operated by the left propeller lever and the other by the right power lever. The circuit is powered from the right DC bus and is protected by the OVERSPEED GOV circuit breaker on the circuit breaker panel.

7.14.6 Propeller Overspeed Governor

The propeller overspeed governor is mounted on the engine reduction gear casing. It provides automatic control of a propeller overspeed condition by dumping oil from the propeller dome, which permits the propeller counterweights and return springs to increase (coarsen) propeller blade angle. This absorbs engine power and maintains propeller speed at the preset overspeed governor setting of 101.5%.

7.14.6.1 Propeller Overspeed Governor Test Switch

PRE-MOD 6/1323 (SN 310 AND PRECEDING)

A propeller overspeed governor test switch is located on the right sub-panel. It is a guarded, three-position switch labelled PROP O/SPEED TEST, with LEFT and RIGHT momentary on positions. The propeller governs at approximately 70% N_P when the switch is moved to LEFT or RIGHT while the aircraft is on the ground. The overspeed governor circuit is powered from the right DC bus and is protected by the OVERSPEED GOV circuit breaker on the main circuit breaker panel.

POST-MOD 6/1323 (SN 311 AND SUBSEQUENT)

If Mod 6/1323 is incorporated, the propeller overspeed test switch is located on the left sub-panel. It is a guarded two-position switch labelled PROP O/SPEED TEST with a center off position and up (test) position. With Mod 6/1323 incorporated, the overspeed

governor test can be done on both engines at the same time or, if desired, one engine at a time.

7.14.7 Propeller N_F Governor

The fuel governing section of the propeller governor (often referred to as a 'fuel topping governor') serves two entirely different purposes. During forward thrust operation (the power levers at idle or forward of idle), the N_F governor will limit fuel flow if propeller speed reaches 6% higher than what has been selected with the propeller levers. This protects the engine against propeller overspeeding in the event of failure of both the propeller governor and the propeller overspeed governor. The maximum speed selectable with the propeller lever is 96%, and the propeller overspeed governor is preset to intervene at 101.5%. If the propeller speed reaches 96% +6% (102%), the N_F governor will also intervene.

When the power levers are twisted and moved aft of the idle stop, the N_F governor is reset to a significantly lower datum (5% less than selected propeller speed). This prevents the propeller speed from exceeding 91% in the reverse range.

In order to ensure that the pilot always has direct control over propeller blade angle via the power levers whenever the power levers have been moved into the reverse range, it is essential to ensure that the propellers can never reach the speed to which the propeller governor has been set. The mechanical interlock between the power levers and the propeller levers ensures that the propeller levers must be set to 96% before the power levers can be moved aft of the idle stop. By using the N_F governor to reduce fuel flow to the engine as the propeller speed approaches 96% less 5% (91%) when the power levers are in the reverse range, it can be assured that the propeller speed in reverse will never reach the propeller governor set point and the propellers will always be underspeeding – and thus subject to control by the beta valve – whenever the power levers have been twisted and moved aft of idle.

7.14.8 Propeller Autofeather System

An automatic propeller feathering system is provided which automatically feathers the propeller of an underpowered engine when a decrease in torque to below approximately 20 PSI is detected. Subsequent autofeathering of the other propeller is prevented by a blocking relay which disarms the autofeather system after the first propeller has feathered. The system is armed for operation when the following three conditions have been met: (a) PROP AUTO FEATHER switch is selected ON; (b) torque has risen above a specified threshold on both engines; and (c) the power levers are advanced beyond 86 – 88% N_G.

Pulling either or both power levers back below 86 – 88% N_G (for example, in the event of a rejected take-off) disarms the autofeather system. Two autofeather indicator

lights illuminate to signify when the system is selected on and when it is armed. An autofeather test switch is provided to permit a ground check of the autofeather system. The autofeather system is powered from the left DC bus and is protected by a PROP AUTO FEATH circuit breaker on the main circuit breaker panel.

Mod 6/1329, cut in at SN 290, introduced a two-second delay between detection of low torque and automatic feathering of the propeller. This allows propeller discing to be used in the event of a rejected take-off due to a loss of torque.

7.14.8.1 Propeller Autofeather Switch

The propeller autofeather switch is located on the left instrument panel under the label PROP AUTOFEATHER; it is a two-position switch with positions ON and OFF. When selected to ON electrical power is connected to the autofeather system as indicated by the illumination of SEL on the propeller autofeather indicator. On some airplanes the autofeather switch is a PUSH ON/OFF switch integral with the AUTOFEATHER SELECT and ARM lights.

7.14.8.2 Propeller Autofeather Indicator

The propeller autofeather indicator is installed on the left side of the instrument panel beside the autofeather switch and is labelled PROP AUTO FEATHER. The indicator consists of two rectangular lights, one above the other; the upper light is green and is labelled SEL and when illuminated indicates that the system has been selected on. The lower light is amber, labelled ARM and when illuminated indicates that the autofeather system is armed for operation. The ARM indicator light illuminates when the autofeather switch is on and both power levers are advanced to 86 – 88% N_G or beyond; it goes out if either or both power levers are retarded and/or when automatic feathering of a propeller has occurred. The autofeather indicator lights are included in the caution lights test and intensity switch circuit. On some airplanes the autofeather indicator has an integral push-on push-off autofeather switch. The indicator is labelled AUTOFEATHER, PUSH ON/OFF, and contains two status lights labelled SELECT and ARM.

7.14.8.3 Propeller Autofeather Test Switch

The propeller autofeather test switch is located on the left sub panel and is a guarded two-position momentary on switch labelled AUTO FEATH TEST. The switch is spring loaded to the center off position and has an unmarked test (up) position. The test switch permits a ground test of the autofeather system with engines operating at low speed, by bypassing the power lever-operated microswitches. Refer to the Aircraft Flight Manual for the autofeathering test procedure. There are three different versions (depending upon modification status) of the autofeather system, and in order to fully and completely test the system, the appropriate test procedure must be used.

7.14.9 Propeller Blade Latches

Propeller blade latches (when installed) retain the propeller blades at approximately +1° blade angle while the engines are shutdown. This permits engine starts to be made with zero thrust at idle power. The latches are extended by springs upon engine shutdown by positioning the power levers at the zero thrust position. Following engine shutdown, the blades of each propeller move slowly towards the feather position as the oil pressure controlling the propeller decays, until arrested by the latches at approximately +1°.

When the engine is started the latches are retracted by centrifugal force once the propeller speed reaches 30% N_P. To facilitate the positioning of the power levers for a zero thrust shutdown, a reference line on each power lever must be aligned with a reference line across the power lever quadrant. A label on the left side of the overhead console labelled ZERO THRUST START STOP identifies the reference line.

Propeller blade latches are only required and only benefit aircraft that are used on floats. They are normally removed from the propellers (or propellers without blade latches are fitted) if there is no possibility that the aircraft will be used on floats. Blade latches were provided as standard equipment by Mod 6/1303 beginning at SN 281, and de-activated on all newly constructed aircraft (except floatplanes) by Mod 6/1716 beginning at SN 616.

7.14.10 Propeller Synchronizer

By special order (S.O.O. 6099, a rare option) a propeller synchronizing system can be installed to synchronize the speed of the two propellers. The system comprises a master governor with pick-up, a slave governor with pick-up and trimmer, an actuator, a control box, and a flexible shaft. The master pick-up and governor are mounted on the left engine and the slave governor and trimmer on the right engine.

The master pick-up transmits impulse signals from the master governor to the synchronizer control box. When the synchronizer is switched on, signals from the control box are relayed to the actuator which adjusts the speed setting of the slave governor through a flexible shaft-operated trimmer, and the speed of the right propeller is increased or decreased to synchronize it with the left propeller.

The propeller synchronizer switch is installed on a bracket to the right of the caution lights panel; it is a two position ON/OFF switch labelled PROP SYNC. The switch is placarded MUST BE OFF FOR TAKE-OFF AND LDG. A press-to-test indicator light adjacent to the switch illuminates when the synchronizer is operating. The system is powered from the left DC bus and is protected by a PROP SYNC circuit breaker on the avionics circuit breaker panel, at the bottom of the instrument panel center pedestal.

7.15 Fire Detecting and Extinguishing Systems

Fire detecting and extinguishing systems are installed in both engine nacelles to provide visual and audible warning of fire and means to extinguish a fire. Fire detection is by means of detection units in each nacelle, any one of which, if closed by heat, activates a warning light in the fire extinguisher pull handle of the affected engine nacelle. A fire warning bell is installed on the bulkhead above and behind the left pilots seat; it is wired in circuit with the warning lights so that it rings concurrently with the illumination of the lights. The system incorporates a test switch for visually checking the operation of the fire warning light circuits and the fire warning bell.

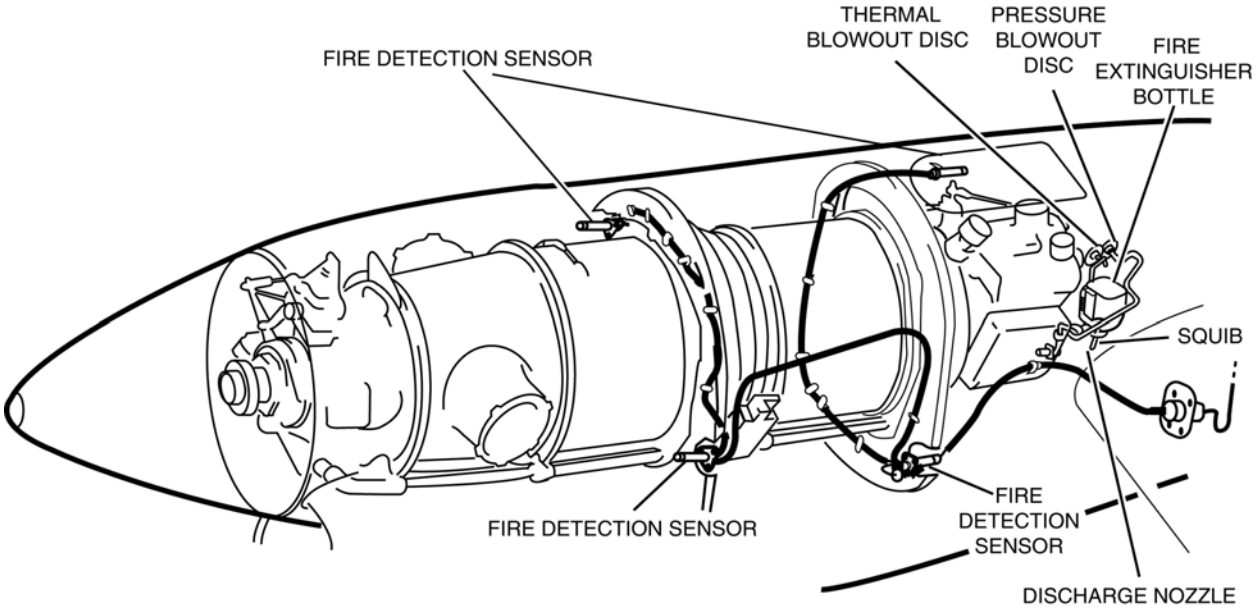


Figure 7-30 Fire System Components

A fire extinguisher bottle is installed in each nacelle. Each bottle, when operated, discharges its contents (bromotriflouromethane, also known as Halon 1301 or CF_3Br) through a pipe into the engine accessories compartment. Indication of fire extinguisher bottle discharge is provided in the form of two coloured discs on the inboard side of each nacelle. Fire instructions are prominently displayed on the emergency panel above the engine instrument panel. The detecting units are powered from the left DC bus through FIRE DET L and R circuit breakers, and the extinguisher circuits from the same supply through FIRE EXT L and R circuit breakers.

7.15.1 Fire Detection System

Each engine fire detection system comprises four thermal switches connected between two wire loops, a fire warning light, magnetic and thermal circuit breakers, and the associated electrical wiring. A circuit test switch, fire bell and fire bell mute switch are also installed but are common to both engine systems. Electrical power for the systems is provided by the aircraft 28 volt left DC bus.

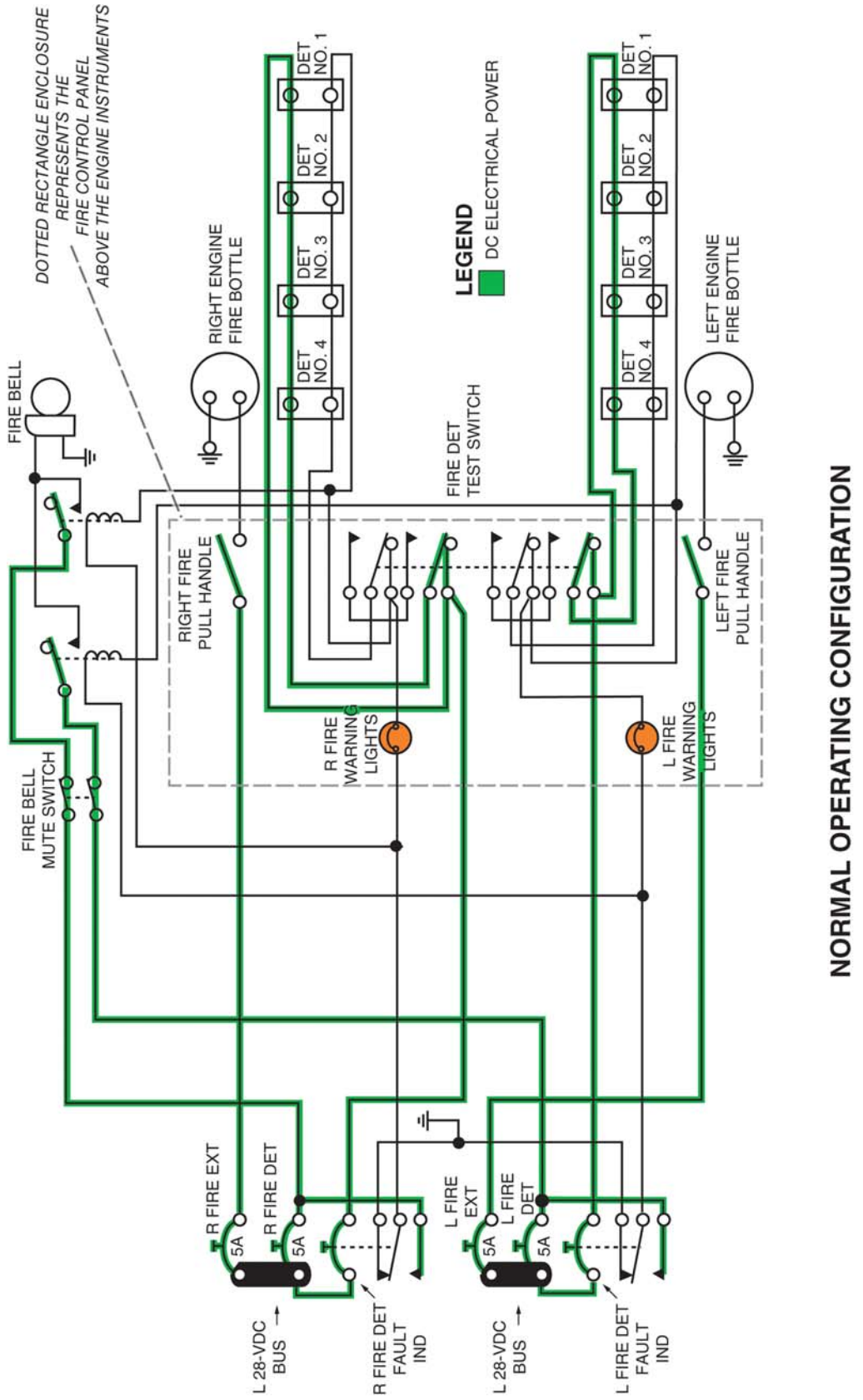


Figure 7-31 Fire Detection and Extinguishing Schematic

With an engine fire detecting circuit energized, power is supplied to one of the two wire loops (the power loop) and the magnetic circuit breaker establishes a ground for the warning light, fire bell, and second loop (the ground loop). In the event of an engine fire one (or more) of the thermal switches operate and complete a circuit between the two wire loops, thus providing power to illuminate the associated fire warning light and to operate the fire bell.

If a ground fault (a short circuit) should occur in the power loop, the magnetic circuit breaker operates to disconnect power from the power loop and disconnect the ground from the ground loop, while at the same time establishing an alternative power supply to the ground loop. In this condition the circuit will still function utilizing the faulty power loop as a ground.

A test switch, when selected to TEST, connects the two wire loops in one engine system in series with each other to complete a test circuit through the wire loops, the warning lights and the fire bell to ground. The serviceability of each circuit (left and right engines) can be verified by the illumination of the fire warning lights.

7.15.2 Fire Extinguisher Operating Handles

The two fire extinguisher operating handles are located on the emergency panel, and are labelled LEFT ENGINE and RIGHT ENGINE with FIRE PULL labelled on each handle. The handles are of T-bar configuration and have a red warning light at each end of the T-bar. When pulled, each handle electrically triggers a detonator at the flood valve of its corresponding extinguisher bottle and releases the agent instantly.

7.15.3 Fire Extinguisher Indicating Discs

Two fire extinguisher indicating discs are located on the inboard side of each engine nacelle. The forward disc of each pair is coloured red and when punctured indicates that the associated extinguisher bottle contents have discharged due to excessive pressure caused by thermal expansion. This will take place when the temperature of the bottle and contents reaches 208°F (98°C) to 220°F (104°C) and the thermal plug on the fire bottle melts.

The aft disc of each pair is yellow and when punctured indicates discharge of the bottle by normal system operation.

7.15.4 Fire Detection Test Switch

The fire detection test switch is located between the fire extinguisher operating handles on the emergency panel. It is a two-position switch labelled FIRE DETECTION and is spring loaded to an unmarked off position. The alternative position is labelled TEST, to which the switch may be held momentarily to check that all fire warning lights in the operating handles illuminate and the fire bell rings.

7.15.5 Fire Warning Bell Mute Switch

The fire warning bell mute switch is located on the AC fuse panel structure to the rear of the overhead console, below the main circuit breaker panel, or, beginning with SN 311, at the extreme left end of the instrument panel. It is a guarded two position switch labelled FIRE BELL, with positions ON and MUTE. The switch should normally be in the ON position, MUTE only being selected to silence the bell when a warning has sounded. The fire warning bell is powered from the left DC bus through the FIRE DET R and FIRE DET L circuit breakers on the circuit breaker panel.

7.15.6 Hand-Operated Fire Extinguishers

A hand-operated fire extinguisher is located on the forward face of the station 111 bulkhead behind the co-pilots seat. The extinguisher contains a frangible disc which, when broken, allows bromochlorodifluoromethane (BCF, also known as Halon 1211) contents to discharge under pressure. By special order a water/glycol extinguisher may be installed on the right cabin door.

7.16 Bleed Air and Pneumatic System

Heated air is bled from each engine compressor casing at engine station 3 and ducted to a common pipe in the fuselage for operation of the aircraft heating system and, when installed, the surface de-icing system. Bleed air is also supplied directly from each engine, upstream of the BLEED AIR control valve, to its respective intake deflector actuator. The bleed air supply from each engine is controlled by a shut-off valve in the engine nacelle which is operated electrically from a switch in the flight compartment. Air is supplied to the de-icing system (and to very early production pneumatically actuated autopilots) through a heat exchanger, dual pressure switch, strainer, pressure regulator and pressure relief valve. The dual pressure switch consists of two switches, one to prevent further opening of the heating system hot air valve if bleed pressure decreases to 25 PSI, and the other to close the hot air valve if the pressure supply decreases below 20 PSI, thereby conserving bleed air pressure for the de-icing and autopilot systems. A caution light is included on the caution lights panel when the de-icing system and or autopilot are installed which, when illuminated, indicates insufficient pressure to satisfactorily operate those systems.

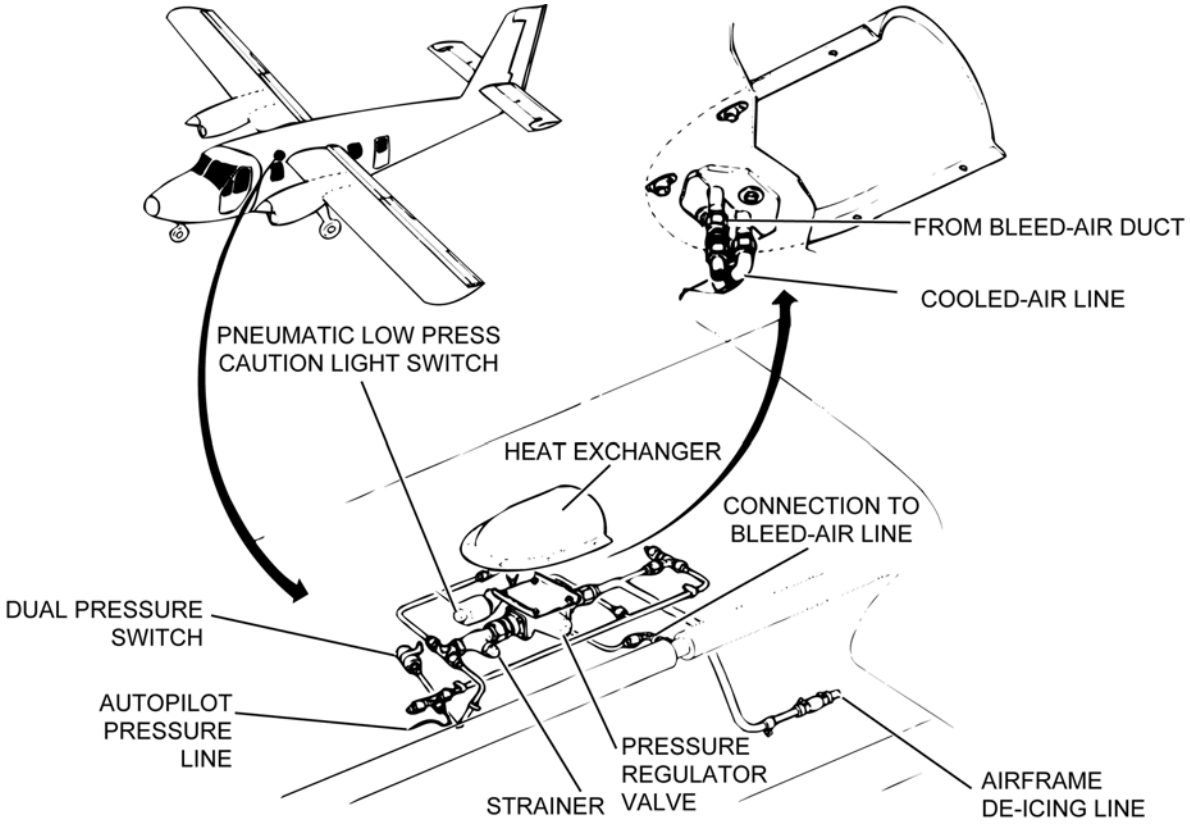


Figure 7-32 Pneumatic System Components

7.16.1 Bleed Air Switches

The two bleed air switches are located on the overhead console; they are labelled BLEED AIR, and (individually) LEFT and RIGHT; a center OFF position is also marked. Each is a two-position, lever lock, toggle-type switch and controls the bleed air shut-off valve in the related engine nacelle. The electrical circuits are powered from the left and right DC buses. BLEED AIR L and BLEED AIR R circuit breakers on the main circuit breaker panel protect the circuits. The switches must be in the BLEED AIR position to supply bleed air to the heating and de-icing systems and the autopilot.

7.16.2 Pneumatic Low Pressure Caution Light

A caution light labelled PNEUMATIC LOW PRESSURE is included on the caution lights panel when the de-icing system and/or pneumatic autopilot is installed. It is operated by a pressure switch in the de-icing and autopilot systems manifold and indicates that pneumatic pressure has decreased to 13 – 15 PSI, which is insufficient to satisfactorily operate the de-icing system and the autopilot.

7.16.3 Bleed Air Temperature Control

When Mod 6/1266 (cut in at SN 311, discontinued after SN 410) is embodied, temperature control valves are included in the bleed air system to control the bleed air supply from the engines in conjunction with temperature sensors in the bleed air ducts, in order to prevent a high temperature condition in the ducts. This prevents exposure of the wing structure to excessive heat in the event of a fractured or leaking duct. A temperature indicator in the flight compartment indicates the temperatures detected by resistance bulbs. A temperature control valve is installed in the bleed air duct from each engine between the engine compressor and the bleed air shut-off valve. It controls the inflow of cold air and hot air into the system in accordance with temperatures detected downstream by a temperature sensor.

At temperatures below 270°F only hot air is admitted by the control valve; at temperatures above 270°F hot air is shut-off and only cold air is admitted; at temperatures over 350°F all bleed air is shut-off. When the duct temperature decreases, the control valve again operates appropriately to admit bleed air. If the supply of bleed air from the opposite engine is inadequate to operate essential systems during an over temperature condition, non-essential systems should be shut-off or engine speed increased appropriately.

7.16.3.1 Bleed Air Temperature Indicator

When Mod 6/1266 is embodied, a bleed air temperature indicator is installed to indicate bleed air duct temperatures. The indicator is labelled COMP BLD AIR °F and is located on the right side sub panel. It is a dual pointer instrument and is connected to resistance bulbs in both the left and right ducts of the bleed air system. Each pointer ranges over

a temperature scale which is colour coded only – no numbers are marked on the dial. A green arc represents 250°F to 350°F, an amber arc represents 350°F to 400°F, and a red arc represents 400°F to 650°F. The indicator is powered from the 28 volt DC supply and is protected by the BLEED AIR L circuit breaker on the main circuit breaker panel. A white eyebrow light illuminates the indicator.

7.17 Ice and Rain Protection

7.17.1 Windshield Wiper System

A windshield wiper system is installed to provide ice and rain protection for the windshield. The system consists of two windshield wipers, one for each panel, driven by a single DC motor powered from the left DC bus. The system is controlled by two switches labelled WIPER located on the windshield switch panel to the right of the overhead console. The left switch has positions labelled PARK, OFF, and ON, with PARK being momentary-on. The right switch has positions labelled FAST and SLOW and selects the operating speed. The circuit is protected by a circuit breaker labelled W/S WIPER WASHER, located on the main circuit breaker panel.

Although there is no published limitation for use of the wipers, it is recommended that they not be used above 100 KIAS airspeed, and not be used in the SLOW mode for longer than 2 minutes. Over 100 KIAS, the motor has difficulty returning the blades to the center position due to airflow. The SLOW speed setting is accomplished by routing power through an in-line resistor, which actually increases current demand when the system is operated in the SLOW mode. In flight, the combination of wind resistance and increased current demand resulting from selection of SLOW mode will often cause the circuit breaker to pop out after approximately 2 minutes of operation.

7.17.2 Windshield Washer System

Early production aircraft could be ordered with a windshield washer system (S.O.O. 6008) that was used to spray de-ice fluid onto the windshield. This system was made standard equipment on production aircraft at SN 531 by Mod 6/1607, and was subsequently deleted from production aircraft beginning at SN 799 by Mod 6/1827. De Havilland subsequently issued Service Bulletin 6/441 recommending that the windshield washer system be removed from all Series 300 aircraft. If the washer system is left in place, Mods 6/1815 and 6/1827 mandate installation of a placard on the washer fluid tank limiting the types of fluid permitted for use.

7.17.3 Engine Intake Deflectors

An engine intake deflector and diffuser are installed in the lower cowl of each engine to prevent the entry of snow and ice into the engine plenum chamber. The deflector functions as an inertial separator and is a retractable louvered plate, hinged at its forward end to the upper surface of the inlet duct, which can be lowered into the inlet airflow by depression of its rear end. The diffuser is a fixed fine mesh screen installed at the upswept aft end of the inlet duct and projecting into the airflow. An exit duct door in the rear of the cowl operates in conjunction with the deflector, opening when the deflector extends to allow deflected snow or ice particles to pass out of the cowl, and closing when the deflector retracts.

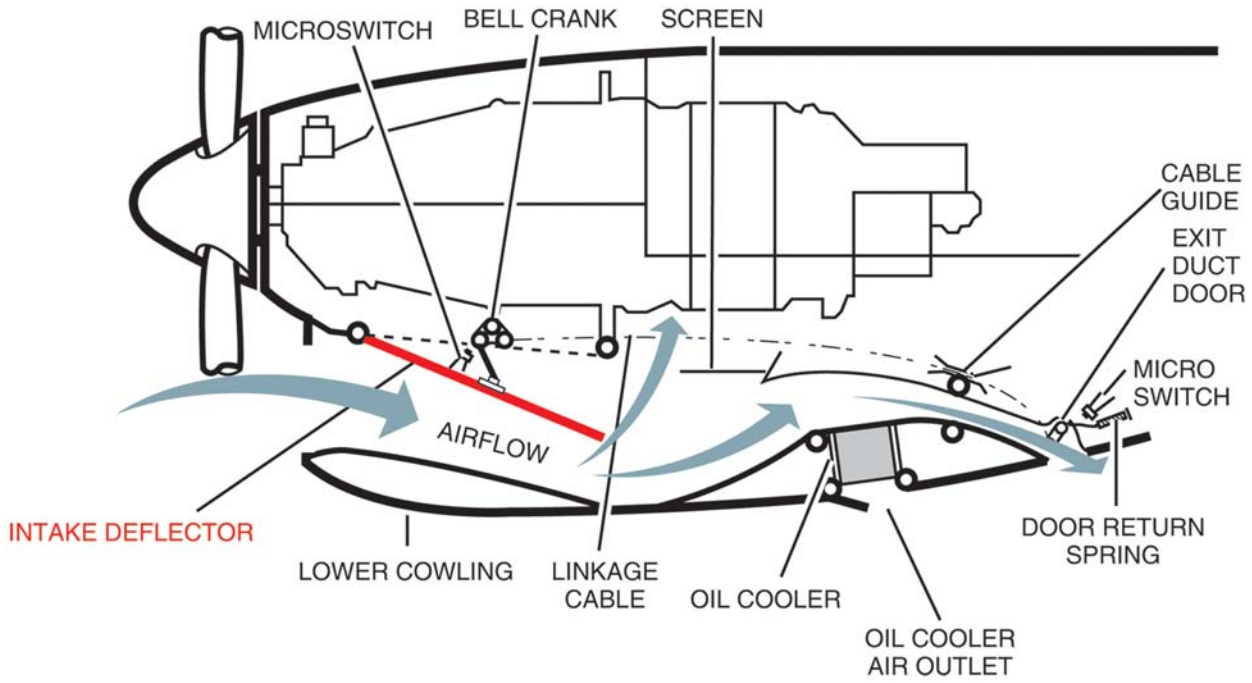


Figure 7-33 Engine Air Intake Airflow - Deflector Extended

Each intake deflector is operated by two pneumatic actuators and compression return springs mounted one on each side above the inlet duct and connected to the deflector by turnbuckle type piston rods. Air pressure from the bleed/pneumatic system extends the actuators to lower the deflector, and the return springs retract it when the imposed air pressure is vented. The air pressure is admitted to and exhausted from the actuators through an electrically operated air valve. Two spring-loaded lock levers lock the deflector at its extended position while a solenoid-operated lever and rod mechanism withdraws the lock levers to allow the deflector to retract due to the force exerted by the door spring. A cable interconnecting the deflector operating mechanism with the exit duct door, and door spring, provide for automatic operation of the exit duct door.

Control of the deflectors is by means of a single switch on the overhead console. Two indicators on the engine instrument panel denote the positions of the deflectors. The deflector plate extends and the exit duct door opens when the INTAKE DEFLECTOR switch is selected to EXTEND, thereby diverting snow, ice or rain aft through the oil cooler bypass duct. When the INTAKE DEFLECTOR switch is released the deflector remains in the extended position due to the action of spring-loaded lock levers. To retract the deflector, the switch must be selected to RETRACT.

The system is powered from the right DC bus through an INT DEFL circuit breaker on the main circuit breaker panel.

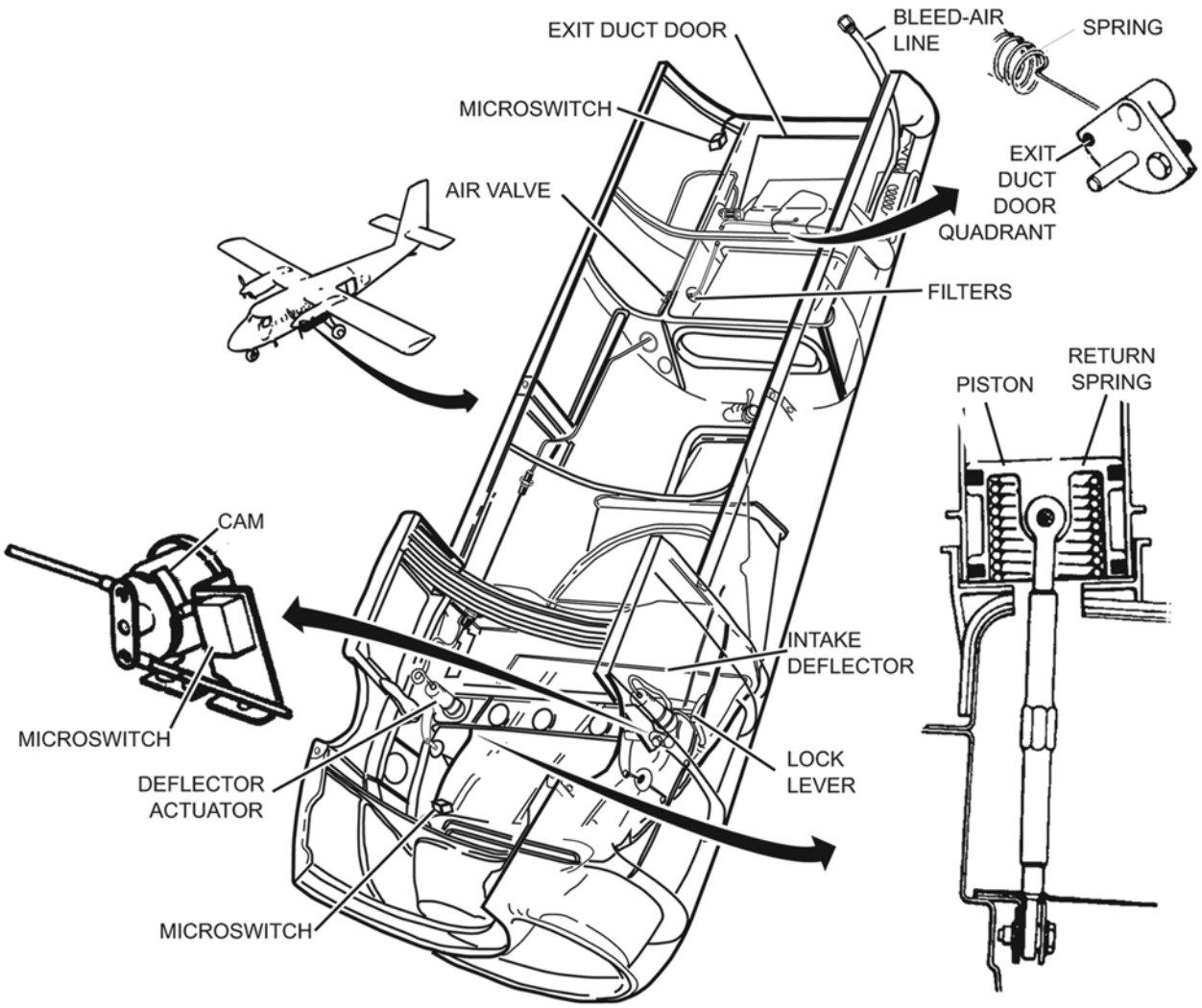


Figure 7-34 Intake Deflector Components

7.17.4 Intake Deflector Switch

A three-position toggle switch with two momentary-on positions controls the operation of the intake deflectors in both engine nacelles. The switch is located on the overhead console and is labelled INTAKE DEFLECTOR, with positions labelled RETRACT, OFF, and EXTEND. When selecting EXTEND the switch should be held for 3 to 5 seconds after EXT is indicated. When selecting RETRACT it is not necessary to hold the switch.

7.17.5 Intake Deflector Indicators

Two intake deflector indicators are mounted on the engine instrument panel. Each is a magnetic "dolls-eye" type indicator and indicates the position of its respective deflector by the inscription EXT when extended and a blank when retracted or when the circuit is de-energized.

7.17.6 Optional De-Icing Systems

By special order, de-icing and anti-icing systems provide for wing, tail, and propeller de-icing and engine air intake anti-icing. Pneumatically operated boots are installed on the wing and tail leading edges which break up formations of ice by inflation and deflation pulsations, which can be automatically or manually controlled. Electrically heated de-icing boots on the propeller blades prevent the accumulation of ice, while similar boots on the engine air intake lip maintain them at a temperature which prevents the formation of ice.

7.17.7 Wing and Tail De-Icing

The wing and tail de-icing boots (S.O.O. 6004) are operated by air pressure from the bleed/pneumatic system, through a system which includes distributor valves, an ejector, an electronic timer, and control switches.

In the AUTOMATIC mode, the air supply is controlled by the distributor valves and inflates the de-icer boots in a sequence and speed governed by the electronic timer. The timer has two operating speeds, SLOW and FAST, either of which can be selected by the pilot, dependent upon the severity of icing conditions. A fast cycle occurs every minute, which comprises 5 seconds inflation time for inner wings, 5 seconds for outer wings, 3 seconds for left stabilizer and 3 seconds for the right stabilizer followed by 44 seconds dwell (standby) period. A slow cycle occurs every 3 minutes. Inflation time for each boot remains the same, however, the dwell time increases to 164 seconds.

In the MANUAL mode, de-icer boots must be operated individually by use of the appropriate switches. The switches on the overhead console provide the pilot full control of operation of all boots.

Deflation of the boots in both automatic and manual modes is by suction induced by ejector venturi action. Suction is automatically applied to the boots anytime one or both of the BLEED AIR switches is placed in the ON position.

The wing and tail de-icer boot electrical circuits are powered from the left and right DC buses and are protected by AFR DEICE AUTO and AFR DEICE MAN circuit breakers on the main circuit breaker panel.

The original timer used for the AUTOMATIC de-ice function is susceptible to interference caused by operation of strobe lights installed on the aircraft. Mod 6/1779, cut in as standard at SN 830 but easily retrofitted to earlier production aircraft, provides a timer that is not affected by operation of strobe lights. On Pre Mod 6/1779 aircraft, the strobe lights should be turned off before the de-ice system is operated in the AUTOMATIC mode.

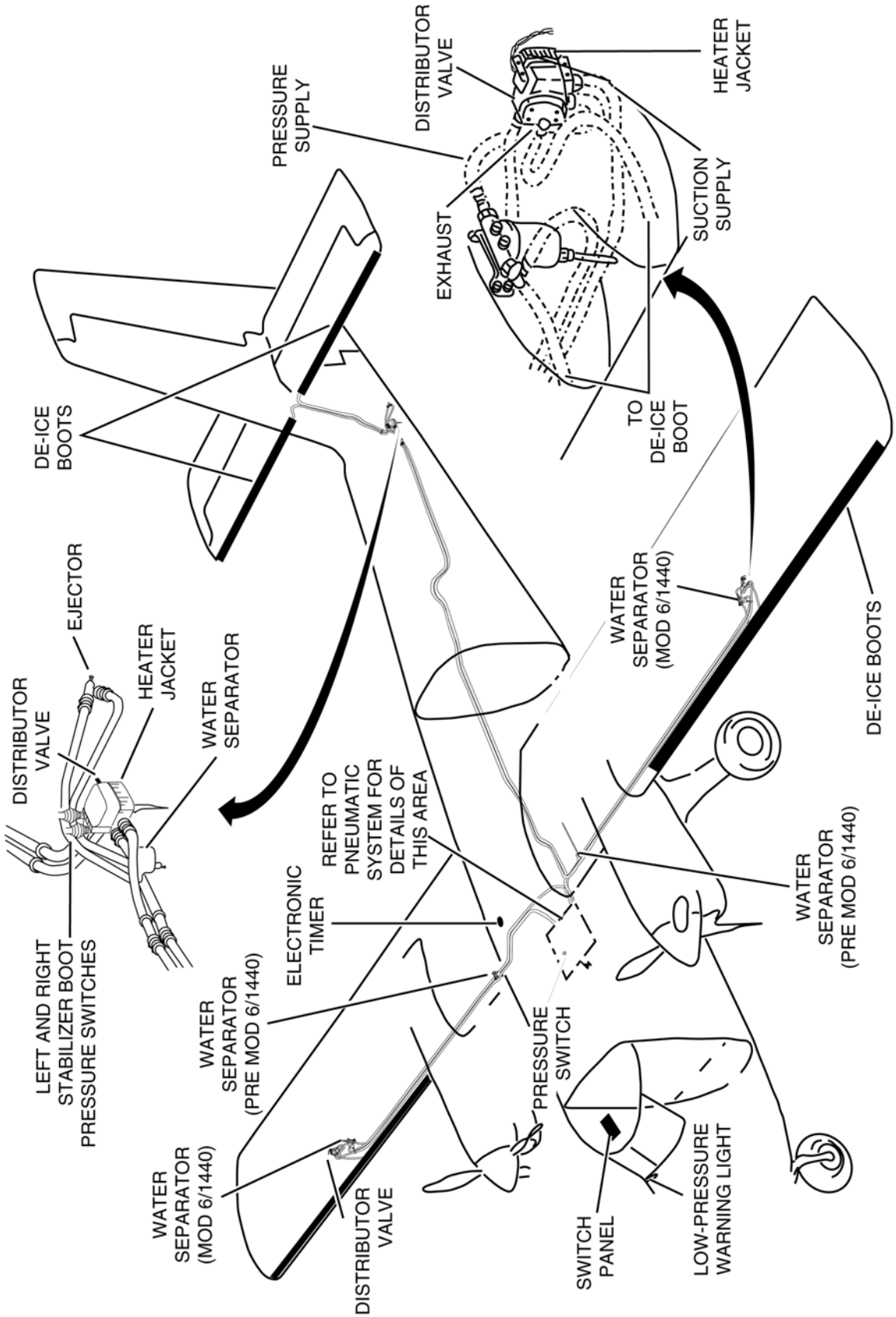


Figure 7-35 Surface De-Ice System Components

7.17.7.1 Wing and Tail De-Icing Switches

Four switches on the overhead console are provided for control of the wing and tail de-icing boots. They are grouped below a label inscribed DEICER BOOTS. The switches and their functions are as follows:

1 A switch for selection of automatic or manual modes. Alternative positions are marked MANUAL and AUTO.

2 A switch for selection of a fast or slow cycle of operation in the automatic mode only. Alternative positions are marked FAST and SLOW.

3 A manual mode switch to manually inflate the wing de-icer boots at the discretion of the pilot. Alternative positions are marked WING INNER and WING OUTER.

4 A second manual mode switch to manually inflate the tail de-ice boots at the pilot's discretion. Alternative positions are marked LEFT STAB and RIGHT STAB.

7.17.7.2 Tailplane De-Icing Boot Indicator Lights

When Mod 6/1393 is incorporated two blue press-to-test indicator lights are installed on the overhead console to provide indication of air pressure distribution to each tailplane de-icer boot during de-icer boot operation. The indicator lights are labelled STAB DEICE PRESS and individually marked LEFT and RIGHT. Each light is operated by a pressure switch in the air pressure line to the related tailplane de-icer boot, and illuminates for the period of time that air at operating pressure is metered to each boot in each inflation cycle, in either automatic or manual mode. The indicator lights are powered through the AFR DEICE MAN circuit breaker on the main circuit breaker panel. The rim of each light can be rotated for dimming control.

If Mod 6/1393 is not embodied on aircraft equipped with surface de-ice boots, flight in icing conditions is prohibited unless engine RPM is maintained above 75% N_G at all times.

7.17.7.3 Distributor Valve Heaters

When Mod 6/1440 (cut in as standard at SN 338, also available for retrofit to earlier production aircraft) is incorporated, distributor valve heaters are installed to improve the operational reliability of the de-icer system. The heaters are controlled by a switch labelled VALVE HTR on the overhead console. The circuit is protected by the AFR DEICE MAN circuit breaker on the main circuit breaker panel.

The heaters should be turned on anytime one or both BLEED AIR switches have been turned on and it is foreseen that the surface de-ice boots will be used at any time during the flight. The heaters may be left off if surface de-ice boots will not be used during the flight.

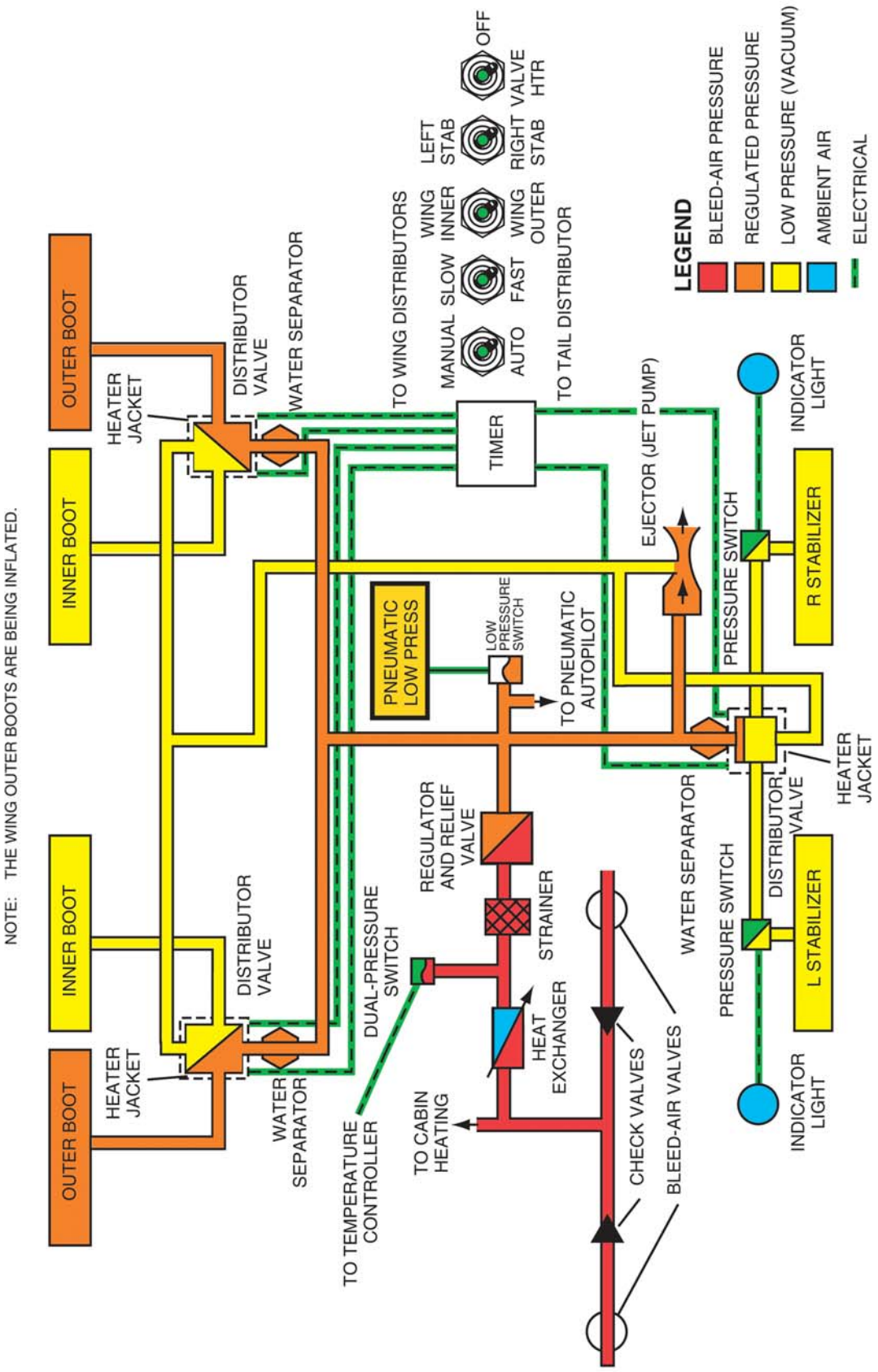


Figure 7-36 Surface De-Ice Schematic

7.17.8 Propeller De-Icing

S.O.O. 6005 provides electric de-ice boots at the root of each propeller blade. Each de-icing boot contains an inner and an outer heater element; these are energized through a slip ring assembly on the propeller hub. The propeller de-icing system is controlled from a two-position switch marked PROP DE-ICE on the overhead console. Each boot is protected by the oil pressure switch on its respective engine. This interconnection with the oil pressure switch ensures that the boot cannot be operated unless the engine is operating. A circuit breaker on the main circuit breaker panel marked PROP DE-ICE safeguards the circuit. Propeller de-icing should be switched off before feathering the propellers.

7.17.9 Engine Intake Anti-Ice

S.O.O. 6062 provides electric anti-ice boots on the leading edge of each engine nacelle air intake. This is a rare option that was mandated for 'flight in known icing' approval by the United Kingdom CAA. The anti-icing boot on the leading edge of each engine air intake contains a heater element and both intakes are controlled by an INTAKE ANTI ICE switch on the overhead console. Circuit breakers marked INT ANTI ICE L and INT ANTI ICE R on the main circuit breaker panel protect the circuits. A thermal overheat switch in each intake prevents overheating of the anti-ice boot by automatically switching off the heater element if a predetermined high temperature is reached.

To avoid depleting the battery, the intake anti-ice must not be used on the ground until the engines are running.

Although the anti-ice boots on the engine intake lip will function as de-ice boots, normal operations practice is to turn the boots on prior to the development of any ice on the intake lip, to prevent ice particles shedding from the lip and being drawn into the engine air intake system.

7.17.10 Windshield Heating System

By special order (S.O.O. 6007 or 6187) electrically heated glass windshield panels can be installed in place of the standard plastic windshield panels. The heated windshield incorporates temperature controllers to automatically regulate the heating capability. Two special glass windshield panels, each with an integral heater element and sensor, two temperature controllers, two relays, and a switch comprise the main components of the system. Each windshield panel is heated independently of the other, each having its own power source, temperature controller, and relay; a single, double-pole switch controls their operation simultaneously.

The switch is located on the switch panel above the right pilot windshield and has positions marked HEAT and OFF. The left windshield glass panel is powered from the left DC bus and the right windshield glass panel from the right DC bus. W/S HEAT

L and R circuit breakers on the overhead circuit breaker panel protect the circuits. The windshield heat switch should be left at the HEAT position continuously in icing conditions.

The glass windshield is inherently bird-proof, and there is no requirement to turn the heat on to increase impact resistance. Windshield heat greatly assists in de-misting the inside of the windshield panels when descending into warm, humid air masses.

7.18 Heating and Ventilating System

The heating and ventilating system utilizes bleed air from the engines and ram air from a scoop intake in the fuselage to provide heated, ram, or mixed air to maintain appropriate temperatures in the cabin and flight compartment. Heated air is circulated through ducts beneath the flooring to outlets at the base of each cabin wall and in the flight compartment floor. A tube delivers heated air to the windshield heater outlets. The same ducts also circulate cooling ram air or a mixture of heated air and ram air in the cabin and flight compartment. Additional ducts deliver ram air to the cabin through individual cabin louvers in cove ducts on each side of the cabin upper walls. A fan is installed in the air intake duct for forced air ventilation when on ground. The system provides for automatic or manual temperature control by means of a motorized hot air valve and manual control of ram air inflow and cabin air supply. An exhaust vent is installed in the cabin roof.

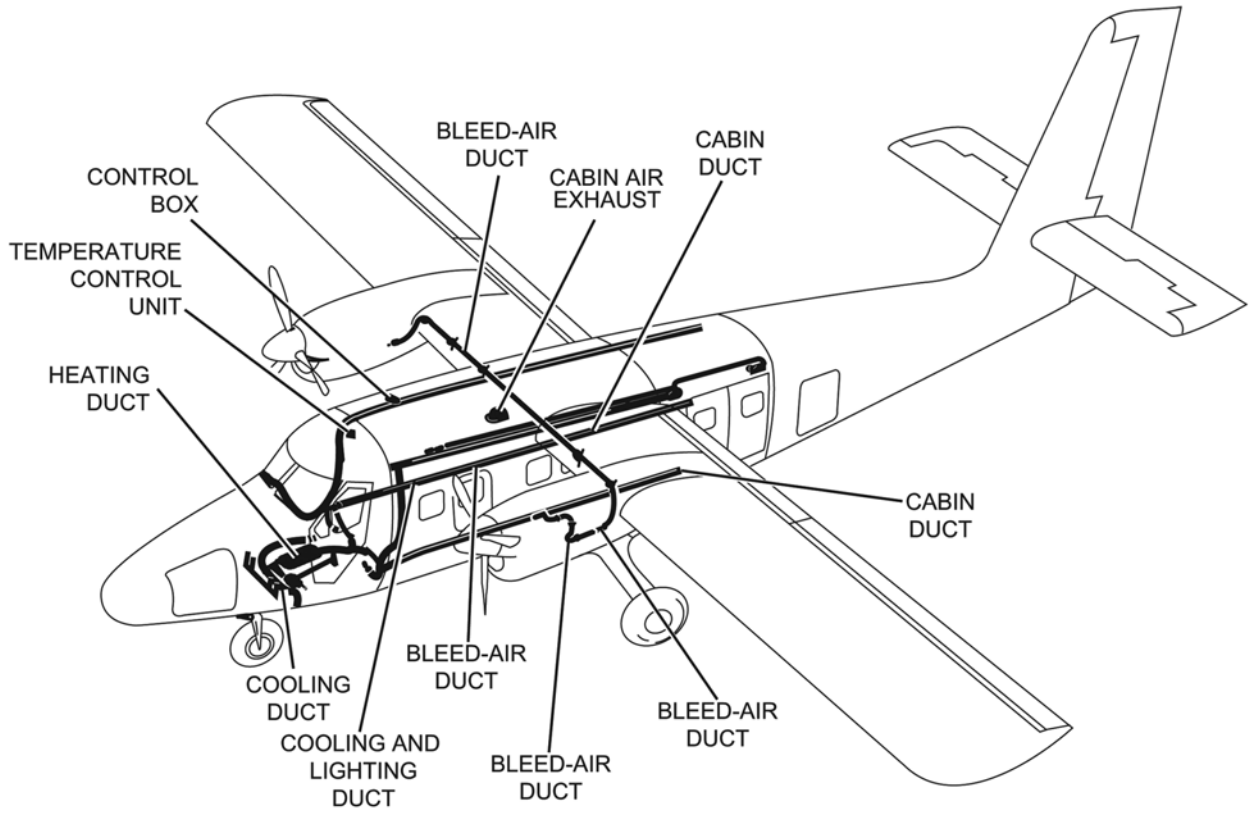


Figure 7-37 Heating and Ventilation Air Distribution

7.18.1 Flight Compartment Fans

Two fans are installed in the flight compartment roof for windshield de-misting or flight compartment cooling. Each fan is ball-mounted and can be adjusted to direct the

airflow in any direction. Both fans are controlled from a circuit breaker switch labelled FLT COMP FANS on the overhead circuit breaker panel.

7.18.2 Ram Air Lever

The ram air lever is labelled RAM AIR with positions OPEN and CLOSED, and moves in a slotted plate on the flight compartment pedestal. The lever operates the ram air valve in the intake duct, and controls the flow of ram air from the intake into the system in accordance with cool air requirements. When the ram air valve is closed, the injection of bleed air into the mixing chamber draws in air from the aircraft interior through a grille in the side of the flight compartment floor well for recirculation.

7.18.3 Ventilation Fan

A ventilation fan is installed in the ram air intake duct to provide forced ventilation for the cabin and flight compartment; it is only intended for use on the ground. The fan is operated by a VENT FAN switch on the flight compartment pedestal above the ram air lever; it is a two-position switch with labelled ON and OFF positions. The fan electrical circuit is protected by a CABIN VENT FAN circuit breaker on the overhead circuit breaker panel.

7.18.4 Cabin Air Control Knob

The cabin air control knob is located on the floor behind the right pilot seat; it operates a valve in the heating duct to the cabin, and controls the flow of conditioned air to the cabin. Closing the valve (by pulling the control knob fully up) directs the entire flow of air to the flight compartment. The cabin air valve should always be open when the automatic mode is selected so that the temperature sensor in the cabin is fully effective.

7.18.5 Heating Control Switch

The heating control switch is grouped with the heating system controls on the overhead console. It is a three-position, center-off switch, with the positions labelled MANUAL, OFF, and AUTO and is powered through a CABIN HT/VENT circuit breaker on the circuit breaker panel. With engines operating and power on, the switch controls the operation of the heating system.

7.18.5.1 Manual Control

At MANUAL, temperature of the aircraft interior can be governed by pilot control of the hot air valve (which admits bleed air to the system) by means of a manual control toggle switch beside the heating control switch.

7.18.5.2 Automatic Control

At AUTO, control of the heating system is transferred to an automatic temperature controller which automatically maintains the temperature selected by the pilot on a temperature selector knob. The controller can maintain any set point between 45° and 80°F. The temperature controller governs the hot air valve under this condition, and in response to signals from temperature sensors within the heater duct, in the cabin, and in the ram air duct, regulates the supply of hot air by adjusting the position of the hot air valve accordingly. In conditions of low bleed air pressure, two pressure switches override heat control selections to retain air pressure for operation of the autopilot and de-icing system. One pressure switch operates if pressure falls below 25 PSI, and prevents further opening of the heat control valve. The second pressure switch operates if pressure falls to 20 PSI, and closes the hot air valve. A fan in the cabin temperature sensor housing provides air circulation around the sensor to ensure a true cabin temperature reading.

The automatic heating mode is only intended for use in flight. It will not give satisfactory performance when on the ground. If the automatic heating mode is used on ground at low engine power settings, the hot air valve will eventually motor to the fully open position, and when take-off power is applied, the DUCT OVERHEAT light will illuminate before the duct and cabin temperature sensors react and can signal the valve to move towards the closed position.

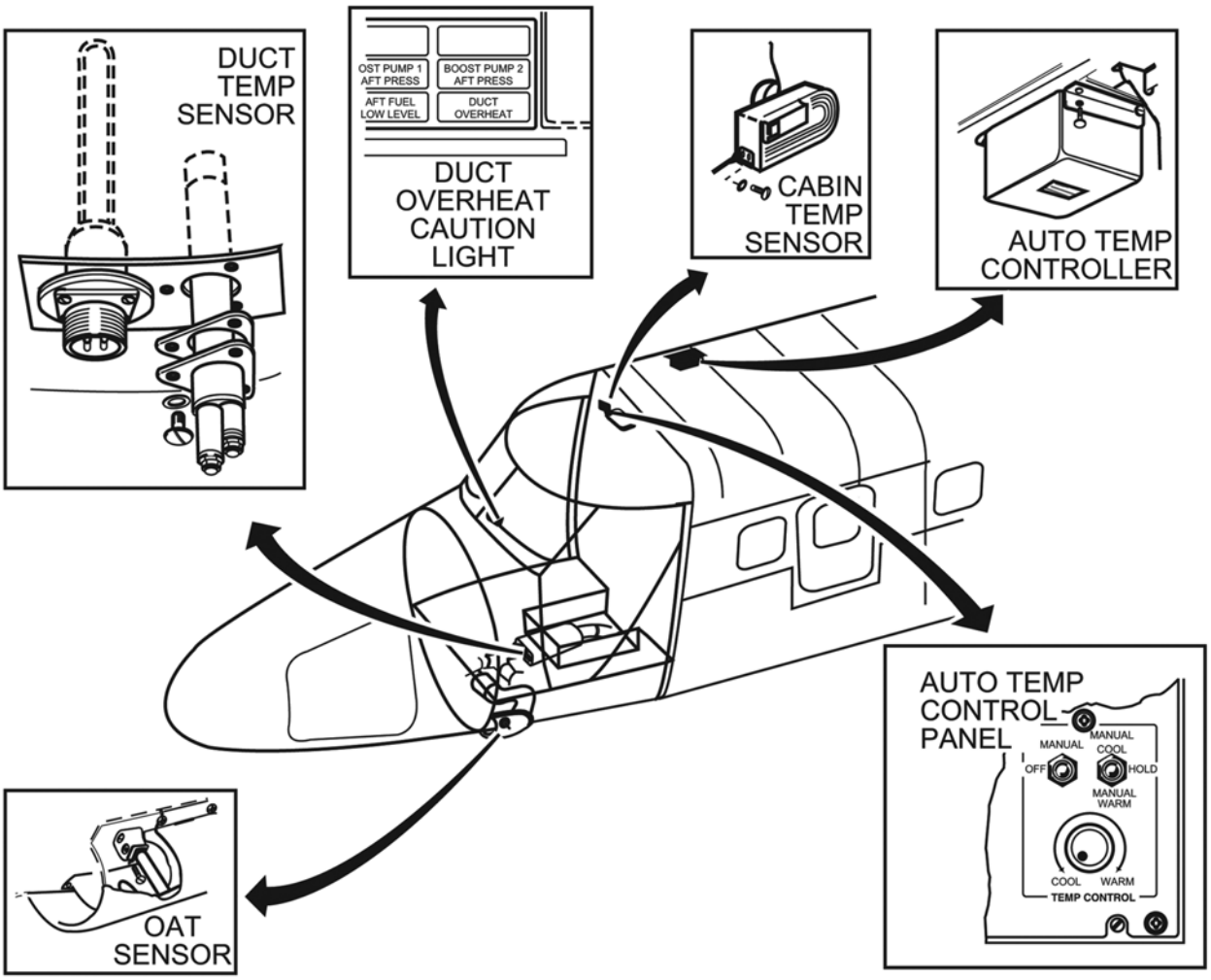


Figure 7-38 Automatic Heating Control Components

7.18.6 Manual Control Switch

The manual control switch is included in the heating system controls on the overhead console. It is a three-position switch, spring-loaded to the center position; the three positions are labelled MANUAL COOL, HOLD, and MANUAL WARM. With MANUAL selected on the heating control switch, the manual control switch governs the position of the hot air valve and thereby regulates the inflow of hot air. At MANUAL COOL, the hot air valve is motored in the closed direction consistent with the length of time the switch is held at MANUAL COOL. Similarly, when the switch is held at MANUAL WARM the hot air valve is motored in the open direction. HOLD position maintains the valve at the position set. The hot air valve takes approximately 30 seconds to motor from fully closed to fully open or vice versa.

7.18.7 Temperature Control Knob

The temperature control knob is grouped with the controls on the overhead console. It is a rotary knob labelled TEMP CONTROL and has arrows indicating directions for rotation to COOL and WARM within the range of 45°F to 80°F. The knob controls a thermostat which determines the temperature at which the aircraft interior is maintained by the automatic temperature controller. The temperature control knob is effective only when the automatic mode is selected. The automatic temperature control mode is designed for in-flight use only.

7.18.8 Duct Overheat Caution Light

A caution light labelled DUCT OVERHEAT, on the caution lights panel, illuminates if an excessive temperature is detected in the heating duct. The temperature is sensed by an overheat switch in the duct beneath the flight compartment floor. Illumination of the DUCT OVERHEAT light is usually caused by not opening the RAM AIR vent sufficiently prior to turning on the heating system.

7.18.9 Venting

A portion of the cabin air is vented to atmosphere by way of an air extractor mounted on the cabin roof. Externally, the vent is covered by a combined fairing/low pressure pneumatic system heat exchanger. The fairing, which is open at the aft end, induces a suction which extracts air from the cabin through grilles in the ceiling panels and the roof vent assembly. Air from the passenger cabin will also exhaust through a screen in the baggage compartment to leave the aircraft at the tail cone.

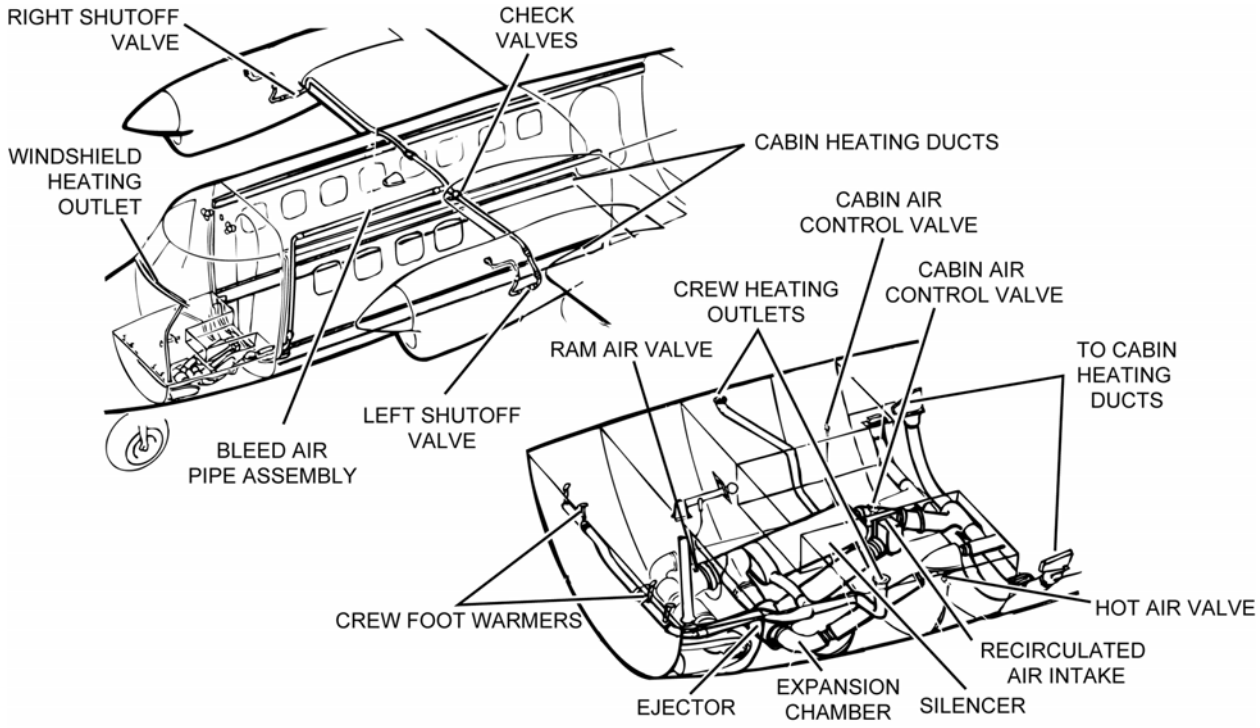


Figure 7-39 Cabin Heating System Components

7.18.10 Air Conditioning System

By special order (S.O.O. 6109), a J.B. Systems 1000 Series air conditioning system can be installed in the aircraft to circulate cooled air within the cabin and flight compartment. On later production airplanes, with effect from SN 637 (Mod 6/1684), the system is supplied by Parker Hannifin Corporation. In all cases, the factory installed air conditioning unit is installed beneath the cabin rear floor, aft of fuselage fuel cell 8.

The main components of the unit comprise an electric motor, compressor, condenser, condenser fan, evaporator, evaporator fan, expansion valve, and a receiver dryer. An air intake and an exhaust outlet for the condenser are incorporated in the underside of the fuselage near the rear cabin doors. Return air from the aircraft interior is admitted through a grille in the cabin floor, cooled by passing through the evaporator and then delivered to two perforated distribution ducts which extend the length of the cabin ceiling. Control of the air conditioning system is by means of two switches on the overhead console in the flight compartment. The system is powered from the left DC bus and is protected by four circuit breakers beneath the right floor panel at fuselage station 336.

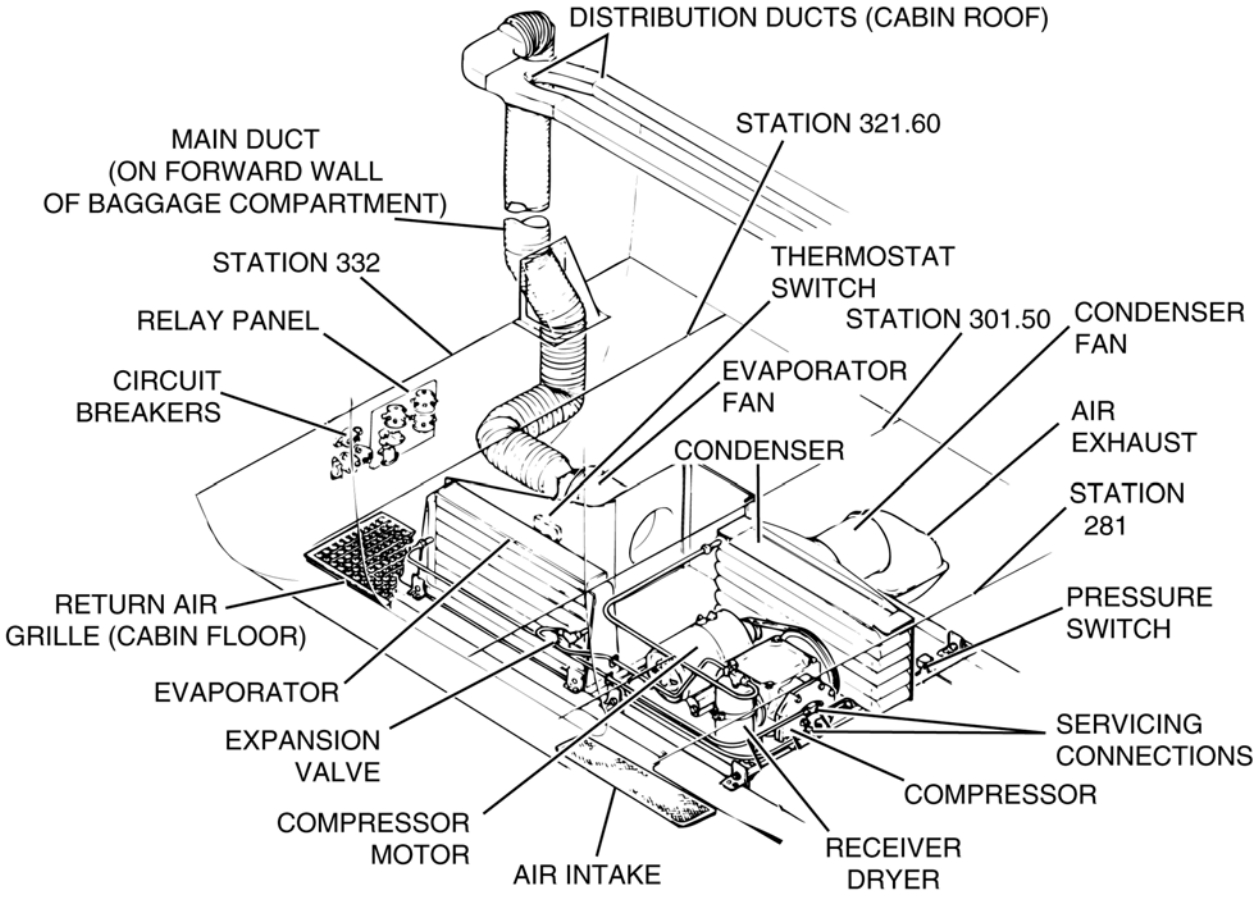


Figure 7-40 Air Conditioning System Components (Factory Installation)

7.18.10.1 Air Conditioning System Switches

The two air conditioning system switches on the overhead console are identified AIR CONDITIONING. Each is a three-position switch. The left switch is marked POWER and controls the system electrical power source; its positions are marked FLIGHT, OFF, and GROUND. FLIGHT position allows power to be drawn from the DC bus, provided both generators are on line. GROUND position eliminates this safety device and allows any available DC power source to operate the system. The right switch is labelled OPERATION and controls the output of the system; its positions are marked NORMAL, FAN ONLY, and QUICK COOL. At NORMAL and QUICK COOL positions, the compressor motor and the condenser and evaporator fans are energized; at NORMAL, the two fans operate in series at a reduced speed and at QUICK COOL they operate in parallel at maximum speed. At FAN ONLY position, the compressor motor is de-energized and the fans operate in series to provide air circulation only.

7.18.10.2 Operation

In order to conserve the aircraft battery, the air conditioning system should not be operated from that source except for a FAN ONLY selection. If the system is being

operated from the aircraft battery while the aircraft is on the ground, it should be switched off during engine start. If external power is available, it should be connected and the EXTERNAL/BATTERY switch selected to EXTERNAL before operating the system at GROUND position.

A GROUND selection also allows operation from a single engine, but to prevent generator overload, the system should not be operated at QUICK COOL. In the event that the system is operated on the ground during engine start and with GROUND position selected (regardless of the power source or the OPERATION switch position) a "fan only" mode of operation occurs while the engine START switch is selected to LEFT or RIGHT. With the POWER switch at FLIGHT position, the air conditioning system will operate only when both left and right generators are on line. On aircraft with Mod 6/1305 (cut in as standard at SN 311) incorporated, if an engine failure or generator failure occurs the system will shut down automatically.

The table below correlates power switch position, the source of power, and the mode of operation that is permitted.

POWER SWITCH	POWER SOURCE	OPERATION SWITCH
FLIGHT	Both generators	NORMAL, FAN ONLY or QUICK COOL
GROUND	One generator	NORMAL or FAN ONLY
	Both generators	NORMAL, FAN ONLY or QUICK COOL
	Aircraft battery	FAN ONLY
	External power	NORMAL, FAN ONLY or QUICK COOL

7.19 Hydraulic System

The hydraulic system operates the wing flaps, nose wheel steering, wheel brakes and (if installed) the wheel-skis. The main components of the system are an electric motor-driven pump, an emergency hand pump, a reservoir, damping and brake accumulators, flap and nose wheel steering actuators, brake valves, and a flap selector. A filter, pressure switch, relief and thermal relief valves, check valves, and pressure gauges are also included in the system.

The system is pressurized by the motor-driven pump and pressure supply is retained by the damping (system) and brake accumulators. Pressure is immediately available from the damping accumulator for operation of the flaps, nose wheel steering, and wheel brakes. The brake accumulator supplements the damping accumulator in supplying the brakes, and also maintains a reserve pressure for brake operation in the event of pressure loss from the damping accumulator or failure of the motor-driven pump. The pressure switch senses system pressure and regulates the operation of the motor-driven pump so that a predetermined working pressure is always maintained by the two accumulators.

The emergency hand pump is provided for use in the event of failure of the motor-driven pump. It may be used manually to pressurize the accumulators or to operate the wing flaps and nose wheel steering directly. The two accumulators are precharged with nitrogen, which is accomplished by a charging valve and a pressure gauge beside each accumulator. The main power components of the hydraulic system (motor-driven pump, reservoir, accumulators and their pressure gauges) are combined in a power package mounted on the fuselage structure beneath the flight compartment floor. It is accessible for servicing from both sides of the fuselage through access doors.

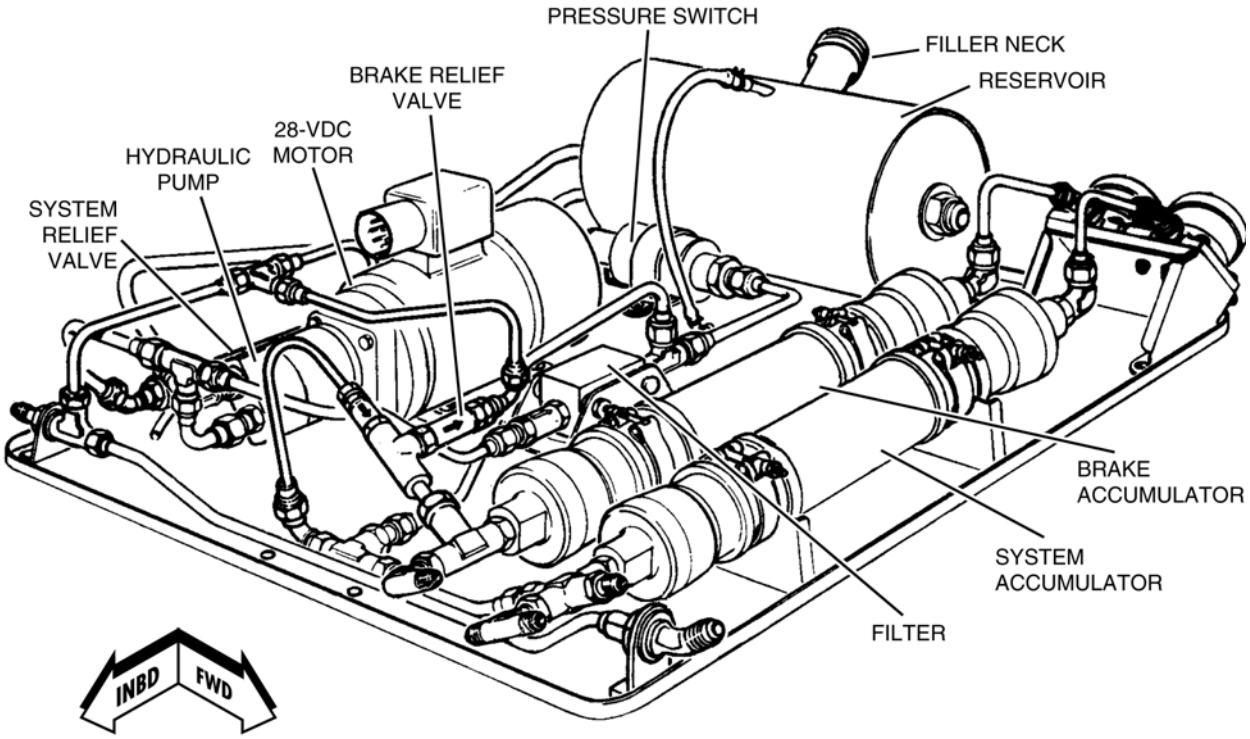


Figure 7-41 Hydraulic Power Pack

7.19.1 Electric Hydraulic Pump

The electric motor-driven hydraulic pump is powered from the left DC bus. It maintains the damping system and brake accumulators at a working pressure in response to pressures sensed by the pressure switch. When pressure falls 175 PSI (150 to 300 PSI Post Mod 6/1570) below the normal system pressure, the motor-driven pump is energized and pressurizes the accumulators to 1550 ± 50 PSI (1575 ± 50 PSI Post Mod 6/1570) at which pressure it is de-energized. The difference between pre and Post Mod 6/1570 aircraft is not operationally significant – post-mod, the pump will operate less frequently but for a longer length of time each cycle. The mod cut in beginning with SN 511.

The motor-driven pump circuit is protected by a HYD OIL PUMP circuit breaker on the main circuit breaker panel. An amber press-to-test caution light labelled HYD PUMP C/BKR OPEN can be installed below the brake hydraulic pressure gauge to provide a visual indication that the HYD OIL PUMP circuit breaker is open. This caution light was provided as standard equipment from SN 531 onwards. Aircraft incorporating Mod 6/1654 (cut in at SN 595) have the HYD PUMP C/BKR OPEN caution light located on the left pilot's flight instrument panel, to the left of the airspeed indicator. If the HYD OIL PUMP circuit breaker is open, operation of nose wheel steering, brakes, or flaps will quickly deplete the system accumulators and the hydraulic services will become

inoperable. The operating circuits for the warning light are supplied through the COPLT RAD & VA PNL LT circuit breaker.

The HYD OIL PUMP circuit breaker should not be pulled out except in the event of an abnormality. It is neither necessary nor desirable to pull the HYD OIL PUMP circuit breaker to minimize electrical system demand prior to engine start.

7.19.2 Emergency Hand Pump

The emergency hand pump is located beneath the flight compartment floor with the pump handle socket accessible through a hinged door in the floor to the right of the left side pilot seat. The emergency hand pump is for use in the event of failure of the motor-driven pump, to restore sufficient pressure to the system to operate all circuits. The hand pump handle is stowed in the front face of the flight compartment bulkhead to the right of the entrance doorway. When Mod 6/1728, cut in as standard at SN 731, is embodied, the handle is stowed on the sub-floor structure below the fire extinguisher.

7.19.3 Hydraulic System Pressure Indicator

The hydraulic system pressure indicator is located below the radio control panels. It indicates the pressure available in the system for operation of the flaps, nose wheel steering, and brakes. The indicator is labelled SYSTEM HYD PRESSURE and has a scale graduated in increments of 100 PSI from 0 to 1,700 PSI. It is illuminated by eyebrow lighting controlled from the COPLT RADIO AND V/A PNL LTS rheostat in the flight compartment roof through the COPLT RAD & V/A PNL LT circuit breaker on the main circuit breaker panel.

7.19.4 Hydraulic Brake Pressure Indicator

The brake pressure indicator is mounted below the engine instrument panel. It indicates the pressure in the system available to the brakes. Normally it should reflect the same pressure as the system pressure indicator, but in the event of system pressure failure, it will indicate pressure retained in the brake circuit by the brake accumulator. The indicator is labelled BRAKE HYD PRESSURE; it is similar to the system pressure indicator and its illumination is electrically powered through the PLT ENG CONS & TRIM PNL LTS circuit breaker and controlled by the PLT ENG INST & EMER PNL LTS switch.

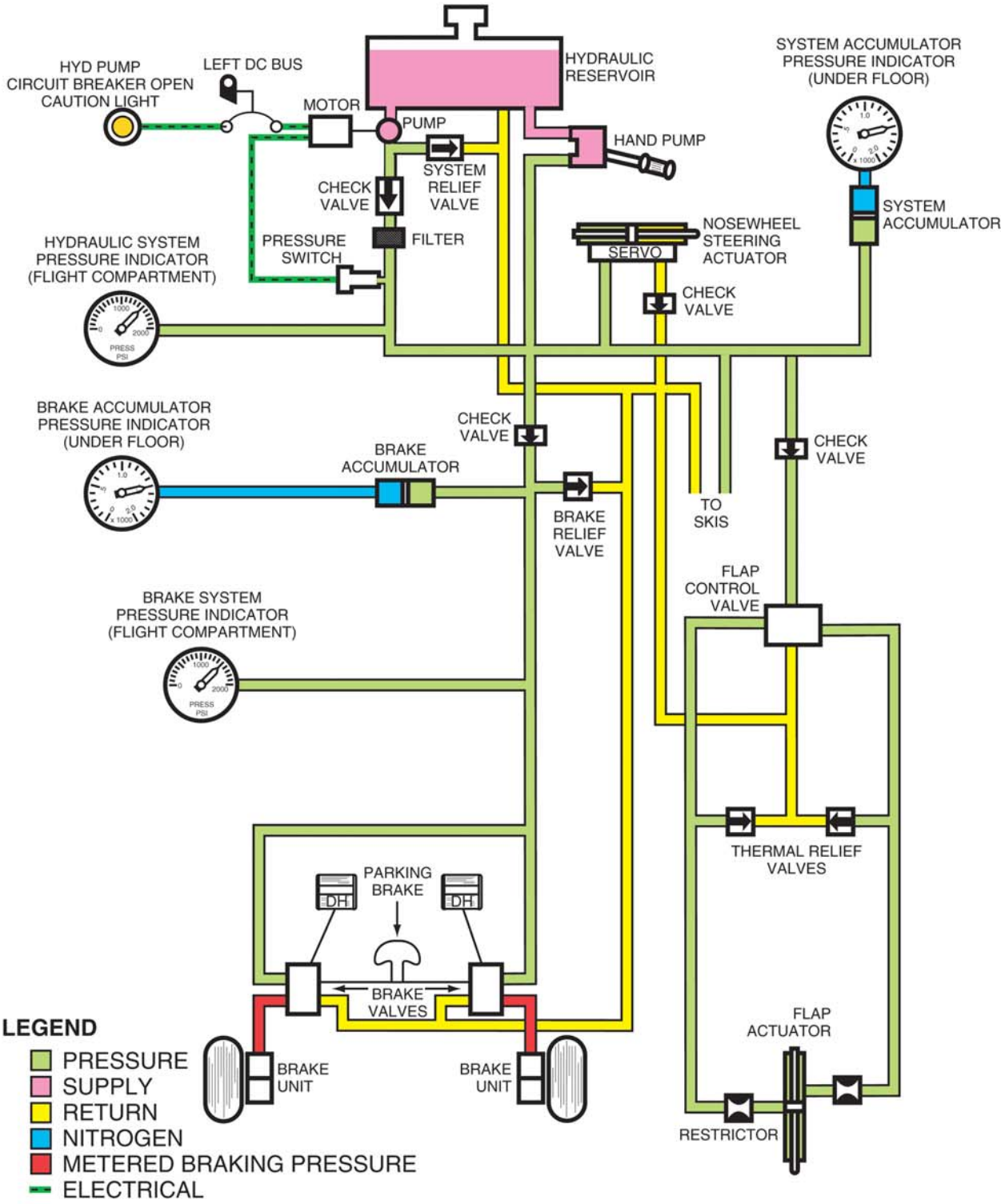


Figure 7-42 Hydraulic System Schematic

7.20 Landing Gear

7.20.1 Conventional Landplane

The landing gear is a non-retractable type and consists of two main landing gear units and a nose landing gear. Each main landing gear unit consists of a wheel mounted on a stub axle which is attached to a Y strut assembly hinged to the side of the fuselage. Compression urethane shock absorbers are connected between the Y strut and the fuselage. A hydraulically operated brake assembly is embodied in each wheel unit. Each main landing gear leg is enclosed in a two-piece fairing. The nose landing gear consists of a pneumatic/hydraulic shock strut with a hydraulically operated steering mechanism and a nose wheel installed in the strut fork assembly. A tail bumper is installed on the underside of the rear fuselage.

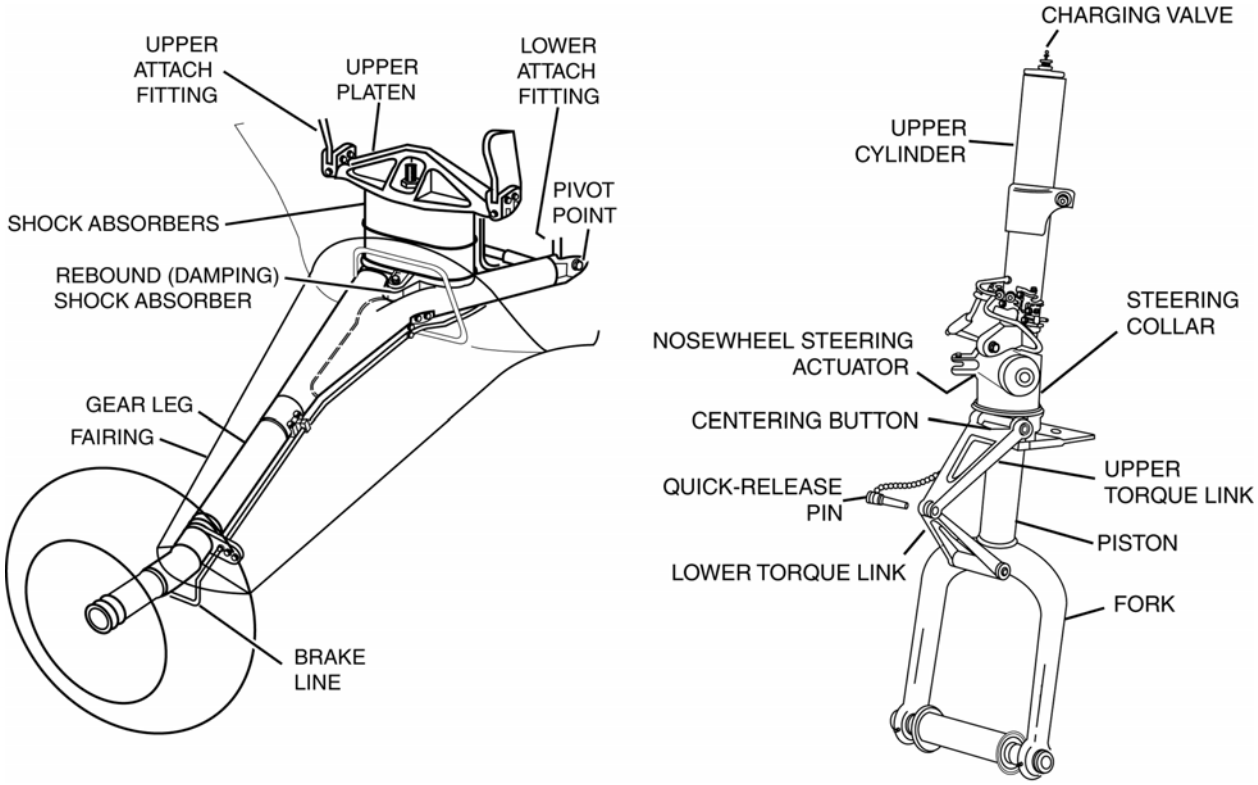


Figure 7-43 Main and Nose Landing Gear

7.20.2 Nose Wheel Steering

The nose wheel is steerable over a range of 60° to left and right of the center position for purposes of low speed ground maneuvering. Steering is controlled from a steering lever which pivots about the hub of the left control wheel and is labelled N.W. STEER, with directional arrows R and L. The nose wheel is swivelled by a hydraulically-operated steering actuator mounted on the nose gear strut; the actuator being connected to a steering collar and torque links at the lower end of the strut. The steering lever is

connected by a cable and pulley system to a drum on the actuator steering valve, which controls the direction and amount of turn in response to steering lever up or down movement. A spring-loaded latch retains the nose wheel in the centered position in flight. For ground handling purposes, the nose gear leg torque links may be disconnected by removing a pip pin so that the leg can caster freely.

Unnecessary pressure on the steering lever while airborne should be avoided in order to prevent unnecessary loads on the steering lock mechanism.

7.20.3 Wheels and Tires

A main wheel is carried on the axle of each main gear leg, and is of the split-hub type to facilitate installation and removal of the tubeless tires. The main wheel has an 8-ply rating, 11.00 – 12 nylon Type III tubeless tire which is normally inflated to 38 PSI (262 kPa, 2.62 bar). The split-hub nose wheel is carried on an axle mounted in the fork of the nose gear, and has a 6-ply rating, 8.90 – 12.50, Type III tubeless tire which is normally inflated to 32 PSI (220 kPa, 2.2 bar). The tires are rated as 'low speed', and have a maximum speed limit of 160 miles per hour.

7.20.4 Wheel Brake System

The main landing gear wheels are equipped with hydraulically operated disc brakes which are applied independently by brake pedals integral with the rudder pedals. A parking brake handle retains the brakes in the on condition when the pedals are depressed. Less than full braking pressure is applied when the park brake is engaged, and chocks should be used if the aircraft is not on a level surface. Brake pressure is supplied from a brake accumulator which is pressurized by the hydraulic system electric motor-driven pump or hand pump. A brake pressure gauge is included in the system.

7.20.5 Parking Brake

The parking brake handle is located between the left side rudder pedals. After the left side brake pedals are depressed, the parking brake is applied by pulling the handle; this retains the brake torsion springs so that the brake pedals cannot return to the off position. The parking brake is released by applying additional pressure on the left side brake pedals and pushing in the brake handle.

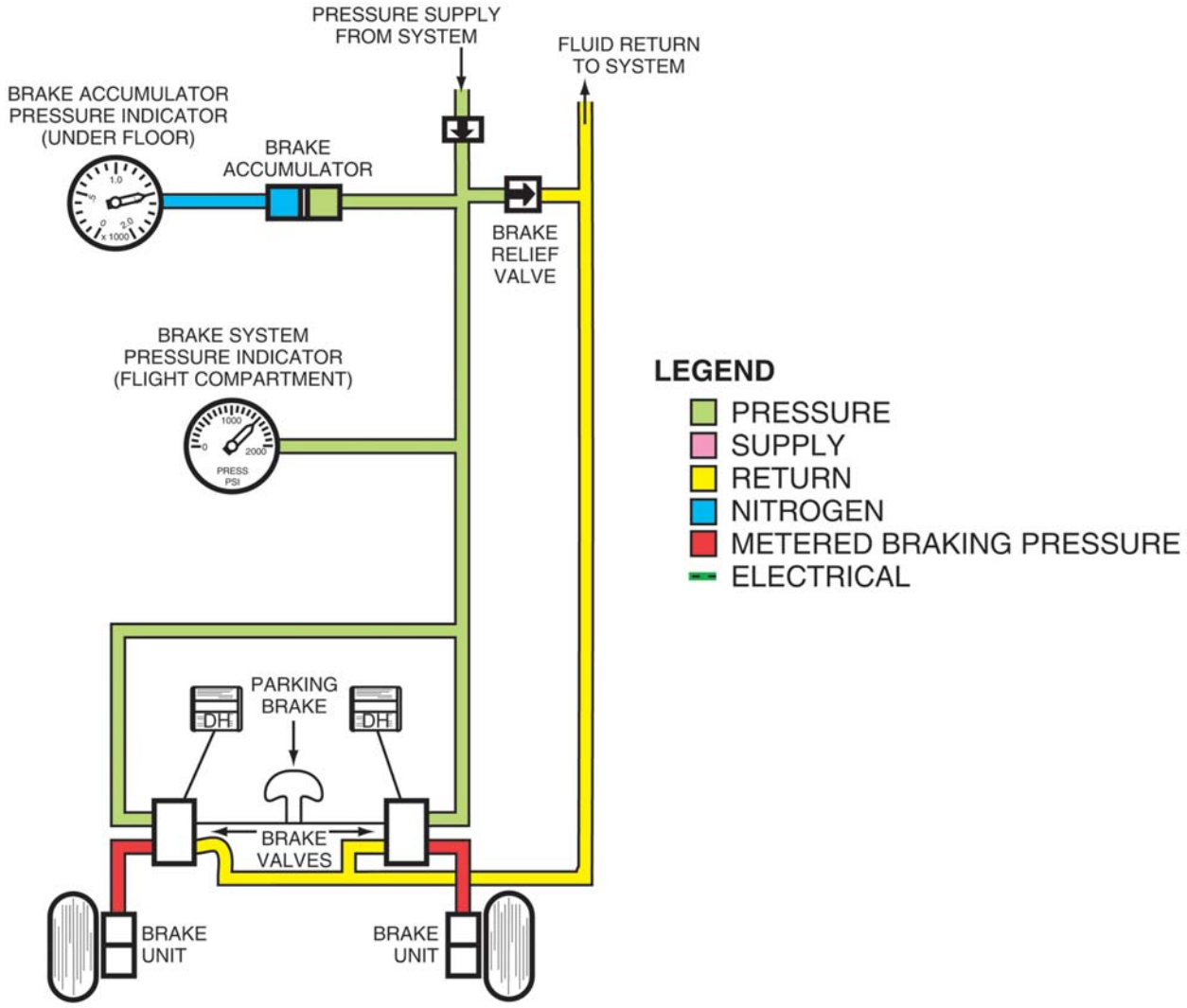


Figure 7-44 Brake Hydraulic System

7.20.6 Intermediate Flotation Gear

By special order the aircraft can be equipped with intermediate flotation gear to facilitate "soft field" operation. The intermediate flotation gear consists of standard 11.00 x 12 wheels with 15.00 x 12 tires on the main landing gear and nose landing gear. A special nose landing gear fork is installed to accommodate the large nose wheel.

