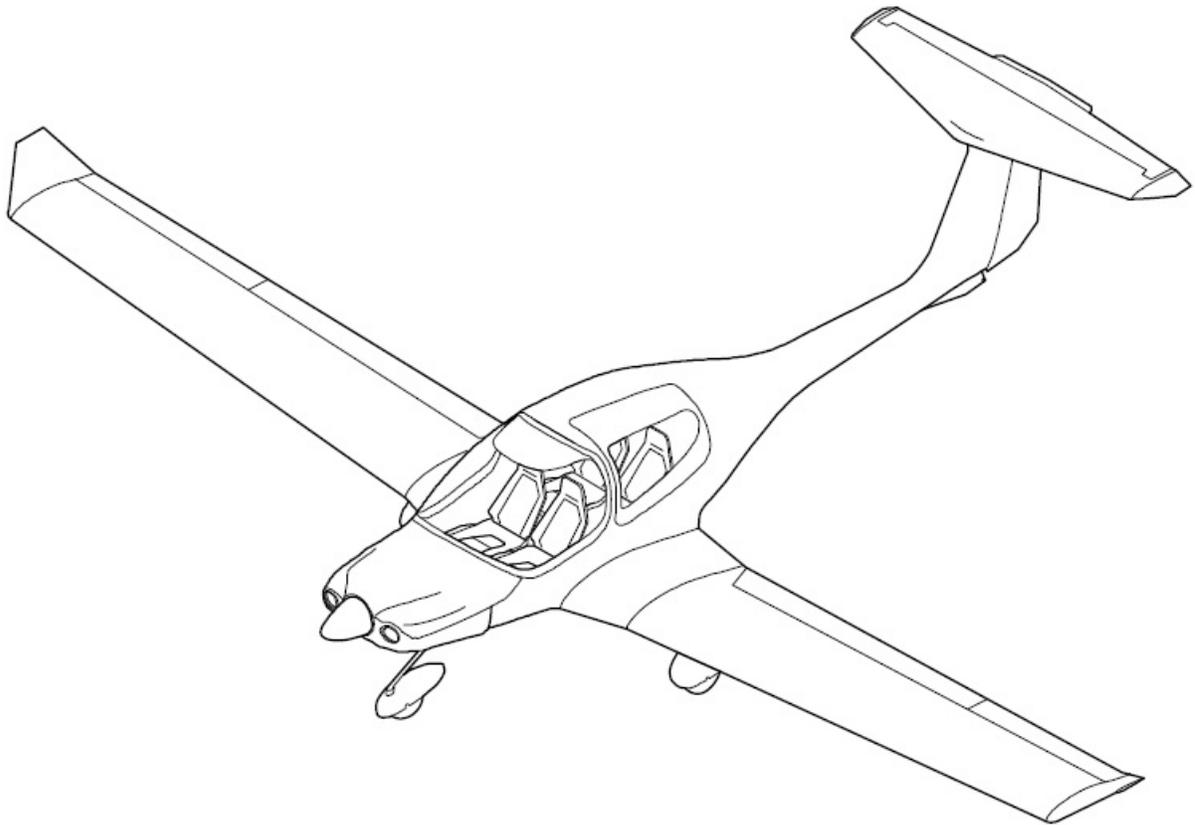


# AIRPLANE FLIGHT MANUAL

---



## **DA 40-180**

Doc. # 6.01.01-E

DIAMOND AIRCRAFT INDUSTRIES INC.  
1560 CRUMLIN SIDEROAD, LONDON, ONTARIO  
CANADA, N5V 1S2

All rights reserved. No part of this manual may be reproduced or copied  
in any form or by any means without written permission  
of DIAMOND AIRCRAFT INDUSTRIES INC.

Copyright © 2023 by DIAMOND AIRCRAFT INDUSTRIES INC., London, Ontario

---

## **REV 10**

Current issue: 18-Sep-2023

This manual contains the maintenance information required by AWM Chapter 523. Contents and revision status can be found in the TABLE OF CONTENTS and the RECORD OF REVISIONS.