Aircraft performance is adversely affected when intermediate floatation gear is installed. Aircraft range and cruise speed decrease slightly as a result of the drag created by the larger wheels. Single engine climb capability is reduced, and this is most evident when operating in hot climates or from high altitude airfields.

A unique set of performance charts is provided for use when intermediate flotation gear has been installed. These charts can be found in Supplement 5 within Section 9 of the AFM.

7.20.7 Floatplane

7.20.7.1 Description

The floatplane is equipped with Canadian Aircraft Products (CAP) Model 12000 floats. Each float is of stressed skin construction and is divided into a number of watertight compartments accessible through covers attached to the decks by screws. Bilge pump connections for drainage of each compartment are provided on the float decks. A rubber bumper is installed on the bow of each float for protection during mooring and for protection from floating objects. Three mooring cleats are attached to each float deck. A bilge pump and a mooring rope are supplied as loose equipment with the floatplane.

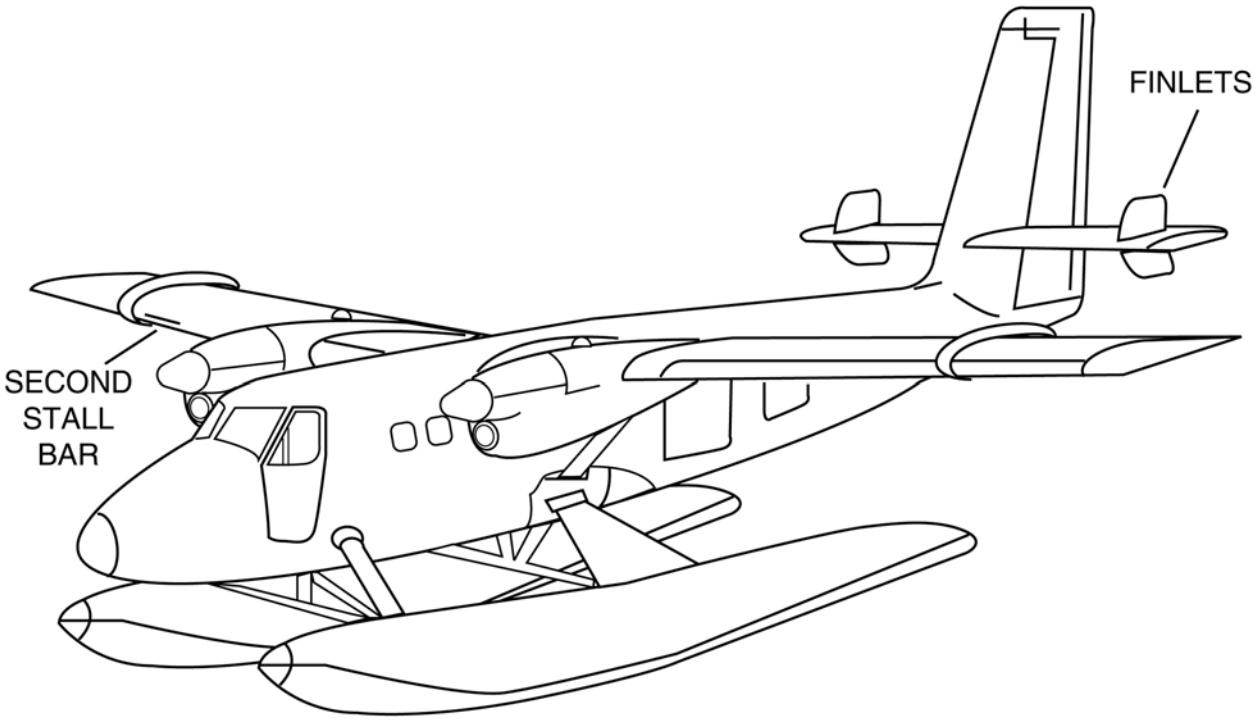


Figure 7-45 Floatplane (CAP floats)

Aircraft equipped with CAP floats must be fitted with a short nose. All float-equipped aircraft have a V_{MO} of 160 KCAS, regardless of whether or not Mod 6/1291 has been embodied. Mod 6/1291 only permits an increase in V_{MO} to 170 KCAS when the aircraft is in landplane configuration.

In addition to the short nose and float landing gear, the following equipment is installed, to adapt the aircraft to its floatplane configuration:

1 Propeller blade latches to provide zero thrust engine starts.

2 An airspeed indicator with limitation markings applicable to the floatplane.

3 An operating limitations placard applicable to the floatplane.

4 A bungee feel spring in the elevator controls which induces a slight elevator down load, to provide the desired longitudinal control characteristics.

5 Finlets on the upper and lower surfaces of the horizontal stabilizer to provide greater lateral stability.

6 A boathook and storage for it on the cabin rear bulkhead.

7 A nose wheel well cover.

8 Stowage for the nose wheel steering cables.

9 A second stall strip installed on the right wing.

7.20.7.2 Optional Equipment

Optional equipment which can be supplied on special order with the floatplane consists of the following:

1 Fixed flight compartment entry ladders.

2 Fixed cargo door ladders.

3 A removable cabin door ladder (with stowage in baggage compartment).

4 A rear baggage compartment loading platform (‘diving board’) with stowage on float.

5 Wing access ladder with stowage on float.

6 Main and tail beaching chassis.

7.20.8 Spring Skiplane

The spring-ski installation comprises a ski assembly installed on each main landing gear unit and on the nose landing gear unit. Each ski assembly consists of a semi-elliptical leaf spring, a ski, and a harness assembly. The skis are restrained in flight by front and rear bungee loaded cables of the harness assembly. Short check cables, attached

parallel to the bungee section, act as safety cables in the event of bungee section breakage.

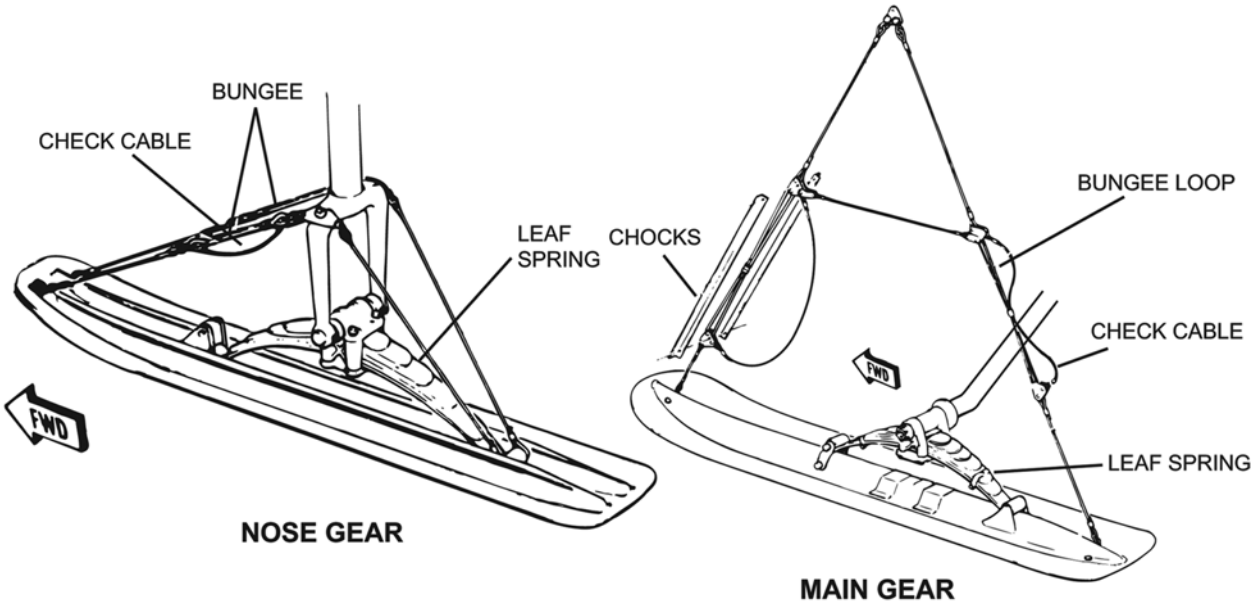


Figure 7-46 Spring Ski Gear

7.20.9 Wheel Skiplane

The combination wheel-ski installation comprises a retractable ski installed on each main landing gear unit and on the nose landing gear unit. The skis are retracted and extended by hydraulic actuators incorporated in each ski, and are operated by hydraulic pressure from the aircraft hydraulic system. Retraction and extension are effected from a single control in the flight compartment. Indicator lights are provided to denote the positions of the skis. The skis may be retracted or extended in flight or on the ground.

7.20.9.1 Main Ski Units

Each main ski is of stressed skin construction and is attached to two lugs on the axle of the main gear leg with the fork of the ski straddling the wheel. A linkage system of shafts, levers and rods connects the actuator to the ski and effects its retraction and extension. A U-shaped metal sling, which is also operated by the linkage system, swivels through a 90° arc simultaneously with movement of the ski, to open and close the aperture at the crotch of the ski fork consistent with the ski position. With the ski extended, the sling closes the aperture and increases the total ski area. With the ski retracted, the sling is swivelled forward and upward, allowing the wheel to occupy the fork aperture. Limit cables are connected between the heel and toe of each ski to brackets on the underside of the sling and assist a torsion bar mechanism in trimming the skis.

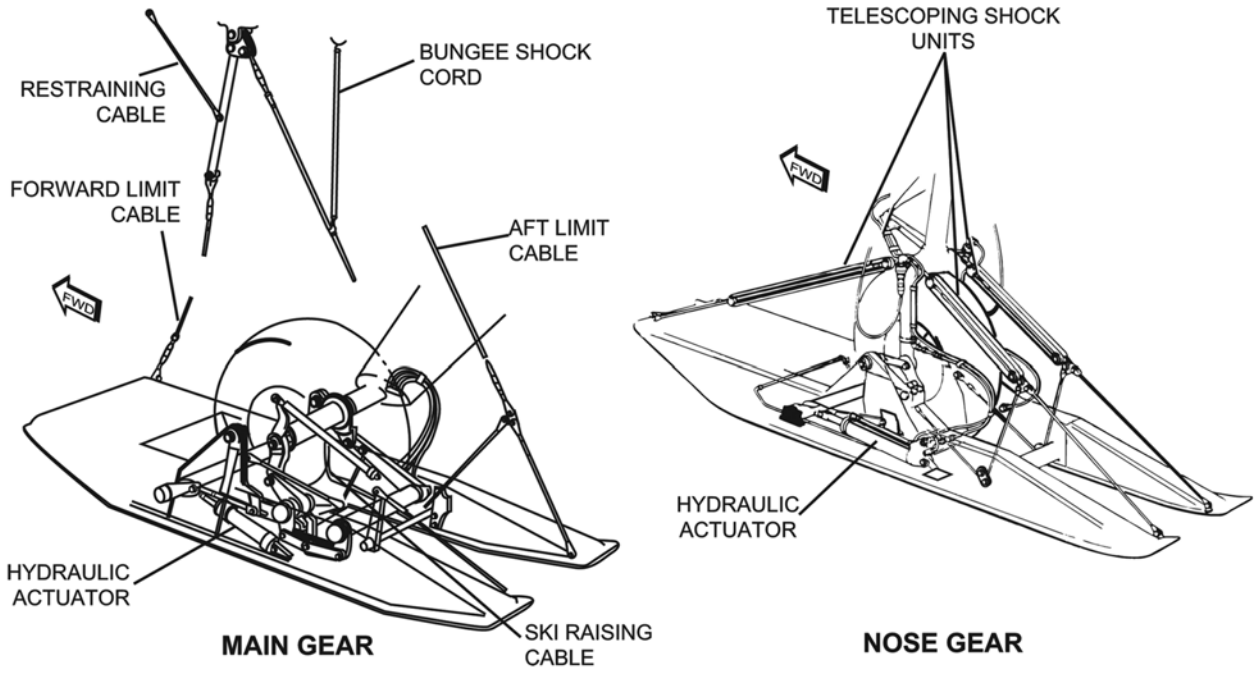


Figure 7-47 Wheel Skis

7.20.9.2 Nose Ski Unit

The nose wheel ski is similar in construction and operation to the main skis. Two pairs of trim cables and shock units provide self-trimming of the nose ski; the forward pair is connected between the toe of the ski and the wheel fork and the aft pair between the heel of the ski and the wheel fork.

7.20.9.3 Ski Position Selector Lever

The ski position selector lever is mounted on a panel below the instrument panel to the left of the pedestal. The lever moves in a slot with marked UP and DOWN positions. Movement of the lever to UP or DOWN appropriately retracts or extends the skis.

7.20.9.4 Ski Position Indicator Lights

The ski position indicator lights are located on the ski position selector lever panel. When illuminated, the upper group of three lights (each inscribed UP) indicate main and nose skis up and the lower group of three (each inscribed DN) indicate main and nose skis down. The lights are activated by switches on each ski unit. The indicator lights are powered from the battery bus through a 5 ampere circuit breaker marked SKI POSITION INDICATION on the radio circuit breaker panel. The brightness of the indicator lights is controlled by the caution lights test and intensity switch on the overhead console.

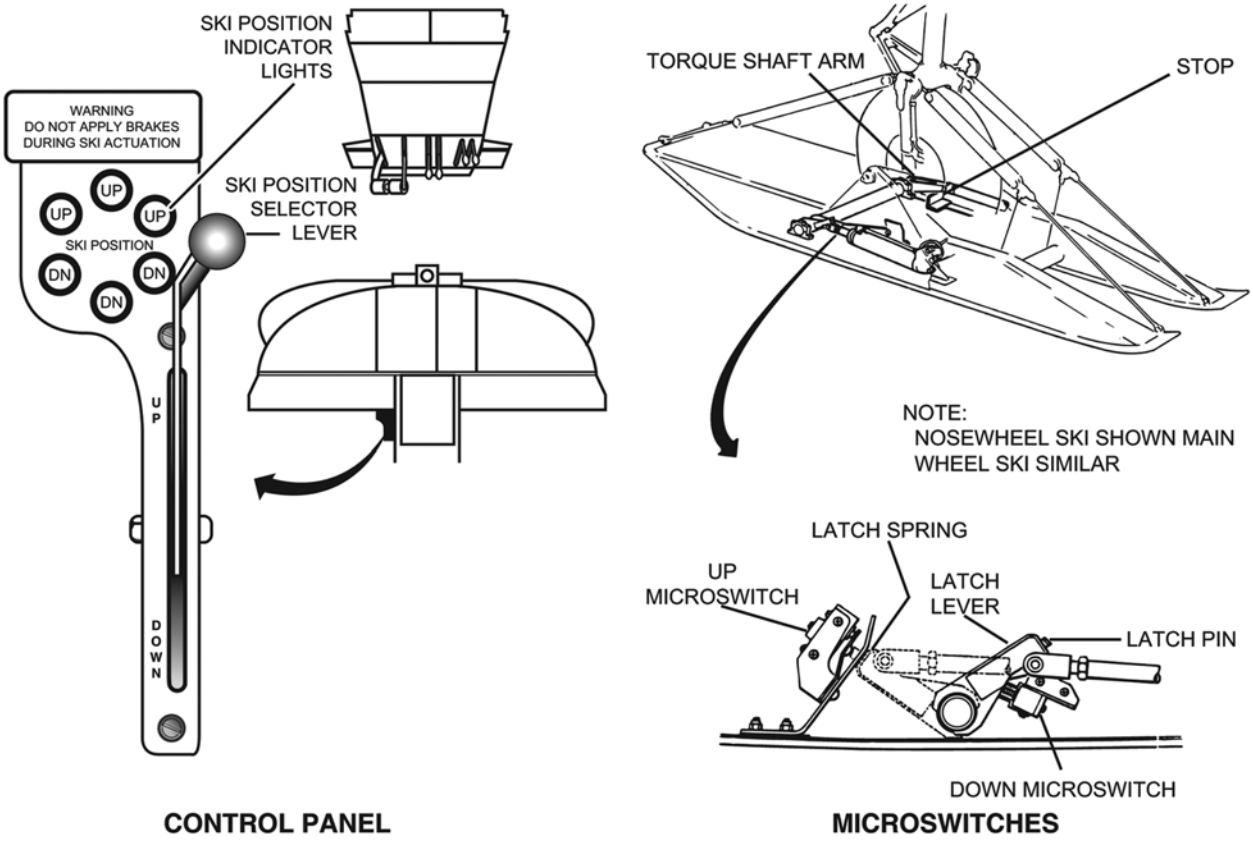


Figure 7-48 Wheel Ski Control and Indication

7.21 Flight Controls

The flight controls are conventionally operated through pulley and cable systems and mechanical linkage by a control column, control wheel and rudder pedals. The control column is of a dual Y configuration located on the aircraft centerline with a control wheel pivoted at the upper end of each arm. The ailerons lower with the wing flaps and their degree of movement, including degree of differential movement, increases proportionately with flap deflection. The ailerons move differentially at any flap position. The left elevator, rudder and left aileron are equipped with flight adjustable trim tabs, and the right elevator with a trim tab that is interconnected with the flaps. A geared tab (a servo tab) is installed on each aileron and on the rudder.

7.21.1 Control Column

The dual 'Y' configuration control column supports left and right control wheels that are interconnected through a chain and sprocket system and linked to the aileron control system. A double acting spring strut attached to the forward side of the right arm of the control column assists the return of the aileron controls to the neutral position. A control arm attached to a transverse torque tube on the base of the control column is connected to the elevator control system. A nose wheel steering lever on the control column pivots about the hub of the left control wheel. A microphone and intercom switch is mounted on each control wheel.

7.21.2 Rudder Pedals

Rudder pedals are installed at the pilot and co-pilot positions. Each set of rudder pedals is adjustable fore and aft for comfortable reach by means of a knob below each instrument panel. When the knob is pulled, leg reach can be adjusted by allowing a spring-loaded adjuster to move the pedals aft, or by exerting pressure on the pedals to move the pedals forward. Re-engagement of the knob locks the pedals in the desired position. The rudder pedals also function as independent left and right brake pedals when the top of each pedal is pressed forward.

7.21.3 Elevator Trim

The adjustable trim tab on the left elevator is controlled by means of an elevator trim wheel on the trim console inboard of the left pilot seat. The adjacent indicator consists of a pointer which moves, as the trim is adjusted, over a scale labelled with the take-off range and trim deflection indices. The take-off range marking corresponds to between 3° nose up to 3° nose down. Elevator trim is applied through a drum and cable system and a screw jack to which the tab is connected.

7.21.4 Flap/Elevator Interconnect Trim

The flap/elevator interconnect trim tab on the right elevator provides for automatic adjustment of longitudinal trim when the flaps are operated to maintain pitch attitude. The flap operating mechanism is coupled to a screw jack which transmits proportional movement to a cable and pulley system which operates the tab through a second screw jack.

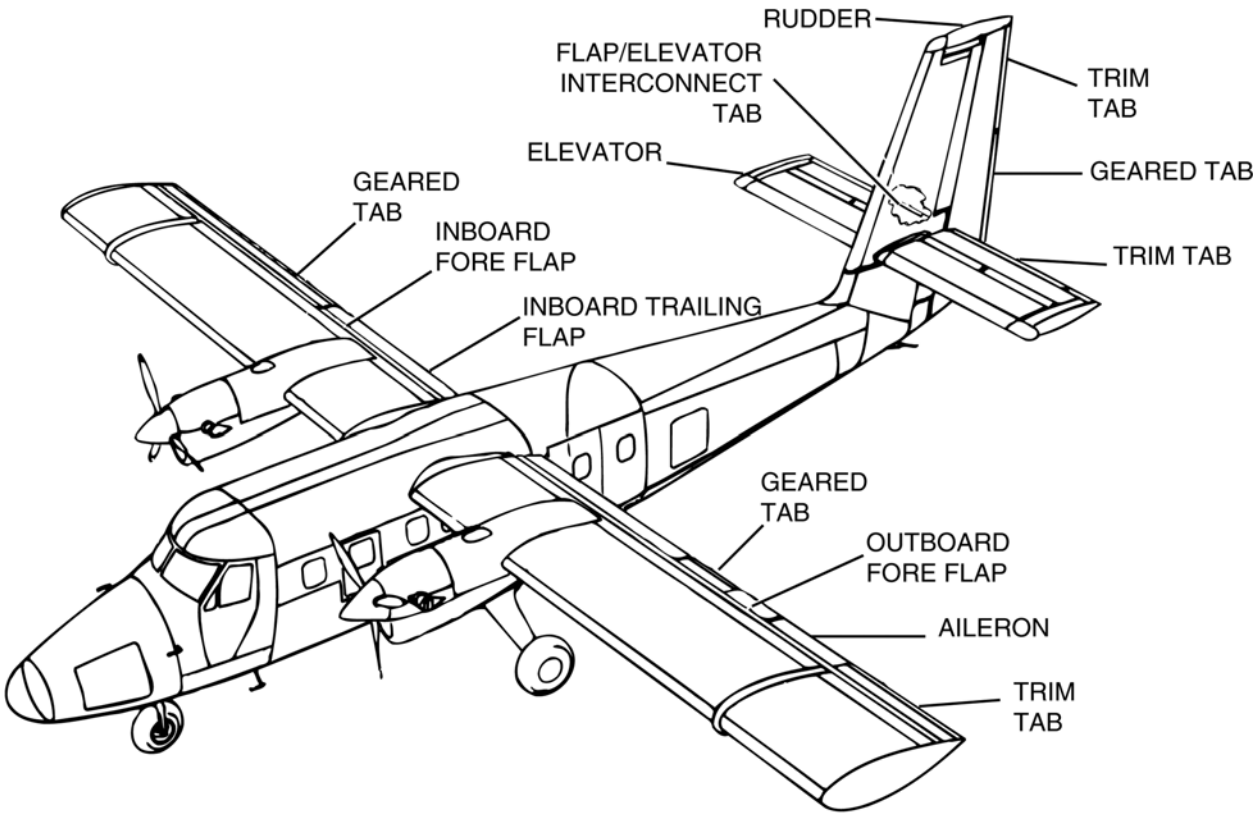


Figure 7-49 Flight Control Surfaces

7.21.5 Rudder Trim

The rudder trim tab, which is above the geared tab on the rudder trailing edge, is adjustable by means of a rudder trim wheel on the trim console. The adjacent indicator consists of a pointer moving over a graduated scale with LEFT and RIGHT directional markings. The indicator scale incorporates a take-off range marking that indicates when the tab is displaced approximately 20% off center. Trim movement is transmitted through a drum and cable system to a screw jack to which the trim tab is connected.

7.21.6 Rudder Geared Tab

The rudder geared tab is located on the lower portion of the rudder trailing edge and provides aerodynamic assistance by moving proportionately in the opposite direction. A

gearbox on the lower rudder hinge bracket transmits a varying ratio of rudder movement to the geared tab through a linkage of rods and levers.

7.21.7 Aileron Trim

The aileron trim tab is hinged to the trailing edge of the outboard end of the left aileron. The tab is operated electrically by an actuator housed in the aileron, and controlled from a switch on the trim console. The trim control switch is a rocker type press switch with a center-off position and two momentary-on positions. A label inside the translucent knob is marked LW DN and RW DN. The electrical circuit is protected by an AIL TRIM ACT circuit breaker on the main circuit breaker panel. The direction and degree of trim applied is shown on an indicator located immediately forward of the switch. The indicator dial is labelled AIL TRIM and has a graduated scale on each side of a central 0, with LW DN and RW DN marked at the scale limits. There is no take-off range marking, as the take-off setting (nominally centered) is identical to the setting for cruise flight. The indicator circuit is protected by an AIL TRIM IND circuit breaker on the main circuit breaker panel.

7.21.8 Aileron Geared Tabs

A geared tab is hinged to the trailing edge of the inboard end of each aileron, and provides aerodynamic assistance to aileron movement. Each tab moves a proportionate amount in the opposite direction to the aileron to which it is attached, by means of a rod connecting it to the aileron arm. The gearing of the tab varies with flap deflection.

7.21.9 Flight Control Locks

All flight controls can be locked when the aircraft is parked. The rudder is locked in the neutral position by centering the rudder pedals and lifting the lever in the floor labelled LIFT FOR GUST LOCK in the floor just aft of the left side rudder pedals. The lever is connected through a permanently installed mechanical linkage below the flight compartment floor to a spring-loaded plunger which engages a detent in the rudder control quadrant. The rudder lock lever is retained in the locked position by a spring-loaded spigot at the lower end of a vertical strut, which is interconnected with the aileron and elevator lock. The aileron and elevators are locked by a device which braces the left control wheel and control column arm to the instrument panel structure. The control wheel is secured by two prongs engaged with the right yoke of the control wheel, and the column is braced between two lugs on the column and one lug on the instrument panel structure. The aileron and elevator control lock assembly is stowed in the rear baggage compartment.

On aircraft fitted with Mod 6/1676 (cut in as standard at SN 613), a modified aileron-elevator gust lock is installed which secures the control column in the full forward (elevators down) position. The lock consists of a shortened aileron and elevator gust

lock assembly and a modified rudder vertical strut assembly, which engages with the lug on the instrument panel to secure both itself and the gust lock hook in position.

On later aircraft (Mod 6/1726, cut in as standard at SN 691), a folding gust lock warning flag is mounted on the aileron and elevator gust lock hook assembly, which covers the flight instruments when the gust lock is in place. The aileron and elevator control lock assembly is stowed in a bracket and retainer strap under the left pilot seat; the rudder vertical strut assembly is stowed behind the left pilot seatback. The warning flag is an important safety feature and should not be removed from the gust lock.

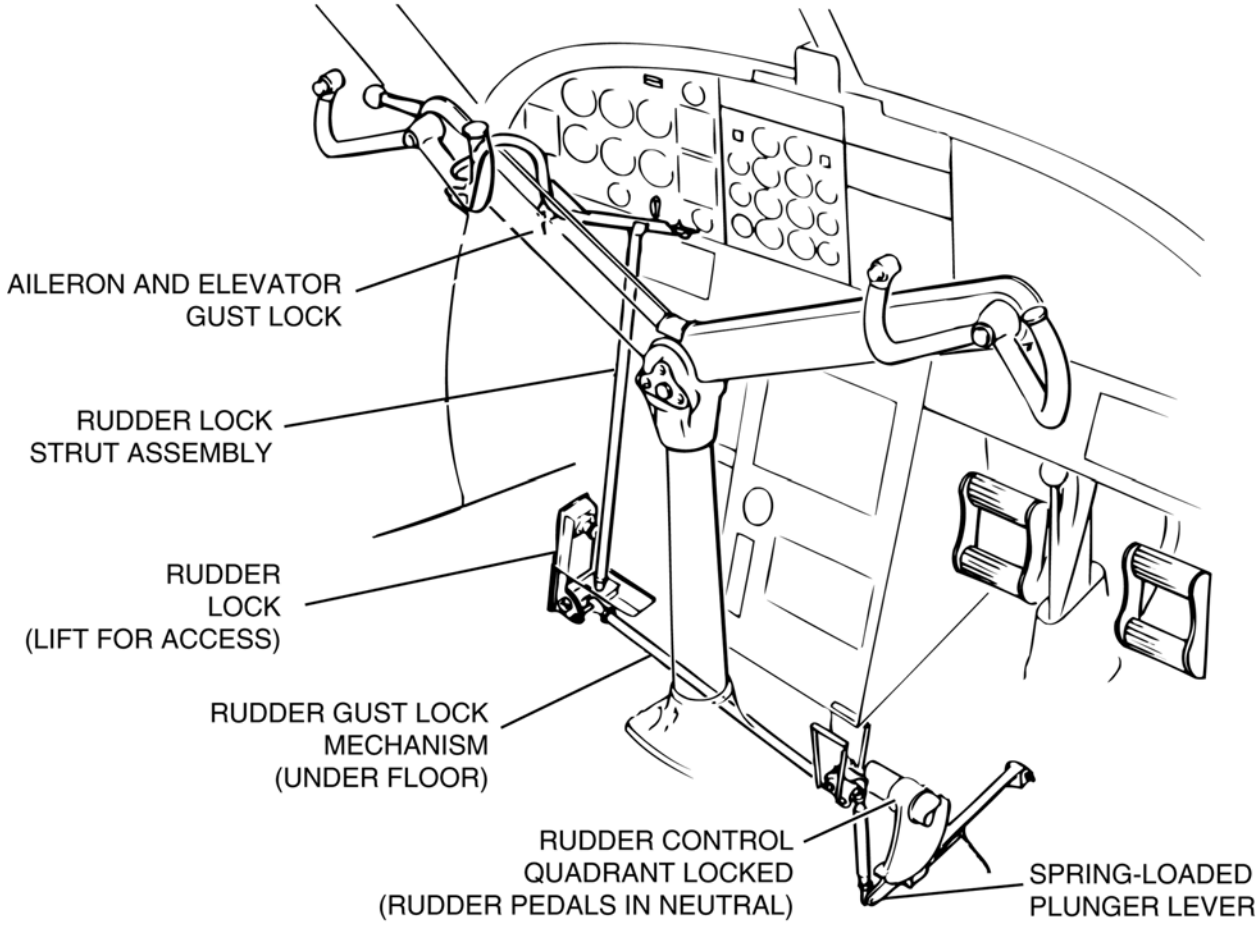


Figure 7-50 Flight Control Lock System — Pre Modification

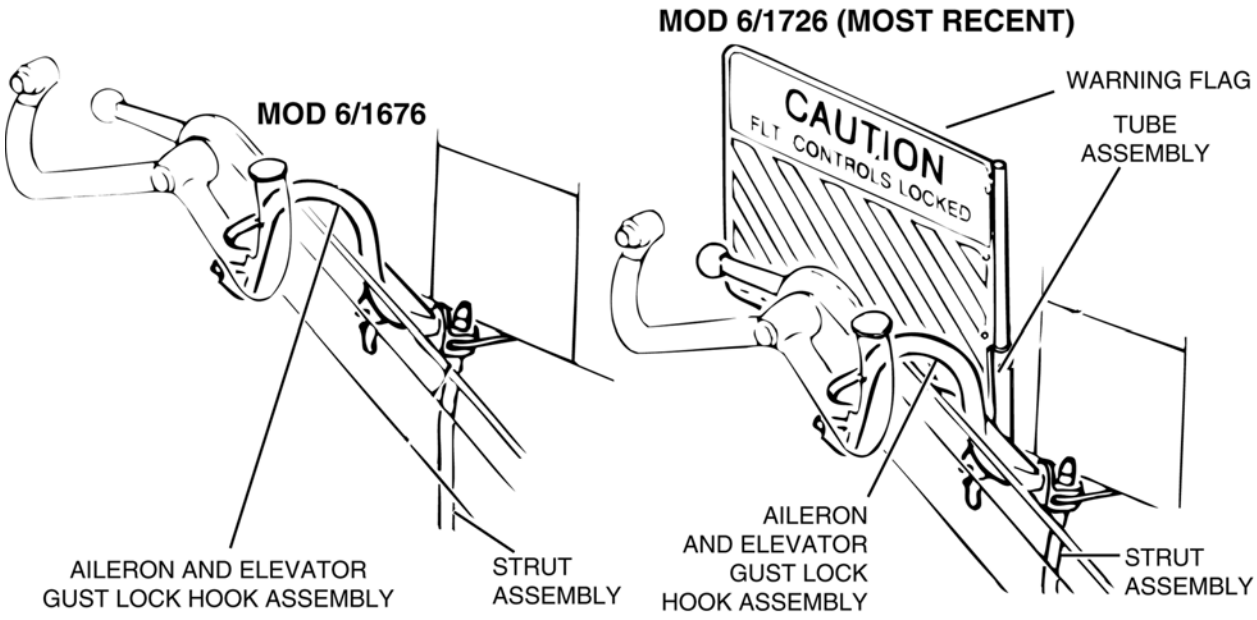


Figure 7-51 Modification History - Control Lock

7.22 Wing Flap System

The wing flaps consist of inboard and outboard fore flaps and an inboard trailing flap on each wing. The fore flaps are hinged to flap hinge attachment brackets which extend from the wing rear spars, and each trailing flap is hinged by its own hinge arms to hinge arms on the inboard fore flap. Each aileron is hinged to its corresponding outboard fore flap. The wing flaps are operated hydraulically by an actuator in the cabin roof through a system of push-pull rods, levers, and bellcranks, and can be selected to any desired setting within a range of 0° to 37.5° by a flap selector lever. A flap position indicator provides a visual indication of flap setting. A flap-elevator interconnect tab on the right elevator is linked to the flap control system and operates simultaneously with the flaps to provide compensating longitudinal trim.

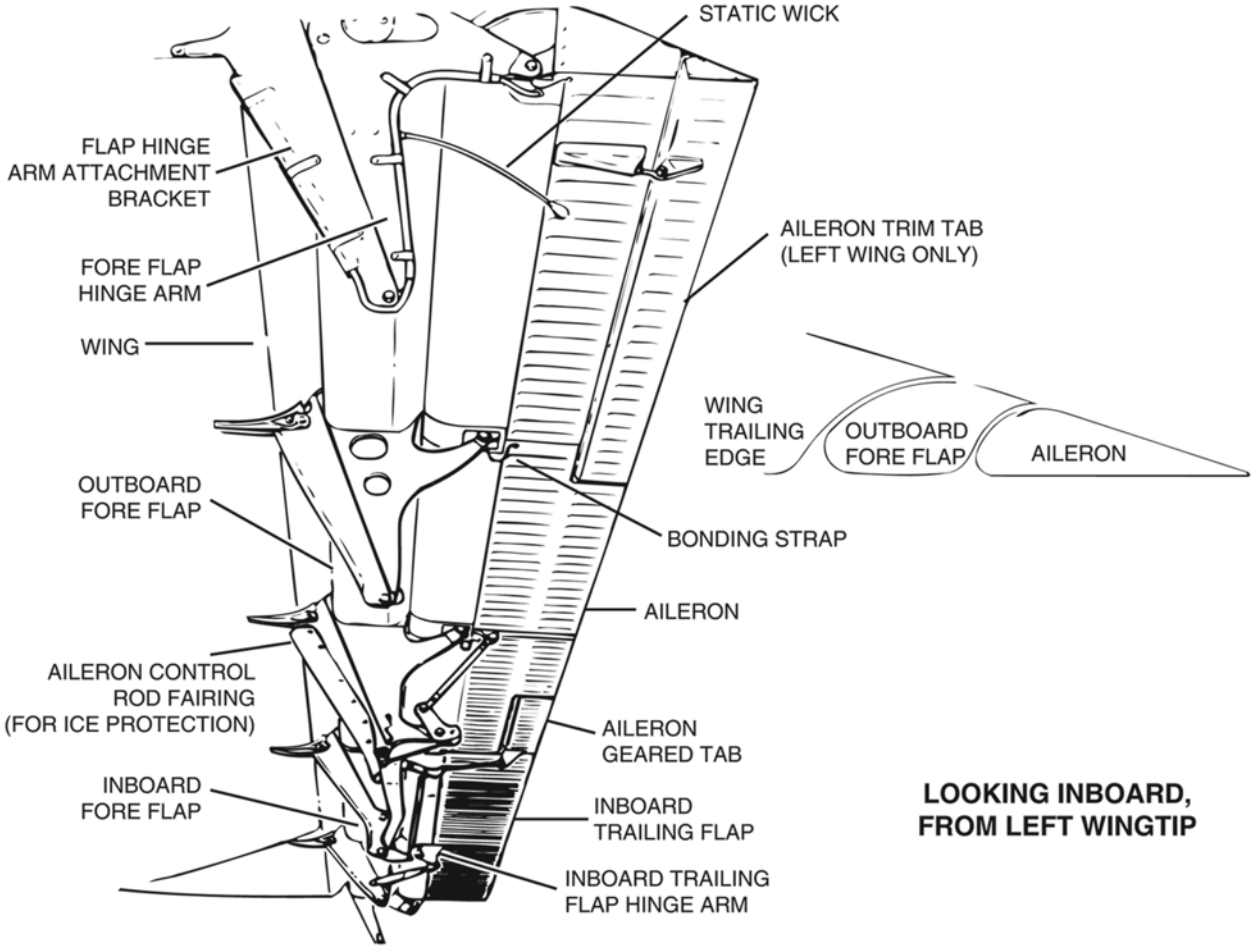


Figure 7-52 Wing Flap Components

7.22.1 Flap Selector Lever

The flap selector lever is mounted on the overhead console and moves in a slot labelled FLAPS and with position settings marked at 10 degree intervals from 0° to 40°. The selector lever incorporates a lock lever which engages a toothed quadrant and positively retains the lever in any selected position. The lock lever knob projects from the selector handle and must be depressed to disengage the lock prior to operation of the selector lever. The selector lever is connected through a quadrant and cable system to the flap actuator operating valve.

7.22.2 Flap Position Indicator

The flap position indicator is mounted on the windshield center post. It is labelled FLAPS and has the direction DOWN at the lower end. The indicator pointer moves in a vertical slot which is graduated in increments of 5°, and labelled with numerals from 0° to 40° at 10° intervals. The indicator is operated by a spring and a cable which is connected to the flap operating mechanism.

The maximum possible flap extension is 37.5°.

7.23 Flight Instruments

7.23.1 Flight Instrument Panel

The flight instruments are installed in a shock mounted flight instrument panel in front of the pilot. The instruments consist of an airspeed indicator, attitude indicator, altimeter, turn and slip indicator, directional indicator and a vertical speed indicator.

The flight instrument panel accommodates the flight instruments and the necessary wiring for the lighting of each instrument. In addition, the panel incorporates a fuel selector, fuel quantity indicators, indicator test switch, boost pump switches, beta range and beta back-up disarmed indicator lights, propeller autofeather switch and indicator lights, stall warning indicator light, and a clock. Provision is made for the installation of a VOR indicator, ADF indicator, marker beacon lights, gyro compass annunciator, slaving switch, and compass calibration card, and a fuel crossfeed valve position indicator.

7.23.2 Pitot Static System

The pitot static system operates the airspeed indicator, altimeter, and vertical speed indicator on the instrument panel. Two static vents are mounted on each side of the fuselage nose, and a pitot head beside the static vents. The left pitot head supplies the left airspeed indicator and the right side pitot head supplies the right airspeed indicator. The pitot heads are equipped with pitot tube heaters. The lower static vent on each side normally operates the left side static operated instruments and the upper vent on each side operates the right side static operated instruments.

A manifold receives static pressure from the lower vents and supplies the left instruments through a PILOT STATIC emergency selector. Static pressure from the upper vents is also received by the manifold which can be connected directly to the right side instruments and to the autopilot computer. The manifold also provides for upper static vent pressure to supply the left side instruments in the event of obstruction of the lower vents.

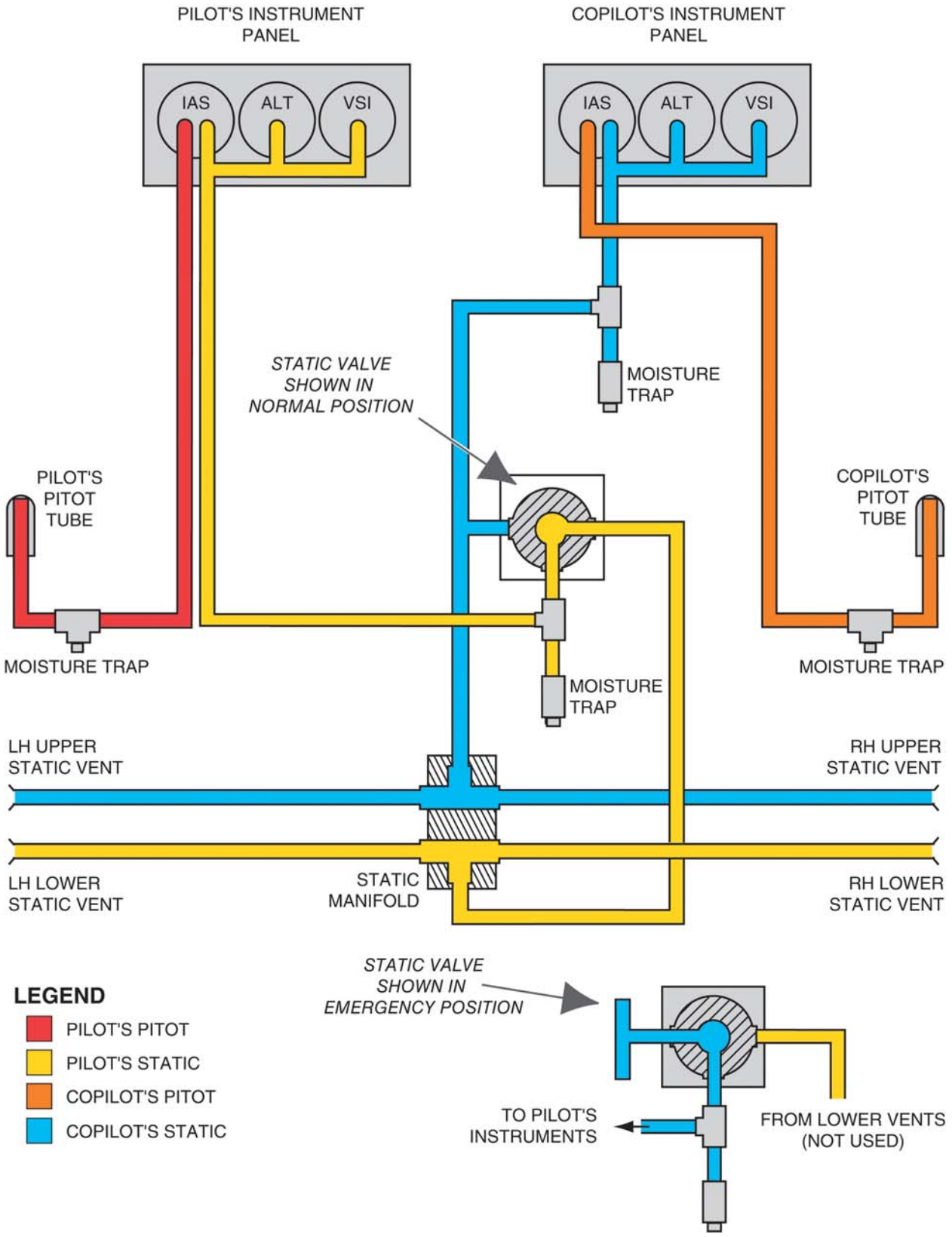


Figure 7-53 Pitot Static System Schematic

7.23.2.1 Pilot Static Emergency Selector

The PILOT STATIC emergency selector is located on the pylon below the instrument panels. It is a two-position handle labelled PILOT STATIC with positions EMER and NORM, and it is for use in the event of a malfunction to the left static system. At the NORM position, it connects the lower static vents to the left side static operated instruments; at EMER, it connects the upper static vents to the left side instruments, simultaneously shutting off the lower vent supply. The right side static operated instruments remain connected to the upper vents at all times.

7.23.3 Pitot Heat Switch

Heater elements in the pitot heads are controlled by a PITOT HEAT switch on the overhead console. The heater circuits are powered from the left and right DC buses and protected by PITOT HTR L and PITOT HTR R circuit breakers on the main circuit breaker panel. The switch also controls the lift detector (stall warning) vane heaters.

7.23.4 Airspeed Indicator

The airspeed indicator is a conventional pressure sensitive capsule type. The instrument is calibrated in knots with the scale reading from 0 to 250 with 5 knot graduations from 30 to 250. Large numerals denote the 50 knot increments, commencing at 50. Colour coded airspeed limitation markings, including flap operating limits, are printed on the dial of the indicator. The indicator is operated by the pitot-static system.

7.23.5 Altimeter

The altimeter is an aneroid type with the instrument case connected to the static pressure system. The three pointers of the instrument indicate altitude in hundreds, thousands, and multiples of ten thousand feet. A barometric scale, (graduated in inches of mercury) can be adjusted by turning a knob at the lower left of the instrument, and may be set to sea level or the airfield barometric altitude. The altimeter dial is calibrated to a standard scale based on a sea level atmospheric pressure of 29.92 inches Hg.

7.23.6 Vertical Speed Indicator

The vertical speed indicator dial has a graduated scale above and below a horizontal zero reference, with a range of 3,000 feet per minute for both climb and descent, the first 1,000 feet of which is graduated in increments of 100. The instrument is operated from the aircraft static pressure system.

7.23.7 Turn and Slip Indicator

The turn and slip indicator is a standard, electrically operated instrument with a power failure warning flag included on the dial. In pre Mod 6/1686 airplanes (prior to SN

650), the indicator is designated as a 4 minute type and has 4 MIN TURN marked on the indicator face (a military designation). In post Mod 6/1686 (SN 650 and onwards) airplanes, the indicator is designated as a 2 minute type (a civil designation) and the indicator face is unmarked. The indicator is powered from the 28 volt DC supply. Circuit protection for the indicator is provided by TURN & SLIP PLT and CPLT circuit breakers on the circuit breaker panel.

7.23.8 Directional Indicator

The directional indicator is an electrically operated gyro instrument, incorporating an adequacy-of-power flag. It provides the pilot with a stabilized directional reference and can be aligned with the magnetic compass reading. The indicator dial is graduated in 5° increments with numerals at 30° intervals through 360°. The instrument is equipped with a caging knob below the indicator window to permit selection of desired headings. It is powered by the 115 volt AC system and is protected by the PILOT DIR GYRO fuse on the fuse panel.

7.23.9 Attitude Indicator

The attitude indicator is an electrically operated gyro instrument, incorporating an adequacy-of-power flag. It provides the pilot with a constant visual indication of the aircraft lateral and longitudinal attitude relative to the horizon. A horizontal reference bar in the center of the instrument represents the aircraft and its level can be adjusted in accordance with the pitch attitude of the aircraft by means of a knob below the instrument. A caging knob is provided on the lower right side and is labelled PULL FOR QUICK ERECT. The indicator is powered from the 115 volt AC system and is protected by the PILOT ART HORIZ fuse on the fuse panel.

7.23.10 Magnetic Standby Compass

A magnetic standby compass is mounted on the windshield center post below the flap position indicator. A compass correction card is retained by a holder immediately above the compass. The magnetic compass cannot be relied upon if electric windshield heat is turned on.

7.24 Miscellaneous Instruments

Miscellaneous instruments installed in the flight compartment consist of a clock and an air temperature gauge.

7.24.1 Clock

A spring-driven, eight-day clock is located on the instrument panel. A combination winding and setting knob is provided beside the clock face.

7.24.2 Outside Air Temperature Gauge

An outside air temperature gauge is installed in the left side of the flight compartment roof with the dial facing down and the stem of the instrument protruding through the roof to the outside air. The dial provides readings in both Centigrade and Fahrenheit.

7.24.3 AIM 400EL/800EEL Compass Systems

An AIM 400EL or AIM 800EEL compass system can be installed to provide aircraft magnetic heading information on a slaved gyro magnetic indicator. Both systems consist of a gyro magnetic compass, flux detector, annunciator, slaving switch and compass calibration card. The AIM 800EEL system can be used in conjunction with the ADF system to obtain radio magnetic heading information which can also be fed to a co-pilot radio magnetic indicator; the system can also be coupled to the autopilot (if installed). Single or double pointer indicators for both pilot and co-pilot can be installed. The compass systems are powered from the left DC bus and the 115 volt 400 cycle and 26 volt 400 cycle AC buses. Protection of the electrical circuit is provided by a GYRO COMP circuit breaker on the main circuit breaker panel, and GYRO COMP and DIR GYRO fuses on the fuse panel.

7.24.3.1 Flux Detector

The flux detector, also referred to as a magnetometer, is located in the right wing near the wing tip and senses the earth's magnetic field and controls the directional gyro in azimuth. If the system is not properly aligned, the annunciator will indicate the direction (• or +) in which the RMI SYNC knob must be turned for manual alignment.

7.24.3.2 Slaved Gyro Magnetic Indicator

The indicator is installed in place of the directional indicator on the left flight instrument panel. The compass dial is graduated through 360° in 5° increments with numerals at 30° intervals, and as optional equipment has a centrally pivoted ADF pointer or pointers (RMI). Information from the ADF loop antenna synchro is transmitted to the RMI pointer synchro and the heading is shown against the compass card. A SYNC knob at the lower left of the RMI provides for synchronizing the compass card with the magnetic

heading of the flux detector when the slaving switch is set to COMP position. The SYNC knob has arrows indicating left and right directions.

7.24.3.3 Annunciator

The annunciator is located to the left of the airspeed indicator on the left side of the instrument panel. The annunciator dial has a pointer which should be vertical when the system is in operation, with the slaving switch at COMP position. A dot (•) and a plus (+) symbol on each side of the dial are used for reference when the magnetic indicator is not synchronized with the flux detector. If the pointer deflects then the SYNC knob should be turned slowly in the appropriate direction until the annunciator pointer is vertically centered in the dial.

7.24.3.4 Slaving Switch

The gyro compass two-position slaving switch is located on the lower left corner of the flight instrument panel above the compass calibration card; the positions are labelled COMP and DG. At COMP position the magnetic indicator is slaved to the flux detector for operation as a gyro magnetic compass. At DG position the flux detector is disconnected and the magnetic indicator operates as a free gyro. If rotation of the SYNC knob towards + is accompanied by the annunciator pointer moving further toward +, either the annunciator wiring is reversed, or the aircraft is on a reciprocal heading, in other words, 180° to the correct direction.

7.25 Radio Systems

Space, weight, structural and power provisions are made to install any one of several radio configurations in the aircraft, to provide the pilot and co-pilot with communications and navigation facilities. All radio equipment is by special order, therefore its location and operation will vary depending on the type of equipment and the configuration installed. The types of radio systems which can be installed on special order are:

HF Communications

VHF (Main) Communications

VHF (Standby) Communications

ADF Navigation

Heading Display

VOR Navigation

Glide Slope Receiver Navigation

Marker Beacon Navigation

Passenger Address System

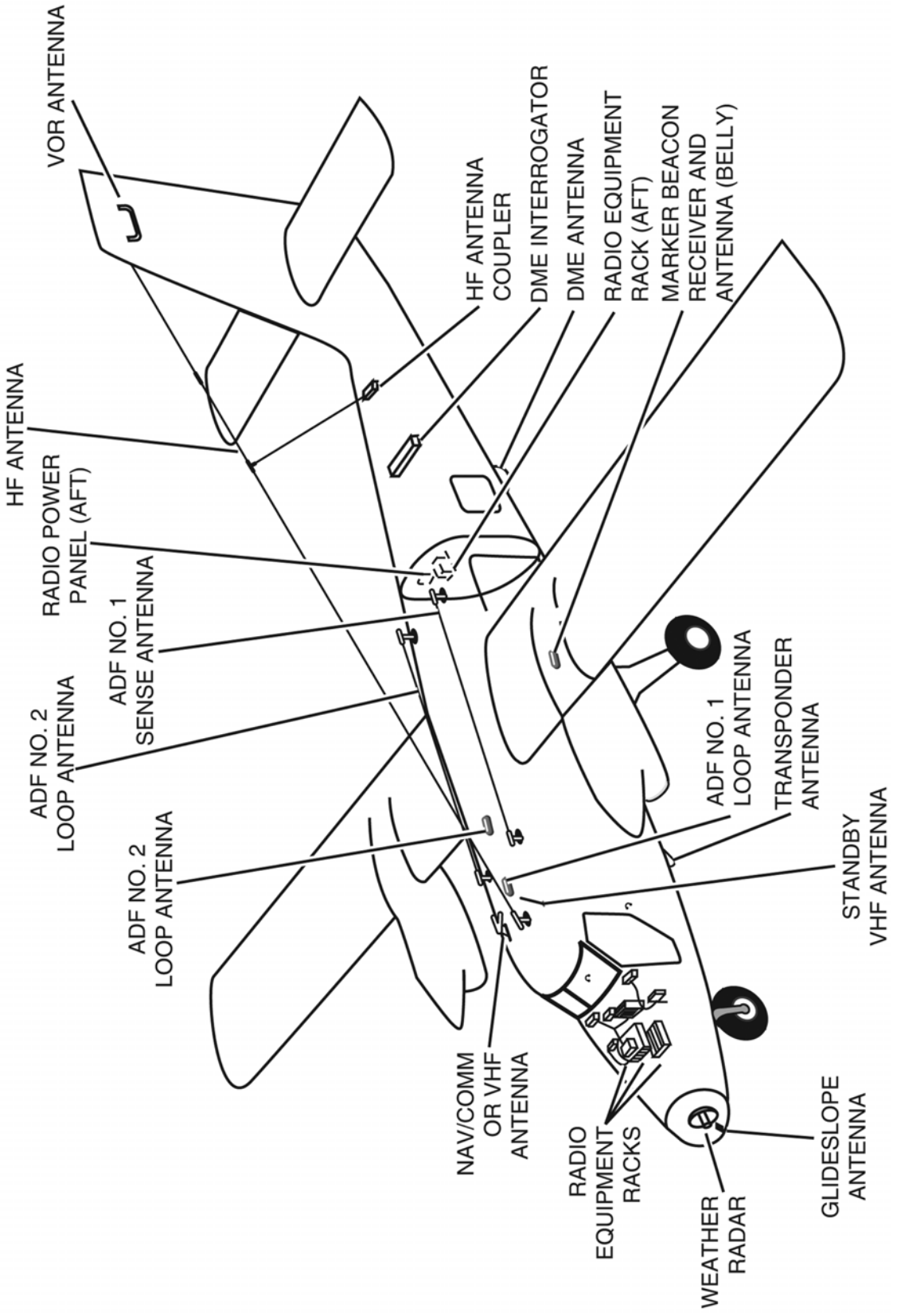


Figure 7-54 Avionic Component Locations (typical)

7.26 Autopilot Systems

Four different autopilot systems were available as factory installed options on the DHC-6 Series 300 and variants. The Honeywell H-14 autopilot was installed on early production aircraft. It is an electrically controlled system that uses pneumatic pressure to operate flight control surfaces. The H-14 autopilot option was superseded by the all-electric Bendix model M-4C. This was superseded by the Collins AP-106 (S.O.O. 6162), which was finally superseded by the Collins APS-65 (S.O.O. 6188). Of the four, the Collins AP-106 is the most common system.

7.26.1 H-14 Autopilot

A Honeywell H-14 autopilot flight control system could be installed by special order (S.O.O. 6085), to provide three-axis stability augmentation, pitch trim and altitude hold, turn command, and lift compensation in turns. The system can also be utilized in conjunction with a navigation receiver to provide automatic control during VOR and ILS system procedures. Supplement 2 of the AFM provides instructions for use of the autopilot.

7.26.2 Bendix M-4C Flight Controller

A Bendix M4-C Flight Controller was available by special order (E.O. 8304) on early production aircraft. Supplement 13 of the AFM provides instructions for use of this autopilot.

7.26.3 Collins AP-106 Autopilot

A Collins AP-106 autopilot replaced the previously mentioned two autopilots in the mid 1970s, and was available as an option (S.O.O. 6162). This autopilot is all electric, and is the most common autopilot found in Series 300 aircraft. Supplement 21 of the AFM provides instructions for use of this autopilot.

7.26.4 Collins FCS-65 Autopilot

A Collins FCS-65 autopilot replaced the AP-106 in the early 1980s, and was available as an option (S.O.O. 6188). This autopilot is all electric, and has greater capability than the AP-106. Supplement 35 of the AFM provides instructions for use of this autopilot.

7.27 Oxygen Systems

7.27.1 Crew Oxygen System

By special order (S.O.O. 6044), a diluter demand oxygen system may be installed for use by the pilot and co-pilot. The system consists of an oxygen cylinder containing gaseous oxygen, located in the nose compartment, connected by high pressure tubing to two oxygen regulators, one for each pilot, located below the flight instrument panels. An oxygen hose connection for each pilot is located on the inside of each flight compartment door. The oxygen cylinder is recharged through a filler connection in the nose compartment and an adjacent pressure gauge indicates the pressure in the cylinder.

Supplement 3 of the AFM provides instructions for use of the oxygen system.

Two additional variations of crew oxygen systems were offered (by special order) for military or research aircraft. An oxygen system for a crew of 6, with 115 cubic foot oxygen capacity is described in Supplement 24. An oxygen system for a crew of 6, with 275 cubic foot oxygen capacity (Engineering Order 68958) is described in Supplement 34.

SECTION 8

HANDLING SERVICING AND MAINTENANCE

PSM 1-6-2T

DHC6 TWIN OTTER
(SERIES 100/200/300/400)

Ground Support Manual

VIKING

Copyright © 2006 by Viking Air Limited. All rights reserved. No part of this work may be reproduced or copied in any form or by any means without written permission from Viking Air Limited.

Revision 8 - Jun. 24/10

The information, technical data and designs disclosed in this document (the "Information") are either the exclusive property of Viking Air Limited or are subject to proprietary rights of others. The Information is not to be used for design or manufacture or disclosed to others without express prior written consent of Viking Air Limited. The holder of this document, by its retention and use, agrees to hold the information in confidence. These restrictions do not apply to persons having proprietary rights in the Information, to the extent of those rights.

January 31, 2006

GROUND SUPPORT MANUAL

LIST OF EFFECTIVE PAGES

On a revised page, the portion of the text and/or illustration affected by the latest technical revision is indicated by a black vertical line. A black vertical line against the date in the footer indicates a nontechnical correction and/or a text shift as a result of changes made on previous pages.

REFERENCE	PAGE	DATE	REFERENCE	PAGE	DATE
EFFECTIVE PAGES	1	Jun. 24/10		4	Jun. 24/10
	2	Jun. 24/10		5	Jun. 24/10
INTRODUCTION	1	Jun. 24/10		6	Jun. 24/10
	2	Jun. 24/10		7	Jun. 24/10
	3	Jun. 24/10		8	Jun. 24/10
	4	Jun. 24/10		9	Jun. 24/10
PART 1	1	Jun. 24/10		10	Jun. 24/10
	2	Jun. 24/10		11	Jun. 24/10
	3	Jun. 24/10		12	Jun. 24/10
	4	Jun. 24/10		13	Jun. 24/10
	5	Jun. 24/10		14	Jun. 24/10
	6	Jun. 24/10		15	Jun. 24/10
	7	Jun. 24/10		16	Jun. 24/10
	8	Jun. 24/10		17	Jun. 24/10
	9	Jun. 24/10		18	Jun. 24/10
	10	Jun. 24/10		19	Jun. 24/10
	11	Jun. 24/10		20	Jun. 24/10
	12	Jun. 24/10		21	Jun. 24/10
	13	Jun. 24/10		22	Jun. 24/10
	14	Jun. 24/10		23	Jun. 24/10
	15	Jun. 24/10		24	Jun. 24/10
	16	Jun. 24/10		25	Jun. 24/10
	17	Jun. 24/10		26	Jun. 24/10
	18	Jun. 24/10		27	Jun. 24/10
	19	Jun. 24/10		28	Jun. 24/10
	20	Jun. 24/10		29	Jun. 24/10
PART 2	1	Jun. 24/10		30	Jun. 24/10
	2	Jun. 24/10		31	Jun. 24/10
	3	Jun. 24/10		32	Jun. 24/10

REFERENCE	PAGE	DATE	REFERENCE	PAGE	DATE
	33	Jun. 24/10		46	Jun. 24/10
	34	Jun. 24/10		47	Jun. 24/10
	35	Jun. 24/10		48	Jun. 24/10
	36	Jun. 24/10	PART 3	1	Jun. 24/10
	37	Jun. 24/10		2	Jun. 24/10
	38	Jun. 24/10		3	Jun. 24/10
	39	Jun. 24/10		4	Jun. 24/10
	40	Jun. 24/10		5	Jun. 24/10
	41	Jun. 24/10		6	Jun. 24/10
	42	Jun. 24/10	APPENDIX 1	1	Jun. 24/10
	43	Jun. 24/10		2	Jun. 24/10
	44	Jun. 24/10		3	Jun. 24/10
	45	Jun. 24/10		4	Jun. 24/10

EFFECTIVE PAGES

INTRODUCTION

This Page Intentionally Left Blank

Introduction – General

1. INTRODUCTION

This manual contains ground support information with respect to servicing, maintenance and repair of the DHC-6 Twin Otter aircraft. Data is provided to assist in planning suitable ground handling areas and hangar facilities, and replenishment requirements. Lists of special tools and equipment for servicing, maintenance and repair are also included.

The PSM1-6-2T, Part 1 only, is included in the Pilot Operating Handbook (PSM1-63-POH & PSM1-64-POH) for convenience and is meant for reference only.

For the Series 400, the skis and CAP Floats are not approved.

The manual is divided into three Parts as follows:

PART 1 AIRCRAFT BASIC DATA

This Part is divided into two sections:

SECTION 1 AIRCRAFT DIMENSIONS. Giving dimensional data for planning suitable ground handling areas and hangar facilities.

SECTION 2 REPLENISHMENT REQUIREMENTS. Giving details of ground equipment required for routine servicing replenishment. Full details of servicing are contained in the aircraft maintenance manuals (PSM 1-6-2, PSM 1-63-2, PSM 1-63S-2 and PSM 1-64-2).

PART 2 GROUND SUPPORT EQUIPMENT

This Part is divided into ATA-100 Chapters and lists items of equipment required for performing maintenance tasks on the airframe, power plant and ancillary equipment.

PART 3 REPAIR EQUIPMENT

Part 3 lists tools required for general repairs to the aircraft. Details of structural repairs are contained in the aircraft structural repair manual (PSM1-6-3).

APPENDIX 1 MECHANIC'S TOOL KIT

Appendix 1 lists the tools recommended for inclusion in a mechanic's tool kit.

This Page Intentionally Left Blank

PART 1

AIRCRAFT BASIC DATA

This Page Intentionally Left Blank

PART 1 – TABLE OF CONTENTS

SUBJECT PAGE

Section 1 – Aircraft Dimensions **5**

1. Dimensions and Areas - General 5
   - A. Landplane and Skiplane 5
   - B. Floatplane 5
   - C. Overhead Clearance 5
2. Turning Radius of Aircraft 5
3. Weight 13
   - A. Weight - Total Aircraft 13
   - B. Landing Gear Loading (static A.U.W.) 13
   - C. Footprint - C.B.R. No. (California Bearing Ratio) 13

Section 2 – Replenishment Requirements **14**

1. Fueling 14
   - A. Fuel Type 14
   - B. Pressure Fueling Provision (Mod S.O.O. 6111) 14
   - C. Gravity Fueling Provisions 14
   - D. Gravity Defueling (draining) Provision 14
   - E. Fuel Grounding Provisions 15
2. Oil Replenishing 15
   - A. Main Engine Oiling Provisions 15
3. Hydraulic System 17
   - A. Filling Provisions 17
4. Nose Gear Strut 17
   - A. Filling Provisions 17
5. Air Requirements 17
   - A. Tire Pressures 17
   - B. Air Charging Points 18
6. Oxygen System - (Mod S.O.O. 6044 and 6101) 18
   - A. Charging Provisions 18
7. Electrical System 18
   - A. External Power Connection 18
8. Windshield Washer 18
   - A. Filling Provisions 19
9. Towing Provisions 19
10. Loading 19

List of Figures

Page

1 Aircraft Dimensions 6
2 Floatplane Dimensions 11
3 Turning Radius 12
4 Servicing Diagram 16

Section 1 – Aircraft Dimensions

1. Dimensions and Areas - General

A. Landplane and Skiplane

The overall dimensions of the landplane are shown in Figure 1. Although the landplane only is depicted, the dimensions are applicable to the skiplane with the exception of the following additional items:

Ski Board Areas

Wheel-ski, nose	14.3 sq ft
Wheel-ski, main (each)	20.5 sq ft
Spring-ski, nose	12.3 sq ft
Spring-ski, main (each)	17.5 sq ft

B. Floatplane

The overall dimensions are shown in Figure 2 with the heights shown relative to the waterline with the aircraft at gross weight. Additional dimensions pertinent to docking and beaching are as follows:

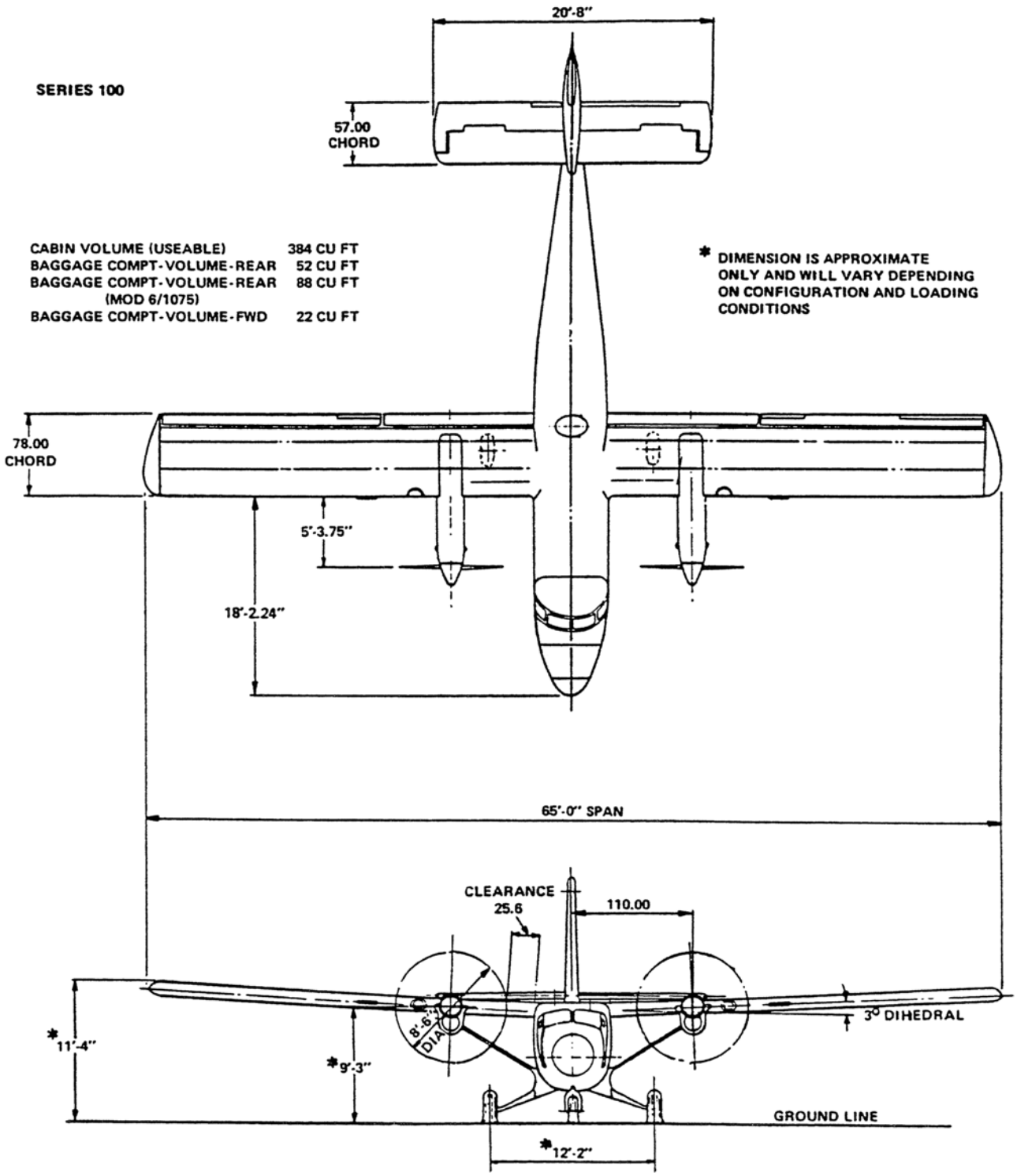
Max. float draft (A/C at 12,500 lb)	2 ft 1 in.
Overhang outboard of float	24 ft 0 in.
Clearance above waterline of wing and stabilizer auxiliary fins	8 ft 4 in.
Max. height above ground with aircraft on beaching gear	20 ft 2 in.
Min. keel clearance	1 ft 6 in.

C. Overhead Clearance

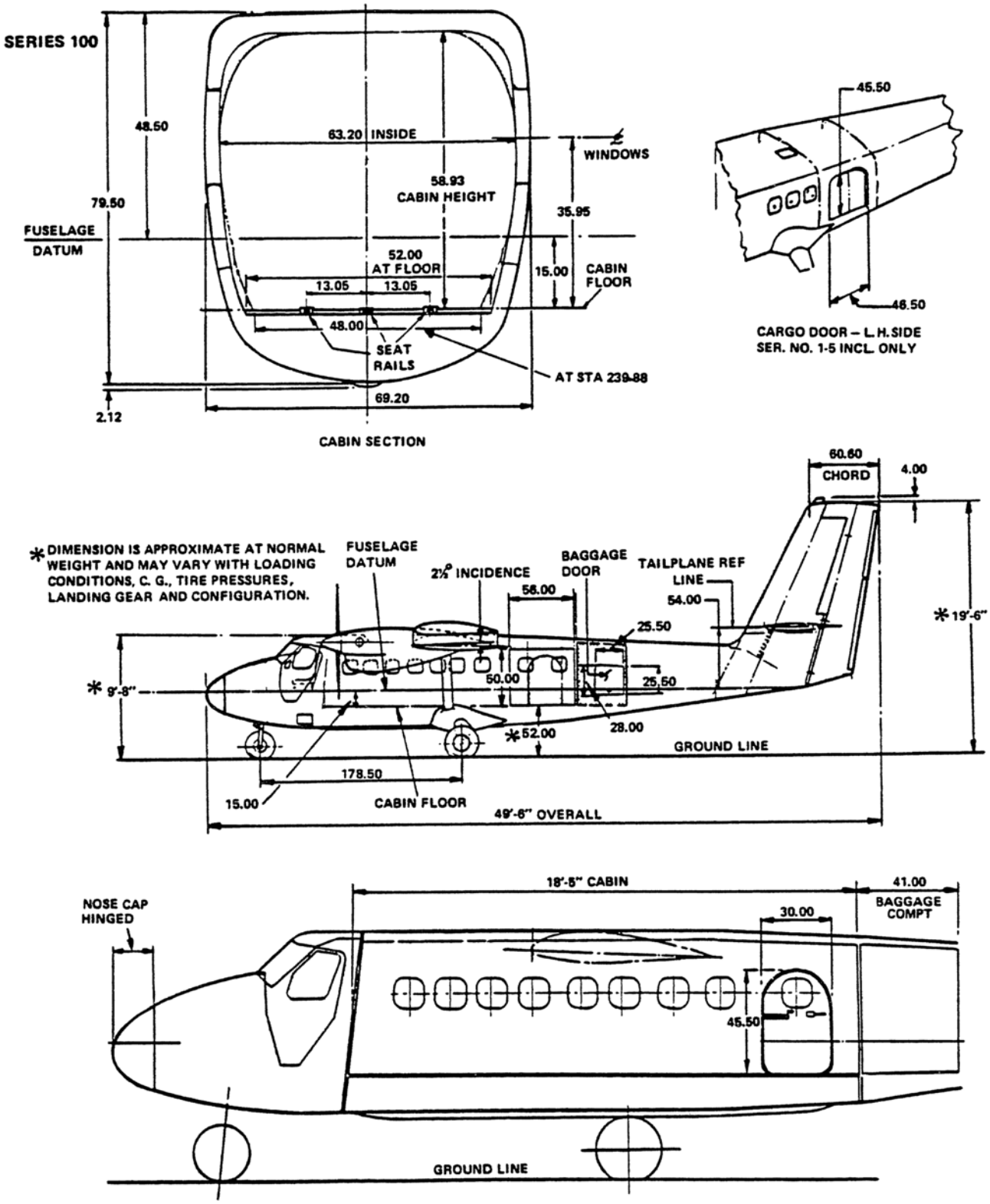
For landplane configurations, additional overhead clearance for hangars with low threshold heights may be obtained by raising aircraft nose during entry or exit. With nose raised approximately 18 inches, vertical stabilizer is lowered approximately 34 inches.

2. Turning Radius of Aircraft

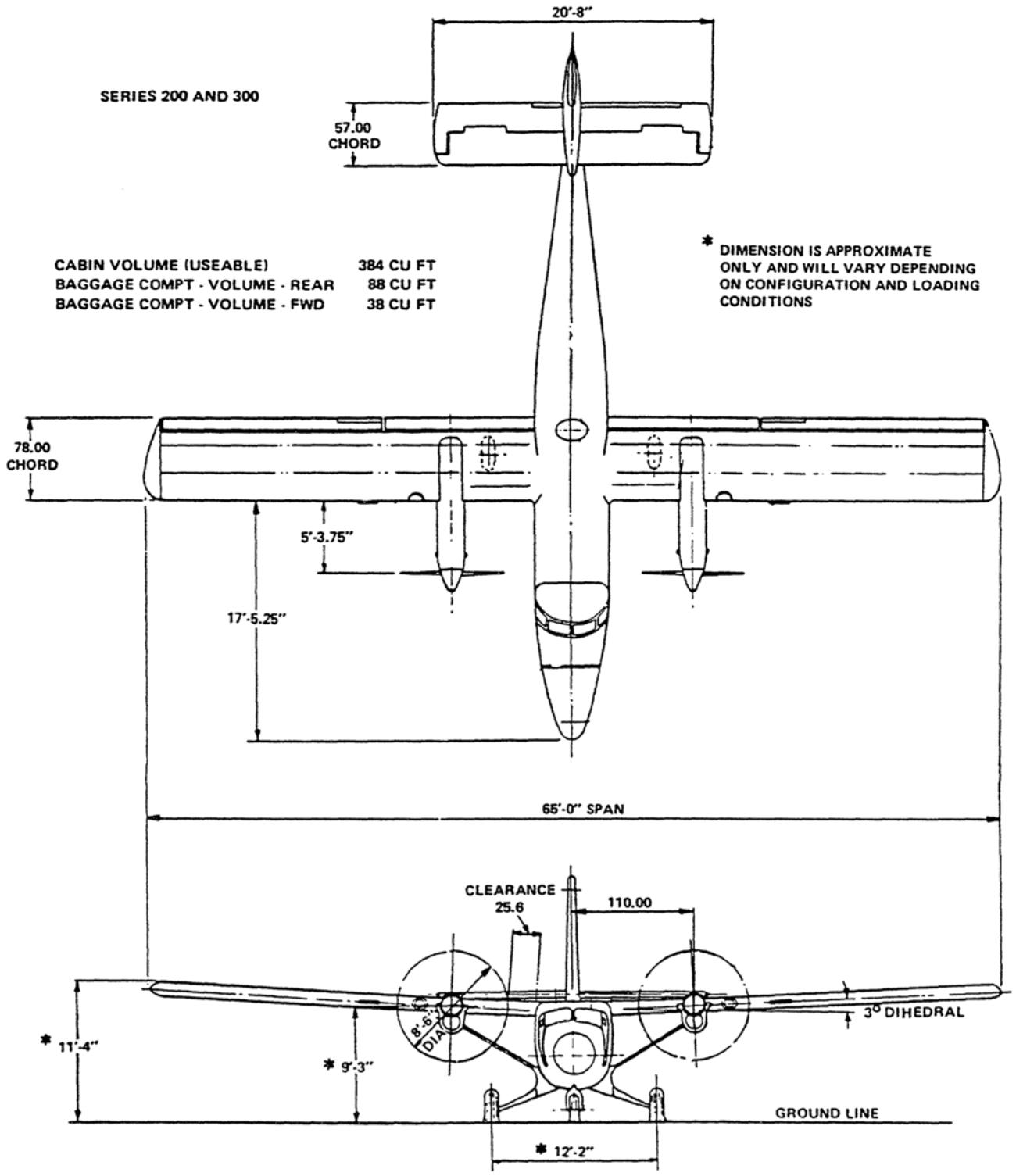
The turning radius of the aircraft is shown in Figure 3.



Aircraft Dimensions
Figure 1 (Sheet 1 of 5)

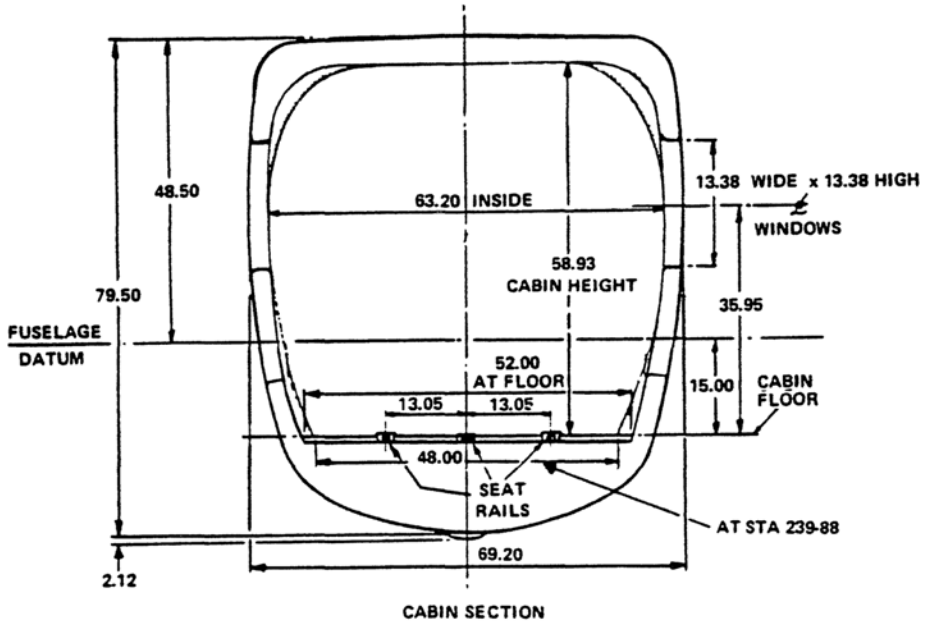


Aircraft Dimensions
Figure 1 (Sheet 2 of 5)



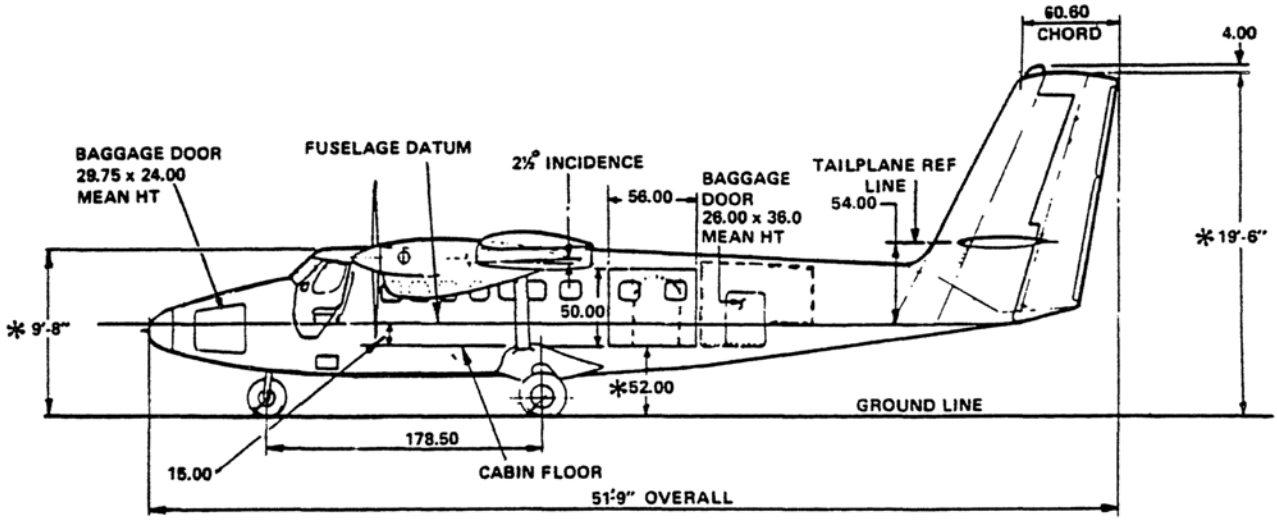
Aircraft Dimensions
Figure 1 (Sheet 3 of 5)

SERIES 200 AND 300

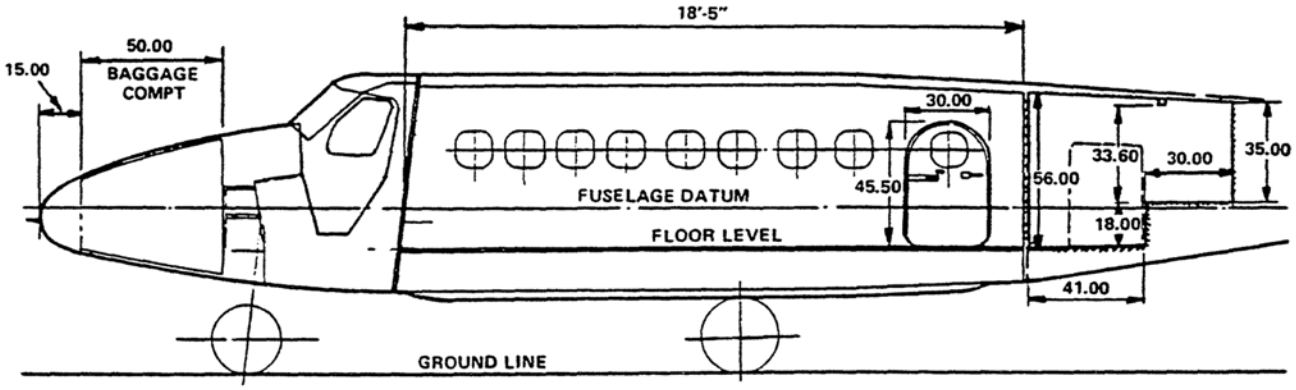


CABIN SECTION

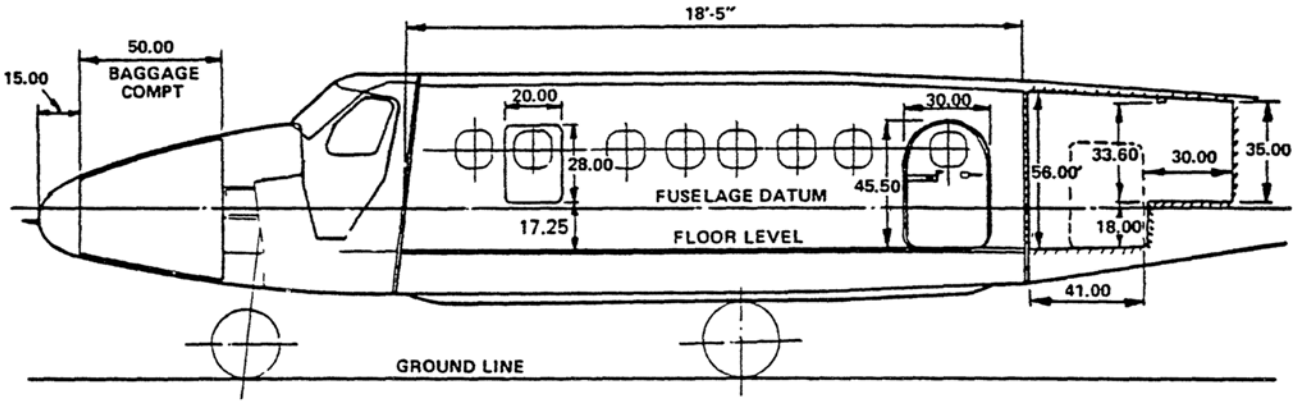
* DIMENSION IS APPROXIMATE AT NORMAL WEIGHT AND MAY VARY WITH LOADING CONDITIONS, C. G., TIRE PRESSURES, LANDING GEAR AND CONFIGURATION.



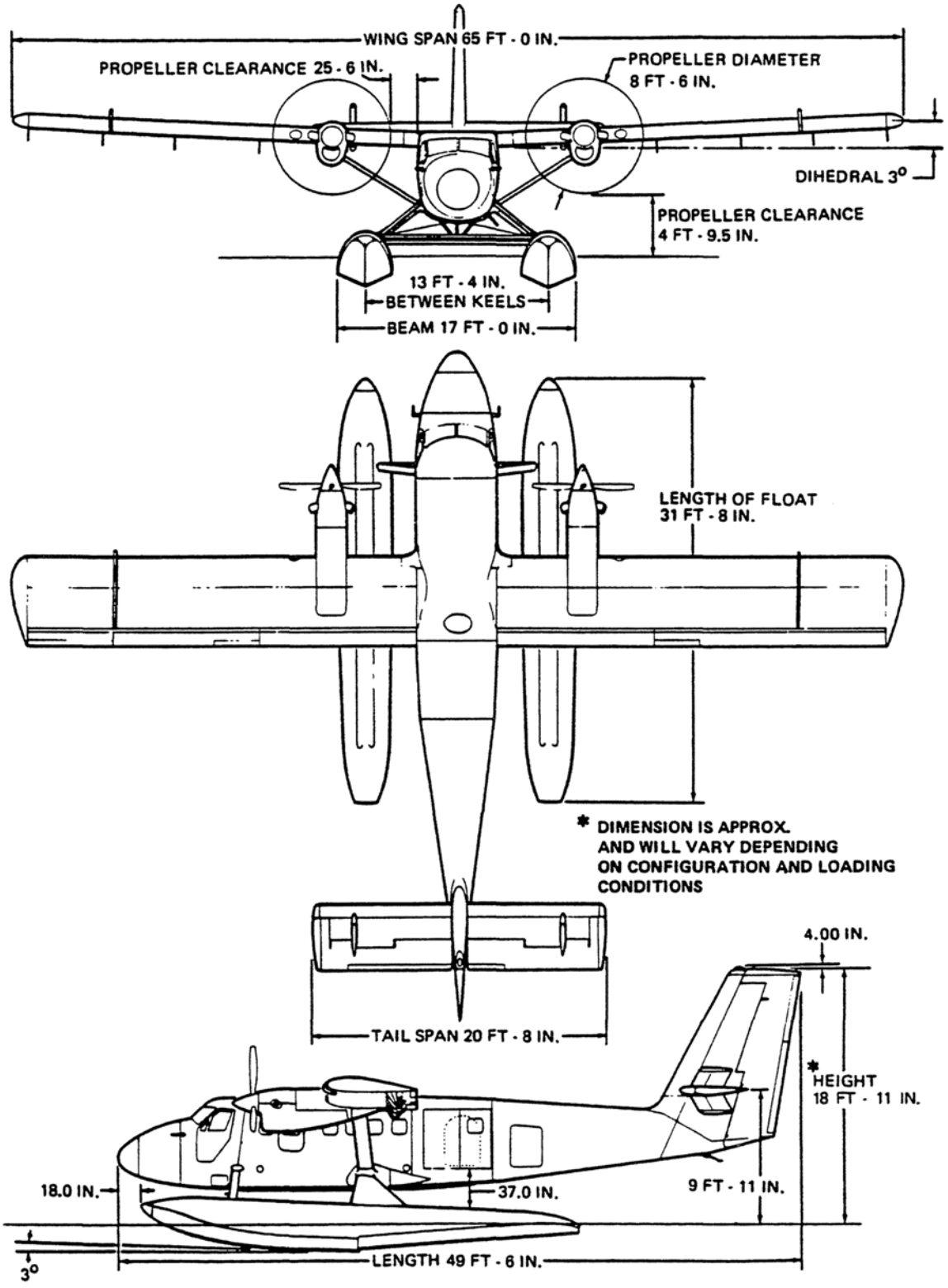
Aircraft Dimensions
Figure 1 (Sheet 4 of 5)



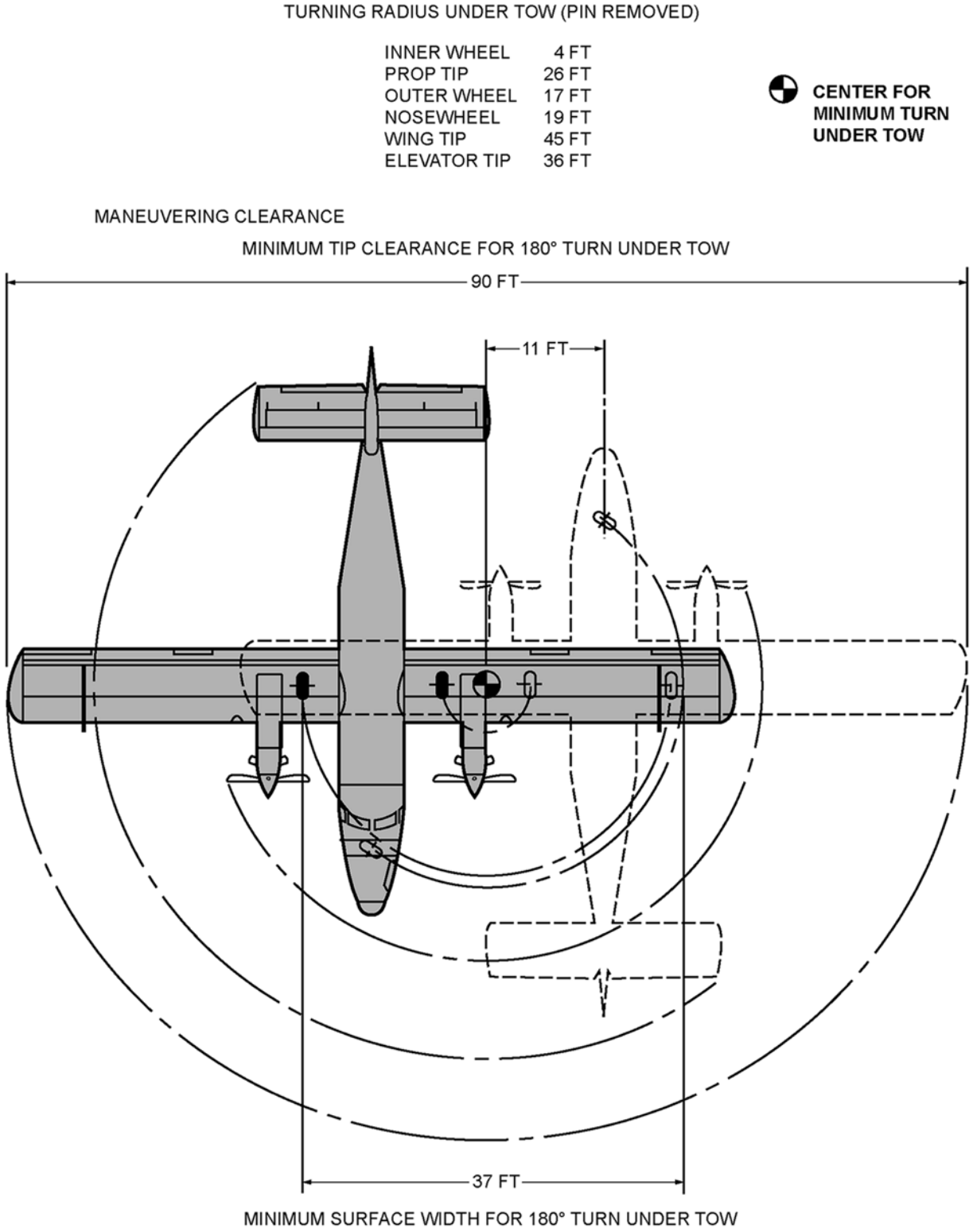
SERIES 200



Aircraft Dimensions
Figure 1 (Sheet 5 of 5)



Floatplane Dimensions
Figure 2



Turning Radius
Figure 3

3. Weight

A. Weight - Total Aircraft

Empty	
Landplane (approximately)	7,000 lb
Floatplane (approximately)	7,850 lb
All-Up Weight (Series 300 and 400)	12,500 lb
All-Up Weight (Series 100 and 200)	11,579 lb

B. Landing Gear Loading (static A.U.W.)

Nose gear (fwd cg)	1,700 lb
Main gear (aft cg)	5,700 lb

C. Footprint - C.B.R. No. (California Bearing Ratio)

Standard landing gear, main	1.67
Intermediate floatation, main	1.46

As nose gear loading is less than main gear loading only main gear values are given.

Section 2 – Replenishment Requirements

1. Fueling

A. Fuel Type

For a list of approved Engine Fuels and acceptable additives refer to the most recent revision/issue of Pratt & Whitney Canada, Service Bulletin No. 1244.

B. Pressure Fueling Provision (Mod S.O.O. 6111)

Location on aircraft	On RH side of fuselage approximately 4 ft above ground Figure 4 (item 6).
Connector on aircraft	Adapter part no. MS29516-1 with protective cap.
Mating ground connector	Nozzle type DI or NAS P305.
Maximum refueling pressure	40 psi.
Maximum defueling suction	Defueling may be achieved as outlined in sub-para D. Pressure defueling is not possible.
Control	Control panel accessible through door located beside connector Figure 4 (item 7).

C. Gravity Fueling Provisions

Location on aircraft	2 places on LH side of fuselage approximately 4 ft above ground Figure 4 (item 1).
Connector on aircraft	Open filler neck with cap.
Mating ground connector	Any nozzle with maximum diameter of 3.0 in.

If wing tip tanks Mod S.O.O. 6095 incorporated:

Location on aircraft	Top surface of both wings Figure 4 (item 2).
Connector on aircraft	Open filler neck with cap.
Mating ground connector	Any nozzle with maximum diameter of 3.0 in.

Note Wing tip tanks may be filled from main tanks. For procedure consult Maintenance Manual.

D. Gravity Defueling (draining) Provision

Location on aircraft	Underside of fuselage on No. 4 and No. 5 fuel cells Figure 4 (item 8).
Connector on aircraft	1.0 in. diameter beaded tube.

Mating ground connector	1.0 in. inside diameter hose.

Wing tip tanks (if installed) may be drained by suction through filler.