DIAMOND AIRCRAFT INDUSTRIES INC.  
1560 CRUMLIN SIDEROAD  
London, Ontario, Canada, N5V 1S2

<http://www.diamondaircraft.com/>

For more information contact:

DIAMOND AIRCRAFT INDUSTRIES INC.  
Technical Publications  
+1-519-457-4000 Ext. 3204  
[techpubs@diamondaircraft.com](mailto:techpubs@diamondaircraft.com)

# AIRPLANE FLIGHT MANUAL

## DA 40

**Category of Airworthiness** : Normal, Utility  
**Requirement** : AWM Chapter 523  
**Serial Number** : \_\_\_\_\_  
**Registration** : \_\_\_\_\_  
**Doc. No.** : 6.01.01-E  
**Date of Issue** : 18-Sep-2023

Signature

DocuSigned by:



2BE2FBE348AE416...  
 Andreas Hartono

A/ Chief Flight Test

for Director,  
 National Aircraft Certification  
 TRANSPORT CANADA

Authority

Date of Approval : September 19, 2023

This Airplane Flight Manual is approved in accordance with the Canadian Aviation Regulations.  
 This Airplane Flight Manual is FAA approved for U.S. registered aircraft in accordance with the provisions of 14 CFR Section 21.29, and is required by FAA Type Certificate Data Sheet no.: A47CE.

**DIAMOND AIRCRAFT INDUSTRIES INC.**

**1560 CRUMLIN SIDEROAD**

**London, Ontario, Canada**

**N5V 1S2**

## FOREWORD

■ We congratulate you on the acquisition of your new DIAMOND DA 40.

■ Skillful operation of an airplane increases both safety and the enjoyment of flying. Please take the time therefore, to familiarize yourself with your new DIAMOND DA 40.

This airplane may only be operated in accordance with the procedures and operating limitations of this Airplane Flight Manual.

■ Before this airplane is operated for the first time, pilots must familiarize themselves with the complete contents of this Airplane Flight Manual.

■ In the event that you have obtained your DIAMOND DA 40 second-hand, please let us know your address, so that we can supply you with the publications necessary for the safe operation of your airplane.

This document is protected by copyright. All associated rights, in particular those of translation, reprinting, radio transmission, reproduction by photo-mechanical or similar means and storing in data processing facilities, in whole or part, are reserved.

■ Copyright © by:           DIAMOND AIRCRAFT INDUSTRIES INC.  
■                               1560 Crumlin Sideroad  
■                               London, Ontario, Canada, N5V 1S2  
■                               Phone : +1-519-457-4000  
■                               E-Mail : Techpubs@diamondaircraft.com

## 0.1 APPROVAL

The content of approved chapters is approved by the Department of Transport.

## 0.2 RECORD OF REVISIONS

All revisions of this manual, with the exception of -

- Temporary Revisions,
- updates of the modification level (Section 1.1),
- updated mass and balance information (Section 6.3),
- updates of the Equipment Inventory (Section 6.5), and
- updates of the List of Supplements (Section 9.2)

must be recorded in the following table.

The new or amended text is indicated by a vertical black line at the left hand side of the revised page, with the revision number and date appearing at the bottom of the page.

### **NOTE**

If pages are revised which contain information valid for your particular serial number (modification level of the airplane, weighing data, Equipment Inventory, List of Supplements), then this information must be transferred to the new pages in hand-writing.

Temporary Revisions, if applicable, are inserted into this manual. Temporary Revisions are used to provide information on systems or equipment until the next “permanent” revision of the Airplane Flight Manual. When a “permanent” revision covers a Mandatory, or Optional Design Change Advisory (MÄM or OÄM), then the corresponding Temporary Revision is superseded. For example: Revision 5 covers OÄM 40-061, therefore the Temporary Revision TR-OÄM 40-061 is superseded by the “permanent” Revision 5.

Rev. No.	Reason	Chapter	Page(s)	Date of Revision	Approval	Date of Approval	Date Inserted	Signature
1	Corrections	All	All	26-Sep-2000	Approved by Ing. Andreas	09-Oct-2000		
2	OÄM 40-060 (White Wire optional)	0	0-2, 0-4 thru 0-7	19-Dec-2000	Approved by Ing. Andreas Winkler for ACG	25-Jan-2001		
		1	1-16					
		2	2-1, 2-7 thru 2-8, 2-13 thru 2-19					
	OÄM 40-058 (Essential Bus)	3	3-7, 3-8, 3-19, 3-20, 3-25, 3-26					
	OÄM 40-073 (LASAR optional)	4A	4A-3 thru 4A-8, 4A-14, 4A-15					
		4B	4B-4 thru 4B-6					
	Corrections	6	6-1, 6-2, 6-12 thru 6-14					
7	7-1, 7-8, 7-14, 7-28 thru 7-38							
3	OÄM 40-064 (Night VFR)	0	0-2 thru 0-7	05-Feb-2001	Approved by Ing. Andreas Winkler for ACG	02-Jul-2001		
		1	1-2					
		2	2-1, 2-8, 2-9, 2-12 2-15 thru 2-20					
	OÄM 40-069 (control surf. gust lock)	3	3-1, 3-25 thru 3-27					
	OÄM 40-070 (tow bar)	4A	4A1, 4A-8 thru 4A-31					
		5	5-7, 5-14, 5-16					
	Corrections	6	6-7, 6-9, 6-12 thru 6-14					
		7	7-32, 7-35, 7-36					
		8	8-1 thru 8-9					

Rev. No.	Reason	Chapter	Page(s)	Date of Revision	Approval	Date of Approval	Date Inserted	Signature
4	OÄM 40-067 (IFR) Corrections	All	All	04-Apr-2001	Approved by Ing. Andreas Winkler for ACG	02-Jul-2001		
5	OÄM 40-061 (KAP 140 autopilot)	0	0-1 thru 0-8	09-Sep- 2001	Approved by Ing. Andreas Winkler for ACG	09-Sep- 2001		
	OÄM 40-073 (SlickSTART)	1	1-2, 1-5, 1-14					
	OÄM 40-081 (door lock)	2	2-1, 2-16, 2-22, 2-23, 2-24					
	OÄM 40-085 (KX 155A as COM 1)	3	3-13, 3-18, 3-22, 3-23, 3-24, 3-31, 3-36					
	OÄMs 40-092 thru 40- 094 (Mikrotechna ASI, altimeter, VSI)	4A	4A-9, 4A-10, 4A-22, 4A-23, 4A-26					
	MÄM 40-039/a (VM 1000)	4B	4B-1, 4B-8					
	MÄM 40-048 (RH emerg. window)	6	6-5, 6-8 thru 6-17					
	Corrections	7	7-13, 7-14, 7-33, 7-35					
		8	8-10					
	9	9-3, 9-4, 9-5						

Rev. No.	Reason	Chapter	Page(s)	Date of Revision	EASA Approval No.	ACG Compliance	Date Inserted	Signature
6	Type certification in China	0	0-0, 0-5, 0-6	15-Sep-2004	2004-12326	Ing. Andreas Winkler for ACG		
7	<p><b>MÄM-40-</b> -047, -069, -075, -078, -096, -099, -123e, -133, -141, -174, -175;</p> <p><b>OÄM-40-</b> -063/b, -071/c, -077, -078, -080, -083/a, -090, -091, -097, -098, -103, -104, -105, -106, -111, -112, -114, -115, -117, -117/a, -119, -120, -121, -122, -124, -127, -128, -138, -140, -154, -165, -167, -168, -179, -181, -183, -185, -186, -190, -198, -200, -206, -237, -250/a;</p> <p>RÄM-40-014;</p> <p>Corrections</p> <p>Double-sided layout</p>	All	All except cover page	15-Jul-2006	Revision No. 7 of the AFM Doc. No. 6.01.01-E is approved under the authority of DOA No. EASA.21J.052	11-Aug-2006 Dipl.-Ing. (FH) Manfred Reichel for DAI		

Rev. No.	Reason	Chapter	Page(s)	Date of Revision	EASA Approval No.	ACG Compliance	Date Inserted	Signature
8	<p><b>MÄM-40-</b> -176, -227/a, -313, -344, -360/a, -378, -401, -415, -428, -446;</p> <p><b>OÄM-40-</b> -217, -251, -253/b, -258, -267, -277/a, -279, -283/a, -284, -289, -326, -327;</p> <p>Corrections</p>	All	All except cover page	01-Dec-2010	Revision No. 8 of the AFM Doc. No. 6.01.01-E is approved under the authority of DOA No. EASA.21J.052			
9	<p><b>MÄM-40-</b> -580, -617;</p> <p><b>OÄM-40-</b> -252, -362, -369, -371</p>	0 1 2 3 4A 6 7	0-5, 0-6, 0-7, 0-8, 0-9, 0-11, 0-12, 0-13, 1-3, 1-7, 2-22, 2-25, 3-29, 4A-11, 4A-12, 4A-22 thru 4A-24, 4A-34, 4A-35, 6-17 thru 6-34 , 7-1, 7-2, 7-25 thru 7-58	31-Jan-2014	Revision No. 9 of the AFM Doc. No. 6.01.01-E is approved under the authority of DOA No. EASA.21J.052			