E. Fuel Grounding Provisions

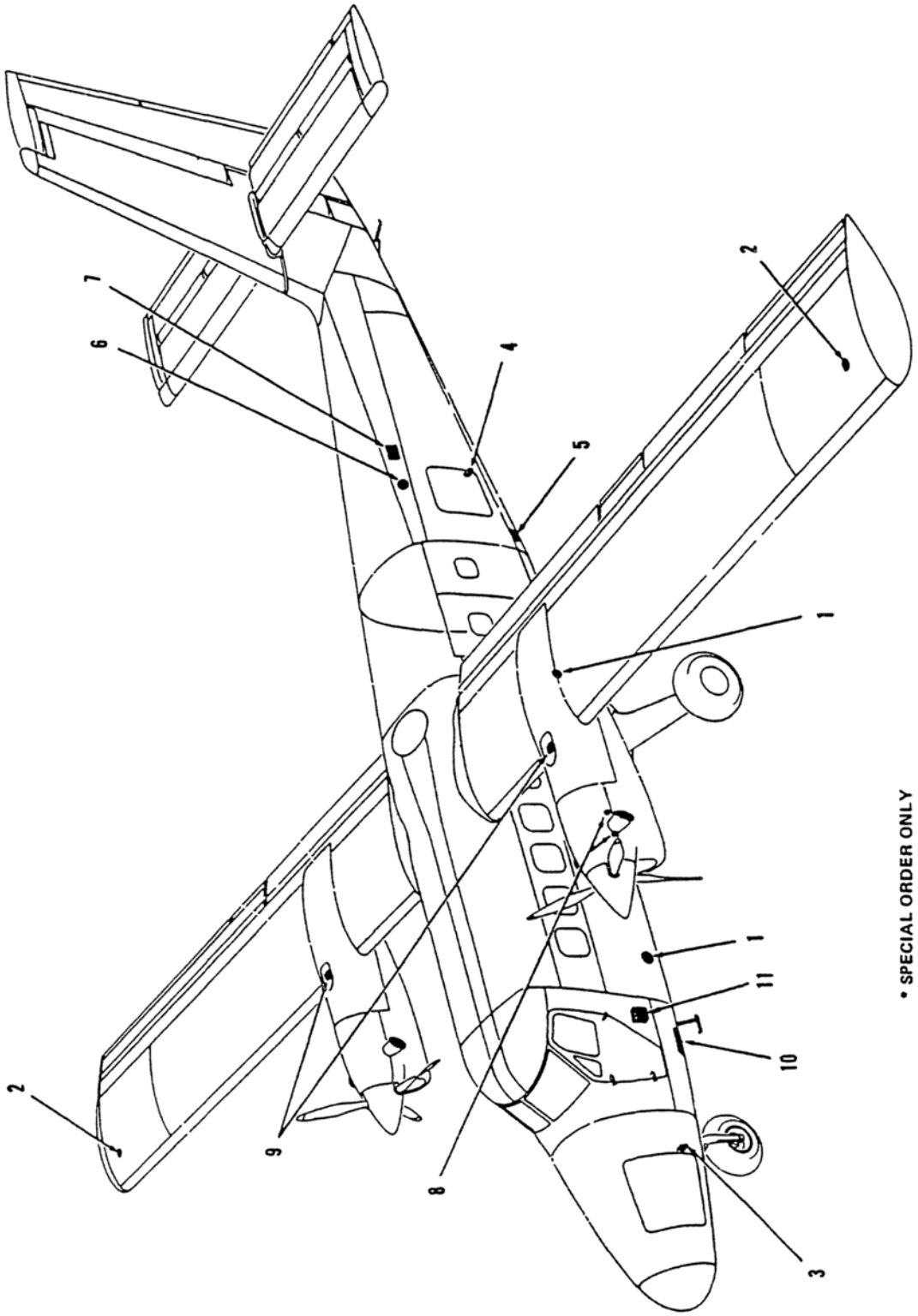
Location on aircraft	Grounding points are located in vicinity of filler points.
Connector on aircraft	AN3117 socket.
Mating ground connector	MS25384 plug.

2. Oil Replenishing

A. Main Engine Oiling Provisions

Location on aircraft	In each nacelle Figure 4 (item 9). Access through door on top of nacelle. Approximately 9.5 ft above ground. Filler cap is located on the engine.
Connector on aircraft	0.75 in. diameter orifice protected by cap.
Mating ground connector	Gravity fill from container using nozzle or funnel.
Oil specifications	Synthetic oil conforming to CPWA 202.
Total capacity	2.3 U.S. gal (1.9 Imp) per engine.

For a list of approved synthetic lubricating oils refer to Pratt & Whitney, Service Bulletin No. 1001.



Servicing Diagram
Figure 4

3. Hydraulic System

A. Filling Provisions

Reservoir location	Beneath flight compartment floor. Access panel located below pilot's door (item 10, Figure 4).
Connector on aircraft	1.38 in. diameter orifice protected by cap.
Mating ground connector	Gravity fill from container using nozzle or funnel.
Fluid specification	MIL-H-5606.

4. Nose Gear Strut

A. Filling Provisions

Location	On top of nose gear strut (air charging valve to be removed. Consult label on strut for instructions). Access through nose baggage compartment.
Connector on aircraft	0.5 in. threaded orifice.
Mating ground connector	Gravity fill from container using nozzle or funnel.
Fluid specification	MIL-H-5606.

5. Air Requirements

A. Tire Pressures

The following requirements are relevant under normal conditions only. For other configurations or environmental conditions refer to the Aircraft Maintenance Manual.

Normal landing gear:	Series 100/200	Series 300/400
Nose (normal)	32 psi	32 psi
Main (normal)	32 psi	38 psi
Intermediate floatation gear:	Series 100/200	Series 300/400
Nose	24 psi	24 psi
Main	30 psi	35 psi

Connector on aircraft	Valve core TRA C4 protected by cap.
Mating ground connector	Schrader P/N 5499.
Air required	Dry air or nitrogen.

B. Air Charging Points

Location	Wheel brake accumulator. Access panel located below pilot's door (item 10, Figure 4).
	Damping accumulator. Located beside wheel brake accumulator (see above).
	Nose gear shock strut. Approximately 3 ft above ground. Access through nose door.
Connector on aircraft	Valve MS28889.
Mating ground connector	Chuck to MIL-G-8348.
Air required	Dry nitrogen.
Pressure	For pressure required at each charging point, reference should be made to the Maintenance Manual. Maximum pressure requirement – 1500 psi.

6. Oxygen System - (Mod S.O.O. 6044 and 6101)

A. Charging Provisions

Location – crew	Access through nose door, approximately 3.5 ft above ground Figure 4 (item 3). Valve protected by dust cap.
Location – passengers	Access through rear baggage compartment door. Approximately 3.5 ft above ground Figure 4 (item 4). Valve protected by dust cap.
Connector on aircraft	3410 valve (Roylyn).
Mating ground connector	A hose or pipe terminating in an AN800-3 end or a hose or pipe terminating in a MS33656 end coupled to adapter SD5687.
Pressure	1800 psi.
Oxygen specification	MIL-O-27210.

7. Electrical System

A. External Power Connection

Location	On LH side of fuselage just aft of cargo door , Figure 4 (item 5). Access through spring loaded door approximately 3.5 ft above ground.
Connector on aircraft	AN2552-3A.
Mating ground connector	CE9183 (Cannon).
Power	28 volts nominal.

8. Windshield Washer

WARNING **USE ONLY FLUIDS KILFROST AL 36WWF MOD 2 OR PACE 116-13 IN WINDSHIELD WASHER SYSTEM.**

A. Filling Provisions

Reservoir	LH side of flight compartment Figure 4 (item 11).
Connector on aircraft	1.25 in. diameter orifice protected by cap.
Mating ground connector	Gravity fill from container using nozzle or funnel.
Windshield washer fluid	Fluids Kilfrost AL36WWF Mod 2 or Pace 116-13.

9. Towing Provisions

Location	Nose wheel axle. Axle is equipped with spools on both ends.
Connector on aircraft	0.75 in. diameter axial hole in spools.
Mating ground connector	Tow bar SD12502-7, -9 and -13 with 3 .0 in. diameter hole for mating with towing vehicle.

10. Loading

Freight	Through cargo doors. Dimensions shown in Figure 4. Steady strut C6GT1012-1/3 should be used under rear fuselage if heavy items are being loaded.

This Page Intentionally Left Blank

SECTION 9

SUPPLEMENTS

LIST OF SUPPLEMENTS

Supple-ment No.	Issue Status	Subject	Remarks
1	Issue 20	De-Icing System	Complete rewrite to conform to GAMA Spec.No.1| – TC Approved10/09/10.
2	Issue 4	Honeywell H-14 Autopilot	Complete rewrite to conform to GAMA Spec.No.1 – TC Approved 19/01/11.
3	Issue 1	Oxygen System	Complete rewrite to conform to GAMA Spec.No.1 – TC Approved 19/01/11.
5	Issue 3	Intermediate Flotation Gear	Complete rewrite to conform to GAMA Spec.No.1 – TC Approved 19/01/11.
6	Issue 1	Propeller Sychronizer	Complete rewrite to conform to GAMA Spec.No.1 – TC Approved 19/01/11.
8	Issue 6	Auxiliary Wing Tanks	Complete rewrite to conform to GAMA Spec.No.1 – TC Approved 19/01/11.
10	Issue 6	Wheel-Skiplane & Spring-Skiplane Operation	Complete rewrite to conform to GAMA Spec.No.1 – TC Approved 19/01/11.
19	Issue 3	Operation with Inoperative Autofeather System	Complete rewrite to conform to GAMA Spec.No.1 – TC Approved 19/01/11.
20	Issue 4	Floatplane Operation SFAR 23	Complete rewrite to conform to GAMA Spec.No.1 – TC Approved 03/02/11.

Supple-ment No.	Issue Status	Subject	Remarks
21	Issue 4	Collins AP-106 Flight Control System	Complete rewrite to conform to GAMA Spec.No.1 –TC Approved 19/01/11.
31	Issue 1	Maintained-Contact Start Switch (SOO 6185)	Complete rewrite to conform to GAMA Spec.No.1 –TC Approved 19/01/11.
35	Issue 3	Collins FCS-65 Flight Control System	Complete rewrite to conform to GAMA Spec.No.1 –TC Approved 19/01/11.
36	Issue 2	Transport Category Operations in Australia	Complete rewrite to conform to GAMA Spec.No.1 –TC Approved 19/01/11.
37	Issue 2	Supplemental Performance Data	TC Approved 25/02/2011 – available by special request only.

SECTION 9 – SUPPLEMENT 1

DE-ICING SYSTEM

PSM 1-63-1A

SECTION 9 (T.C. Approved)

SUPPLEMENT 1

DE-ICING SYSTEM

For Aircraft with S.O.O 6004, 6005, 6006, 6007, 6008, 6009 or 6157, 6062, and Mods 6/1393, 6/1779 and 6/1827.

Approved:_____
Chief, Flight Test
Transport Canada

Date: 10 Sep 2010

LIST OF EFFECTIVE PAGES

SECTION	PAGE	DATE	SECTION	PAGE	DATE
9-1	1	10 Sep. 2010		10	10 Sep. 2010
	2	10 Sep. 2010		11	10 Sep. 2010
	3	10 Sep. 2010		12	10 Sep. 2010
	4	10 Sep. 2010		13	10 Sep. 2010
	5	10 Sep. 2010		14	10 Sep. 2010
	6	10 Sep. 2010		15	10 Sep. 2010
	7	10 Sep. 2010		16	10 Sep. 2010
	8	10 Sep. 2010		17	10 Sep. 2010
	9	10 Sep. 2010		18	10 Sep. 2010

This Page Intentionally Left Blank

TABLE OF CONTENTS **PAGE**

9-1.1 General **7**
9-1.1.1 Equipment Required for Flight in Icing Conditions 8

9-1.2 Operating Limitations **9**

9-1.3 Emergency Operating Procedures **11**
9-1.3.1 Excessive Ice Accretion 11
9-1.3.2 De-Icing System Failure 11
9-1.3.3 Inadvertent Flight in Severe Icing 11

9-1.4 Normal Operating Procedures **13**
9-1.4.1 Stall Speed Increase 13
9-1.4.2 Flap Angles and Approach Speed 13
9-1.4.3 Weight – Altitude Icing Limitations 13
9-1.4.4 Engine Speed Required for De-Icer Boot Operation 13
9-1.4.5 Before Starting Engines 14
9-1.4.6 After Starting Engines 14
9-1.4.7 Before Entering Icing Conditions 16
9-1.4.8 Climb, Cruise and Descent in Icing Conditions 16
9-1.4.9 Holding, Approach and Landing in Icing Conditions 17
9-1.4.10 Approach and Landing Procedures After Flight in any Icing Conditions . 17
9-1.4.11 Windshield De-Icing 18

List of Tables Page

9-1-1 18

List of Figures Page

9-1-1 Weight – Altitude Icing Limitations 10

This Page Intentionally Left Blank

9-1.1 General

Airplanes with the required de-icing equipment are authorized to fly in icing conditions when operation is in compliance with the operating limitations and procedures in this supplement. Such airplanes are certificated with ice protection provisions in compliance with 14 CFR, Part SFAR 23.

NOTE

Icing conditions exist when the static air temperature on the ground and for take-off is +10°C or below, or static air temperature in flight is +5°C or below, and visible moisture in any form is present (such as clouds, fog with visibility one mile or less, rain, snow, sleet, or ice crystals).

Icing conditions also exist when the static air temperature on the ground and for take-off is +10°C or below when operating on ramps, taxiways or runways where surface snow, ice, standing water, or slush may be ingested by the engines or freeze on engines or nacelles.

⚠ WARNING

FLIGHT IN FREEZING RAIN, FREEZING DRIZZLE OR MIXED ICING CONDITIONS (SUPERCOOLED LIQUID WATER AND ICE CRYSTALS) MAY RESULT IN ICE BUILD-UP ON PROTECTED SURFACES EXCEEDING THE CAPABILITY OF THE ICE PROTECTION SYSTEM OR MAY RESULT IN ICE FORMING AFT OF THE PROTECTED SURFACES. THIS ICE MAY NOT BE SHED USING THE ICE PROTECTION SYSTEMS AND MAY SERIOUSLY DEGRADE THE PERFORMANCE AND CONTROLLABILITY OF THE AIRPLANE.

SEVERE ICING CONDITIONS MAY BE ENCOUNTERED DURING FLIGHT IN VISIBLE RAIN WITH AIR TEMPERATURES BELOW 0° C AMBIENT TEMPERATURE AND SPECIFICALLY WITH DROPLETS THAT SPLASH OR SPLATTER ON IMPACT.

SEVERE ICING MAY BE IDENTIFIED BY UNUSUALLY EXTENSIVE ICE ACCRETED ON THE AIRFRAME IN AREAS NOT NORMALLY OBSERVED TO COLLECT ICE, THE ACCRETION OF ICE ON THE PROPELLER SPINNER AFT OF THE SPINNER NOSE TOWARD THE PROPELLER BLADES OR ICE ACCRETED ON THE SIDE WINDOWS OF THE FLIGHT COMPARTMENT AFT OF THE LEADING EDGE.

9-1.1.1 Equipment Required for Flight in Icing Conditions

The DHC-6 is landplane or skiplane approved for operation in icing conditions only when the aircraft is equipped with the following modifications and options:

Mod 6/1043 – Engine lower cowl redesign (standard equipment on all Series 300 aircraft)

Mod 6/1066 – Wing flap hinge arm fairing (standard equipment on all Series 300 aircraft)

Mod 6/1089 – Horizontal stabilizer leading edge reinforcement (only provided on aircraft ordered with surface de-icing equipment)

Mod 6/1393 – Horizontal stabilizer de-ice boot function indicator lights (standard equipment on aircraft equipped with S.O.O. 6004 from serial number 290 onwards, mandatory retrofit by SB 6/275)

Mod 6/1815 – Labels, windshield washer/de-icer system (only for aircraft with a windshield washer fluid system present)

Mod 6/1847 – Yellow procedural placard for control column, for all aircraft with de-ice equipment.

S.O.O. 6004 – Airframe de-icing equipment installation

S.O.O. 6005 – Propeller de-icing boots

S.O.O. 6006 – Wing inspection lights

Either of **S.O.O. 6009 or 6157** – Windshield wiper system (standard equipment on all Series 300 aircraft from serial number 531)

Either of **S.O.O. 6007 or 6008** – An electrically heated windshield, or a windshield washer system. Either one of the two systems is sufficient. The washer system should be removed if an electrically heated windshield is present (Mod 6/1827, SB 6/441 refers).

Pitot heat and engine intake deflectors are standard equipment on all DHC 6 aircraft.

9-1.2 Operating Limitations

1 All de-icing systems must be fully operative prior to entering known or probable icing conditions. If Mod 6/1393 (tailplane de-icer boot indicator lights) is embodied, sufficient engine RPM must be maintained during all phases of flight to ensure that illumination of each light is positive during each cycle (a momentary flash indicates unsatisfactory operation).

2 If any icing condition has been encountered, the de-icer boots must be operated prior to flap extension.

3 If Mod 6/1393 is not embodied, flight in icing conditions is prohibited unless engine RPM is maintained above 75% N_G.

4 In icing conditions flap angles must not exceed 10°.

5 Intake deflectors must be extended during flight in snow or icing conditions.

6 Intentional flight in severe icing is prohibited.

WEIGHT – ALTITUDE ICING LIMITATIONS

ASSOCIATED CONDITIONS:

1. ONE HALF-HOUR HOLD IN CONTINUOUS STRATIFORM CLOUD:
2. LIQUID WATER CONTENT = 0.8 GRAM/CUBIC METER
3. DROPLET SIZE = 20 MICRONS
4. AMBIENT TEMPERATURE = –10°C

REMARKS:

1. DATA BASIS: ESTIMATED

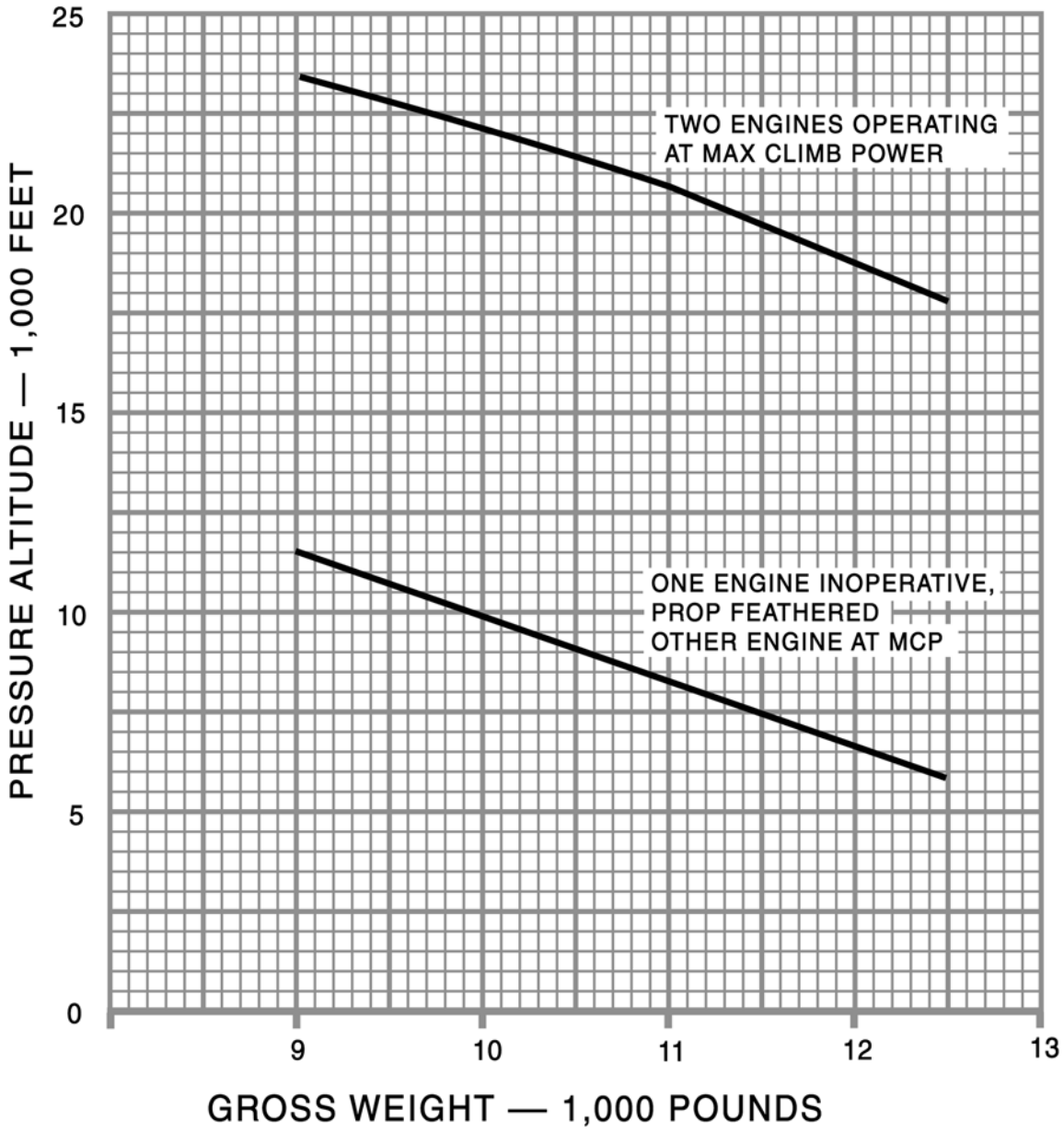


Figure 9-1-1 Weight – Altitude Icing Limitations

9-1.3 Emergency Operating Procedures

9-1.3.1 Excessive Ice Accretion

If the rate of ice accretion is such that cruising speed at a constant cruise power setting is reduced by more than 10 KIAS with all de-icing systems operating, alternative action should be considered which could be taken to avoid further exposure to icing.

9-1.3.2 De-Icing System Failure

If any of the de-icing systems become inoperative (excluding engine intake anti-icing), descent or other avoidance of icing conditions should be attempted. If further exposure to icing conditions cannot be avoided, a landing should be made as soon as possible using procedure for APPROACH AND LANDING IN ICING CONDITIONS (Para 9-1.4.9) as much as is practicable.

WARNING

ON AIRCRAFT WITH TAILPLANE DE-ICER BOOT INDICATOR LIGHTS IT IS POSSIBLE FOR SATISFACTORY OPERATION TO BE INDICATED WITH UNSERVICEABLE TAILPLANE DE-ICER BOOTS.

9-1.3.3 Inadvertent Flight in Severe Icing

1 Autopilot (if installed) – disconnect immediately. Be prepared for a possible roll force requirement by firmly holding the control wheel prior to disconnecting the autopilot.

2 IGNITION switch – Manual

3 IGNITER switches (if installed) – BOTH

4 INTAKE DEFLECTORS – EXTEND

5 PROP Levers – MAX RPM

6 Power Levers – Maximum Continuous Power

7 All installed de-icing equipment, including PITOT HEAT– ON

8 Airspeed – Minimum 125 KIAS, avoid aggressive maneuvering.

9 Exit severe icing conditions – turn back or change altitude as required to obtain an outside air temperature that is less conducive to icing.

10 Notify Air Traffic Control of the severe icing conditions.

WHEN CLEAR OF SEVERE ICING CONDITIONS:

11 Power and PROP Levers – As required

12 Airspeed – As required

13 Autopilot (if installed) – may be used as desired

14 IGNITION switch – NORMAL

15 All installed de-icing equipment – as required

9-1.4 Normal Operating Procedures

Important factors to be considered and procedures which must be followed if icing conditions are anticipated are given in the following paragraphs.

NOTE

On Pre-Mod 6/1779 aircraft, the following operating procedure is advised for airplanes equipped with strobe lights:

1 With airframe de-icing system operating in automatic mode, do not operate strobe lights.

2 If it is necessary to operate strobe lights and airframe de-icing simultaneously, operate de-icing system in manual mode.

9-1.4.1 Stall Speed Increase

An accumulation of ice on the airplane may change the stall characteristics, stall speed and warning margin provided by the stall warning system. Therefore, when the airplane has accumulated ice, an approach speed of not less than 1.3 times the normal stall speed should be maintained.

9-1.4.2 Flap Angles and Approach Speed

An airspeed of 1.3 times stall speed appropriate to flap angle and weight should be maintained. Refer to Table 9-1-1.

9-1.4.3 Weight – Altitude Icing Limitations

The loss in performance from ice accretion with all de-icing systems operating may be such that the airplane may have to descend to the limits shown in Figure 9-1-1.

9-1.4.4 Engine Speed Required for De-Icer Boot Operation

Sufficient engine speed must be maintained to ensure de-icer boot operation under all conditions. This may vary consistent with flight mode, altitude, and use of heating system. 75% – 80% N_G may be required to achieve positive illumination of the STAB DEICE PRESS indicator lights.

NOTE

With Mod 6/1874 incorporated, the horizontal stabilizer de-icer boots will automatically cycle when flaps are selected and the AUTO/MANUAL mode switch is in the OFF position.

Indication of bleed air pressure to the tailplane de-icer boots during operation is provided by the illumination of the two blue indicator lights (Mod 6/1393).

9-1.4.5 Before Starting Engines

1 Carry out the checks in AFM Section 4.5, steps 1 to 10 inclusive.

2 EXTERNAL/BATTERY switch – BATTERY

3 DC MASTER switch – MASTER

4 Check for loadmeter discharge when:

a PITOT HEAT switch is momentarily selected to PITOT HEAT

b INTAKE ANTI-ICE switch (if installed) is momentarily selected to HEAT

NOTE

Engine intake anti-ice must not be used on the ground until engines are running.

c WINDSHIELD HEAT switch is momentarily selected to HEAT

d VALVE HTR switch (if installed) is momentarily selected on.

5 STAB DEICE PRESS indicator lights (if installed) – Press to test.

9-1.4.6 After Starting Engines

Select VALVE HTR switch (if installed) on, complete pre-taxi check, and carry out the following checks in addition to the ground checks in AFM Section 4.8 and 4.9:

1 Hold IND SELECT switch to either L GEN or R GEN position and then select propeller de-ice switch to PROP DEICE and observe loadmeter fluctuation indicating propeller de-icing cycling. Select propeller de-ice switch as desired.

2 Check wing inspection lights.

3 Power lever – 75% N_G

4 De-icing system mode switch – MANUAL

5 Wing manual switch – Hold at WING INNER then WING OUTER and check that wing boots operate.

6 Stabilize manual switch – Hold at LEFT STAB then RIGHT STAB while ground crew verify that tailplane boots operate. If tailplane de-icer boot indicator lights are installed, check that LEFT STAB and RIGHT STAB DEICE PRESS lights each illuminate within two seconds of appropriate switch selection to LEFT STAB and RIGHT STAB, and each light goes out almost immediately when the switch is released to OFF. Operation of indicator lights should be consistent with each other.

WARNING

IF EITHER LIGHT DOES NOT COME ON WITHIN 2 SECONDS, RELEASE SWITCH AND REPEAT CHECK. IF THE CHECK IS NOT SATISFACTORY A MALFUNCTION IS INDICATED AND RECTIFICATION MUST BE CARRIED OUT BEFORE FLIGHT IN ICING CONDITIONS.

THE DE-ICER BOOT INDICATOR LIGHTS ARE OPERATED BY PRESSURE SWITCHES IN THE AIR PRESSURE LINES SUPPLYING THE DE-ICER BOOTS AND DO NOT, THEREFORE, POSITIVELY INDICATE DE-ICER BOOT OPERATION.

7 Mode switch – AUTO

8 Rate switch – FAST

NOTE

A fast cycle takes 60 seconds which comprises 5 seconds inflation time for inner wings, 5 seconds for outer wings, 3 seconds for the left stabilizer and 3 seconds for the right stabilizer followed by 44 seconds dwell period.

A slow cycle takes 180 seconds. Inflation time for each boot remains the same; dwell time lasts 164 seconds.

With MANUAL mode selected, de-icer boots must be selected individually by use of the appropriate switches.

9 If STAB DEICE PRESS indicator lights are installed, check that each illuminates for at least 1 second in each 60 second cycle (or 180 second cycle), and at no time are on simultaneously.

NOTE

If the LEFT indicator light does not go out before the RIGHT comes on, a malfunction is indicated and rectification must be carried out before flight in icing conditions.

10 Mode switch – OFF

11 Flaps (Mod 6/1874) – Select 10 degrees, check LEFT STAB and RIGHT STAB DEICE PRESS lights illuminate within a 12 second period in a sequence of right, left, right, left stabilizer. Select greater than 15 degrees, check that another 12 second cycle consisting of two alternating 3 second inflations occurs for each stabilizer boot.

9-1.4.7 Before Entering Icing Conditions

1 DEICER BOOTS VALVE HTR switch (if applicable) – VALVE HTR.

2 PITOT HEAT switch – PITOT HEAT

3 INTAKE DEFLECTOR – EXTEND. Check intake deflector position indicator reads EXT. If not, select as described in AFM Section 4.8.9.

4 INTAKE ANTI-ICE switch – INTAKE ANTI-ICE

5 PROP DEICE switch (if installed) – PROP DEICE

6 WINDSHIELD HEAT switch – HEAT

7 IGNITION switch – MANUAL (if required)

9-1.4.8 Climb, Cruise and Descent in Icing Conditions

ON INITIAL DETECTION OF ICE:

1 DEICER BOOTS MANUAL/OFF/AUTO switch – AUTO

2 FAST/SLOW switch – FAST or SLOW depending on the rate of ice accumulation. With Mod 6/1393 incorporated, check LEFT and RIGHT STAB DEICE PRESS lights illuminate.

NOTE

Monitor ice accumulation between boot cycles (use wing inspection lights as required) to confirm that the FAST/SLOW selection is appropriate.

WHEN CLEAR OF ICING CONDITIONS:

3 DEICER BOOTS MANUAL/OFF/AUTO switch – OFF. With Mod 6/1440 incorporated, check LEFT and RIGHT STAB DEICE PRESS lights out.

9-1.4.9 Holding, Approach and Landing in Icing Conditions

WARNING

WHEN HOLDING IN ICING CONDITIONS, FLAP MUST BE AT 0°.

ON INITIAL DETECTION OF ICE:

1 DEICER BOOTS MANUAL/OFF/AUTO switch – AUTO

2 FAST/SLOW switch – FAST. With Mod 6/1440 incorporated, check LEFT and RIGHT STAB DEICE PRESS lights illuminate.

BEFORE LOWERING 10° FLAP:

3 TEMP CONTROL MANUAL/OFF/AUTO switch – OFF

4 Operate de-icer boots continuously until touchdown.

5 Maximum flaps – 10°

6 Minimum approach speeds appropriate to weight with 10° flap are as follows:

Weight - LB	12,300	11,500	10,500	9,500	8,500	7,500
IAS - KT	85	83	79	75	71	67

These speeds may be increased by a maximum of 10 knots. Airspeeds in excess of those recommended for flap angle and operating weight must be avoided.

Landing distance with flaps 10° for all landing gear configurations is approximately 1.8 times the landing distance with flaps 37.5° obtained from AFM Section 5, Figure 29; or skiplane landing distance graph reference, as appropriate.

9-1.4.10 Approach and Landing Procedures After Flight in any Icing Conditions

The following procedures must be observed during approach and landing after flight in any icing conditions:

1 De-Icer Boots – Select AUTO/FAST at least three minutes before flap extension.

2 Flap – Select desired settings and if any loss of control occurs retract to 10°. Extension of flaps beyond 10° must only be made above 500 feet above ground level. With Mod 6/1874 incorporated, the left and right stabilizer de-icer boots cycle when flaps are selected, if the AUTO/MANUAL mode switch is in the OFF position.

3 If any part of the de-icer boot system was inoperative or if the aircraft behaved abnormally during flight in icing conditions, approach and land as for APPROACH AND LANDING PROCEDURES IN ICING CONDITIONS. Strictly observe appropriate airspeed for 10° flap.

4 Do not use excessively high airspeeds with flaps extended after flight in icing conditions. Airspeeds given in Table 9-1-1 may be increased by 5 knots to offset conditions of turbulence, but airspeeds in excess of those recommended for flap angle and operating weight must be avoided.

WARNING

ON AIRCRAFT WITH TAILPLANE DE-ICER BOOT INDICATOR LIGHTS IT IS POSSIBLE FOR SATISFACTORY OPERATION TO BE INDICATED WITH UNSERVICEABLE TAILPLANE DE-ICER BOOTS.

Table 9-1-1

Indicated Airspeeds to Achieve 1.3 times the Power-off Stall Speed as a Function of Weight

FLAP ANGLE	1.3 V_S KIAS					
	12,300 LB	11,500 LB	10,500 LB	9,500 LB	9,500 LB	7,500 LB
10°	85	83	79	75	71	66
20°	80	77	73	70	66	62
37.5°	74	70	67	64	60	57

5 An approach speed equal to 1.3 times the power-off stalling speed (V_S) appropriate to the prevailing weight and flap setting is recommended. These values are given in the table above.

9-1.4.11 Windshield De-Icing

The windshield heat switch should remain at HEAT position continuously in icing conditions.

SECTION 9 – SUPPLEMENT 2

H-14 AUTOMATIC PILOT

This Page Intentionally Left Blank

PSM 1-63-1A

SECTION 9 (T.C. Approved)

SUPPLEMENT 2

H-14 AUTOMATIC PILOT

S.O.O. 6085

Approved: _____
Chief, Flight Test
Transport Canada

Date: 19 Jan 2011

Issue 4

LIST OF EFFECTIVE PAGES

SECTION	PAGE	DATE	SECTION	PAGE	DATE
9-2	1	19 Jan. 2011		11	19 Jan. 2011
	2	19 Jan. 2011		12	19 Jan. 2011
	3	19 Jan. 2011		13	19 Jan. 2011
	4	19 Jan. 2011		14	19 Jan. 2011
	5	19 Jan. 2011		15	19 Jan. 2011
	6	19 Jan. 2011		16	19 Jan. 2011
	7	19 Jan. 2011		17	19 Jan. 2011
	8	19 Jan. 2011		18	19 Jan. 2011
	9	19 Jan. 2011		19	19 Jan. 2011
	10	19 Jan. 2011		20	19 Jan. 2011

This Page Intentionally Left Blank

TABLE OF CONTENTS **PAGE**

9-2.1 General **7**
9-2.1.1 Component Description 7

9-2.2 Limitations **8**

9-2.3 Emergency and Abnormal Procedures **9**
9-2.3.1 Disengaging the Autopilot 9
9-2.3.2 Single Engine Operations 9
9-2.3.3 Autopilot Malfunction – Height Loss 9
9-2.3.4 Autopilot Disengage Indicator Light (S.O.O. 6121) 10
9-2.3.5 Autopilot Emergency Static Supply 10

9-2.4 Normal Procedures **11**
9-2.4.1 Pre-Flight Checks 11
9-2.4.1.1 Switching Checks 11
9-2.4.1.2 Functional Checks 11
9-2.4.1.3 ILS Coupling Check 12
9-2.4.1.4 VOR Coupling Check 12
9-2.4.2 In-Flight Procedures 13
9-2.4.2.1 Maneuvering with the Autopilot 13
9-2.4.2.2 Navigating Using the Heading Selector 13
9-2.4.2.3 Using the Altitude Control 14
9-2.4.2.4 Navigating Using VOR Coupling 14
9-2.4.2.5 ILS Coupling 14
9-2.4.2.6 Disengaging the Autopilot 15

9-2.5 Performance **16**

9-2.6 Weight and Balance **17**

9-2.7 System Description **18**
9-2.7.1 General 18
9-2.7.2 System Description 18
9-2.7.3 System Components 18
9-2.7.3.1 Servo Actuators and Solenoid Engage Air Valve 18
9-2.7.3.2 Computer 18
9-2.7.3.3 Flight Controller 20

TABLE OF CONTENTS **PAGE**

9-2.7.3.4 Automatic Pilot Disengage Switch 20
9-2.7.3.5 Automatic Pilot Dual VOR G/S Selector 20

List of Figures Page

9-2-1 H-14 Automatic Pilot Components 19

9-2.1 General

This supplement provides information applicable only to the Honeywell H-14 Automatic Pilot, which is S.O.O. 6085.

9-2.1.1 Component Description

The H-14 is a very early generation Honeywell adaptive autopilot that uses pneumatically powered servos to actuate flight controls. Honeywell developed this automatic pilot in the early 1960s. It was the very first autopilot fitted to the Series 300 Twin Otter, having been previously fitted the Series 100 and 200 by S.O.O. 6003 and 6060 respectively.

The H-14 Automatic Pilot was succeeded by the Collins AP-106 all electric autopilot (that being the most common autopilot found on Series 300 aircraft), and, at the very end of the Series 300 production run, the Collins AP-106 autopilot was succeeded by the Collins FCS-65.

The Honeywell H-14 Automatic Pilot can be identified by comparing the control head (located on the aft face of the control yoke) with the illustration in Figure 9-2-1.

Be certain you are using the correct supplement for the autopilot used in your aircraft. There are three different autopilot supplements applicable to Series 300 aircraft:

Supplement Number	Applicable to
Supplement 2 (this supplement)	Honeywell H-14 Pneumatic Automatic Pilot, S.O.O. 6085
Supplement 21	Collins AP-106 Autopilot, S.O.O. 6162
Supplement 35	Collins FCS-65 Autopilot, S.O.O. 6188

Only the one supplement appropriate to the autopilot fitted to the aircraft should be present in Section 9, all other autopilot supplements should be discarded. If the aircraft is not fitted with an autopilot, all the autopilot supplements should be removed and discarded.

9-2.2 Limitations

The limitations in Section 2 of the AFM are applicable. The following additional limitations apply:

1 The autopilot must be disengaged in severe icing.

2 The autopilot must be disengaged during single engine flight.

9-2.3 Emergency and Abnormal Procedures

9-2.3.1 Disengaging the Autopilot

The autopilot may be normally disengaged by any one of the following methods:

1 Depressing the A/P OFF disengage button switch.

2 Selecting the controller AUTO PILOT switch to off.

3 Pulling out the AUTO PILOT circuit breaker.

In the event of failure of the autopilot to disengage after a two second period has elapsed (see Para 9-2.4.2.6) the autopilot can be overpowered by applying a manual force on the flight controls.

Approximately 50 pounds of force is required to overpower the rudder, and approximately 30 pounds of force is required to overpower the ailerons and the elevator.

9-2.3.2 Single Engine Operations

In the event of failure of one engine in flight, the autopilot will react to a change of heading greater than 7°, and will apply up to full rudder deflection when 20° of heading change is experienced to correct for the yaw caused by the asymmetric power. When the heading selector is engaged or the NAV switch is at ON, this automatic rudder compensation is not available.

The autopilot is not approved for use during single engine operations and should be fully disengaged prior to any deliberate single engine operation, or disengaged as soon as practical following an engine failure.

9-2.3.3 Autopilot Malfunction – Height Loss

In the event of a hardover signal to an autopilot servo (a servo runaway), the resulting height loss will be less than 50 feet, provided that corrective action is taken within:

1 3 seconds, during cruise, climb, or descent, or;

2 1 second during approach or maneuvering flight.

If S.O.O. 6121 (Autopilot-disengagement indication and static cut-off valve, Series 320) is incorporated, the following procedure applies.

9-2.3.4 Autopilot Disengage Indicator Light (S.O.O. 6121)

Illumination of the AUTOPILOT DISENGAGE INDICATOR MASTER caution light while the autopilot is in use indicates autopilot malfunction or power failure. If this occurs, proceed as follows:

1 Take over manual control of aircraft.

2 Check AUTO PILOT circuit breaker on radio power panel and (if accessible) fuse on autopilot computer.

3 If practicable attempt reset of autopilot (maximum two attempts).

The AUTOPILOT DISENGAGE INDICATOR MASTER caution light will illuminate when electrical power is on and autopilot is not engaged.

If S.O.O. 6121 (Autopilot-disengagement indication and static cut-off valve, Series 320) is incorporated, the following procedure applies.

9-2.3.5 Autopilot Emergency Static Supply

The normal static pressure supply to the altitude hold control in the autopilot computer is from the right pilot's static pressure system. In the event of a leak in the supply line, the right pilot's instruments will be affected. If this occurs, static pressure supply to the altitude hold control should be shut off by operation of AUTO PILOT STATIC selector to OFF. This will provide the altitude hold control with static pressure supply from the aircraft interior. The following procedure should be observed if autopilot altitude hold is operating when such a malfunction is identified:

1 Autopilot controller ALT switch – Off

2 AUTO PILOT STATIC selector – OFF

3 Autopilot controller ALT switch – On

9-2.4 Normal Procedures

9-2.4.1 Pre-Flight Checks

If the automatic pilot will be used during a flight, the following checks should be completed prior to take-off. Reference to ALT and NAV switches, heading selector, altitude control and VOR/ILS coupling should be disregarded if these options are not installed.

9-2.4.1.1 Switching Checks

With the airplane electrical system energized, carry out the following checks:

1 Flight controller AUTO PILOT, ALT and NAV switches – On

2 Control wheel disengage switch – Depress. The controller switches should move to off.

3 Controller AUTO PILOT, ALT and NAV switches – On

4 Controller PITCH wheel – Rotate. The ALT switch should move to off.

5 TURN knob – Rotate to L or R. The NAV switch should move to off. Re-center the TURN knob.

6 NAV switch – On. Select the HDG SEL switch to on, and the NAV switch should move to off.

7 NAV switch – On. The HDG SEL switch should move to off.

8 HDG SEL switch – On. The NAV switch should move to off. Rotate the TURN knob towards L or R. The HDG SEL switch should move to off.

9 Controller AUTO PILOT switch – Off

9-2.4.1.2 Functional Checks

With the engines operating at 75% N_G, circuit breakers in, gyro instruments fully erect, and bleed air pneumatic pressure adequate, carry out the following checks:

1 Elevator trim – Centered

2 Controller TURN knob – Centered

3 Hold the elevator and ailerons (the control wheel) at the neutral position and select the AUTO PILOT switch on.

4 Turn knob – Rotate towards L, then R. The control wheel should rotate to left, then right.

5 Controller PITCH wheel – Rotate towards DOWN, then UP. The control column should move forward, then aft. When auto pitch trim is fitted, the elevator trim wheel will move in the same direction as the control column.

⚠ CAUTION

DO NOT MOVE THE ELEVATOR TRIM TO EITHER LIMIT OF TRAVEL BY MEANS OF THE CONTROLLER PITCH WHEEL.

6 Heading selector (if installed) – Set to directional gyro heading and select HDG SEL switch on.

a Heading selector knob – Rotate to left, then right. The flight control wheel should rotate to left, then right.

7 Directional gyro – Set and uncage, and center the controller TURN knob.

8 Taxi the airplane and turn left, then right, with nose wheel steering – the flight control wheel should turn right, then left respectively, in an attempt to return to the directional gyro heading.

9 Stop the airplane.

10 Control wheel disengage switch – Depress (or AUTO PILOT control switch off), then adjust elevator trim wheel.

9-2.4.1.3 ILS Coupling Check

ILS Coupling is an optional component that is not installed on all aircraft.

With engines operating at 75% N_G, carry out the following checks:

1 Navigation receiver – Tune to local ILS station.

2 Controller AUTO PILOT and NAV switches – On. The flight control wheel should turn in direction of ILS indicator pointer.

9-2.4.1.4 VOR Coupling Check

VOR Coupling is an optional component that is not installed on all aircraft.

With engines operating at 75% N_G carry out the following checks:

1 Navigational receiver – Tune to nearest VOR station, or local test station (VOT).

2 Omni bearing selector (OBS) – Adjust to center needle. Set the heading selector (if installed) to the directional gyro heading, then select the AUTO PILOT and NAV switches to on.

3 OBS knob – Rotate to move needle left, then right. The flight control wheel should turn left, then right.

9-2.4.2 In-Flight Procedures

9-2.4.2.1 Maneuvering with the Autopilot

The autopilot can be used to maneuver the airplane as follows:

1 **CLIMB OR DESCENT** – Move the PITCH wheel towards UP or DOWN as desired. The amount that the PITCH wheel is offset from center determines the rate of climb or descent.

2 **TURNS** – Move the TURN knob towards L or R as desired. The amount the TURN knob is offset from center determines the rate of turn. The bank angle is limited to 30° maximum.

3 **FLAPS** – Movement of flaps should be made in small increments (normally 5° of extension at one time) to enable the autopilot to compensate for the resulting trim change.

9-2.4.2.2 Navigating Using the Heading Selector

The Heading Selector is an optional component that is not installed on all aircraft.

1 Turn the heading selector knob to set the desired heading at the index mark. The maximum possible single stage turn is 180°. The autopilot will always turn the aircraft towards the heading bug in the direction that requires the least heading change. If a turn of more than 180° is desired, the heading bug must be moved in steps of less than 180° to ensure that the aircraft turns only in the desired direction.

2 Select the flight controller HDG SEL switch on. The airplane will make shortest turning arc to heading selected.

3 The heading selector can be disengaged by any of the following actions:

   a HDG SEL switch – Off

   b NAV switch – On

   c TURN knob – Move out of center temporarily.

9-2.4.2.3 Using the Altitude Control

Altitude Control is an optional component that is not installed on all aircraft.

1 ALT switch – On. The airplane will do a 1 *g* level-off to the pressure attitude at which the ALT switch was selected on.

9-2.4.2.4 Navigating Using VOR Coupling

VOR Coupling is an optional component that is not installed on all aircraft.

A 2 minute minimum waiting period between tuning a VOR station and selecting the NAV switch on is required to enable the automatic pilot computer to condition and smooth data received from the VOR.

1 Navigation receiver – Tune to desired VOR station

2 Set the Omni bearing selector (OBS) to the desired VOR heading if the aircraft heading is within 10° of the desired VOR course, otherwise, use the TURN knob to bring the heading within 10° of the desired VOR course, or; set the OBS and heading selector (if installed) to the heading required to fly to the VOR.

3 Controller AUTO PILOT and NAV switches – On

4 At the station – To fly outbound, proceed as follows:

   a If the outbound heading is within 30° of inbound heading – Reset the OBS and heading selector.

   b If the outbound heading is more than a 30° change from inbound heading – Use the TURN knob to complete the turn, then reset the OBS and heading selector, then select the NAV switch on.

9-2.4.2.5 ILS Coupling

ILS Coupling is an optional component that is not installed on all aircraft.

A 19 second minimum waiting period is required after tuning the localizer before selecting the NAV switch to on. The procedure below only addresses use of the automatic pilot, therefore this procedure is additional to the standard approach procedures (for example, descent, approach, and pre-landing checklists).

1 Navigation receiver – Tune to the ILS or localizer station.

2 Controller AUTO PILOT switch – On

3 TURN knob and PITCH wheel – Use as required to fly normal ILS approach pattern.

4 At 3 dots localizer deflection – Select the NAV switch on. The automatic pilot will automatically begin to follow both the localizer beam and the glide path, disengaging the ALT hold function when the glideslope is captured (if the ALT hold function was in use).

5 Lower the flaps in small increments (normally 5° at a time) as desired.

6 When established on glide path – Control speed with power levers.

7 At minima – Depress the automatic pilot disengage switch and take over manual control.

9-2.4.2.6 Disengaging the Autopilot

The autopilot may be disengaged by any one of the following methods:

1 Depressing the A/P OFF disengage button switch.

2 Selecting the controller AUTO PILOT switch to off.

3 Pulling out the AUTO PILOT circuit breaker.

Normal disengagement of the autopilot the system requires approximately 2 seconds for all of the servos to completely disconnect from the flight controls. If manual control is attempted before the completion of this period, or if disengagement is made while holding a force on the controls, a resisting force will be experienced. This is a completely normal situation which in no way restricts control of the airplane. This resisting force can be overcome by the pilot and, if the situation allows, a subsequent momentary relaxation of effort will enable the servos to fully disengage.

9-2.5 Performance

There are no changes to aircraft performance data when the automatic pilot is fitted to the aircraft or the automatic pilot is in use.

9-2.6 Weight and Balance

Optional equipment described in this supplement will be listed in Part 2 of PSM 1-63-8.

9-2.7 System Description

9-2.7.1 General

The H-14 automatic pilot flight control system provides three-axis stability augmentation, pitch trim and altitude hold, turn command, and lift compensation in turns. The system can also be utilized in conjunction with a navigation receiver to provide automatic control during VOR and ILS procedures.

9-2.7.2 System Description

The system comprises: aileron, elevator and rudder servo actuators which are pneumatically powered through a solenoid engage air valve; a computer; a flight controller and an A/P disengage switch. Optional components that can be installed include: a heading selector, automatic pitch trim, and automatic ILS and VOR coupling. The automatic pilot system is powered from the 28 volt left DC bus through a 5 ampere AUTO PILOT circuit breaker located on the radio circuit breaker panel on the lower portion of the flight compartment center pedestal.

9-2.7.3 System Components

9-2.7.3.1 Servo Actuators and Solenoid Engage Air Valve

The elevator and rudder servos are located near floor level, aft of station 332, and the aileron servo is located on the lower rear right side of the flight compartment outboard of the right pilot seat. The servos are powered by the aircraft bleed air pneumatic system and controlled by a solenoid engage air valve which is energized to the open position when the automatic pilot AUTO PILOT switch is on. The servos respond to commands relayed from the autopilot computer to control the aircraft flight path.

9-2.7.3.2 Computer

The automatic pilot computer, located either in the right side of the instrument panel or beneath the flight compartment floor, interprets and computes corrective signals which are sent to the servos to control the aircraft flight path. The computer is a transistorized unit which produces its own regulated AC and DC outputs.

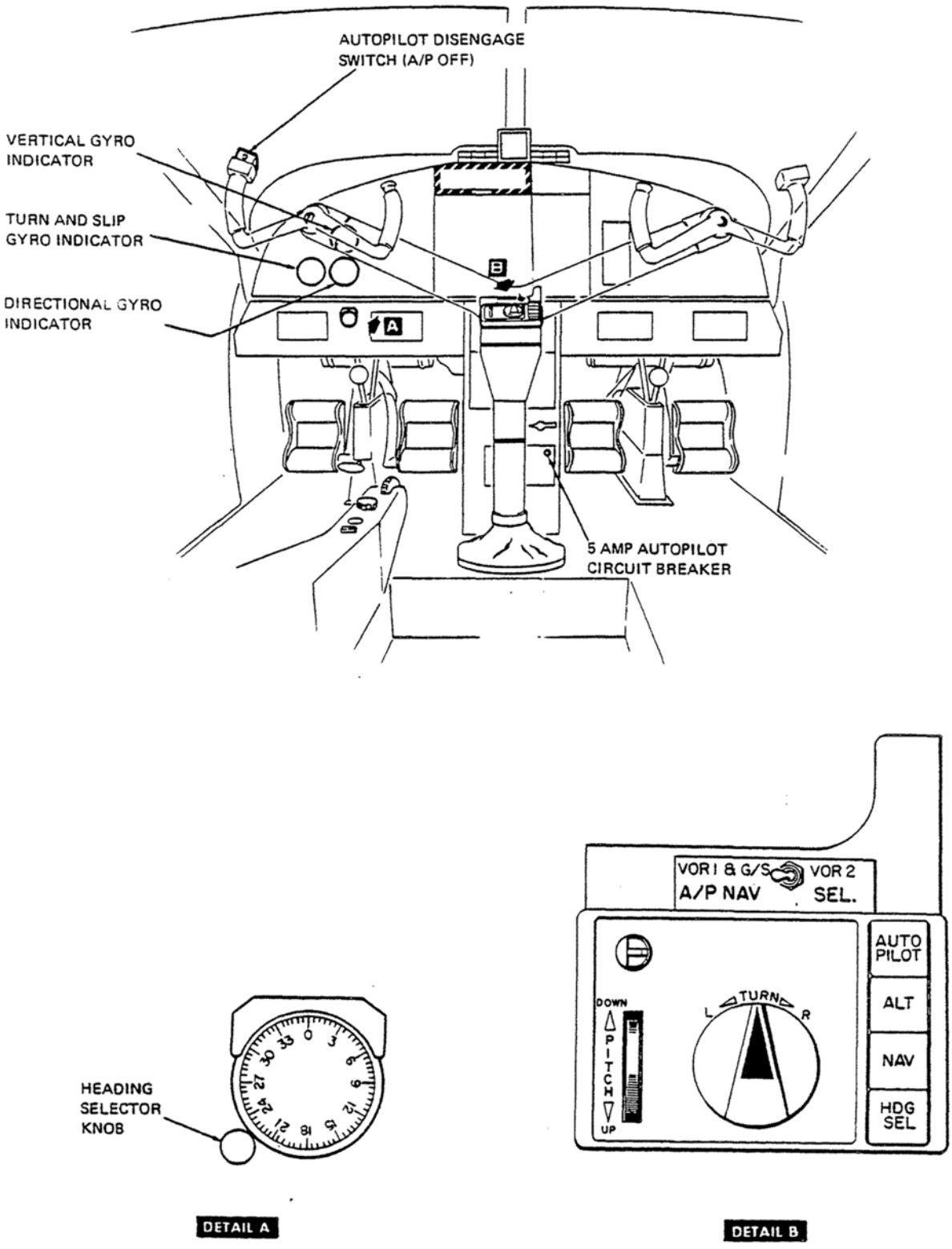


Figure 9-2-1 H-14 Automatic Pilot Components

9-2.7.3.3 Flight Controller

The automatic pilot flight controller (Figure 9-2-1 detail B) is attached to the aft face of the control column and contains the following controls: a knurled wheel marked PITCH with positions DOWN (forward) and UP (rear) for control of pitch attitude, with a pitch trim indicator forward of the wheel; a knob marked TURN with arrowed L and R directions for control of direction; four push-on, push-again-for-off type switches labelled AUTO PILOT (the master switch), ALT (altitude hold), NAV (navigation), and HDG SEL (heading select). The AUTO PILOT switch is the main control of computer output signals to the automatic pilot system and the control for the solenoid engage air valve of the pneumatic system.

9-2.7.3.4 Automatic Pilot Disengage Switch

The automatic pilot disengage switch is a button type marked A/P OFF, mounted above the left pilot's (and/or the right pilot's) radio transmit switch on the outboard handgrip of the flight control wheel.

Depressing the button de-energizes the electrical power supply to the AUTO PILOT switch and air valve to permit the pilot to manually maneuver the aircraft. When the button is released electrical power is restored but the flight controller switches must be reset to regain normal autopilot operation.

9-2.7.3.5 Automatic Pilot Dual VOR G/S Selector

The automatic pilot dual VOR G/S selector may be installed as optional equipment in conjunction with dual VOR receivers. When installed, the selector switch is located on a mounting plate above the flight controller; it is marked A/P NAV SEL with positions VOR 1 & G/S and VOR 2. When the switch is set in either position it connects the selected VOR signal to the automatic pilot computer. This controls the aircraft when the NAV switch on the flight controller is selected on.

SECTION 9 – SUPPLEMENT 3

OXYGEN SYSTEM

This Page Intentionally Left Blank

PSM 1-63-1A

SECTION 9 (T.C. Approved)

SUPPLEMENT 3

OXYGEN SYSTEMS

S.O.O. 6044, 6101

Approved: _____
Chief, Flight Test
Transport Canada

Date: 19 Jan 2011

Issue 1

LIST OF EFFECTIVE PAGES

SECTION	PAGE	DATE	SECTION	PAGE	DATE
9-3	1	19 Jan. 2011		11	19 Jan. 2011
	2	19 Jan. 2011		12	19 Jan. 2011
	3	19 Jan. 2011		13	19 Jan. 2011
	4	19 Jan. 2011		14	19 Jan. 2011
	5	19 Jan. 2011		15	19 Jan. 2011
	6	19 Jan. 2011		16	19 Jan. 2011
	7	19 Jan. 2011		17	19 Jan. 2011
	8	19 Jan. 2011		18	19 Jan. 2011
	9	19 Jan. 2011		19	19 Jan. 2011
	10	19 Jan. 2011		20	19 Jan. 2011

This Page Intentionally Left Blank

TABLE OF CONTENTS **PAGE**

9-3.1 General **7**

9-3.2 Limitations **8**

9-3.3 Emergency and Abnormal Procedures **9**
9-3.3.1 Crew Oxygen System – Provision of Pure Oxygen 9
9-3.3.2 Crew Oxygen System – Provision of Constant Positive Pressure 9
9-3.3.3 Passenger Oxygen System – Provision of Passenger Oxygen to Flight Crew 9
9-3.3.4 Passenger Oxygen System – Emergency Shut-Off 9

9-3.4 Normal Procedures **10**
9-3.4.1 Crew Oxygen System 10
9-3.4.1.1 Pre-Flight Procedures 10
9-3.4.1.2 Operation 10
9-3.4.1.3 To Turn Off Crew Oxygen Supply 11
9-3.4.2 Passenger Oxygen System 11
9-3.4.2.1 Pre-Flight Procedures 11
9-3.4.2.2 Operation 11
9-3.4.2.3 To Turn Off Passenger Oxygen Supply 12

9-3.5 Performance **13**

9-3.6 Weight and Balance **15**

9-3.7 System Description **16**
9-3.7.1 Crew Oxygen System 16
9-3.7.1.1 Oxygen Regulators 16
9-3.7.2 Passenger Oxygen System 17

List of Figures Page

9-3-1 Crew Oxygen System Duration Chart 13
9-3-2 Passenger Oxygen System Duration Chart 14
9-3-3 Crew Oxygen System Components 16
9-3-4 Passenger Oxygen System Components 18
9-3-5 Oxygen System Schematic (Crew and Passenger) 19

This Page Intentionally Left Blank

9-3.1 General

This supplement describes both the crew oxygen system (S.O.O. 6044) and the passenger oxygen system (S.O.O. 6101). It is possible to have the crew oxygen system fitted without the passenger oxygen system. The crew oxygen system is a prerequisite for installing the passenger oxygen system.

Both systems are described in this supplement.

Two additional variations of crew oxygen systems were offered (by special order) for military or research aircraft. An oxygen system for a crew of 6, with 115 cubic foot oxygen capacity is described in Supplement 24. An oxygen system for a crew of 6, with 275 cubic foot oxygen capacity (Engineering Order 68958) is described in Supplement 34.

9-3.2 Limitations

The limitations published in Section 2 of the AFM apply. The following additional limitations apply:

1 Smoking is prohibited whenever the crew or passenger oxygen system is in use.

2 Only fill the oxygen system with Aviator's Breathing Oxygen, specification MIL-O-27210.

WARNING

OIL, GREASE, SOAP, LIPSTICK, LIP BALM AND OTHER FATTY MATERIALS CONSTITUTE A SERIOUS FIRE HAZARD WHEN IN CONTACT WITH OXYGEN. BE SURE THAT YOUR FACE, HANDS AND CLOTHING ARE CLEAN AND OIL FREE BEFORE HANDLING OXYGEN EQUIPMENT.

WARNING

THE EFFICIENCY OF THE SEAL OF THE OXYGEN MASK TO THE FACE IS SEVERELY CURTAILED WHEN USED BY PERSONS WITH BEARDS OR HEAVY FACIAL HAIR. THE OXYGEN ENDURANCE CHARTS PROVIDED Figure 9-3-1 AND Figure 9-3-2 MAKE NO PROVISIONS FOR SUCH APPLICATIONS.

9-3.3 Emergency and Abnormal Procedures

The emergency and abnormal procedures published in Section 3 of the AFM apply whenever one or both oxygen systems are in use. In addition, the following emergency and abnormal procedures apply.

WARNING

WITH THE CREW OXYGEN PANEL DILUTER SWITCH AT 100% POSITION OR THE CREW OXYGEN PANEL PRESSURE SUPPLY SWITCH AT THE EMERGENCY POSITION, THE NORMAL DURATION OF THE OXYGEN SUPPLY WILL BE REDUCED. IT IS THEREFORE ESSENTIAL THAT OXYGEN MASKS ARE CORRECTLY FITTED TO PREVENT LEAKAGE.

9-3.3.1 Crew Oxygen System – Provision of Pure Oxygen

If any doubt exists regarding the oxygen flow, placing the diluter switch in the 100% OXYGEN position will supply pure oxygen to the user's mask. The diluter system will be bypassed. If smoke or other toxic or noxious fumes are present in the cabin, the diluter switch should be placed in the 100% OXYGEN position.

9-3.3.2 Crew Oxygen System – Provision of Constant Positive Pressure

If any doubt exists regarding the oxygen flow, placing the pressure supply switch at the EMERGENCY position will supply constant positive pressure oxygen to the user's mask regardless of altitude. The pressure regulator system will be bypassed.

9-3.3.3 Passenger Oxygen System – Provision of Passenger Oxygen to Flight Crew

An oxygen transfer valve is located below the passenger supply shut-off valve to enable oxygen from the passenger system to be supplied to the crew system. If necessary, the passenger supply shut-off valve can be CLOSED to direct all passenger oxygen to the crew.

9-3.3.4 Passenger Oxygen System – Emergency Shut-Off

The oxygen shut-off valve in the rear baggage compartment can be used to stop the oxygen flow to the passenger oxygen mask distribution system if this is necessary in the event of an emergency.

9-3.4 Normal Procedures

9-3.4.1 Crew Oxygen System

9-3.4.1.1 Pre-Flight Procedures

In addition to other interior checks normally completed before starting engines, proceed as follows:

1 Check the supply pressure of the oxygen system on the left or right pilot regulator panel.

2 Clean the oxygen mask prior to use.

Fit the oxygen mask to face, adjust for proper fit, connect the mask to the regulator panel and check oxygen flow as follows:

3 Supply switch (green) – ON

4 Diluter switch (white) – NORMAL OXYGEN

5 Pressure supply switch (red) – TEST MASK. Observe flow on flow indicator on regulator panel. Select diluter switch to 100% and recheck flow. Release pressure supply switch to NORMAL and return diluter switch to NORMAL OXYGEN.

6 Supply switch – OFF

7 Stow mask.

8 Determine from the Oxygen Duration Chart Figure 9-3-1 if the oxygen supply is sufficient for the intended flight. Recharge the oxygen system if necessary.

9-3.4.1.2 Operation

When oxygen is desired, proceed as follows:

1 Fit mask to face, adjust for proper fit, and connect mask to regulator panel.

2 Supply switch (green) – ON

3 Diluter switch (white) – NORMAL OXYGEN

4 Pressure supply switch (red) – NORMAL

5 Check oxygen flow by observing indicator on the regulator panel.

9-3.4.1.3 To Turn Off Crew Oxygen Supply

When oxygen is no longer desired, proceed as follows:

1 Supply switch (green) – OFF

2 Diluter switch (white) – NORMAL OXYGEN

3 Remove masks and stow.

9-3.4.2 Passenger Oxygen System

9-3.4.2.1 Pre-Flight Procedures

In addition to other interior checks normally completed before starting engines, proceed as follows:

1 Open the oxygen shut-off valve on the aft face of the rear baggage compartment bulkhead, and check the supply pressure of the constant-flow system on the gauge which is located on the panel attached to flight compartment rear bulkhead, behind the right pilot seat.

Check the oxygen flow to the passenger system as follows:

2 Passenger oxygen system supply shut-off valve – OPEN position.

3 Connect a passenger oxygen mask to a constant-flow outlet. Check flow on the indicator in the flexible tubing between the outlet and the mask.

4 Disconnect and stow the passenger mask.

5 Passenger oxygen system supply shut-off valve – CLOSED position.

6 Determine by reference to the Passenger Oxygen Duration Chart (Figure 9-3-2) if the oxygen supply is sufficient for the intended flight. Recharge the passenger oxygen system if necessary.

9-3.4.2.2 Operation

When oxygen is required for the passengers, proceed as follows:

1 Passenger oxygen system supply shut-off valve – OPEN position

2 Check all passengers have their masks fitted correctly and that each is connected to an appropriate outlet.

3 Ensure that all passengers understand how to monitor flow to their mask by observing the flow indicator in the tubing of their mask. Oxygen is flowing if the indicator is being forced towards the mask.

9-3.4.2.3 To Turn Off Passenger Oxygen Supply

When oxygen is no longer required, proceed as follows:

1 Supervise removal and stowage of all passengers' masks.

2 Passenger oxygen system supply shut-off valve – CLOSED position

9-3.5 Performance

Aircraft performance is not affected when crew and/or passenger oxygen equipment is installed or in use.

The following two charts are provided to assist in estimating oxygen consumption.

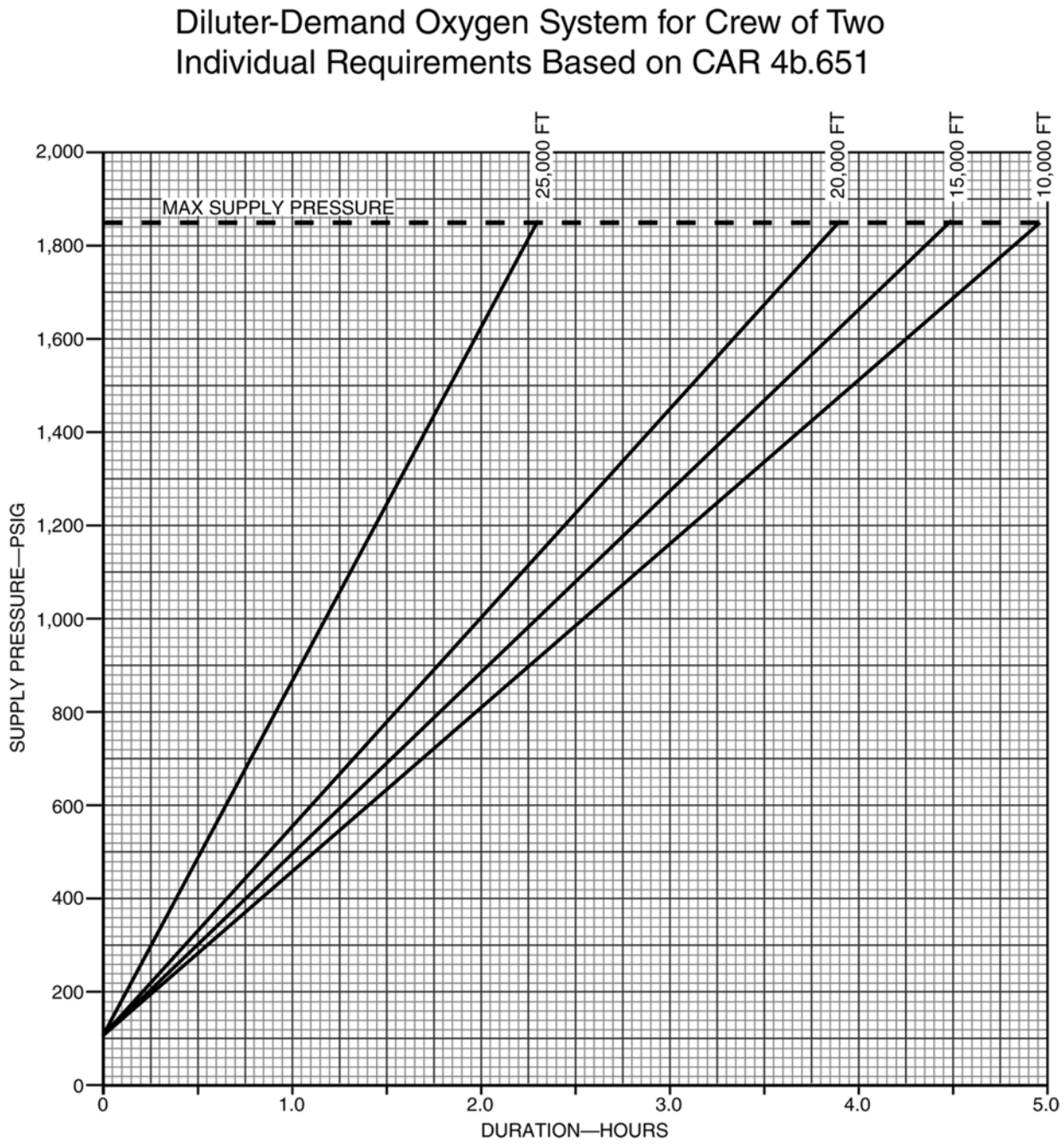


Figure 9-3-1 Crew Oxygen System Duration Chart

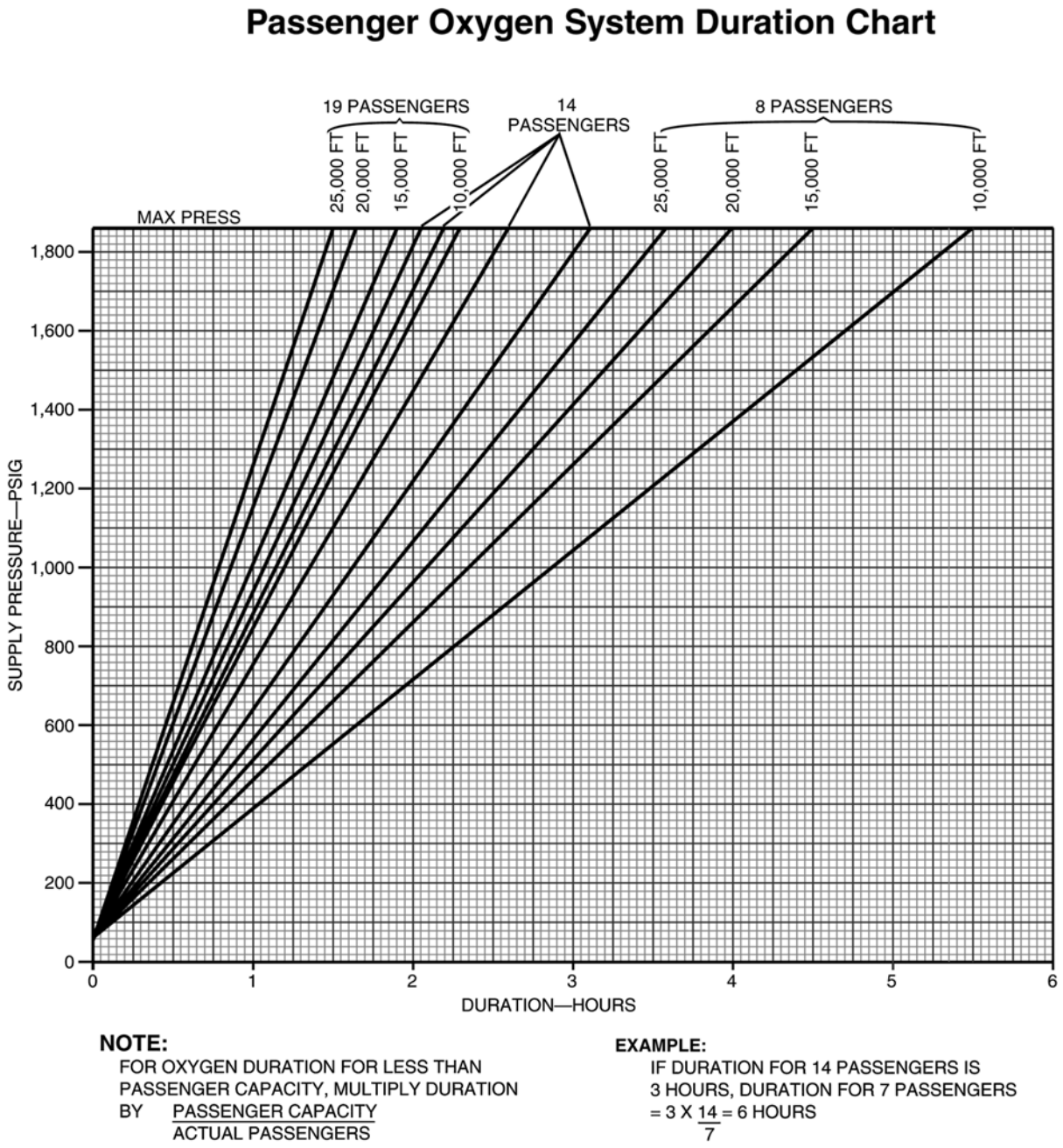


Figure 9-3-2 Passenger Oxygen System Duration Chart

9-3.6 Weight and Balance

Optional equipment described in this supplement will be listed in Part 2 of PSM 1-63-8.

9-3.7 System Description

9-3.7.1 Crew Oxygen System

S.O.O. 6044 consists of a diluter demand oxygen system for use by the pilot and co-pilot. The system consists of an oxygen cylinder containing gaseous oxygen, located in the nose compartment, connected by high pressure tubing to two oxygen regulators, one for each pilot, located below the flight instrument panels. An oxygen hose connection for each pilot is located on the inside of each flight compartment door. The oxygen cylinder is recharged through a filler connection in the nose compartment and an adjacent pressure gauge indicates the pressure in the cylinder. The charging pressure is 1,800 ±50 PSI.

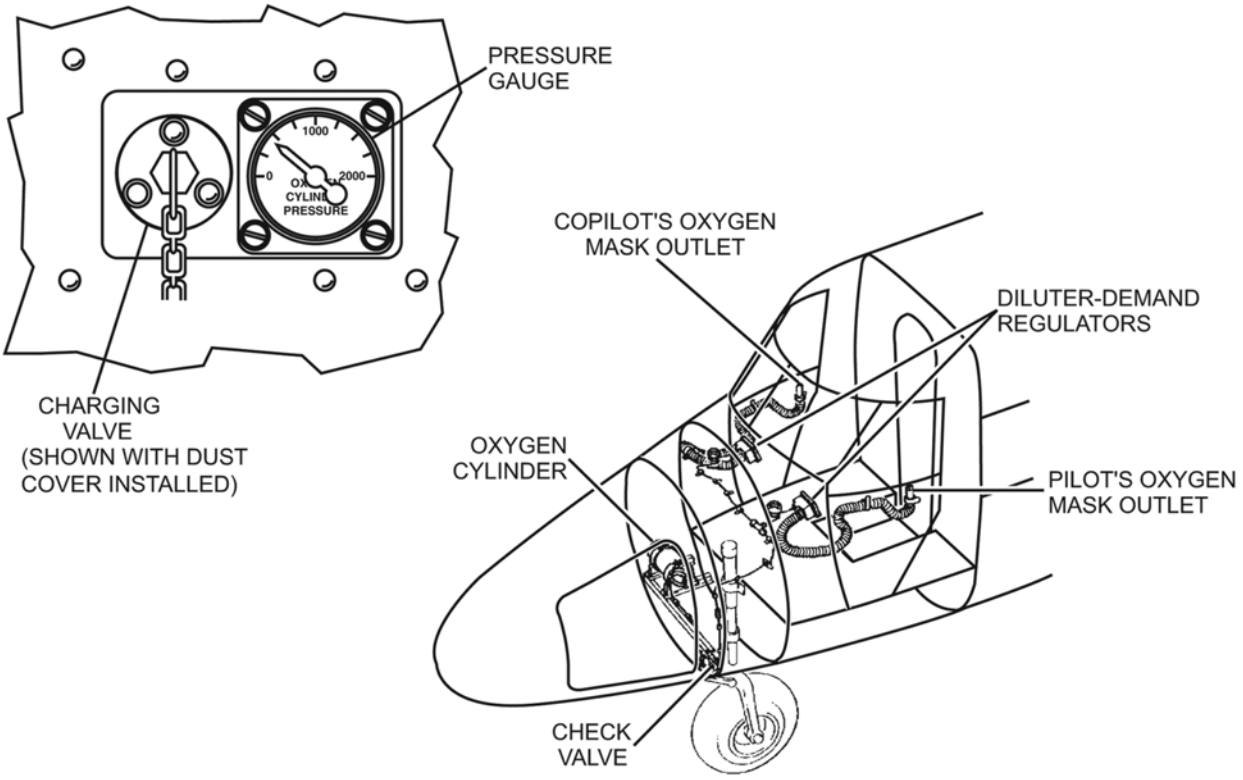


Figure 9-3-3 Crew Oxygen System Components

9-3.7.1.1 Oxygen Regulators

The panel mounted oxygen regulators are marked OXYGEN REGULATOR PRESSURE DEMAND and each is illuminated by a center eyebrow type light. Each regulator has a gauge marked OXYGEN PSI calibrated from 0 – 2,000 PSI with FULL at 1,800 PSI, a blinker indicator marked FLOW which shows that oxygen is flowing on demand to the user's mask, and three individually coloured switches which control the oxygen supply flow as follows:

1 Supply Switch (Green Colour). The supply two-position switch on the right of the regulator panel is marked SUPPLY with ON and OFF at the up and down positions respectively. The switch is used to control the supply of oxygen at each regulator.

2 Diluter Switch (White Colour). The diluter two-position switch on the lower center of the regulator panel is marked 100% OXYGEN and NORMAL OXYGEN at the up and down positions respectively. With the switch at NORMAL OXYGEN position the oxygen passes through a diluter demand route for normal operation. At 100% OXYGEN position the air valve of the diluter demand route is closed and pure oxygen is fed to the user's mask; this position should be selected if any doubt exists regarding the oxygen supply. When 100% OXYGEN is used, the duration of the oxygen supply will be reduced.

3 Pressure Supply Switch (Red Colour). The pressure supply three-position switch on the left of the regulator panel is marked EMERGENCY and NORMAL at the up and center positions respectively, and TEST MASK at the down (momentary) position which is selected against a spring tension. The switch should be at NORMAL position for routine operation to allow regulated oxygen pressure to be supplied to the user. At EMERGENCY position a continuous positive pressure of oxygen is supplied to the user regardless of altitude, to prevent hypoxia or unconsciousness. When the switch is held at TEST MASK position, oxygen at positive pressure is supplied to test the user's mask for leaks.

When positive oxygen pressures are required, it is essential that the oxygen mask be well fitted to the face. Unless special precautions are taken to ensure that there is no leakage, continued use of positive pressure will result in the rapid depletion of the oxygen supply.

9-3.7.2 Passenger Oxygen System

S.O.O. 6101 consists of a constant flow oxygen system to supply the passengers. Oxygen is supplied from two high pressure cylinders installed in the aft baggage compartment extension shelf area. The cylinders are charged through a filler connection aft of the rear baggage compartment door. An adjacent pressure gauge indicates the pressure in the cylinders. The charging pressure is 1,800 PSI. A shut-off valve, located on the aft face of the rear baggage compartment bulkhead above the door, can be used to shut off the oxygen in an emergency.

Oxygen is delivered through an automatic continuous flow regulator to an outlet above or beside each passenger seat, to which a semi-disposable oxygen mask can be connected. An oxygen control panel attached to the flight compartment bulkhead contains the automatic continuous flow regulator, a shut-off valve, a transfer valve and a pressure gauge. The shut-off valve enables the crew to shut off the passenger supply, and the transfer valve to direct the passenger supply to the crew. The pressure gauge indicates the oxygen pressure available in the cylinders.

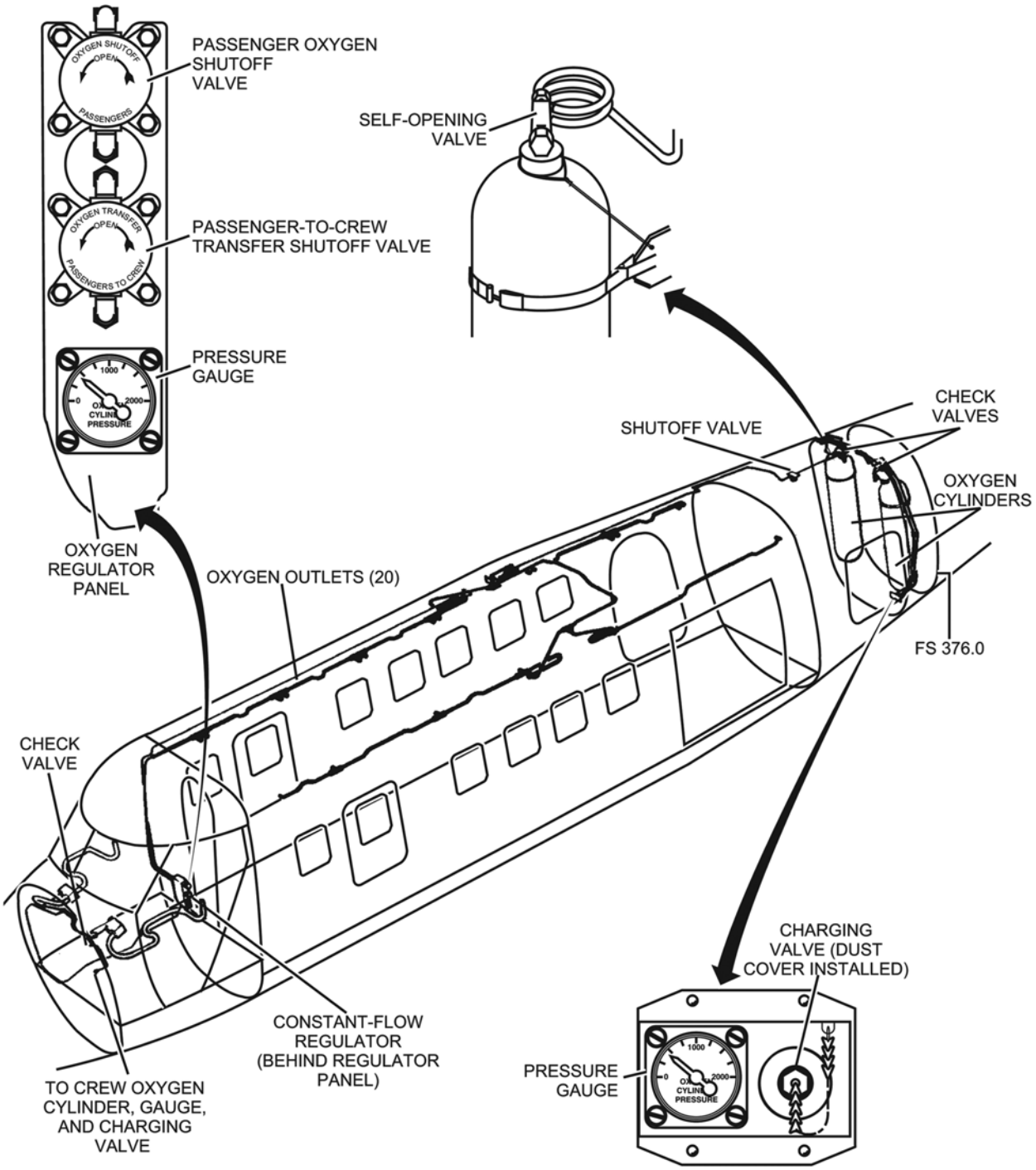


Figure 9-3-4 Passenger Oxygen System Components

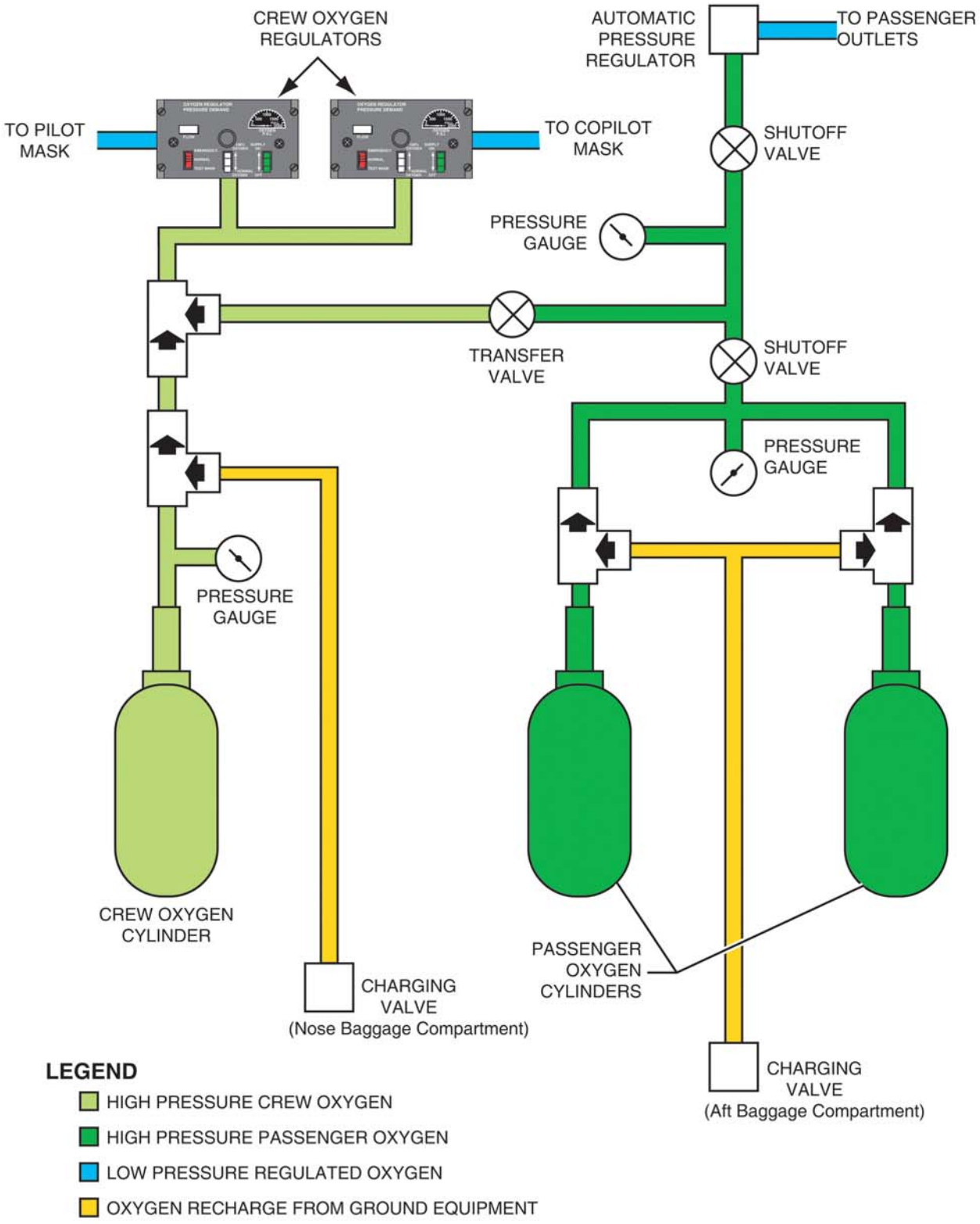


Figure 9-3-5 Oxygen System Schematic (Crew and Passenger)

This Page Intentionally Left Blank

SECTION 9 – SUPPLEMENT 5

INTERMEDIATE FLOTATION GEAR

This Page Intentionally Left Blank

PSM 1-63-1A

SECTION 9 (T.C. Approved)

SUPPLEMENT 5

INTERMEDIATE FLOATATION GEAR

S.O.O. 6048

Approved: _____
for Chief, Flight Test
Transport Canada

Date: 19 Jan 2011

Issue 3

LIST OF EFFECTIVE PAGES

SECTION	PAGE	DATE	SECTION	PAGE	DATE
9-5	1	19 Jan. 2011		19	19 Jan. 2011
	2	19 Jan. 2011		20	19 Jan. 2011
	3	19 Jan. 2011		21	19 Jan. 2011
	4	19 Jan. 2011		22	19 Jan. 2011
	5	19 Jan. 2011		23	19 Jan. 2011
	6	19 Jan. 2011		24	19 Jan. 2011
	7	19 Jan. 2011		25	19 Jan. 2011
	8	19 Jan. 2011		26	19 Jan. 2011
	9	19 Jan. 2011		27	19 Jan. 2011
	10	19 Jan. 2011		28	19 Jan. 2011
	11	19 Jan. 2011		29	19 Jan. 2011
	12	19 Jan. 2011		30	19 Jan. 2011
	13	19 Jan. 2011		31	19 Jan. 2011
	14	19 Jan. 2011		32	19 Jan. 2011
	15	19 Jan. 2011		33	19 Jan. 2011
	16	19 Jan. 2011		34	19 Jan. 2011
	17	19 Jan. 2011		35	19 Jan. 2011
	18	19 Jan. 2011		36	19 Jan. 2011

This Page Intentionally Left Blank

TABLE OF CONTENTS **PAGE**

9-5.1 General **7**

9-5.2 Limitations **8**

9-5.3 Emergency and Abnormal Procedures **9**

9-5.4 Normal Procedures **10**

9-5.5 Performance Data and Charts **11**
9-5.5.1 General 11
9-5.5.2 List of Replacement Performance Charts 12
9-5.5.3 List of AFM Section 5 Charts that are not Applicable to IFG 12
9-5.5.4 Maximum Take-Off Weight – Single Engine Climb with Feathered Propeller 14
9-5.5.5 Take-Off Rate of Climb, Both Engines Operating 16
9-5.5.6 Take-Off Gradient of Climb, Both Engines Operating 18
9-5.5.7 Enroute Rate of Climb, Single Engine, Propeller Feathered 22
9-5.5.8 Enroute Gradient of Climb, Single Engine, Propeller Feathered 24
9-5.5.9 Balked Landing Rate of Climb 28
9-5.5.10 Balked Landing Gradient of Climb 32

List of Figures Page

9-5-1 Maximum Take-Off Weight – OEI Take-Off Climb with Feathered Propeller 15
9-5-2 Take-Off Rate of Climb, Both Engines Operating 17
9-5-3 Take-Off Gradient of Climb, Both Engines Operating 21
9-5-4 Enroute Rate of Climb – Single Engine, Propeller Feathered 23
9-5-5 Enroute Gradient of Climb – Single Engine, Propeller Feathered 27
9-5-6 Balked Landing Rate of Climb 31
9-5-7 Balked Landing Gradient of Climb 35

This Page Intentionally Left Blank

9-5.1 General

Intermediate flotation gear consists of three standard 11.00 x 12 wheels, fitted with 15.00 by 12 tires. A special nose landing gear fork is installed to accommodate the larger nose wheel. Either Dunlop or Goodyear tires may be fitted, the procedures and performance data are identical for both. A modified nose wheel shimmy damper (Mod 6/1321, TAB 619/6 refers) may be present on aircraft equipped with intermediate flotation gear; however, the presence or absence of this modified shimmy damper does not affect procedures or performance.

Intermediate flotation gear was available as a factory installed option by S.O.O. 6048.

9-5.2 Limitations

The operating limitations detailed in Section 2 of the main body of the AFM apply when intermediate flotation gear is fitted.

9-5.3 Emergency and Abnormal Procedures

The emergency procedures detailed in Section 3 of the main body of the AFM apply when intermediate flotation gear is fitted.

9-5.4 Normal Procedures

The Operating Procedures detailed in Section 4 of the main body of the AFM apply.

Because of the flexibility of the large low-pressure tire casings, some lateral movement of the airplane can be expected in crosswind take-offs and landings. Depending upon the type of surface, consideration should be given to the possibility of lateral movement when taking off or landing in crosswind conditions as discussed in Section 4, para 4.10.1 and 4.16.1.

A longer jury strut is available for use on aircraft fitted with intermediate flotation gear, Mod 6/1411 (TAB 632/1) and Mod 6/1549 refers.

An additional fuselage fuel tank drain (Mod 6/1498) may be fitted to aircraft equipped with intermediate flotation gear, SB 6/313 refers.

9-5.5 Performance Data and Charts

9-5.5.1 General

Performance charts provided in Section 5 of the main body of the AFM apply when intermediate flotation gear (IFG) is fitted, except that both two-engine and single-engine climb performance will be degraded as a result of the additional drag created by the larger wheels and tires. Seven replacement performance charts are provided in this supplement to address the degraded climb performance.

Take-off distances will vary considerably depending on airfield surface characteristics. The take-off distances published in Section 5 of the main body of the AFM apply to aircraft fitted with intermediate flotation gear, however, it must be understood that all of these take-off distances are based on dry, hard, level surfaces. Operators who fit intermediate flotation gear to their aircraft generally do so in anticipation of operating on surfaces that are not dry, hard, or level. Therefore, the operator must consider and allow for degradation in take-off performance arising from the unique characteristics of each airfield at which operations are planned.

9-5.5.2 List of Replacement Performance Charts

The following seven charts replace the data provided in Section 5 of the main body of the AFM when intermediate flotation gear is fitted. These seven charts comply with CAR 3 certification requirements.

Figure	Chart Title	Replaces AFM Section 5 Chart
Figure 9-5-1	Maximum Permissible Take-Off Weight OEI Enroute Climb – IFG	Replaces Figure 5-12.
Figure 9-5-2	Take-Off Gross Rate of Climb – IFG	Replaces Figure 5-19.
Figure 9-5-3	Take-Off Gross Climb Gradient – IFG	Replaces Figure 5-20.
Figure 9-5-4	Enroute Gross Rate of Climb – IFG (OEI)	Replaces Figure 5-25.
Figure 9-5-5	Enroute Gross Climb Gradient – IFG (OEI)	Replaces Figure 5-26.
Figure 9-5-6	Balked Landing Rate of Climb – IFG	Replaces Figure 5-27.
Figure 9-5-7	Balked Landing Gradient of Climb – IFG	Replaces Figure 5-28.

9-5.5.3 List of AFM Section 5 Charts that are not Applicable to IFG

The following charts from Section 5 of the main body of the AFM must not be used when intermediate flotation gear (IFG) is fitted because the data presented in these charts is only applicable to aircraft with standard landplane gear.

Figure	Chart Title
5-13	Maximum Take-Off Weight – OEI Take-Off Climb with Windmilling Propeller
5-24	Take-Off Gradient of Climb – Single Engine, Propeller Windmilling

This Page Intentionally Left Blank

9-5.5.4 Maximum Take-Off Weight – Single Engine Climb with Feathered Propeller

Conditions associated with this chart

Flaps set at take-off position (10°), intake deflectors retracted (see note below if deflectors are extended), one engine inoperative with the propeller feathered, the other engine set to Take-off Power (see "Take-Off Power Setting" chart for that value), speed according to chart inset. Calculation basis CAR 3.85(b).

Interpretive Guidance

This chart is used to determine the maximum allowable take-off weight permitted to ensure a positive rate of climb at Take-off Power for an aircraft with one engine inoperative (OEI) and the propeller of that engine feathered. This chart may only be used if the autofeather system is installed, operational, and selected on prior to take-off.

The structural limits for the maximum take-off and landing weights are given in Section 5 para 5.4.1 of the main body of the AFM.

One engine inoperative enroute climb requirement of CAR Part 3 and special conditions are met at the maximum structural weight.

Example Calculation

No example calculation is provided, because the chart shows that as long as pressure altitude is equal to or less than 5,000 feet and ambient air temperature is less than ISA +22.5°C, the maximum take-off weight is limited by the structural limitation, not by a performance limitation.

No data is provided to allow determination of compliance at pressure altitudes greater than 5,000 feet.

If intake deflectors are extended, add 3°C to actual airfield temperature and use that value to enter the chart.

MAXIMUM PERMISSIBLE TAKE-OFF WEIGHT
AT OR BELOW 5,000 FEET

INTERMEDIATE FLOTATION GEAR

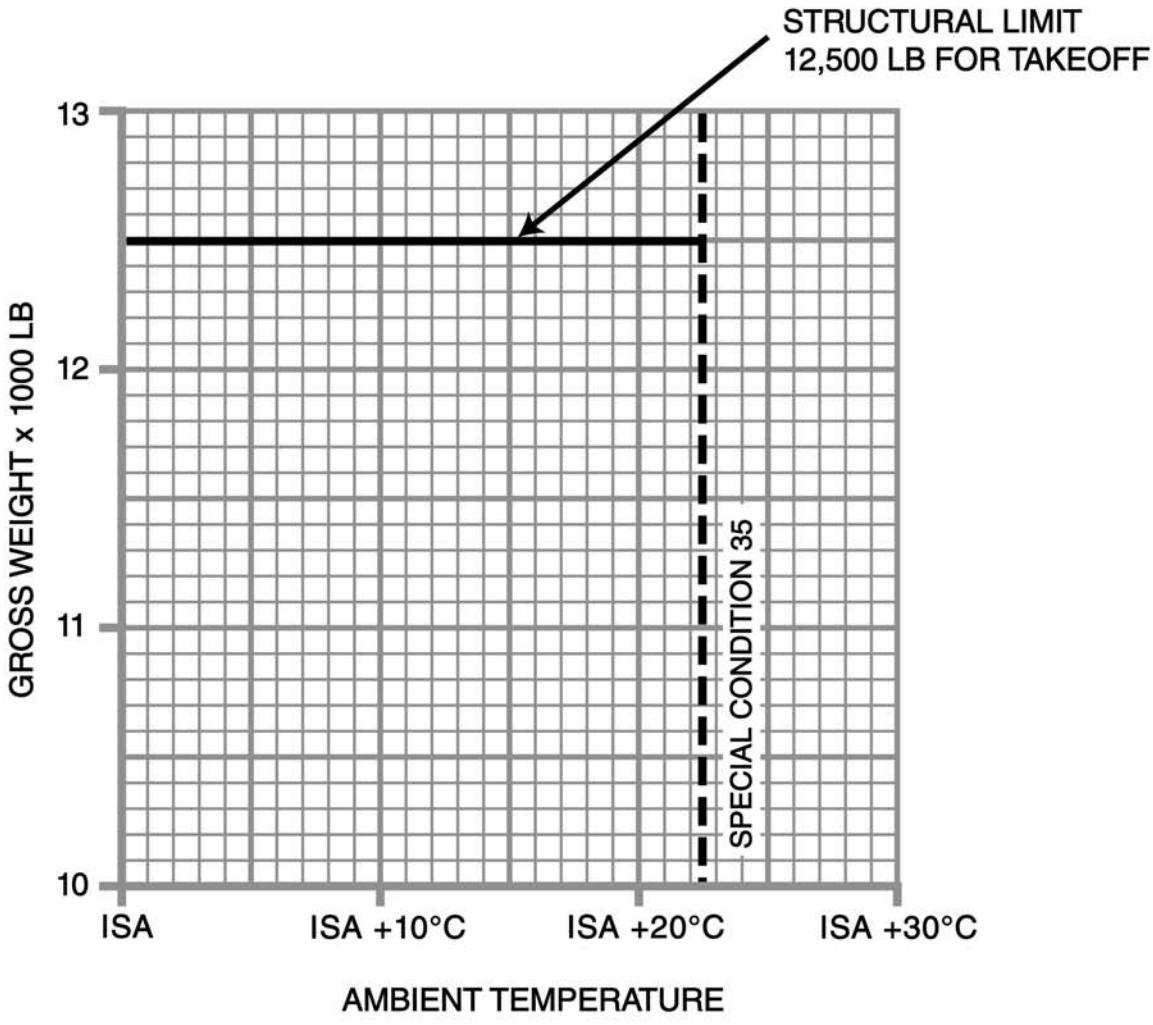


Figure 9-5-1 Maximum Take-Off Weight – OEI Take-Off Climb with Feathered Propeller

9-5.5.5 Take-Off Rate of Climb, Both Engines Operating

Conditions associated with this chart

Flaps set at take-off position (10°), intake deflectors retracted (see note below if deflectors are extended), both engines set to Take-off Power, propeller speed 96% (see "Take-Off Power Setting" chart for that value), climb speed according to chart inset. Calculation basis CAR 3.85(a).

Interpretive Guidance

This chart provides the initial gross take-off rate of climb in feet per minute when both engines are set to Take-off Power and the aircraft speed is maintained at the value determined from the inset chart.

Example Calculation (dotted line)

Determine take-off rate of climb at an air temperature of +13°C, pressure altitude of 6,000 feet, and aircraft weight of 11,000 pounds.

1 Enter the chart from the lower left at the outside air temperature (+13°C). Continue vertically up until reaching the pressure altitude (6,000 feet). Proceed horizontally right until reaching the gross weight reference line.

2 Proceed diagonally up and to the right between the guidelines until reaching the aircraft weight (11,000 pounds). Exit horizontally right to determine take-off rate of climb (1,480 feet per minute).

3 Enter the inset chart from the bottom at the aircraft weight (11,000 pounds). Proceed right from the reference line to exit at the best rate of climb speed for the take-off configuration, which is 75 KIAS.

Summary of Example Calculation

At an air temperature of 13°C, pressure altitude of 6,000 feet, and aircraft weight of 11,000 pounds, the take-off rate of climb will be 1,480 feet per minute at 75 KIAS.

This chart assumes use of Take-off Power, which is normally only used until flap retraction is completed. Flap retraction is initiated either upon reaching 400 feet AGL or after clearing all obstacles in the take-off area, whichever comes later.

The calculated take-off rate of climb will only be achieved if the initial climb speed (determined from the inset chart) is maintained.

If intake deflectors are extended and Take-off Power is less than 50 PSI, deduct 30 feet per minute from the value derived from this chart.

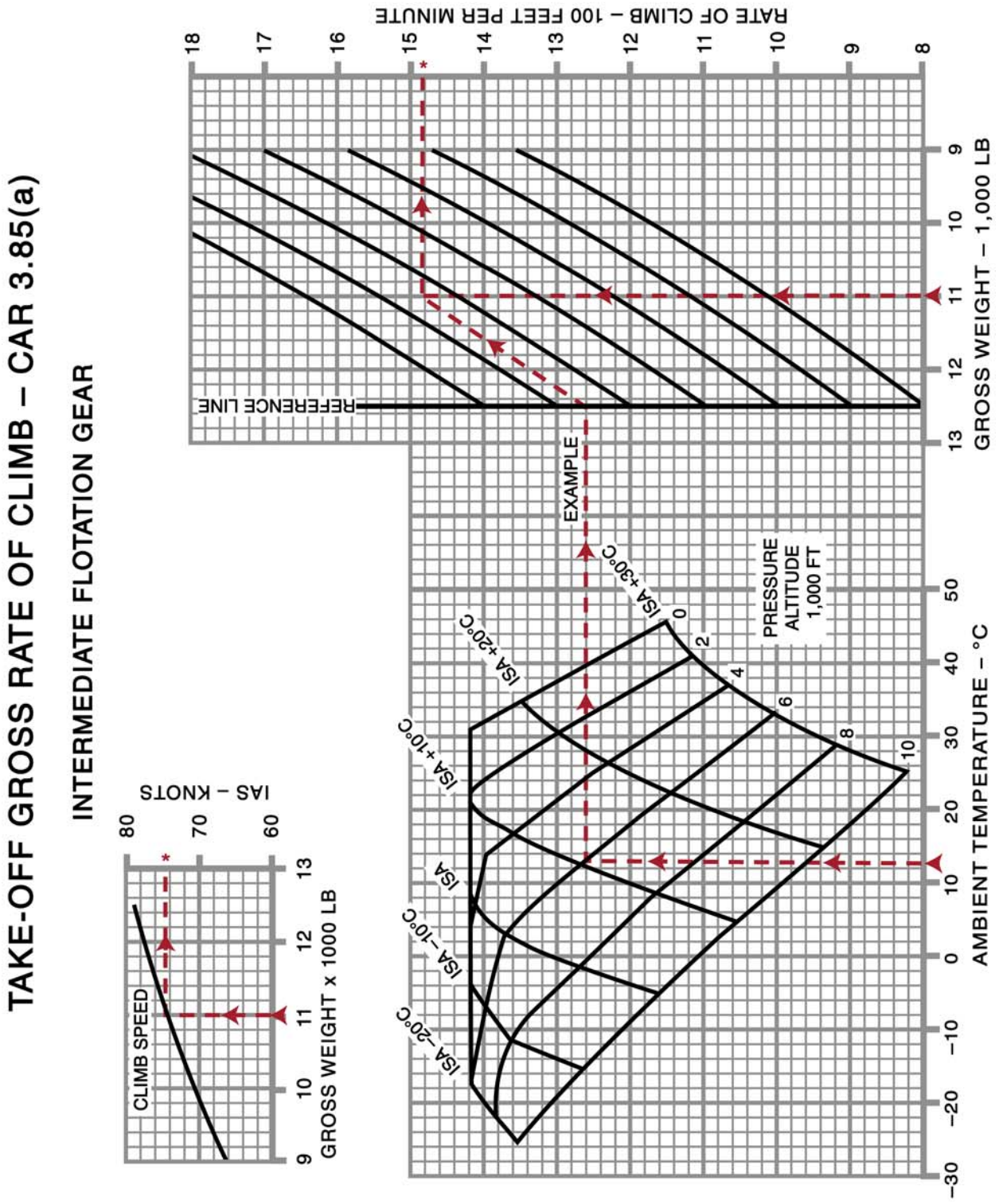


Figure 9-5-2 Take-Off Rate of Climb, Both Engines Operating

9-5.5.6 Take-Off Gradient of Climb, Both Engines Operating

Conditions associated with this chart

Flaps set at take-off position (10°), intake deflectors retracted (see note below if deflectors are extended), both engines set to Take-off Power, propeller speed 96% (see "Take-Off Power Setting" chart for that value), climb speed according to chart inset. Calculation basis CAR 3.85(a).

Interpretive Guidance

This chart provides initial gross take-off climb gradient when both engines are set to Take-off Power and the aircraft speed is maintained at the value determined from the inset chart. The gradient is expressed as a ratio of vertical distance gained to horizontal distance travelled.

Example Calculation (dotted line)

Determine take-off climb gradient at an air temperature of +13°C, pressure altitude of 6,000 feet, and aircraft weight of 10,700 pounds.

1 Enter the chart from the lower left at the outside air temperature (+13°C). Continue vertically up until reaching the pressure altitude (6,000 feet). Proceed horizontally right until reaching the gross weight reference line.

2 Proceed diagonally up and to the right between the guidelines until reaching the aircraft weight (10,700 pounds). Exit horizontally right to determine take-off climb gradient ratio (0.18, or 18%).

3 Enter the inset chart from the bottom at the aircraft weight (10,700 pounds). Proceed right from the reference line to exit at the best rate of climb speed for the take-off configuration, which is 74 KIAS.

Summary of Example Calculation

At an air temperature of 13°C, pressure altitude of 6,000 feet, and aircraft weight of 10,700 pounds, the take-off climb gradient will be 0.18 (18%) at 74 KIAS. The aircraft will climb 180 feet for every 1,000 feet of forward travel.

This chart assumes use of Take-off Power, which is normally only used until flap retraction is completed. Flap retraction is initiated either upon reaching 400 feet AGL or after clearing all obstacles in the take-off area, whichever comes later.

The calculated gradient of climb will only be achieved if the initial climb speed (determined from the inset chart) is maintained.

If intake deflectors are extended and Take-off Power is less than 50 PSI, deduct 0.004 (approximately half a percent) from the value derived from this chart.

This Page Intentionally Left Blank

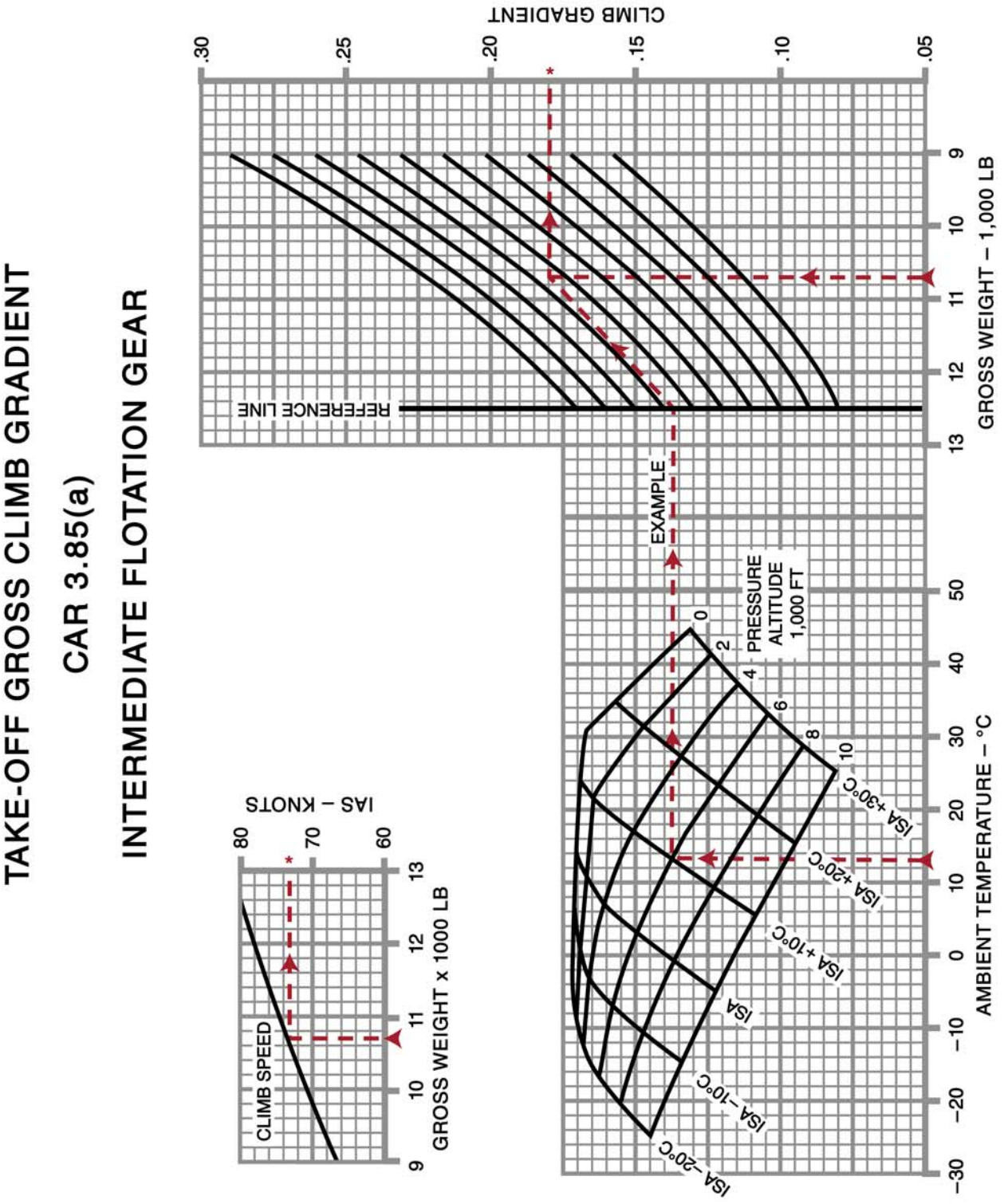


Figure 9-5-3 Take-Off Gradient of Climb, Both Engines Operating

9-5.5.7 Enroute Rate of Climb, Single Engine, Propeller Feathered

Conditions associated with this chart

Flaps set at take-off position (10°), intake deflectors retracted, one engine set to Maximum Continuous Power (see “Maximum Continuous Power Setting” chart), propeller speed 96%, one engine inoperative with propeller feathered, climb speed according to chart inset. Calculation basis CAR 3.85(b).

Interpretive Guidance

This chart provides enroute gross rate of climb in feet per minute when one engine is set to Maximum Continuous Power, the other engine is inoperative and feathered, and the aircraft speed is maintained at the value determined from the inset chart.

Example Calculation (dotted line)

Determine enroute rate of climb with one engine inoperative (OEI) and the propeller of that engine feathered at an air temperature of +13°C, pressure altitude of 6,000 feet, and aircraft weight of 10,500 pounds.

1 Enter the chart from the lower left at the outside air temperature (+13°C). Continue vertically up until reaching the pressure altitude (6,000 feet). Proceed horizontally right until reaching the gross weight reference line.

2 Proceed diagonally up and to the right between the guidelines until reaching the aircraft weight (10,500 pounds). Exit horizontally right to determine take-off rate of climb with one engine inoperative (320 feet per minute).

3 Enter the inset chart from the bottom at the aircraft weight (10,500 pounds). Proceed right from the reference line to exit at the best rate of climb speed for the enroute configuration, which is 72 KIAS.

Summary of Example Calculation

At an air temperature of +28°C, pressure altitude of 2,000 feet, and aircraft weight of 12,500 pounds, the take-off rate of climb will be 295 feet per minute at 80 KIAS.

This chart assumes use of Maximum Continuous Power (equal to Take-off Power) on the operating engine.

The calculated rate of climb will only be achieved if the climb speed (determined from the inset chart) is maintained.

If intake deflectors are extended and Take-off Power is less than 50 PSI, deduct 15 feet per minute from the value derived from this chart.

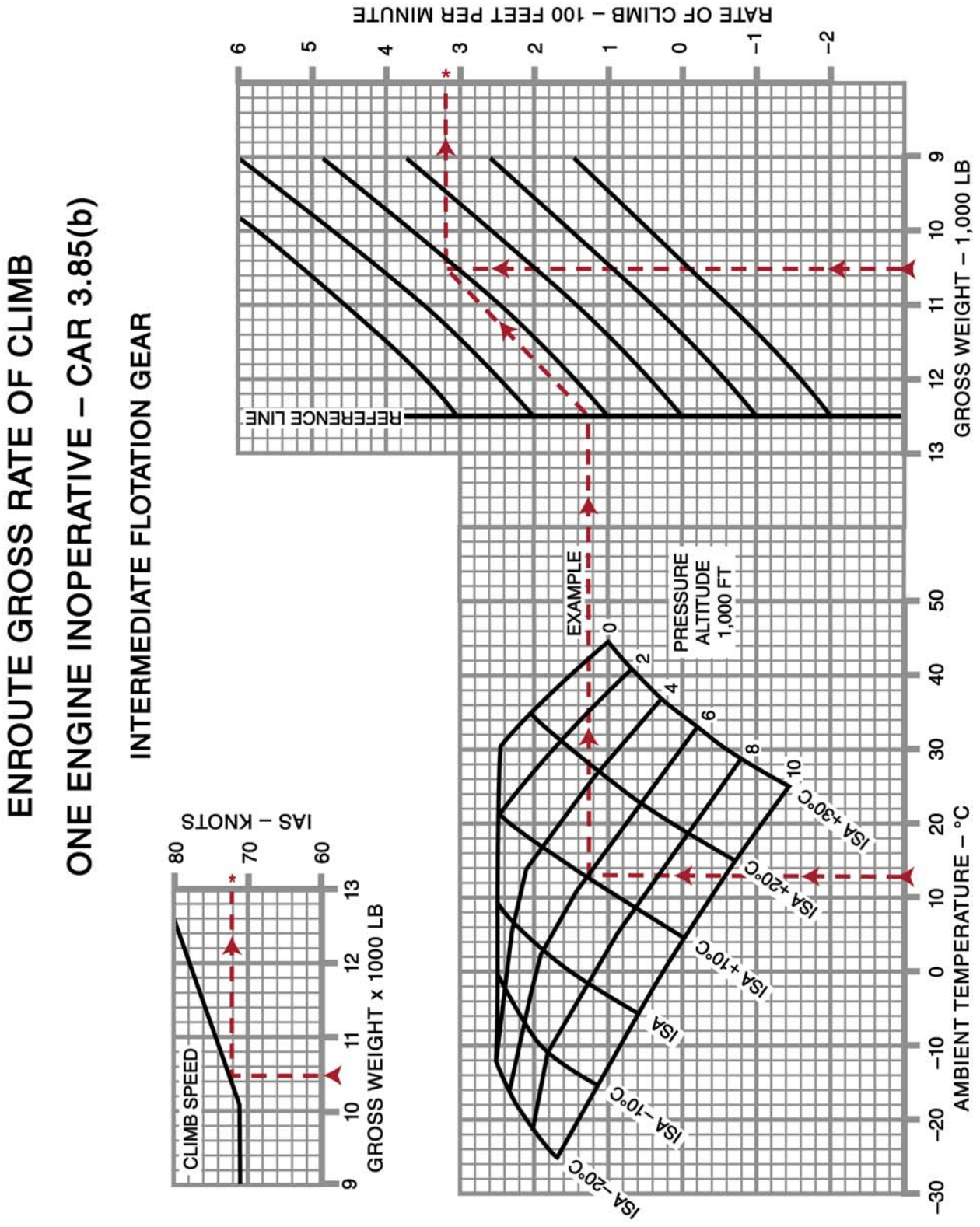


Figure 9-5-4 Enroute Rate of Climb – Single Engine, Propeller Feathered

9-5.5.8 Enroute Gradient of Climb, Single Engine, Propeller Feathered

Conditions associated with this chart

Flaps set at take-off position (10°), intake deflectors retracted, one engine set to Maximum Continuous Power (see “Maximum Continuous Power Setting” chart for that value), propeller speed 96%, one engine inoperative with propeller feathered, climb speed according to chart inset. Calculation basis CAR 3.85(b).

Interpretive Guidance

This chart provides enroute gross climb gradient when one engine is set to Maximum Continuous Power, the other engine is inoperative and feathered, and the aircraft speed is maintained at the value determined from the inset chart. The gradient is expressed as a ratio of vertical distance gained to horizontal distance travelled.

Example Calculation (dotted line)

Determine the enroute gradient of climb with a propeller feathered from an aerodrome with a pressure altitude of 6,000 feet, a temperature of +13°C, and aircraft weight of 10,700 pounds. Then, determine the best single engine climb speed for that weight.

1 Enter the chart from the bottom at the prevailing OAT (+13°C). Move upwards until reaching the reference line for the aerodrome pressure altitude (6,000 feet).

2 Move horizontally right from the pressure altitude to the reference line for gross weight, then move diagonally upward until reaching the aircraft weight (10,700 pounds). Then, move horizontally right to determine the climb gradient (0.037, or 3.7%).

3 Enter the smaller inset chart from the bottom at the calculated weight (10,700 pounds) and proceed upward to the reference line. Then proceed left to determine best single engine gradient of climb speed for that weight (74 KIAS).

Summary of Example Calculation

At an air temperature of +13°C, pressure altitude of 6,000 feet, and aircraft weight of 10,700 pounds, the initial enroute climb gradient will be 0.037 (3.7%) at 74 KIAS. The aircraft will climb 37 feet for every 1,000 feet of forward travel.

This chart assumes use of Maximum Continuous Power (equal to Take-off Power) on the operating engine.

The calculated gradient of climb will only be achieved if the climb speed (determined from the inset chart) is maintained.

If intake deflectors are extended and Take-off Power is less than 50 PSI, deduct 0.002 (two-tenths of one percent) from the value derived from this chart.

This Page Intentionally Left Blank

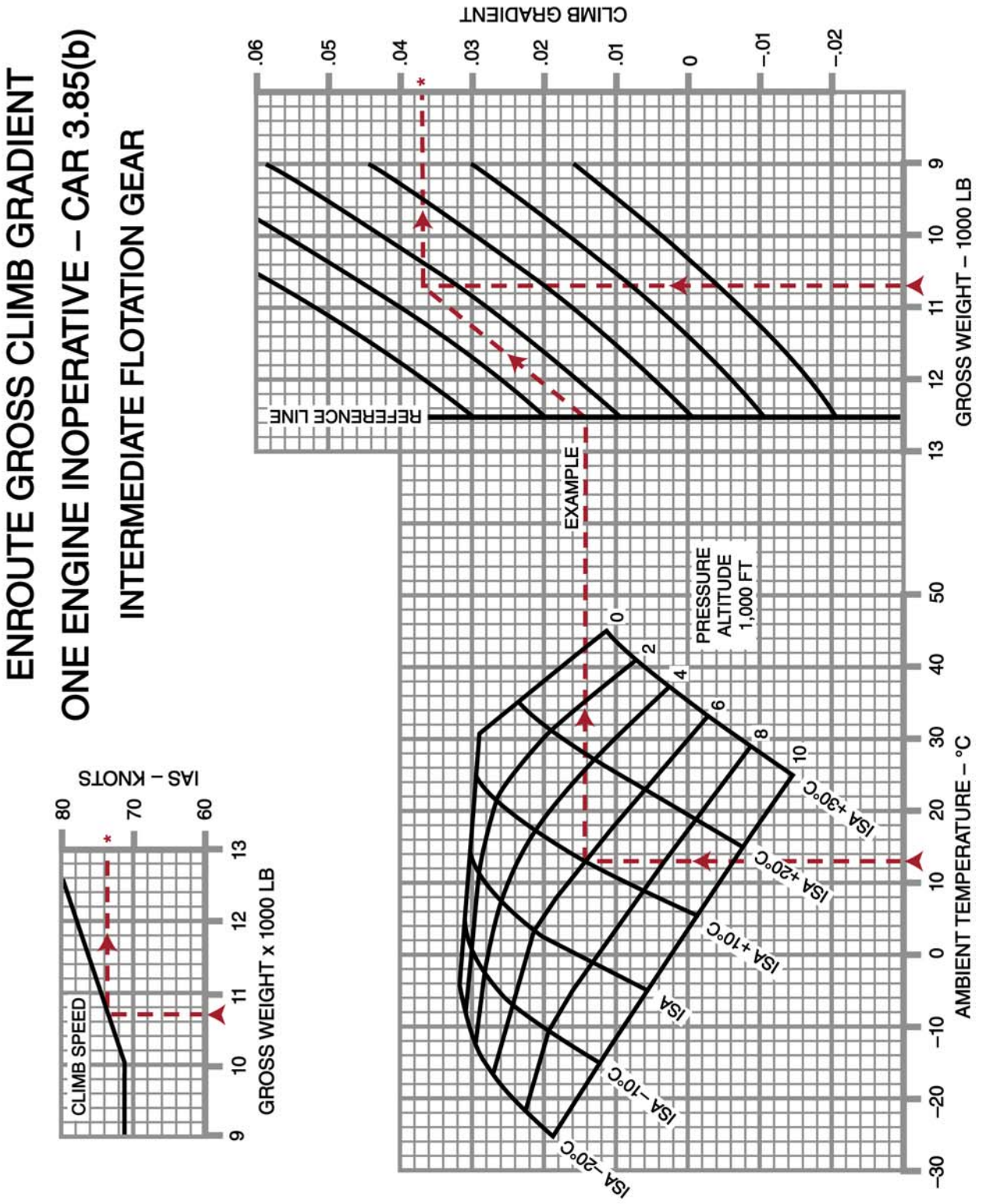


Figure 9-5-5 Enroute Gradient of Climb – Single Engine, Propeller Feathered

9-5.5.9 Balked Landing Rate of Climb

Conditions associated with this chart

Flaps fully extended (37.5°), intake deflectors retracted (see note below if deflectors are extended), both engines set to Take-off Power, propeller speed 96% (see "Take-Off Power Setting" chart for that value), climb speed according to chart inset. Calculation basis CAR 3.85(c).

Interpretive Guidance

This chart provides gross rate of climb information with the aircraft in the landing configuration (flaps fully extended, propellers set to 96% N_P).

Example Calculation (dotted line)

Determine balked landing rate of climb at +12°C air temperature, 6,000 foot pressure altitude, and 10,500 pounds landing weight.

1 Enter the chart from the bottom at the air temperature (+12°C) and proceed upward to the pressure altitude (6,000 feet). From there, proceed horizontally right to the gross weight reference line. Then proceed diagonally upwards along the guidelines until reaching the aircraft weight (10,500 pounds). Then proceed horizontally right to exit at the rate of climb.

2 Using the inset chart, enter the chart vertically at the bottom at the aircraft weight (10,500 pounds) and continue upwards to the reference line, then proceed horizontally right to determine the initial climb speed (68 KIAS) for the aircraft in the flaps 37.5° configuration

Summary of Example Calculation

At +12°C air temperature, 6,000 foot pressure altitude, and 10,500 pounds landing weight, the initial rate of climb with flaps fully extended will be 1,110 feet per minute, at a climb speed of 68 KIAS.

WARNING

THIS CHART ASSUMES USE OF TAKE-OFF POWER FOR THE BALKED LANDING. PROPELLER SPEED MUST BE 96%.

⚠ CAUTION

IF A BALKED LANDING IS INITIATED WITH FLAPS LESS THAN FULLY EXTENDED, THE INITIAL RATE OF CLIMB MAY BE GREATER THAN THAT SHOWN ON THE CHART. AS FLAPS ARE RETRACTED DURING THE BALKED LANDING MANEUVER, CLIMB SPEED SHOULD BE PROGRESSIVELY INCREASED UNTIL REACHING V_X (BEST ANGLE) OF CLIMB. WHEN ALL OBSTACLES HAVE BEEN CLEARED, CLIMB SPEED SHOULD BE INCREASED TO V_Y (BEST RATE) OF CLIMB. SEE SECTION 2 (LIMITATIONS) FOR V_X AND V_Y SPEEDS.

NOTE

With intake deflectors extended and torque settings less than 50 PSI, reduce rate of climb shown by 30 feet per minute.

This Page Intentionally Left Blank

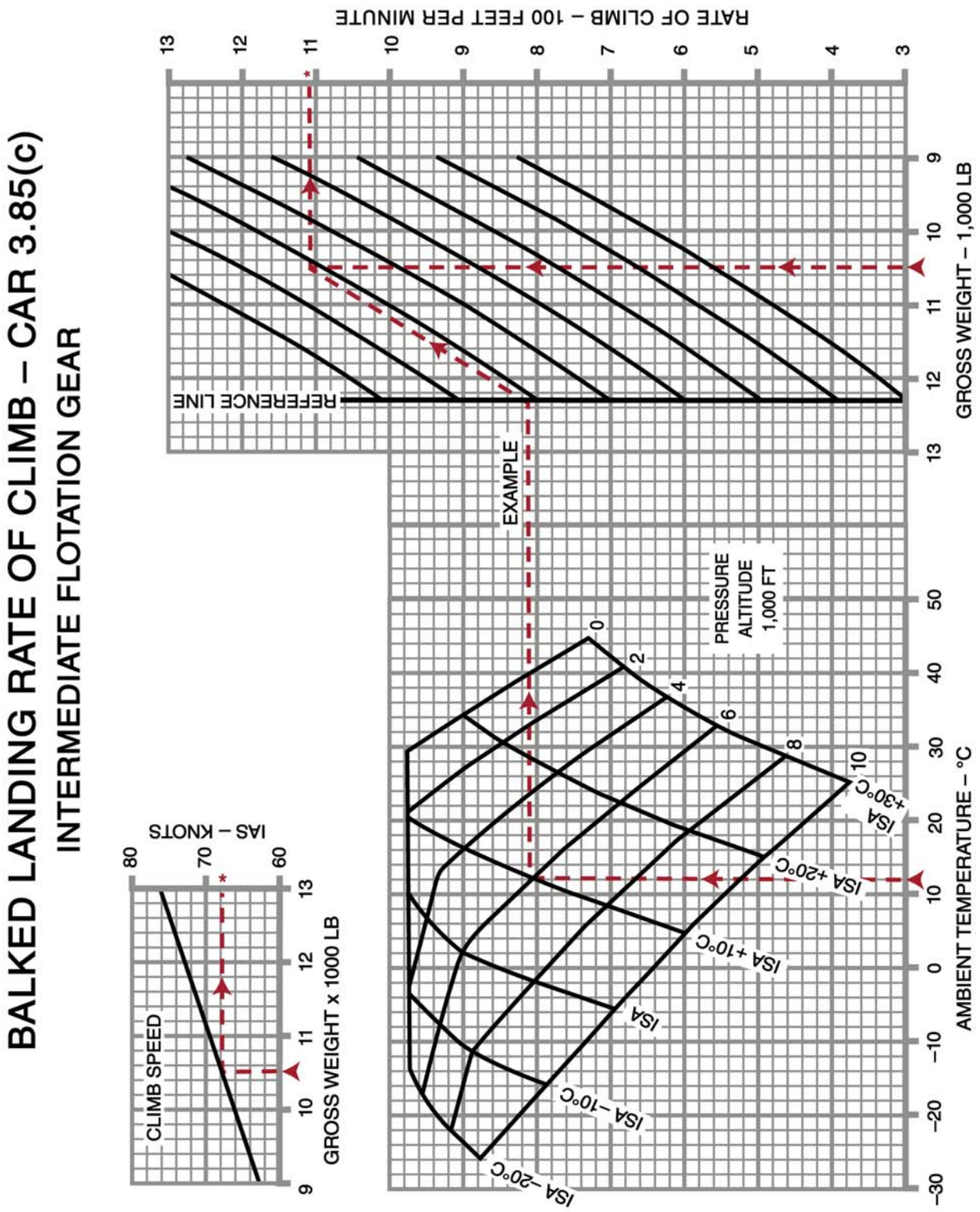


Figure 9-5-6 Balked Landing Rate of Climb

9-5.5.10 Balked Landing Gradient of Climb

Conditions associated with this chart

Flaps fully extended (37.5°), intake deflectors retracted (see note below if deflectors are extended), both engines set to Take-off Power, propeller speed 96% (see "Take-Off Power Setting" chart for that value), climb speed according to chart inset. Standard landplane gear only.

Interpretive Guidance

This chart provides gross climb gradient information with the aircraft in the landing configuration (flaps fully extended, propellers set to 96% N_P).

Example Calculation (dotted line)

Determine balked landing climb gradient at +13°C air temperature, 6,000 foot pressure altitude, and 10,500 pounds landing weight.

1 Enter the chart from the bottom at the air temperature (+13°C) and proceed upward to the pressure altitude (6,000 feet). From there, proceed horizontally right to the gross weight reference line. Then proceed diagonally upwards along the guidelines until reaching the aircraft weight (10,500 pounds). Then proceed horizontally right to exit at the climb gradient (0.14).

2 Using the inset chart, enter the chart vertically at the bottom at the aircraft weight (10,500 pounds) and continue upwards to the reference line, then proceed horizontally right to determine the initial climb speed (68 KIAS) for the aircraft in the flaps 37.5° configuration

Summary of Example Calculation

At +13°C air temperature, 6,000 foot pressure altitude, and 10,500 pounds landing weight, the initial climb gradient with flaps fully extended will be 0.14 (14%), at a climb speed of 68 KIAS. The aircraft will climb 140 feet for every 1,000 feet of forward travel.

WARNING

THIS CHART ASSUMES USE OF TAKE-OFF POWER FOR THE BALKED LANDING. PROPELLER SPEED MUST BE 96%.

⚠ CAUTION

AS FLAPS ARE RETRACTED DURING THE BALKED LANDING MANEUVER, CLIMB SPEED SHOULD BE PROGRESSIVELY INCREASED UNTIL REACHING V_X (BEST ANGLE) OF CLIMB. WHEN ALL OBSTACLES HAVE BEEN CLEARED, CLIMB SPEED SHOULD BE INCREASED TO VY (BEST RATE) OF CLIMB. SEE SECTION 2 (LIMITATIONS) FOR V_X AND V_Y SPEEDS.

IF A BALKED LANDING IS INITIATED WITH FLAPS LESS THAN FULLY EXTENDED, THE INITIAL CLIMB GRADIENT MAY BE SLIGHTLY LESS THAN THAT SHOWN ON THE CHART – THIS IS DUE TO THE HIGHER AIRCRAFT FORWARD SPEED DURING THE CLIMB.

NOTE

With intake deflectors extended and torque settings less than 50 PSI, reduce climb gradient shown by 0.004.

This Page Intentionally Left Blank

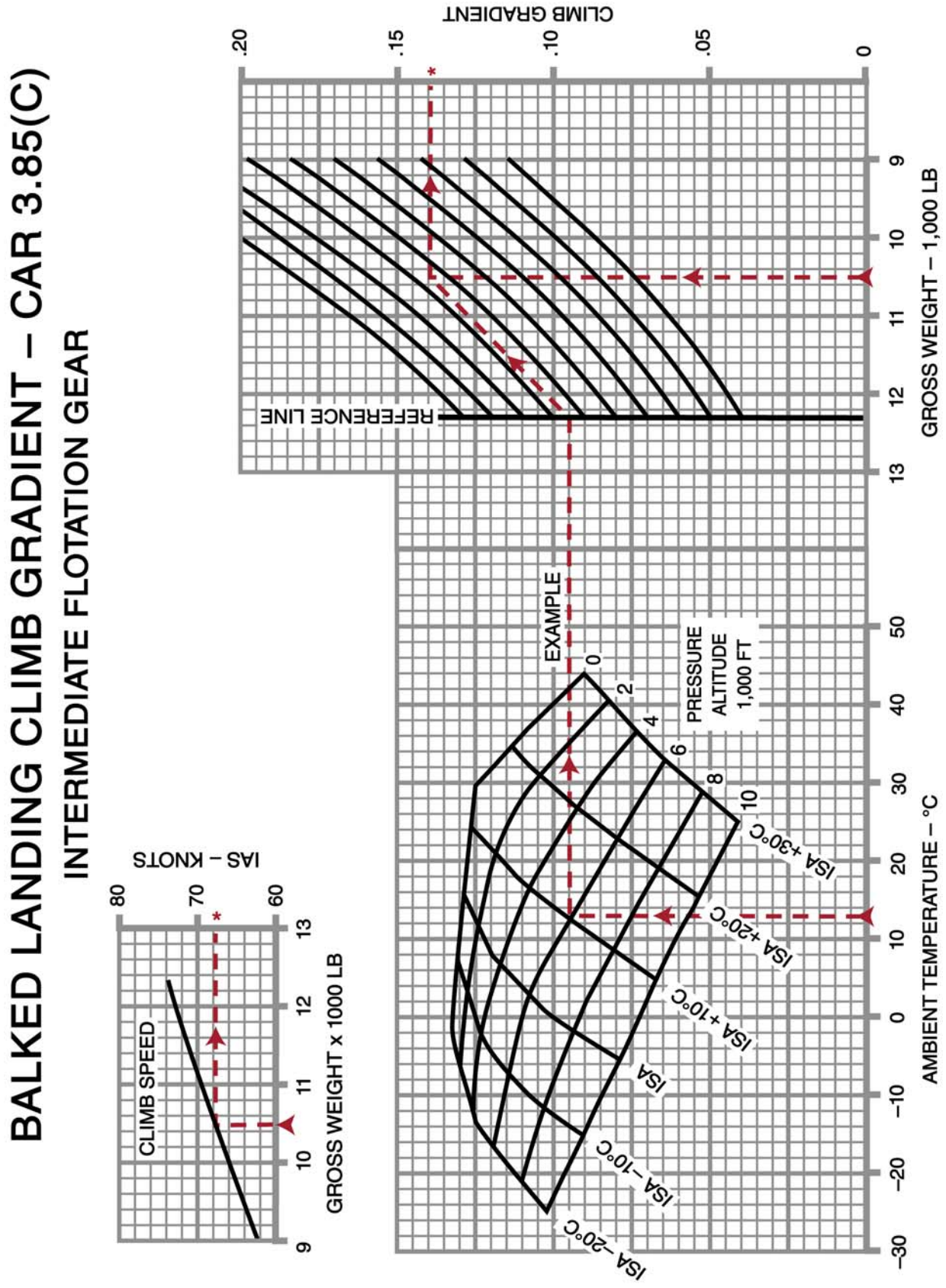


Figure 9-5-7 Balked Landing Gradient of Climb

This Page Intentionally Left Blank

SECTION 9 – SUPPLEMENT 6

PROPELLER SYNCHRONIZER

This Page Intentionally Left Blank

PSM 1-63-1A

SECTION 9 (T.C. Approved)

SUPPLEMENT 6

PROPELLER SYNCHRONIZER

MOD S.O.O. 6099

Approved: _____
A/Chief, Flight Test
Transport Canada

Date: 19 Jan 2011

Issue 1

LIST OF EFFECTIVE PAGES

SECTION	PAGE	DATE	SECTION	PAGE	DATE
9-6	1	19 Jan. 2011		8	19 Jan. 2011
	2	19 Jan. 2011		9	19 Jan. 2011
	3	19 Jan. 2011		10	19 Jan. 2011
	4	19 Jan. 2011		11	19 Jan. 2011
	5	19 Jan. 2011		12	19 Jan. 2011
	6	19 Jan. 2011		13	19 Jan. 2011
	7	19 Jan. 2011		14	19 Jan. 2011

This Page Intentionally Left Blank

TABLE OF CONTENTS **PAGE**

9-6.1 General **7**

9-6.2 Limitations **8**

9-6.3 Emergency and Abnormal Procedures **9**

9-6.4 Normal Procedures **10**
9-6.4.1 Pre-Flight Check 10
9-6.4.2 Operation in Stabilized Climb, Cruise or Descent 10
9-6.4.3 Changing Propeller Speed 10
9-6.4.4 Functional Test During Flight 10

9-6.5 Performance **11**

9-6.6 Weight and Balance **12**

9-6.7 System Description **13**

This Page Intentionally Left Blank

9-6.1 General

This supplement describes Standard Order Option (S.O.O.) 6099, a propeller synchronizer provided by Woodward.

9-6.2 Limitations

1 The PROP SYNC switch must be at OFF during engine ground operation, taxiing, take-off, approach, landing, and single engine operation.

9-6.3 Emergency and Abnormal Procedures

1 If the propeller synchronizer fails to operate correctly, or if any propeller malfunction occurs, or in the event of single engine operation, the PROP SYNC switch must be selected to OFF.

WARNING

IF ANY ENGINE FAILURE OCCURS, OR IF AN ENGINE SHUTDOWN IS NECESSARY WHILE THE PROPELLER SYNCHRONIZER IS OPERATING, THE PROP SYNC SWITCH MUST BE SELECTED TO OFF BEFORE FEATHERING THE PROPELLER, OTHERWISE THE PROPELLER MAY NOT FULLY FEATHER.

9-6.4 Normal Procedures

9-6.4.1 Pre-Flight Check

Press the propeller synchronizer press-to-test indicator light and check that the light comes on.

9-6.4.2 Operation in Stabilized Climb, Cruise or Descent

Once established in a steady climb, cruise or descent, operate the propeller synchronizer as follows:

1 Adjust the right propeller lever to approximately synchronize the right propeller RPM with the left propeller RPM.

2 PROP SYNC switch – ON. The propeller speeds should automatically synchronize.

9-6.4.3 Changing Propeller Speed

1 If a change in propeller RPM is required, move both the left (master) and the right propeller levers together.

2 If synchronization is not maintained with switch at ON, (indicating that actuator has reached the end of its travel), select the switch to OFF and repeat procedures given in Para 9-6.4.2 When the switch is selected to the OFF position, the actuator is returned to the center of its travel.

9-6.4.4 Functional Test During Flight

The RPM range of the propeller synchronizer may be checked during stable flight by slowly moving the left (master) propeller lever in the increase RPM and decrease RPM directions until the propellers are no longer synchronized. Note the RPM range over which the right (slave) propeller remains synchronized with the left propeller. This is the limited range provided for safety, and is the maximum speed adjustment range beyond which the slave propeller cannot be adjusted by the synchronizer.

9-6.5 Performance

Performance data for the airplane is not affected by the installation or operation of the propeller synchronizer.

9-6.6 Weight and Balance

Optional equipment described in this supplement will be listed in Part 2 of PSM 1-63-8.

9-6.7 System Description

The propeller synchronizing system is used to keep the speed of the two propellers synchronized once the pilot has set both propellers to approximately the same speed. The synchronizer has a very limited range of authority within which it will adjust the speed of the right propeller only.

The system comprises a master governor with pick-up, a slave governor with pick-up and trimmer, an actuator, a control box, and a flexible shaft. The master pick-up and governor are mounted on the left engine and the slave governor and trimmer on the right engine.

The master pick-up transmits impulse signals from the master governor to the synchronizer control box. When the synchronizer is switched on, signals from the control box are relayed to the actuator which adjusts the speed setting of the slave governor through a flexible shaft-operated trimmer, and the speed of the right propeller is increased or decreased to synchronize it with the left propeller.

The propeller synchronizer switch is installed on a bracket to the right of the caution lights panel; it is a two position ON/OFF switch labelled PROP SYNC. The switch is placarded MUST BE OFF FOR TAKE-OFF AND LDG. A press-to-test indicator light adjacent to the switch illuminates when the synchronizer is operating. The system is powered from the left DC bus and is protected by a PROP SYNC circuit breaker on the avionics circuit breaker panel, at the bottom of the instrument panel center pedestal.

This Page Intentionally Left Blank

SECTION 9 – SUPPLEMENT 8

AUXILIARY WING FUEL TANKS

This Page Intentionally Left Blank

PSM 1-63-1A

SECTION 9 (T.C. Approved)

SUPPLEMENT 8

AUXILARY WING TANKS

S.O.O. 6095

Approved: _____
A/ Chief, Flight Test
Transport Canada

Date: 19 Jan 2011

Issue 6

LIST OF EFFECTIVE PAGES

SECTION	PAGE	DATE	SECTION	PAGE	DATE
9-8	1	19 Jan. 2011		7	19 Jan. 2011
	2	19 Jan. 2011		8	19 Jan. 2011
	3	19 Jan. 2011		9	19 Jan. 2011
	4	19 Jan. 2011		10	19 Jan. 2011
	5	19 Jan. 2011		11	19 Jan. 2011
	6	19 Jan. 2011		12	19 Jan. 2011

This Page Intentionally Left Blank

TABLE OF CONTENTS **PAGE**

9-8.1 General **7**

9-8.2 Limitations **8**

9-8.3 Emergency and Abnormal Procedures **9**
9-8.3.1 Single Engine Operation 9
9-8.3.2 Wing Tank Fuel Pump Failure 9

9-8.4 Normal Procedures **10**
9-8.4.1 Wing Fuel Tank Refuelling Procedures 10
9-8.4.2 Pre-Flight Procedure 10
9-8.4.3 In-Flight Procedures 11
9-8.4.4 Landing Procedures 11

9-8.5 Performance **12**

This Page Intentionally Left Blank

9-8.1 General

Auxiliary Wing Fuel Tanks (S.O.O. 6095) allow an additional 37 Imperial Gallons (44 U.S. Gallons, 168 litres) of fuel to be carried in each wing. This is equivalent to 300 pounds of Jet A1 at standard temperature and density. Unusable fuel in each tank is negligible, approximately 1 pint (0.5 litres).

NOTE

Jet A1 density is based on ASTM specification D1655.

9-8.2 Limitations

The operating limitations detailed in Section 2 of the AFM apply when auxiliary wing fuel tanks are fitted. The following additional limitations apply:

1 It is prohibited to refuel the wing tanks while in flight.

2 If the fuel contained in the auxiliary wing tanks is required for completion of the flight, it must be used prior to the point of no return.

3 Wing fuel tank switches must be at OFF for take-off, climb, descent, and landing.

9-8.3 Emergency and Abnormal Procedures

The emergency and abnormal procedures detailed in Section 3 of the AFM apply when auxiliary wing fuel tanks are fitted. The following additional procedures also apply.

9-8.3.1 Single Engine Operation

When operating on one engine, fuel may be drawn from the opposite wing tank by selecting the appropriate wing tank switch (L ENGINE if left engine is shut down or R ENGINE if right engine is shut down) and selecting the FUEL SELECTOR (main tanks) toward the side of the aircraft in which the engine has been shut down.

For example, if the left engine has been shut down, and the pilot wishes to send fuel from the left wing tank to the right engine, switch and fuel selector settings should be set as follows:

1 Left Wing Tank Switch – ENGINE

2 Fuel Selector Knob – BOTH ON AFT

The pilot must then monitor the contents of the two fuselage fuel tanks and the selected wing tank to confirm that fuel is being consumed from the selected wing tank.

9-8.3.2 Wing Tank Fuel Pump Failure

Wing tank fuel pump failure would be indicated by:

1 Illumination of a pump fail caution light when the tank is not empty.

2 Observation of fuel gauges – with wing tank switches selected to L ENGINE and R ENGINE the L or R WING TANK indicators register no change in contents while the main tank contents gradually decrease.

In this event the fuel in the tank with the defective pump should be considered unusable and, if necessary, the flight plan should be adjusted accordingly.

9-8.4 Normal Procedures

The normal procedures detailed in Section 4 of the AFM apply when auxiliary wing fuel tanks are fitted. The following additional procedures also apply.

9-8.4.1 Wing Fuel Tank Refuelling Procedures

WARNING

IT IS PROHIBITED TO REFUEL THE WING TANKS WHILE IN FLIGHT.

In addition to the normal over-wing refuelling capability using the filler caps located on the top of the wing tanks, the wing tanks may be refilled on the ground from the main tank system as follows:

1 DC master switch – MASTER

2 EXTERNAL/BATTERY switch – as desired (see note below)

3 Boost pump switches – FWD BOOST and/or AFT BOOST

4 Wing fuel tank switches (left and/or right) – REFUEL

The forward fuselage tank will refill the right wing tank and the rear fuselage tank will refill the left wing tank.

5 Observe that L WING TANK and R WING TANK indicators register gradual increase in contents, and that AFT and FWD (main tank) fuel quantity indicators register a corresponding decrease. When tank content indicators show no further change, select wing fuel tank switch(es) and boost pump switch(es) to OFF.

NOTE

It takes approximately 15 to 20 minutes to completely fill a wing tank. To avoid depleting the battery, it is recommended that a generator be on line or that an external power source be connected.

9-8.4.2 Pre-Flight Procedure

The following checks and procedures should be carried out in addition to those given in Section 4.

1 Check wing tank fuel contents.

2 Press-to-test PUMP FAIL R TANK and PUMP FAIL L TANK caution lights.

3 After the engines have been started, select wing fuel tank switches to L ENGINE and R ENGINE for approximately 30 seconds and then return both switches to OFF. This will purge any air that may be in the wing tank fuel lines.

9-8.4.3 In-Flight Procedures

WARNING

WING TANK FUEL SWITCHES MUST BE AT OFF FOR TAKE-OFF, CLIMB, DESCENT, AND LANDING.

When fuel is required from wing tanks proceed as follows:

1 Fuel selector – NORM

2 Wing tank switches – L ENGINE and R ENGINE

3 Observe that L WING TANK and R WING TANK indicators register gradual decrease in contents and that AFT and FWD (main tank) fuel quantity indicators register no change in contents.

4 Monitor wing tank fuel quantity indicator to confirm fuel flow and when each denotes tank empty and fuel flow from the main tanks is confirmed, select wing tank switch OFF.

CAUTION

WING TANK SWITCHES MUST BE SELECTED OFF WHEN THE TANKS ARE EMPTY, OTHERWISE PUMP LIFE MAY BE SERIOUSLY REDUCED THROUGH RUNNING WITHOUT FUEL TO COOL AND LUBRICATE. THE PUMP FAIL LIGHTS WILL EVENTUALLY BEGIN TO FLICKER ON AND OFF TO CONFIRM LACK OF FUEL IN THE TANKS. THE PUMP FAIL LIGHTS SHOULD NOT BE USED AS A TANKS EMPTY WARNING.

9-8.4.4 Landing Procedures

If the aircraft is being operated on skis or floats, irregularities in the landing surface can produce very high post-touchdown wing loads when the auxiliary wing fuel tanks are full. It is therefore recommended that landings on water, snow, or ice surfaces be made with the wing tanks not more than half full.

9-8.5 Performance

There is no change to the performance data provided in Section 5 when auxiliary wing fuel tanks are fitted.

SECTION 9 – SUPPLEMENT 10

WHEEL-SKIPLANE AND SPRING-SKIPLANE OPERATION

This Page Intentionally Left Blank

PSM 1-63-1A

SECTION 9 (T.C. Approved)

SUPPLEMENT 10

WHEEL-SKIPLANE AND SPRING-SKIPLANE OPERATION

S.O.O. 6001 (Wheel-Skiplane) S.O.O. 6116 (Spring-Skiplane)

Approved: _____
A/ Chief, Flight Test
Transport Canada

Date: 19 Jan 2011

Issue 6

LIST OF EFFECTIVE PAGES

SECTION	PAGE	DATE	SECTION	PAGE	DATE
9-10	1	19 Jan. 2011		22	19 Jan. 2011
	2	19 Jan. 2011		23	19 Jan. 2011
	3	19 Jan. 2011		24	19 Jan. 2011
	4	19 Jan. 2011		25	19 Jan. 2011
	5	19 Jan. 2011		26	19 Jan. 2011
	6	19 Jan. 2011		27	19 Jan. 2011
	7	19 Jan. 2011		28	19 Jan. 2011
	8	19 Jan. 2011		29	19 Jan. 2011
	9	19 Jan. 2011		30	19 Jan. 2011
	10	19 Jan. 2011		31	19 Jan. 2011
	11	19 Jan. 2011		32	19 Jan. 2011
	12	19 Jan. 2011		33	19 Jan. 2011
	13	19 Jan. 2011		34	19 Jan. 2011
	14	19 Jan. 2011		35	19 Jan. 2011
	15	19 Jan. 2011		36	19 Jan. 2011
	16	19 Jan. 2011		37	19 Jan. 2011
	17	19 Jan. 2011		38	19 Jan. 2011
	18	19 Jan. 2011		39	19 Jan. 2011
	19	19 Jan. 2011		40	19 Jan. 2011
	20	19 Jan. 2011		41	19 Jan. 2011
	21	19 Jan. 2011		42	19 Jan. 2011

This Page Intentionally Left Blank

TABLE OF CONTENTS **PAGE**

9-10.1 General **7**
9-10.1.1 Scope 7
9-10.1.2 Certification Basis 7

9-10.2 Limitations **8**
9-10.2.1 Airspeed Limitations 8
9-10.2.2 Airspeed Indicator Markings 10

9-10.3 Emergency and Abnormal Procedures **11**

9-10.4 Normal Procedures **12**
9-10.4.1 Pre-Flight Inspection 12
9-10.4.2 Taxiing 12
9-10.4.3 Take-Off 12
9-10.4.4 After Take-Off 13
9-10.4.5 Before Landing 13
9-10.4.6 Landing 13
9-10.4.7 After Landing 13

9-10.5 Performance **14**
9-10.5.1 General 14
9-10.5.2 Chart Differences 14
9-10.5.3 Wheel-Skiplane Performance Charts 14
9-10.5.4 Flap Settings 16
9-10.5.5 Landing Distance Adjustments for Different Flap Settings 16
9-10.5.6 Maximum Take-Off Weight – Single Engine Climb with Feathered Propeller 18
9-10.5.7 Take-Off Distance to 50 Feet, Both Engines Operating 20
9-10.5.8 Take-Off Gross Rate of Climb, Both Engines Operating 22
9-10.5.9 Take-Off Gross Gradient of Climb, Both Engines Operating 24
9-10.5.10 Take-Off or Enroute Gross Rate of Climb – OEI 26
9-10.5.11 Take-Off or Enroute Gross Gradient of Climb – OEI 28
9-10.5.12 Balked Landing Gross Rate of Climb 30
9-10.5.13 Balked Landing Gross Gradient of Climb 32
9-10.5.14 Landing Distance from 50 feet AGL to Full Stop 36

9-10.6 Weight and Balance **38**

TABLE OF CONTENTS **PAGE**

9-10.7 System Description **39**
9-10.7.1 Spring Skiplane 39
9-10.7.2 Wheel Skiplane 39
9-10.7.3 Main Ski Units 39
9-10.7.4 Nose Ski Unit 40
9-10.7.5 Ski Position Selector Lever 40
9-10.7.6 Ski Position Indicator Lights 40

List of Figures Page

9-10-1 Maximum Take-Off Weight – OEI Enroute Climb 19
9-10-2 Take-Off Distance to 50 Feet, Both Engines Operating 21
9-10-3 Take-Off Gross Rate of Climb, Both Engines Operating 23
9-10-4 Take-Off Gross Gradient of Climb, Both Engines Operating 25
9-10-5 Take-Off or Enroute Gross Rate of Climb, Single Engine, Propeller Feathered 27
9-10-6 Take-Off or Enroute Gross Gradient of Climb – Single Engine, Propeller Feathered 29
9-10-7 Balked Gross Landing Rate of Climb 31
9-10-8 Balked Landing Gross Gradient of Climb 35
9-10-9 Landing Distance from 50 feet AGL to Full Stop 37
9-10-10 Spring Ski Gear 39
9-10-11 Wheel Skis 40
9-10-12 Wheel Ski Control and Indication 41

9-10.1 General

9-10.1.1 Scope

This supplement applies to the wheel-skiplane and, with the following qualifications, to the spring-skiplane:

1 Disregard information on the use of wheels and raising and lowering of skis.

2 Consider the spring-skiplane to be a wheel-skiplane on skis in determining take-off and landing distances.

9-10.1.2 Certification Basis

The limitations, procedures, and performance data presented in this supplement comply with the requirements of CAR Part 3, dated May 15, 1956, including Amendments 3-1 through 3-8 plus Special Conditions for multi-engine turbine-powered aircraft dated November 6, 1964.

No supplement has been published to support wheel-skiplane operation to the requirements of SFAR 23 or FAR 25.

9-10.2 Limitations

The limitations provided in this supplement supersede the equivalent limitations in Section 2. All other limitations in Section 2 not specifically addressed in this supplement remain valid.

Special purpose operations such as STOL, aerial survey, support of scientific research, fire-fighting, agricultural spraying and dusting must be conducted within the limits specified by the appropriate Airworthiness Authority.

9-10.2.1 Airspeed Limitations

The air speed limitations and associated definitions for the wheel-skiplane are as follows:

NOTE

The airspeed limitations apply to all weights up to 12,500 pounds gross weight.

			KNOTS	
			CAS	**IAS**
a.	Minimum Control Speed (V_{MC})	Flaps 10°	67	65
b.	Climb Speed – Best Angle (V_X)	Flaps 0°	89	87
	Climb Speed – Best Rate (V_Y)	Flaps 0°	103	100
	Climb Speed – Single Engine (V_{YSE})	Flaps 10°	82	80
c.	Flaps Extended Speed (V_{FE})	Flaps 10°	102	100
	(Pre Mod 6/1395)	Flaps 10° to 37.5°	95	93
	Flaps Extended Speed (V_{FE})	Flaps 10°	105	103
	(Mod 6/1395)	Flaps 10° to 37.5°	95	93
d.	Maximum Operating Speed (V_{MO})	Sea Level	160	156
	(Pre or Post Mod 6/1291)	5,000 feet	155	151
		10,000 feet	150	146
		15,000 feet	145	141
		20,000 feet	130	126
		25,000 feet	115	112

		KNOTS CAS	KNOTS IAS
e.	Gust Penetration Speed (V_B), the speed recommended for-flight in severe turbulence – Sea Level to 18,000 feet	136	132
f.	Maneuvering Speed (V_P), the maximum speed for maneuvers involving an approach to stall conditions, or full application of the primary flight controls Sea Level to 18,000 feet Above 18,000 feet V_P and V_B are limited by V_{MO}.	136	132
g.	Recommended Approach Speed – Flaps 37.5°	76	74

⚠ CAUTION

MAXIMUM OPERATING SPEED SHALL NOT BE DELIBERATELY EXCEEDED IN ANY REGIME OF FLIGHT (CLIMB, CRUISE, DESCENT) EXCEPT WHERE A HIGHER SPEED HAS BEEN AUTHORIZED FOR FLIGHT TEST OR PILOT TRAINING OPERATIONS.

9-10.2.2 Airspeed Indicator Markings

Aircraft fitted with skis or wheel-skis are equipped with an airspeed indicator that has unique limitation markings on it for ski operations. These markings, all of which are expressed in calibrated airspeed, are as follows:

a. Maximum Operating Speed (red radial line)	160
b. Normal Operating Range (green arc)	74 to 160
c. Flap Operating Range (white arc)	58 to 95
d. Minimum Control Speed (red radial line)	67
e. Climb Speed (one engine inoperative) flaps 10° (blue radial line)	80

9-10.3 Emergency and Abnormal Procedures

The normal operating procedures detailed in Section 3 apply to the wheel-skiplane. When operating with the skis extended (skiplane mode), references made to brake application should be disregarded.

9-10.4 Normal Procedures

The normal operating procedures detailed in Section 4 apply to the wheel-skiplane with the exceptions given in the following paragraphs. When operating with the skis extended (skiplane mode), references made to brake application should be disregarded.

9-10.4.1 Pre-Flight Inspection

The following checks should be carried out in addition to those given in Section 2 Para 2.1.

1 Check that neither wheels nor skis are frozen to the ground. If either are frozen in, particularly in thick ice, break or melt ice to free the airplane. If the skis are moderately frozen to the ground, retract skis to free them.

2 With skis retracted, check that running surfaces of skis are free from ice. Unequal accumulations of ice on the skis may cause the airplane to swing slightly on take-off.

3 Check security of skis, shock units, and trim cables. Check hydraulic lines for leakage.

9-10.4.2 Taxiing

When taxiing or ground maneuvering, the airplane must be stopped to extend or retract the skis. Extension of the skis should not take place on concrete or tarmac or any harsh surface likely to damage the skis. When maneuvering on snow or ice, the airplane should be steered by nose wheel steering and asymmetric thrust.

⚠ CAUTION

WHEN GROUND MANEUVERING WITH REVERSE THRUST, CARE MUST BE TAKEN NOT TO REVERSE OVER LOOSE OBJECTS (E.G. LOOSE ICE CHUNKS, SNOW CRUST) WHICH CAN DAMAGE THE PROPELLER OR BE BLOWN FORWARD.

9-10.4.3 Take-Off

The take-off procedure with skis retracted or extended is identical to that given for the landplane. The take-off roll with skis down may be longer depending upon surface conditions. Heavier than normal snow creates considerable friction on the skis as well as packing ahead of the skis; consequently more backward pressure on the control wheel may be necessary to attain the take-off attitude.

9-10.4.4 After Take-Off

Position of the skis has no significant effect on airspeed, center of gravity position, or flight characteristics. The skis, therefore, may be left in either the up or down position consistent with conditions at the arrival landing field.

9-10.4.5 Before Landing

Prior to the landing approach, the pilot should decide whether to raise or lower the skis in accordance with landing conditions. Extremely low temperatures normally increase ski lowering time. When the skis are at the desired position they should be checked by reference to the indicators.

9-10.4.6 Landing

A normal landing approach should be made. In deep snow, the control column should be held back after touchdown to relieve nose ski load.

9-10.4.7 After Landing

When the airplane is to be parked on snow or ice it is advisable to stand the airplane on boards or evergreen branches, if there is any likelihood of the skis or wheels freezing to the parking surface.

9-10.5 Performance

9-10.5.1 General

The performance data given in this section is consistent with the limitations set forth in Section 2 of the AFM and Para 9-10.2 of this supplement and with the requirements of CAR Part 3, and should be used for operational planning. All performance data is based on engine power corrected for intake and accessory losses appropriate to the flight condition.

9-10.5.2 Chart Differences

Because of performance differences between the wheel-skiplane and other DHC-6 gear configurations arising from fitment of the skis, many of the performance charts provided in Section 5 of the AFM are not suitable for use with the wheel-skiplane. Any chart in Section 5 of the AFM that addresses take-off or landing distances or rates/gradients of climb is unsuitable for use with the wheel-skiplane.

All other performance related data and practices provided in Section 5 that is not specifically identified as 'landplane only' applies to the wheel-skiplane.

9-10.5.3 Wheel-Skiplane Performance Charts

The first eleven figures (performance charts) from AFM Section 5 may be used for both the landplane and the wheel-skiplane, therefore, duplicates of these Section 5 charts are not provided in this supplement – the charts in Section 5 should be used.

Section 5 Performance Charts Applicable to the Wheel-Skiplane	
Figure	**Chart Title**
Figure 5-1	Temperature Conversion Chart
Figure 5-2	Wind Component
Figure 5-3	Airspeed Position Error Correction – Ground
Figure 5-4	Airspeed Position Error Correction – Flight
Figure 5-5	Altimeter Position Error Correction – Flight
Figure 5-6	Stalling Speed – Propellers Feathered
Figure 5-7	Take-Off Power Setting
Figure 5-8	Maximum Continuous Power Setting
Figure 5-9	Maximum Climb Power Setting
Figure 5-10	Maximum Climb and Cruise Power – 91% N_P
Figure 5-11	Maximum Cruise Power Setting

The following performance charts, provided in this supplement, are unique to the wheel-skiplane and should be used as direct replacements for charts provided in Section 5.

Section 9-20 Performance Charts Unique to the Wheel-Skiplane		
Figure	**Chart Title**	**Replaces AFM Section 5 Chart**
Figure 9-10-1	MTOW– OEI Enroute Climb with Feathered Propeller	New performance chart, unique to wheel-skiplane.
Figure 9-10-2	Take-Off Distance to 50 Feet, Both Engines Operating	Replaces Figure 5-14.
Figure 9-10-3	Take-Off Gross Rate of Climb, Both Engines Operating	Replaces Figure 5-19.
Figure 9-10-4	Take-Off Gross Gradient of Climb, Both Engines Operating	Replaces Figure 5-20.
Figure 9-10-5	Take-Off or Enroute Gross Rate of Climb – Single Engine, Propeller Feathered	Replaces Figure 5-21 and 5-25.
Figure 9-10-6	Take-Off or Enroute Gradient of Climb – Single Engine, Propeller Feathered	Replaces Figure 5-22 and 5-26.
Figure 9-10-7	Balked Gross Landing Rate of Climb	Replaces Figure 5-27.
Figure 9-10-8	Balked Gross Landing Gradient of Climb	Replaces Figure 5-28.
Figure 9-10-9	Landing Distance from 50 feet AGL to Full Stop	Replaces Figure 5-29.

Section 5 Performance Charts Not Applicable to the Wheel-Skiplane	
The following figures (performance charts) from AFM Section 5 must not be used, however, no equivalent replacement chart applicable to the wheel-skiplane has been published.	
Figure 5-12	Maximum Take-Off Weight – OEI Take-off Climb with Windmilling Propeller
Figure 5-15	Take-Off Ground Roll
Figure 5-16	Accelerate-Stop Distance (to full stop)
Figure 5-17	Take-Off Distance to Liftoff Speed – Engine Failure at V_1
Figure 5-18	Take-Off Distance to 35 Feet – Engine Failure Recognized at V_1
Figure 5-23	Take-Off Rate of Climb – Single Engine, Propeller Windmilling
Figure 5-24	Take-Off Gradient of Climb – Single Engine, Propeller Windmilling

9-10.5.4 Flap Settings

All charts presented in this supplement are based on the following aircraft configuration:

Take-Off	10°
Take-Off climb (prior to 400 feet AGL or obstacle clearance, whichever comes later)	10°
Enroute climb with two engines	0°
Any form of climb with one engine	10°
Landing	37.5°

9-10.5.5 Landing Distance Adjustments for Different Flap Settings

All landing charts give distances for landing with full flap (37.5°). Landing with 20° flap is permitted when sufficient landing distance is available and landing surface conditions allow for the higher touchdown speed. Landing with 10° flap is only permitted during or subsequent to exposure to icing conditions. Landing with 0° flap is an unapproved, abnormal maneuver that is only permitted in the event of a malfunction of the flap system.

To adjust the published landing distances for flaps 37.5° to suit other flap settings, proceed as follows:

For landing with flaps 20°, multiply calculated distance by 1.3 (130%).

For landing with flaps 10°, multiply calculated distance by 1.8 (180%).

For landing with flaps 0°, multiply calculated distance by 2.3 (230%).

9-10.5.6 Maximum Take-Off Weight – Single Engine Climb with Feathered Propeller

Conditions associated with this Chart

Flaps set at take-off position (10°) or position for best single engine rate of climb (10°), one engine inoperative with the propeller feathered, the other engine set to take-off Power or Maximum Continuous Power (the two power settings are the same).

Interpretive Guidance

This chart is used to determine the maximum allowable take-off weight at pressure altitudes equal to or less than 5,000 feet that will ensure a positive rate of climb enroute for an aircraft with one engine inoperative (OEI) and the propeller of that engine feathered.

No limitation exists at temperatures of ISA or below. A positive rate of climb is possible at all weights up to and including the maximum take-off weight of 12,500 pounds at pressure altitudes equal to or less than 5,000 feet provided that the ambient temperature is equal to or less than ISA.

Example Calculation (dotted line)

No example is provided.

MAXIMUM PERMISSIBLE TAKE-OFF WEIGHT (AT OR BELOW 5000 FT) BASED ON OEI ENROUTE CLIMB

WHEEL-SKIPLANE

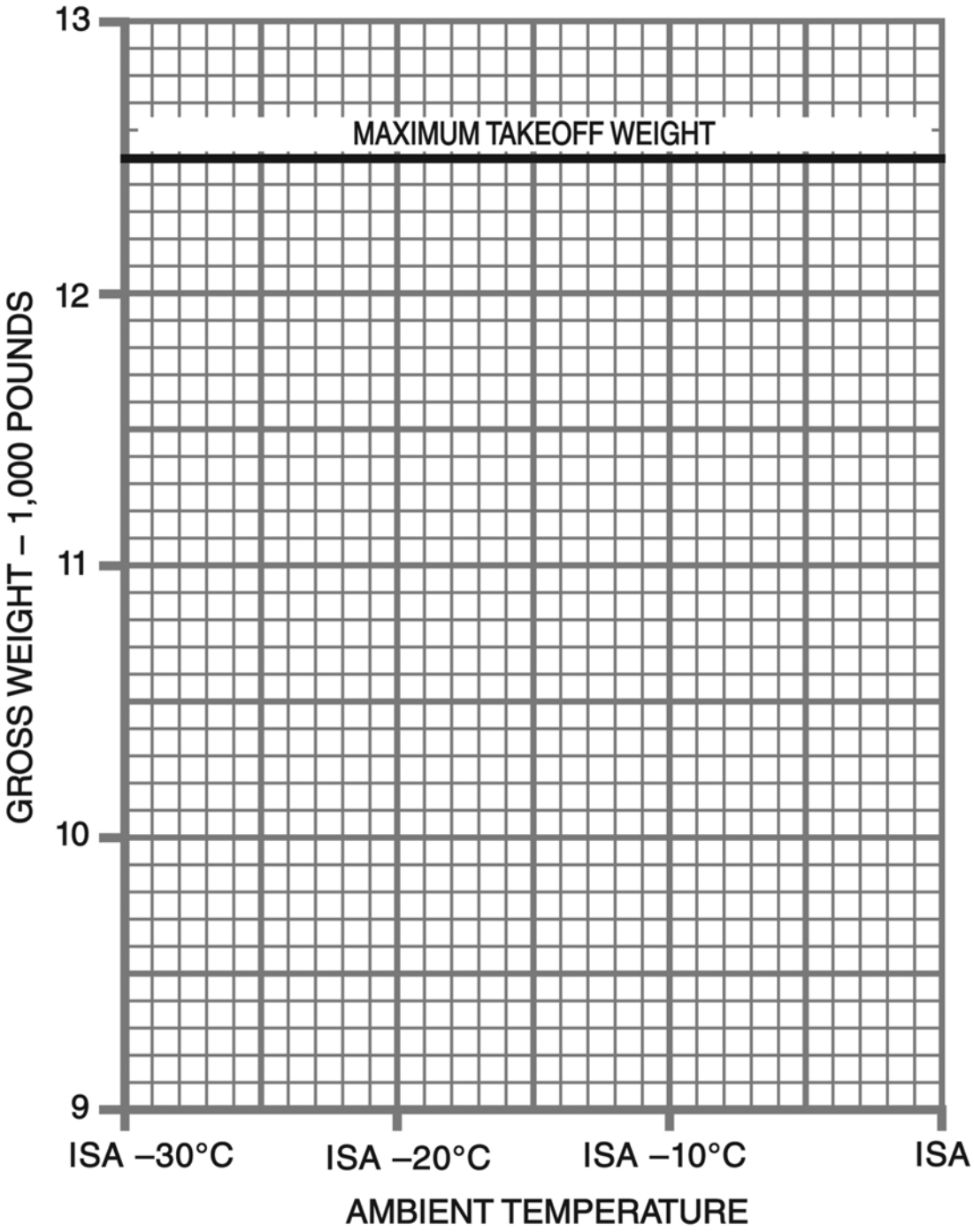


Figure 9-10-1 Maximum Take-Off Weight – OEI Enroute Climb

9-10.5.7 Take-Off Distance to 50 Feet, Both Engines Operating

Conditions associated with this Chart

Flaps set at take-off position (10°), both engines set to Take-off Power, propeller speed 96%, speed according to chart inset; dry hard surfaced runway. Distances are for actual winds and are not factored.

Interpretive Guidance

This chart allows calculation of the total distance required to take-off from a dry hard surfaced runway and reach a height of 50 feet above the runway.

When operating on snow the chart distances should be increased as follows:

(a) on “very slippery” snow, increase distance by 100 – 500 feet.

(b) on “normal” snow increase distance by 1,000 feet.

(c) on “sticky” snow or “doubtful” conditions increase distance by 2,000 to 3,000 feet or more.

It must be understood that the distances for the wheel-skiplane when operating on snow will vary according to snow conditions which are difficult to define. The distances predicted from the chart, therefore, should be used only as a guide.

Example Calculation (dotted line)

For guidance explaining how to use the chart, refer to the example calculation provided in Section 5 for Figure 5-14.

Summary of Example Calculation

With an OAT of –10°C, pressure altitude 2,000 feet, weight of 11,000 pounds, and headwind component of 10 KIAS, the wheel-skiplane will require 980 feet total distance from the beginning of the take-off run to 50 feet above the runway if a take-off is conducted in accordance with the instructions in Section 4 of this AFM as modified by the instructions in this supplement.

NOTE

If intake deflectors are extended and take-off torque is less than 50 PSI, increase the distance by 2.5%.

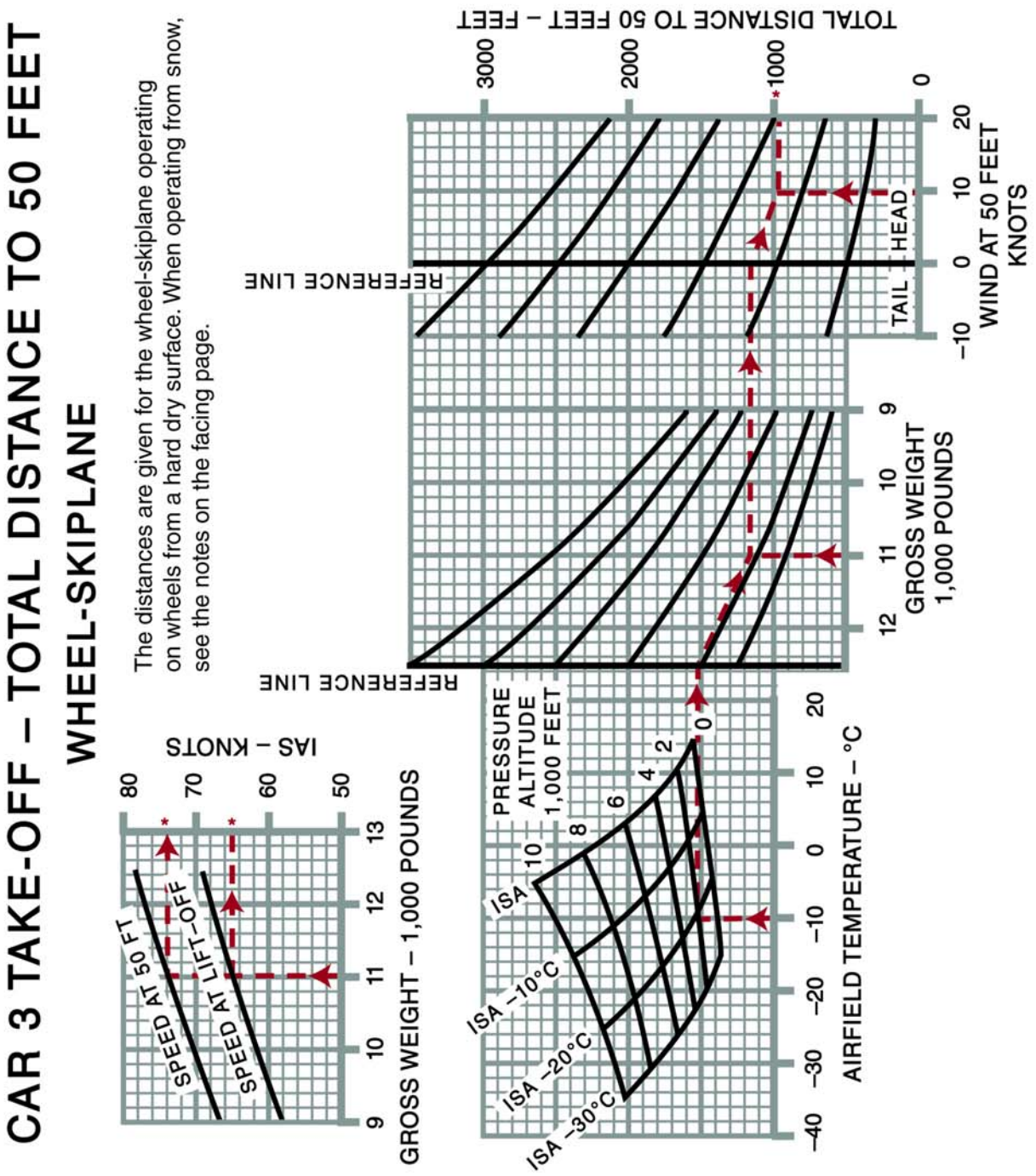


Figure 9-10-2 Take-Off Distance to 50 Feet, Both Engines Operating

9-10.5.8 Take-Off Gross Rate of Climb, Both Engines Operating

Conditions associated with this chart

Flaps set at take-off position (10°), intake deflectors retracted (see note below if deflectors are extended), both engines set to Take-off Power, propeller speed 96%, climb speed according to chart inset.

Interpretive Guidance

This chart provides the initial gross take-off rate of climb in feet per minute when both engines are set to Take-off Power and the aircraft speed is maintained at the value determined from the inset chart.

Example Calculation (dotted line)

For guidance explaining how to use the chart, refer to the example calculation provided in Section 5 for Figure 5-19.

Summary of Example Calculation

At an air temperature of –10°C, pressure altitude of 2,000 feet, and aircraft weight of 11,000 pounds, the take-off rate of climb will be 1,620 feet per minute at 74 KIAS.

NOTE

If intake deflectors are extended and Take-off Power is less than 50 PSI, deduct 30 feet per minute from the value derived from this chart.

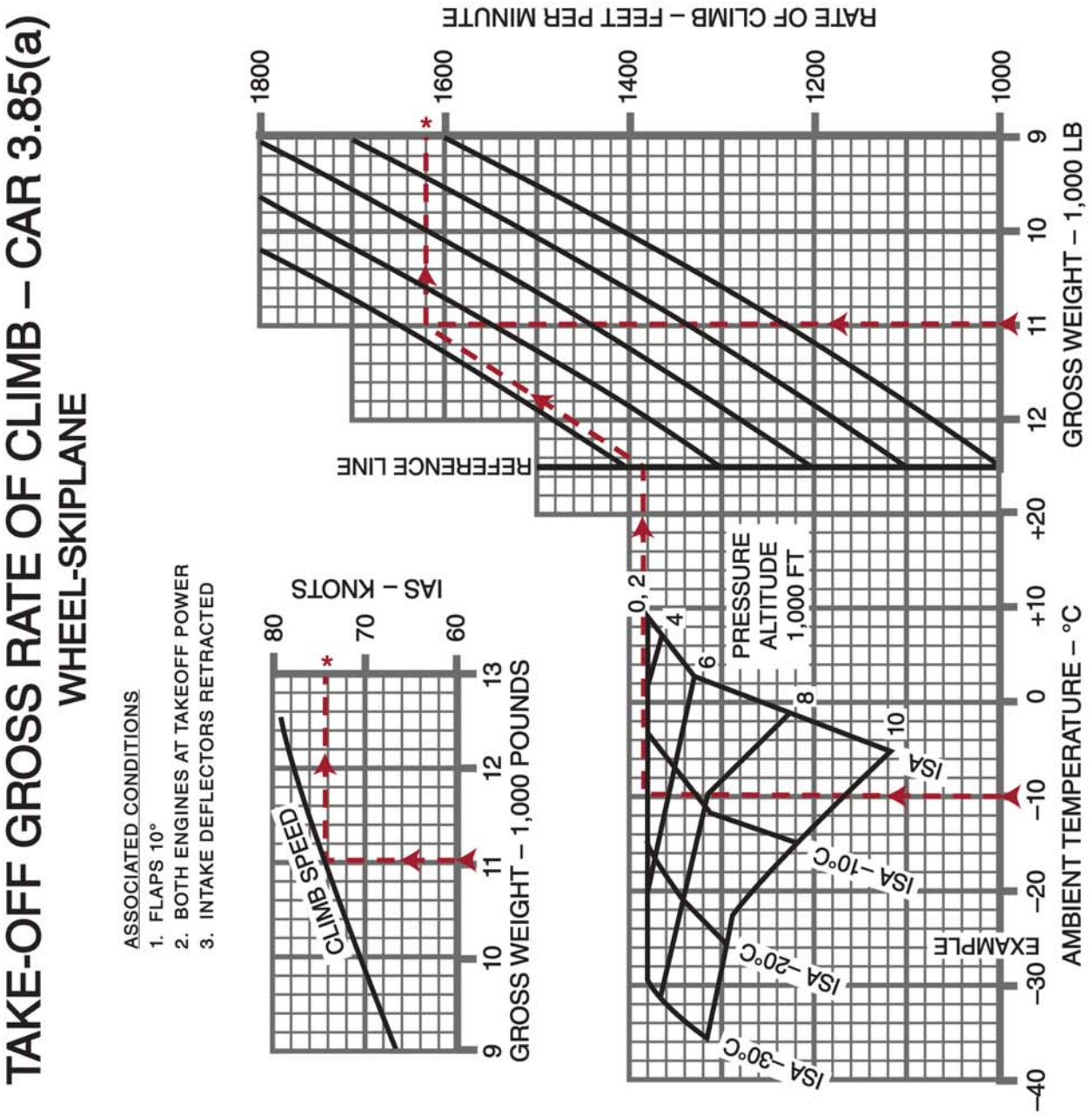


Figure 9-10-3 Take-Off Gross Rate of Climb, Both Engines Operating

9-10.5.9 Take-Off Gross Gradient of Climb, Both Engines Operating

Conditions associated with this chart

Flaps set at take-off position (10°), intake deflectors retracted (see note below if deflectors are extended), both engines set to Take-off Power, propeller speed 96%, climb speed according to chart inset.

Interpretive Guidance

This chart provides initial gross take-off climb gradient when both engines are set to Take-off Power and the aircraft speed is maintained at the value determined from the inset chart. The gradient is expressed as a ratio of vertical distance gained to horizontal distance travelled.

Example Calculation (dotted line)

For guidance explaining how to use the chart, refer to the example calculation provided in Section 5 for Figure 5-20.

Summary of Example Calculation

At an air temperature of –10°C, pressure altitude of 2,000 feet, and aircraft weight of 11,000 pounds, the take-off climb gradient will be 0.21 (21%). The aircraft will climb 210 feet for every 1,000 feet of forward travel.

NOTE

If intake deflectors are extended and Take-off Power is less than 50 PSI, deduct 0.004 (approximately half a percent) from the value derived from this chart.

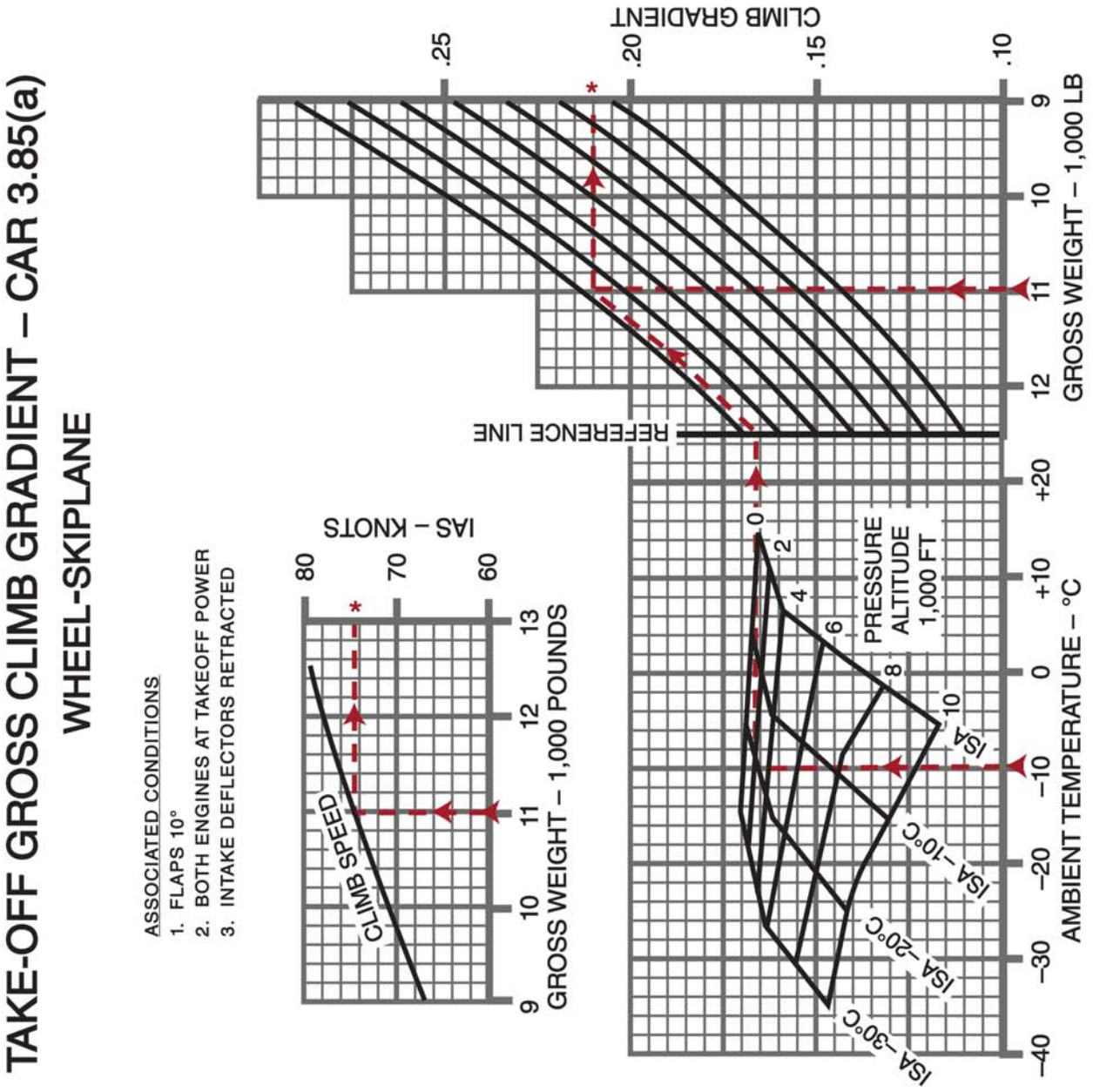


Figure 9-10-4 Take-Off Gross Gradient of Climb, Both Engines Operating

9-10.5.10 Take-Off or Enroute Gross Rate of Climb – OEI

Conditions associated with this chart

Flaps set at best single engine rate of climb position (10°), intake deflectors retracted (see note below if deflectors are extended), one engine set to Take-off Power or Maximum Continuous Power (the two values are the same), propeller speed 96%, one engine inoperative with propeller feathered, climb speed according to chart inset.

Interpretive Guidance

This chart provides enroute gross rate of climb in feet per minute when one engine is set to Take-off or Maximum Continuous Power, the other engine is inoperative and feathered, and the aircraft speed is maintained at the value determined from the inset chart.

Because the result of the Maximum Continuous Power calculation (the power setting allowed for single engine flight) and the configuration of the aircraft for best single engine climb enroute happens to be identical to the result of the Maximum Take-off Power calculation, the results of the calculation for Enroute Rate of Climb – Single Engine, Propeller Feathered are identical to the results of a calculation made to determine Take-off Rate of Climb – Single Engine, Propeller Feathered.

Example Calculation (dotted line)

For guidance explaining how to use the chart, refer to the example calculation provided in Section 5 for Figure 5-22.

Summary of Example Calculation

At an air temperature of –10°C, pressure altitude of 2,000 feet, and aircraft weight of 11,000 pounds, the enroute rate of climb will be 360 feet per minute.

NOTE

If intake deflectors are extended and Take-off Power is less than 50 PSI, deduct 15 feet per minute from the value derived from this chart.

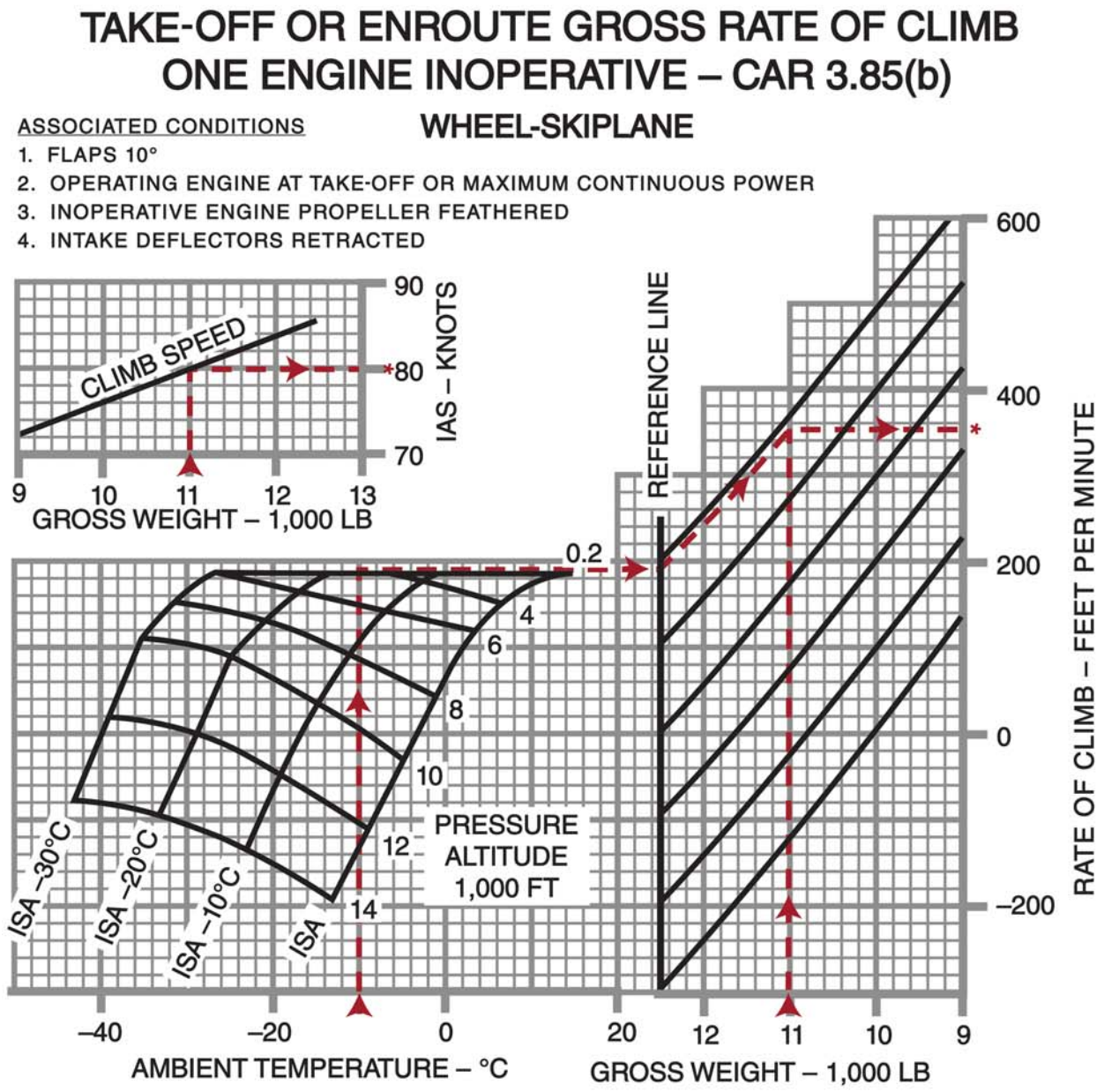


Figure 9-10-5 Take-Off or Enroute Gross Rate of Climb, Single Engine, Propeller Feathered

9-10.5.11 Take-Off or Enroute Gross Gradient of Climb – OEI

Conditions associated with this chart

Flaps set at best single engine rate of climb position (10°), intake deflectors retracted (see note below if deflectors are extended), one engine set to Take-off Power or Maximum Continuous Power (the two values are the same), propeller speed 96%, one engine inoperative with propeller feathered, climb speed according to chart inset.

Interpretive Guidance

This chart provides enroute gross climb gradient when one engine is set to Take-off or Maximum Continuous Power, the other engine is inoperative and feathered, and the aircraft speed is maintained at the value determined from the inset chart. The gradient is expressed as a ratio of vertical distance gained to horizontal distance travelled.

Because the result of the Maximum Continuous Power calculation (the power setting allowed for single engine flight) and the configuration of the aircraft for best single engine climb enroute happens to be identical to the result of the Maximum Take-off Power calculation, the results of the calculation for Enroute Gradient of Climb – Single Engine, Propeller Feathered are identical to the results of a calculation made to determine Take-off Gradient of Climb – Single Engine, Propeller Feathered.

Example Calculation (dotted line)

For guidance explaining how to use the chart, refer to the example calculation provided in Section 5 for Figure 5-25.

Summary of Example Calculation

At an air temperature of –10°C, pressure altitude of 2,000 feet, and aircraft weight of 11,000 pounds, the initial single engine take-off or enroute climb gradient will be 0.04 (4%). The aircraft will climb 40 feet for every 1,000 feet of forward travel.

NOTE

If intake deflectors are extended and Take-off Power is less than 50 PSI, deduct 0.002 (two-tenths of one percent) from the value derived from this chart.