Rev. No.	Reason	Chapter	Page(s)	Date of Revision	Approval Note	Date of Approval	Date Inserted	Signature
10	<p><b>MÄM DAIC-0042</b></p> <p><b>MÄM 40-</b> -766, -816, 1008, -1020, -1087;</p> <p><b>OÄM 40-</b> -375, -401, -1030, -1034;</p> <p>TR-17-01, change in type design responsibility from ACG to TCCA;</p> <p>Corrections</p>	All	All	18-Sep-2023				

### 0.3 LIST OF EFFECTIVE PAGES

Ch.	Page	Date
0	0-1	18-Sep-2023
	0-2	18-Sep-2023
	0-3	18-Sep-2023
	0-4	18-Sep-2023
	0-5	18-Sep-2023
	0-6	18-Sep-2023
	0-7	18-Sep-2023
	0-8	18-Sep-2023
	0-9	18-Sep-2023
	0-10	18-Sep-2023
	0-11	18-Sep-2023
	0-12	18-Sep-2023
	0-13	18-Sep-2023
	0-14	18-Sep-2023
	0-15	18-Sep-2023
	0-16	18-Sep-2023

Ch.	Page	Date
1	1-1	18-Sep-2023
	1-2	18-Sep-2023
	1-3	18-Sep-2023
	1-4	18-Sep-2023
	1-5	18-Sep-2023
	1-6	18-Sep-2023
	1-7	18-Sep-2023
	1-8	18-Sep-2023
	1-9	18-Sep-2023
	1-10	18-Sep-2023
	1-11	18-Sep-2023
	1-12	18-Sep-2023
	1-13	18-Sep-2023
	1-14	18-Sep-2023
	1-15	18-Sep-2023
	1-16	18-Sep-2023
	1-17	18-Sep-2023
	1-18	18-Sep-2023
	1-19	18-Sep-2023
	1-20	18-Sep-2023
	1-21	18-Sep-2023
	1-22	18-Sep-2023



Ch.	Page	Date
2	2-1	18-Sep-2023
	2-2	18-Sep-2023
	2-3	18-Sep-2023
	2-4	18-Sep-2023
	2-5	18-Sep-2023
	2-6	18-Sep-2023
	2-7	18-Sep-2023
	2-8	18-Sep-2023
	2-9	18-Sep-2023
	2-10	18-Sep-2023
	2-11	18-Sep-2023
	2-12	18-Sep-2023
	2-13	18-Sep-2023
	2-14	18-Sep-2023
	2-15	18-Sep-2023
	2-16	18-Sep-2023
	2-17	18-Sep-2023
	2-18	18-Sep-2023
	2-19	18-Sep-2023
	2-20	18-Sep-2023
	2-21	18-Sep-2023
	2-22	18-Sep-2023
	2-23	18-Sep-2023
	2-24	18-Sep-2023
	2-25	18-Sep-2023
	2-26	18-Sep-2023
	2-27	18-Sep-2023
	2-28	18-Sep-2023

Ch.	Page	Date
3	3-1	18-Sep-2023
	3-2	18-Sep-2023
	3-3	18-Sep-2023
	3-4	18-Sep-2023
	3-5	18-Sep-2023
	3-6	18-Sep-2023
	3-7	18-Sep-2023
	3-8	18-Sep-2023
	3-9	18-Sep-2023
	3-10	18-Sep-2023
	3-11	18-Sep-2023
	3-12	18-Sep-2023
	3-13	18-Sep-2023
	3-14	18-Sep-2023
	3-15	18-Sep-2023
	3-16	18-Sep-2023
	3-17	18-Sep-2023
	3-18	18-Sep-2023
	3-19	18-Sep-2023
	3-20	18-Sep-2023
3-21	18-Sep-2023	
3-22	18-Sep-2023	
3-23	18-Sep-2023	
3-24	18-Sep-2023	
3-25	18-Sep-2023	
3-26	18-Sep-2023	
3-27	18-Sep-2023	
3-28	18-Sep-2023	
3-29	18-Sep-2023	
3-30	18-Sep-2023	