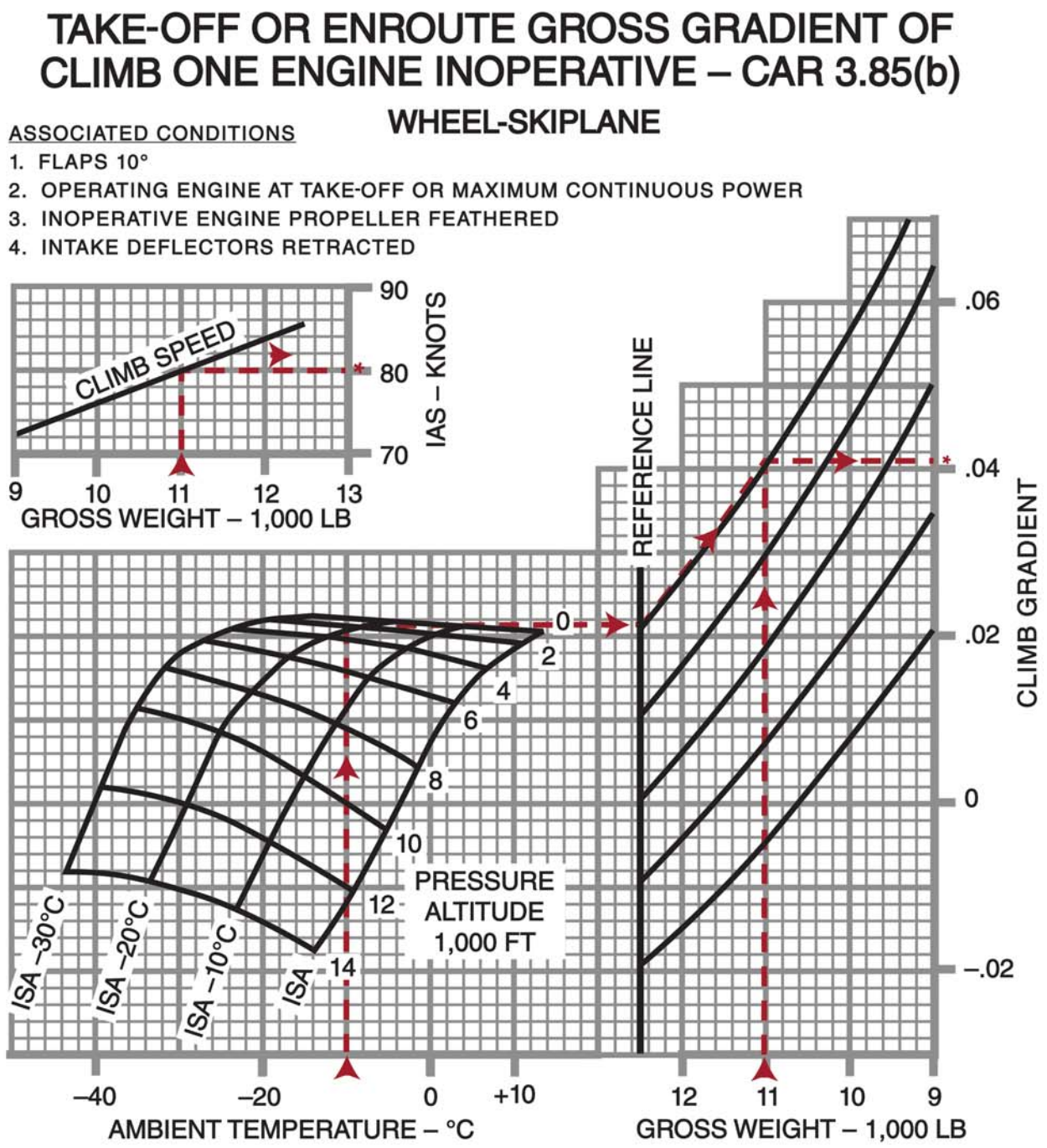


Figure 9-10-6 Take-Off or Enroute Gross Gradient of Climb – Single Engine, Propeller Feathered

9-10.5.12 Balked Landing Gross Rate of Climb

Conditions associated with this chart

Flaps fully extended (37.5°), intake deflectors retracted (see note below if deflectors are extended), both engines set to Take-off Power, propeller speed 96%, climb speed according to chart inset.

Interpretive Guidance

This chart provides gross rate of climb information with the aircraft in the landing configuration (flaps fully extended, propellers set to 96% N_P).

Example Calculation (dotted line)

For guidance explaining how to use the chart, refer to the example calculation provided in Section 5 for Figure 5-27.

Summary of Example Calculation

At –10°C air temperature, 2,000 feet pressure altitude, and 11,000 pound landing weight, the initial rate of climb with flaps fully extended will be 1,080 feet per minute.

WARNING

THIS CHART ASSUMES USE OF TAKE-OFF POWER FOR THE BALKED LANDING. PROPELLER SPEED MUST BE 96%.

CAUTION

IF A BALKED LANDING IS INITIATED WITH FLAPS LESS THAN FULLY EXTENDED, THE INITIAL RATE OF CLIMB MAY BE GREATER THAN THAT SHOWN ON THE CHART. AS FLAPS ARE RETRACTED DURING THE BALKED LANDING MANEUVER, CLIMB SPEED SHOULD BE PROGRESSIVELY INCREASED UNTIL REACHING V_X (BEST ANGLE) OF CLIMB. WHEN ALL OBSTACLES HAVE BEEN CLEARED, CLIMB SPEED SHOULD BE INCREASED TO V_Y (BEST RATE) OF CLIMB. SEE SECTION 2 (LIMITATIONS) FOR V_X AND V_Y SPEEDS.

NOTE

With intake deflectors extended and torque settings less than 50 PSI, reduce rate of climb shown by 30 feet per minute.

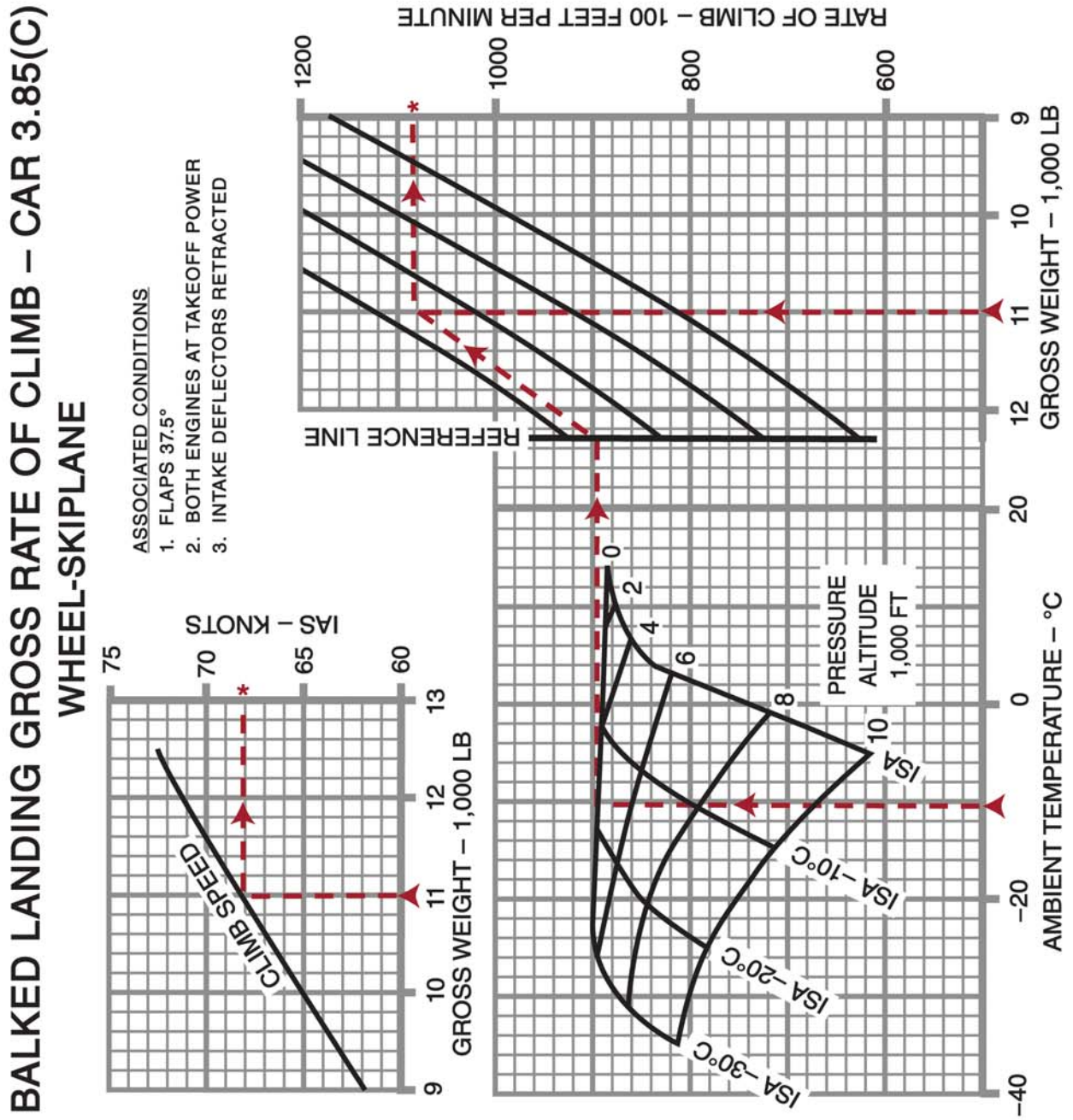


Figure 9-10-7 Balked Gross Landing Rate of Climb

9-10.5.13 Balked Landing Gross Gradient of Climb

Conditions associated with this chart

Flaps fully extended (37.5°), intake deflectors retracted (see note below if deflectors are extended), both engines set to Take-off Power, propeller speed 96%, climb speed according to chart inset.

Interpretive Guidance

This chart provides gross climb gradient information with the aircraft in the landing configuration (flaps fully extended, propellers set to 96% N_P).

Example Calculation (dotted line)

For guidance explaining how to use the chart, refer to the example calculation provided in Section 5 for Figure 5-28.

Summary of Example Calculation

At 0°C air temperature, sea level pressure altitude, and 11,000 pound landing weight, the initial climb gradient with flaps fully extended will be 0.15 (15%). The aircraft will climb 150 feet for every 1,000 feet of forward travel.

WARNING

THIS CHART ASSUMES USE OF TAKE-OFF POWER FOR THE BALKED LANDING. PROPELLER SPEED MUST BE 96%.

WARNING

AS FLAPS ARE RETRACTED DURING THE BALKED LANDING MANEUVER, CLIMB SPEED SHOULD BE PROGRESSIVELY INCREASED UNTIL REACHING V_X (BEST ANGLE) OF CLIMB. WHEN ALL OBSTACLES HAVE BEEN CLEARED, CLIMB SPEED SHOULD BE INCREASED TO V_Y (BEST RATE) OF CLIMB.

CAUTION

IF A BALKED LANDING IS INITIATED WITH FLAPS LESS THAN FULLY EXTENDED, THE INITIAL CLIMB GRADIENT MAY BE SLIGHTLY LESS THAN THAT SHOWN ON THE GRAPH – THIS IS DUE TO THE HIGHER AIRCRAFT FORWARD SPEED DURING THE CLIMB.

NOTE

With intake deflectors extended and torque settings less than 50 PSI, reduce climb gradient shown by 0.004.

This Page Intentionally Left Blank

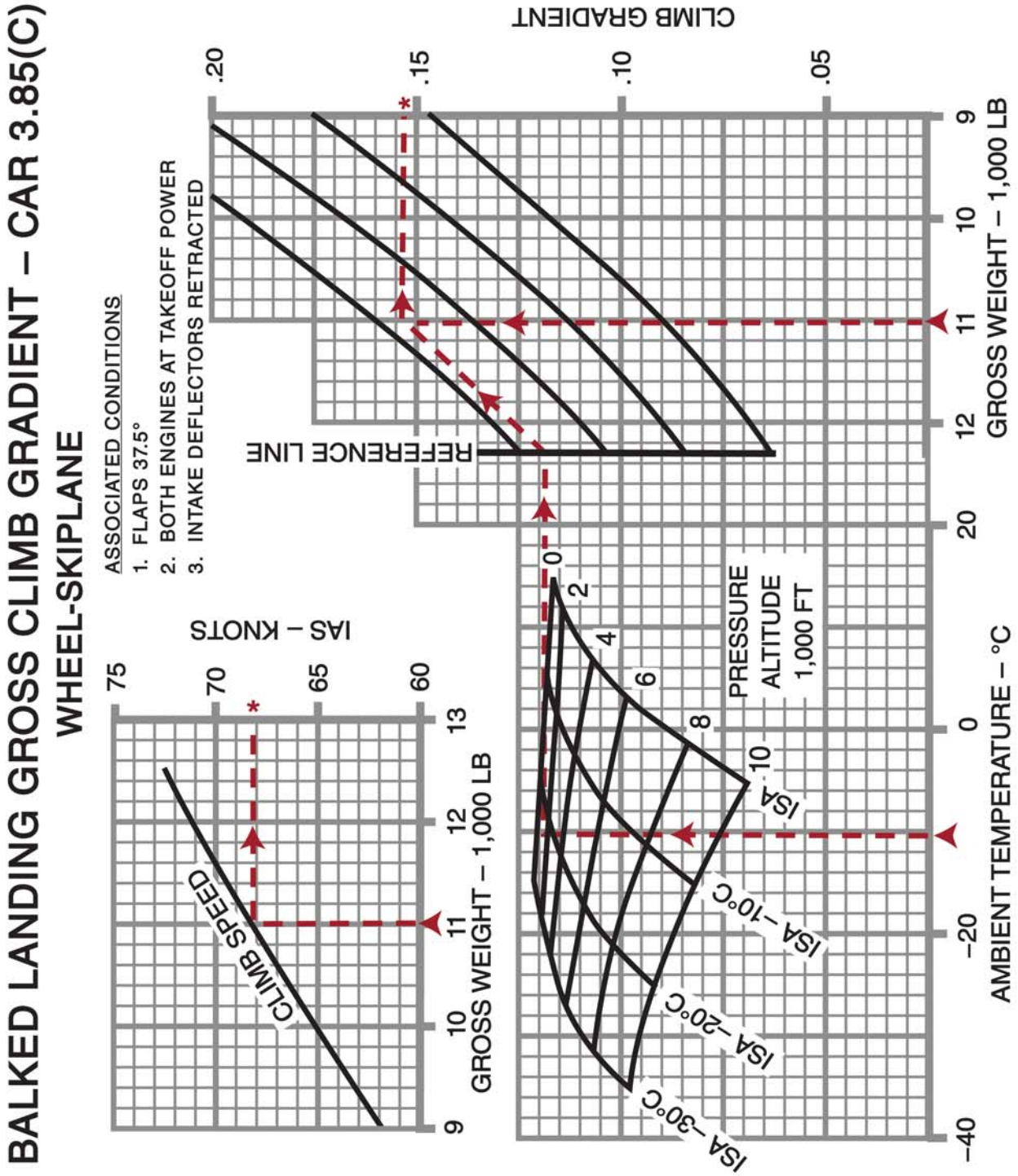


Figure 9-10-8 Balked Landing Gross Gradient of Climb

9-10.5.14 Landing Distance from 50 feet AGL to Full Stop

Conditions associated with this chart

Flaps fully extended (37.5°), intake deflectors retracted or extended, propeller speed 96%, speed according to chart inset, power as required to maintain a 3° approach angle to 50 feet, then power promptly reduced to IDLE at 50 feet AGL. Wheel landing at a dry, hard, level airfield. Retardation by brakes alone. Maximum brake effort used for stopping. Distances are for actual winds and are not factored.

Interpretive Guidance

The distances have been calculated using the procedure and technique specified in CAR 3 and are consistent with the procedures given for a normal landing in Section 4 of this AFM.

Example Calculation (dotted line)

For guidance explaining how to use the chart, refer to the example calculation provided in Section 5 for Figure 5-29.

Summary of Example Calculation

At a temperature of 0°C, airfield pressure altitude of sea level, with a headwind component of 5 KIAS, the aircraft configured with full flap extended, the total distance from 50 feet AGL to a full stop on a dry, hard, level surface will be 1,750 feet if maximum braking is used.

NOTE

When operating on snow the chart distances should be increased as follows:

1 On “very slippery” snow or “doubtful” conditions increase distance by 2,000 to 3,000 feet or more.

2 On “dry” snow or favourable conditions increase distance by 500 to 1,500 feet.

3 It must be noted that the distances for the wheel-skiplane when operating on snow will vary according to snow conditions which are difficult to define. The distances predicted from the chart, therefore should be used as a guide.

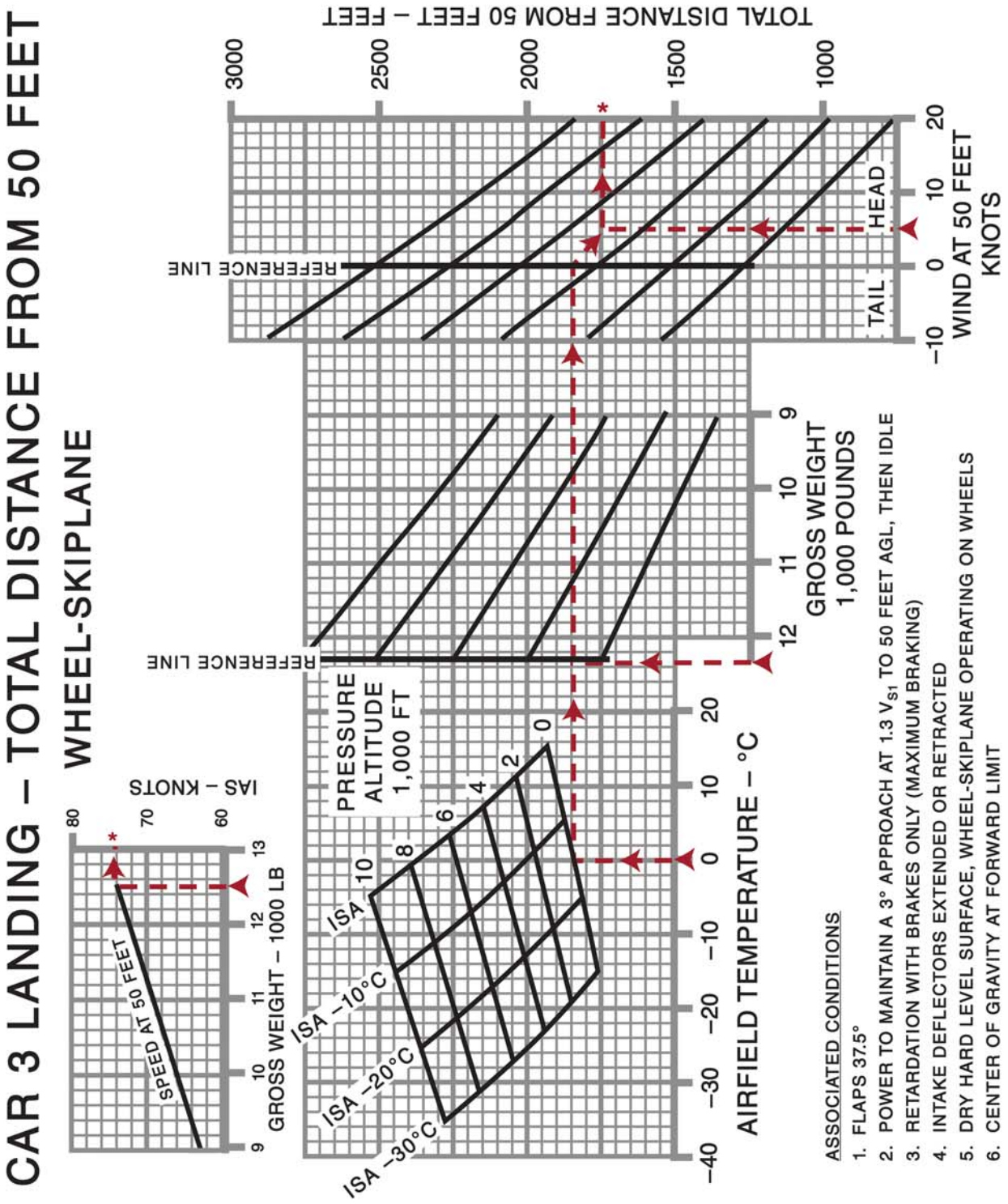


Figure 9-10-9 Landing Distance from 50 feet AGL to Full Stop

9-10.6 Weight and Balance

Optional equipment described in this supplement will be listed in Part 2 of PSM 1-63-8.

9-10.7 System Description

9-10.7.1 Spring Skiplane

The spring-ski installation comprises a ski assembly installed on each main landing gear unit and on the nose landing gear unit. Each ski assembly consists of a semi-elliptical leaf spring, a ski, and a harness assembly. The skis are restrained in flight by front and rear bungee loaded cables of the harness assembly. Short check cables, attached parallel to the bungee section, act as safety cables in the event of bungee section breakage.

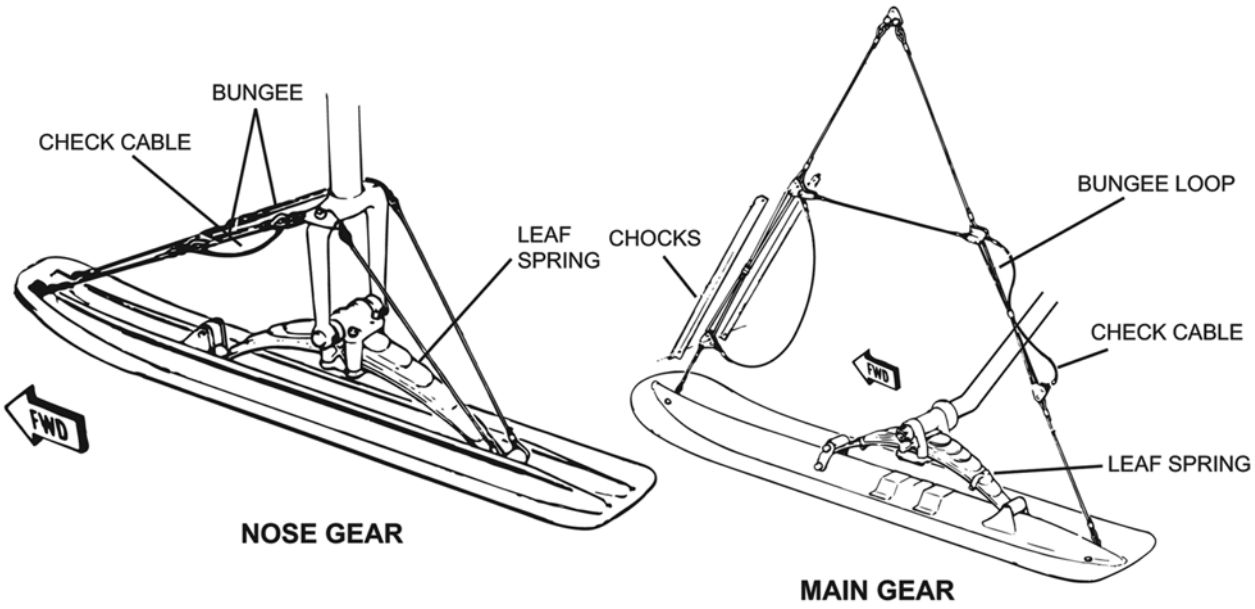


Figure 9-10-10 Spring Ski Gear

9-10.7.2 Wheel Skiplane

The combination wheel-ski installation comprises a retractable ski installed on each main landing gear unit and on the nose landing gear unit. The skis are retracted and extended by hydraulic actuators incorporated in each ski, and are operated by hydraulic pressure from the aircraft hydraulic system. Retraction and extension are effected from a single control in the flight compartment. Indicator lights are provided to denote the positions of the skis. The skis may be retracted or extended in flight or on the ground.

9-10.7.3 Main Ski Units

Each main ski is of stressed skin construction and is attached to two lugs on the axle of the main gear leg with the fork of the ski straddling the wheel. A linkage system of shafts, levers and rods connects the actuator to the ski and effects its retraction and extension. A U-shaped metal sling, which is also operated by the linkage system, swivels through a 90° arc simultaneously with movement of the ski, to open and close

the aperture at the crotch of the ski fork consistent with the ski position. With the ski extended, the sling closes the aperture and increases the total ski area. With the ski retracted, the sling is swivelled forward and upward, allowing the wheel to occupy the fork aperture. Limit cables are connected between the heel and toe of each ski to brackets on the underside of the sling and assist a torsion bar mechanism in trimming the skis.

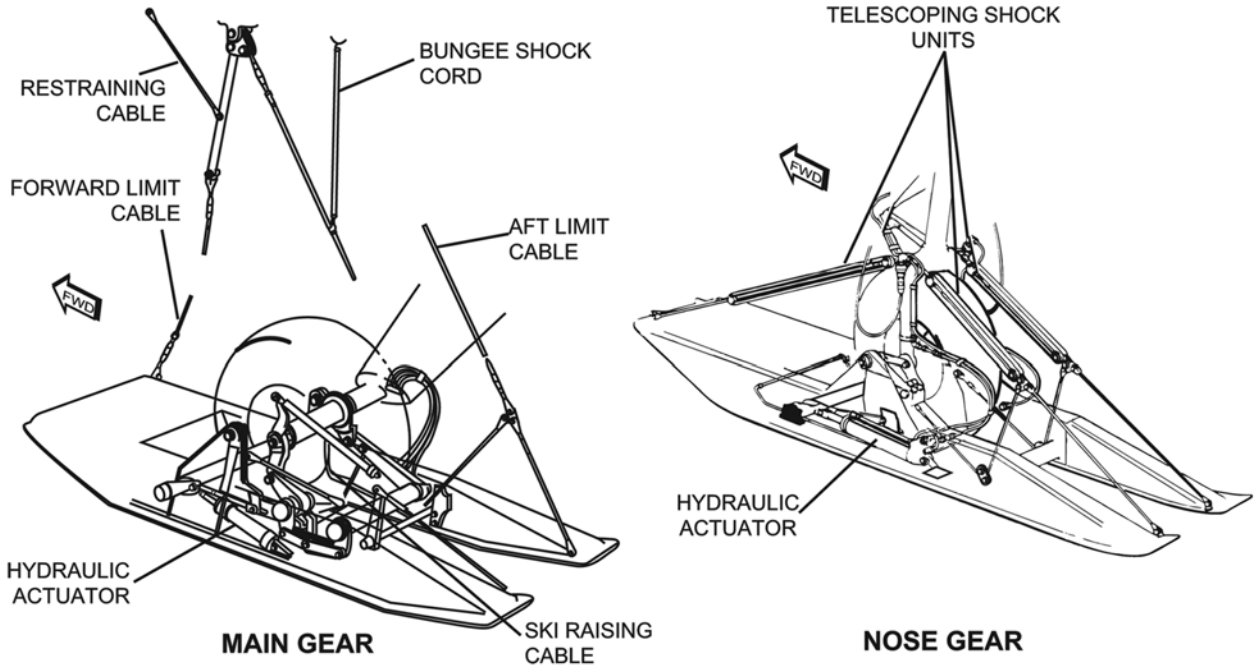


Figure 9-10-11 Wheel Skis

9-10.7.4 Nose Ski Unit

The nose wheel ski is similar in construction and operation to the main skis. Two pairs of trim cables and shock units provide self-trimming of the nose ski; the forward pair is connected between the toe of the ski and the wheel fork and the aft pair between the heel of the ski and the wheel fork.

9-10.7.5 Ski Position Selector Lever

The ski position selector lever is mounted on a panel below the instrument panel to the left of the pedestal. The lever moves in a slot with marked UP and DOWN positions. Movement of the lever to UP or DOWN appropriately retracts or extends the skis.

9-10.7.6 Ski Position Indicator Lights

The ski position indicator lights are located on the ski position selector lever panel. When illuminated, the upper group of three lights (each inscribed UP) indicate main and nose skis up and the lower group of three (each inscribed DN) indicate main and nose skis down. The lights are activated by switches on each ski unit. The indicator

lights are powered from the battery bus through a 5 ampere circuit breaker marked SKI POSITION INDICATION on the radio circuit breaker panel. The brightness of the indicator lights is controlled by the caution lights test and intensity switch on the overhead console.

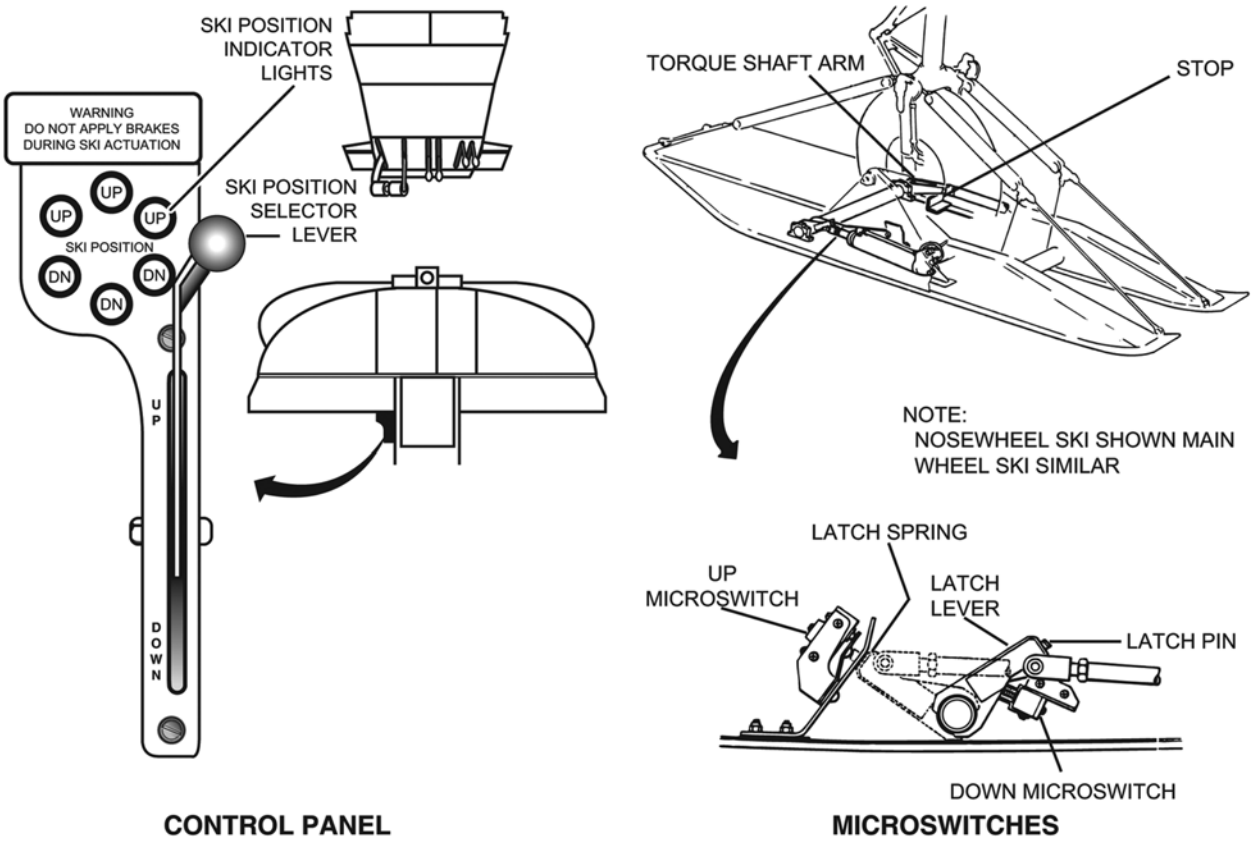


Figure 9-10-12 Wheel Ski Control and Indication

This Page Intentionally Left Blank

SECTION 9 – SUPPLEMENT 19

OPERATION WITH INOPERATIVE AUTOFEATHER SYSTEM

This Page Intentionally Left Blank

PSM 1-63-1A

SECTION 9 (T.C. Approved)

SUPPLEMENT 19

OPERATION WITH INOPERATIVE AUTOFEATHER SYSTEM

Approved: _____
A/Chief, Flight Test
Transport Canada

Date: 19 Jan 2011

LIST OF EFFECTIVE PAGES

SECTION	PAGE	DATE	SECTION	PAGE	DATE
9-19	1	19 Jan. 2011		7	19 Jan. 2011
	2	19 Jan. 2011		8	19 Jan. 2011
	3	19 Jan. 2011		9	19 Jan. 2011
	4	19 Jan. 2011		10	19 Jan. 2011
	5	19 Jan. 2011		11	19 Jan. 2011
	6	19 Jan. 2011		12	19 Jan. 2011

This Page Intentionally Left Blank

TABLE OF CONTENTS **PAGE**

9-19.1 General **7**
9-19.1.1 Scope 7
9-19.1.2 Purpose of Supplement 7

9-19.2 Limitations **8**
9-19.2.1 General 8
9-19.2.2 Airspeed Limitations 8
9-19.2.3 Airspeed Indicator Markings 8
9-19.2.4 Use of Supplement 37 (Supplemental Performance Data) 8

9-19.3 Emergency and Abnormal Procedures **9**
9-19.3.1 General 9
9-19.3.2 Engine Failure During Take-Off 9
9-19.3.3 Go-Around With Engine Inoperative 9

9-19.4 Normal Procedures **10**
9-19.4.1 General 10
9-19.4.2 Ground Checks 10
9-19.4.3 Take-Off Checks 10
9-19.4.4 Climb 10

9-19.5 Performance **11**
9-19.5.1 Replacement Performance Charts 11
9-19.5.2 Amending Performance Calculations 11

This Page Intentionally Left Blank

9-19.1 General

9-19.1.1 Scope

This supplement provides procedures for flight when the autofeather system is inoperative. It is valid only for aircraft fitted with standard landplane gear.

9-19.1.2 Purpose of Supplement

The procedures set out in this supplement are provided to allow the aircraft to be ferried to a maintenance base for the purpose of repairing an inoperative autofeather system.

The propeller autofeather system is standard equipment on all Series 300 aircraft, and is part of the basic configuration of every aircraft. It is one of the most important safety systems on the aircraft, and it **must** be used for every take-off. This requirement applies to all gear configurations of the aircraft.

AFM Supplement 19, Operation with Inoperative Autofeather System, is only provided to permit temporary continued operation of the aircraft in accordance with the relief provided in the MEL until such time as the autofeather system can be repaired. The MMEL lists the autofeather system as a 'Category C' item, which means that repairs shall be carried out within ten (10) consecutive calendar days, excluding the day of discovery. Individual operator MELs may impose more restrictive limitations.

Viking Air Limited does not and will not grant permission for normal (i.e. ongoing) operation of any DHC-6 Series 300 aircraft in any configuration, for any purpose (except when authorized for flight test or pilot training purposes), without use of the autofeather system as set out in Section 4 of the AFM.

9-19.2 Limitations

9-19.2.1 General

The operating limitations detailed in Section 2 apply when the Autofeather System is inoperative with the exceptions given in the following paragraphs.

9-19.2.2 Airspeed Limitations

The minimum control speed (V_{MC}) with flaps 10° is 70 KCAS, 68 KIAS.

9-19.2.3 Airspeed Indicator Markings

The minimum control speed (red radial line) marked on the face of the airspeed indicator is not appropriate for operations with an inoperative autofeather system. The crew should consider the minimum control speed marking to be at 70 KCAS.

9-19.2.4 Use of Supplement 37 (Supplemental Performance Data)

Supplement 37 may not be used when the autofeather system is inoperative. A properly functioning autofeather system that is used in accordance with procedures set out in the main body of the AFM is a prerequisite for use of Supplement 37.

9-19.3 Emergency and Abnormal Procedures

9-19.3.1 General

The emergency operating procedures detailed in Section 3 apply when the autofeather system is inoperative with the exceptions given in the following paragraphs.

9-19.3.2 Engine Failure During Take-Off

1 If an engine failure occurs above V_{MC} and a decision is made to continue the take-off, the propeller of the failed engine must be feathered manually by selecting the propeller lever of the failed engine to FEATHER.

2 Step 4 of Section 3.3.3 is amended by replacing step 4 in its entirety with the following text:

4. Determine if the power loss is partial or total. If the power loss is partial, it may be appropriate to leave the affected engine operating if it is contributing thrust.

If the power loss is total:

4.a Propeller of inoperative engine – FEATHER manually.

Climb to a safe altitude (typically several thousand feet AGL). If turns are necessary for obstacle clearance, limit bank angle to 15° during single engine operations to avoid negative rates of climb caused by higher wing loading during turns. When a safe altitude has been reached, carry out the following secondary actions:

(from this point on, complete step 5 and subsequent steps exactly as set out in Section 3.3.3, except that steps 6 and 12 will be unnecessary, as explained below.)

3 Selecting the propeller lever of the failed engine to FEATHER (step 6 of Section 3.3.3) after the propeller has autofeathered and selecting the autofeather switch to OFF (step 12 of Section 3.3.3), does not apply. These steps are unnecessary.

9-19.3.3 Go-Around With Engine Inoperative

V_{MC} is 68 KIAS.

9-19.4 Normal Procedures

9-19.4.1 General

The normal operating procedures detailed in Section 4 apply when the autofeather system is inoperative with the exceptions given in the following paragraphs.

9-19.4.2 Ground Checks

Selecting the autofeather switch ON and carrying out an autofeather ground function test does not apply.

9-19.4.3 Take-Off Checks

Selecting the autofeather switch ON does not apply. Confirming that the autofeather ARMED light illuminates when take-off power is set does not apply.

9-19.4.4 Climb

Selecting the autofeather switch OFF does not apply.

9-19.5 Performance

The performance data provided in Section 5 applies when the autofeather system is inoperative, with the exceptions given below.

9-19.5.1 Replacement Performance Charts

Section 5 of the AFM contains performance charts that address performance with and without a feathered propeller. The performance charts that address performance with a windmilling (not feathered) propeller must be used if the autofeather system is inoperative.

These performance charts must not be used if the autofeather system is inoperative	**These performance charts should be used instead if the autofeather system is inoperative**
5-12, Maximum Take-Off Weight – OEI Take-off Climb with Feathered Propeller	5-13, Maximum Take-Off Weight – OEI Take-Off Climb with Windmilling Propeller
5-21, Take-Off Rate of Climb – Single Engine, Propeller Feathered	5-23, Take-Off Rate of Climb – Single Engine, Propeller Windmilling
5-22, Take-Off Gradient of Climb – Single Engine, Propeller Feathered	5-24, Take-Off Gradient of Climb – Single Engine, Propeller Windmilling

9-19.5.2 Amending Performance Calculations

The process for calculating the take-off distance to 50 feet, both engines operating (chart 5-14) and the accelerate-stop distance (chart 5-16) is amended by adding the following two steps to the process to be followed to determine the required distances:

1 Increase V_1 and V_2 (derived from the inset charts) by 4 knots.

2 Add 15% to the distances determined by using charts 5-14 and 5-16.

WARNING

THE INCREASE IN BOTH V_1 AND V_2 IS NECESSARY TO MAINTAIN A SAFE MARGIN FROM V_{MC}, WHICH IS INCREASED BY 4 KNOTS (TO ALLOW FOR SPEED DEGRADATION WHILE THE PILOT MANUALLY FEATHERS THE PROPELLER) WHENEVER THE AUTOFEATHER SYSTEM IS INOPERATIVE. THE 15% INCREASES IN DISTANCES REQUIRED ARE A DIRECT RESULT OF THE 4 KNOT INCREASE IN V_1 AND V_2.

This Page Intentionally Left Blank

SECTION 9 – SUPPLEMENT 20

FLOATPLANE OPERATION SFAR 23

This Page Intentionally Left Blank

PSM 1-63-1A

SECTION 9 (T.C. Approved)

SUPPLEMENT 20

FLOATPLANE OPERATION SFAR 23

S.O.O. 6082

Approved: _____
Chief, Flight Test
Transport Canada

Date: 3 February 2011

Issue 4

LIST OF EFFECTIVE PAGES

SECTION	PAGE	DATE	SECTION	PAGE	DATE
9-20	1	03 Feb. 2011		31	03 Feb. 2011
	2	03 Feb. 2011		32	03 Feb. 2011
	3	03 Feb. 2011		33	03 Feb. 2011
	4	03 Feb. 2011		34	03 Feb. 2011
	5	03 Feb. 2011		35	03 Feb. 2011
	6	03 Feb. 2011		36	03 Feb. 2011
	7	03 Feb. 2011		37	03 Feb. 2011
	8	03 Feb. 2011		38	03 Feb. 2011
	9	03 Feb. 2011		39	03 Feb. 2011
	10	03 Feb. 2011		40	03 Feb. 2011
	11	03 Feb. 2011		41	03 Feb. 2011
	12	03 Feb. 2011		42	03 Feb. 2011
	13	03 Feb. 2011		43	03 Feb. 2011
	14	03 Feb. 2011		44	03 Feb. 2011
	15	03 Feb. 2011		45	03 Feb. 2011
	16	03 Feb. 2011		46	03 Feb. 2011
	17	03 Feb. 2011		47	03 Feb. 2011
	18	03 Feb. 2011		48	03 Feb. 2011
	19	03 Feb. 2011		49	03 Feb. 2011
	20	03 Feb. 2011		50	03 Feb. 2011
	21	03 Feb. 2011		51	03 Feb. 2011
	22	03 Feb. 2011		52	03 Feb. 2011
	23	03 Feb. 2011		53	03 Feb. 2011
	24	03 Feb. 2011		54	03 Feb. 2011
	25	03 Feb. 2011		55	03 Feb. 2011
	26	03 Feb. 2011		56	03 Feb. 2011
	27	03 Feb. 2011		57	03 Feb. 2011
	28	03 Feb. 2011		58	03 Feb. 2011
	29	03 Feb. 2011		59	03 Feb. 2011
	30	03 Feb. 2011		60	03 Feb. 2011

SECTION	PAGE	DATE	SECTION	PAGE	DATE
	61	03 Feb. 2011		63	03 Feb. 2011
	62	03 Feb. 2011		64	03 Feb. 2011

TABLE OF CONTENTS **PAGE**

9-20.1 General 9
9-20.1.1 Scope 9
9-20.1.2 Certification Basis 9

9-20.2 Limitations 10
9-20.2.1 Airspeed Limitations 10
9-20.2.2 Airspeed Indicator Markings 11
9-20.2.3 Landing Weight Limitation 11
9-20.2.4 Take-Off and Landing Center of Gravity Range 12

9-20.3 Emergency and Abnormal Procedures 13
9-20.3.1 General Concepts 13
9-20.3.2 Airspeeds for Emergency Operations 13
9-20.3.3 Engine Failure Waterborne 14
9-20.3.4 Engine Failure Airborne, Prior to VMC 14
9-20.3.5 Engine Failure Airborne, After VMC 14
9-20.3.6 One Engine Inoperative Landing 15
9-20.3.7 One Engine Inoperative Missed Approach 16
9-20.3.8 Landing with Flaps Inoperative (Flaps 0°) 16
9-20.3.9 Go-Around from a Flapless Approach 17

9-20.4 Normal Procedures 18
9-20.4.1 Preparation and Inspection 18
9-20.4.2 Starting Engines 18
9-20.4.3 After Start (Pre-Taxi) 19
9-20.4.4 Taxi Checks 19
9-20.4.5 System Functional Checks 19
9-20.4.6 Before Take-Off 20
9-20.4.7 Take-Off 20
9-20.4.8 Crosswind Take-Offs 20
9-20.4.9 After Take-Off, Climb, Cruise, Descent 21
9-20.4.10 Approach 21
9-20.4.11 Final Approach and Landing 21
9-20.4.12 Landing on Glassy Water 22
9-20.4.13 Go-Around (Balked Landing) 22
9-20.4.14 After Landing 23
9-20.4.15 Shutdown 23

TABLE OF CONTENTS **PAGE**

9-20.5 Performance 25
9-20.5.1 General 25
9-20.5.2 Autofeather System 25
9-20.5.3 Floatplane Performance Charts 25
9-20.5.4 Conventions and Practices Used in Presentation of Performance Data . 27
9-20.5.5 Assumptions and Conditions Common to all Charts 28
9-20.5.5.1 Flap Settings 28
9-20.5.5.2 Engine Performance 28
9-20.5.5.3 Water Surface Condition 29
9-20.5.5.4 Headwinds 29
9-20.5.5.5 Tailwinds 29
9-20.5.5.6 Effect of Intake Deflectors 30
9-20.5.6 Maximum Permissible Operational Weights 30
9-20.5.6.1 Maximum Take-Off Weight 30
9-20.5.6.2 Maximum Landing Weight 31
9-20.5.7 Maximum Take-Off Weight – Single Engine Take-Off Climb 32
9-20.5.8 Maximum Take-Off Weight – Single Engine Enroute Climb 34
9-20.5.9 Take-Off Distance to 50 Feet, Both Engines Operating 36
9-20.5.10 Accelerate-Stop Distance 38
9-20.5.11 Take-Off Distance to 35 Feet – Engine Failure Recognized at V1 40
9-20.5.12 Take-Off Gross Rate of Climb, Both Engines Operating 42
9-20.5.13 Take-Off Gross Gradient of Climb, Both Engines Operating 44
9-20.5.14 Take-Off Gross Rate of Climb – Single Engine, Propeller Feathered..... 46
9-20.5.15 Take-Off Gross Gradient of Climb – Single Engine, Propeller Feathered 48
9-20.5.16 Enroute Gross Rate of Climb – Single Engine, Propeller Feathered 50
9-20.5.17 Enroute Gross Gradient of Climb – Single Engine, Propeller Feathered 52
9-20.5.18 Balked Landing Gross Rate of Climb 54
9-20.5.19 Balked Landing Gross Gradient of Climb 56
9-20.5.20 Landing Distance from 50 feet Above Water to Full Stop 59

9-20.6 Weight and Balance 61

9-20.7 Aircraft Description 62
9-20.7.1 Floatplane 62
9-20.7.1.1 Description 62
9-20.7.1.2 Optional Equipment 63

List of Tables Page

9-20-1 Landing Flap Settings 15
9-20-2 Engine Power Settings 28

List of Figures Page

9-20-1 Horizontal Center of Gravity Limits 12
9-20-2 Maximum Take-Off Weight – OEI Take-Off Climb 33
9-20-3 Maximum Take-Off Weight – OEI Enroute Climb 35
9-20-4 Take-Off Distance to 50 Feet, Both Engines Operating 37
9-20-5 Accelerate-Stop Distance 39
9-20-6 Take-Off Distance to Liftoff Speed – Engine Failure Recognized at V1 . 41
9-20-7 Take-Off Gross Rate of Climb, Both Engines Operating 43
9-20-8 Take-Off Gross Gradient of Climb, Both Engines Operating 45
9-20-9 Take-Off Gross Rate of Climb, Single Engine, Propeller Feathered 47
9-20-10 Take-Off Gross Gradient of Climb, Single Engine, Propeller Feathered 49
9-20-11 Enroute Gross Rate of Climb, Single Engine, Propeller Feathered 51
9-20-12 Enroute Gross Gradient of Climb, Single Engine, Propeller Feathered . 53
9-20-13 Balked Landing Gross Rate of Climb 55
9-20-14 Balked Landing Gross Gradient of Climb 58
9-20-15 Landing Distance from 50 feet Above Water to Full Stop 60
9-20-16 Floatplane (CAP floats) 62

This Page Intentionally Left Blank

9-20.1 General

9-20.1.1 Scope

This supplement addresses operation of Series 300 and variant DHC-6 aircraft when equipped with Canadian Aircraft Products (CAP) straight floats, S.O.O. 6082.

For operation on other floats (for example, floats manufactured by Wipaire), consult the supplement provided by the float manufacturer and/or STC holder.

9-20.1.2 Certification Basis

The limitations, procedures, and performance data presented in this supplement comply with the requirements of SFAR 23 and supersede the equivalent procedures published in Sections 2, 3, 4 and 5 of the AFM.

Viking Air Limited no longer supports or approves of operation of the floatplane to CAR 3 certification standards and Viking Air Limited no longer publishes limitations, procedures, and performance data for the floatplane to CAR 3 certification standards. Approval for use of CAR 3 limitations, procedures, and performance data formerly published in PSM 1-63-1A Supplement 7 has been withdrawn.

9-20.2 Limitations

The limitations provided in this supplement supersede the equivalent limitations in Section 2. All other limitations in Section 2 not specifically addressed in this supplement remain valid.

The air speed limitations and associated definitions for the floatplane are as follows:

NOTE

The airspeed limitations apply to all weights up to 12,500 pounds gross weight.

9-20.2.1 Airspeed Limitations

		CAS	IAS
a. Minimum Control Speed (V_{MC})	Flaps 20°	67	65
b. Climb Speed – (one or two engines)	Flaps 0°	89	87
c. Flaps Extended Speed (V_{FE})	Flaps 10°	105	103
	Flaps 10° to 37.5°	95	93
d. Maximum Operating Speed (V_{MO})	Sea Level	160	156
	5000 feet	155	151
	10,000 feet	150	146
	15,000 feet	145	141
	20,000 feet	130	126
	25,000 feet	115	112
e. Gust Penetration Speed (V_B), the speed recommended for flight in severe turbulence – Sea Level to 18,000 feet		136	132
f. Maneuvering Speed (V_P), the maximum speed for maneuvers involving an approach to stall conditions, or full application of the primary flight controls –			
Sea Level to 18,000 feet		136	132
Above 18,000 feet V_P and V_B are limited by V_{MO}.			
g. Recommended Approach Speed – Flaps 37.5°		76	74

⚠ CAUTION

MAXIMUM OPERATING SPEED SHALL NOT BE DELIBERATELY EXCEEDED IN ANY REGIME OF FLIGHT (CLIMB, CRUISE, DESCENT) EXCEPT WHERE A HIGHER SPEED HAS BEEN AUTHORIZED FOR FLIGHT TEST OR PILOT TRAINING OPERATIONS.

9-20.2.2 Airspeed Indicator Markings

Aircraft fitted with floats are equipped with an airspeed indicator that has unique limitation markings on it for float operations. These markings, all of which are expressed in calibrated airspeed, are as follows:

	CAS
a. Maximum Operating Speed (red radial line)	160
b. Normal Operating Range (green arc)	74 to 160
c. Flap Operating Range (white arc)	58 to 95
d. Minimum Control Speed (red radial line)	67
e. Climb Speed (one engine inoperative) flaps 0° (blue radial line)	89

The maximum permitted operating speed for a floatplane is 160 KCAS, regardless of whether or not modification 6/1291 is embodied.

9-20.2.3 Landing Weight Limitation

The maximum structural landing weight is 12,500 pounds. For maximum landing weight as limited by performance, refer to Para 9-20.5.6.2.

9-20.2.4 Take-Off and Landing Center of Gravity Range

The center of gravity limits authorized for take-off and landing are as follows:

Forward	Aft
25% MAC at all weights	32% MAC at all weights

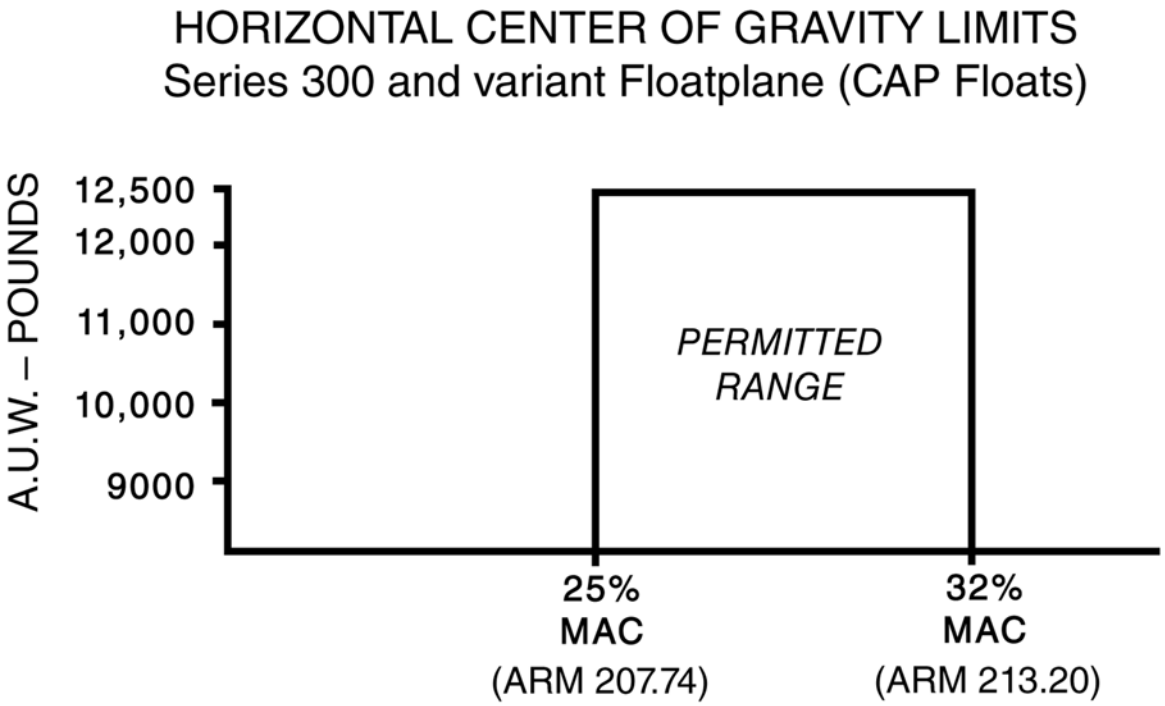


Figure 9-20-1 Horizontal Center of Gravity Limits

9-20.3 Emergency and Abnormal Procedures

9-20.3.1 General Concepts

The emergency and abnormal procedures provided in this supplement supersede the equivalent emergency and abnormal procedures in Section 3. All other emergency and abnormal procedures in Section 3 not specifically addressed in this supplement are applicable to the floatplane.

In general, all the **in-flight** emergency and abnormal procedures set out in Section 3 that do not directly relate to take-off and landing apply to the floatplane, except that speeds and flap configurations during certain maneuvers such as single engine operations will be different. References to braking or nose wheel steering should be disregarded.

When operating on the water surface, directions given in Section 3 to apply brakes or apply the parking brake should be disregarded. Loss of hydraulic pressure in a floatplane does not present the same risks as loss of hydraulic pressure in a landplane, because the floatplane does not have nose wheel steering or brakes, and hydraulic pressure is only used for flap operation.

When the floatplane is operating on the water surface and away from the dock, directions given in some of the smoke and fire procedures to ‘evacuate’ the aircraft should be critically evaluated – the consequences of evacuating the floatplane when away from the dock are more severe than the consequences of evacuating a landplane when away from the terminal.

The directions given in Section 3.7.6, Flapless Landing, do not apply to the floatplane. Unique procedures for a flapless landing in a floatplane are provided in this supplement. The directions given in Sections 3.7.3, Precautionary Landing, and 3.7.4, Forced Landing, do not apply to the floatplane.

The directions given in Section 3.7.7, Ditching, should only be followed if it is anticipated that the floatplane will sink after landing on the water surface.

The glide speeds given in Section 3 apply to the floatplane; however, the power-off descent gradient (and thus the range that can be expected during a glide) is less than that of a landplane due to the parasitic drag of the float chassis.

9-20.3.2 Airspeeds for Emergency Operations

The speeds below are valid at 12,500 pounds weight.

Engine Failure after Take-off, Flaps 20°:	74 KIAS
Engine Failure after Take-off, Flaps 0°:	87 KIAS
Minimum Control Speed, One Engine Inoperative:	65 KIAS

Enroute Climb, Single engine, Flaps 0°	87 KIAS
Stall speed, landing configuration (Flaps 37.5°):	56 KIAS
Stall speed, take-off configuration (Flaps 20°):	66 KIAS
Stall speed, flaps up:	73 KIAS

9-20.3.3 Engine Failure Waterborne

If an engine failure occurs while waterborne during the take-off run, reduce power on the operating engine to zero thrust and discontinue the take-off.

WARNING

IT IS PROHIBITED TO USE REVERSE POWER WHEN ONLY ONE ENGINE IS OPERATING.

9-20.3.4 Engine Failure Airborne, Prior to V_{MC}

The following procedure completely replaces Section 3.3.2:

1 Reduce power and land aircraft.

WARNING

IT IS PROHIBITED TO USE REVERSE POWER WHEN ONLY ONE ENGINE IS OPERATING.

9-20.3.5 Engine Failure Airborne, After V_{MC}

The procedures set out in Section 3.3.3 apply to the floatplane, with three of the steps modified as listed below:

2 FLAP position indicator – Confirm flaps are set to 20°

3 Aircraft Control – Maintain directional control with rudder. Adjust pitch attitude to achieve 74 KIAS. Hold aircraft near the water until the climb speed in Figure 9-20-9 is achieved. Climb (with flaps at 20°) at that speed.

Step 4, including steps 4a, 4b, and 4c are applicable to the floatplane without any change. Prior to the direction at the end of step 4 to “climb to a safe altitude (typically several thousand feet AGL)”, the floatplane pilot needs to add one additional step:

4d When clear of obstacles, retract flaps to 0° and accelerate to the speeds given in Figure 9-20-11.

The balance of the procedure, from the second sentence of the note following step 4c to the end of the procedure, is unchanged for the floatplane.

9-20.3.6 One Engine Inoperative Landing

The following procedure completely replaces Section 3.7.1:

The procedure for landing with one engine inoperative is as follows:

1 Maintain 100 KIAS speed or greater during initial maneuvering.

2 Approach Flaps – 10°

3 Minimum airspeed – 90 KIAS (all weights).

4 PROP lever of operating engine – advance to full INCREASE immediately following flap extension, or when the RESET PROPS caution light illuminates, whichever occurs first.

5 The prop lever of the operating engine should be set to the full INCREASE position prior to reaching 500 feet AGL (for visual approaches) or prior to reaching 500 feet above minima (for instrument approaches).

6 Power levers – Adjust to obtain desired rate of descent.

WHEN LANDING IS ASSURED:

7 Flaps – Select 37.5°.

8 Minimum airspeed – 1.3 times stall speed for flaps 37.5° Figure 9-20-15. Be aware that at weights below 10,500 pounds, V_{REF} will be less than V_{MC}.

9 Touchdown – In typical nose-up attitude with power levers at IDLE prior to touchdown, for smooth water conditions. When surface conditions are rough, contact should be made with the water at very low rates of descent, at as low an airspeed as is practicable.

Table 9-20-1 Landing Flap Settings

FLAP ANGLE	1.3 V_S KIAS					
	12,300 LB	11,500 LB	10,500 LB	9,500 LB	8,500 LB	7,500 LB
37.5°	74	70	67	64	60	57

NOTE

Taxiing with one engine is possible, but will become more difficult with increasing wind speed. The aircraft can be held into wind with one engine until it is moored or anchored and the operating engine is shutdown.

9-20.3.7 One Engine Inoperative Missed Approach

A missed approach (also referred to as a go-around or a balked landing) on one engine must not be attempted if the airspeed is below 80 KIAS. A missed approach on one engine must not be attempted if more than 20° of flap has been selected.

1 Set Maximum Power on the unaffected engine. Advance the unaffected engine power lever to the torque, T_5, or N_G limit, whichever is reached first. Ensure the PROP lever of the unaffected engine is at the MAX RPM position (96% N_P).

2 Airspeed (flap 20°) – Climb at the airspeed indicated in Figure 9-20-9.

3 Maintain heading by applying rudder and, if necessary, lowering the wing on the side of the operating engine up to 5°.

9-20.3.8 Landing with Flaps Inoperative (Flaps 0°)

WARNING

A FLAPLESS LANDING MAY ONLY BE PERFORMED IN AN EMERGENCY. LANDING DISTANCE REQUIRED WILL BE 2.5 TIMES GREATER THAN THE DISTANCE DETERMINED BY USE OF CHART Figure 9-20-15. DURING A FLAPLESS LANDING, THE FLOATPLANE DEMONSTRATES A TENDENCY TO PITCH NOSE UP AT TOUCHDOWN. ON INITIAL CONTACT WITH THE WATER, POWER SHOULD BE REDUCED SLOWLY WHILE HOLDING THE NOSE DOWN TO PREVENT PITCH-UP.

1 Ensure that sufficient landing distance is available, if possible with smooth but not glassy surface conditions.

2 Perform the approach and landing directly into wind.

3 Set the propeller levers to their minimum governing (75% N_P) position.

4 Carry out a flat approach at 105 to 110 KIAS.

5 Fly the aircraft onto the water. Do not raise the nose prior to touchdown.

6 Reduce power slowly after touchdown, and hold the nose down during deceleration.

⚠ CAUTION

REVERSE THRUST WILL NOT BE AVAILABLE DURING LANDING DUE TO THE MECHANICAL INTERLOCK, BECAUSE THE PROP LEVERS WILL BE IN THE MINIMUM GOVERNING (75% N_P) POSITION.

9-20.3.9 Go-Around from a Flapless Approach

1 Advance power levers to the take-off power setting.

2 Advance propeller levers to the MAX RPM (96% N_P) position.

3 Increase airspeed to no less than 105 KIAS. Allow the aircraft to fly off the water with minimal nose-up rotation.

9-20.4 Normal Procedures

The normal operating procedures for the floatplane are the same as the normal operating procedures for the landplane set out in Section 4 of this AFM, except for changes and additional procedures listed below that arise as a result of the unique requirements of water operation, or the different operational speeds applicable to the floatplane.

9-20.4.1 Preparation and Inspection

The following checks should be carried out during exterior inspection, in addition to, or instead of (as applicable) those given in Section 4.4 and 4.5.

a. Floats and rubber float bumpers – Inspect general condition.

b. Float spreader bars, struts, and bracing wires – Inspect general condition and security.

c. Wing fences and finlets – Inspect general condition.

d. Check that neither propeller is feathered in the event that blade latches failed to engage on engine shutdown.

If a propeller failed to latch on previous shutdown (due to misalignment of power lever reference lines), the propeller blades will creep into the feathered position as the oil pressure controlling the propeller decays. In this event, as the propeller unfeathers during engine start, considerable forward thrust rather than the anticipated zero thrust will be produced. This could be extremely hazardous.

e. Ensure that the floatplane is securely moored to the dock.

f. Remove the rubber plugs which serve as caps on the standpipe in each float compartment and pump out any accumulation of water. Reinstall the rubber plugs.

9-20.4.2 Starting Engines

In addition to the procedures set out in Section 4.6, the following caution and note applies to the floatplane.

⚠ CAUTION

THE FLOATPLANE MUST BE SECURELY MOORED TO THE DOCK BEFORE STARTING THE ENGINES.

NOTE

After the engine start has been completed, the propeller lever may be moved to full INCREASE. If starting an engine with the propeller feathered, a momentary surge of forward thrust will be produced as the propeller moves from the feathered position into the operating range. Once the propeller unfeathers the power lever may be retarded toward the zero thrust position.

9-20.4.3 After Start (Pre-Taxi)

In addition to the procedures set out in Section 4.7, check that both engines are functioning properly and that the propellers operate correctly in forward and reverse thrust ranges before releasing the mooring ropes.

9-20.4.4 Taxi Checks

The following new checks are added, following the completion of the After Start (Pre-Taxi) checks in Section 4.7 and prior to commencing the System Functional Checks in Section 4.8:

1 Cast off and proceed to take-off position at a speed compatible with water conditions, steering by means of differential thrust.

In the vicinity of the dock, care must be exercised when maneuvering due to the weathercocking characteristics of the floatplane when headed downwind. Any weathercocking tendency should be counteracted immediately by application of large amounts of reverse thrust on the appropriate engine. It should be noted that maximum available reverse thrust is only 30% (approximately) of maximum available forward thrust.

The oil temperature must be closely monitored during beta range operation because there is a lack of airflow through the oil cooler.

2 Maintain an alert watch for floating and partially submerged objects.

3 For step taxiing, flap angles between 0° and 20° may be used.

4 On arrival at the take-off position, turn the aircraft into wind.

9-20.4.5 System Functional Checks

System functional checks described in Section 4.8 that do not require application of engine power may be carried out while moored at the dock if it is safe to do so. System functional checks that require any application of engine power should only be carried out after the floatplane has left the dock and is in a position where it is safe to apply power to the engines.

9-20.4.6 Before Take-Off

Before take-off checks described in Section 4.9 are modified as follows:

1 Trims – SET. Floatplane take-off elevator trim tab setting is approximately one indicator pointer width forward of the take-off setting for a landplane with the same center of gravity.

8 Flaps – Set to Take-off position (20°).

9-20.4.7 Take-Off

Take-off procedures described in Section 4.10 are modified as follows.

Disregard all references to brake application.

The following note is appended to step 2. All other notes present after step 2 in Section 4.10 apply to the floatplane.

NOTE

During the initial take-off run prior to becoming step-borne, the nose of the airplane will rise without any pilot action. Just prior to becoming step-borne, as the nose tends to drop, the control wheel should be held aft until the airplane is well up on the step, after which the pull force can be relaxed as the airplane accelerates. If the wheel is not held aft and the nose is permitted to lower prematurely, a slow porpoising tendency can develop. This can be arrested by holding the wheel well back or by reducing power.

The following step replaces step 5 of Section 4.10:

5 Allow airplane to become airborne, not below V_{MC} (65 KIAS).

No undue effort should be made to maintain contact with the water at speeds in excess of V_{MC}. Airspeed increases rapidly following liftoff, at 2 to 3 KIAS per second. If airborne below decision speed (V_1), the airplane should be held near the surface until V_1 is achieved.

The following new step is added to Section 4.10:

6 Increase airspeed to attain speed at 50 feet obtained from Figure 9-20-7.

9-20.4.8 Crosswind Take-Offs

When applying take-off power, use asymmetric thrust to maintain the intended take-off heading. As airspeed increases and the rudder becomes effective, apply symmetrical take-off power.

9-20.4.9 After Take-Off, Climb, Cruise, Descent

The procedures set out in Sections 4.11, 4.12, and 4.13 apply to the floatplane. References to the nose wheel steering lever should be disregarded.

In flight, whether climbing, cruising, or descending, flight characteristics of the floatplane are comparable to those of the landplane. Due to the configuration differences and parasitic drag of the float chassis, in-flight performance in most respects is less than that of the landplane.

9-20.4.10 Approach

Steps 1 through 5 inclusive of Section 4.14 apply to the floatplane. Step 5 should be disregarded. The note following Step 6 applies to the floatplane.

9-20.4.11 Final Approach and Landing

The procedures set out in Sections 4.15 and 4.16 (including 4.16.1) do not apply to the floatplane. The following complete procedure replaces the contents of Sections 4.15 and 4.16 (including 4.16.1).

1 Before landing, careful observation should be made of the landing area for surface craft, floating or partially submerged objects, and the surface state of the water. For landing on glassy water refer to Para 9-20.4.12.

2 Approach speed – Maintain 100 KIAS.

3 Flaps – Select approach flap (20°) and allow airspeed to decrease to 80 KIAS.

4 PROP levers – advance to full INCREASE immediately following flap extension, or when the RESET PROPS caution light illuminates, whichever occurs first.

Prop levers should be set to the full INCREASE position prior to reaching 500 feet above water surface (for visual approaches) or prior to reaching 500 feet above minima (for instrument approaches).

5 Power levers – Adjust to obtain desired rate of descent.

6 Flaps – When landing is assured, select landing flap (37.5°), adjust airspeed to V_{REF} value obtained from Figure 9-20-15.

7 Touchdown – In typical nose-up (step taxi) attitude with power levers at IDLE prior to touchdown, for smooth water conditions. When surface conditions are rough, contact should be made with the water at very low rates of descent, at as low an airspeed as is practicable. This may require that up to 10 PSI torque be maintained during the landing.

8 Apply reverse power as necessary.

⚠ CAUTION

REVERSE POWER CANNOT BE APPLIED UNLESS THE PROPELLER LEVERS ARE AT FULL INCREASE.

⚠ CAUTION

"SLAM" APPLICATION OF REVERSE POWER IS PROHIBITED.

⚠ CAUTION

RETURN POWER LEVERS TO IDLE FROM REVERSE POSITIONS BEFORE THE AIRCRAFT STOPS, OTHERWISE FORWARD VISION WILL BE OBSCURED BY WATER SPRAY.

9 Maintain direction using rudder. If rudder is not sufficiently effective, use differential power.

10 Taxiing – Flaps up (0°). For taxiing "on the step" – flaps 0° to 20°, as desired.

9-20.4.12 Landing on Glassy Water

If it is necessary to land on a glassy water surface, the airplane should be flown to touchdown with flaps at 20°, airspeed between 76 KIAS (12,500 pound landing weight) and 67 KIAS (9,000 pound landing weight), and power as required to maintain a rate of descent of 200 to 300 feet per minute.

Maintain this configuration until contact with the water is made, then retard the power levers to IDLE. During the approach and landing no visual reference should be made to the water except to ensure that no obstructions exist. Shorelines, docks, and other features should be used as points of reference from which the landing procedure can be commenced. It is obvious that a glassy water landing requires an appreciably greater length than a landing made under normal conditions.

9-20.4.13 Go-Around (Balked Landing)

If possible, the decision to go-around should be made before flaps have been extended beyond 20°. If flaps are set to 20° and the propeller levers are at the full INCREASE position, aircraft performance and handling during the go-around maneuver will be very similar to aircraft performance and handling during a normal take-off.

1 Power Levers – Advance to take-off setting. Ensure that the propellers are at the full INCREASE position.

2 Minimum airspeed – 1.3 times stall speed with flaps 20°.

WHEN CLEAR OF OBSTACLES WITH POSITIVE CLIMB RATE:

3 Flaps – Select 0°

DURING FLAP RETRACTION:

4 Airspeed – Increase to 87 KIAS (the best angle of climb speed for flaps 0°).

WARNING

WITH FLAP FULLY EXTENDED AT 37.5°, ANY PITCH ATTITUDE IN THE GO-AROUND MANEUVER GREATER THAN 0° (LEVEL FLIGHT ATTITUDE) MAY CAUSE A RAPID DECREASE IN AIRSPEED AND POSSIBLE STALL.

With flaps fully extended at 37.5°, the pitch attitude required for initial climb at the beginning of the go-around maneuver will be no higher than 0° (level flight attitude). If flaps are extended beyond 20° when the decision is made to initiate a go-around, flaps should be immediately selected to 20° as soon as go-around power has been applied.

9-20.4.14 After Landing

The procedures set out in Section 4.18 apply to the floatplane. The following additional procedures apply uniquely to the floatplane.

1 Approach dock using beta control for maneuvering.

In the vicinity of the dock care must be exercised when maneuvering due to the weathercocking characteristics of floatplanes when headed downwind. Any weathercocking tendency should be counteracted immediately by application of large amounts of reverse thrust on the appropriate engine. It should be noted that maximum available reverse thrust is only 30% (approximately) of maximum available forward thrust.

2 Position the airplane against the dock with the appropriate thrust selected to hold the airplane stationary.

9-20.4.15 Shutdown

The shutdown procedures set out in Section 4.19 apply to the floatplane, disregarding the requirements to set the parking brake and apply chocks. The following additional caution applies to the floatplane:

CAUTION

WHEN A FLOATPLANE IS MOORED OR ANCHORED IN LOCATIONS WHERE WEATHER CONDITIONS CAN PRODUCE ROUGH WATERS, IT SHOULD NOT BE LEFT UNATTENDED. THE RISK OF SWAMPING WHEN MOORED OR ANCHORED IN ROUGH WATER INCREASES WITH LOADING OF THE AIRPLANE AND ALSO INCREASES AS THE CENTER OF GRAVITY IS MOVED AFT.

9-20.5 Performance

9-20.5.1 General

Because of performance differences between the floatplane and other DHC-6 gear configurations arising from fitment of the float chassis, many of the performance charts provided in Section 5 of the AFM are not suitable for use with the floatplane. Any chart in Section 5 of the AFM that addresses take-off or landing distances or rates/gradients of climb is unsuitable for use with the floatplane.

9-20.5.2 Autofeather System

All performance data contained in this supplement is based on the use of the autofeather system, which is installed on all DHC-6 Series 300 and variant aircraft. No supplement permitting operation of a floatplane without use of the autofeather system or with an inoperative autofeather system has been published. Supplement 19, 'Operation With Inoperative Autofeather System', is only applicable to aircraft with standard landplane gear.

The autofeather system must be used for every take-off in accordance with the directions given in Section 4 and in this supplement. Operation with an inoperative autofeather system is strictly limited to whatever temporary relief may be granted in the operator's approved MEL to allow time for repairs to be carried out.

9-20.5.3 Floatplane Performance Charts

The first eleven figures (performance charts) from AFM Section 5 may be used for both the landplane and the floatplane; therefore, duplicates of these Section 5 charts are not provided in this supplement – the charts in Section 5 should be used.

Section 5 Performance Charts Applicable to the Floatplane	
Figure	**Chart Title**
Figure 5-1	Temperature Conversion Chart
Figure 5-2	Wind Component
Figure 5-3	Airspeed Position Error Correction – Ground
Figure 5-4	Altimeter Position Error Correction – Flight
Figure 5-5	Airspeed Position Error Correction – Flight
Figure 5-6	Stalling Speed – Propellers Feathered
Figure 5-7	Take-Off Power Setting
Figure 5-8	Maximum Continuous Power Setting
Figure 5-9	Maximum Climb Power Setting

Section 5 Performance Charts Applicable to the Floatplane	
Figure 5-10	Maximum Climb and Cruise Power – 91% N_P
Figure 5-11	Maximum Cruise Power Setting

The following performance charts, provided in this supplement, are unique to the floatplane and should be used as direct replacements for charts provided in Section 5.

Section 9-20 Performance Charts Unique to the Floatplane		
Figure	**Chart Title**	**Replaces AFM Section 5 Chart**
Figure 9-20-2	MTOW – OEI Take-Off Climb	Replaces Figure 5-12
Figure 9-20-3	MTOW– OEI Enroute Climbr	New performance chart, unique to floatplane.
Figure 9-20-4	Take-Off Distance to 50 Feet, Both Engines Operating	Replaces Figure 5-14
Figure 9-20-5	Accelerate-Stop Distance	Replaces Figure 5-16
Figure 9-20-6	Take-Off Distance to lift off speed – Engine Failure Recognized at V_1	Replaces Figure 5-18
Figure 9-20-7	Take-Off Gross Rate of Climb, Both Engines Operating	Replaces Figure 5-19
Figure 9-20-8	Take-Off Gross Gradient of Climb, Both Engines Operating	Replaces Figure 5-20
Figure 9-20-9	Take-Off Gross Rate of Climb – Single Engine, Propeller Feathered	Replaces Figure 5-21
Figure 9-20-10	Take-Off Gradient of Climb – Single Engine, Propeller Feathered	Replaces Figure 5-22
Figure 9-20-11	Enroute Rate of Climb – Single Engine, Propeller Feathered	Replaces Figure 5-25
Figure 9-20-12	Enroute Gradient of Climb – Single Engine, Propeller Feathered	Replaces Figure 5-26
Figure 9-20-13	Balked Landing Gross Rate of Climb	Replaces Figure 5-27

Section 9-20 Performance Charts Unique to the Floatplane		
Figure	**Chart Title**	**Replaces AFM Section 5 Chart**
Figure 9-20-14	Balked Landing Gross Gradient of Climb	Replaces Figure 5-28
Figure 9-20-15	Landing Distance from 50 feet Above Water to Full Stop	Replaces Figure 5-29

The following figures (performance charts) from AFM Section 5 must not be used, however, no equivalent replacement chart applicable to the floatplane has been published.

Section 5 Performance Charts Not Applicable to the Floatplane	
Figure	**Chart Title**
Figure 5-13	Maximum Take-Off Weight – OEI Take-Off Climb with Windmilling Propeller
Figure 5-15	Take-Off Ground Roll
Figure 5-17	Take-Off Distance to Liftoff Speed – Engine Failure at V_1
Figure 5-23	Take-Off Rate of Climb – Single Engine, Propeller Windmilling
Figure 5-24	Take-Off Gradient of Climb – Single Engine, Propeller Windmilling

9-20.5.4 Conventions and Practices Used in Presentation of Performance Data

All distances have been expressed in nautical miles (for large distances), or in feet (for small distances).

Only pressure altitude has been used whenever any reference to altitude is made in a chart. Each chart will have an entry point that allows the pilot to adjust to the prevailing temperature.

Distances presented with references to “Take-off Power” always assume that full calculated Take-off Power is used. Landing distances presented always assume that the power levers are at IDLE at touchdown. No credit has been taken for use of zero thrust or reverse thrust in any chart.

An arrow (→) is used to indicate the entry point to a chart, and also to indicate the direction in which lines making up the calculation progress. An asterisk (*) is used on examples to indicate the exit point from a chart.

9-20.5.5 Assumptions and Conditions Common to all Charts

9-20.5.5.1 Flap Settings

All Charts presented in this supplement are based on the following aircraft configuration:

Take-off	Flaps 20°
Enroute Climb	Flaps 0°
Landing	Flaps 37.5°

9-20.5.5.2 Engine Performance

The aircraft is equipped with two Pratt & Whitney Canada PT6A-27 engines at build specification 583 (January 10, 1967) or higher and two Hartzell HC-3BTN-DY blade propellers. All values in Table 9-20-2 below are based on 96% N_P and ISA conditions. The values below reflect the flat rating that has been applied to this 680 SHP engine.

Table 9-20-2 Engine Power Settings

Power Rating	SHP	ESHP	SFC	Note
		(lb/ESHP/hr)		
Take-off Power	620	652	0.612	Note 1
Maximum Continuous Power	620	652	0.612	Note 1
Maximum Climb Power	620	652	0.612	Note 2
Maximum Cruise Power	620	652	0.612	Note 2

NOTE

1) 620 SHP Take-off Power and Maximum Continuous Power is available to ISA +18°C at sea level.

2) 620 SHP Maximum Climb Power and Maximum Cruise Power is available to ISA +6°C at sea level.

WARNING

IT IS MANDATORY TO SET FULL CALCULATED TAKE-OFF POWER AS DERIVED FROM THE POWER SETTING GRAPH FOR EVERY TAKE-OFF, REGARDLESS OF AIRCRAFT WEIGHT OR AVAILABLE TAKE-OFF RUN LENGTH. REDUCED POWER TAKE-OFFS ARE PROHIBITED.

IT IS MANDATORY TO PAUSE FOR AT LEAST 5 SECONDS AT 85% N_G PRIOR TO SETTING FULL CALCULATED TAKE-OFF POWER.

IF EITHER ENGINE IS NOT CAPABLE OF ACHIEVING FULL CALCULATED TAKE-OFF POWER, OR IF EITHER ENGINE REACHES THE T_5 LIMIT OR THE N_G LIMIT PRIOR TO REACHING THE FULL CALCULATED TAKE-OFF POWER TORQUE VALUE, THEN THE CONDITION OF THE ENGINE HAS DETERIORATED AND THE PROBLEM MUST BE INVESTIGATED AND CORRECTED BEFORE FLIGHT.

IF EITHER ENGINE CANNOT ACHIEVE THE FULL CALCULATED TAKE-OFF POWER TORQUE VALUE AS PUBLISHED IN THE TAKE-OFF POWER SETTING GRAPH, OR IF THE T_5 OR N_G LIMIT IS REACHED BEFORE THE FULL CALCULATED TAKE-OFF POWER TORQUE VALUE IS REACHED, THE ENGINE IS NOT AIRWORTHY AND THE AIRCRAFT MUST NOT BE FLOWN.

9-20.5.5.3 Water Surface Condition

Unless otherwise specified, all performance data presented in this section was collected on a freshwater lake with relatively calm, but not glassy, surface conditions.

9-20.5.5.4 Headwinds

For operation in headwinds exceeding 20 KIAS, the take-off and landing data appropriate to 20 KIAS should be used

9-20.5.5.5 Tailwinds

WARNING

LANDING OR TAKING OFF WITH A TAILWIND IS NOT RECOMMENDED.

9-20.5.5.6 Effect of Intake Deflectors

Extension of engine intake deflectors will only affect take-off and climb performance when the torque setting is less than 50 PSI. Extension of engine intake deflectors has no effect on landing performance.

The effect of extending the engine intake deflectors at power settings of maximum Take-off Power, maximum continuous power, and Maximum Climb Power, when those settings are calculated to be less than 50 PSI, is as follows:

	Single Engine Operation	Two Engine Operation
Loss in rate of climb	15 FPM	30 FPM
Loss in gradient of climb	0.002 (0.2%)	0.004 (0.4%)
Loss in operating ceiling	400 feet	400 feet

9-20.5.6 Maximum Permissible Operational Weights

9-20.5.6.1 Maximum Take-Off Weight

The maximum take-off weight must not exceed the most restrictive of the following limitations or requirements:

1 STRUCTURAL LIMITATIONS

The structural weight limitation of 12,500 pounds. Note that there is no allowance for maximum ramp (dock) weight for the DHC-6. The maximum ramp (dock) weight is also 12,500 pounds.

2 CLIMB REQUIREMENTS

The single engine rate of climb must be positive.

The chart 'Maximum Take-Off Weight – Single Engine Climb with Feathered Propeller' may be consulted to quickly determine the maximum weight that will permit compliance with the minimum enroute climb requirements.

If any obstacles are present beyond the take-off run, the single engine take-off gradient of climb must be sufficient to enable meeting obstacle clearance requirements.

3 TAKE-OFF RUN LENGTH REQUIREMENTS

Sufficient take-off run and/or clearway to meet the all-engine take-off distance requirement (Take-off Distance to 50 Feet, Both Engines Operating), the accelerate-stop distance requirement, and the accelerate-go (Take-off Distance to 35 Feet – Engine Failure at V_1) requirement must be available.

9-20.5.6.2 Maximum Landing Weight

The maximum landing weight must not exceed the most restrictive of the following limitations or requirements:

1 STRUCTURAL LIMITATIONS

The structural landing weight limitation of 12,500 pounds.

2 CLIMB REQUIREMENTS

The single engine take-off gradient of climb should be considered, to enable meeting obstacle clearance requirements if a single-engine missed approach is carried out at the destination.

3 LANDING DISTANCE LENGTH REQUIREMENTS

Sufficient landing distance to meet the ‘Landing Distance from 50 feet Above Water to Full Stop’ must be available at the destination.

9-20.5.7 Maximum Take-Off Weight – Single Engine Take-Off Climb

Conditions associated with this chart

Flaps set at take-off position (20°), intake deflectors retracted (see note below if deflectors are extended), one engine inoperative with the propeller feathered, the other engine set to Take-off Power (see “Take-off Power Setting” chart for that value), speed according to chart inset.

Interpretive Guidance

This chart is used to determine the maximum take-off weight limit necessary to ensure a positive rate of climb at Take-off Power for an aircraft with one engine inoperative (OEI) and the propeller of that engine feathered. The performance data is only valid if the autofeather system is installed, operational, and selected ON prior to take-off.

Example Calculation (dotted line)

For guidance explaining how to use the chart, refer to the example calculation provided in Section 5 for Figure 5-12.

Summary of Example Calculation

At an OAT of ISA +17°C and pressure altitude of sea level (equal to a free air temperature of +32°C), the maximum allowable take-off weight to meet the single engine take-off climb requirements of SFAR 23 is 12,450 pounds.

NOTE

If intake deflectors are extended, add 3°C to actual airfield temperature and use that value (in this example, it would be ISA +20°C) to enter the chart.

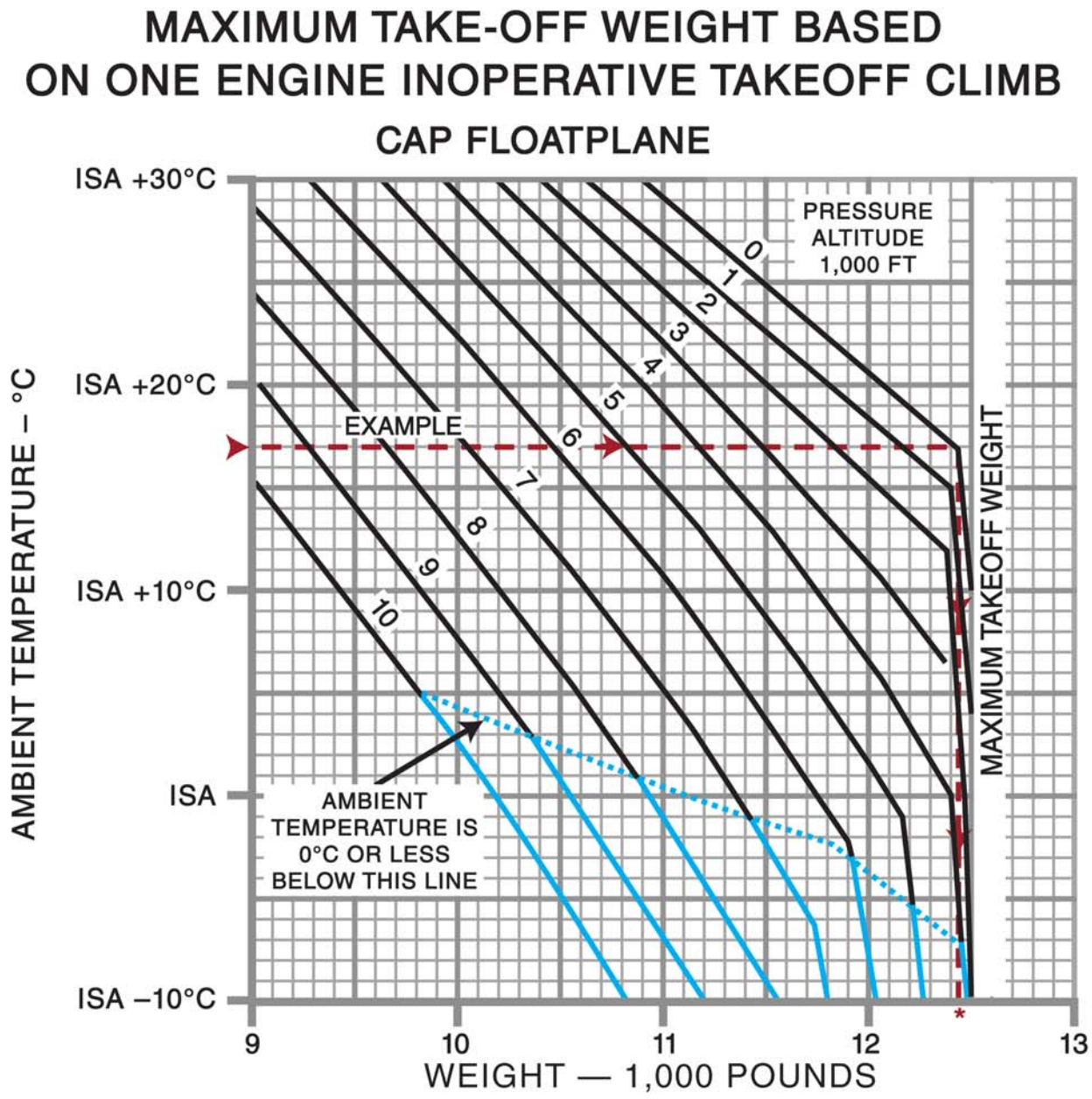


Figure 9-20-2 Maximum Take-Off Weight – OEI Take-Off Climb

9-20.5.8 Maximum Take-Off Weight – Single Engine Enroute Climb

Conditions associated with this chart

Flaps set at enroute position (flaps up, 0°), intake deflectors retracted (see note below if deflectors are extended), one engine inoperative with the propeller feathered, the other engine set to Maximum Continuous Power (see “Maximum Continuous Power Setting” chart), propeller speed 96%.

Interpretive Guidance

This chart is used to determine the maximum take-off weight limit necessary to ensure a satisfactory rate of climb in the enroute (flaps up) configuration at all altitudes up to and including 5,000 feet pressure altitude, at Maximum Continuous Power, for an aircraft with one engine inoperative (OEI) and the propeller of that engine feathered.

If the result derived from this chart is limiting, but enroute obstacle clearance permits use of a lower cruise altitude than 5,000 feet, Figure 9-20-11 and Figure 9-20-12 may be used to determine if satisfactory enroute single engine climb performance can be assured at the planned lower cruise altitude.

If environmental conditions do not permit a satisfactory enroute rate of climb to be accomplished with flaps up (0°), then any single engine climb that may be required during the enroute phase of flight will have to be carried out with flaps extended to 10°.

Maximum Continuous Power (the power setting allowed for single engine flight during the enroute phase of flight) is the same as Maximum Take-off Power.

Example Calculation (dotted line)

For guidance explaining how to use the chart, refer to the example calculation provided in Section 5 for Figure 5-12.

Summary of Example Calculation

At an OAT of ISA +13°C and pressure altitude of sea level (equal to a free air temperature of +28°C), the maximum allowable take-off weight that permits meeting the single engine enroute climb requirements of SFAR 23 at all enroute altitudes up to 5,000 feet pressure altitude is 12,200 pounds.

NOTE

If intake deflectors are extended, add 3°C to actual airfield temperature and use that value (in this example, it would be ISA +20°C) to enter the chart.

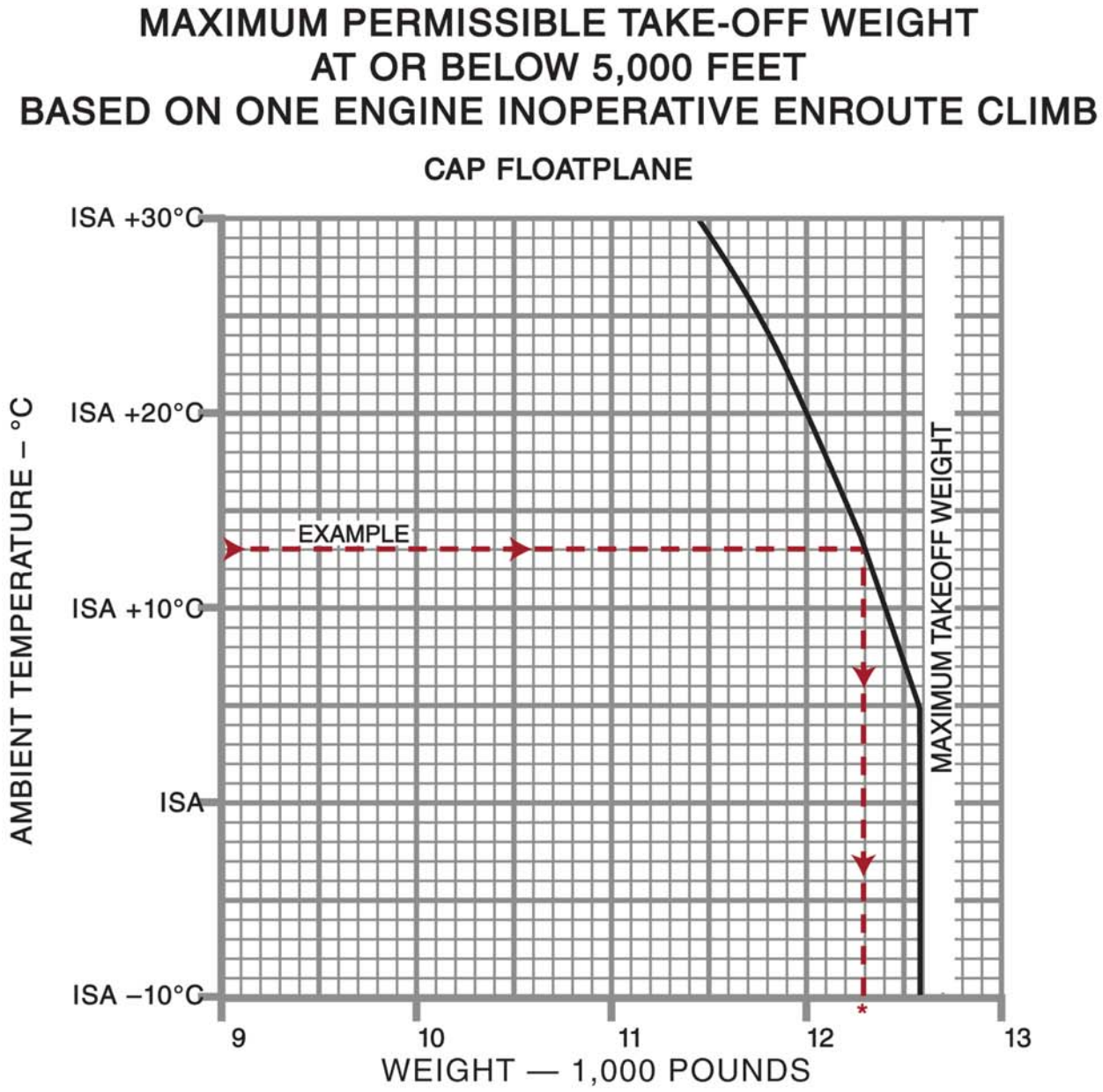


Figure 9-20-3 Maximum Take-Off Weight – OEI Enroute Climb

9-20.5.9 Take-Off Distance to 50 Feet, Both Engines Operating

Conditions associated with this chart

Flaps set at take-off position (20°), intake deflectors retracted (see note below if deflectors are extended), both engines set to Take-off Power, propeller speed 96% (see "Take-off Power Setting" chart for that value), speed according to chart inset; calm but not glassy water. Distances are for actual winds and are not factored.

Interpretive Guidance

This chart allows calculation of the total distance required to take-off from the water surface and reach a height of 50 feet above the water surface.

Example Calculation (dotted line)

For guidance explaining how to use the chart, refer to the example calculation provided in Section 5 for Figure 5-14.

Summary of Example Calculation

With an OAT of +33°C, pressure altitude sea level, weight of 12,500 pounds, and headwind component of 10 KIAS, the DHC-6 will require 2,150 feet total distance from the beginning of the take-off run to 50 feet above the water if a take-off is conducted in accordance with the instructions in Section 4 of this AFM as modified by the instructions in this supplement. The target speed at 50 feet above the water is 80 KIAS.

WARNING

TAKE-OFF WITH A TAILWIND IS NOT RECOMMENDED.

NOTE

If intake deflectors are extended and take-off torque is less than 50 PSI, increase the distance by 2.5%.

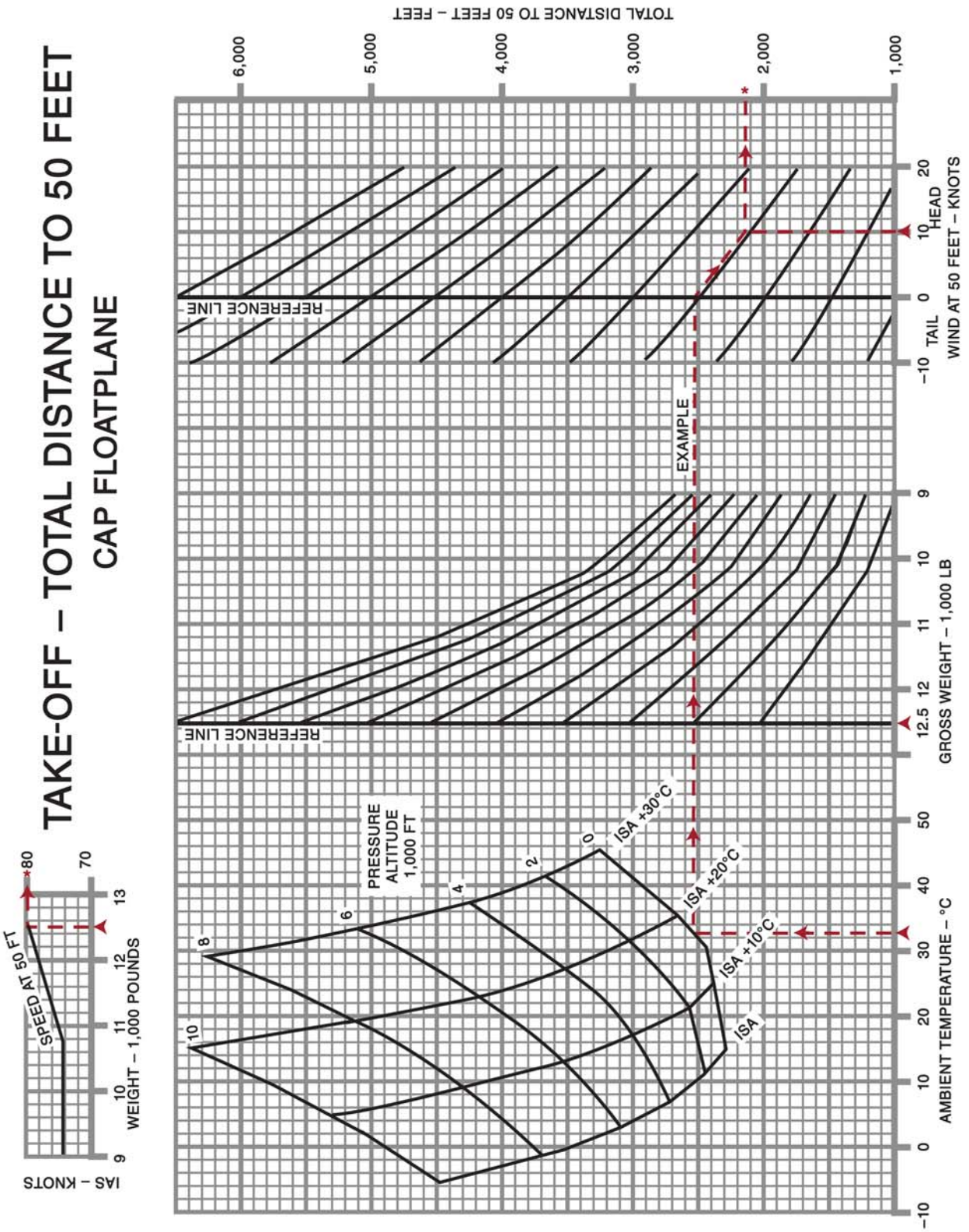


Figure 9-20-4 Take-Off Distance to 50 Feet, Both Engines Operating

9-20.5.10 Accelerate-Stop Distance

Conditions associated with this chart

Flaps set at take-off position (20°), intake deflectors retracted (see note below if deflectors are extended), both engines set to Take-off Power, propeller speed 96% (see "Take-Off Power Setting" chart for that value), V_1 speed according to the notation on chart; calm but not glassy water. Engine failed at V_1 and then goes into autofeather 2 seconds later, remaining engine reduced to idle power one second after the engine failure is recognized.

Distances are for actual winds and are not factored.

Interpretive Guidance

The distances have been calculated using the procedure and technique specified in SFAR 23 and are consistent with the procedures given for take-off in Section 4 of this AFM, as modified by additional or superseding instructions given in this supplement.

The performance data is only valid if the autofeather system is installed, operational, and selected ON prior to take-off.

Example Calculation (dotted line)

For guidance explaining how to use the chart, refer to the example calculation provided in Section 5 for Figure 5-16.

Summary of Example Calculation

With an OAT of +24°C, pressure altitude of 2,000 feet, weight of 11,500 pounds, and headwind component of 7 KIAS, 3,350 feet total accelerate-stop distance is needed if a take-off is conducted in accordance with the instructions in Section 4 of this AFM as modified by the instructions in this supplement, the left engine fails at either 74 KIAS on the water or 72 KIAS while accelerating in ground effect slightly above the water, and the take-off is then rejected.

NOTE

If intake deflectors are extended and take-off torque is less than 50 PSI, increase total accelerate-stop distance by 1%.

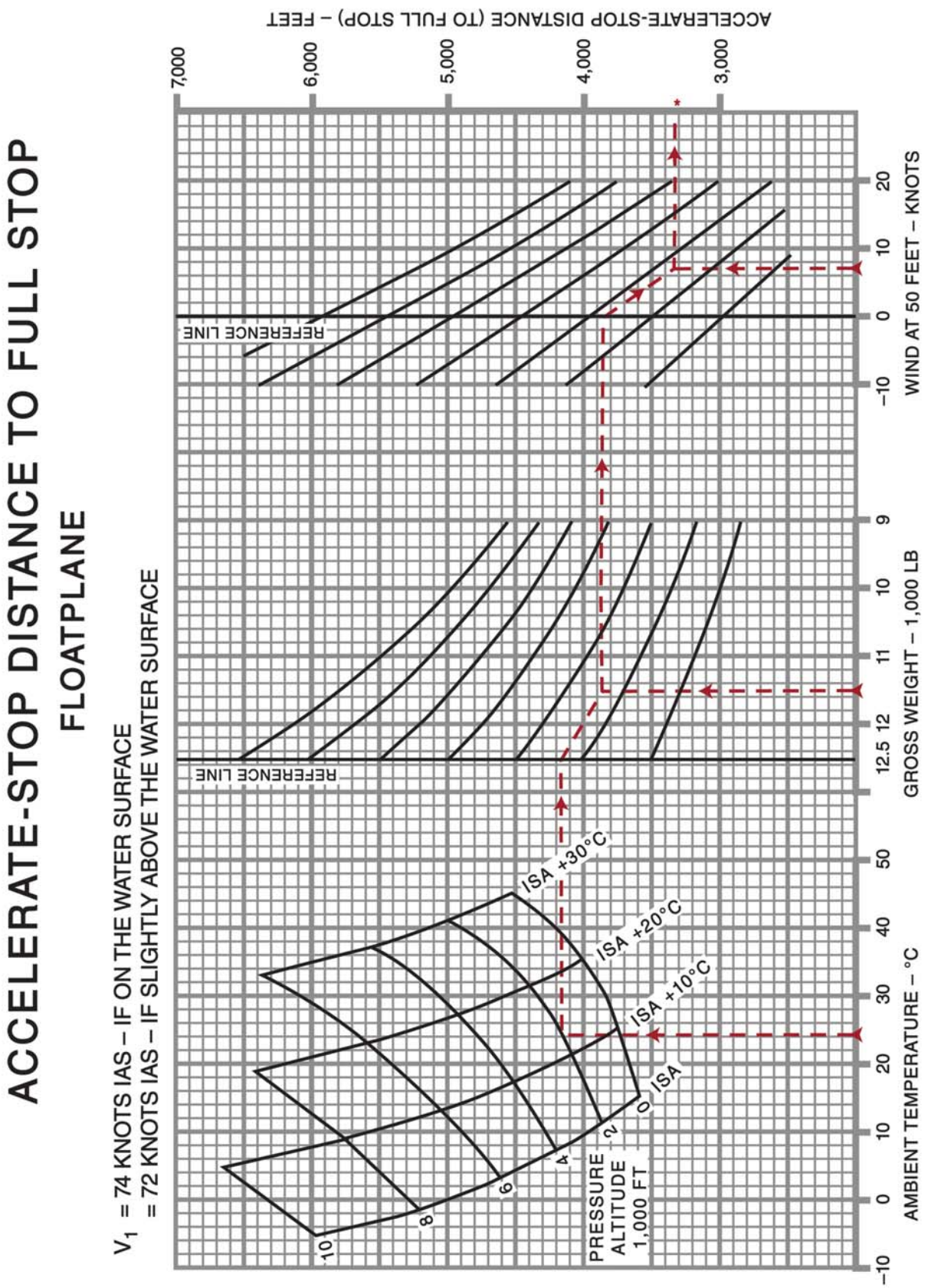


Figure 9-20-5 Accelerate-Stop Distance

9-20.5.11 Take-Off Distance to 35 Feet – Engine Failure Recognized at V_1

Conditions associated with this chart

Flaps set at take-off position (20°), intake deflectors retracted, both engines set to Take-Off Power (for the prevailing ambient conditions, this would be 50 PSI torque), propeller speed 96%, V speeds according to chart inset; calm but not glassy water surface.

Engine fails at V_{EF} and then goes into autofeather two seconds later, functioning engine remains at Take-Off Power, pilot recognizes the engine failure at V_1 and take-off is continued. Rotation initiated at V_1 and aircraft climbs to 35 feet at V_2. Distances are for actual winds and are not factored.

Interpretive Guidance

The distances have been calculated using the procedure and technique specified in SFAR 23 and are consistent with the procedures given for take-off in Section 4 of this AFM, as modified by additional or superseding instructions given in this supplement.

This chart enables calculation of “accelerate-go” distance required to clear a 35 foot obstacle. No factors have been applied. This chart may only be used if the autofeather system is installed, operational, and selected ON prior to take-off.

Example Calculation (dotted line)

For guidance explaining how to use the chart, refer to the example calculation provided in Section 5 for Figure 5-18.

Summary of Example Calculation

With an OAT of +32°C, pressure altitude of sea level, weight of 11,800 pounds, and headwind of 10 KIAS, the floatplane will require 5,280 feet total take-off distance to reach 35 feet above the water surface, if the take-off is conducted in accordance with the instructions in Section 4 of this AFM, an engine fails one second before V_1, and the take-off is continued with the propeller of the failed engine autofeathering two seconds after the engine failure.

NOTE

In the example shown, 11,800 pounds is the highest weight at which this calculation can be completed given the prevailing temperature and pressure altitude. At weights higher than 11,800 pounds, the calculation cannot be completed within the confines of the chart – the example line will exit the chart at the top of the page if the weight is greater than 11,800 pounds.

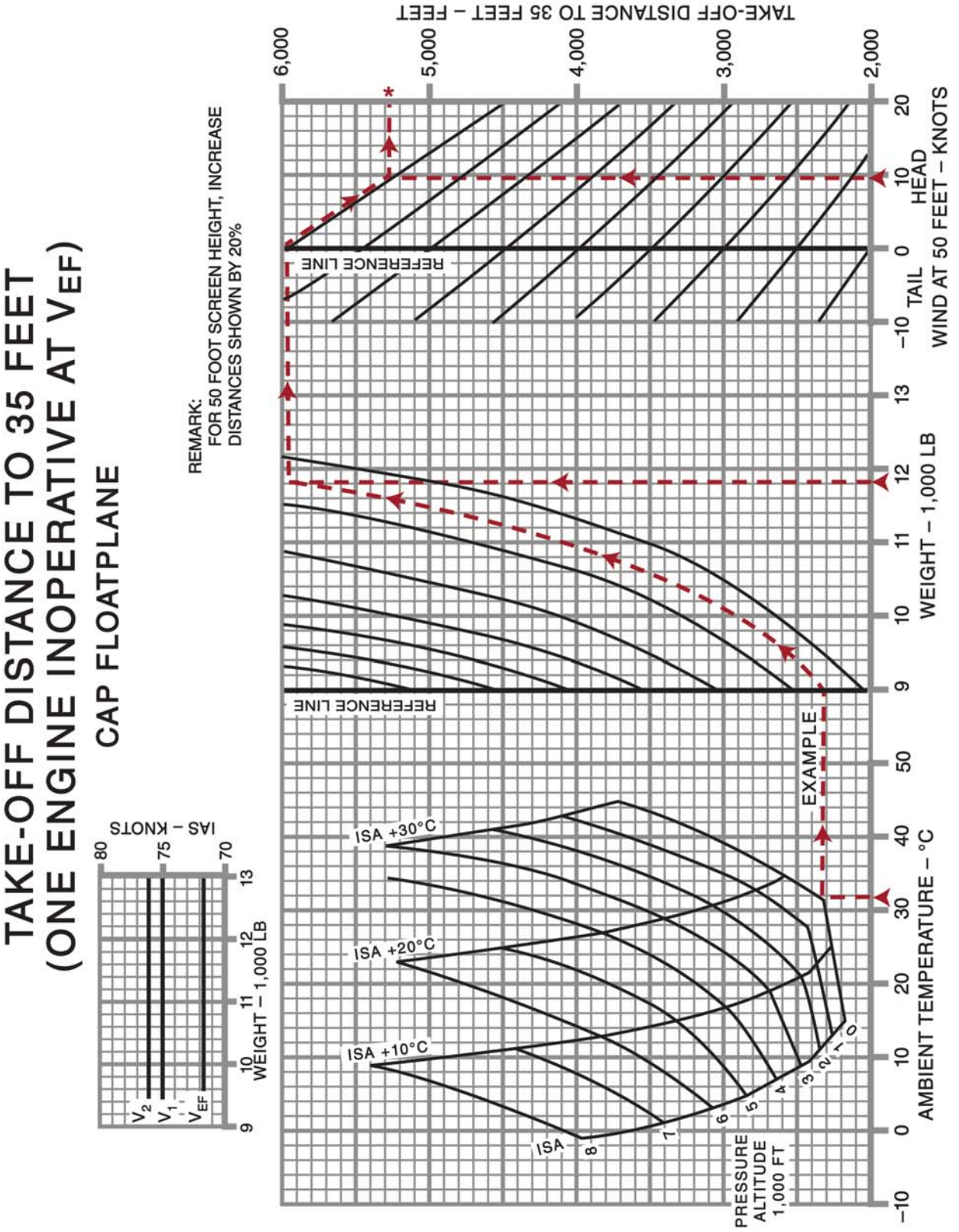


Figure 9-20-6 Take-Off Distance to Liftoff Speed – Engine Failure Recognized at V_1

9-20.5.12 Take-Off Gross Rate of Climb, Both Engines Operating

Conditions associated with this chart

Flaps set at take-off position (20°), intake deflectors retracted (see note below if deflectors are extended), both engines set to Take-off Power, propeller speed 96% (see "Take-off Power Setting" chart for that value), climb speed according to chart inset.

Interpretive Guidance

This chart provides the initial gross take-off rate of climb in feet per minute when both engines are set to Take-off Power, the aircraft is in the take-off configuration, and the aircraft speed is maintained at the value determined from the inset chart.

Example Calculation (dotted line)

For guidance explaining how to use the chart, refer to the example calculation provided in Section 5 for Figure 5-19.

Summary of Example Calculation

At an air temperature of 32°C, pressure altitude of sea level, and aircraft weight of 12,000 pounds, the take-off gross rate of climb will be 1,210 feet per minute at 78 KIAS.

NOTE

This chart assumes use of Take-off Power, which is normally only used until flap retraction is completed. Flap retraction is initiated either upon reaching 400 feet AGL or after clearing all obstacles in the take-off area, whichever comes later.

The calculated take-off rate of climb will only be achieved if the initial climb speed (determined from the inset chart) is maintained.

If intake deflectors are extended and Take-off Power is less than 50 PSI, deduct 30 feet per minute from the value derived from this chart.

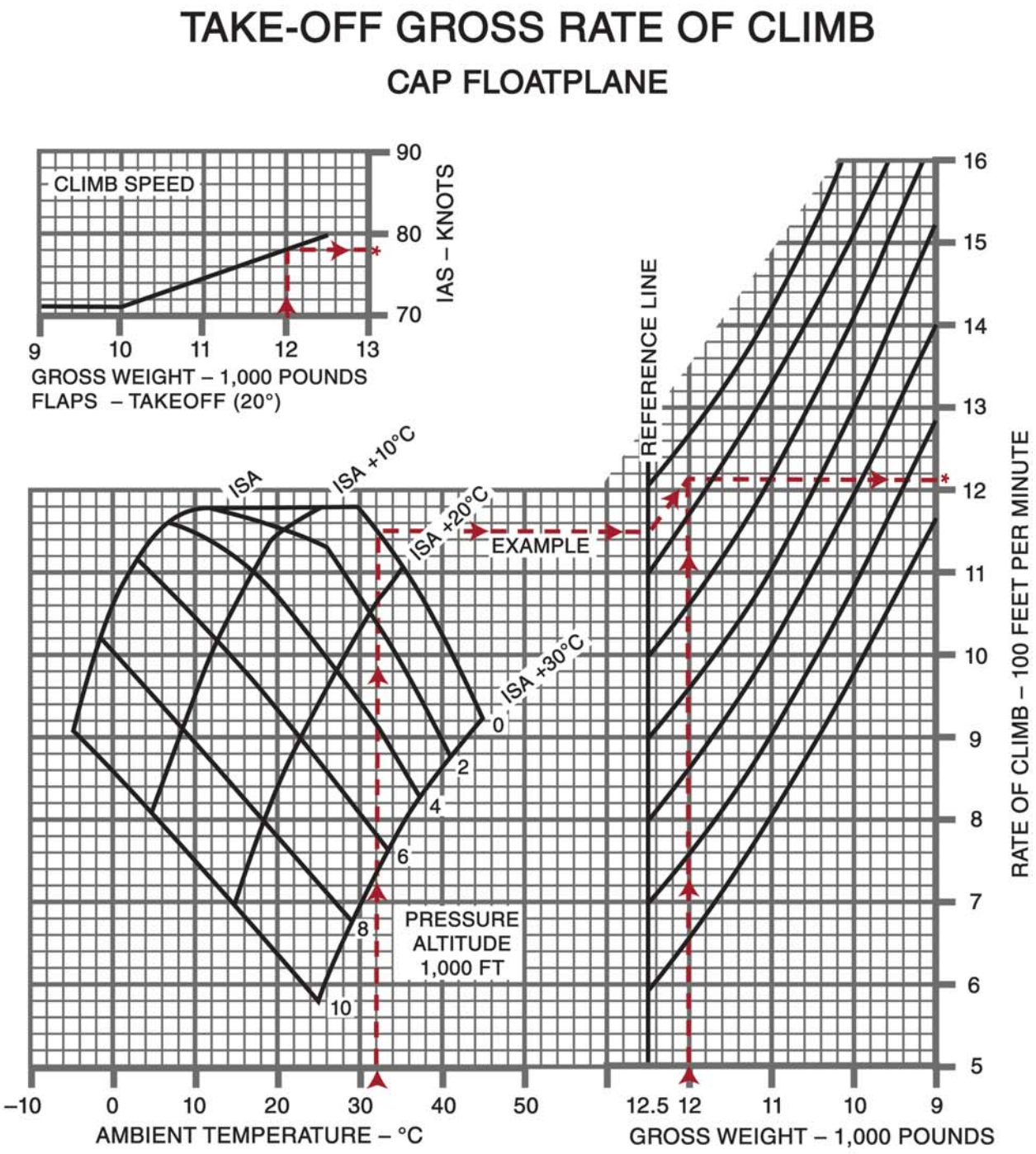


Figure 9-20-7 Take-Off Gross Rate of Climb, Both Engines Operating

9-20.5.13 Take-Off Gross Gradient of Climb, Both Engines Operating

Conditions associated with this chart

Flaps set at take-off position (20°), intake deflectors retracted (see note below if deflectors are extended), both engines set to Take-off Power, propeller speed 96% (see "Take-off Power Setting" chart for that value), climb speed according to chart inset.

Interpretive Guidance

This chart provides initial gross take-off climb gradient when both engines are set to Take-off Power and the aircraft speed is maintained at the value determined from the inset chart. The gradient is expressed as a ratio of vertical distance gained to horizontal distance travelled.

Example Calculation (dotted line)

For guidance explaining how to use the chart, refer to the example calculation provided in Section 5 for Figure 5-20.

Summary of Example Calculation

At an air temperature of 18°C, pressure altitude of 2,000 feet, and aircraft weight of 10,700 pounds, the take-off climb gradient will be 0.180 (18.0%) at 77 KIAS. The aircraft will climb 180 feet for every 1,000 feet of forward travel.

NOTE

This chart assumes use of Take-off Power, which is normally only used until flap retraction is completed. Flap retraction is initiated either upon reaching 400 feet AGL or after clearing all obstacles in the take-off area, whichever comes later.

The calculated gradient of climb will only be achieved if the initial climb speed (determined from the inset chart) is maintained.

If intake deflectors are extended and Take-off Power is less than 50 PSI, deduct 0.004 (approximately half a percent) from the value derived from this chart.

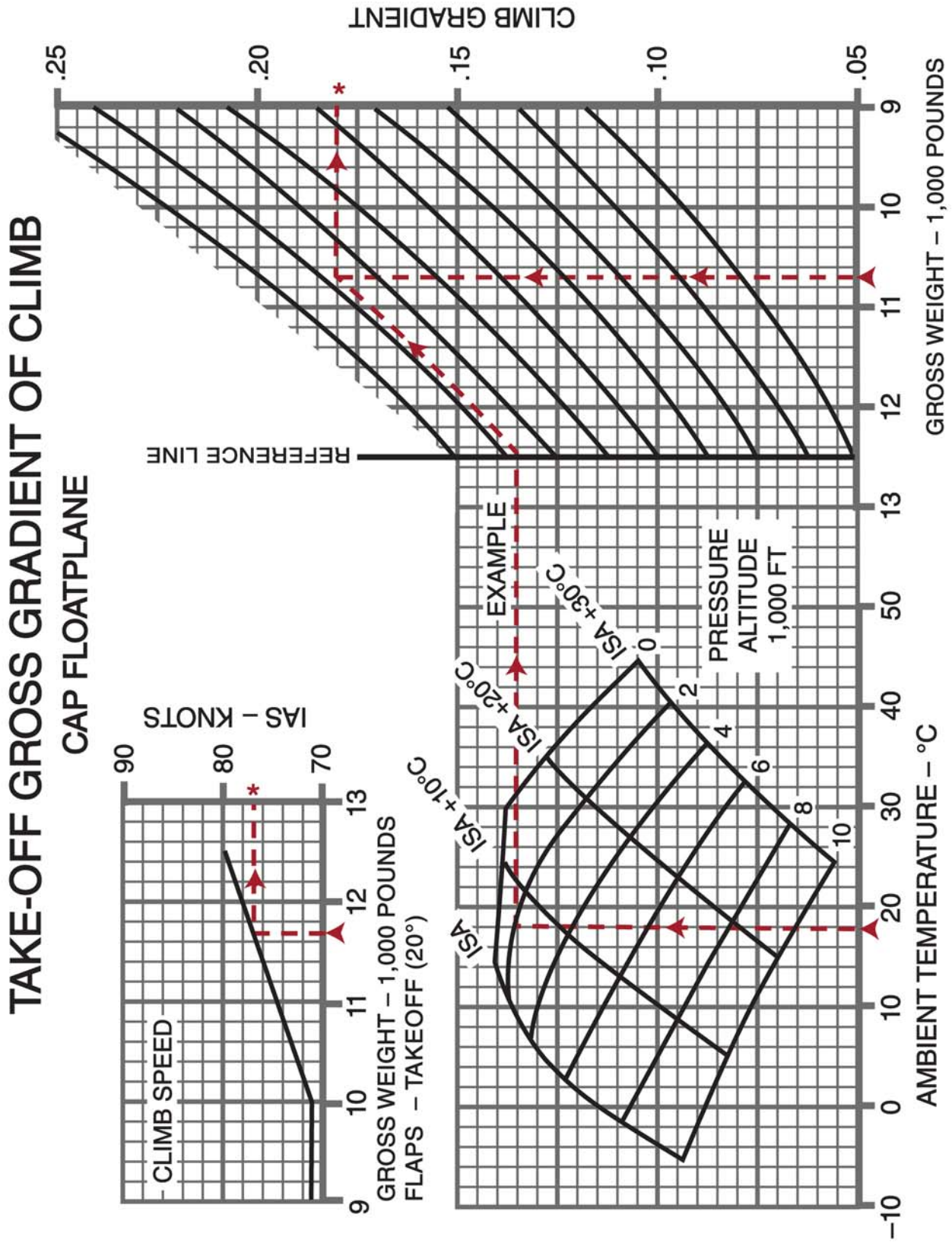


Figure 9-20-8 Take-Off Gross Gradient of Climb, Both Engines Operating

9-20.5.14 Take-Off Gross Rate of Climb – Single Engine, Propeller Feathered

Conditions associated with this chart

Flaps set at take-off position (20°), intake deflectors retracted (see note below if deflectors are extended), one engine set to Take-off Power, propeller speed 96% (see "Take-off Power Setting" chart for that value), one engine inoperative with propeller feathered, climb speed according to chart inset.

Interpretive Guidance

This chart provides initial gross rate of climb in feet per minute when one engine is set to Take-off Power, the other engine is inoperative and feathered, and the aircraft speed is maintained at the value determined from the inset chart.

This chart may only be used if the autofeather system is installed, operational, and selected ON prior to take-off.

Example Calculation (dotted line)

For guidance explaining how to use the chart, refer to the example calculation provided in Section 5 for Figure 5-21.

Summary of Example Calculation

At an air temperature of 32°C, pressure altitude of sea level, and aircraft weight of 12,500 pounds, the take-off rate of climb will be 30 feet per minute at 74 KIAS if engine power is set to 50 PSI torque on the operating engine (the calculated take-off power setting for the prevailing ambient conditions) and the propeller of the inoperative engine is feathered.

NOTE

This chart assumes use of Take-off Power on the operating engine.

The calculated rate of climb will only be achieved if the climb speed (determined from the inset chart) is maintained.

If intake deflectors are extended and Take-off Power is less than 50 PSI, deduct 15 feet per minute from the value derived from this chart.

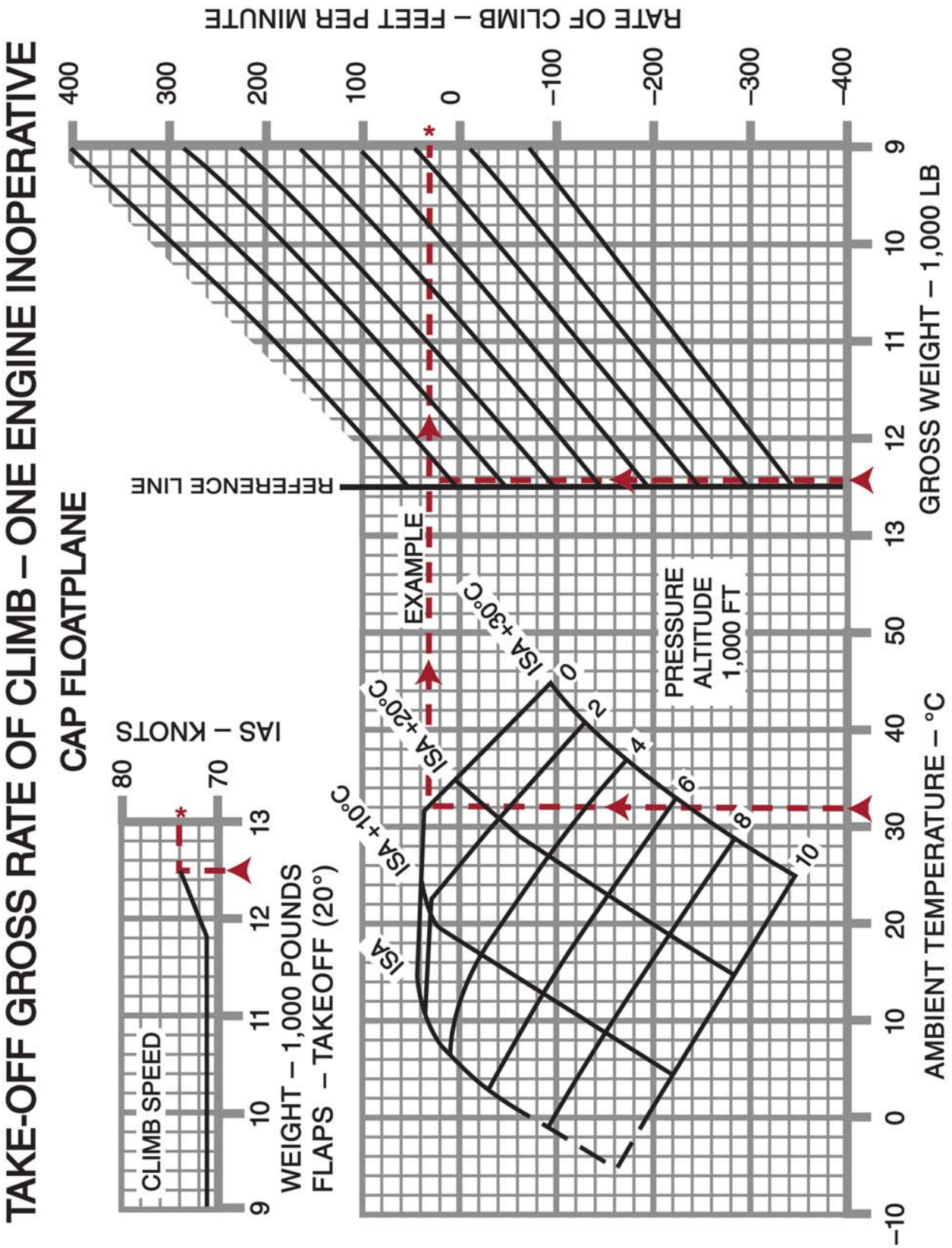


Figure 9-20-9 Take-Off Gross Rate of Climb, Single Engine, Propeller Feathered

9-20.5.15 Take-Off Gross Gradient of Climb – Single Engine, Propeller Feathered

Conditions associated with this chart

Flaps set at take-off position (20°), intake deflectors retracted (see note below if deflectors are extended), one engine set to Take-off Power, propeller speed 96% (see "Take-off Power Setting" chart for that value), one engine inoperative with propeller feathered, climb speed according to chart inset.

Interpretive Guidance

This chart provides initial gross climb gradient when one engine is set to Take-off Power, the other engine is inoperative and feathered, and the aircraft speed is maintained at the value determined from the inset chart. The gradient is expressed as a ratio of vertical distance gained to horizontal distance travelled.

This chart may only be used if the autofeather system is installed, operational, and selected ON prior to take-off.

Example Calculation (dotted line)

For guidance explaining how to use the chart, refer to the example calculation provided in Section 5 for Figure 5-22.

Summary of Example Calculation

At an air temperature of 32°C, pressure altitude of sea level, and aircraft weight of 12,500 pounds, the single engine take-off climb gradient will be 0.004 (0.04%) at 74 KIAS if engine power is set to 50 PSI torque on the operating engine (the calculated take-off power setting for the prevailing ambient conditions) and the propeller of the inoperative engine is feathered.

The aircraft will climb 4 feet for every 1,000 feet of forward travel.

NOTE

This chart assumes use of Take-off Power on the operating engine.

The calculated gradient of climb will only be achieved if the climb speed (determined from the inset chart) is maintained.

If intake deflectors are extended and torque is less than 50 PSI, deduct 0.002 (two-tenths of one percent) from the value derived from this chart.

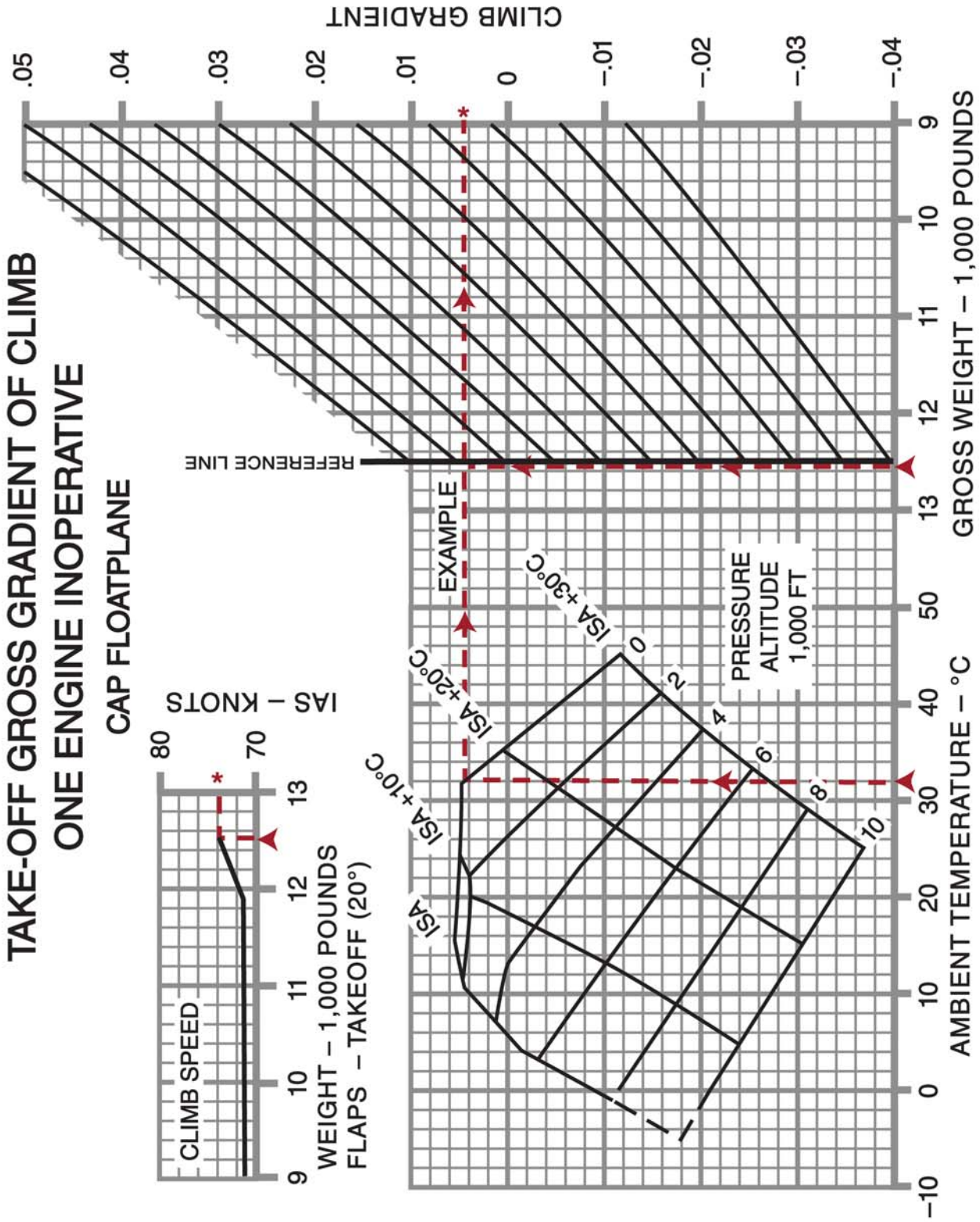


Figure 9-20-10 Take-Off Gross Gradient of Climb, Single Engine, Propeller Feathered

9-20.5.16 Enroute Gross Rate of Climb – Single Engine, Propeller Feathered

Conditions associated with this chart

Flaps set at cruise position (flaps up, 0°), intake deflectors retracted (see note below if deflectors are extended), one engine set to Maximum Continuous Power (see "Maximum Continuous Power Setting" chart), propeller speed 96%, one engine inoperative with propeller feathered, climb speed according to chart inset.

Interpretive Guidance

This chart provides enroute gross rate of climb in feet per minute when one engine is set to Maximum Continuous Power, the other engine is inoperative and feathered, the flaps are in the enroute position, and the aircraft speed is maintained at the value determined from the inset chart.

Example Calculation (dotted line)

For guidance explaining how to use the chart, refer to the example calculation provided in Section 5 for Figure 5-25.

Summary of Example Calculation

At an air temperature of +28°C, pressure altitude of 2,000 feet, and aircraft weight of 12,000 pounds, the enroute rate of climb (the rate of climb with flaps up) will be 160 feet per minute at 84 KIAS if engine power is set to 50 PSI torque on the operating engine (the calculated Maximum Continuous Power setting for the prevailing ambient conditions) and the propeller of the inoperative engine is feathered.

The rate of climb will decrease as the aircraft climbs.

The example calculation shown is based on the same environmental conditions as Figure 9-20-9 and Figure 9-20-10 except that an enroute cruise altitude of 2,000 feet is used and a standard lapse rate is assumed.

NOTE

This chart assumes use of Maximum Continuous Power (equal to Take-off Power) on the operating engine.

The calculated rate of climb will only be achieved if the climb speed (determined from the inset chart) is maintained.

If intake deflectors are extended and Take-off Power is less than 50 PSI, deduct 15 feet per minute from the value derived from this chart.

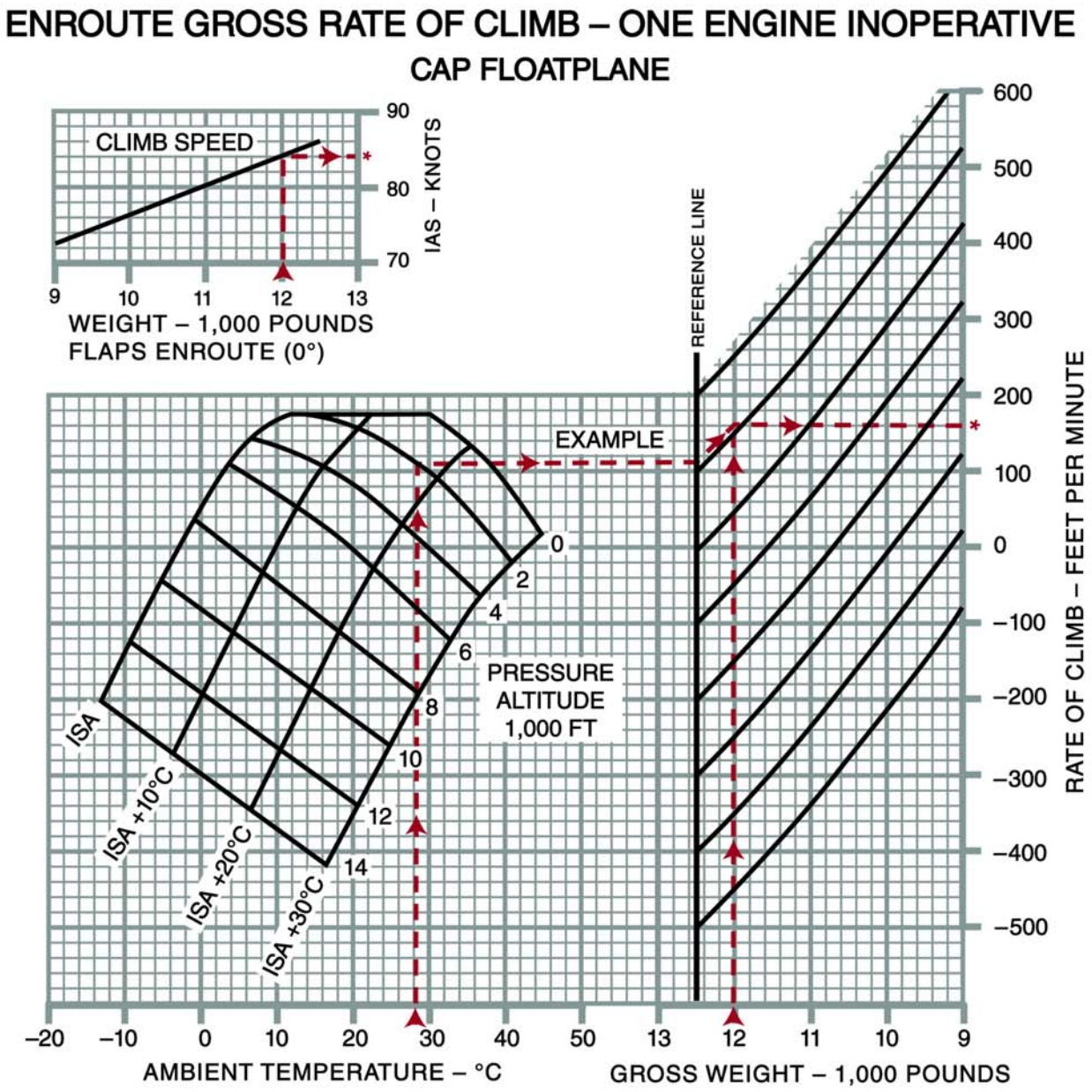


Figure 9-20-11 Enroute Gross Rate of Climb, Single Engine, Propeller Feathered

9-20.5.17 Enroute Gross Gradient of Climb – Single Engine, Propeller Feathered

Conditions associated with this chart

Flaps set at cruise position (flaps up, 0°), intake deflectors retracted (see note below if deflectors are extended), one engine set to Maximum Continuous Power (see "Maximum Continuous Power Setting" chart for that value), propeller speed 96%, one engine inoperative with propeller feathered, climb speed according to chart inset.

Interpretive Guidance

This chart provides enroute gross gradient of climb when one engine is set to Maximum Continuous Power, the other engine is inoperative and feathered, the flaps are in the enroute position, and the aircraft speed is maintained at the value determined from the inset chart. The gradient is expressed as a ratio of vertical distance gained to horizontal distance travelled.

Example Calculation (dotted line)

For guidance explaining how to use the chart, refer to the example calculation provided in Section 5 for Figure 5-26.

Summary of Example Calculation

At an air temperature of +28°C, pressure altitude of 2,000 feet, and aircraft weight of 12,000 pounds, the initial enroute climb gradient will be 0.019 (1.9%) at 84 KIAS if engine power is set to 50 PSI torque on the operating engine (the calculated Maximum Continuous Power setting for the prevailing ambient conditions) and the propeller of the inoperative engine is feathered. The aircraft will climb 19 feet for every 1,000 feet of forward travel.

The gradient will decrease as the aircraft climbs.

NOTE

This chart assumes use of Maximum Continuous Power (equal to Take-off Power) on the operating engine.

The calculated gradient of climb will only be achieved if the climb speed (determined from the inset chart) is maintained.

If intake deflectors are extended and Take-Off Power is less than 50 PSI, deduct 0.002 (two-tenths of one percent) from the value derived from this chart.

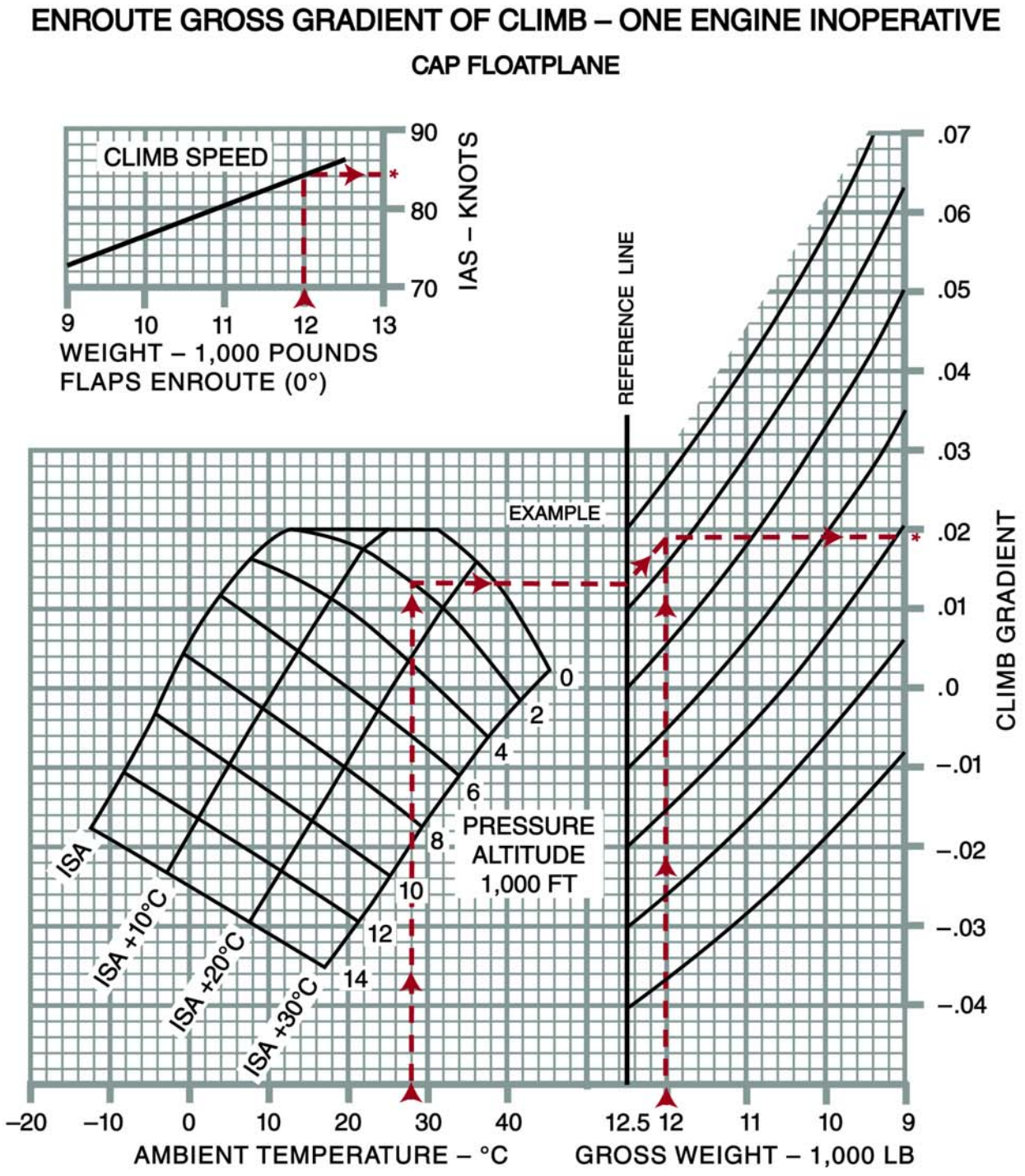


Figure 9-20-12 Enroute Gross Gradient of Climb, Single Engine, Propeller Feathered

9-20.5.18 Balked Landing Gross Rate of Climb

Conditions associated with this chart

Flaps fully extended (37.5°), intake deflectors retracted (see note below if deflectors are extended), both engines set to Take-Off Power, propeller speed 96% (see "Take-off Power Setting" chart for that value), climb speed according to chart inset.

Interpretive Guidance

This chart provides gross rate of climb information with the aircraft in the landing configuration (flaps fully extended, propellers set to 96% N_P).

Example Calculation (dotted line)

For guidance explaining how to use the chart, refer to the example calculation provided in Section 5 for Figure 5-27.

Summary of Example Calculation

At +32°C air temperature, sea level pressure altitude, and 11,000 pound landing weight, the initial rate of climb with flaps fully extended will be 1,100 feet per minute, at a climb speed of 68 KIAS.

WARNING

THIS CHART ASSUMES USE OF TAKE-OFF POWER FOR THE BALKED LANDING. PROPELLER SPEED MUST BE 96%.

CAUTION

IF A BALKED LANDING IS INITIATED WITH FLAPS LESS THAN FULLY EXTENDED, THE INITIAL RATE OF CLIMB MAY BE GREATER THAN THAT SHOWN ON THE GRAPH. AS FLAPS ARE RETRACTED DURING THE BALKED LANDING MANEUVER, CLIMB SPEED SHOULD BE PROGRESSIVELY INCREASED UNTIL REACHING V_X (BEST ANGLE) OF CLIMB. WHEN ALL OBSTACLES HAVE BEEN CLEARED, CLIMB SPEED SHOULD BE INCREASED TO V_Y (BEST RATE) OF CLIMB.

NOTE

With intake deflectors extended and torque settings less than 50 PSI, reduce rate of climb shown by 30 feet per minute.

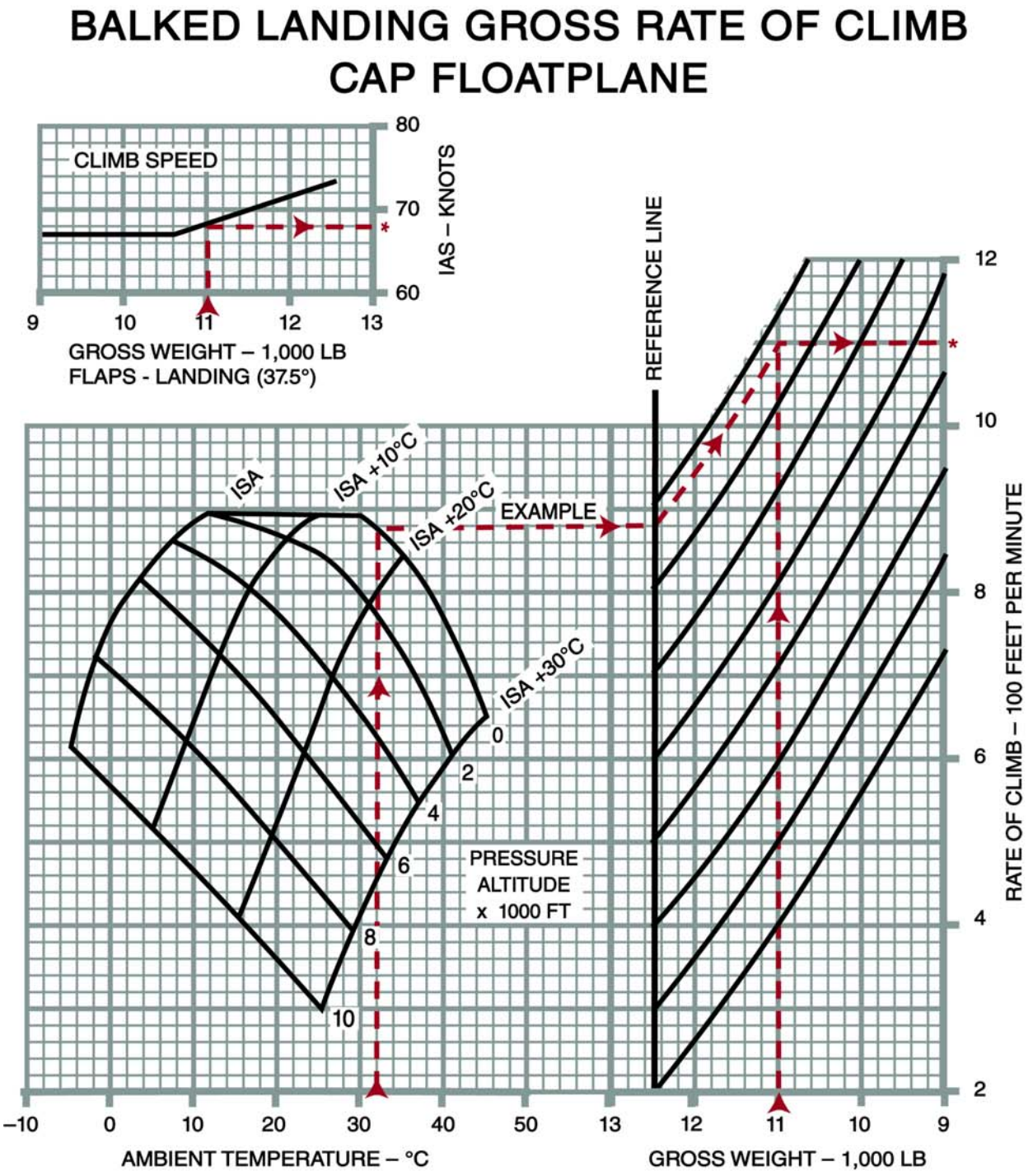


Figure 9-20-13 Balked Landing Gross Rate of Climb

9-20.5.19 Balked Landing Gross Gradient of Climb

Conditions associated with this chart

Flaps fully extended (37.5°), intake deflectors retracted (see note below if deflectors are extended), both engines set to Take-Off Power, propeller speed 96% (see “Take-off Power Setting” chart for that value), climb speed according to chart inset.

Interpretive Guidance

This chart provides gross climb gradient information with the aircraft in the landing configuration (flaps fully extended, propellers set to 96% N_P).

Example Calculation (dotted line)

For guidance explaining how to use the chart, refer to the example calculation provided in Section 5 for Figure 5-28.

Summary of Example Calculation

At +13°C air temperature, 6,000 foot pressure altitude, and 10,500 Pounds landing weight, the initial climb gradient with flaps fully extended will be 0.14 (14%), at a climb speed of 67 KIAS. The aircraft will climb 140 feet for every 1,000 feet of forward travel.

WARNING

THIS CHART ASSUMES USE OF TAKE-OFF POWER FOR THE BALKED LANDING. PROPELLER SPEED MUST BE 96%.

WARNING

AS FLAPS ARE RETRACTED DURING THE BALKED LANDING MANEUVER, CLIMB SPEED SHOULD BE PROGRESSIVELY INCREASED UNTIL REACHING V_X (BEST ANGLE) OF CLIMB. WHEN ALL OBSTACLES HAVE BEEN CLEARED, CLIMB SPEED SHOULD BE INCREASED TO V_Y (BEST RATE) OF CLIMB.

CAUTION

IF A BALKED LANDING IS INITIATED WITH FLAPS LESS THAN FULLY EXTENDED, THE INITIAL CLIMB GRADIENT MAY BE SLIGHTLY LESS THAN THAT SHOWN ON THE GRAPH – THIS IS DUE TO THE HIGHER AIRCRAFT FORWARD SPEED DURING THE CLIMB.

NOTE

With intake deflectors extended and torque settings less than 50 PSI, reduce climb gradient shown by 0.004.

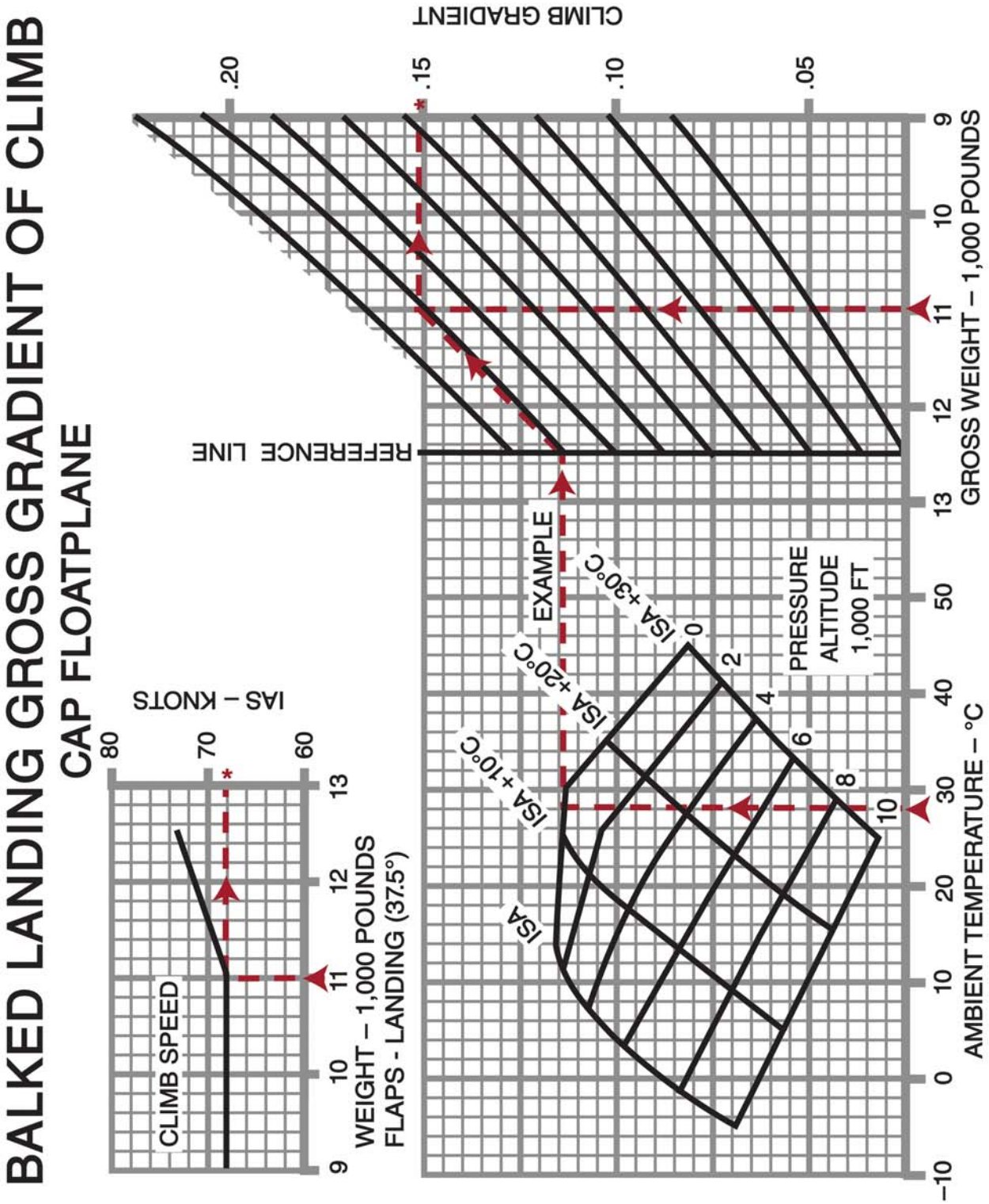


Figure 9-20-14 Balked Landing Gross Gradient of Climb

9-20.5.20 Landing Distance from 50 feet Above Water to Full Stop

Conditions associated with this chart

Flaps fully extended (37.5°), intake deflectors retracted or extended, propeller speed 96% , power as required to maintain a 3° approach angle to 50 feet above the water, then power reduced to IDLE at 50 feet above the water. Speed at 50 feet according to inset chart. Calm but not glassy water. Power levers at IDLE only following touchdown.

Interpretive Guidance

The distances have been calculated using the procedure and technique specified in SFAR 23 and are consistent with the procedures given for a normal landing in Section 4 of this AFM, as modified by additional or superseding instructions given in this supplement.

Neither zero thrust or reverse thrust were used when establishing the values in this chart.

Example Calculation (dotted line)

For guidance explaining how to use the chart, refer to the example calculation provided in Section 5 for Figure 5-29.

Summary of Example Calculation

At a temperature of +28°C, airfield pressure altitude of sea level, with a headwind component of 5 KIAS, the aircraft configured with full flap extended and at a speed of 69 KIAS at 50 feet above the water, the total distance from 50 feet above the water to a full stop is 1,925 feet.

NOTE

The chart presumes that the ‘speed at 50 feet’ will be achieved, and power will be reduced to IDLE at 50 feet above the water surface. This technique may not be appropriate for rough water conditions, therefore, longer landing distances will be required on rough water if power is carried into the flare and touchdown.

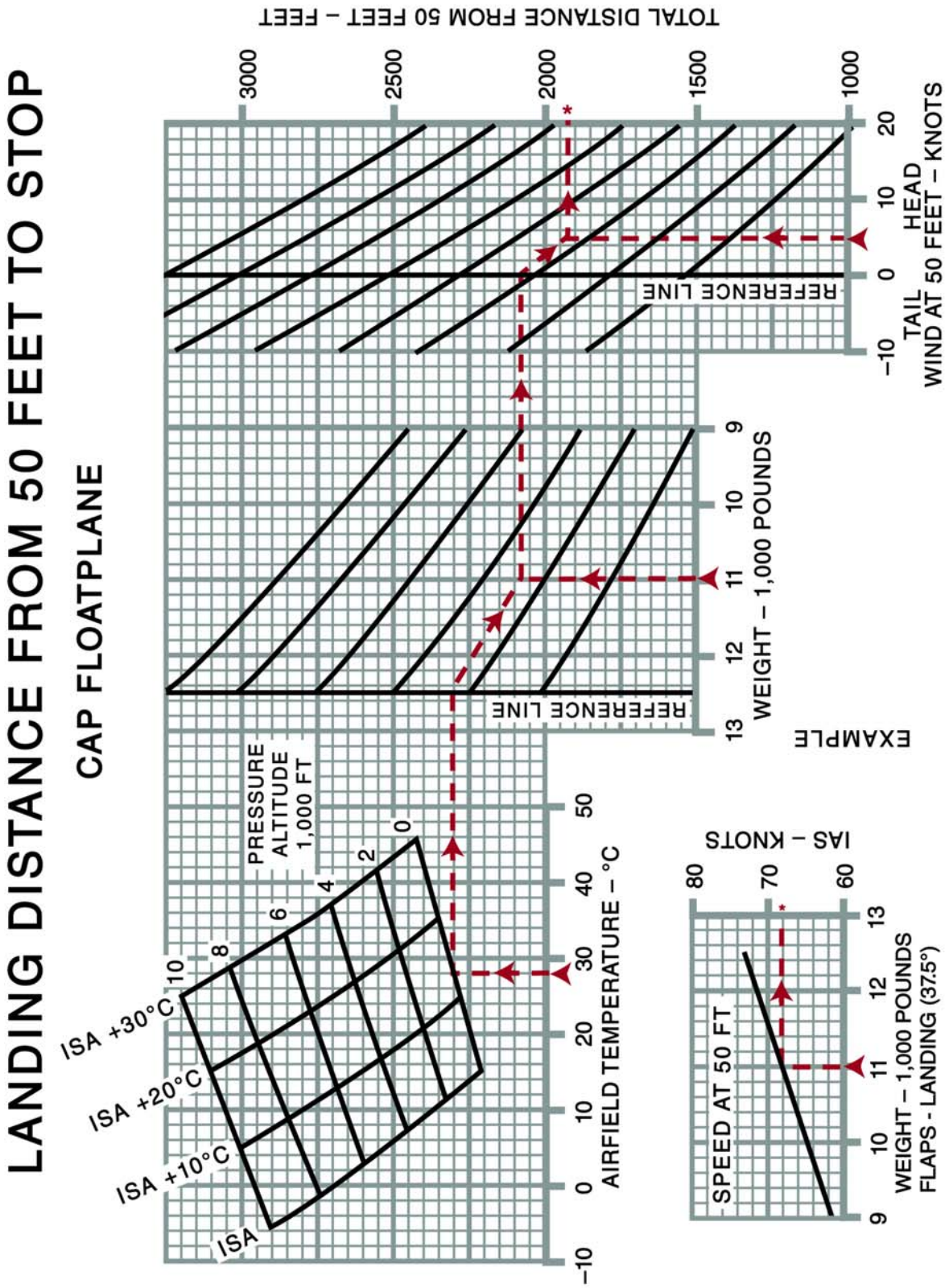


Figure 9-20-15 Landing Distance from 50 feet Above Water to Full Stop

9-20.6 Weight and Balance

Optional equipment described in this supplement will be listed in Part 2 of PSM 1-63-8.

9-20.7 Aircraft Description

9-20.7.1 Floatplane

9-20.7.1.1 Description

The floatplane is equipped with Canadian Aircraft Products (CAP) Model 12000 floats. Each float is of stressed skin construction and is divided into a number of watertight compartments accessible through covers attached to the decks by screws. Bilge pump connections for drainage of each compartment are provided on the float decks. A rubber bumper is installed on the bow of each float for protection during mooring and for protection from floating objects. Three mooring cleats are attached to each float deck. A bilge pump and a mooring rope are supplied as loose equipment with the floatplane.

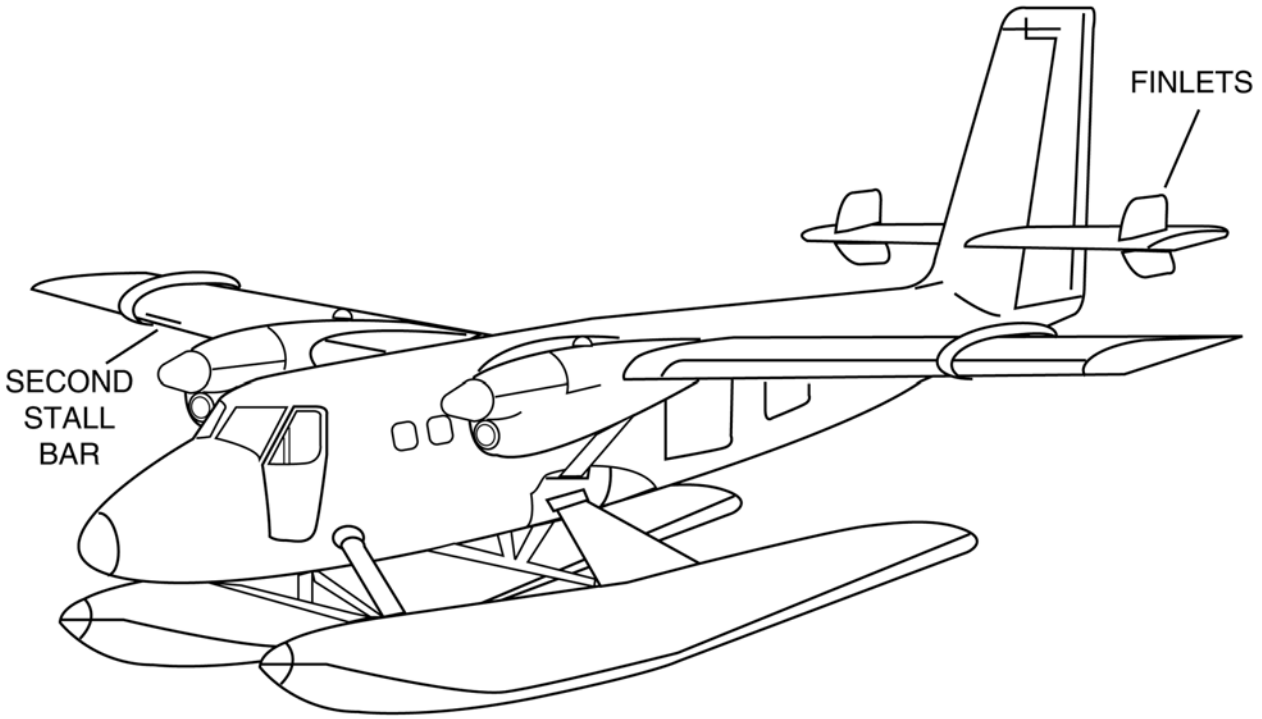


Figure 9-20-16 Floatplane (CAP floats)

Aircraft equipped with CAP floats must be fitted with a short nose. All float-equipped aircraft have a V_{MO} of 160 KCAS, regardless of whether or not Mod 6/1291 has been embodied. Mod 6/1291 only permits an increase in V_{MO} to 170 KCAS when the aircraft is in landplane configuration.

In addition to the short nose and float landing gear, the following equipment is installed, to adapt the aircraft to its floatplane configuration:

1 Propeller blade latches to provide zero thrust engine starts.

2 An airspeed indicator with limitation markings applicable to the floatplane.

3 An operating limitations placard applicable to the floatplane.

4 A bungee feel spring in the elevator controls which induces a slight elevator down load, to provide the desired longitudinal control characteristics.

5 Finlets on the upper and lower surfaces of the horizontal stabilizer to provide greater lateral stability.

6 A boathook and storage for it on the cabin rear bulkhead.

7 A nose wheel well cover.

8 Stowage for the nose wheel steering cables.

9 A second stall strip installed on the right wing.

NOTE

The second stall strip may be left in position if the aircraft is subsequently fitted with landplane or skiplane gear.

9-20.7.1.2 Optional Equipment

Optional equipment which can be supplied on special order with the floatplane consists of the following:

1 Fixed flight compartment entry ladders.

2 Fixed cargo door ladders.

3 A removable cabin door ladder (with stowage in baggage compartment).

4 A rear baggage compartment loading platform (‘diving board’) with stowage on float.

5 Wing access ladder with stowage on float.

6 Main and tail beaching chassis.

This Page Intentionally Left Blank

SECTION 9 – SUPPLEMENT 21

COLLINS AP-106 FLIGHT CONTROL SYSTEM

This Page Intentionally Left Blank

PSM 1-63-1A

SECTION 9 (T.C. Approved)

SUPPLEMENT 21

COLLINS AP-106 FLIGHT CONTROL SYSTEM

S.O.O. 6162

Approved: _____
A/Chief, Flight Test
Transport Canada

Date: 19 Jan 2011

Issue 4

LIST OF EFFECTIVE PAGES

SECTION	PAGE	DATE	SECTION	PAGE	DATE
9-21	1	19 Jan. 2011		12	19 Jan. 2011
	2	19 Jan. 2011		13	19 Jan. 2011
	3	19 Jan. 2011		14	19 Jan. 2011
	4	19 Jan. 2011		15	19 Jan. 2011
	5	19 Jan. 2011		16	19 Jan. 2011
	6	19 Jan. 2011		17	19 Jan. 2011
	7	19 Jan. 2011		18	19 Jan. 2011
	8	19 Jan. 2011		19	19 Jan. 2011
	9	19 Jan. 2011		20	19 Jan. 2011
	10	19 Jan. 2011		21	19 Jan. 2011
	11	19 Jan. 2011		22	19 Jan. 2011

This Page Intentionally Left Blank

TABLE OF CONTENTS **PAGE**

9-21.1 General **7**
9-21.1.1 Abbreviations Used 8

9-21.2 Limitations **9**

9-21.3 Emergency and Abnormal Procedures **10**
9-21.3.1 Altitude Loss Under Autopilot Failure Conditions 10
9-21.3.2 Disengaging the Autopilot 10
9-21.3.3 Single Engine Procedures 10

9-21.4 Normal Procedures **11**
9-21.4.1 Ground Checks 11
9-21.4.2 In-Flight Procedures 12

9-21.5 Performance **14**

9-21.6 Weight and Balance **15**

9-21.7 System Description **16**
9-21.7.1 General 16
9-21.7.2 Operating Modes 16
9-21.7.2.1 Attitude (Manual) Mode 16
9-21.7.2.2 Guidance Mode 16
9-21.7.3 Component Description 16
9-21.7.3.1 Autopilot Controls 16
9-21.7.3.2 Flight Computer 16
9-21.7.3.3 Primary Servos 17
9-21.7.4 Autopilot Control and Indication 19
9-21.7.4.1 Autopilot Engage Switch 19
9-21.7.4.2 Turn Knob 19
9-21.7.4.3 UP-DN Pitch Wheel 19
9-21.7.4.4 Control Wheel Steering 19
9-21.7.4.5 G/A Pushbutton 20
9-21.7.4.6 Automatic Disengagement 20
9-21.7.4.7 Autopilot Annunciation 20
9-21.7.4.8 Yaw Damper 21
9-21.7.5 Rockwell Collins Publications 21

List of Figures Page

9-21-1 Collins AP-106 Flight Control System Controls 18

9-21.1 General

The Collins AP-106 autopilot (S.O.O. 6162) integrated with a Collins FD-112 flight director is the most common autopilot installed in Series 300 Twin Otter aircraft. It is possible to have an AP-106 autopilot installed without the FD-112 flight director.

When engaged and coupled to the flight director, the autopilot controls the aircraft by using the commands generated by the flight computer. When engaged without a flight director mode selected (not coupled), or when engaged if a FD-112 flight director is not fitted to the aircraft, manual pitch and roll commands are given by the pilot using the pitch wheel and turn knob. The typical AFCS can perform the following functions:

Maintain a preselected attitude.

Maintain a barometric altitude.

Maintain an indicated airspeed.

Capture and maintain a desired heading.

Capture and maintain a preselected radio navigation course (if coupled to a navigation aid).

Capture and maintain an ILS approach to published minimums (if coupled to an ILS).

The Collins AP-106 autopilot can be identified by comparing the control head (located on the aft face of the control yoke) with the illustration in Figure 9-21-1.

Be certain you are using the correct supplement for the autopilot used in your aircraft. There are three different autopilot supplements applicable to Series 300 aircraft:

Supplement Number	**Applicable to**
Supplement 2	Honeywell H-14 Pneumatic Automatic Pilot, S.O.O. 6085
Supplement 21 (this supplement)	Collins AP-106 Autopilot, S.O.O. 6162
Supplement 35	Collins FCS-65 Autopilot, S.O.O. 6188

Only the one supplement appropriate to the autopilot fitted to the aircraft should be present in Section 9, all other autopilot supplements should be discarded. If the aircraft is not fitted with an autopilot, all the autopilot supplements should be removed and discarded.

9-21.1.1 Abbreviations Used

The following abbreviations are used on instruments and controls. They are listed here in the order in which they appear in this supplement.

AFCS	Automatic Flight Control System
AFCS DISC	Automatic Flight Control System Disconnect (a button on the control wheel)
ATT	Attitude (a flag on the attitude indicator)
ENG/DIS	Engage / Disengage (a toggle switch on the autopilot control head)
DN	Down
UP	Up
HDG	Heading (a mode of operation of the autopilot)
APPR	Approach (a mode of operation of the autopilot)
G/A	Go-around (a button on the control wheel)
NAV	Navigation (a mode of operation of the autopilot)
CWS	Control Wheel Steering (a button on the control wheel)
ALT	Altitude (a mode of operation of the autopilot)
IAS	Indicated Airspeed (a mode of operation of the autopilot)
B/C	Back Course (a mode of operation of the autopilot)
NAV ARM	Navigation mode is armed (an annunciation from the autopilot)
NAV CAPT	Navigation Capture (an annunciation from the autopilot)
G/S CAPT	Glideslope Capture (an annunciation from the autopilot)
DEAD REC	Dead Reckoning (an annunciation from the autopilot)

9-21.2 Limitations

1 During autopilot operation, a pilot must be seated at the controls with seat belt fastened.

2 Do not override the autopilot except for ground checks, or to correct a hardover malfunction.

3 Maximum speed for autopilot operation is V_{MO}.

4 Minimum speed for autopilot operation is 96 KIAS.

5 Pitch attitude limit is 12° nose up and 12° nose down.

6 The autopilot must be disengaged in severe icing.

7 The autopilot must be disengaged during single engine flight.

9-21.3 Emergency and Abnormal Procedures

9-21.3.1 Altitude Loss Under Autopilot Failure Conditions

The maximum altitude losses recorded during malfunction tests in certain flight configurations are listed below. These may be expected to occur under actual failure conditions.

Cruise	100 feet
ILS Approach	100 feet
ILS Approach	100 feet (engine out)

9-21.3.2 Disengaging the Autopilot

In the event a malfunction in the autopilot performance is detected, the pilot may disengage the autopilot by momentarily pressing the AFCS DISC button on the control wheel. Slip clutches are provided on the servo output capstans to permit the human pilot to physically override the autopilot.

9-21.3.3 Single Engine Procedures

1 If one engine becomes inoperative, disengage the autopilot.

2 If an engine failure should occur during a coupled approach the autopilot should be disengaged by depressing the AFCS DISC button and the approach continued manually.

9-21.4 Normal Procedures

9-21.4.1 Ground Checks

If the automatic pilot will be used during a flight, the following checks should be completed prior to take-off.

1 With the electrical system powered, check that the vertical gyro is erect (the ATT flag is out of view), and that the magnetic compass is slaved (the HEADING flag is out of view).

2 ENG/DIS switch – ENG. Check that the ENG annunciator light illuminates.

3 Turn the lighting intensity dimmer control fully counter clockwise to check all annunciator lights, then turn the control clockwise to set annunciator brightness as desired.

4 Apply a force to the controls, one axis at a time, to determine if the autopilot may be overpowered. The autopilot should not disconnect prior to applying a force strong enough to cause clutch slippage.

5 Rotate the pitch control knob DN and then UP. The control yoke should move forward and backward, and the TRIM DN and TRIM UP annunciators should light and flash appropriately and the TRIM IN MOTION annunciator (if present) should illuminate. Rotate the turn control knob right, then left. The control wheel should move right and left.

⚠ CAUTION

THE PRESSURE OF AIRFLOW THAT NORMALLY OPPOSES MOVEMENT OF CONTROL SURFACES IS ABSENT DURING ANY PREFLIGHT CHECK. IT IS POSSIBLE TO REACH A HARDOVER CONTROL SURFACE DEFLECTION IF AN AUTOPILOT COMMAND IS ALLOWED TO REMAIN ACTIVE FOR LONGER THAN NECESSARY TO OBSERVE CONTROL MOVEMENT. WHEN CHECKING THE OPERATION OF THE PITCH/TURN CONTROL KNOBS, MOVE THEM ONLY AS REQUIRED TO CHECK CONTROL OPERATION, AND THEN RETURN THEM TO THE CENTRE POSITION.

6 Pull back on the control yoke and hold. After a few seconds the TRIM ON annunciator should light and flash and the TRIM IN MOTION annunciator (if present) should illuminate.

7 Press the AFCS DISC button on the control wheel. Observe that the DIS annunciator light illuminates, the autopilot disengages, and that the flight controls operate freely.

8 Set the heading marker under the lubber line, and press the HDG button of the mode selector. Engage the autopilot. Adjust the HDG knob to move the heading marker 10° right, and then 10° left. The control wheel should move right and left, and if applicable, the command bars or crosspointers should command right and left bank.

9 If the aircraft is equipped with a flight director system, tune the navigation receiver to a localizer frequency and press the APPR button. Then press the G/A button on the control wheel and observe that the autopilot disengages and that the command bars or crosspointers move to command a wings-level, pitch-up attitude.

10 Tune the navigation receiver to a VOR or VOT within reception range. Adjust the course arrow to center the lateral deviation bar and obtain a TO indication. Engage the autopilot and press the NAV button of the mode selector. Adjust the course arrow 10° right, then left. The control wheel should move right and left, and if installed, the command bars or crosspointers in the attitude indicator should command right and left bank.

11 Press the APPR button of the mode selector. Adjust the course arrow 10° right, then left. The control wheel should move right and left, and if installed, the command bars or crosspointers in the attitude indicator should command right and left bank.

12 ENG/DIS switch – DIS. Observe that the autopilot disengages and the flight controls operate freely.

13 Set the elevator trim to take-off setting; set the heading marker to the heading of the runway in use, and press the HDG button on the mode selector panel.

9-21.4.2 In-Flight Procedures

1 Trim the aircraft before engaging the autopilot.

2 ENG/DIS switch – ENG

⚠ CAUTION

DO NOT ENGAGE THE AUTOPILOT AT PITCH ATTITUDES IN EXCESS OF 12° NOSE UP, OTHERWISE THE AUTOPILOT WILL COMMAND AN ABRUPT NOSE DOWN PITCH CHANGE TO THE 12° LIMIT.

3 Control the aircraft with the pitch/turn control knobs, or press the CWS button while changing pitch or bank manually.

4 If desired and if the aircraft is appropriately equipped, the autopilot can be used as an integral part of the automatic flight control system (if installed) to control the aircraft as follows:

In a climb.

In level flight (by selecting the ALT button).

With airspeed hold (by selecting the IAS button).

During VOR navigation (by selecting the NAV button).

For an ILS front-course approach (by selecting the APPR button).

For an ILS back-course approach (by selecting the B/C button).

Depressing the CWS button will disengage the ALT or IAS mode if selected. The HDG, NAV, or B/C modes may or may not disengage when the CWS button is depressed, depending on the modification status of the autopilot. See Para 9-21.7.4.4 for elaboration.

The APPR mode does not disengage when the CWS button is pressed. When the CWS button is released the autopilot will continue to attempt to track the localizer and glideslope.

When the autopilot is being used for enroute radio navigation or for radio navigation during an approach, the appropriate annunciator lights should be monitored. The annunciator lights that indicate autopilot status are NAV ARM, NAV CAPT, G/S ARM, G/S CAPT, DEAD REC, and if applicable GO AROUND).

If desired, the yaw damper (if installed) can be engaged independently of the autopilot by depressing the YAW DAMP button. When the YAW DAMP button is depressed the button will illuminate. To disengage the yaw damper depress the AFCS DISC button. The yaw damper must be disengaged for take-off and landing.

5 The autopilot may be disengaged by taking any of the following actions:

a by selecting the ENG/DIS switch to DIS,

b by depressing the AFCS DISC button,

c by depressing the G/A button (if a G/A button is installed).

9-21.5 Performance

There are no changes to aircraft performance data when the automatic pilot is installed or when the automatic pilot is in use.

9-21.6 Weight and Balance

Optional equipment described in this supplement will be listed in Part 2 of PSM 1-63-8.

9-21.7 System Description

9-21.7.1 General

The AP-106 controls provides autopilot engagement control and the pitch wheel and turn knob for manually controlling the autopilot. Figure 9-21-1 shows the autopilot and flight director controls. This supplement only contains a system description for the AP-106 autopilot. A Pilot Guide containing a system description of the FD-112 flight director is available from Collins Avionics.

9-21.7.2 Operating Modes

The autopilot has two modes of operation – attitude and guidance.

9-21.7.2.1 Attitude (Manual) Mode

When the autopilot is engaged (accomplished by moving the spring-loaded engage lever to the ENG position) and no modes are selected on the computer/control or by use of the go-around button, the autopilot is in the manual mode. The autopilot accepts pitch and roll rate or position commands from the pitch wheel and turn knob.

9-21.7.2.2 Guidance Mode

When the autopilot is engaged and a lateral and/or vertical mode is selected on the flight director control, the autopilot is in the guidance mode and accepts steering commands from the flight computer (the computer section of the flight director). Whether the autopilot is engaged or disengaged, the attitude indicator command bars are always driven by the flight computer.

9-21.7.3 Component Description

9-21.7.3.1 Autopilot Controls

The autopilot controls include the engage/disengage switch, pitch wheel and turn knob, autopilot disengage switch on the control wheel, and trim up/down indicators.

9-21.7.3.2 Flight Computer

The flight computer is the heart of the AFCS. It is composed of the computer control system, pitch computer, roll computer, and trim controller. The signals received by the flight computer from various systems and sensors are converted into proper command signals according to the selected mode of operation. The command signals are sent to the flight director pitch and roll command bars and (with autopilot engaged) to the rudder, aileron, and elevator servos, and the pitch trim system.

9-21.7.3.3 Primary Servos

The primary flight control servos position the aircraft primary flight control surfaces in response to commands from the autopilot flight computer.

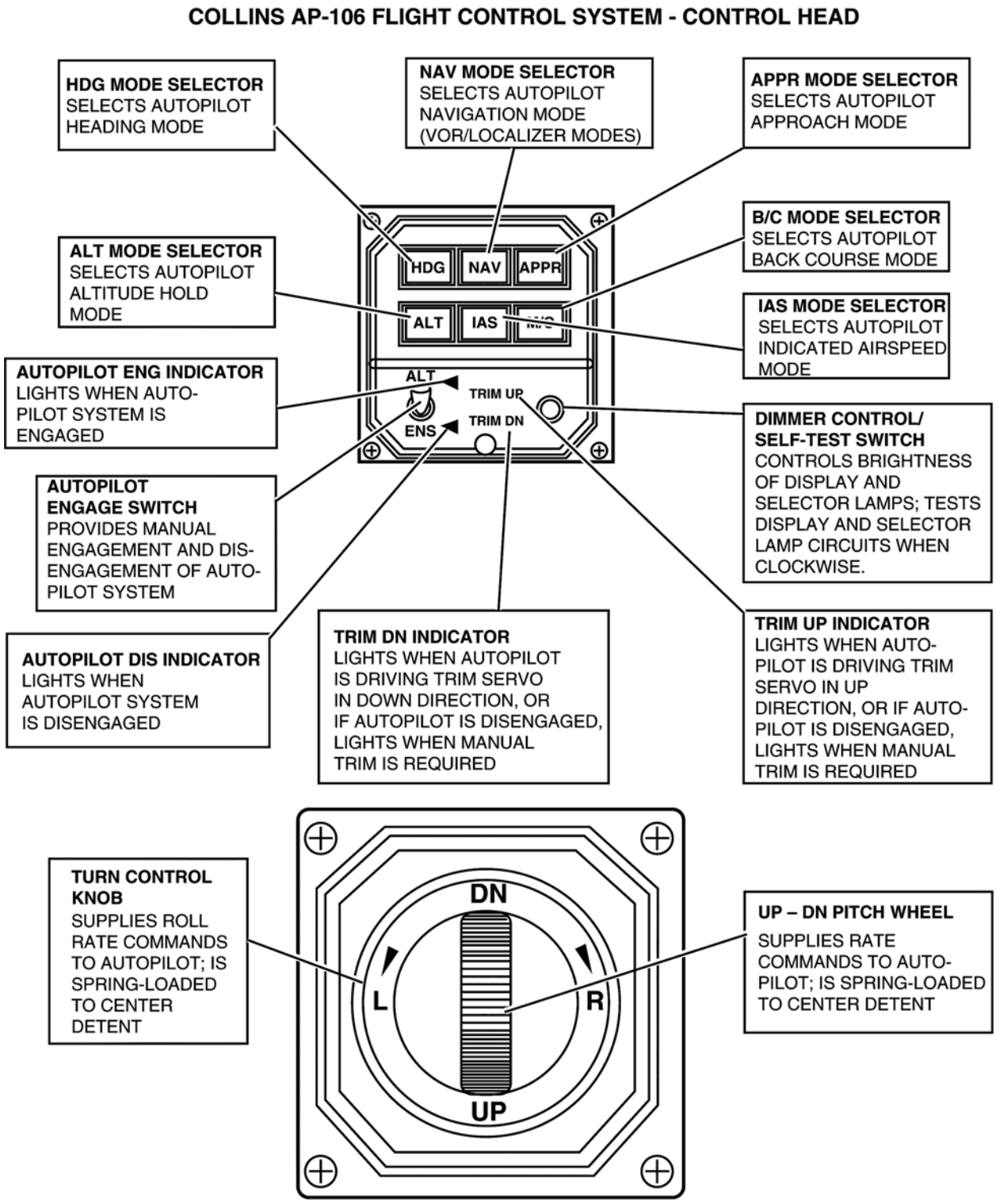


Figure 9-21-1 Collins AP-106 Flight Control System Controls

9-21.7.4 Autopilot Control and Indication

9-21.7.4.1 Autopilot Engage Switch

The autopilot engage switch allows manual engagement or disengagement of the autopilot system. The lever has 3 positions: DIS (disengaged), an unmarked center position, and a momentary ENG (engage) position. Moving the lever to the spring-loaded ENG position engages the autopilot. This is confirmed by the illumination of a small green triangle adjacent to the ENG label.

When the lever is moved to the DIS position, a small amber triangle illuminates by the DIS label. The autopilot may be in either condition, engaged or disengaged, when the lever is in the unmarked center position. The amber triangle illuminates whenever the autopilot is disengaged by pressing the autopilot disconnect button on the control wheel, when the autopilot fails to engage, or when automatic disengagement occurs.

The DIS switch position, when selected manually, is used as the autopilot master disconnect. If the autopilot becomes disengaged at any time while the flight director is in use (guidance mode), an AFCS DISC (automatic flight control system disconnect) annunciator will illuminate on the instrument panel.

9-21.7.4.2 Turn Knob

The turn knob is spring-loaded to the center detent position. It is used to supply roll commands to the autopilot when no lateral modes have been selected on the control panel. If a lateral mode is selected and the autopilot is engaged, moving the turn knob from detent deselects that mode. When the aircraft is rolled to a normal roll attitude and the knob is then positioned to the center detent, the existing roll attitude is held.

9-21.7.4.3 UP-DN Pitch Wheel

The pitch wheel is spring-loaded to the center detent position. It supplies pitch commands to the autopilot when no vertical modes are selected on the control panel. Moving this thumbwheel to UP or DN causes an appropriate change in pitch attitude at a rate proportional to the amount of pitch wheel displacement. When released, the pitch wheel returns to the center detent, and the pitch attitude present at that time is held. Movement of the pitch wheel clears any selected vertical mode; the autopilot then assumes pitch hold mode.

9-21.7.4.4 Control Wheel Steering

When the AFCS includes control wheel steering (CWS), pressing the CWS button disengages the autopilot servos from the control surfaces and disengages the ALT or IAS hold mode, if these modes have been selected.

The effect of CWS on HDG, NAV, or B/C depends on the modification status of the 91 3K-1 computer/control (the 913K-1A has the following modifications factory-installed).

As supplied from the factory
(913K-1 only), HDG, NAV, or B/C disengages when the CWS button is pressed and movement of the control wheel results in more than 10° of bank. When CWS is released, the existing attitude is maintained. Bank angles of less than 10° will not disengage a selected lateral mode. If the 913K-1 computer/control has been field modified by Service Bulletin No. 9 (a customer option) or a 913K-1A is being used, HDG, NAV, APPR, and B/C do not disengage when the CWS button is pressed and bank angles exceed 10°. When the CWS button is released, the aircraft returns to the selected heading or radio course. APPR does not disengage when the CWS button is pressed. When the CWS button is released, the aircraft returns to the localizer course and glide slope.

9-21.7.4.5 G/A Pushbutton

The G/A pushbutton on the control wheel is used to select go-around mode, a flight-director-only mode. When depressed, the G/A button commands a wings level , fixed-pitch-up command without disengaging the autopilot. G/A may be selected any time after APPR is selected.

9-21.7.4.6 Automatic Disengagement

The autopilot automatically disengages when any of the following occurs:

An autopilot power supply failure

A gyro instrument failure is detected by the monitoring system (a flag will appear in the instrument)

The force required to maintain the control surfaces in the desired position exceeds a certain threshold, or if the pilot overpowers the autopilot

GA (go-around) mode is selected

9-21.7.4.7 Autopilot Annunciation

ENG-DIS indicators – The triangular green engage light illuminates when the autopilot is engaged. The triangular amber disengage light illuminates when the autopilot is disengaged.

TRIM UP/TRIM DN indicators – The appropriate flashing amber legend illuminates when the autopilot is driving the trim servo in the up or down direction or, if the autopilot is disengaged, illuminates when manual up or down trim is required.

TRIM-IN-MOTION – The legend illuminates when the autopilot is trimming.

9-21.7.4.8 Yaw Damper

A yaw damper is available as an optional installation. The pilot must manually trim the aircraft and 'put the ball in the middle' of the turn and bank indicator before engaging the yaw damper. The yaw damper is engaged by pressing on the YAW DAMPER button, which is a magnetic-type pushswitch normally located beside the autopilot control head. The yaw damper may be disengaged by pressing the AFCS DISC button.

The yaw damper is independent of the autopilot, and does not normally disengage when the ENG-DIS switch is moved to the DIS position. The yaw damper must be disengaged for take-off and landing.

In some installations, RF energy caused by HF radio transmissions has caused interference with the yaw damper operation, and a placard is provided indicating that the yaw damper is not to be engaged when making HF transmissions.

9-21.7.5 Rockwell Collins Publications

A generic pilot guide to operation of the AP-106/FD-112V/PN-101 Low Profiles FCS is available from Rockwell Collins, the publication number is 523–0765014.

This Page Intentionally Left Blank

SECTION 9 – SUPPLEMENT 31

MAINTAINED-CONTACT START SWITCH (S.O.O. 6185)

This Page Intentionally Left Blank

PSM 1-63-1A

SECTION 9 (T.C. Approved)

SUPPLEMENT 31

MAINTAINED-CONTACT START SWITCH

MOD S.O.O. 6185

Approved: _____
for Chief, Flight Test
Transport Canada

Date: 19 Jan 2011

Issue 1

LIST OF EFFECTIVE PAGES

SECTION	PAGE	DATE	SECTION	PAGE	DATE
9-31	1	19 Jan. 2011		7	19 Jan. 2011
	2	19 Jan. 2011		8	19 Jan. 2011
	3	19 Jan. 2011		9	19 Jan. 2011
	4	19 Jan. 2011		10	19 Jan. 2011
	5	19 Jan. 2011		11	19 Jan. 2011
	6	19 Jan. 2011		12	19 Jan. 2011

This Page Intentionally Left Blank

TABLE OF CONTENTS **PAGE**

9-31.1 General **7**

9-31.2 Limitations **8**

9-31.3 Emergency and Abnormal Procedures **9**

9-31.4 Normal Procedures **10**

9-31.5 Performance **11**

This Page Intentionally Left Blank

9-31.1 General

When S.O.O. 6185 is incorporated, a “maintained-contact” engine start switch is installed in place of the normal start switch (which must be held when selected) to simplify engine starting. The maintained contact START switch is lever locked at the center off position to prevent unintentional selection to the LEFT or RIGHT position. An advisory light labelled START ON, located immediately aft of the start panel, illuminates when LEFT or RIGHT is selected using the START switch, and this light indicates the requirement to move the start switch back to the center off position when the start cycle is complete.

9-31.2 Limitations

All operating limitations published in Section 2 are applicable. No additional limitations apply.

9-31.3 Emergency and Abnormal Procedures

All emergency operating procedures contained in Section 3 are applicable. No additional emergency procedures apply.

9-31.4 Normal Procedures

All normal operating procedures contained in Section 4 are applicable except during engine starting and clearing an engine when operation of the maintained contact engine start switch is as follows:

1 For all procedures in Section 4 that contain the step: “START switch – Select LEFT or RIGHT as required”, add the following action:

a Check that the START ON advisory light comes on when the START switch is operated.

2 At the conclusion of all starting or engine clearing procedures, add the following two actions:

a START switch – Return to center off position.

b Check that the START ON advisory light goes out.

⚠ CAUTION

IF THE START SWITCH IS NOT RETURNED TO ITS CENTER OFF POSITION AT THE COMPLETION OF THE START CYCLE, THE STARTER SYSTEM AND IGNITERS WILL REMAIN ENERGIZED AND THE GENERATOR WILL NOT COME ON LINE.

9-31.5 Performance

All performance data contained in Section 5 is applicable. No additional performance data is provided.

This Page Intentionally Left Blank

SECTION 9 – SUPPLEMENT 35

COLLINS FCS-65 FLIGHT CONTROL SYSTEM

This Page Intentionally Left Blank

PSM 1-63-1A

SECTION 9 (T.C. Approved)

SUPPLEMENT 35

COLLINS FCS-65 FLIGHT CONTROL SYSTEM

S.O.O. 6188

Approved: _____
for Chief, Flight Test
Transport Canada

Date: 19 Jan 2011

Issue 3

LIST OF EFFECTIVE PAGES

SECTION	PAGE	DATE	SECTION	PAGE	DATE
9-35	1	19 Jan. 2011		10	19 Jan. 2011
	2	19 Jan. 2011		11	19 Jan. 2011
	3	19 Jan. 2011		12	19 Jan. 2011
	4	19 Jan. 2011		13	19 Jan. 2011
	5	19 Jan. 2011		14	19 Jan. 2011
	6	19 Jan. 2011		15	19 Jan. 2011
	7	19 Jan. 2011		16	19 Jan. 2011
	8	19 Jan. 2011		17	19 Jan. 2011
	9	19 Jan. 2011		18	19 Jan. 2011

This Page Intentionally Left Blank

TABLE OF CONTENTS **PAGE**

9-35.1 General **7**

9-35.2 Limitations **8**

9-35.3 Emergency and Abnormal Procedures **9**

9-35.4 Normal Procedures **11**
9-35.4.1 Ground Checks 11
9-35.4.2 In-Flight Procedures 12
9-35.4.3 Mode Selection, General 13

9-35.5 Performance Data **17**

This Page Intentionally Left Blank

9-35.1 General

This supplement provides information applicable only to the Collins APS-65 Automatic Flight Control System, which is S.O.O. 6188.

9-35.2 Limitations

1 During autopilot operations, the pilot must be seated at the flight controls with seat belt fastened.

2 The autopilot is certified for Category 1 coupled ILS approaches.

3 Minimum altitude for autopilot operation, other than during coupled ILS approaches, is restricted to 500 feet above ground level.