Ch.	Page	Date
4A	4A-1	18-Sep-2023
	4A-2	18-Sep-2023
	4A-3	18-Sep-2023
	4A-4	18-Sep-2023
	4A-5	18-Sep-2023
	4A-6	18-Sep-2023
	4A-7	18-Sep-2023
	4A-8	18-Sep-2023
	4A-9	18-Sep-2023
	4A-10	18-Sep-2023
	4A-11	18-Sep-2023
	4A-12	18-Sep-2023
	4A-13	18-Sep-2023
	4A-14	18-Sep-2023
	4A-15	18-Sep-2023
	4A-16	18-Sep-2023
	4A-17	18-Sep-2023
	4A-18	18-Sep-2023
	4A-19	18-Sep-2023
	4A-20	18-Sep-2023
	4A-21	18-Sep-2023
	4A-22	18-Sep-2023
	4A-23	18-Sep-2023
	4A-24	18-Sep-2023
	4A-25	18-Sep-2023
	4A-26	18-Sep-2023
	4A-27	18-Sep-2023
	4A-28	18-Sep-2023
	4A-29	18-Sep-2023
	4A-30	18-Sep-2023

Ch.	Page	Date
4A	4A-31	18-Sep-2023
	4A-32	18-Sep-2023
	4A-33	18-Sep-2023
	4A-34	18-Sep-2023

Ch.	Page	Date
4B	4B-1	18-Sep-2023
	4B-2	18-Sep-2023
	4B-3	18-Sep-2023
	4B-4	18-Sep-2023
	4B-5	18-Sep-2023
	4B-6	18-Sep-2023
	4B-7	18-Sep-2023
	4B-8	18-Sep-2023
	4B-9	18-Sep-2023
	4B-10	18-Sep-2023
	4B-11	18-Sep-2023
	4B-12	18-Sep-2023

Ch.	Page	Date
5	5-1	18-Sep-2023
	5-2	18-Sep-2023
	5-3	18-Sep-2023
	5-4	18-Sep-2023
	5-5	18-Sep-2023
	5-6	18-Sep-2023
	5-7	18-Sep-2023
	5-8	18-Sep-2023
	5-9	18-Sep-2023
	5-10	18-Sep-2023
	5-11	18-Sep-2023
	5-12	18-Sep-2023
	5-13	18-Sep-2023
	5-14	18-Sep-2023
	5-15	18-Sep-2023
	5-16	18-Sep-2023
	5-17	18-Sep-2023
	5-18	18-Sep-2023
	5-19	18-Sep-2023
	5-20	18-Sep-2023
	5-21	18-Sep-2023
	5-22	18-Sep-2023
	5-23	18-Sep-2023
	5-24	18-Sep-2023
	5-25	18-Sep-2023
	5-26	18-Sep-2023

Ch.	Page	Date
6	6-1	18-Sep-2023
	6-2	18-Sep-2023
	6-3	18-Sep-2023
	6-4	18-Sep-2023
	6-5	18-Sep-2023
	6-6	18-Sep-2023
	6-7	18-Sep-2023
	6-8	18-Sep-2023
	6-9	18-Sep-2023
	6-10	18-Sep-2023
	6-11	18-Sep-2023
	6-12	18-Sep-2023
	6-13	18-Sep-2023
	6-14	18-Sep-2023
	6-15	18-Sep-2023
	6-16	18-Sep-2023
	6-17	18-Sep-2023
	6-18	18-Sep-2023
	6-19	18-Sep-2023
	6-20	18-Sep-2023
	6-21	18-Sep-2023
	6-22	18-Sep-2023
	6-23	18-Sep-2023
	6-24	18-Sep-2023
	6-25	18-Sep-2023
	6-26	18-Sep-2023
	6-27	18-Sep-2023
	6-28	18-Sep-2023
	6-29	18-Sep-2023
	6-30	18-Sep-2023

Ch.	Page	Date
6	6-31	18-Sep-2023
	6-32	18-Sep-2023
	6-33	18-Sep-2023
	6-34	18-Sep-2023



Ch.	Page	Date
7	7-1	18-Sep-2023
	7-2	18-Sep-2023
	7-3	18-Sep-2023
	7-4	18-Sep-2023
	7-5	18-Sep-2023
	7-6	18-Sep-2023
	7-7	18-Sep-2023
	7-8	18-Sep-2023
	7-9	18-Sep-2023
	7-10	18-Sep-2023
	7-11	18-Sep-2023
	7-12	18-Sep-2023
	7-13	18-Sep-2023
	7-14	18-Sep-2023
	7-15	18-Sep-2023
	7-16	18-Sep-2023
	7-17	18-Sep-2023
	7-18	18-Sep-2023
	7-19	18-Sep-2023
	7-20	18-Sep-2023
	7-21	18-Sep-2023
	7-22	18-Sep-2023
	7-23	18-Sep-2023
	7-24	18-Sep-2023
	7-25	18-Sep-2023
	7-26	18-Sep-2023
	7-27	18-Sep-2023
	7-28	18-Sep-2023
	7-29	18-Sep-2023
	7-30	18-Sep-2023