4 On a coupled ILS approach the autopilot must be disengaged at or above 200 feet above runway elevation.

5 The autopilot/yaw damper must not be engaged during take-off or landing.

6 Do not engage autopilot if airplane is out of trim.

7 Maximum speed tor autopilot operation is V_{MO} as per AFM, Table 2-1 Airspeed Limitations.

8 Minimum speed for autopilot operation is 85 KIAS with flap 10°.

9 Minimum speed for autopilot operation single engine is 105 KIAS.

10 Do not override the autopilot except for ground checks or to overcome a system malfunction, while simultaneously disengaging the autopilot.

11 Maximum flap setting for autopilot operation is 10°.

12 Coupled ILS approaches are only permitted with all engines operating.

13 The autopilot must be disengaged in severe icing.

9-35.3 Emergency and Abnormal Procedures

1 The autopilot can be disengaged by any of the following methods:

a Push the AFCS DISC button on either control wheel.

b Push the AP ENG button on the Autopilot Panel (yaw damper stays engaged).

c Pull the autopilot SERVOS, CMPTR, or AIR DATA circuit breakers.

d With a mode selected, operate the G/A button (yaw damper stays engaged).

e Select CAUTION LT TEST switch to TEST:

2 The following conditions will cause the autopilot to disengage automatically:

a Any major degradation, interruption or failure of input electrical power.

b Detection of a failure in the APC-55 by the internal monitor.

c Loss of vertical gyro monitor.

d Bank angles in excess of 45° and pitch attitudes in excess of 30°.

e Indicated airspeeds below 60 knots.

f Activation of the airplane stall warning system.

3 The Yaw Damper can be disconnected by any of the following methods:

a Push the AFCS DISC button on either control wheel.

b Push the YAW ENG button on the autopilot panel.

c Pull autopilot AP SERVOS, CMPTR, or AIR DATA circuit breakers.

4 The following conditions will cause the yaw damper to disengage automatically:

a Detection of failure in the APC-65 by the internal monitor.

b Any major degradation, interruption or failure of input electrical power.

NOTE

In the unlikely event of any servo becoming mechanically jammed, control of airplane can be maintained by manually overpowering the relevant control while at the same time disengaging the autopilot.

5 In the event of engine failure with the autopilot/yaw damper engaged:

a Disengage autopilot/yaw damper by pressing either of the AFCS/DISC buttons.

b Follow procedure for Engine Failure During Flight, as per AFM Para 3.3.4

c Manually fly airplane and retrim as required.

d If the engine failure occurs during the approach, the approach should be continued in manual flight. If the engine failure occurs during cruise flight, the autopilot may be re-engaged after the airplane has been re-trimmed, but the autopilot and yaw damper must be disengaged for the approach.

WARNING

AUTOPILOT MALFUNCTIONS MAY CAUSE THE FOLLOWING ATTITUDE LOSS RELATIVE TO THE ALTITUDE AT MALFUNCTION ONSET.

1 ILS APPROACH – 105 FEET

2 CRUISE – 250 FEET

9-35.4 Normal Procedures

9-35.4.1 Ground Checks

1 The following checks should be done before every flight, and prior to each functional check.

a Check all circuit breakers – in

b Check gyro attitude flag – Not in view

c Elevator trim – Set to take-off position.

d Controls unlocked – Check for unrestricted full travel.

2 The following functional checks must be made once in each flying day (24 hours):

NOTE

If bus voltage is low, neither the autopilot nor the yaw damper will engage.

With the control column at neutral and autopilot engaged:

1 Autopilot turn knob – Rotate left and right, and note that the control wheel rotates left and right in response to knob movement.

2 Vertical trim switch – Apply nose down and nose up pitch inputs and note that the control column moves fore and aft in response to switch movement.

3 Control column – Apply and hold forward pressure and note that the elevator trim wheel rotates NOSE UP. A pull force should cause the trim wheel to rotate NOSE DOWN. The white TRIM light should illuminate while trim is in motion.

4 Rudder pedals – Apply pressure and note a resistance to force applied.

5 Note that both the autopilot and yaw damper disengage when the AFCS DISC button on the pilot's control wheel is pressed. Re-engage the autopilot and repeat, using the AFCS DISC button on the co-pilot's control wheel.

6 Push and hold the TEST button on the Mode Annunciator Panel and note that all annunciators illuminate in bright mode.

7 Move all primary flight controls through full travel to ensure that no restrictions exist.

8 Reset elevator trim to take-off position.

9-35.4.2 In-Flight Procedures

1 AUTOPILOT OPERATION

The airplane must be trimmed prior to engaging the autopilot. The AP ENG button automatically engages both the autopilot and yaw damper.

The autopilot may be engaged in any typical attitude. When engaged beyond 30° bank and/or 17° nose up or 10° nose down (in basic autopilot mode), the autopilot will return the airplane to these limits.

Changes in pitch attitude may be made using the vertical trim switch on the Autopilot Panel or the control wheel synchronization (CWS) button. CWS is actuated by holding in the wheel-mounted CWS button while manually flying the airplane to the desired attitude, and then releasing the button. Autopilot pitch trimming is indicated by a white TRIM annunciator light.

Autopilot pitch trim malfunction is indicated by a continuous white TRIM annunciator, for more than 10 seconds. Autopilot pitch trim failure is indicated by a red TRIM annunciator. Malfunction or failure annunciations require that the autopilot be disengaged while the pilot securely holds the wheel in order to counter possible out-of-trim forces. To disengage the autopilot, press the AP ENG button, or press the AFCS DISC button on either control wheel (yaw damper will remain engaged). Refer to Para 9-35.3 Emergency and Abnormal Procedures for other means of disconnecting. Pitch trim must then be manually checked.

⚠ WARNING

AUTOPILOT WILL DISENGAGE DURING AIRPLANE CAUTION LIGHT PANEL CHECK BECAUSE STALL WARNING CIRCUITS ARE ACTIVATED.

1 YAW DAMPER OPERATION

Engaging the autopilot automatically engages the yaw damper. Once engaged, the yaw damper may be independently disengaged or reengaged by using the YAW ENG button.

The yaw damper channel of the autopilot may be selected independently by the YAW ENG button on the Autopilot Panel.

Refer to Para 9-35.3 Emergency Operating Procedures for other means of disconnecting.

WARNING

LANDINGS AND TAKE-OFFS WITH THE YAW DAMPER ENGAGED ARE PROHIBITED.

9-35.4.3 Mode Selection, General

All modes with the exception of Go-Around are selected by pushing the designated push-on/push-off button on the Flight Control Panel. Annunciator lights on the Flight Control Panel and Mode Annunciator Panel indicate the selected modes of operation.

A lateral mode must be selected prior to selection of a vertical mode for flight director operation.

Holding the vertical trim switch on the Autopilot Panel longer than one second will cause any vertical hold mode currently selected to revert to off, except Approach and Go-Around.

1 HEADING MODE (HDG)

When HDG is selected, the autopilot will cause the airplane to turn to and maintain the heading set with the heading bug on the HSI. The heading bug should not be displaced from the airplane heading by more than 155 degrees when HDG is selected.

2 NAV MODE (NAV)

Prior to selecting NAV the course arrow on the HSI should be set to the desired radio course. When NAV is selected, the green HDG, NAV and white ARM annunciators will illuminate. The airplane will maintain the heading selected on the HSI until the selected radio course is captured. HDG will then extinguish, and the airplane will turn to track the selected course. Crosswind correction, up to 30°, is automatically computed after course capture. During VOR passage, the green DR annunciator light illuminates.

3 APPROACH MODE (APPR)

When APPR is selected, the green HDG, APPR and white ARM annunciators will illuminate. The localizer capture is similar to that described in NAV. After localizer capture is achieved, the system will automatically arm to capture the glideslope. The green GS and white ARM annunciators will illuminate at this time. When the glideslope is captured, either from above or below, the white ARM annunciator will go out indicating the system is in full ILS operation. Crosswind correction, up to 30 degrees, is automatically computed after localizer capture.

Any vertical mode will automatically disengage at glideslope capture. ILS, VOR or RNAV approaches must be made with APPR selected. Back course approaches must be made with B/C selected. Annunciation will only occur at capture, and GS (submode) requires that both APPR and an ILS frequency be selected.

4 BACK COURSE MODE (B/C)

When B/C is selected, localizer capture follows the same sequence as a front course approach. Pitch commands are displayed as a function of the vertical mode selected.

The front inbound course must be selected with the HSI Course Arrow when using B/C.

5 ALTITUDE HOLD MODE (ALT)

ALT can be selected during all modes of operation except after glideslope capture in APPR. Deviations from the reference altitude will be displayed on the ADI as pitch commands.

The autopilot maintains the reference altitude by changing the pitch attitude of the airplane. The pilot must adjust the power setting to maintain the desired airspeed.

6 INDICATED AIRSPEED MODE (IAS)

IAS may be selected during all modes of operation except after glideslope capture in APPR. Deviations from the reference airspeed will be displayed on the ADI as pitch commands.

7 VERTICAL SPEED MODE (VS)

VS may be selected during all modes of operation except after glideslope capture in APPR. VS provides pitch commands to maintain the vertical speed existing at the time of mode selection. The vertical speed must be stable for 10 seconds prior to selecting VS mode.

The autopilot maintains the selected vertical speed by changing the pitch attitude of the airplane. The pilot must adjust the power setting to maintain the desired airspeed.

8 DESCENT MODE (DSC)

Prior to selecting DSC, the desired lower attitude must be selected on the Altitude Preselector. When DSC is selected, the autopilot will begin a gradual descent, stabilizing at an average rate of descent of 600 feet per minute. The pilot may vary

the rate of descent in 200 feet per minute increments by operation of the vertical trim switch.

9 CLIMB MODE (CLIMB)

Prior to selecting CLIMB, the desired higher attitude must be selected on the Altitude Preselector. When CLIMB is selected, the autopilot will begin a gradual climb, stabilizing at a speed of approximately 110 KIAS. When the attitude is captured, the system engages ALT and CLIMB is cancelled.

If CLIMB is selected at a speed below the climb profile speed, the FCS-65 will command a minimum rate of climb of 200 feet per minute. The pilot must adjust the power setting appropriately to maintain the desired airspeed.

10 ALTITUDE PRESELECT MODE (ALT SEL)

Prior to selecting ALT SEL, the desired altitude must be selected on the Altitude Preselector. When ALT SEL is selected, altitude preselect mode is armed to capture the selected attitude. Any vertical mode, except ALT, may be selected in conjunction with ALT SEL to establish a climb or descent to the selected altitude. The IAS mode should be used for climb. As the airplane reaches the selected attitude the white SEL annunciator goes out, the system engages ALT, and the green ALT annunciator illuminates.

11 SYNC MODE

The SYNC mode is activated by the CWS button on either control wheel. While the CWS button is held in, the autopilot control is interrupted and the airplane attitude or heading may be changed manually. The autopilot will remain in synchronization, and when the button is released, the autopilot will cause the airplane to maintain the attitude at release.

If a lateral mode is selected, the system will return to the lateral mode upon release of the CWS button.

If a vertical mode is selected, release of the CWS button will return the autopilot to the vertical mode selected, as modified to existing vertical conditions at button release. The GS sub-mode will be unaffected.

12 GO-AROUND MODE

The Go-Around mode is activated by pressing the G/A button on the outboard side of either control wheel. If the G/A button is pushed while in any lateral mode, the autopilot will disengage and a 7° pitch up, wings level attitude will be commanded on the ADI. The green G/A annunciator will illuminate and remain on until a lateral mode is selected. Operation of the CWS button will cancel the Go-Around mode and

synchronize the vertical command to the existing airplane attitude. Re-engagement of the autopilot while in Go-Around cancels the Go-Around mode and synchronizes the autopilot commands to the existing airplane pitch and bank angle at the time of engagement. A lateral mode selection will disconnect the Go-Around mode and synchronize the vertical commands to airplane pitch angle existing at the time of mode selection.

13 HALF BANK (1/2 Φ)

When selecting 1/2 Φ the bank limit in HDG or NAV is reduced to approximately .5 the normal value. Capture of NAV or APPR clears the 1/2 Φ.

14 SOFT RIDE (SR)

SR is used to reduce the autopilot response to turbulence. The pilot may use SR at his or her discretion. SR is cancelled by APPR and by disengaging the autopilot.

9-35.5 Performance Data

Performance data for the airplane is not affected by the installation or operation of the FCS-65 autopilot.

This Page Intentionally Left Blank

SECTION 9 – SUPPLEMENT 36

TRANSPORT CATEGORY OPERATIONS IN AUSTRALIA

This Page Intentionally Left Blank

PSM 1-63-1A

SECTION 9 (T.C. Approved)

SUPPLEMENT 36

TRANSPORT CATEGORY OPERATIONS IN AUSTRALIA

Approved: _____
for Chief, Flight Test
Transport Canada

Date: 19 Jan 2011

Issue 2

LIST OF EFFECTIVE PAGES

SECTION	PAGE	DATE	SECTION	PAGE	DATE
9-36	1	19 Jan. 2011		10	19 Jan. 2011
	2	19 Jan. 2011		11	19 Jan. 2011
	3	19 Jan. 2011		12	19 Jan. 2011
	4	19 Jan. 2011		13	19 Jan. 2011
	5	19 Jan. 2011		14	19 Jan. 2011
	6	19 Jan. 2011		15	19 Jan. 2011
	7	19 Jan. 2011		16	19 Jan. 2011
	8	19 Jan. 2011		17	19 Jan. 2011
	9	19 Jan. 2011		18	19 Jan. 2011

This Page Intentionally Left Blank

TABLE OF CONTENTS **PAGE**

9-36.1 Introduction **7**

9-36.2 Take-Off – Transport Category **8**

9-36.3 Take-Off – Operation in Transport Category **9**

9-36.4 Landing – Transport Category **15**

9-36.5 Landing – Operation in Transport Category **16**

List of Figures Page

9-36-1 Take-off Weight 11
9-36-2 Climb Requirement 14
9-36-3 Landing Weight 17

This Page Intentionally Left Blank

9-36.1 Introduction

Data for operation in the Transport Category is provided in this Supplement, this consists of take-off and landing performance data. Information given in Sections 2, 3, 4, 5 and the relevant supplements in Section 9, of this manual applies equally to aircraft operated in the Transport Category.

NOTE

Power settings must be achieved by use of power setting charts or hand computer (Part Number C6GT1004).

9-36.1.1 Each chart is applicable to only the following category of operation and must be used when operating in that category.

Category in Which Aircraft is Certified	Area of Operation	Applicable Civil Aviation orders
Transport	Australian Mainland	CAO 101.4

9-36.2 Take-Off – Transport Category

9-36.2.1 The information in this section is provided in order that the level of safety implicit in the scheduled take-off performance can consistently be achieved under all normal conditions.

9-36.2.2 The gross weight of the aeroplane for take-off shall not exceed the lesser of:

1 The maximum take-off weight specified in Section 2 of this manual.

2 The gross weight for take-off determined from the appropriate take-off weight chart of this part.

9-36.2.3 The take-off weight charts are based on factored take-off distances from rest to a height of 50 feet with both engines operating at take-off power. Where necessary, weight limitations are imposed to ensure the initial take-off climb gradient meets the appropriate requirement.

9-36.2.4 The technique used in establishing the take-off distance is that the aeroplane is rotated in such a manner that it leaves the ground at the scheduled liftoff speed, and accelerates smoothly to the take-off safety speed in order that this speed is achieved and maintained at or before the 50 foot height point. The take-off speeds to be used are presented graphically on each chart.

9-36.2.5 The surface corrections on the charts are based on standard factors related to strips with firm surfaces. Soft ground and unusually long grass will increase the take-off distance over that scheduled and the pilot should therefore ensure that adequate strip length is available to cover these conditions.

9-36.2.6 The scheduled distances are based on flight tests conducted on a sealed surface and on short dry grass.

9-36.3 Take-Off – Operation in Transport Category

9-36.3.1 MAINLAND OPERATION. The technique used in establishing the take-off distance is that the aeroplane is rotated in such a manner that it leaves the ground at the scheduled liftoff speed, and accelerates smoothly to the take-off safety speed in order that this speed is achieved and maintained at or below the 50 foot height point. The take-off speeds to be used are presented graphically on each chart.

9-36.3.1.1 The surface corrections on the charts are based on standard factors related to strips with firm surfaces. Soft ground and unusually long grass will increase the take-off distance over that scheduled and the pilot should therefore ensure that adequate strip length is available to cover these conditions.

9-36.3.1.2 The scheduled distances are based on flight tests conducted on a sealed surface and on short dry grass.

9-36.3.1.3 In determining the take-off weight which must not be exceeded for a particular set of conditions, the physical characteristics of the runway are to be obtained from the Aeronautical Information Publication (A.I.P.) Section AGA–1. The effective operational length (EOL) given there has an associated obstruction clear gradient, which is to be not less than 1.9%. The aircraft must be able to climb at that gradient after take-off, with one engine inoperative and hence the take-off weight must be based on two criteria: one is the EOL or take-off distance available, and the other is the single-engine climb performance. For the take-off distance available case, the take-off weight is based on the both-engines distance from a standing start to a 50 foot height, factored by 1.5. The take-off weight based on the EOL is determined from Figure 9-36-1. The take-off weight based on the climb requirement is obtained from Figure 9-36-2.

Associated conditions:

Wing flap	Take-off 10°
Intake deflectors	Retracted
Engines	Both at take-off power. Prop RPM 96%. Use Figure 4–6 or hand computer (Part Number C6GT1004)
Speeds at liftoff and at 50 feet	See chart inset

NOTE

If taking off with the intake deflectors extended and the engine torque is less than 50 PSI, in Figure 9-36-1 reduce the take-off distance available by 2.5% to determine (B), and in Figure 9-36-2 use an obstruction clear gradient 0.2% steeper than that required.

The wind correction grids are factored so that 50% of headwinds and 150% of tailwinds are obtained. Reported winds may therefore be used directly in the grids.

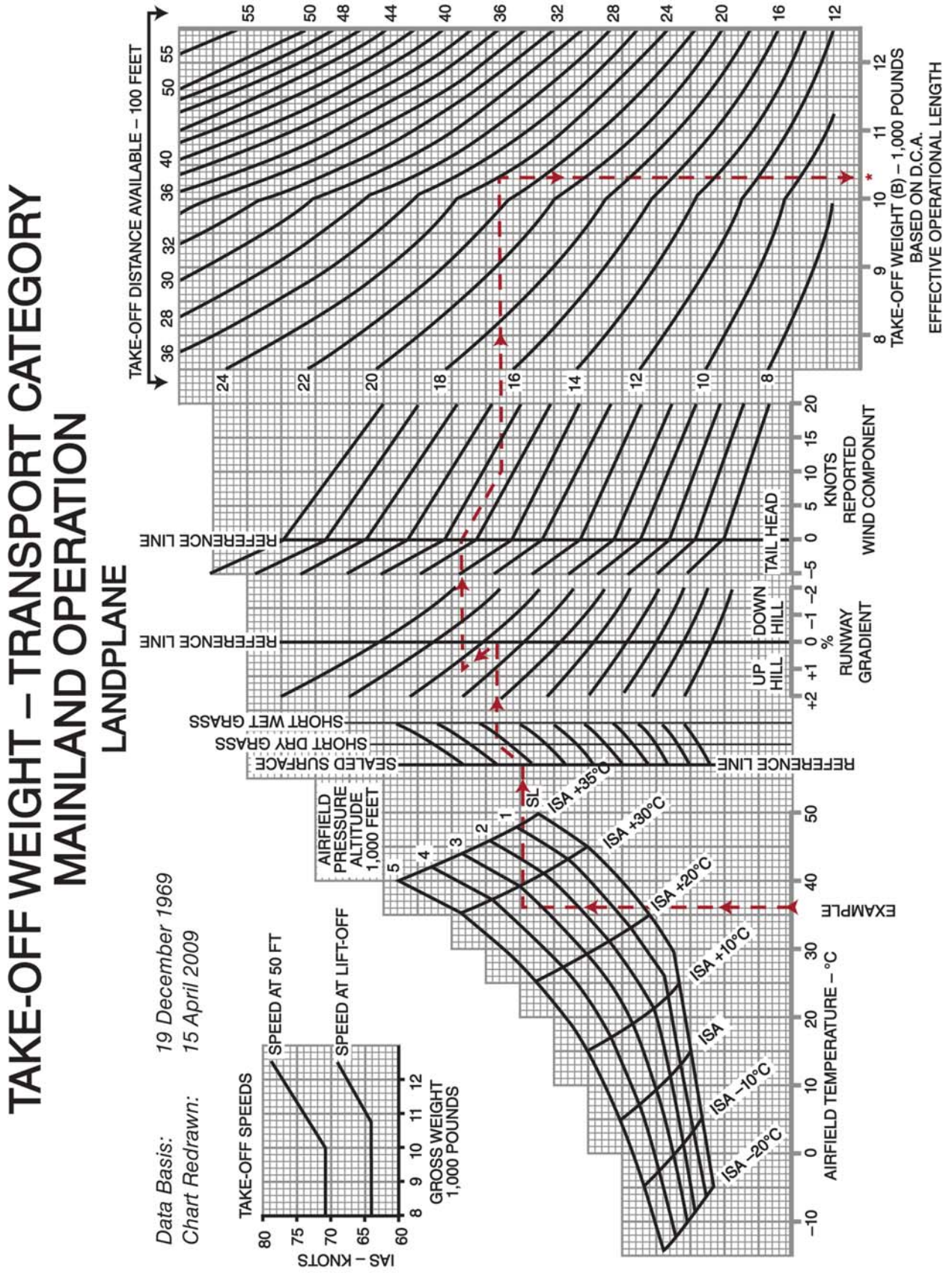


Figure 9-36-1 Take-off Weight

FIGURE 9-36-1 AND FIGURE 9-36-2

Airfield pressure altitutde	3,500 feet
Airfield temperature	36°C (ISA + 28°C)
Surface	Short dry grass
Runway gradeint	1.0% uphill
Reported wind component	10 knots headwind
Take-off distance available (EOL)	2,400 feet
Associated obstruction clear gradient	1.9%

Find:

Take-off weight

Procedure:

1 Enter Figure 9-36-1 at 36°C on the horizontal scale at far left of the chart and move vertically to the 3,500 foot position between the pressure altitude lines. Move horizontally right to meet the surface REF LINE and then parallel to the guide lines to intersect the short dry grass surface line. From this point move horizontally right to the runway gradient REF LINE, then parallel to the guide lines to intersect the 1.0% uphill line. From this point move horizontally right to the wind REF LINE, then parallel to the guide lines to intersect the 10 knot headwind line. Move horizontally right to intersect the line of 2,400 foot take-off distance available. Move vertically down to read on the horizontal scale:

2 Take-off weight (B) not to be exceeded = 10,300 pounds (Based on EOL).

3 From Figure 9-36-2 (illustrated by the broken, arrowed lines):

4 Take-off weight (A) not to be exceeded = 12,300 pounds (Based on climb).

5 Take-off weight must not exceed the lesser of (A) and (B), i.e., 10,300 pounds not to be exceeded.

6 For this example, at 10,300 pounds, the speed at 50 feet is 72 KIAS. The take-off power torque pressure setting at Index 1 (intake deflectors retracted, heater OFF) and 96% prop RPM is found to be 41.6 PSI static and 42.8 PSI at 72 KIAS. If taking off with the intake deflectors extended (heater is to be OFF hence Index 2) the take-off power torque pressure setting is found to be 40.6 PSI static and 41.8 PSI at 72 KIAS.

7 Hence re-establish the take-off weight (B) by reducing the take-off distance available by 2.5%; i.e. 2,400 – (2.5/100 x 2,400) = 2,340 feet, and (B) is now not to exceed 10,200 pounds. Re-establish (A) by using an obstruction clear gradient of (1.9 + 0.2)% = 2.1k%; (A) is not to exceed 12,200 pounds.

8 Hence with the intake deflectors extended, the weight not to be exceeded is 10,200 pounds.

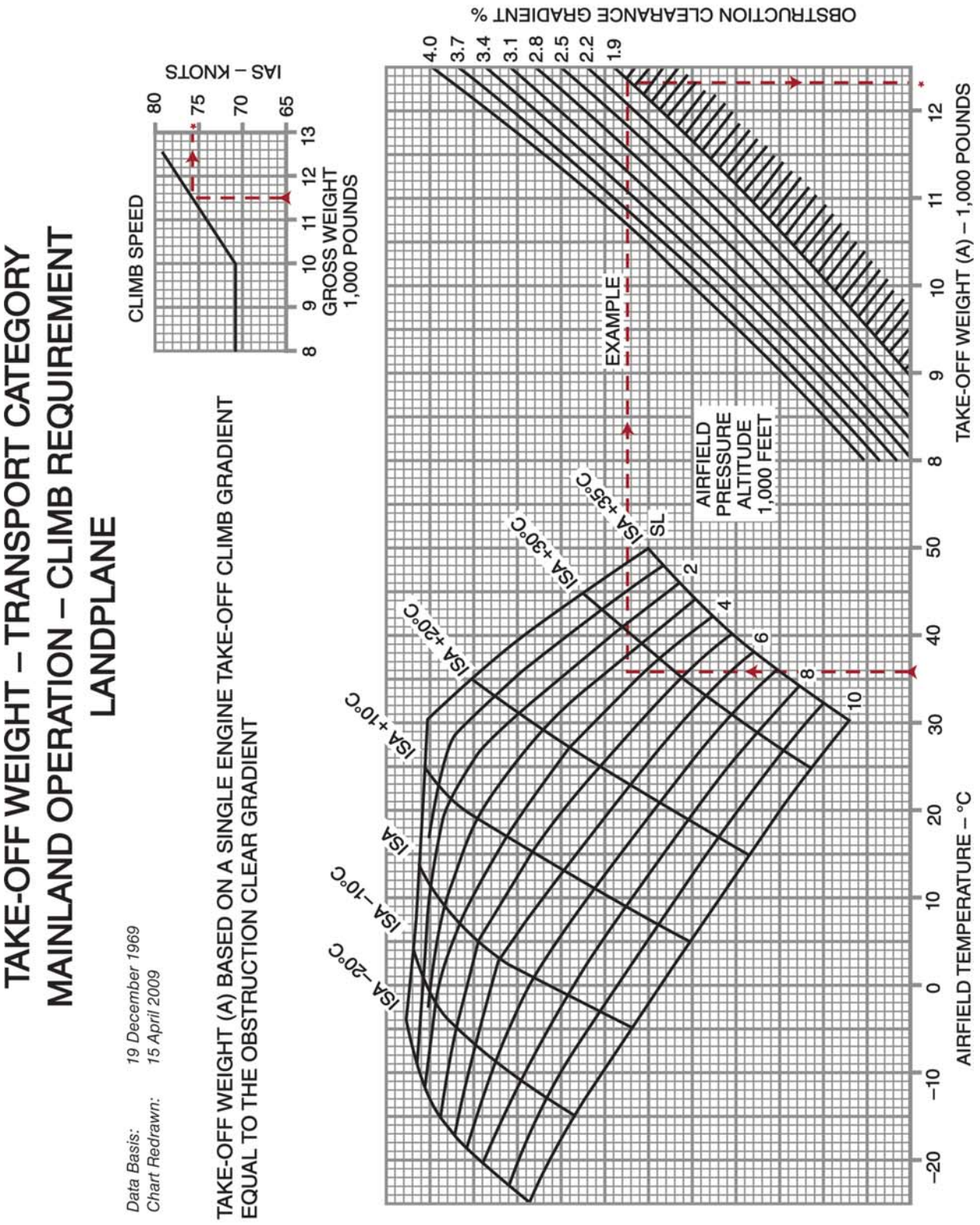


Figure 9-36-2 Climb Requirement

9-36.4 Landing – Transport Category

9-36.4.1 The information in this section is provided in order that the level of safety implicit in the scheduled landing performance can consistently be achieved under all normal conditions.

9-36.4.2 The gross weight of the aeroplane for landing shall not exceed the lesser of:

1 The maximum landing weight specified in Section 2 of this manual.

2 The gross weight for landing determined from the appropriate landing weight chart of this part.

9-36.4.3 The landing weight charts are based on factored landing distances from a height of 50 feet to stop. The charts are applicable to both dry sealed surfaces and short dry grass surfaces.

9-36.4.4 The technique used in establishing the landing distance is such that the aeroplane approaches through the 50 foot height over the runway threshold, at the given approach speed, with the engines at idle power. The aeroplane is flared to touch down smoothly on the main wheels. After touchdown, the aeroplane is brought to a stop, using at least the means of retardation noted for the appropriate chart. “Brakes” implies maximum wheel braking. The approach speed to be used is presented graphically on each chart.

9-36.5 Landing – Operation in Transport Category

9-36.5.1 LANDING – MAINLAND OPERATION – The landing weight charts are based on factored landing distances from a height of 50 foot to stop. The charts are applicable to both dry sealed surfaces and short dry grass surfaces.

9-36.5.2 The technique used in establishing the landing distance is such that the aeroplane approaches through the 50 foot height over the runway threshold, at the given approach speed, with the engine at idle power. The aeroplane is flared to touch down smoothly on the main wheels. After touchdown, the aeroplane is brought to a stop, using at least the means of retardation noted. “Brakes” implies maximum wheel braking. The approach speed to be used is presented graphically on the chart.

9-36.5.3 The scheduled landing distances are based on flight tests conducted on a dry sealed surface and short dry grass.

9-36.5.4 The landing weight is based on the landing distance from a 50 foot height to stop, factored by 1.43.

Associated conditions:

Wing flap	Landing (37.5°)
Engines	Idle power on approach
Approach speed	See chart inset
Retardation	Brakes only

NOTE

1 The wind correction grids are factored so that 50% of headwinds and 150% of tailwinds are obtained. Reported winds may therefore be used directly in the grids.

2 There is no climb requirement weight limitation associated with this chart.

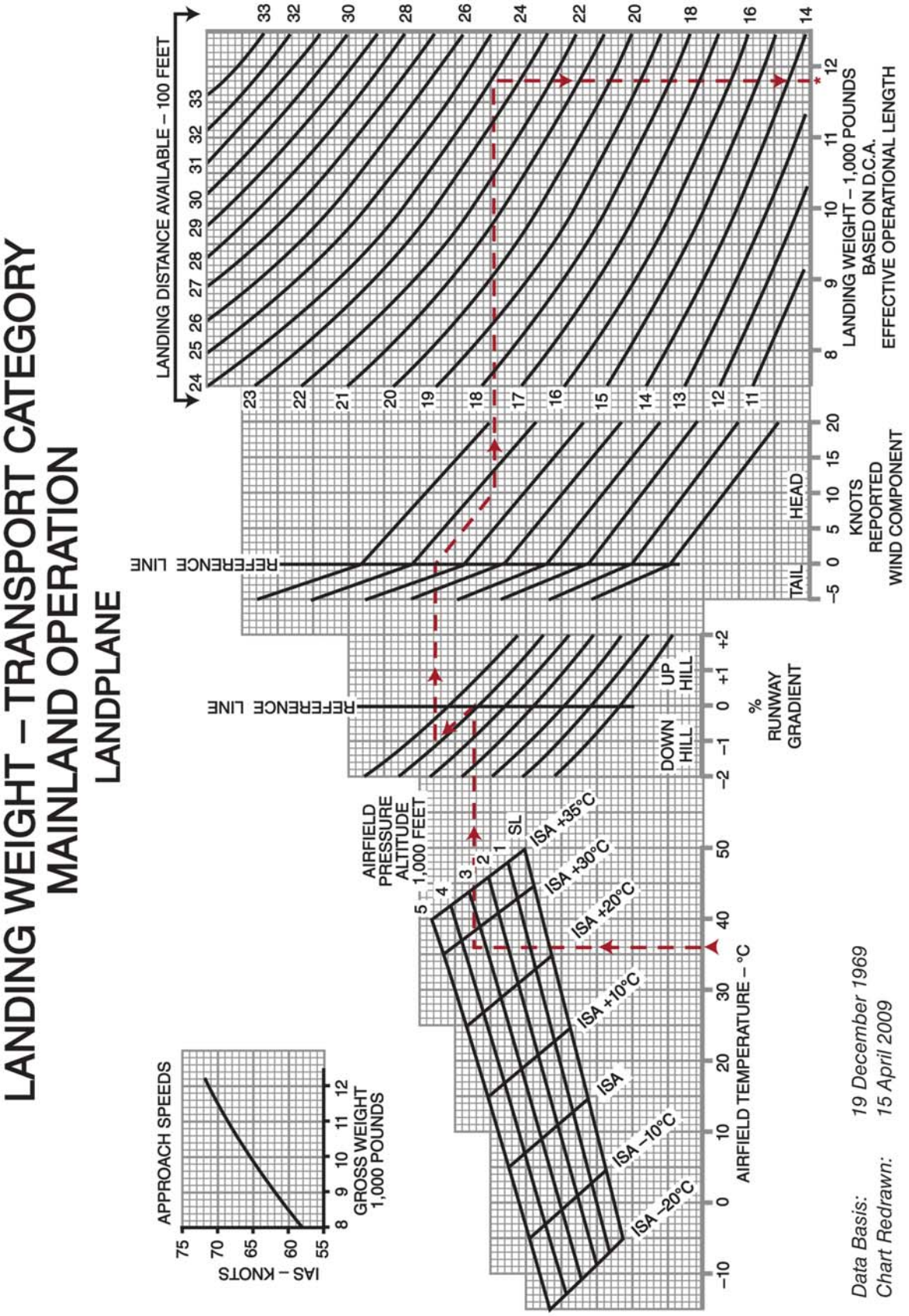


Figure 9-36-3 Landing Weight

Figure 9-36-3 EXAMPLE:

Given:

Airfield pressure altitude	3,500 feet
Airfield temperature	36°C (ISA + 28°C)
Runway gradient	1.0% downhill
Reported wind component	10 knots headwind
Take-off distance available (EOL)	2,400 feet

Find:

Take-off weight

Procedure:

1 Enter Figure 9-36-3 at 36°C on the horizontal scale at far left of the chart and move vertically to the 3,500 foot position between the pressure altitude lines. Move horizontally right to meet the runway gradient REF LINE, and then parallel to the guide lines to intersect to 1.0% downhill line. From this point move horizontally right to meet the wind REF LINE, and then parallel to the guide lines to intersect the 10 knot headwind line. Move horizontally right to intersect the line of 2,400 foot landing distance available. Move vertically down to read on the horizontal scale:

2 Landing weight not to be exceeded = 11,800 pounds.

SECTION 10

SAFETY AND OPERATIONAL TIPS

LIST OF EFFECTIVE PAGES

SECTION	PAGE	DATE	SECTION	PAGE	DATE
10	1	10 Sep. 2010		31	10 Sep. 2010
	2	10 Sep. 2010		32	10 Sep. 2010
	3	10 Sep. 2010		33	10 Sep. 2010
	4	10 Sep. 2010		34	10 Sep. 2010
	5	10 Sep. 2010		35	10 Sep. 2010
	6	10 Sep. 2010		36	10 Sep. 2010
	7	10 Sep. 2010		37	10 Sep. 2010
	8	10 Sep. 2010		38	10 Sep. 2010
	9	10 Sep. 2010		39	10 Sep. 2010
	10	10 Sep. 2010		40	10 Sep. 2010
	11	10 Sep. 2010		41	10 Sep. 2010
	12	10 Sep. 2010		42	10 Sep. 2010
	13	10 Sep. 2010		43	10 Sep. 2010
	14	10 Sep. 2010		44	10 Sep. 2010
	15	10 Sep. 2010		45	10 Sep. 2010
	16	10 Sep. 2010		46	10 Sep. 2010
	17	10 Sep. 2010		47	10 Sep. 2010
	18	10 Sep. 2010		48	10 Sep. 2010
	19	10 Sep. 2010		49	10 Sep. 2010
	20	10 Sep. 2010		50	10 Sep. 2010
	21	10 Sep. 2010		51	10 Sep. 2010
	22	10 Sep. 2010		52	10 Sep. 2010
	23	10 Sep. 2010		53	10 Sep. 2010
	24	10 Sep. 2010		54	10 Sep. 2010
	25	10 Sep. 2010		55	10 Sep. 2010
	26	10 Sep. 2010		56	10 Sep. 2010
	27	10 Sep. 2010		57	10 Sep. 2010
	28	10 Sep. 2010		58	10 Sep. 2010
	29	10 Sep. 2010		59	10 Sep. 2010
	30	10 Sep. 2010		60	10 Sep. 2010

SECTION	PAGE	DATE	SECTION	PAGE	DATE
	61	10 Sep. 2010		72	10 Sep. 2010
	62	10 Sep. 2010		73	10 Sep. 2010
	63	10 Sep. 2010		74	10 Sep. 2010
	64	10 Sep. 2010		75	10 Sep. 2010
	65	10 Sep. 2010		76	10 Sep. 2010
	66	10 Sep. 2010		77	10 Sep. 2010
	67	10 Sep. 2010		78	10 Sep. 2010
	68	10 Sep. 2010		79	10 Sep. 2010
	69	10 Sep. 2010		80	10 Sep. 2010
	70	10 Sep. 2010		81	10 Sep. 2010
	71	10 Sep. 2010		82	10 Sep. 2010

TABLE OF CONTENTS **PAGE**

10.1 General Information 9
10.1.1 Events Requiring Unscheduled Maintenance Inspection 9
10.1.2 Headset Use 9
10.1.3 Touch and Go Flights 9
10.1.4 In-Flight Selection of Reverse Thrust Prohibited 10
10.1.5 30° Flap Floatplane Take-Off Prohibited 10
10.1.6 Generator Operations 11
10.1.7 Resetting Circuit Breakers 11

10.2 Cold Weather Operations, Flight in Known Icing (FIKI) 12
10.2.1 Effect of Cold on Aircraft and Equipment 12
10.2.2 Pre-Flight Checks 13
10.2.3 Removal of Ice, Snow of Frost Prior to Take-Off 14
10.2.4 Inspection of Pitot and Static Sources 15
10.2.5 Use of De-Icing and Anti-Icing Fluids 16
10.2.5.1 De-Icing (Type I) Fluids 16
10.2.5.2 Anti-Icing (Type II, III and IV) Fluids 16
10.2.5.3 Fluid Application Guidelines 17
10.2.6 Engine Starting 17
10.2.7 Additional Ground Checks 18
10.2.8 Taxiing 18
10.2.9 Operation From Snow Covered Surfaces 18
10.2.10 Take-Off Procedures Following De-Icing or Anti-Icing 18
10.2.11 Equipment Required for Flight in Icing Conditions 19
10.2.12 Operation of De-Ice Equipment 20
10.2.12.1 Pitot Heat 20
10.2.12.2 Intake Deflectors 20
10.2.12.3 Windshield Heat 20
10.2.12.4 Valve Heat 21
10.2.12.5 Bleed Air Switches 21
10.2.12.6 Surface De-Ice Boots 21
10.2.12.7 Propeller Anti-Ice 22
10.2.12.8 Engine Ignition System 23
10.2.13 Precautions During Flight in Icing Conditions 23
10.2.14 Monitoring the Autopilot in Icing Conditions 23
10.2.15 Use of Flap During if Following Flight in Icing Conditions 24
10.2.16 Recognition and Recovery from Tailplane Stall 24

TABLE OF CONTENTS **PAGE**

10.2.17 Precautions During Approach and Landing in Icing Conditions 26
10.2.18 Training or Maintenance Flights in Icing Conditions 27
10.2.19 Contamination Arising from Anti-Icing Fluid Residue 27

10.3 Hot Weather and Desert Operation 31
10.3.1 Pre-Flight Checks 31
10.3.1.1 Engine Starting 31
10.3.1.2 Taxiing 32
10.3.1.3 Take-Off 32
10.3.1.4 Landing 33
10.3.1.5 After Landing 34
10.3.2 Turbulent Air and Thunderstorms 34

10.4 Ground Operations 35
10.4.1 Hydraulic Circuit Breaker 35
10.4.2 Flight Control Locks 35
10.4.3 Backing with Reverse Thrust 35
10.4.4 Contamination Arising from Operation on Unprepared Surfaces 36
10.4.5 Nose Wheel/Rudder Pedal Steering 36
10.4.6 Use of the Autofeather System 36

10.5 Take-Off 38
10.5.1 Directional Control During Take-Off 38
10.5.2 Noise Abatement 38
10.5.3 Minimum Fuel Requirements 39
10.5.4 Brake Energy Limitations 39
10.5.5 Headwinds and Tailwinds 39
10.5.6 Crosswind Take-Offs 39
10.5.7 Setting Take-Off Power 40
10.5.8 Reduced Power Take-Offs Prohibited 40
10.5.9 Initial Climb 41
10.5.10 Flap Retraction 41
10.5.11 Engine Failure During Take-Off 41
10.5.12 Flap Retraction – One Engine Inoperative 42

10.6 Flight Characteristics, Maneuvers 43
10.6.1 Climb 43
10.6.2 Single Engine Climb 43

TABLE OF CONTENTS **PAGE**

10.6.3 Slow Flying 43
10.6.4 Steep Turns 43
10.6.5 Spins 44
10.6.6 Stalls 44
10.6.6.1 Stall Recovery 44
10.6.7 Recovery from Inadvertent High Angles of Attack 45
10.6.8 Minimum Control Speed 45
10.6.9 Single Engine Operations 46
10.6.10 Windshear Recovery Procedures 46
10.6.10.1 Background 47
10.6.10.2 Windshear Avoidance 47
10.6.10.3 Windshear Precautions – Take-Off 47
10.6.10.4 Windshear Precautions – Approach 48
10.6.10.5 Windshear In-Flight Recovery Maneuver 48

10.7 Approach and Landing 52
10.7.1 Propeller Speed 52
10.7.2 Landing 52
10.7.3 Crosswind Landings 52
10.7.4 Use of Autopilot 54
10.7.5 Selection of Landing Flap 54
10.7.6 Single Engine Approaches 54
10.7.7 Reverse Thrust Operation 54
10.7.8 Brake Operation 55
10.7.9 Directional Control During Landing 55
10.7.10 Landing with Precision 55
10.7.11 Overweight Landings 55

10.8 Amplified Emergency and Abnormal Procedures 56
10.8.1 One Engine Inoperative Landing 56
10.8.2 One Engine Inoperative Missed Approach (Flaps 10°) 56
10.8.3 Precautionary Landing 57
10.8.4 Forced Landing 57
10.8.5 Landing with a Flat Tire 60
10.8.6 Flapless Landing 60
10.8.7 Ditching 61
10.8.8 Starting Abnormalities 63
10.8.9 Engine Shutdown in Flight 63

TABLE OF CONTENTS **PAGE**

10.8.10 Engine Flameout 65
10.8.11 Oil Pressure Abnormalities 65
10.8.12 Propeller Abnormalities 66
10.8.12.1 Beta Control Malfunctions 67
10.8.12.2 RESET PROPS Caution Lights 68
10.8.13 Electrical Abnormalities – DC Electrical 69
10.8.14 Electrical Abnormalities – Battery Overheat 70
10.8.15 Electrical Abnormalities – AC Electrical 71
10.8.16 Electrical Abnormalities – Gyro Instruments 73
10.8.17 Fuel System Abnormalities 73
10.8.18 Duct Overheat 76
10.8.19 Hydraulic System Abnormalities 76
10.8.20 Doors Unlocked Caution Light 77
10.8.21 Static System Miscompare, or Questionable Static Instrument Indications 79

10.9 Maximum Performance STOL Take-Off 80
10.9.1 Introduction 80
10.9.2 Purpose 80
10.9.3 Background 80
10.9.4 Decision 81
10.9.5 Conclusion 82

List of Tables Page

10-1 Windshear In-Flight Recovery Procedures (Two Pilot Operations) 50

List of Figures Page

10-1 Glide Speed for Maximum Range 58
10-2 Glide Speed for Maximum Endurance 59

10.1 General Information

Unless specified otherwise, the information provided in this section refers to an aircraft on standard landplane gear.

10.1.1 Events Requiring Unscheduled Maintenance Inspection

During ground or flight operations, events may occur which require a maintenance inspection after flight. Most operators have established a procedure/policy to ensure that pilots document these events so that proper maintenance can take place. Such an event is called a “Conditional Inspection”. These include, but are not limited to:

- hard landing
- any wheel or gear component striking an object while maneuvering
- nose wheel or main wheel becoming stuck in a soft surface, subsequently greater than normal taxi power having been applied to free the wheel
- severe turbulence
- flap (V_{FE}) or (V_{MO}) overspeed
- high-energy stop such as a rejected take-off
- lightning strike
- operation in extreme dust such as a sandstorm or volcanic ash
- tail strike
- overweight landing

Additional events may also require maintenance inspection and should also be reported. An example of such an event is an overly aggressive pitch up during a TCAS event or a Terrain Avoidance maneuver that could cause structural damage. If in doubt, the best course of action is to report it.

10.1.2 Headset Use

A headset must be worn by all flight deck occupants (including passengers who may be carried in the right seat) at all times from block departure to block arrival.

10.1.3 Touch and Go Flights

Touch and go flights are strongly discouraged. During training or proficiency checks, stop and go landings may be conducted. To ensure that training and proficiency checks are carried out using procedures that match normal line operation procedures, both

the ‘after landing’ and ‘before take-off’ checklists should be completed whenever a stop and go landing is made.

Brake kinetic energy limitations normally will not restrict stop and go landings because the exposed brake assemblies will cool sufficiently during the time it takes to complete a circuit. If a practice rejected take-off is planned for a training or checking flight, consideration should be given to completing this maneuver last, after all flights have been made, particularly if the aerodrome being used is above 5,000 feet pressure altitude, if the runway has a downslope, or if there is any tailwind.

If there is any doubt about brake kinetic energy limitations following a rejected take-off from a speed greater than 40 KIAS, wait 30 minutes, or wait until the brake discs are cool enough to allow them to be touched without discomfort before making the next take-off.

10.1.4 In-Flight Selection of Reverse Thrust Prohibited

Fatal accidents have been caused by the in-flight selection of reverse thrust, which would require the pilot to first over-ride the flight idle stop by twisting the power lever handles to permit access to the reverse thrust range.

⚠ WARNING

PILOTS ARE ADVISED THAT THE TWIN OTTER AIRCRAFT FLIGHT MANUAL PERMITS THE USE OF REVERSE POWER ONLY WHEN WATER-BORNE OR GROUND-BORNE, AND DOES NOT DESCRIBE ANY PROCEDURE WHICH PERMITS THE SELECTION OF REVERSE WHILE AIRBORNE. THE IN-FLIGHT SELECTION OF REVERSE THRUST CAN CAUSE SERIOUS CHANGES IN AIRCRAFT HANDLING CHARACTERISTICS WITH POSSIBLE LOSS OF CONTROL, TOGETHER WITH SIGNIFICANT CHANGES IN STALLING SPEEDS AND ENGINE BEHAVIOUR.

It is strictly prohibited to twist the power lever grips and move the power levers aft of the IDLE position unless the aircraft is on the ground or water surface.

10.1.5 30° Flap Floatplane Take-Off Prohibited

The only approved flap setting for take-off on DHC-6 aircraft operated on floats is 20°, and all performance information provided in the AFM supplement for floatplane operation is predicated on using flaps 20° for take-off.

Use of 30° flap may degrade aircraft performance in the event of an engine power loss immediately following liftoff and may adversely affect aircraft handling characteristics

during certain center of gravity and all-up-weight conditions. The use of 30° flap for take-off on DHC-6 float aircraft is prohibited.

10.1.6 Generator Operations

The requirement to always increase N_G to idle +15% prior to bringing a generator online has been deleted at AFM revision 53. This requirement was originally published for Series 100 aircraft equipped with PT6A-20 engines, and was carried over without change to Series 300 aircraft equipped with PT6A-27 engines. The purpose of the requirement was to ensure that T_5 temperatures in the engine did not rise above the unmarked idle limit when the additional mechanical load arising from bringing the generator online was imposed on the engine accessory drive train.

Operational experience has proven that it is not necessary to increase N_G beyond the normal idle speed of approximately 52% if it is anticipated that the generator load(s) will be less than 0.5 (less than 100 amperes per generator) when the generators are brought online, and if it can be reasonably foreseen that T_5 temperatures will not rise appreciably when one or both generators are brought online.

If there is any reason to expect that generator loads will be greater than 0.5 (greater than 100 amperes per generator) when the generators are brought online – for example, following use of the battery to start the two engines – or if any concerns exist about the ability to maintain acceptable T_5 temperatures at idle speed when one or both generators are brought online – then N_G should be increased to idle +15% prior to bringing one or both generators online. Doing so will increase airflow through the engine hot section and ensure that T_5 temperatures remain below the unmarked idle limit of 660°C.

10.1.7 Resetting Circuit Breakers

Pilots may create a potentially hazardous situation if they reset a CB without knowing what caused it to trip. A tripped CB should not be reset in flight unless doing so is consistent with explicit procedures set out in AFM Section 3 or unless, in the judgment of the Captain, resetting a CB is necessary for the safe completion of the flight. In principle, a tripped CB should not be reset before any associated fault is located and eliminated. This may require maintenance attention.

Under no circumstances should power distribution circuit breakers be reset by a pilot.

10.2 Cold Weather Operations, Flight in Known Icing (FIKI)

The operation and maintenance of the aircraft in low temperature conditions presents a number of challenges; these, together with recommended precautions and remedies are presented in this section.

10.2.1 Effect of Cold on Aircraft and Equipment

Ice, snow, and frost must be removed from the aircraft prior to take-off, especially from control surfaces and wing and tail leading edges. This is particularly important if a thaw is forecast so that the formation of ice and frozen slush in subsequent freezing temperatures is prevented. Ice can be readily removed from the aircraft exterior with de-icing fluid, but at temperatures below –15°C (4°F) the use of hot air may be required. When hot air is used, only enough should be applied to loosen the ice; a stiff brush should then be used to remove the ice. If the ice were melted completely with the hot air, the resultant water could enter control surface hinges or control mechanisms and subsequently freeze again. If wing and horizontal stabilizer covers are available they should be fitted to the aircraft while it is parked outside.

During very cold weather a close check should be kept on the water content of fuel in the tanks. Water separates from fuel more readily in low temperatures and descends to the lowest point of its container, where it may freeze. This could result in restricted flow or loss of fuel flow to the engines. It is important to check the fuel at the strainers and tank drains for the presence of ice or water whenever the aircraft has been exposed to low temperatures.

Engine starting during cold weather will be facilitated by the application of hot air to each engine intake for a ten minute period. The normal operations section of the AFM contains a special procedure that may be followed when starting engines in extreme cold conditions.

Plastics are prone to cracking if subjected to sudden changes in temperature, for example, when moving an aircraft from a warm hangar outside to a cold atmosphere. Cracks usually originate at the edges of mounting frames or at small radii on curved panels. Careful checks should be made under such conditions, as cracks in the windshield could result in its complete failure in flight. The electrically heated windshield (when installed) can be operated on the ground provided an external power source is connected, or electrical power is being generated by the engines. It is not recommended to operate windshield heat from aircraft battery power as this will rapidly deplete the battery.

Tires on an aircraft parked in the open during cold weather develop flat spots where the tires contact the ground. This “set” in the tires is temporary and disappears quickly when the aircraft is taxied.

A temperature inversion can occur while climbing, which may cause sudden and complete frosting of the windshield if the windshield has not been pre-heated. If electric windshield heat is not installed, instrument flying will be necessary until the windshield clears. For this reason, it is recommended that windshield heat be turned on prior to taxi if it will be needed during flight.

Mechanical flight instruments may be initially sluggish and unreliable; this is caused by additional bearing friction due to congealed lubricants. Above 60° to 65° N and S latitude a magnetic compass is usually unreliable; a gyroscopic instrument should be used for steering.

If a de-icing system is not installed, or has become inoperative during the flight, and icing conditions have been encountered, the landing must be carried out using a flap setting no greater than 10°.

Leave the parking brake off if moisture is present. Brakes may freeze if the parking brake is applied when the brakes are hot and moisture is present. Refuel as soon as possible after landing to minimize condensation in fuel tanks. Finally, install all available covers before leaving the aircraft outside.

10.2.2 Pre-Flight Checks

WARNING

WHEN CONTINUALLY OPERATING IN SUB ZERO TEMPERATURES, CARE MUST BE TAKEN NOT TO INTRODUCE SUBSTANTIAL QUANTITIES OF SNOW INTO THE PASSENGER CABIN DURING CARGO LOADING OR THROUGH OPEN DOORWAYS. SHOULD CABIN HEAT BE USED, THE SNOW MAY MELT AND REFREEZE BENEATH THE CABIN FLOOR. THIS MAY RESULT IN ICE FORMATION AND BUILD-UP WHICH MAY AFFECT FLIGHT CONTROL CABLES THAT RUN UNDERNEATH THE CABIN FLOOR.

Determine and verify the existence or risk of icing conditions along the proposed route. Obviously, flight into known or forecast icing conditions is prohibited unless the aircraft is fitted with all required de-icing equipment, and all of that equipment is functional. Be aware that ice may form in conditions of visible moisture at temperatures below + 5°C.

Additional pre-flight checks to be carried out in cold weather if the aircraft has been parked outside, before starting the engines, are as follows:

1 Check that all ice, snow, or frost has been removed from wings, tailplane, and all control surfaces.

2 Ensure that prior to flight any snow or standing water is removed from the airplane cabin.

3 Inspect all control surface hinges for removal of ice or packed snow likely to cause jamming.

4 Check for water and ice in fuel at fuel strainers and tank drains.

5 Check all de-icing boots (if installed) for damage.

6 Check that the windshield and windows are defrosted. De-icing fluid should be used for defrosting as scraping scratches the surfaces of plastic panels.

7 Test all main and auxiliary controls to ensure their freedom of operation.

10.2.3 Removal of Ice, Snow of Frost Prior to Take-Off

A very small amount of roughness, in thickness as low as 1/64 inch (half a millimetre), caused by ice, snow, or frost, disrupts the air flow over the lift and control surfaces of an aircraft. The consequence of this roughness is severe lift loss, increased drag and impaired maneuverability, particularly during the take-off and initial climb phases of flight. Ice can also interfere with the movement of control surfaces or add significantly to aircraft weight. There is no such thing as an insignificant amount of ice.

Wind tunnel and flight tests indicate that ice, frost, or snow formations on the leading edge and upper surface of a wing, having a thickness and surface roughness similar to medium or coarse sandpaper, can reduce wing lift by as much as 30% and increase drag by 40%. This may negate take-off stall margins altogether on commuter type aircraft. The only method currently known of positively ascertaining that an aircraft is clean prior to take-off is by close inspection.

Ice and frost formation is not limited to northern latitudes. Frost often forms on the horizontal surfaces of DHC-6 aircraft parked overnight in Africa when night-time temperatures fall to +5°C (41°F) or less and skies are clear.

Ice can form even when the outside air temperature (OAT) is well above freezing. A DHC-6 aircraft equipped with extended range wing fuel tanks may have fuel in these tanks that is at a sufficiently low temperature that it lowers the wing skin temperature to below the freezing point. This phenomenon is known as cold-soaking. This situation can also occur when a Twin Otter fitted with extended range wing tanks has been cruising at high altitude for a period of time and this is followed by a quick descent to a landing in a humid environment. Any form of moisture that comes in contact with a wing that is at a temperature below freezing will then freeze to the wing surfaces.

Cold-soaking can also be caused by fuelling Twin Otter extended range wing tanks with cold fuel. If there is rain or high humidity present, ice can form on the cold-soaked portions of the wing and accumulate over time. This ice can be invisible to the eye and is often referred to as clear ice. This ice can be detected by performing a tactile inspection or by using specially designed ice detecting systems such as a Ground Ice Detection System (GIDS).

It is essential that all lift and control surfaces of the aircraft be completely clear of ice, snow, or frost prior to take-off. At major airports, de-icing services may be available from a contractor, or the aircraft can be put in a heated hangar until such time that all ice, snow, or frost melts. At remote airports, manual methods of ice, snow, or frost removal such as use of a broom, brush, or rope may be used. Using these devices to remove contamination does not always mean that the lift or control surface is clean and safe for flight. Every time a manual method (as opposed to application of hot de-icing fluid, or parking the aircraft in a heated hangar) is used to remove contamination, a tactile inspection shall be done. If any contamination is found adhering to a lift or control surface, it must be removed prior to flight. All frost must be removed – even residual 'polished' frost is dangerous and must be removed.

If any doubt exists concerning the aerodynamic cleanliness of the aircraft, request de-icing or proceed to a de-icing facility. NEVER assume that snow will blow off, because there could be a layer of frost or ice under it. Do not underestimate the effect of even a thin layer of frost or ice on wing surfaces.

Under no circumstances should ice or snow that has frozen and adhered to the aircraft be 'chipped' off the aircraft. The allowable damage tolerances for dents in the aircraft skin – particularly for dents or scratches in the upper surface of the wings and horizontal stabilizer – is measured in thousandths of an inch. A few moments of carelessness attempting to chip ice off a wing surface can easily cause damage that may cost hundreds of thousands of dollars to repair. The cost of using heated Type I de-icing fluid to remove ice or snow, or parking the aircraft in a heated hangar for a few hours to remove ice or show is insignificant by comparison.

10.2.4 Inspection of Pitot and Static Sources

Fluctuating and inaccurate airspeed and altimeter indications after take-off have been attributed to static ports obstructed by ice formed while the airplane was on the ground. Precipitation or water rundown after snow removal may freeze on or near the static ports. This may cause an ice build-up which disturbs airflow over the static ports resulting in erroneous airspeed and altimeter readings, even when static ports appear to be clear. Since static ports are not heated when pitot heat is activated, a thorough pre-flight inspection and clearing of all contaminants around these static ports are critical.

Pay particular attention to the static ports during the exterior inspection when the airplane has been subjected to freezing precipitation. Clear ice on or around the static ports can be difficult to detect visually. A tactile inspection should be made.

10.2.5 Use of De-Icing and Anti-Icing Fluids

10.2.5.1 De-Icing (Type I) Fluids

De-icing fluids are thin liquids that are intended to remove ice, snow, or frost from an aircraft. They are not designed to adhere to the aircraft or to provide any residual protection against possible future contamination. Heated Type I fluids are normally used to de-ice an aircraft. Type I fluids are acceptable for use on the Twin Otter.

10.2.5.2 Anti-Icing (Type II, III and IV) Fluids

Anti-icing fluids are thicker liquids that are intended to adhere to the surface of the aircraft (in other words, to not run off) to provide ongoing protection against snow, ice, or frost forming or adhering to the aircraft after it has been de-iced. These fluids are known as pseudo-plastic fluids or non-Newtonian fluids, and are identified as Type II, III, or IV anti-ice fluids.

Type II and Type IV anti-icing fluids are designed to adhere to the surface of the aircraft until speeds just below the typical rotation speed of large jets, in other words, to adhere to the aircraft until speeds are well above 100 KIAS. If these fluids are used on a Twin Otter, they will continue to adhere to the lift and control surfaces after the Twin Otter has become airborne, and the anti-icing fluid itself will become a contaminant to the lift or control surface. For this reason, Type II and Type IV anti-icing fluids must not be applied to Twin Otter aircraft to provide residual anti-ice protection.

Type III anti-icing fluids are suitable for aircraft such as the Twin Otter that have take-off rotation speeds between 60 and 100 KIAS. Type III fluids begin to flow off the wing at approximately 30 KIAS and the wing is intended to be essentially clean at airspeeds of typically 60 KIAS. Type III fluids may be applied to DHC-6 aircraft in accordance with the instructions provided by the fluid manufacturer.

If anti-icing fluid is to be applied to a Twin Otter after it has been de-iced, considerable care must be taken to ensure that the formulation of the fluid is such that it is suitable for application to low speed aircraft. In practice, this means following a two-step process, using only Type I fluid for ice, snow, and frost removal, and only Type III fluid if residual anti-ice protection is required during the time between de-icing and take-off.

Some airports or de-ice service providers offer a one-step de-icing and anti-icing fluid application using heated and diluted Type II fluid. This one-step procedure using Type II fluid is not acceptable for Twin Otter aircraft.

10.2.5.3 Fluid Application Guidelines

No special or unique procedures need to be followed when applying de-ice or anti-ice fluids to DHC-6 aircraft. The following general guidelines, which are common to all aircraft, should be followed:

- Apply fluid from the front of the aircraft so that the fluid flows in the same direction as airflow when the aircraft is in flight. This will avoid fluid accumulation behind wing and horizontal stabilizer rear spars, and prevent fluid from entering the cabin and engine air vent outlets.
- Do not force ice and snow into openings around flight control surfaces during removal procedures.
- Do not apply fluid directly to aircraft windows.
- Do not spray fluid in engine air intakes or exhaust pipes, or to the cabin air intake.
- Do not apply fluid directly to pitot tubes or static ports.
- Do not spray fluid directly onto the lift detector (stall warning sensor).
- Do not direct a solid stream of fluid perpendicular to airplane surfaces. A high pressure stream of fluid can damage airplane surfaces.
- Both the right and left sides of the wing and the right and left sides of the horizontal stabilizer must receive equal and complete de-icing and/or anti-icing treatment.

If possible, shut down the engines prior to applying fluid to the aircraft. If this is not possible, ensure that the bleed air valves are closed prior to applying fluid to the aircraft.

10.2.6 Engine Starting

If time and appropriate equipment is available, the engines and engine accessories should be preheated. Cold starting will be facilitated if the battery or external power supply unit are stored in a warm place until just before they are required.

If the pilot wishes to prevent the hydraulic pump from cycling prior to engine start, the hydraulic hand pump may be used to pump up the hydraulic system to normal operating pressure. Do not, under any circumstances, pull the hydraulic system circuit breaker out prior to engine start. This practice is no longer permitted. A contemporary 40 amp hour battery has more than sufficient energy, even during very cold weather, to bring the hydraulic system pressure up to normal levels and then start an engine.

During cold weather conditions, particularly at low altitudes, an engine may fail to reach normal governing idle speed (approximately 51% N_G) and instead stabilize at minimum fuel flow (approximately 48% N_G) if the engine is started with the propeller lever in the FEATHER position. This is caused by a very small leak of governor servo pressure

(P_Y) within the N_F governor portion of the propeller governor, and this problem can be avoided by moving the PROP lever out of the FEATHER position prior to engine start.

10.2.7 Additional Ground Checks

After the engines have been started and the generators brought online, switch on the electric windshield heat (if installed). If ground temperatures are close to the freezing point or if it is likely that the de-ice systems will be needed during the flight, fully check and confirm the correct operation of all the installed de-ice and anti-ice systems.

10.2.8 Taxiing

During taxiing the following precautions should be observed:

1 Taxi slowly on slippery ground and use brakes and nose wheel steering with caution.

2 Do not stop the aircraft on slush; continue moving until dry snow is reached.

3 Beware of obstacles, such as airfield markers, that may be concealed by snow.

4 Switch on pitot heat and windshield heat to ensure that the pitot head is warm before taking off.

Visually confirm that the electronic flat-panel displays on any flight, navigation, or communication equipment so equipped are properly functioning prior to take-off. The majority of flat-panel displays used in civil aviation applications have a low temperature limitation of –20°C (–4°F), and may not illuminate satisfactorily at lower temperatures. It may therefore be necessary to wait on ground and warm up the instrument panel (using the aircraft heating system) prior to take-off.

10.2.9 Operation From Snow Covered Surfaces

Because acceleration is poor from unpacked snow, it may be necessary to taxi back and forth on the intended take-off path a few times to compress the surface sufficiently to facilitate take-off.

When landing on unbroken snow, height should be judged by reference to trees, fences, or other ground objects.

10.2.10 Take-Off Procedures Following De-Icing or Anti-Icing

Whenever **ANY** de-icing or anti-icing fluid is present on the aircraft, follow these guidelines during take-off:

1 Accelerate to 75 KIAS prior to rotation.

2 Rotate gently at a normal rate of rotation – avoid a rapid rotation.

3 If conditions permit, conduct the initial climb to 400 feet AGL (or greater) at 90 KIAS, instead of the normal initial climb speed of 80 KIAS.

Procedures for the cruise, descent, approach and landing phases of flight are not affected by application of de-ice or anti-ice fluids.

10.2.11 Equipment Required for Flight in Icing Conditions

Operation in known or forecast icing conditions is strictly prohibited unless the aircraft is equipped with all of the following modifications and options:

Mod 6/1043 – Engine lower cowl redesign (standard equipment on all Series 300 aircraft)

Mod 6/1066 – Wing flap hinge arm fairing (standard equipment on all Series 300 aircraft)

Mod 6/1089 – Horizontal stabilizer leading edge reinforcement (only provided on aircraft ordered with surface de-icing equipment)

Mod 6/1393 – Horizontal Stabilizer de-ice boot function indicator lights (standard equipment on aircraft equipped with S.O.O. 6004 from SN 290 onwards, mandatory retrofit by SB 6/275)

Mod 6/1815 – Labels, windshield washer / de-icer system (only for aircraft with a windshield washer fluid system present)

Mod 6/1847 – Yellow procedural placard for control column, specific to aircraft with de-ice equipment.

S.O.O. 6004 – Airframe de-icing equipment installation

S.O.O. 6005 – Propeller de-icing boots

S.O.O. 6006 – Wing inspection lights

Either of S.O.O. 6009 or 6157 – Windshield wiper system (standard equipment on all Series 300 aircraft from SN 531)

Either of S.O.O. 6007 or 6008 – An electrically heated windshield, or a windshield washer system. Either one of the two systems is sufficient. The washer system should be removed if an electrically heated windshield is present (Mod 6/1827, SB 6/441 refers).

Pitot heat and engine intake deflectors are standard equipment on all DHC-6 aircraft.

NOTE

S.O.O. 6062, Engine Air Intake Anti-Icing Boots (electrically operated boots that surround each engine nacelle air intake) are not required for flight in icing conditions.

10.2.12 Operation of De-Ice Equipment

10.2.12.1 Pitot Heat

Pitot heat must be turned on anytime the aircraft is being operated in visible moisture at temperatures below +5°C. The pitot tube heating element is a robust component, and pitot heat may be turned on for the entire duration of a flight if temperatures below +5°C are anticipated. To minimize the risk of injury to ground crew who may accidentally touch the very hot pitot tube, pitot heat should be turned off promptly after landing.

A small heater behind the lift detectors (stall warning sensors) is energized when pitot heat is selected on, however, this heater is primarily intended to dry out the lift detectors, not to de-ice the lift detectors. The lift detectors (stall warning system) must not be relied upon as the only source for advance warning of impending stall whenever the aircraft is being operated in icing conditions.

10.2.12.2 Intake Deflectors

Intake deflectors must be extended anytime the aircraft is being operated in visible moisture at temperatures below +5°C. If 50 PSI torque can be achieved with intake deflectors extended (refer to the power setting tables in Section 5), the intake deflectors may be extended prior to take-off and left extended for the duration of the flight. If extension of intake deflectors results in a reduction of maximum calculated take-off power, intake deflectors should not be extended until after take-off, except that they must be extended prior to take-off when the take-off will be made in visible moisture at temperatures below +5°C.

10.2.12.3 Windshield Heat

Each windshield is individually thermostatically controlled, and the heating element automatically switches off when the windshield temperature (detected by the embedded sensor) reaches approximately 40°C (≈105°F). Windshield heat may be left on for the entire duration of the flight. If icing conditions are anticipated, windshield heat should be turned on prior to commencing taxi, to allow sufficient time for the windshield to warm up prior to take-off.

10.2.12.4 Valve Heat

Valve heat should be turned on prior to taxi on every flight if there is any possibility at all that de-ice boots may be required during the flight. The valve heaters are intended to prevent moisture from freezing in the valves. It takes some time for the valve heater to thaw out a valve that contains frozen moisture. To ensure that all valves are operating properly, a complete functional check of operation of the surface de-ice boots should be conducted prior to take-off if there is any possibility at all that the surface de-ice boots may be required during the flight.

10.2.12.5 Bleed Air Switches

It is generally not necessary to remind pilots to turn on bleed air switches prior to flight in known icing conditions, because bleed air will likely have been turned on to provide cabin heat prior to entering icing conditions. This notwithstanding, both bleed air switches must be turned on prior to encountering any visible moisture at temperatures below +5°C. When the bleed air switches are turned on, suction is applied to the surface de-ice boots (whether the surface de-ice boots are on or off), and this suction retains the boots in the fully deflated position. This ensures maximum boot deflection when the surface de-ice system is turned on. Although it is acceptable to have only one bleed air switch selected on for the purpose of heating the cabin, both bleed air switches must be selected on when the surface de-ice boots are being used.

10.2.12.6 Surface De-Ice Boots

The surface de-ice boots should be turned on – meaning, selected to the AUTO-FAST or AUTO-SLOW position – at the very first sign of any ice accumulation on the aircraft.

Several generations of pilots operating aircraft with pneumatic de-icing boots have been cautioned against the dangers of ice bridging. Pilots were advised against activation of the de-icing boots before sufficient ice has built up on the leading edge – generally between 0.25 and 1 inch – out of concern that the ice would form around the shape of the inflated boot, resulting in the boot inflating and deflating under a shell of ice, making de-icing impossible. Despite the widespread belief in this phenomenon within the pilot community and its coverage in numerous technical publications, its existence cannot be substantiated, either technically or anecdotally. The major manufacturers of de-icing boots reported that they had been unable to reproduce ice bridging under any laboratory/wind tunnel conditions, and that any operational report of ice bridging investigated by them had been determined to be a report of residual ice.

Residual ice is the ice remaining on a boot surface after an inflation cycle. Wind tunnel tests have shown that a higher percentage of the ice on a boot breaks away if the ice is allowed to build up to 0.25 to 1 inch prior to boot activation. Even in this case, some ice may adhere to the boot after inflation, and be removed after a subsequent boot cycle. If, however, the boots are inflated with a thin layer of ice on the boot surface, as little as

40% of the ice may be removed during the inflation cycle. This is not ice bridging, but residual ice. When pneumatic boots with an automatic cycle are selected "On" with a thin layer of ice on the boots, typically some residual ice will remain on the boots after the first and second inflation/deflation cycles, but be totally cleared following the third or fourth cycle. If the boots are left on automatic, the clearing pattern will repeat every third or fourth cycle. To repeat, the ice remaining on the boots under such circumstances is not evidence of ice bridging; it is evidence of residual ice.

It is both unnecessary and unsafe to “wait until a certain amount of ice has developed” before turning on the de-ice boots. All Twin Otter de-ice boots are of a newer design that provides a rapid inflation whenever pressure is applied to the boot. Twin Otter de-ice boots have short, segmented, small diameter tubes that are operated by relatively high-pressure engine bleed air. Older boot designs (dating back to the 1930s) such as those fitted to the DC-3 or Gulfstream 1 have long, unsegmented, large diameter tubes that are typically operated by engine-driven pneumatic pumps at lower pressures. The NASA Glenn Research Center has used a Twin Otter aircraft to conduct icing research since the early 1990s, and have never reported evidence of “ice bridging” on their Twin Otter.

In Advisory Circular (AC) 91-74A, the FAA states that “even a thin layer of ice at the leading edge of a wing, especially if it is rough, can have a significant effect in increasing stall speeds” and recommends that de-ice systems be activated at the first indication of icing.

The MANUAL mode of operation of the surface de-ice boots is provided only to increase dispatch reliability in the event of a failure of the automatic (SLOW – FAST) timer. The MANUAL mode should not be used in flight except as a reversionary mode in the event of timer failure.

In summary: Viking recommends that surface de-ice boots be turned on using either AUTO-FAST or AUTO-SLOW, as appropriate to the rate of ice accretion, at the first indication of ice formation, and operated continuously in the automatic mode at all times while flying in icing conditions.

10.2.12.7 Propeller Anti-Ice

Propeller anti-ice boots should be turned prior to entering icing conditions, and left on at all times when flying in icing conditions. Propeller boots are an anti-icing system, intended to prevent ice from forming on the propeller blades. They are not designed to be used as de-icing devices to remove ice that has already formed on the propeller blades.

If necessary, propeller ice removal can be enhanced by periodically increasing propeller speed to the 96% N_P (maximum RPM) position

10.2.12.8 Engine Ignition System

The IGNITION switch should be moved to the MANUAL (continuously on) position if severe icing conditions are encountered. Otherwise, it should be left in the NORMAL (starting only) position.

Severe icing is considered an in-flight emergency, therefore, there is no limitation on the length of time that the IGNITION switch may be left in the MANUAL position if severe icing conditions are encountered.

10.2.13 Precautions During Flight in Icing Conditions

Do not use the autopilot in Vertical Speed mode during initial climb out.

Use 0° flap only when holding in icing conditions.

Cycle surface de-ice boots before commencing holding, approach, or landing, following any flight in icing conditions (even if ice appears to be insignificant).

Do not assume that because there is no longer significant ice on parts of the aircraft you can see, the same is true of parts you cannot see.

Use surface de-ice boots in the automatic (fast/slow) mode. The manual inflation mode is provided as a back-up in case of failure of the timer.

Remember that an accumulation of ice on the wing may change stall characteristics, stall speeds or stall warning margins and if unchecked, could ultimately negate stall warning.

Be aware that even light icing can be hazardous.

Anticipate ahead of time the need for windshield heat, engine anti-ice (intake deflector extension), propeller anti-ice (propeller heat) and wing/tail surface de-ice at all times, especially during low speed hold or approach in instrument meteorological conditions (IMC) or through precipitation.

Always know “the way out” of icing conditions. This may be above, below, forward, or behind the aircraft. DHC-6 aircraft equipped for flight in known icing are designed for flight in light or moderate icing conditions. Intentional flight in severe icing conditions is prohibited.

10.2.14 Monitoring the Autopilot in Icing Conditions

When the autopilot is in use while flying in icing conditions, it can mask changes in performance due to the aerodynamic effects of icing that would otherwise be detected

by the pilot if the aircraft was being hand flown. It is highly recommended that pilots disengage the autopilot and hand fly the aircraft when operating in icing conditions.

If this is not desirable for safety reasons, such as cockpit workload or single-pilot operations, pilots should monitor the autopilot closely. This can be accomplished by frequently disengaging the autopilot while holding the control wheel firmly. The pilot should then be able to feel any trim changes and be better able to assess the effect of any ice accumulation on the performance of the airplane.

In all cases, do not use the autopilot Altitude, Vertical Speed, or Indicated Airspeed modes if there is significant performance loss in icing conditions. A decrease of more than 10 KIAS in airspeed is considered a significant performance loss for a DHC-6.

10.2.15 Use of Flap During if Following Flight in Icing Conditions

All Twin Otter pilots are required to be fully familiar with the procedures and limitations in the de-icing supplement (Supplement 1) of the AFM dealing with approach and landing in icing conditions, and approach and landing after flight in icing conditions.

Incidents have been reported of uncommanded rapid nose-down pitch occurrences when flap has been extended during or after flight in icing conditions. In all cases, the de-icer boots had not been cycled prior to flap extension and indicated airspeed was in excess of the approach speeds listed in the de-icing supplement. In each incident a complete loss of pitch control occurred, accompanied by a significant loss of altitude. In most incidents complete control was regained through flap retraction.

Failure to operate the boots before extending flaps beyond 10° after any exposure to icing conditions can cause tailplane stall, producing uncommanded rapid nose down pitch. As a result, the de-ice supplement instructions require boot operation prior to flap extension greater than 10° any time following mere exposure to ice during that flight.

10.2.16 Recognition and Recovery from Tailplane Stall

If landing flap selection is accompanied by stick force lightening, or stick force irregularities, immediately retract flap to a lesser setting. Cycle the surface de-ice boots several times and if possible, land using a lesser landing flap setting. This condition, which is the precursor to ice contaminated tail plane stall, will not occur if the procedures in AFM Supplement 1, De-Icing, are followed.

Description

Since the rate at which ice accumulates on an airfoil is related to the shape of the airfoil, and thinner airfoils have a higher collection efficiency than thicker ones, ice may accumulate on the horizontal stabilizer at a higher rate than on the wings. Ice has in fact been reported on the tailplane with none at all visible on the wings.

Tailplane stall occurs when the critical AOA of the tailplane is exceeded. Because the horizontal stabilizer produces a downward force to counter the nose down tendency caused by the centre of lift on the wing, stall of the tailplane will lead to a rapid pitch down. Application of flaps, which in the case of the Twin Otter will increase downwash on the tailplane, can aggravate or initiate the stall. Pilots should therefore be very cautious in lowering flaps if tailplane icing is suspected. Abrupt nose-down pitching movements should also be avoided, since these increase the tailplane AOA and may cause a contaminated tailplane to stall.

Tailplane stall can occur at relatively high speeds, well above the normal 1*g* stall speed. The pitch down may occur without warning and be uncontrollable. It is more likely to occur when the flaps are selected to the landing position, after a nose down pitching maneuver, during airspeed changes following flap extension, or during flight through wind gusts.

Recognition

Symptoms of incipient tailplane stall may include:

- Abnormal elevator control forces, pulsing, oscillation or vibration.
- An abnormal nose down trim change.

NOTE

This may not be detected if the autopilot is engaged.

- Any other abnormal or unusual pitch anomalies (possibly leading to pilot induced oscillations).
- Reduction or loss of elevator effectiveness.

NOTE

This may not be detected if the autopilot is engaged.

- Sudden change in elevator force (control would move nose down if not restrained).
- A sudden, uncommanded nose down pitch.

Corrective Actions

If any of the above symptoms occur, the pilot should:

- Plan approaches in icing conditions with minimum flap settings for the conditions. In the case of the Twin Otter, this means using flap 10° for both approach and landing. Fly the approach "on speed" for the configuration.

- If symptoms occurred shortly after flap extension, immediately retract the flaps to the previous setting.
- Increase airspeed as appropriate to the reduced flap setting.
- Apply sufficient power for the configuration and conditions.
- Make any nose down pitch changes slowly, even in gusting conditions, if circumstances allow.
- If the aircraft is equipped with a surface de-ice boots, operate the boots through several cycles to attempt to clear ice from the tailplane.

Once a tailplane stall is encountered, the stall condition tends to worsen with increased airspeed and possibly may worsen with increased power settings at the same flap setting. At any flap setting, airspeed in excess of the published V_{REF} (1.3 times V_{S1}) for the configuration and environmental conditions, accompanied by uncleared ice on the tailplane, may result in tailplane stall and an uncontrollable nose down pitch. Tailplane stall may occur at speeds below Maximum Flap Extended Speed (V_{FE}).

WARNING

THE PROCEDURES FOR RECOVERY FROM WING STALL AND TAILPLANE STALL ARE ALMOST EXACTLY OPPOSITE. IMPROPER IDENTIFICATION OF THE EVENT AND APPLICATION OF THE WRONG RECOVERY PROCEDURE WILL MAKE AN ALREADY CRITICAL SITUATION EVEN WORSE.

10.2.17 Precautions During Approach and Landing in Icing Conditions

The airplane should be flown to a firm touchdown at the aiming point.

Immediately after main wheel touchdown, lower the nose wheel to the runway to enhance directional control.

Avoid use of reverse thrust on icy or slippery runways.

If reverse thrust is used in a crosswind, be prepared for a possible down-wind drift on slippery runways. To correct back to runway centerline, advance power levers to flight idle and release the brakes. After regaining directional control, apply braking and select zero thrust. Do not select reverse thrust unless required.

Do not attempt to turn off the runway until speed has been reduced to a manageable level.

10.2.18 Training or Maintenance Flights in Icing Conditions

Multiple approaches and/or stop and go landings in icing conditions may result in significant ice accumulations beyond those experienced during typical revenue flights. During ground maneuvering, ice may accumulate on unprotected surfaces. Therefore, multiple approaches and/or stop and go landings for training or maintenance test purposes should not be conducted during icing conditions.

If multiple approaches and/or stop and go landings in icing conditions must be carried out, the aircraft must be fully visually inspected by a qualified ground observer prior to each take-off, with particular attention paid to inspection of the upper surface of the wings and horizontal stabilizers. If any contamination is found, it must be removed prior to flight.

10.2.19 Contamination Arising from Anti-Icing Fluid Residue

Some anti-icing (Type II, III, and IV) fluids may leave a powder-like residue behind on the aircraft when they evaporate. This residue can accumulate on the aircraft and in crevices on the wings and control surfaces. This accumulation presents two hazards. First is a possible loss of correct balance of flight control surfaces caused by the weight of the residue, and second is possible blockage of flight control surface movement if the residue is later rehydrated during ground operations or flight in rain.

Blockage of flight controls has been reported by operators of MD-80, BA-146, and Dash 8 aircraft. The cause of the blockage of flight controls was found to be rehydrated residue from Type IV fluid.

The rehydration occurred after Type IV fluid was repeatedly applied to these aircraft in dry conditions, either to prevent frost from forming overnight or for de-icing just before flight. The fluid dried out either prior to or during flight, and fluid residue remained in aerodynamically quiet areas such as balance bays and wing and stabilizer rear spars. In such conditions, if the airplane later encounters rain on the ground or during climb, the dry residue will absorb water and turn into a gel. The gel then swells to many times its original size and can freeze during flight, potentially restricting the movement of flight control surfaces.

As stated earlier, Type IV fluid should never be used on Twin Otter aircraft. It is theoretically possible that residue may accumulate on DHC-6 aircraft if Type III fluid is used for anti-ice purposes. Although Type III fluids have not been directly linked to any events involving flight controls, the composition of these fluids makes them equally susceptible to residue problems as the Type II and Type IV fluids. It is important to note that Type III fluids have only been commercially available for a short time, and on a limited distribution basis, which is possibly the reason why no residue problems have been reported so far.

Inspection and Recognition

To guard against the possibility of residue problems arising from the use of anti-icing fluids, the aircraft should be inspected on a scheduled basis by an appropriately trained and licensed maintenance technician if anti-icing fluids have been used. Viking cannot prescribe an inspection interval because of the significant differences in weather conditions and operational environments affecting the worldwide fleet. At a minimum, aircraft should be inspected at least once per month whenever anti-icing fluids are being used. Each operator needs to develop their own inspection schedule based on operational experience, and to revise that schedule periodically based on findings arising from the inspections.

To carry out an inspection for dried anti-ice fluid residue, visually inspect the above-mentioned areas for the presence of dry or rehydrated residue anywhere in these areas. The residue may be very hard to see, especially if dry.

Type I fluids, which are not thickened fluids and which are used only for de-ice (ice, snow and frost removal) purposes, do not present the same risk of residue accumulation. No inspection program is required if only Type I fluids are used.

Areas to be inspected if anti-icing fluids are used include the wing rear spar area, including the actuating components for the ailerons and flaps, the aileron trim tab, and all control surface hinges and balance bays; the horizontal stabilizer rear spar, including the actuating components for the elevators, the gap seals, both elevator tabs, and the control surface hinges and balance bays; and the vertical stabilizer, including the actuating components for the rudder, both rudder tabs, and the control surface hinges.

Dry residue will normally be a thin film that may be partially covered with dirt or grease. Rehydrated residue will often be a gel-like substance of more visible thickness, very similar in appearance and texture to wallpaper paste. It is typically clear to slightly straw-coloured, and thus difficult to see unless it is well illuminated.

Spray all the above-noted areas with a fine mist of warm water to rehydrate any residue that may be present and to make it easier to identify. In some cases, rehydration may occur quickly, but the process may be slow, especially if residue has accumulated from multiple applications over a long period of time. Wait at least 15 minutes to allow rehydration to take place. Obviously, do not spray the controls with water when the ambient temperature is below freezing unless the airplane is in a heated hangar.

Cleaning and Removal

Once identified, the residue should be removed by using warm water with rags and/or soft brushes to hand clean the gel-like substances away. You may also use a low-pressure stream of water or compressed air to rinse away the residue. Make sure the

water or compressed air does not cause the residue to enter crevice areas that are not accessible.

Research and experience have shown that the use of Type I de-icing fluid, or a mixture of water and Type I de-icing fluid, is also a good cleaning agent for removal of residue left by Type II, III, or IV anti-icing fluids.

Relubrication

This cleaning process has the potential of removing lubricants from control system bearings and fittings, and removing corrosion inhibiters from control cables. Care should be taken to avoid spraying cleaning fluids onto bearings, fittings, control cables, and electrical connectors.

The cleaning process also has the potential to wash the residue into other areas, where it may deposit and create a future problem. Attention should be paid to the runoff from the cleaning process into other areas of the airplane, and these areas should also be flushed until the operator is confident that any de-icing/anti-icing fluid residues have completely left the airplane.

Similar to the inspection phase, do not spray the controls with water when the ambient temperature is below freezing unless the airplane is in a heated hangar. Doing so may result in ice that impairs the flight controls.

If residue has been found and removed by cleaning, all bearings, fittings, and control cables in the area that was cleaned should be relubricated in accordance with Aircraft Maintenance Manual instructions.

Prevention

If only Type I de-icing fluid is used, residue will not develop. If two-step de-icing and anti-icing procedures are used, the residue problem will be greatly reduced (but not entirely eliminated) because application of Type I de-icing fluid contributes to cleaning any residue that may be present from a previous application of Type III anti-icing fluid.

One-step de-ice and anti-ice procedures using Type II or Type IV fluid must not be carried out on DHC-6 aircraft. Type III anti-ice fluid should not be applied to parked, dry DHC-6 aircraft to prevent anticipated frost or ice formation unless an immediate take-off is planned after application of the fluid.

When Type III fluid is applied to the aircraft to provide holdover protection, the spray should only be directed from the front of the aircraft towards the back, in the same direction as airflow in flight. This will prevent Type III fluid from being forced into areas behind the rear spar of the wing and horizontal stabilizer.

Application of any anti-icing fluid (e.g. Type III fluid) must be recorded in the aircraft technical log.

10.3 Hot Weather and Desert Operation

An aircraft operated in hot weather conditions, particularly in tropical climates, requires protection from dust and sand, and precautionary measures against humidity. The following recommendations are made for safeguarding the aircraft while operating in such conditions:

1 Park the aircraft in an area that is likely to be free of sand or dust blown by other aircraft.

2 Maintain fuel tanks full to reduce the susceptibility of fuel to moisture contamination.

3 Maintain intake deflectors at the extended positions during engine start and ground maneuvering in desert environments.

4 Use covers to prevent the entry of sand or dust into the engines and pitot heads.

5 Head the aircraft into wind during loading and unloading to minimize sand entry into the cabin.

10.3.1 Pre-Flight Checks

In tropical conditions certain special checks should be made and some normal checks need to be carried out with particular care during the pre-flight inspection. These are as follows:

1 Check the fuel strainers and fuel tanks for condensate by draining off a small amount of fuel for examination.

2 Examine the tires for deterioration and check pressures.

3 Check the engine intakes, pitot heads, and static vents for obstructions.

4 If the aircraft has been exposed to blowing sand, even with engine intake covers installed, lower the engine cowlings before engine start and check for sand in the air ducts. Even small accumulations of sand in the lower engine cowling can cause considerable damage to the engine during start.

5 Check all control surface hinges for sand or dust accumulations.

10.3.1.1 Engine Starting

In conditions of sand and dust it is advisable to plan operations so that it will be possible to commence taxi as soon as the engines have been started. This will avoid problems caused by propeller blades stirring up sand and debris while the aircraft is stationery. Many experienced desert operators choose to install large steel plates (approximately

8 feet square) on the ground, centered under the propellers in the aircraft parking position. These plates can then be swept clean with a broom before engine start.

A somewhat less effective method of minimizing sand erosion caused by propellers is to leave the propellers feathered after engine start, and to not unfeather the propellers until ready to taxi. The disadvantage of this technique is that temperatures within the engine cowling can rise to undesirable levels if more than 5 minutes elapse between engine start and commencing taxi.

If a stop is to be longer than 5 minutes shut down both engines; if 5 minutes or less shut down the left engine and leave the right engine running with the propeller feathered. Constantly monitor the oil temperature of the operating engine.

When the propeller is feathered, there is very little airflow through the engine oil cooler and close attention must be paid to engine oil temperature, particularly if the intake deflectors are extended. It is possible that the oil temperature of an engine running with propeller feathered will rise above the maximum limit due to loss of airflow over the oil cooler. Normal operating temperature will be regained as soon as airflow over oil cooler is restored by unfeathering the propeller.

10.3.1.2 Taxiing

The following recommendations are made to alleviate the conditions associated with taxiing in hot weather and on sand strips.

Minimize taxiing as much as possible, particularly downwind and crosswind taxiing.

Use brakes as little as possible to avoid overheating them, but be aware that it is far better to use brakes than it is to use reverse thrust when operating in desert environments. Brake pads and discs can be replaced for only a fraction of the cost of an engine overhaul. Use of beta range between idle and zero thrust is acceptable, but use of reverse during taxi or landing is to be avoided unless it is absolutely necessary for safety reasons.

While turning in soft sand maintain a taxi speed and radius of turn that is compatible with conditions. A turn made at excessive speed using nose wheel steering may cause the nose wheel to plow and dig in, and this may overstress the nose wheel mounting at fuselage station 60, resulting in a very expensive and time-consuming repair.

Do not, under any circumstances, use reverse power for backing the aircraft on sand.

10.3.1.3 Take-Off

When taking off from sand strips and in high ambient temperatures the following procedures are recommended:

1 Do not lower flaps to the take-off setting of 10° until the aircraft is lined up into wind.

2 Leave the engine intake deflectors in the extended position until in position and ready for take-off. Then, advance the power levers to 85% N_G, retract intake deflectors, wait 5 seconds until all engine indications have stabilized, then proceed with the take-off.

3 To facilitate unstick of nose wheel during take-off from soft sand, hold the control column fully back to relieve the load on the nose wheel, then check forward as the aircraft becomes airborne; this will allow the nose wheel to lift clear of ground and thus reduce drag during ground roll.

4 Due to lower air density in hot temperatures, the take-off run will be longer than normal and the rate of climb will be reduced. Greater allowances, therefore, should be made for clearing obstacles.

The intake deflectors must be retracted (as described in step 2, above) prior to take-off whenever the outside air temperature is higher than ISA +18° C. This is because at temperatures above ISA +18° C, engine power is limited by the thermodynamic limitation of the engine, rather than by the flat rating limitation. This means that less than 50 pounds of torque will be available for take-off at temperatures above ISA +18° C. Extending the intake deflectors will reduce available torque by 2 PSI whenever the engine is operating against its thermodynamic limit.

When intake deflectors are used during winter operations to prevent snow from entering the engine, available torque is always limited by the flat rating of the engine, thus the loss of 2 PSI of torque arising from intake deflector deployment is not a concern – the power levers can still be advanced until 50 PSI of torque is achieved. In hot weather conditions, when operating against the engine thermodynamic limit, it is not possible to advance the power levers to recover the torque lost as a result of intake deflector deployment.

10.3.1.4 Landing

When landing the aircraft in high ambient temperatures and on soft sand, the following recommendations are made:

1 Extend the intake deflectors before power is reduced below 80% N_G at the beginning of the approach.

2 Avoid using reverse power when landing. If, however, it is necessary to use reverse power for safety reasons, select full reverse immediately after touchdown, pause momentarily, then advance the power levers to the zero thrust position in time to prevent engine gas generator speed from increasing in reverse range. This will

prevent sand or dust from being blown forward into the engine air intakes and into the propeller blades.

3 After touchdown hold the control wheel fully back until elevator effectiveness is lost. This will maximize aerodynamic braking and minimize the risk of the nose wheel digging into soft sand.

4 Use normal braking during landing ground roll. Heavy braking may cause brakes to overheat. However, as was mentioned before, keep in mind that it is far less expensive to replace brakes than it is to overhaul an engine, therefore heavy braking should be used in preference to reverse thrust if retardation is required.

5 Because of the low air density in hot environments, the true airspeed of the aircraft will be greater than the indicated air speed and the landing run will be longer.

6 When landing in the desert, judgement of height during the flare may be affected by heat shimmer which produces a water effect and loss of horizon. Under these conditions a powered approach is recommended and the flare may be made with reference to ground objects.

10.3.1.5 After Landing

To minimize the effects of heat, humidity, and sand or dust, the following recommendations are made:

1 Apply the parking brake only after the brake calipers and discs have cooled.

2 Refuel as soon as possible to keep condensation in the fuel tanks to a minimum.

3 Leave the intake deflectors extended.

4 Promptly install covers on pitot tubes, static ports, engine inlets, engine exhaust stubs, and the ram air inlet scoop.

10.3.2 Turbulent Air and Thunderstorms

Flight into areas where severe turbulence is forecast or will be encountered should be avoided if possible. Power settings and pitch attitude should be established before entering a storm and maintained, rather than attempting to maintain a constant airspeed. A safe penetration speed for the aircraft is provided in the limitations section of the AFM.

10.4 Ground Operations

10.4.1 Hydraulic Circuit Breaker

Engine start is **prohibited** if the hydraulic oil pump circuit breaker is pulled out or if the electrically powered hydraulic oil pump is inoperative.

Loss of control and collision with objects on the ground because the hydraulic oil pump circuit breaker has been pulled out has been the single largest cause of Twin Otter accidents during the past 30 years.

There is no justifiable reason for flight crew or maintenance staff to pull out the hydraulic oil pump circuit breaker except when directed to do so by an abnormal or emergency checklist, or if maintenance work is to be carried out on the hydraulic power pack and/or associated electrical circuits.

10.4.2 Flight Control Locks

Incidents have occurred of attempted take-offs with flight control locks installed, notwithstanding the Flight Manual requirements to remove the control locks and to check flight controls for full and free travel before take-off. In view of the disastrous consequences which could result from such an oversight, attention is drawn to the following amplification of the pre-take-off check: Before take-off, check that flight control locks are removed and stowed and that all flight controls operate freely.

In 1990, Transport Canada published Airworthiness Directive CF-90-01 that mandated incorporation of de Havilland Modification 6/1676 which ensures full downward deflection of the elevators when the control locks are engaged **and** mandated incorporation of de Havilland Modification 6/1726 to add to the control lock a warning flag which masks essential flight instruments on the pilot's instrument panel.

These two modifications are obligatory, and aircraft operating without these two modifications embodied to the control lock are not airworthy. The warning flag must not be removed from the control lock.

Flight control locks must always be removed and stowed prior to engine start. Flight controls must always be checked for full and free movement prior to take-off.

10.4.3 Backing with Reverse Thrust

Backing the aircraft (other than when in floatplane configuration) using reverse thrust is not recommended. Even when accomplished with great care, dust and debris from the surface will be disturbed and blown up in front of the engines. This may result in propeller blade damage or ingestion of sand and FOD into the engine.

If the aircraft must be backed up, an outside observer should assist to ensure that the area behind the aircraft remains clear. Brakes must never be used when backing up. The pilot(s) should ensure that their feet are flat on the floor (not on the brake pedals) at all times when backing up.

10.4.4 Contamination Arising from Operation on Unprepared Surfaces

Ground operations on muddy and/or wet surfaces may result in soil and debris being thrown up by the main and nose wheels and deposited on the underside of the wing and possibly on both sides of the horizontal stabilizer. This type of contamination of the wing and/or horizontal stabilizer presents equally as serious a problem as ice, and it must be removed prior to flight.

10.4.5 Nose Wheel/Rudder Pedal Steering

The nose wheel steering system is primarily intended for use when maneuvering on the airport apron or parking areas, or for making tight turns from runways to taxiways and vice-versa. To maintain a straight path when taxiing, the nose wheel steering tiller should be left alone in the center position and coarse (full deflection) application of rudder used to make any necessary corrections to the aircraft's path down the taxiway.

Avoid prolonged brake application to control taxi speed as this causes high brake temperatures and increased wear of brakes. If taxi speed is too high, reduce speed by selecting zero thrust with the power levers.

Under normal conditions, differential braking and braking while turning should be avoided. Allow for decreased braking effectiveness on slippery surfaces. Avoid following other airplanes too closely. Jet blast is a major cause of foreign object damage.

During taxi, the use of reverse thrust above zero thrust is not recommended due to the possibility of foreign object damage and engine surge. Momentary use of reverse thrust may be necessary on slippery surfaces for airplane control while taxiing. Consider having the airplane towed rather than relying on extended use of reverse thrust for airplane control if the surface is extremely slippery.

10.4.6 Use of the Autofeather System

The propeller autofeather system is standard equipment on all Series 300 aircraft, and is part of the basic configuration of every aircraft. It is one of the most important safety systems on the aircraft, and it must be used for every take-off. This requirement applies to all gear configurations of the aircraft.

AFM Supplement 19, Operation with Inoperative Autofeather System, is only provided to permit temporary continued operation of the aircraft in accordance with the relief provided in the MEL until such time as the autofeather system can be repaired. The MMEL lists the autofeather system as a 'Category C' item, which means that repairs shall be carried out within ten (10) consecutive calendar days, excluding the day of discovery. Individual operator MELs may impose more restrictive limitations.

The autofeather system must be selected on prior to each take-off, and should not be selected off until completion of the after-take-off checklist. Selecting the autofeather system off is the last item on the after-take-off checklist.

The autofeather system is not designed or intended for use during approach and landing and must not be selected on during approach and landing.

Effective with Revision 53 of the AFM, conducting a functional test of the autofeather system has been changed to a weekly requirement. Satisfactory completion of the functional test should be recorded in the aircraft technical log.

10.5 Take-Off

10.5.1 Directional Control During Take-Off

The nose wheel must be confirmed to be centered in the straight-ahead position prior to commencing the take-off roll. After maneuvring to take-off position on the runway, center the nose wheel using the tiller, then allow the aircraft to roll forward approximately 3 meters (10 feet) to confirm that the nose wheel is correctly centered.

Normal take-off procedures dictate that N_G must be increased to approximately 85% and held at that value for 5 seconds (with brakes applied) prior to commencing the take-off roll. This requirement ensures that the compressor bleed valves at engine station 2.5 fully close prior to application of take-off power, and allows the pilot to confirm (by observation of the sharp drop in T_5 on both engines) that both bleed valves have closed.

A significant additional benefit of stabilizing N_G at 85% for 5 seconds prior to brake release is that this practice establishes sufficient airflow over the rudder to enable the rudder – rather than nose wheel steering – to be used to maintain directional control during the first few hundred feet of the take-off run. Use of the nose wheel steering tiller during the take-off roll is strongly discouraged; maintaining directional control with rudder and/or asymmetric application of power is the preferred (and safest) technique.

Allowing the engines to stabilize at 85% N_G for 5 seconds prior to brake release also provides uniform engine acceleration when full take-off power is set, thus minimizing directional control problems. This is particularly important if crosswinds exist or the runway surface is slippery. Achieving an exact initial setting of 85% N_G on both engines is not as important as setting symmetrical torque when both engines are operating at or above 85% N_G.

Under normal circumstances, when the all of the above procedures are followed, nose wheel steering should not be required at any time during the take-off run.

10.5.2 Noise Abatement

Normal take-off procedures satisfy typical noise abatement requirements. When departing airports that have particularly demanding noise abatement procedures, maintaining best rate of climb speed in the take-off configuration (80 KIAS with 10° of flap) and leaving take-off power set until reaching circuit height is the most effective way of containing the aircraft noise footprint within the airport boundary.

10.5.3 Minimum Fuel Requirements

Take-off should not be made if either LOW FUEL caution light is illuminated, regardless of the amount of fuel determined to be in the tank by either observation of the fuel gauges or measuring tank contents with the dipstick.

10.5.4 Brake Energy Limitations

Twin Otter aircraft are not normally limited by brake kinetic energy requirements; however, a combination of any two of the following three conditions may cause brake temperatures to reach or exceed limits following a rejected take-off from a speed greater than 40 KIAS:

1 An aerodrome pressure altitude greater than 5,000 feet

2 a downslope runway

3 a tailwind

Following any rejected take-off from a speed greater than 40 KIAS, consideration should be given to allowing brakes to cool prior to the next take-off.

10.5.5 Headwinds and Tailwinds

The maximum allowable tailwind component for landing or take-off is 10 KIAS.

When operating in headwinds greater than 20 KIAS, take-off and landing performance data appropriate to 20 KIAS headwind shall be used.

10.5.6 Crosswind Take-Offs

Take-off (with flaps set at 10°) has been performed in crosswind components of up to 20 KIAS measured at 6 feet, which is equivalent to 27 KIAS at a tower height of 50 feet. This is the maximum experienced during crosswind trials and is not considered a limitation. Operators are encouraged to establish their own crosswind take-off policies.

Proper initial runway alignment and take-off power application result in good crosswind control capability during take-off. Partial aileron deflection – approximately 30% of total aileron travel – should be applied into wind at the beginning of the take-off roll, with aileron input gradually reduced as speed increases. Light forward pressure on the control column during the initial phase of take-off roll (below approximately 50 KIAS) increases the contribution the nose wheel provides to maintaining a straight path on the runway centerline. Any deviation from the centerline during the take-off run should be countered with immediate rudder pedal inputs.

When taking off with strong crosswinds, asymmetric application of engine power at the very beginning of the take-off roll may assist in maintaining directional control.

10.5.7 Setting Take-Off Power

If sufficient runway is available, brakes may be released after pausing for 5 seconds at 85% N_G, thus allowing the aircraft to begin to roll forward prior to setting full take-off power. If a maximum performance take-off is desired, or if runway distance is marginal, full static take-off power should be set prior to brake release.

All take-off distances, accelerate-stop distances, and accelerate-go distances presented in the charts provided in the performance section of this manual are based on full static power being applied prior to brake release. Take-off distances will increase by approximately 100 feet if take-off power is set after brakes are released. Full calculated take-off power should be set before the aircraft speed reaches 40 KIAS.

Control forces are light throughout the take-off when the correct flap and trim settings are used. The airplane accelerates rapidly and can be rotated to unstick at liftoff speed. At all weights 12,500 lbs and below, the target V_2 airspeed of 80 KIAS should be achieved by 50 feet and maintained until no less than 400 feet AGL. Power must not be reduced from the full calculated take-off power setting until the flaps have fully retracted, and flap retraction must not be initiated until either above 400 feet AGL or clear of all obstacles, whichever occurs last.

10.5.8 Reduced Power Take-Offs Prohibited

Reduced power take-offs are now prohibited. Previous editions of AFM supplements that described reduced power take-off procedures have been withdrawn and are no longer part of this approved AFM.

The PT6A-27 engine installed on Series 300 and variant DHC-6 aircraft has been flat rated to 620 SHP. This is a 60 SHP reduction from the engine's full rated power of 680 SHP. Therefore, a take-off during ISA conditions with 620 SHP set (equivalent to 50 PSI torque) is already a 91% power take-off.

Many years of operational experience has proven that imposing a further reduction on take-off power does not increase engine TBO or decrease TBO costs. If an additional reduction from full calculated take-off power is applied, take-off distances increase, accelerate-stop distances increase, directional control during take-off degrades, and the risk of an unsatisfactory outcome following a power loss during take-off greatly increases.

10.5.9 Initial Climb

Following rotation, initial climb to 400 feet AGL must be made at 80 KIAS, which is the best rate of climb speed (one engine or two engines) when the aircraft is in the flap 10° configuration.

Conducting the initial climb at higher airspeeds offers no safety benefit, increases the noise footprint of the aircraft, and increases the length of time required to reach 400 feet AGL.

10.5.10 Flap Retraction

The minimum height for flap retraction following take-off is 400 feet AGL. Engine power must not be reduced from the take-off power setting until the flaps have fully retracted.

10.5.11 Engine Failure During Take-Off

V_1 is equal to V_{LOF} (liftoff speed) at all weights (SFAR 23 basis). In principle, this means that if a power loss occurs and the aircraft is on the ground, it should be kept on the ground (a rejected take-off should be made), and if a power loss occurs and the aircraft is in the air, take-off should be continued (single engine flight should continue).

The first indication of a power loss will be yaw. If the aircraft is airborne during the take-off phase of flight and a power loss occurs, pitch attitude must be reduced promptly in order to maintain V_2, which is 80 KIAS at maximum take-off weight. Reducing pitch attitude by approximately half (e.g. if normal two engine pitch attitude to maintain V_2 is approximately 10° nose up, reduce pitch attitude to 5° nose up following a power loss) is normally sufficient to maintain V_2. The reduction in pitch must be made promptly following recognition of a power loss. Failure to promptly reduce pitch attitude will result in airspeed decreasing below V_2, and this is a most serious piloting error that will likely have fatal consequences.

Maximum power should already have been set as part of the normal take-off power setting procedure. If maximum calculated take-off power was less than 50 PSI, the power levers must be advanced until the first redline (Torque, N_G, or T_5) is reached. Power levers must NOT be slammed forward to the physical stops, because this may result in torque greater than 50 PSI. If torque is set higher than 50 PSI during single engine operations V_{MC} will increase and directional control may be lost.

If the power loss occurs at an altitude less than 400 feet, flaps should already be set at 10°, which is the only approved take-off flap setting for a landplane.

Confirm that the affected engine has feathered. If the affected engine has feathered, no further immediate actions are necessary. All attention should be given to maintaining V_2 speed, maintaining directional control, and continuing to climb to a safe altitude.

The propeller of the operating engine is normally left at the 96% N_P (maximum RPM) position at all times following an engine failure. This ensures that maximum power is always immediately available from the operating engine.

Only the first four actions (the bold print actions) in Section 3.3.3, Engine Failure Airborne, After V_{MC} should be carried out immediately, from memory. All subsequent actions in that checklist should be deferred until the aircraft has reached a safe altitude (typically several thousand feet AGL), and the aircraft has been established and properly trimmed in level cruise flight.

10.5.12 Flap Retraction – One Engine Inoperative

Following an engine failure during take-off, flaps should not be retracted from the 10° best single engine rate of climb position until after the aircraft has reached the desired cruise altitude and has been accelerated to 100 KIAS.

10.6 Flight Characteristics, Maneuvers

The stability of the airplane is good about all axes. All flight controls are effective under all operating conditions and forces are light for ease of maneuvering during low airspeed operations.

10.6.1 Climb

Once the flaps have been retracted and the aircraft has accelerated, any speed equal to or greater than 100 KIAS may be used for enroute climb. 100 KIAS is the best rate of climb speed when flaps are retracted. Higher climb speeds may be used if desired.

Best angle of climb with two engines operating is achieved at 87 KIAS with flaps fully up. This configuration is rarely if ever used in day to day operations. If maximum climb performance is required to clear a 'close-in' obstacle immediately after take-off, it is best to leave maximum take-off power set, leave flaps set at 10°, and continue to climb at 80 KIAS until a satisfactory altitude is reached. For 'close-in' obstacle clearance, the performance penalty incurred during flap retraction and subsequent acceleration to 87 KIAS is far greater than the increase in angle of climb gained.

10.6.2 Single Engine Climb

Flaps should always be selected to 10° for any single engine climb. Propeller RPM should always be selected to 96% N_P for any single engine climb. 80 KIAS is the best rate of climb speed (single engine or two engine) when flaps are set to 10°. Higher speeds than 80 KIAS may be used for single climb if desired, however, at heavy weights, single engine climb performance may be poor at speeds greater than 80 KIAS.

10.6.3 Slow Flying

Handling characteristics are excellent in slow flight and controls remain light and effective down to the stall. With take-off flaps (10°) set, visibility is good and the airplane can be maneuvered at speeds of 67 to 72 KIAS IAS. Refer to Para 10.6.6 and Para 10.6.7 for information about recovery from high angles of attack.

10.6.4 Steep Turns

The objective of a steep turn maneuver is to familiarize the pilot with airplane handling characteristics beyond 35° of bank and improve the instrument cross check. During training, up to 45° of bank may be used for this maneuver. It is not intended that the pilot should ever be required to bank greater than 25° to 30° in any normal or non-normal condition.

10.6.5 Spins

Intentional spins are prohibited. However, should an inadvertent spin develop, normal (generic) recovery technique should be employed. This consists of full opposite rudder followed by progressive forward movement of the control column. When the spin stops, the rudder should be centralized and the airplane eased out of the ensuing dive.

10.6.6 Stalls

The 1 *g* stall characteristics are satisfactory with power on or off at all approved center of gravity positions. At the stall, the airplane pitches nose down slowly. Recovery is effected by moving the control column forward and applying engine power; height loss during a practice power-off stall need not exceed 300 feet. Throughout the stall, the controls remain positive. An artificial stall warning system consisting of a light and warning horn is provided because with flaps fully extended, there is only a very small margin between the 'natural' stall warning of the aircraft (a gentle buffet of the elevator) and the stall.

It is not recommended that 1 *g* power on stalls above the certification power level (28 PSI torque and 90% propeller RPM) be practiced. At higher power settings than this, the airspeed will be very low (in the range of 30 to 40 KIAS) before the stall occurs, and any error in aircraft handling or stall recovery technique may result in a violent aircraft upset.

Accelerated stalls (also known as whip stalls) are strictly prohibited. An accelerated stall is a stall with a *g* loading greater than 1 *g*.

Stalls should not be practiced when the aircraft is configured for simulated single engine operations, because the aircraft will decelerate below V_{MC} prior to stalling.

10.6.6.1 Stall Recovery

A procedure is provided in Section 3 for Stall (or Stall Warning) Recovery. This procedure required that the primary pitch control (elevator) be used to initiate a stall recovery. The goal of minimizing altitude loss should be a secondary consideration, until a positive stall recovery has been completed. Correct control of pitch attitude (angle of attack, or alpha) throughout the stall recovery is essential to avoid a recurrence of the stall (or stall warning) and, as a secondary consideration, to minimize the altitude loss during the recovery.

At all times handling of aircraft should be in a smooth, deliberate and positive manner. Avoid increasing load factors until a minimum maneuvering speed – nominally V_{REF} – has been achieved. Airspeed should be increased to no less than the V_{REF} (1.3 times stall speed) applicable to the aircraft weight and flap configuration, plus any additional factors (for example, an additional airspeed allowance for gusts) that may be applicable.

The flap configuration should not be changed until airspeed has been increased to V_{REF}.

During training or checking activities that address recovery from stall warnings, the training or checking should encourage recovery at the first indication of an impending stall (stall light illuminates, stall horn sounds, or stall buffet detected). At no time should a goal of zero altitude loss be a criteria for successful demonstration of recovery from the initial indications of a stall.

10.6.7 Recovery from Inadvertent High Angles of Attack

If a high angle of attack has been inadvertently allowed to develop, recovery is accomplished by reducing pitch attitude and allowing airspeed to increase. Once the pitch attitude has been reduced and airspeed begins to increase, power may then be increased if necessary to avoid further descent. It is not acceptable to maintain a high angle of attack, add power, and attempt to “power out” of the high angle of attack. It is essential that the nose be lowered in order to increase airspeed.

In a situation where the airplane pitch attitude is unintentionally more than 25 degrees nose high and increasing, airspeed will be decreasing rapidly. Normally (but not always) this will be accompanied by a stall warning (illumination of the STALL light and sounding of the horn).

As airspeed decreases, the pilot’s ability to maneuver the airplane also decreases. In this situation the pilot should trade altitude for airspeed, and maneuver the airplane’s flight path back toward the horizon. This is accomplished with nose-down elevator movement. A rapid and large elevator application should be avoided as it could result in a negative g maneuver. However, the rate of and degree of nose down pitch must be sufficient to achieve the desired airspeed.

Once pitch attitude has been reduced airspeed will increase, improving elevator and aileron control effectiveness. After the pitch attitude and airspeed return to the desired range the pilot can reduce angle of bank with normal lateral flight controls and return the airplane to normal flight.

Refer to the ‘Windshear Recovery Procedures’ later in this section for additional guidance concerning operations at, and recovery from, high angles of attack. In particular, note the warning immediately following “Windshear In-Flight Recovery Procedure”.

10.6.8 Minimum Control Speed

The airplane has a low minimum control speed (V_{MC}), 64 KIAS with 10° flaps. When operating single engine, the aircraft can be trimmed for ‘hands off’ flight at all speeds down to approximately 80 KIAS. When power to maintain level flight is set, as the

airspeed decreases from 80 KIAS to the 64 KIAS V_{MC}, it may be necessary to apply force to the controls (most especially the rudder) to maintain directional control, even when the trims have been fully deflected. Considerable rudder force is required close to V_{MC} with maximum power set. Because of this, it is strongly recommended that airspeed during single engine operations never be allowed to decrease below 80 KIAS.

10.6.9 Single Engine Operations

Although optimum single engine performance will be achieved with 5° of bank towards the live engine and the slip-skid ball displaced half a ball width from center, it should not be necessary to do this except during the most demanding single engine climb scenario when the greatest possible rate of climb is required for obstacle clearance.

For all other single engine operation conditions, the aircraft should be trimmed for wings level flight with the ball in the middle. This will result in a decrease of about 30 feet per minute from the single engine rate of climb figures published in the performance charts, however, pilot workload will be substantially reduced, particularly so during instrument flight conditions.

During single engine level cruise flight with the flaps up, airspeed will stabilize somewhere between 105 KIAS and 120 KIAS (depending on weight) at normal cruise power settings. If the airspeed falls below 100 KIAS during single engine cruse, this usually indicates that an attempt to climb is being made, and consideration should be given to extending 10° of flap in order to configure the aircraft for best single engine climb performance.

Use of the Honeywell H14 or Collins AP 106 autopilot during single engine operations is prohibited. The Collins APS-65 autopilot may be used during some phases of single engine flight, but only within the limitations allowed in the AFM supplement for this autopilot. One such limitation is that the APS-65 autopilot must not be used during single engine operations when airspeed is below 105 KIAS. Refer to the approved AFM supplement for the autopilot for complete information.

10.6.10 Windshear Recovery Procedures

This section provides information to the Operator's Flight Operations Department for review of their windshear recovery procedures and ensure they are appropriate for DHC-6 Twin Otter aircraft.

It must be emphasized that the Twin Otter aircraft must NOT be flown at stall warning as a windshear recovery technique.

10.6.10.1 Background

Windshear is defined as a sudden change in air mass direction and speed lasting for a measurable period of time (as opposed to simple turbulence). Knowledge of how windshear affects aircraft performance is essential to the application of proper vertical flight path control techniques during an inadvertent windshear encounter. While many windshear encounters have been related to weather fronts, strong surface winds, mountain waves, etc., the worst encounters have involved wet microburst/downburst phenomena associated with thunderstorms.

A microburst or downburst is a shaft of high velocity air moving down from the core of a convective cloud to the ground where it spreads out in a gustfront in all directions. The wind component is mostly horizontal at altitudes below 500 feet.

Horizontal windshear may improve or degrade vertical flight path performance. Performance improving windshear will first be indicated in the cockpit by an increasing airspeed. Performance improving windshear may be a precursor of a shear that will decrease airspeed and degrade vertical flight path performance. Accordingly, when windshear is suspected, avoid large power reductions and excessive trim changes in response to sudden airspeed increases as these may be followed quickly by sudden decreases. All events will not be in the classic mould of symmetrical outflows as described above. In fact, they can vary to the extent that the first recognizable encounter might be the decreasing performance tailwind shear. Crew actions are divided into three areas: Avoidance, Precautions and Recovery.

10.6.10.2 Windshear Avoidance

Carefully access all available information such as pilot reports of windshear or turbulence, low level windshear alerts, and weather reports, including thunderstorm and virga activity.

Avoid areas of known severe windshear. If severe windshear is indicated, delay take-off or do not continue an approach until conditions improve. All crews should broadcast any instances of airspeed fluctuation when shear is encountered. One aircraft, upon entering the outflow area of a downburst, may encounter airspeed fluctuations but no significant control problems. Another aircraft on the same flight path a few minutes later, may experience airspeed changes many times greater than the previous aircraft, accompanied by marked performance degradation and handling difficulties.

10.6.10.3 Windshear Precautions – Take-Off

Always use the full calculated take-off power given in Section 5 of the Aircraft Flight Manual (AFM).

Use the full length of the longest suitable runway, provided it is clear of areas of known windshear.

Be alert for airspeed fluctuations during take-off and initial climb. Airspeed fluctuations may be the first indication of windshear.

Rotate at the normal pitch rate to the normal take-off pitch attitude. Minimize reductions from this initial attitude until terrain and obstacle clearance is assured. Crews should develop an awareness of the normal values of airspeed, attitude, vertical speed and acceleration. Vertical flight path instruments such as vertical speed indicators and altimeters should be closely monitored.

The PNF (pilot not flying) should call out any deviations from normal. If the PF (pilot flying) feels that vertical flight path control is marginal at any time the PF will call "WINDSHEAR – MAX POWER" and carry out the in-flight recovery maneuver outlined below.

NOTE

MAX POWER is achieved at the torque, T_5 or N_G limit, whichever is reached first.

10.6.10.4 Windshear Precautions – Approach

Utilize all available means in the cockpit that might indicate the presence of windshear such as visual indications, pilot reports, radar and flight instruments.

Select the minimum approach/landing flap position consistent with field length and add an appropriate wind correction to approach airspeed (such correction is applied in the same manner as gust correction). Avoid large power reductions or trim changes in response to sudden airspeed increases as these may be followed by airspeed decreases. Closely monitor the vertical flight path instruments, specifically vertical speed, altimeters and glideslope indicators – increasing the normal cross check between these instruments and the flight director commands.

In this regard, crew coordination is most important, especially at night or in marginal weather conditions. The PNF should be ready to promptly call out any deviation from normal. If the PF feels that vertical flight path control is marginal at any time the PF will call "WINDSHEAR – MAX POWER" and carry out the in-flight recovery maneuver outlined below.

10.6.10.5 Windshear In-Flight Recovery Maneuver

The flight crew must make the determination of marginal flight path control using all the information available in the cockpit and react promptly. This determination is subjective and based on the pilots' judgment of the situation. As a guideline, marginal flight path control may be indicated by uncontrolled changes from normal steady state flight conditions in excess of:

10 KIAS indicated airspeed

500 feet per minute vertical speed

5 degrees pitch attitude

1 dot displacement from the glideslope

The following action is recommended when preventative action is not successful, or whenever flight path control becomes marginal below 500 feet above the ground on take-off or landing:

Initial response:

1 Apply MAX POWER/target known go-around attitude. This provides a fixed pitch target in turbulence.

2 Do not change configuration unless the flight path is under control.

3 If the aircraft is still descending:

Increase thrust and pitch attitude:

a Firewall power (POWER levers fully forward).

b Increase pitch target sufficient to stop descent but do not allow airspeed to decrease below SPEED AT 50 FEET (from landing data graphs) or BALKED LANDING CLIMB SPEED (from balked landing charts).

c Maintain the pitch attitude that achieves airspeed given in b.

4 If the STALL advisory light illuminates:

Should the STALL advisory light illuminate in turbulence, immediately reduce the pitch attitude sufficient to extinguish the STALL advisory light. In the event this should occur close to the ground, maintain the pitch attitude which extinguishes the STALL advisory light, until terrain contact is no longer a factor, then allow the aircraft to accelerate back to the airspeed given in Step 3b.

5 Continue climb until clear of terrain.

6 Select FLAP to 10°

7 Airspeed – 80 KIAS

8 When clear of terrain:

a Reduce power and pitch attitude appropriate to the phase of flight.

b Reconfigure aircraft as necessary.

Table 10-1 Windshear In-Flight Recovery Procedures (Two Pilot Operations)

PF	PNF
Commands “Windshear – Max Power” Simultaneously advances Power Levers and smoothly rotates aircraft to go-around attitude	Sets Prop Levers to MAX Follows up on power Levers to set MAX POWER Calls “POWER SET” Monitor radar altimeter and IVSI, Calls “<radar altitude> FEET CLIMBING” or “<radar altitude> FEET DESCENDING”
Aircraft Still Descending or GPWS Warning Continues	
Advance Power Levers to maximum available Power (firewall) Increase pitch attitude sufficient to stop descent. Do not allow airspeed to decrease below SPEED AT 50 FT or BALKED LANDING CLIMB SPEED	
If STALL WARNING occurs	
Immediately reduce pitch attitude to extinguish the STALL advisory light, then adjust pitch to return to SPEED AT 50 FT or BALKED LANDING CLIMB SPEED	
Aircraft Climbing	
Continue climb as required to safe altitude Call FLAP 10˚	Determine safe altitude Calls “<obstacle clearance altitude ASL> FEET” Select FLAP 10˚
Once Clear Terrain	
Reduce power and pitch attitude appropriate to the phase of flight. Reconfigure aircraft as necessary	Advise ATC of any deviation to clearance

WARNING

DO NOT CHANGE THE FLAP CONFIGURATION IF THE VERTICAL FLIGHT PATH IS NOT UNDER CONTROL. DO NOT ALLOW THE AIRSPEED TO DECREASE BELOW THE TARGET AIRSPEED.

UNLIKE A JET AIRCRAFT, IT IS NOT PERMISSIBLE TO CONTINUE TO INCREASE PITCH ATTITUDE UNTIL STALL WARNING OCCURS. THIS IS BECAUSE AT HIGH POWER SETTINGS, THE PROPELLER SLIPSTREAM CREATES ADDITIONAL LIFT ON THE AIRFRAME, WHICH IS NOT ACCOUNTED FOR IN THE STALL WARNING ACTIVATION POINT. AS A RESULT, THE AIRCRAFT COULD REACH A DANGEROUSLY LOW INDICATED AIRSPEED BEFORE THE STALL ADVISORY LIGHT ILLUMINATES.

AT THESE VERY LOW AIRSPEEDS, THE AIRCRAFT IS OPERATING ON THE EXTREME "BACK SIDE" OF THE LIFT/DRAG CURVE WITH A SIGNIFICANT DETERIORATION OF CLIMB CAPABILITY. ADDITIONALLY, THE FLIGHT CONTROLS MAY NOT RETAIN SUFFICIENT AUTHORITY TO MAINTAIN CONTROL OF THE AIRCRAFT IN TURBULENCE OR FOLLOWING AN ENGINE FLAMEOUT.

JET AIRCRAFT CAN BE FLOWN TO STICKSHAKER BECAUSE THE STICKSHAKER PROVIDES AN ARTIFICIAL BARRIER TO REACHING VERY LOW IAS. PROPELLER AIRCRAFT MUST "CREATE" SUCH A BARRIER USING PROCEDURAL MEANS INSTEAD. RESTRICTING THE AIRCRAFT TO THE MINIMUM GO-AROUND AIRSPEED DURING THE RECOVERY IS A NATURAL CHOICE SINCE THESE SPEEDS ARE READILY AVAILABLE TO CREW MEMBERS AND MATCH OPTIMAL CLIMB SPEED.

10.7 Approach and Landing

Under FAA criteria, the speed used to determine the approach category is the V_{REF} speed. Aircraft with a V_{REF} equal to or less than 90 KIAS are considered Category A. Thus, the Twin Otter is a Category A aircraft. ICAO and other regulatory agencies may use different criteria.

Circling approaches – single engine or two engine – should be flown with flaps extended to 10°.

10.7.1 Propeller Speed

Propellers must be set to 96% N_P (the maximum RPM setting) in order to enable direct pilot control over propeller blade angle, and in order to enable maximum engine power to be developed if required for windshear recovery or if a go-around is required.

For this reason, once an approach has been commenced, the propeller levers must be set to the 96% N_P position no later than 500 feet AGL, or 500 feet above DH or MDA, or whenever the RESET PROPS caution light illuminates, whichever of the three conditions occurs first.

10.7.2 Landing

All landing performance figures (total landing distance, ground roll distance) were determined using the following technique: Airspeed at 1.3 times stall for the selected flap configuration, propeller levers forward, power sufficient to maintain a 3° glide path until 50 feet above airport elevation (in practice, this means until 'crossing the fence'), then power reduced sharply to idle at 50 feet above airport elevation. In all cases, the touchdown speed was 1.05 times stall speed for the selected flap configuration.

When the aircraft is landed using this technique, the kinetic energy traded off between 'power levers to idle' at 130% of stall speed and touchdown at 105% of stall speed is sufficient to permit a steady and gentle transition from a 3° descent profile at 50 feet above airport elevation to level flight just a few inches above the runway moments prior to touchdown.

If this recommended technique is accomplished with precision, the stall warning horn will sound just prior to touchdown as the aircraft is decelerating in level flight a few inches above the runway.

10.7.3 Crosswind Landings

Adequate controllability during landing has been demonstrated using full flap extension (37.5° flap) in crosswind components up to 25 KIAS measured at a tower height of 33 feet. This demonstration was made with both engines operating, on a dry runway. This

is the maximum crosswind experienced during crosswind trials and is not considered limiting. Operators are encouraged to establish their own crosswind landing policies.

The following comments were written by the engineering test pilot who conducted crosswind testing of the Twin Otter for initial certification in 1967:

"The crosswind landings did not pose any problem, nor was any control limitation reached prior to touchdown. Approaching at 77 KIAS, the flare was performed with power at idle, and after touchdown the nose wheel was lowered to the ground, and held there with depressed elevator for the full ground run.

The approach was, in all cases, made with the into wind wing lowered and opposite rudder applied to align the aircraft with the runway. Just prior to touchdown, if the flare is sufficiently protracted that speed is significantly reduced, aileron requirements can grow such that occasionally it will reach the stop (applied to windward). Rudder only reaches the stop as speed falls off during the ground roll, and if used without brake, was sufficient to keep the aircraft straight down to nominal speeds. Any early use of brake introduced lateral skidding which made directional control more difficult. Nose wheel steering, while not directly required, is an effective aid particularly if skidding develops.

All touchdowns were made on the windward wheel, and occasionally the initial ground roll was on it and the nose wheel prior to the downwind main wheel touching the ground. Aileron was, in all cases, held applied during the ground roll, as it seems to aid in more equally distributing aircraft weight on the main wheels".

Based upon the above comments, the recommended technique for crosswind landing is to approach and touchdown with the upwind wing lowered, using rudder to align the aircraft with the runway. As airspeed decreases in the flare to touchdown, lateral and directional control requirements will increase.

Following touchdown, hold the nose wheel on the runway with the elevators and use the ailerons to inhibit any upwind wing lifting. The rudder should be used to control aircraft heading until deceleration to taxi speed is complete, at which point nose wheel steering and brakes may be used. Early use of brakes or application of significant amounts of reverse thrust may produce lateral skidding, making directional control more difficult. If lateral skidding is encountered during a crosswind landing, brakes should be released and the power levers should be moved out of reverse to either zero thrust or IDLE thrust.

When runway lengths permit, landing flap setting may be reduced to further improve both controllability and tolerance to crosswind.

The DHC-6 can land on very short runways if full flap is used for landing, and it can also land in strong crosswinds when less than full flap is used for landing. Attempting to land

in strong crosswinds with flaps fully extended is not recommended, simply because the crosswind component at touchdown speed becomes too great.

10.7.4 Use of Autopilot

Limitations apply to use of the autopilot during the final phase of approach and during single engine operations. The limitations vary depending on the type of autopilot fitted. Consult the AFM supplement for the autopilot.

10.7.5 Selection of Landing Flap

Only two flap settings are approved for landing the wheelplane. They are flaps 20° and flaps 37.5°. The performance charts are all based on landing with flaps 37.5°. Flaps 20° may be used if runway length permits.

Exceptionally, flaps 10° must be used for landing if an aircraft equipped for flight in known icing (FIKI) is landing during icing conditions, or if an aircraft not equipped for FIKI is landing following inadvertent exposure to icing conditions at any time during the flight.

Flaps 37.5° should not be used for landing if strong crosswinds are present.

Normally, flaps are not extended beyond 10° in IMC until the runway is in sight and the decision to land has been made. This ensures that the aircraft is configured for maximum missed approach performance if a missed approach becomes necessary.

During approach in VMC, landing flap may be extended once the aircraft is established on final. Landing flap should be selected with sufficient time remaining to allow the aircraft to be fully trimmed and fully stabilized prior to reaching 50 feet AGL.

10.7.6 Single Engine Approaches

During single engine approaches, flap should not be extended beyond 10° until landing is assured. The decision of what final flap configuration to use for single engine landings is made using the same criteria that would be used for a normal two engine landing.

10.7.7 Reverse Thrust Operation

Reverse thrust – defined as power lever movement aft of the IDLE stop that results in a N_G increase at negative blade angles – is most effective at speeds greater than 60 KIAS. If reverse thrust is to be used, it should be applied immediately following main gear touchdown. The objective is to use reverse thrust as the primary force to decelerate the aircraft to a speed less than 60 KIAS. On dry runways that offer good braking action, reverse thrust is of little value once speeds decrease to less than 40 KIAS. If desired,

the power levers may be left at the zero thrust position while decelerating from 40 KIAS to taxi speeds.

After any power lever movement aft of the IDLE stop is initiated, a full stop landing must be made.

Use of reverse thrust during single engine landings is not recommended.

10.7.8 Brake Operation

Brakes may be applied once the nose wheel has contacted the ground.

The pilot's seat(s) and the rudder pedals should be adjusted so that it is possible to apply maximum braking with full rudder deflection.

10.7.9 Directional Control During Landing

Directional control during landing should be maintained by use of rudder. As the aircraft slows down, asymmetric thrust may be used to control any tendency to weathercock in crosswinds.

In a crosswind, apply into wind aileron to maintain a wings-level attitude. This will increase directional control. Nose wheel steering should not be used until the aircraft has decelerated to taxi speeds.

10.7.10 Landing with Precision

If the aircraft is stabilized exactly at V_{REF} at 50 feet AGL when crossing the runway threshold, and if the power levers are promptly brought fully back to the IDLE position at 50 feet AGL, a precision ('spot') landing can be made. A firm touchdown should be targeted. Floating above the runway must be avoided, because the deceleration rate on the runway is approximately three times as great as the deceleration rate when airborne.

10.7.11 Overweight Landings

An overweight landing with a Twin Otter should be carried out using the same procedures as a normal landing. Because the difference between maximum take-off weight and maximum landing weight is only 200 pounds, no special techniques are required. To minimize brake energy requirements, the longest available into-wind runway should be used.

A maintenance inspection must be carried out following any overweight landing.

10.8 Amplified Emergency and Abnormal Procedures

This section provides additional explanation and elaboration of certain emergency and abnormal procedures that are provided in Section 3 of the AFM. In case of any conflict or ambiguity between the information presented here and the directions presented in Section 3, the directions presented in Section 3 take precedence.

10.8.1 One Engine Inoperative Landing

Approach flap (10° flap) and maximum RPM for the propeller of the operating engine (96% N_P) should be selected prior to circuit entry. This configures the aircraft for best rate of climb if climb should later be necessary. Once 10° flap has been selected, airspeed is limited by V_{FE} at the high end (103 KIAS for most aircraft) and V_{YSE} at the low end (80 KIAS). 90 KIAS is recommended as a single engine initial approach speed, as this provides the best margin between the two limitations.

Flaps should not be extended beyond 10° until the decision to land the aircraft has been made. Likewise, airspeed should not be decreased below 80 KIAS until the decision to land the aircraft has been made. Flap 20° may be selected for a single engine landing if runway length permits. If the runway is so short that full flap (37.5°) is needed, consideration should be given to selecting a different, longer runway.

Be prepared for greater than normal deceleration of the aircraft when flap is extended during single engine operation. This will require a proportionately larger than normal forward movement of the power lever to counteract it. If the aircraft has been properly trimmed during the single engine approach, it will yaw towards the operating engine when power is reduced to idle, so be prepared to adjust rudder trim during the flare.

Use of reverse thrust during single engine landings of landplanes and skiplanes is not necessary and is discouraged; however, it is not prohibited. Use of single engine reverse is prohibited when the aircraft is operating on floats.

10.8.2 One Engine Inoperative Missed Approach (Flaps 10°)

A single engine missed approach (or go-around) is straightforward and not difficult as long as the airspeed is equal to or greater than 80 KIAS at the beginning of the maneuver and no more than 10° of flap has been extended. The procedure is exactly the same as the procedure for an engine failure after take-off – set maximum power, maintain 80 KIAS, and ensure flaps are set to 10°. A climb will begin immediately. If flaps have been extended beyond 10° and/or airspeed is less than 80 KIAS, the aircraft will continue to descend while airspeed increases and flaps retract before transitioning to climb. For this reason, initiation of a single engine missed approach or single engine go-around at speeds less than 80 KIAS is prohibited, and initiation of a single engine

missed approach or single engine go-around with flap settings greater than 10° is not recommended.

10.8.3 Precautionary Landing

The procedure for a precautionary (off-airport) landing is exactly the same as the procedure for a normal full flap landing. To minimize total landing distance, precise control of approach airspeed at 1.3 V_S (the normal published reference speed) is required. Power levers should be brought back to the idle stop at 50 feet above ground, the same as a normal landing. Touchdown should be made on the main wheels, and the nose wheel should be kept off the ground as long as possible with elevator back pressure. On soft or rough surfaces, the most effective direction control is achieved with use of rudder only while the nose wheel is kept off the ground with full aft elevator movement. Use of reverse thrust should be avoided because application of reverse causes forward rotation about the lateral axis of the aircraft and brings the nose wheel down.

The main gear of the DHC-6 is robust. The nose wheel is less robust, particularly if it is not in the centered position. The objective during an off-airport landing is to keep the nose wheel off the ground as until the lowest possible speed, and to avoid using nose wheel steering when landing on soft or rough surfaces.

10.8.4 Forced Landing

The concepts are the same as for a precautionary landing. By landing with full flap and using full aft elevator to keep the nose wheel off the ground for as long as possible, maximum aerodynamic braking will be accomplished and the risk of nose wheel damage or collapse will be minimized.

The power off glide ratio of the Twin Otter, with both propellers feathered, is –8.18%. This results in a power off glide range of approximately two nautical miles for every 1,000 feet of height lost if the aircraft is flown at the appropriate glide speed for maximum range.

Graphs showing the appropriate speeds for glide (for maximum range, and for maximum endurance) are presented in on the following pages.

POWER-OFF GLIDE SPEED FOR MAXIMUM RANGE

(LANDPLANE)

GLIDE RANGE

1. –8.18% GRADIENT AT CORRECT SPEED FOR WEIGHT
2. APPROXIMATELY 2 NM PER 1,000 FEET ALTITUDE

ASSOCIATED CONDITIONS

1. FLAPS RETRACTED
2. POWER OFF GLIDE, BOTH PROPELLERS FEATHERED

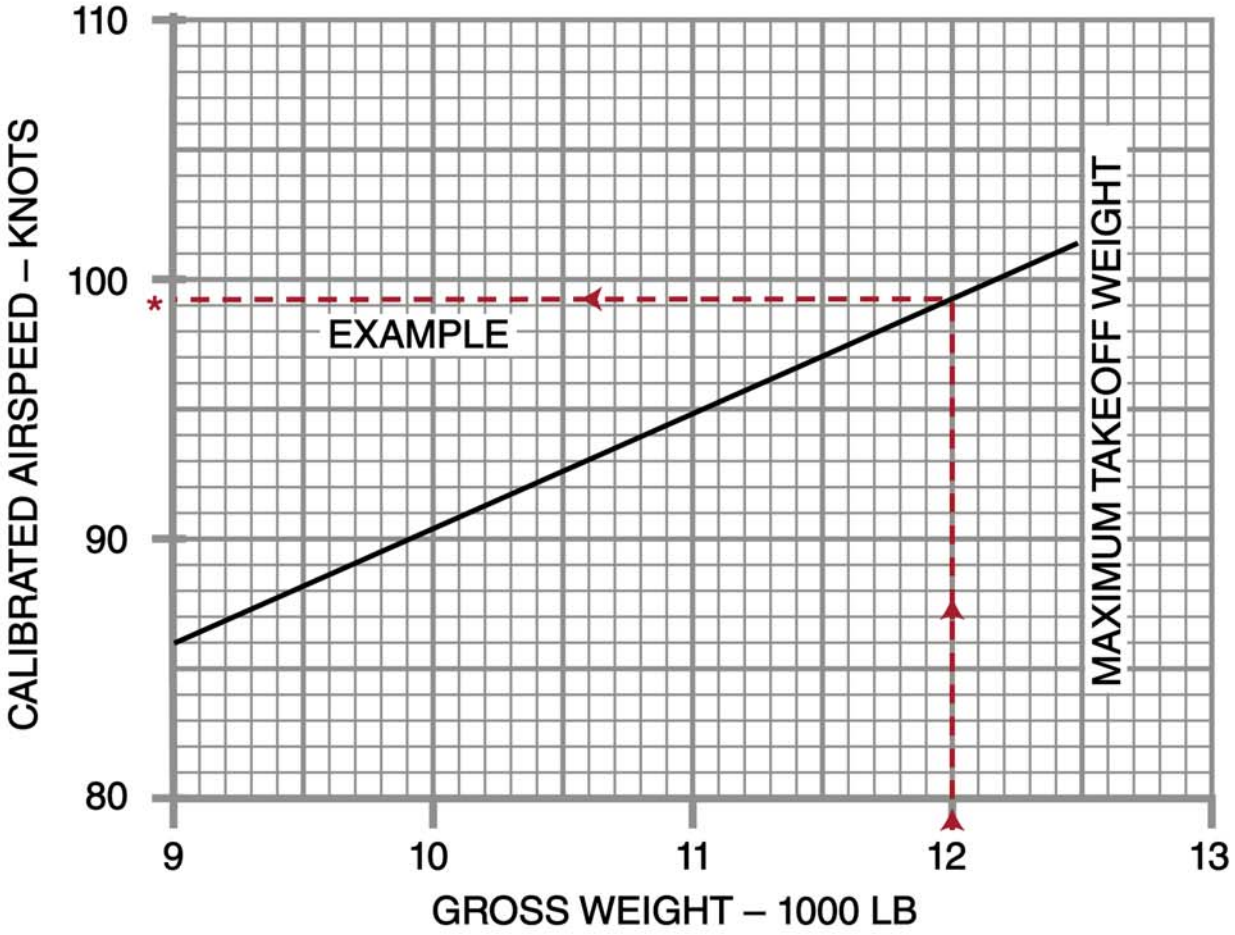


Figure 10-1 Glide Speed for Maximum Range

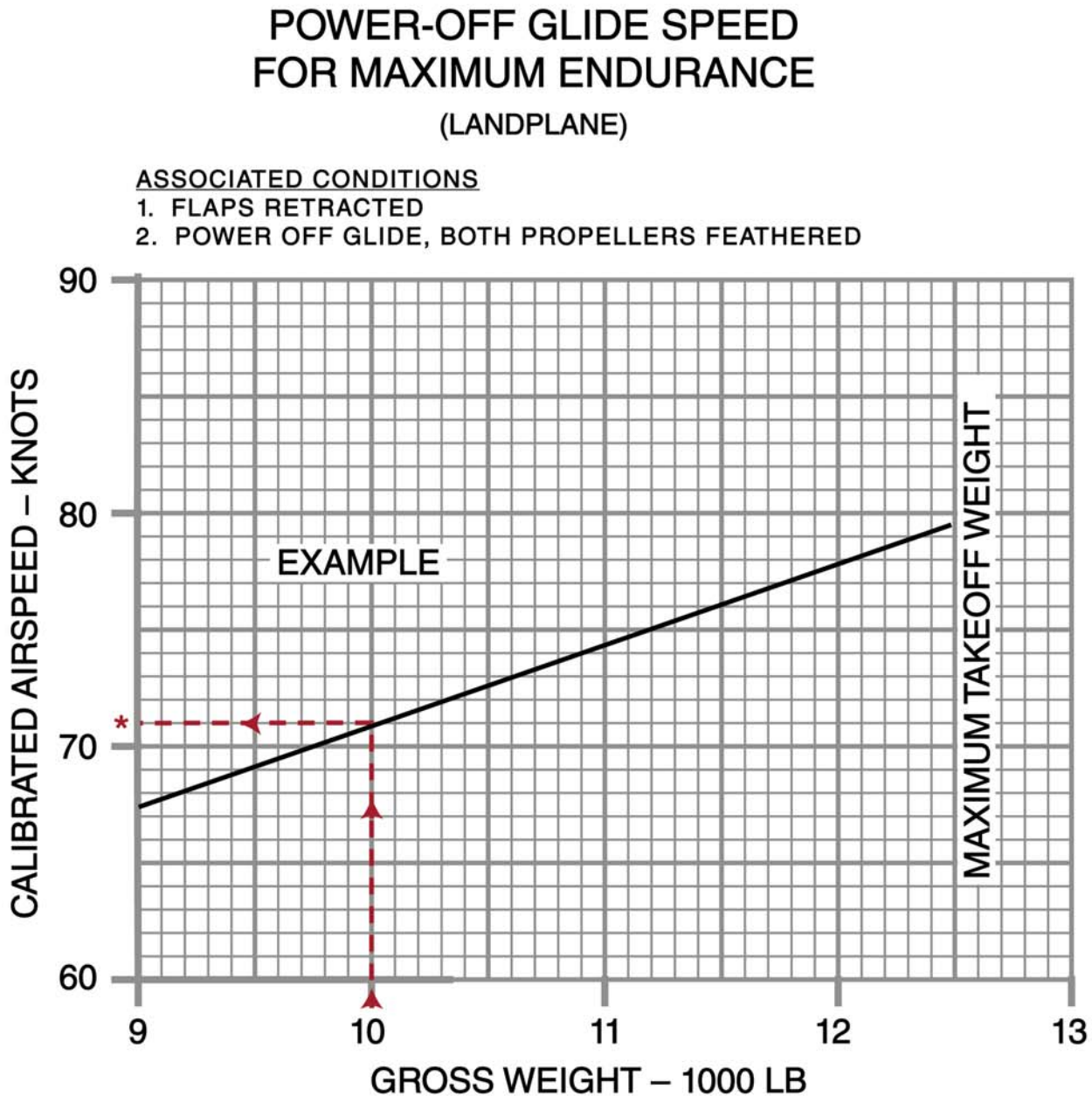


Figure 10-2 Glide Speed for Maximum Endurance

10.8.5 Landing with a Flat Tire

When landing with a flat main tire, the aircraft will begin to yaw towards the flat tire as soon as the flat tire begins to bear weight. This yaw can be minimized by using full aileron deflection to minimize weight on the flat tire during the initial portion of the landing. Rudder should be used to maintain directional control, followed by braking on the unaffected wheel only if required. Nose wheel steering should be avoided unless absolutely necessary to prevent a runway excursion.

When landing with a flat nose wheel tire, the concepts and procedure are similar to a precautionary or forced landing. The objective is to keep weight off the nose wheel until the lowest possible speed, hence the recommendation to avoid using the wheel brakes or reverse thrust, both of which will apply pressure to the nose wheel. Nose wheel steering should not be used at any time except as a last resort to prevent the aircraft from leaving the runway.

10.8.6 Flapless Landing

The most serious concern associated with making a flapless landing is the possibility of descending below a nominal 3° approach profile, most especially during the final 500 feet of descent, due to the unusual (uncommon for the pilot) pitch attitude of the aircraft during a flapless landing. To avoid this risk, it is recommended that the pilot choose a runway that is served by some form of vertical approach guidance system such as VASI or PAPI lighting or an ILS glideslope.

Carry out the initial portion of the approach at no less than 95 KIAS with a descent rate of 300 to 400 feet per minute, then slow to no less than 1.3 times stall speed for the aircraft weight during the last 500 feet of descent. Speed should be reduced below 95 KIAS only when landing has been assured. The target descent rate of 300 to 400 feet per minute should be maintained with power until just before touchdown. If the power levers are moved to the IDLE position too early (at too great a height above the runway) the tail skid may strike the ground during the flare. Touchdown should be made on the main wheels only.

If the aircraft begins to sink below a nominal 3° approach profile during the final 500 feet of descent once speed has been reduced below 95 KIAS, recovery will require **substantial** application of power.

If a go-around is necessary, best rate of climb speed with flaps 0° is 100 KIAS.

After touchdown on the main wheels, the nose wheel should be kept off the ground with application of aft elevator until airspeed decreases below 60 KIAS. This will avoid possible nose wheel shimmy due to the high touchdown speed. If runway length is minimal, apply reverse thrust and maximum wheel braking immediately following touchdown on the main wheels, but be alert to the risk of unequal response from the

engines when reverse thrust is applied, and the possibility of nose wheel shimmy due to the high nose wheel touchdown speed.

The total landing distance required is substantial, at least twice the total landing distance published for a full flap landing under the same circumstances.

A flapless landing is an abnormal maneuver, permitted only when necessary due to a malfunction of the flap system.

10.8.7 Ditching

Ditching should not be attempted unless it is absolutely unavoidable. No ditching trials were conducted during certification testing of the DHC-6. Several Twin Otters have been unintentionally ditched. Based upon experience gathered from these unintended ditchings, the following recommendations – which are generic in nature for high wing aircraft, and do not constitute a formal procedure – are offered.

The crew should be familiar with the use of emergency and survival equipment contained in their airplane. The passengers should be briefed on ditching procedures.

When a possible ditching emergency exists, appropriate distress procedures should be followed and preparations for the ditching should be initiated. If a passenger is available to assist, all cargo and equipment that will not be needed following the ditching should be jettisoned overboard via the right rear cabin door, and any loose objects remaining in the cabin should be secured. Do not jettison objects out the flight compartment windows due the risk of objects striking the propeller.

Fuel should be consumed until only the minimum fuel required for several approaches remains because empty fuel tanks will provide additional buoyancy. To maximize buoyancy, all doors and escape exits should be left closed until the airplane has come to a complete stop on the water.

In order to select a heading for ditching which will allow for an optimum touchdown, the wind speed and direction should be determined and as many low passes as circumstances permit should be made to assess water surface condition relative to the wind direction. If swell conditions exist, they should be assessed to avoid touching the water with a wingtip during or immediately after touchdown. If approaching across the swell, avoid landing into the face of the swell because the impact could cause structural failure or loss of control.

Approach check:

1 Final distress message, including aircraft position – transmitted

2 Flaps – Full 37.5°

3 PROP Levers – MAX RPM

4 Landing Lights – ON (if applicable)

5 Seat Belts (and Shoulder Harness if applicable) – Secure

6 ELT (if installed) – activate prior to ditching (ELT does not work under water)

Perform a power-on approach at the normal speed with a rate of descent of as low as possible (maximum 200 feet per minute rate of descent). As the water surface is approached, the nose should be raised in a normal flare, and power should be smoothly brought to IDLE by the time the level attitude has been reached in the flare. The airplane should be held off the water until the aft limit of the control wheel travel has been reached.

If you elect to use reverse thrust at or near touchdown to minimize nose down pitch be aware that reverse thrust applied at altitudes above approximately 10 feet (AGL) may result in a hard landing and structural damage to the airplane. The structural damage may make it difficult to open doors for escape. Additionally, it may not be possible to apply reverse thrust after contact with the water, owing to the "*g*" forces caused by rapid deceleration of the airplane.

The control wheel should be held fully aft until the airplane has come to a complete stop. Both the engine FUEL levers and the FUEL OFF emergency switches on the fire panel should be used to shut off the engines.

Because the undercarriage is not retractable, the airplane will decelerate rapidly following contact with the water, and will be subject to a strong nose-down pitching motion. The airplane should be expected to initially float with one wing in the water. The evacuation should be made from the high side of the aircraft, since opening doors or escape hatches on the high side will admit less water. The plug-type escape hatches near the wing in the passenger cabin do not reach the floor, and would not be expected to admit water as readily as the doors in the crew or passenger compartments. The top portion of the escape hatches must open before the retaining tabs in the bottom of the escape hatch doors can come free of the fuselage. If it is necessary, kick or punch the top half of the escape hatch plug-type door outwards after the release handle has been pulled.

The airplane should be evacuated as quickly as possible after coming to a complete stop. Life vests or other flotation devices should not be inflated until well clear of the airplane.

No data is available for estimating the floating duration of the DHC-6 airplane.

10.8.8 Starting Abnormalities

A fully charged main battery will normally accelerate the engine to between 16% and 18% N_G when the starter is engaged. If the engine stabilizes at less than 12% N_G, fuel should not be introduced and no further battery start attempt should be made.

If a starting abnormality is encountered after fuel has been introduced to the engine, the starter should be kept engaged for 10 seconds after the FUEL lever is moved to the OFF position. This will aid in reducing engine internal temperatures and clearing unburned fuel out of the engine. If a fire develops in an engine during start (as evidenced by smoke or flames visible at the exhaust stub), move the FUEL lever to the OFF position immediately, and continue to crank the engine with the starter to clear the fire. It may be appropriate in such circumstances to exceed the normal 25 second starter operation time limit.

Allowable T_5 temperatures during start are significantly higher than the colour codes marked on the face of the T_5 gauge. Starting temperatures as high as 1090° is acceptable as long as the temperature decreases to below 980° within 2 seconds, and continues to decrease to below 925° within 10 seconds. Temperatures as high as 925° are acceptable for the entire duration of the start, without time limitation. Starting temperature above 850° are, however, abnormal and should be investigated for cause. At the end of the start procedure, the idle temperature limit of 660° becomes applicable.

Oil pressure should rise above 0 PSI by the time the engine N_G has stabilized following starter engagement. If no rise in oil pressure is observed by the time N_G has stabilized, release the START switch and abandon the start attempt. Oil pressure should be 40 PSI or greater at the end of the start procedure when the engine has reached idle speed. If oil pressure has not reached 40 PSI at the end of the start procedure, shut down the engine by moving the FUEL lever to OFF.

10.8.9 Engine Shutdown in Flight

Always increase power on the operating engine as required before beginning shut-down of the problem engine. It is normally appropriate to move the PROP lever of the operating engine to the MAX RPM position prior to beginning shut-down of the problem engine in order to ensure that full power is available from the operating engine.

When beginning the engine shutdown procedure, reduce torque on the problem engine to 10 PSI torque – this is approximately equal to zero thrust. If the engine has failed completely and is not producing any torque at all, retard the power lever of the problem engine to the position that would normally produce 10 PSI torque – this is about one inch forward of the idle stop. If the power lever is brought back all the way to the idle stop before the propeller is feathered, excessive drag will be created (this as a result of the beta reverse valve on the propeller governor being partially depressed) and this will

aggravate yaw, create directional control difficulties, and cause an unwanted reduction in airspeed.

After retarding the power lever of the problem engine to about one inch forward of the idle stop, feather the propeller of the problem engine. Finally, shut the problem engine down by moving the fuel lever of the problem engine to the OFF position.

Once this is done, attention should be focused entirely on aircraft control, trim setting, and aircraft performance. Calculate and, if necessary, set maximum continuous power on the operating engine. The remainder of the checklist may be completed once the aircraft is fully trimmed and satisfactorily under control.

After the inoperative engine has been shut down, the position of the power lever of the inoperative engine should be brought forward and matched to the position of the power lever for the operating engine, and the two power levers should be moved together for the remainder of the flight. This will simplify engine control actions for the remainder of the flight and eliminate any confusion about which power lever needs to be moved – the pilot just moves both power levers together at the same time, same as he or she would during two engine flight.

The practice of moving the power lever of the problem engine back to only one inch forward of the idle stop (rather than moving it all the way back to the idle stop) applies any time an engine needs to be shut down during flight for any reason.

Once the Engine Failure checklist has been fully completed, confirm that both boost pump lights for the affected (failed) engine are illuminated. If the boost pump for the affected engine is turned off and the two boost pump caution lights for that engine do not illuminate, it is possible that the number 1 boost pump for that engine has failed, but the pressure switch for that boost pump has not correctly detected the failure. In this case, an airstart may be attempted after fuel supply to the affected engine has been re-established, either by liftint the number 2 boost pump switch of that engine (the emergency boost pump switch) up to the ON position, or by turning the fuel selctor knob so that both engines are supplied with fuel from the tank that is supplying the operating engine.

The Honeywell H-14 and Collins AP-106 autopilots, if installed, are not approved for use during single engine operations. The Collins FCS-65 Flight Control System installed on some late production DHC-6 aircraft is approved for single engine use, but only at speeds over 105 KIAS. It must not be used at lower speeds when only one engine is operating. Refer to AFM supplement 35 for additional information concerning the Collins FCS-65 Flight Control System.

10.8.10 Engine Flameout

Many years ago, the DHC-6 AFM contained a procedure entitled 'Emergency Relight'. This procedure was deleted from the aircraft flight manual in 1993 and should no longer be attempted. If an engine flames out, treat it as an 'Engine Failure in Flight', using the appropriate operational checklist, and if following investigation of the cause of the flameout it is appropriate to restart the engine, use the 'Airstart' operational checklist.

10.8.11 Oil Pressure Abnormalities

Oil pressure should be 80 PSI or greater anytime N_G is 72% or higher. Oil pressures between 40 and 80 PSI are marginally acceptable in older engines at idle speeds only (N_G less than 72%), provided that oil pressure rises above 80 PSI once N_G reaches 72%. Satisfactory engine oil pressures should be confirmed during the 5 second pause at 85% N_G prior to each take-off.

If oil pressure drops into the caution range (40 to 80 PSI) during flight, this indicates a significant problem within the engine. If operational safety permits, engine speed should be reduced to 70% N_G or less. If the oil pressure remains above 40 PSI, the engine may be left running at 70% N_G or less for the rest of the flight if it is required to provide bleed air and electrical generation (for example, during flight in icing conditions), otherwise, it is recommended that it be shut down when it is safe and convenient to do so.

If the ENGINE OIL PRESSURE caution light illuminates, confirm the oil pressure indicated on the oil pressure gauge for the same engine. If oil pressure indicated on the gauge is less than 40 PSI, the engine should be shut down if operational safety permits. If there is a disagreement between the ENGINE OIL PRESSURE caution light and the indication on the oil pressure gauge, observe the torque gauge. The torque gauge operates by sensing and measuring engine oil pressure in the reduction gearbox at the front of the engine. If there is any unusual indication observed on the torque gauge, or any instability in propeller speed, the engine should be shut down. If the torque gauge indication remains steady, the actual propeller speed remains steady, and the engine oil pressure displayed on the OIL PRESS gauge remains above 80 PSI and steady, but the ENGINE OIL PRESSURE caution light is on, it is probable that the ENGINE OIL PRESSURE caution light sensing mechanism has failed.

In the event of a sudden and catastrophic loss of oil pressure and/or quantity, the propeller will feather immediately. If this happens, the engine should be shut down in accordance with the 'Engine Shut-down in Flight' checklist. Priority should be given to aircraft control, as the engine will already be scrap if the propeller has feathered by itself due to loss of oil pressure or quantity.

10.8.12 Propeller Abnormalities

Propeller Overspeed

The primary propeller governor is calibrated to allow a maximum speed of 96% N_P. If the primary governor should fail, the propeller overspeed governor will limit maximum propeller speed to 101.5%. If the primary governor fails and the overspeed governor operates satisfactorily at 101.5%, the engine does not need to be shut down, and it may be used through its full range of power output for the balance of the flight. A landing should be made as soon as practical. To reduce the propeller speed mismatch between engines, the PROP lever of the unaffected engine should be moved forward to the MAX RPM position. This will reduce power lever stagger and minimize rudder trim change.

If N_P exceeds 101.5%, the overspeed governor is not functioning correctly and the engine should be shut down.

The green arc that marks the normal operating speed range of the propeller indicates 75% to 96% on aircraft without Mod 6/1687 (Propeller Tachometer – Revised Green Arc), and 75% to 91% on aircraft with Mod 6/1687. This modification was cut in as standard fitment beginning with SN 671 in order to comply with American FAA noise regulations that require limiting propeller speed (other than during take-off, landing, and abnormal or emergency operations) to 91%. No changes of any kind were made to the engine or the propeller – only the paint marking on the face of the gauge was changed. 96% N_P remains the 'engineering' limit for propeller speed for the purpose of interpreting propeller abnormalities. Aircraft fitted with 4 blade propellers (by STC) may be rigged to allow cruise N_P as low as 71% and be equipped with propeller tachometers that are marked for this lower limit. By itself, this lower speed range does not affect procedures for propeller abnormalities, however, the approved AFM supplement for the 4 blade propeller should be consulted for guidance.

Uncommanded Feathering

An uncommanded feathering of a propeller in flight results in a loss of all propulsion from that engine, thus the immediate actions are similar to those for an engine failure in flight. Engine gauge indications of the affected engine, particularly engine oil pressure, should be checked to see if they are within limits. If the N_G of the affected engine can be controlled with the power lever and all engine indications other than N_P are satisfactory, the problem should be investigated for cause before the engine is shut down. It may be possible to solve the problem and restore normal engine function.

A failure of any one of several unrelated sub-systems could be responsible for an uncommanded feathering. A catastrophic loss of oil quantity or oil pressure will cause the propeller to feather. In most cases, this will be indicated on the engine oil pressure gauge, and the engine should be shut down if oil pressure is below normal and the propeller has feathered by itself.

A failure of the beta back-up system, accompanied by a steady propeller beta range light, will also cause the propeller to feather. If the propeller beta range light is on, complete the checklist entitled 'Steady Beta Light'. If this solves the problem, the engine may be used for the remainder of the flight, and reverse may be used when landing. A failure of the autofeather system, if selected on, could also cause a propeller to feather, although the probability of this happening is rare. Selecting the autofeather switch to the off position should cause the propeller to come out of feather. If this solves the problem, the engine may be used for the remainder of the flight.

If none of these actions solve the problem, and all engine indications other N_P than are satisfactory, the engine may be left running at idle power if so desired in order to supply electricity and bleed air for operation of the de-icing systems. The PROP lever of the affected engine should be moved to the FEATHER position. If the affected engine is not needed for electrical generation or bleed air purposes, it should be shut down.

Propeller Reversal

The actions to take for an in-flight propeller reversal depend on whether the aircraft is equipped with propeller blade latches. Propeller blade latches are fitted to all floatplanes, but are normally not fitted to aircraft used exclusively on wheels or skis. If the propeller is not fitted with blade latches, the engine should be shut down. If the propeller is fitted with blade latches, the power lever of the affected engine should be brought to IDLE, and the engine left running.

10.8.12.1 Beta Control Malfunctions

The function of the BETA range lights is not always adequately understood by Twin Otter flight crew. Attention is directed to AFM Section 3, "Emergency Procedures", para 3.9.11.4 and 3.9.11.5, in which the appropriate actions in the event of BETA range light illumination as a result of malfunction are described.

Intermittent (Flashing) Beta Light

An intermittent propeller beta range light, accompanied by slight yaw towards the affected engine when the light illuminates, indicates that the that the propeller control is malfunctioning, and the beta back-up system is in operation. The appropriate action is to select the propeller levers to the minimum governing position, after which the flight may be continued in accordance with steps 2 to 6 of para 3.9.11.4.

An intermittently flashing propeller beta range light will only be observed when airspeed and engine power are reduced during the approach phase of flight and the PROP levers have been moved forward to the MAX RPM position in preparation for landing.

If the propeller beta range light begins to flash slowly when power is reduced, move both PROP levers aft to the minimum governing position (75% N_P), add power as needed

to increase propeller speed to 75% N_P, and do not advance the PROP levers to MAX RPM prior to landing. After landing, reverse will not be available due to the mechanical interlock. Do not twist the power lever handgrips at any time if the beta back-up light is flashing. If the power lever handgrips are twisted, the beta back-up system will be disabled, and the propeller may move towards reverse. After landing, the propeller beta range light will begin to flash. The affected engine does not need to be shut down and may be used for ground maneuvering purposes if desired. Maintenance attention will be required prior to the next flight.

Steady Beta Light

Steady illumination of either BETA range light during flight indicates a beta back-up system malfunction causing a slow increase in propeller blade angle towards feather. In this event, torque will increase on the affected engine and de-synchronization of propeller RPM will occur. The appropriate action to take should this event happen in cruise flight is detailed in Section 3 para 3.9.11.5, it is as follows:

1 Verify that the propeller beta range light is illuminated steadily and not slowly flashing.

2 Power lever (affected engine) – retard if necessary to prevent overtorque.

3 BETA SYS circuit breaker – pull circuit breaker out.

4 Power lever (affected engine) – as required.

5 Normal power may be used to complete the flight. Normal procedures should be followed for approach and landing. Reverse may be used after landing if desired.

Do not twist the power lever handles to deactivate the malfunctioning beta back-up system.

10.8.12.2 RESET PROPS Caution Lights

The RESET PROPS caution light will illuminate whenever the power levers are moved aft to a low power setting if the PROP levers have not been moved forward to the MAX RPM position. During final approach, the RESET PROPS caution light serves as a reminder to the pilot to put the two PROP levers forward to the MAX RPM position in order to force the primary propeller governor into an underspeed condition and thus give the pilot direct control of propeller blade angle via the power levers. To enhance control of the aircraft and also to ensure that the pilot has full engine horsepower available during final approach, the PROP levers must be moved forward to the MAX RPM position no later than 500 feet AGL when making a visual approach, or 500 feet above decision height or MDA when making an instrument approach.

If the RESET PROPS light illuminates during other phases of flight (for example, during an enroute descent at a low power setting), it may be disregarded. No action is necessary.

10.8.13 Electrical Abnormalities – DC Electrical

Loss of a single generator in flight is not a significant problem. The cabin air conditioner (if installed) will automatically drop off line when one generator fails as long as the mode switch is in the FLIGHT position. If the aircraft is not equipped with windshield heat, propeller de-ice, or non-standard scientific or photographic survey equipment, it will not be necessary to reduce electrical loads. If electrically powered de-icing equipment is being used, and the electrical load on the functioning generator is greater than 1.0, unnecessary lighting should be turned off first, followed by any unnecessary de-ice equipment such as windshield heat and propeller de-icing. It should not be necessary to turn off any avionics equipment.

No more than two attempts should be made to reset a generator which has failed.

If both generators trip offline, the inverter switch should be moved to the INVERTER NO. 1 position prior to opening the bus tie. This will ensure that battery power is available to the inverter after the BUS TIE switch is moved to the OPEN position. This procedure is not necessary on aircraft equipped with two independent inverter switches (S.O.O. 6142, which is standard fitment on Series 310 and 320 aircraft).

The reverse current circuit breaker is located in the passenger cabin, on the right side of the aircraft just above the emergency exit near seat row 2. If the reverse current circuit breaker (RCCB) has tripped (as evidenced by no electrical load of any kind on the battery loadmeter), it may be reset in flight, assuming a second person is on board the aircraft to do this. To prevent arcing within the RCCB, the EXTERNAL / BATTERY switch should be selected to the center OFF position prior to resetting RCCB, and then moved back to BATTERY after the RCCB has been successfully reset. The RCCB was replaced by current limiters (fuses) beginning with SN 631. It is not possible to reset or change these current limiters in flight.

If the BUS TIE switch is OPEN and one electrical bus is without power, generator caution light indications can be misleading. The left generator caution light receives power to illuminate from the right bus, and the right generator caution light receives power to illuminate from the left bus. If both generator switches are turned off and the bus tie is open, the left generator light will not be illuminated because there will be no power available on the right bus to illuminate the light. Do not misinterpret this as an indication that the left generator has come back on line. Whenever the BUS TIE switch is open, do not rely on the GENERATOR caution lights, instead, check the loadmeter to determine if a generator is producing power.

In the event of a failure of both generators that cannot be resolved, the main aircraft battery will support IFR operations for at least 20 minutes. Battery life may be prolonged by shutting off unnecessary electrical services. Electrical services that use considerable amounts of power, in approximate order from highest to lowest, include air conditioning, windshield heat, nacelle inlet intake de-ice boots (S.O.O. 6062, a rare option installed on Series 310 and 320 aircraft), propeller de-ice, valve heat, pitot heat, weather radar, exterior and interior lighting, autopilots, and HF radios.

Most DHC-6 aircraft are equipped with 40 amp-hour main batteries. A rough approximation of battery life can be made by dividing electrical demand observed on the battery loadmeter by the amp hour rating of the battery. If electrical demand is 60 amps, the battery will provide power for up to 40 minutes. This calculation should be discounted by approximately 20% because the battery will not maintain full voltage until total discharge is reached. Thus, 32 minutes of battery service could reasonably be expected from a 40 amp-hour battery if the electrical demand is 60 amps. Likewise, 64 minutes of service could be expected if electrical load is reduced to 30 amps.

GENERATOR OVERHEAT caution lights were fitted as standard equipment to Series 310 and 320 aircraft only, and were rarely ordered as an option (S.O.O. 6031) on other aircraft. They operate by sensing the temperature on the upper surface of the generator case. High generator temperatures could be caused by high electrical demand or by mechanical failure (for example, bearing degradation) within the generator. If the GENERATOR OVERHEAT light does not go out within 3 minutes of turning off the generator, mechanical failure can be presumed.

10.8.14 Electrical Abnormalities – Battery Overheat

The most probable cause of a battery overheat is a sustained high demand for charging current from a battery that was significantly discharged before the generators were brought online. The most likely time that crew will encounter a battery overheat is between 5 and 10 minutes after the generators have been brought online. For this reason, it is advisable to check the battery temperature indicator immediately prior to take-off. This is why checking the battery temperature indicator is the very last item in the ‘Before Take-off’ checklist.

Battery temperature monitoring is required on aircraft fitted with nickel-cadmium batteries. It is not required on aircraft fitted with lead-acid batteries. Very few lead-acid batteries are equipped with the temperature sensors needed to support battery temperature monitoring. For this reason, it is common to see the battery temperature indicator placarded as ‘inoperative’ on aircraft that have been fitted with a lead-acid battery.

The battery temperature monitor is comprised of two totally independent systems, one that operates the dial pointer and one that operates the red light. Indication of

an overheat condition from either one of the sensor systems is sufficient to warrant completing the battery overheat checklist – it is not necessary that both sensor systems (the pointer and the light) indicate that an overheat exists.

10.8.15 Electrical Abnormalities – AC Electrical

There are two different designs of AC power supply for DHC-6 aircraft, and the procedures for normal and abnormal operations are different between the two designs.

For aircraft with a single inverter switch:

The basic design for Series 300 aircraft provides one INVERTER switch with two positions, INVERTER 1 and INVERTER 2. If the inverter in use fails, the switch should be moved to select the other inverter. If any unusual problems are observed with any of the AC powered instruments prior to inverter failure, remove the fuse for the affected instrument from either the fuse panel behind the left pilot or the center pedestal panel before changing to the other inverter.

Each inverter has its own circuit breaker to protect power being supplied to the inverter. These breakers, labelled INVERTER 1 and INVERTER 2, are located on the overhead circuit breaker panel on the right hand side of the flight compartment roof. A third circuit breaker, labelled INVR 2 CONT and located at the top of the main circuit breaker panel, provides power to the relays used to switch from one inverter to the other. These three circuit breakers should be checked. If it is not possible to restore 400 cycle power by changing the INVERTER switch to the other inverter, one reset attempt may be made if one of these circuit breakers is found to have tripped.

There is a fuse on the AC fuse panel (located above and behind the left pilot seat) labelled 400 ~ FAIL. If this fuse has blown, the 400 CYCLE caution light will illuminate even though both inverters may be functioning properly and all AC powered services are being supplied with AC power. Pressing the FUEL IND TEST button momentarily and checking for movement of the main tank fuel gauge needles will confirm whether or not 115 volt AC power is present. It is possible to have a failure of 26 volt AC power (which will cause the 400 CYCLE light to illuminate) without an accompanying failure of 115 volt power, or vice-versa.

In the event of a total AC electrical failure (failure of both inverters), the electrically powered HSI will no longer indicate aircraft heading, although it is possible that the DC powered course deviation needle may still correctly indicate displacement from the selected radial or localizer. The standby magnetic compass can be used for heading information. Windshield heat must be turned off when using the magnetic compass; otherwise the compass indications will be unreliable.

Following a total AC electrical failure, the main tank fuel gauges will no longer function. The time of the failure and the fuel quantity present at the time of the failure should

be noted to enable calculation of probable fuel remaining for the duration of the flight. Wing tank fuel gauges are DC powered and will not be affected.

AC powered instruments may be identified by referring to the AC fuse panel above and behind the left pilot seat, and by referring to all fuses present on the avionics circuit breaker panel at the bottom of the center pedestal. At the time the aircraft was constructed, all AC powered equipment was protected by fuses, and all DC powered equipment was protected by circuit breakers. It is possible that AC powered equipment retrofitted since the aircraft left the factory may be protected by AC circuit breakers.

For aircraft with two inverter switches (Series 310, 320, and aircraft with S.O.O. 6142 installed):

The design of the AC electrical system on aircraft with S.O.O. 6142 installed is as follows: When both inverter switches are in the NORM position, each inverter is supplied with power from a different DC bus, and both inverters function at the same time, supplying AC power to instruments and services on their own unique AC bus or busses.

If either one of the 400 CYCLE caution lights illuminates, the switch of the affected inverter should be moved downwards to the center OFF position. If the 400 CYCLE light goes out, this indicates that there is a ground fault on one of the AC busses that this particular inverter serves. In such a case, the services powered by that inverter are lost, and no further action should be taken.

If the 400 CYCLE light remains on after the INVERTER switch of the affected inverter has been moved to the OFF position, this indicates that there is no ground fault present on the busses served by that inverter. In such a case, the INVERTER switch of the affected inverter may be moved further downward to the EMER position. This will route power from the other (unaffected) inverter to the busses normally supplied by the failed inverter. The unaffected inverter will now be powering all of the AC busses on the aircraft, and all AC services should operate normally.

Aircraft modified by Engineering Order 68473 or equipped with S.O.O. 6176 will have a DC powered left hand attitude indicator.

On aircraft fitted with S.O.O. 6142, AC electrical load distribution is as follows:

Left 115 Volt AC Bus (Left Inverter)	**Right 115 Volt AC Bus (Right Inverter)**
Left pilot directional gyro	Right pilot directional gyro
Left pilot attitude indicator	Right pilot attitude indicator
FWD and AFT fuel quantity indicators	

The 26 volt AC bus is normally powered by the left inverter. The fuel flow, oil pressure, and torque indicators are supplied with power from the 26 volt AC bus.

10.8.16 Electrical Abnormalities – Gyro Instruments

Gyroscopic instruments are electrically powered on all Series 300 aircraft. AC power is commonly used. The inverters supply both 26 volt and 115 volt AC power, both at 400 cycles per second. The 400 CYCLE caution light will illuminate if 26 volt AC power is lost, but there is no equivalent annunciation if only 115 volt AC power is lost. The main fuel tank gauges are powered by 115 volt AC power, thus pressing the FUEL IND test button and observing movement of the fuel indicator needles will prove the presence (or absence) of 115 volt AC power.

Gyroscopic instruments may use either 26 volt or 115 volt AC power. If a red flag appears on more than one gyroscopic instrument at the same time, indicating loss of power, the most likely cause is a total (26 and 115 volt) or partial (26 volt only or 115 volt only) failure of the inverter, and this should be investigated first using the operational procedures for inverter failure.

If the inverter is not the cause of the problem, or if a red flag is observed on a single flight instrument, the individual fuses for the flight instrument(s) should be checked. Fuses for the attitude indicator and artificial horizon are located on the AC fuse panel behind the left pilot seat. Some complex instruments such as flight director displays may have more than one fuse, and the additional fuse(s) may be located on the avionics fuse panel at the base of the center pedestal.

Aircraft fitted with S.O.O. 6176 (a DC powered attitude indicator at the left pilot position) operate differently. If a major DC power failure occurs, this instrument will be automatically powered from the auxiliary battery bus as long as the EXTERNAL /BATTERY switch remains in the BATTERY position and the DC MASTER switch remains in the ON position. This instrument is powered through a single circuit breaker on the main (left side) panel labelled PILOT ART HORIZ.

10.8.17 Fuel System Abnormalities

Illumination of the BOOST PUMP 1 caution light for one fuel tank is not a serious problem and does not require immediate action. The automatic changeover system will automatically energize the number 2 boost pump in the affected tank. This can be confirmed by observing that the BOOST PUMP 2 caution light for the affected tank is not illuminated. A brief flickering of the BOOST PUMP 2 caution light for the affected tank is normal at the moment the boost pump number 1 fails, however, the BOOST PUMP 2 caution light should extinguish within one second following failure of the number 1 boost pump.

If the automatic changeover system works as designed and the BOOST PUMP 2 caution light for the affected tank is not illuminated, do not lift up (turn on) the STDBY BOOST PUMP EMER switch.

If the automatic changeover system does not work, as evidenced by illumination of both the BOOST PUMP 1 and BOOST PUMP 2 caution lights for the same tank, lift up (turn on) the STDBY BOOST PUMP EMER switch for the affected tank. If the BOOST PUMP 2 caution light does not go out, adjust the FUEL SELECTOR rotary switch so that both engines are supplied from the opposite side (unaffected) tank, and land with the FUEL SELECTOR switch in this position. Consider the fuel in the affected tank to be unusable for fuel planning purposes.

It has been demonstrated that the engines will perform at low altitudes without the fuselage fuel tank boost pumps operating. The altitude at which the fuel supply to the engine may become inadequate varies with the fuel used and the temperature of the fuel. Flights over 10,000 feet have been made using new engines, new engine-driven fuel pumps, and cold JP4 fuel. If a double boost pump failure occurs at high altitudes (above 8,000 feet pressure altitude at cruise power), an engine flameout is possible. If this occurs, the engine may be re-started once fuel supply has been re-established.

In all of the above cases, the abnormal procedure provided in Section 3 will include pulling the circuit breaker for the affected number 1 pump.

The FUEL LOW LEVEL caution light will illuminate when 75 pounds of fuel remains in the forward tank and/or when 110 pounds of fuel remains in the aft tank. This is equal to 12 minute and 17 minutes, respectively, of flight at maximum continuous power. It is unlikely that any pilot would choose to operate the engine at maximum continuous power when a FUEL LOW LEVEL light is illuminated.

The basic principle to follow when FUEL LOW LEVEL light illuminates is to adjust the FUEL SELECTOR rotary switch so that both engines are supplied from the opposite side (unaffected) tank, and land with the FUEL SELECTOR switch in this position. The fuel in the tank with the FUEL LOW LEVEL caution light on should be considered unusable for fuel planning purposes.

In the event of imminent fuel exhaustion, as indicated by illumination of both FUEL LOW LEVEL caution lights and correspondingly low fuel levels indicated on the fuel gauges, virtually all the remaining fuel may be used down to the zero point on the fuel gauges, but in order to use all of the usable fuel on board (in other words, in order to use the last 100 pounds remaining in each tank), the aircraft pitch attitude must be kept as close to level as possible. The FUEL SELECTOR rotary switch may be adjusted as necessary to balance fuel tank levels so as to make use of all fuel on board. Obviously, a landing must be made as soon as possible. This may require consideration of an off-aerodrome

precautionary landing. Minimum power necessary to sustain flight should be used in order to conserve fuel.

In an emergency, 240 pounds per engine per hour (assuming no winds aloft and a pressure altitude of 10,000 feet) may be used as a starting point while more precise calculations are made to determine the appropriate power setting for best fuel range. Detailed calculations for best range and best endurance based on actual conditions may be found in the performance section of this AFM and in the supplementary performance data contained towards the end of Section 10.

If a FUEL LOW LEVEL caution light illuminates and the fuel gauge for the corresponding tank indicates a quantity of 300 pounds or greater, it is probable that fuel is not transferring correctly from the collector cells into the fuel tank cell that contains the boost pumps and the fuel low level float switch. Lifting up (turning on) the STDBY BOOST PUMP EMER switch for the affected tank may help with fuel transfer if the problem is caused by reduced performance of the number 1 boost pump, but this may not help if the problem is caused by a blockage in the fuel gallery under the tanks. The most appropriate action is to adjust the FUEL SELECTOR rotary switch so that both engines are supplied from the opposite side (unaffected) tank, then consider the fuel remaining in the affected tank to be unusable for fuel planning purposes.

If fuel quantity becomes critical following a fuel transfer failure, almost all of the fuel in the affected tank can be used provided that the aircraft is kept in an approximately level pitch attitude. A slight nose-up attitude will facilitate gravity transfer of fuel if the problem is in the forward tank, likewise, a slight nose down attitude will facilitate gravity transfer of fuel if the problem is in the aft tank. Extreme pitch attitudes, or prolonged nose-up or nose-down attitudes that do not favour gravity flow of fuel within the cells of the affected tank should be avoided.

Be aware that when the STDBY BOOST PUMP EMER switch for either tank has been selected up to the on position, the number 2 boost pump will continue to operate even when the FUEL SELECTOR rotary switch has been rotated to select the other (opposite side) tank. This can be either advantageous or undesirable, depending on fuel tank levels and fuel management objectives.

If the aircraft is equipped with optional extended range wing tanks, the boost pumps for the wing tanks may be selected ON in order to take advantage of any fuel that may be present in the wing tanks. Fuel will continue to flow from any one wing tank to the engines when the FUEL SELECTOR rotary switch has been moved away from the center (NORM) position, as long as fuel is present in the wing tank and the wing tank boost pump is ON. This may be confirmed by observing the reduction in fuel quantity in the wing tank over time, and the corresponding decrease in the rate of consumption of fuel from the selected main tank over time.

10.8.18 Duct Overheat

Illumination of the DUCT OVERHEAT caution light most often occurs shortly after take-off. The overheat is caused by a lack of ram air input that is needed to move hot bleed air out of the heater plenum to the flight compartment and the cabin. In most cases, opening the RAM AIR valve will solve the problem.

The AUTO mode of the cabin heating system is not designed for use on ground. If cabin heating is selected to AUTO when the aircraft is on ground and the engines are idling, the heater bleed air valve will open fully. As soon as take-off power is applied, a DUCT OVERHEAT warning will appear.

10.8.19 Hydraulic System Abnormalities

It is not possible to determine from observation alone whether lower than normal hydraulic pressure is caused by a failure of the electric hydraulic pump or by a loss of hydraulic system fluid. If the electric hydraulic pump runs continuously but pressure does not rise, this suggests a loss of fluid.

If low hydraulic pressure is observed, the first action to take is to attempt to pump up hydraulic pressure using the hand pump. If pressure rises, a failure of the electric pump can be presumed, and the circuit breaker for the electric pump should be pulled. Hydraulic pressures as low as zero PSI are acceptable in cruise flight because air loads will keep the flaps in the fully retracted position, and wheel brakes and nose wheel steering are not required in flight. Prior to reducing speed in preparation for flap extension, hydraulic pressure should be pumped up to approximately 1,500 PSI.

The acceptable range of normal hydraulic pressure is not marked on the face of the gauge. The acceptable ranges are 1,300 to 1,600 PSI for aircraft prior to SN 511 and 1,225 to 1,625 PSI for aircraft SN 511 and subsequent or for earlier aircraft with Mod 6/1570 incorporated. The difference between pre and post mod status is minor and is not operationally significant.

Once flaps are extended, hydraulic pressure should be maintained at 1,500 PSI or higher at all times. The pilot should plan to come to a full stop following landing. Flaps should not be retracted until the aircraft has come to a full stop and the parking brake has been set. Otherwise, a normal approach and landing may be carried out. Subsequent taxiing of the aircraft should be carried out slowly and with considerable caution. Large movements of the nose wheel tiller may deplete hydraulic system pressure faster than the pilot can operate the pump.

If hydraulic pressure does not rise after 30 to 40 strokes of the hand pump, a loss of hydraulic fluid can be presumed. If the leak is in the braking system, all fluid will be lost. If the leak is not in the braking system, sufficient fluid may remain in the brake

accumulator to allow for 2 or 3 applications of brakes after landing. To conserve fluid, do not press the brake pedals until the aircraft is on ground and wheel braking is needed.

In either case, if hydraulic fluid has been lost, flaps will not be available, and nose wheel steering will not be available. A flapless landing will need to be made. Runway requirements will be well in excess of twice the length published for a normal landing, and a minimum 4,000 foot runway length at ISA conditions is recommended if there is any doubt about availability of wheel brakes.

The recommended procedure for a flapless landing is provided in the abnormal checklist for 'Flapless Landing'. Additional guidance is for a flapless landing without wheel brakes is as follows:

After touchdown, the nose wheel should be kept off the ground as long as possible with application of aft elevator. Rudder should be used for directional control. Aileron may also be used if a crosswind is present, to equalize the weight on the main wheels. When the nose wheel eventually falls to the ground even though full aft elevator has been applied (typically this will happen at approximately 30 KIAS), slow and cautious application of zero thrust (not reverse thrust) will assist in stopping.

Be aware that engines may not spool up at equal rates of speed if reverse thrust is used, and nose wheel steering will not be available. For this reason, use of reverse is not recommended unless there is a risk of over-running the far end of the runway.

Once the aircraft has come to a stop on the runway, shut the engines down by moving the fuel levers to the OFF position without feathering the propellers. Do not under any circumstances attempt to taxi the aircraft after it has come to a full stop on the runway following landing. The aircraft will need to be towed off the runway.

10.8.20 Doors Unlocked Caution Light

The aircraft control problems caused by a door (or number of doors) opening on the ground or in flight are minimal. The risk of serious injury or death resulting from efforts made to close doors is far more serious. Twin Otter pilots have been killed by the propellers when exiting the aircraft on the ground to secure a door, and there has been one confirmed report of a pilot falling out of the DHC-6 passenger cabin in flight as a result of an attempt to secure a cabin door.

The operational checklists for a DOOR UNLOCKED caution light are thus constructed based on the lessons learned in these unfortunate accidents. It is difficult and dangerous to attempt to exit the DHC-6 on ground via the flight compartment doors unless the engine on the appropriate side has been shut down. At normal engine idle speed, even a feathered propeller still rotates with sufficient force to kill a person on contact.

Successful control of the DHC-6 has been demonstrated in flight with all doors opened. During nose up climb attitudes, the nose baggage compartment door will open fully. It is quite likely that the door will part from the nose baggage compartment structure shortly after it opens if it becomes unlatched during a climb, and it will likely strike the left propeller after it parts from the nose section. There is nothing that can be done to stop this from happening; therefore all attention should be focused on normal control of the aircraft during the climb. If the nose baggage door is still present at the top of climb, it will move towards the closed position when the aircraft is levelled off. A full flap landing should be made to minimize the likelihood of the door lifting again during the flare.

The flight compartment doors will open and trail several inches out at the aft edge due to low pressure in the area of the door if they become unlocked during flight. Closing and re-locking the door can be assisted by lowering the window of the opposite side pilot door several inches and then making a forward slip towards the affected door. The pilots should keep their seat belt and shoulder harness fastened at all times. If it is not possible to easily close the door, simply disregard it.

If the main cabin doors (the double doors) become unlocked on an aircraft equipped with cargo doors (dual sideways opening doors), the forward of the two doors will remain almost fully closed due to airflow. The rear of the two doors may open fully and impact the baggage compartment door handle. This may cause the baggage compartment door to unlock, however, the baggage compartment door will not be able to open due to the presence of the aft main door which will held against the baggage compartment door by the airflow.

If the airstair door opens in flight, considerable rudder and aileron trim will be required to compensate for the drag created by the door, but the aircraft will continue to be fully controllable. The landing should be made in as level an attitude as possible to minimize the possibility of the airstair door touching the ground during the flare and causing directional control difficulties during the flare. No attempt of any kind should be made to close the airstair door in flight.

If the right rear door becomes unlocked in flight, it will remain mostly closed due to air flow.

There has been one report of a passenger unintentionally opening a plug-type emergency exit (near passenger seat row 2) during flight. The exit door parted the aircraft as expected and fell free without interference to the propeller. The engine noise and blast of wind was frightening to all, but no control difficulties were encountered and a normal approach and landing was carried out.

10.8.21 Static System Miscompare, or Questionable Static Instrument Indications

When the PILOT STATIC lever is in the NORM position, the left hand pilot instruments are supplied with static from the two lower static vents and the right hand pilot instruments are supplied with static from the two upper vents. If the PILOT STATIC lever is moved to the EMER position, both sets of instruments will be provided with static pressure from the upper vents only. Moving the PILOT STATIC selector to the EMER position does not provide a third, independent source of static pressure.

In the event of a miscompare between left and right hand static instruments, attempt to determine which side is most likely to be accurate by consulting independent sources of absolute altitude or groundspeed information such as GPS receivers prior to moving the PILOT STATIC selector to the EMER position. Do not rely on information from the transponder (Mode C altitude encoding data), because the encoder is normally connected to the one of the two pilot static systems.

If it is determined that the right pilot's static instruments are trustworthy, moving the PILOT STATIC lever to the EMER position will supply the left pilot's instruments with static air from the same source that is used to supply the right pilot's instruments.

In a worst-case situation, break the glass on the face of the left pilot's vertical speed indicator. This will supply the left pilot's instruments with static air from the cabin, and the right pilot's instruments will continue to be supplied with static from the two upper ports regardless of the position of the PILOT STATIC selector lever.

10.9 Maximum Performance STOL Take-Off

10.9.1 Introduction

The procedures for Maximum Performance STOL (MPS) operations exploit the full STOL capabilities of the aircraft. Because they do not provided the level of safety required by CAR 3, Normal Category Operations they may be used only when specifically authorized (by way of an Operations Specification) by the appropriate regulatory authority. Procedures and supporting performance data for MPS are no longer published in the POH. These procedures and the supporting performance data may be obtained by DHC-6 operators upon written application to Viking Air Limited – Customer Support.

The material that follows in this section is an exact reproduction of an Air Carrier Advisory Circular (ACAC) that was published by Transport Canada in the mid 1990s and circulated to all Canadian Air Carriers. The document was also circulated to all regulatory authorities in the world who had DHC-6 aircraft registered in their jurisdiction.

10.9.2 Purpose

Several operators of the DHC-6 Twin Otter aircraft have requested permission for use in commercial operation of the "Maximum Performance STOL" (MPS) technique described in the supplementary operating data. The purpose of this Air Carrier Advisory Circular (ACAC) is to set out the guidelines for DHC-6 MPS take-offs.

10.9.3 Background

Transportation Safety Board of Canada (TSB) investigation into a DHC-6 accident in March of 1992 revealed that several operators were conducting MPS take-offs in this aircraft despite the unapproved status of the procedure. The first page outlining the procedure bears an annotation requiring specific authorization by the regulating authority for MPS operations. Because no such approvals had been granted or requested at the time of the TSB recommendation, Transport Canada Civil Aviation (TCCA) Air Carrier Inspectors were directed to advise all affected air carriers that MPS take-offs should cease until approval was granted.

Subsequent to that action, TCCA began researching DHC-6 MPS operations together with industry pilots and FlightSafety International's DHC-6 simulator staff in order to determine a safe mode of operation. A secondary goal was to evaluate the effectiveness of the simulator in MPS training.

Exercises included all-engine MPS take-offs, and the following engine failures:

1 Critical engine failure at liftoff, autofeather operating;

2 Critical engine failure at liftoff, autofeather off;

3 Critical engine failure at V_{MCA}, autofeather operating;

4 Critical engine failure at V_{MCA}, autofeather off;

5 Critical engine failure at liftoff during single-pilot MPS operations; and

6 Failure of the non-critical engine at liftoff, autofeather operating.

The research yielded the following results:

1 During MPS operations, the aircraft becomes airborne well below V_{MCA}. With both engines operating, acceleration to V_{MCA} occurs in 1-3 seconds. This creates a window during which an engine failure could result in a loss of directional control, particularly if the inoperative engine does not feather immediately;

2 Initial climb following a MPS liftoff is very shallow, requiring special obstacle clearance considerations;

3 Even when properly flown, a single-engine climb following a MPS liftoff resulted in a lateral deviation of between 15 and 30 degrees from centreline. At 0.5 NM, this resulted in lateral displacements of over 500 feet from the centreline. Altitude gain did not exceed 160 feet at 1 Nautical Mile from the point of liftoff with take-off weights from 10,800 pounds to 12,500 pounds;

4 Use of autofeather greatly enhanced initial climb performance following an engine failure. In cases where autofeather was not used, the aircraft generally did not perform adequately to ensure a safe recovery;

5 The simulator used provided an adequate facility for conducting MPS training and testing.

10.9.4 Decision

Operations employing the MPS take-off procedure will require specific authorization in the form of an Operations Specification from TCCA. Single pilot MPS operations will be authorized separately from MPS operations using two-pilot crews.

MPS take-offs may be conducted by an authorized operator provided the following conditions are met:

1 The Chief Pilot or senior pilot responsible for DHC-6 training will require a minimum of two hours MPS familiarization in a simulator equipped to faithfully recreate MPS normal and abnormal operations;

2 Line pilots who are authorized to conduct MPS take-offs will require annual training consisting of the following:

a Ground training covering MPS normal and abnormal procedures for each series of aircraft operated;

b A review of Limitations during normal and MPS operations; and

c A minimum of three MPS take-offs monitored by an individual qualified in accordance with paragraph (a) immediately above.

NOTE

Engine failures associated with MPS conditions shall not be simulated below 1000 feet AGL.

3 Proof of annual MPS training will be indicated on the pilot's company training files and certified by an individual qualified as indicated in paragraph (a) immediately above;

4 Company MPS procedures will be set out in the Operations Manual;

5 For each MPS departure:

a The aircraft shall have a fully serviceable autofeather system installed and operating;

b The pilot-in-command shall verify that adequate visual cues exist to conduct a MPS take-off. MPS take-offs shall not be performed at night nor in whiteout/greyout conditions;

c The pilot-in-command shall ensure that the ceiling and visibility are adequate to permit visual obstacle avoidance in the event of an engine failure during a MPS take-off.

10.9.5 Conclusion

This ACAC has identified the conditions necessary for the use of the "Maximum Performance STOL" take-off procedure which appears as Supplementary Operating Data for the DHC-6 Twin Otter aircraft. Operators wishing to employ this procedure should contact the nearest TCCA regional office.