Ch.	Page	Date
7	7-31	18-Sep-2023
	7-32	18-Sep-2023
	7-33	18-Sep-2023
	7-34	18-Sep-2023
	7-35	18-Sep-2023
	7-36	18-Sep-2023
	7-37	18-Sep-2023
	7-38	18-Sep-2023
	7-39	18-Sep-2023
	7-40	18-Sep-2023
	7-41	18-Sep-2023
	7-42	18-Sep-2023
	7-43	18-Sep-2023
	7-44	18-Sep-2023
	7-45	18-Sep-2023
	7-46	18-Sep-2023
	7-47	18-Sep-2023
	7-48	18-Sep-2023

Ch.	Page	Date
8	8-1	18-Sep-2023
	8-2	18-Sep-2023
	8-3	18-Sep-2023
	8-4	18-Sep-2023
	8-5	18-Sep-2023
	8-6	18-Sep-2023
	8-7	18-Sep-2023
	8-8	18-Sep-2023
	8-9	18-Sep-2023
	8-10	18-Sep-2023
	8-11	18-Sep-2023
	8-12	18-Sep-2023

Ch.	Page	Date
9	9-1	18-Sep-2023
	9-2	18-Sep-2023
	9-3	18-Sep-2023
	9-4	18-Sep-2023
	9-5	18-Sep-2023
	9-6	18-Sep-2023

**0.4 TABLE OF CONTENTS**

	Chapter
<b>GENERAL</b> .....	1
(a non-approved chapter)	
<b>OPERATING LIMITATIONS</b> .....	2
(an approved chapter)	
<b>EMERGENCY PROCEDURES</b> .....	3
(a non-approved chapter)	
<b>NORMAL OPERATING PROCEDURES</b> .....	4A
(a non-approved chapter)	
<b>ABNORMAL OPERATING PROCEDURES</b> .....	4B
(a non-approved chapter)	
<b>PERFORMANCE</b> .....	5
(a non-approved chapter)	
<b>MASS AND BALANCE / EQUIPMENT LIST</b> .....	6
(a non-approved chapter)	
<b>DESCRIPTION OF THE AIRPLANE AND ITS SYSTEMS</b> .....	7
(a non-approved chapter)	
<b>AIRPLANE HANDLING, CARE AND MAINTENANCE</b> .....	8
(a non-approved chapter)	
<b>SUPPLEMENTS</b> .....	9

# CHAPTER 1

## GENERAL

	Page
1.1 INTRODUCTION .....	1-3
1.2 CERTIFICATION BASIS .....	1-5
1.3 WARNINGS, CAUTIONS AND NOTES .....	1-5
1.4 DIMENSIONS .....	1-6
1.4.1 OVERALL DIMENSIONS .....	1-6
1.4.2 WING .....	1-6
1.4.3 AILERON .....	1-6
1.4.4 WING FLAPS .....	1-6
1.4.5 HORIZONTAL TAIL .....	1-6
1.4.6 VERTICAL TAIL .....	1-7
1.4.7 LANDING GEAR .....	1-7
1.5 DEFINITIONS AND ABBREVIATIONS .....	1-7
1.5.1 AIRSPEEDS .....	1-7
1.5.2 METEOROLOGICAL TERMS .....	1-8
1.5.3 FLIGHT PERFORMANCE AND FLIGHT PLANNING .....	1-9
1.5.4 MASS AND BALANCE (M&B, W&B) .....	1-9
1.5.5 ENGINE .....	1-11
1.5.6 DESIGNATION OF THE CIRCUIT BREAKERS .....	1-11
ON THE INSTRUMENT PANEL	
1.5.7 EQUIPMENT .....	1-14
1.5.8 DESIGN CHANGE ADVISORIES .....	1-14
1.5.9 MISCELLANEOUS .....	1-15
1.6 UNITS OF MEASUREMENT .....	1-16
1.6.1 CONVERSION FACTORS .....	1-16
1.6.2 CONVERSION CHART LITERS/US GALLONS .....	1-18
1.7 THREE-VIEW DRAWING .....	1-19

1.8	SOURCE DOCUMENTATION .....	1-20
1.8.1	ENGINE .....	1-20
1.8.2	PROPELLER .....	1-21
1.8.3	ENGINE INSTRUMENTS .....	1-21
1.8.4	IGNITION CONTROL UNIT .....	1-22

## 1.1 INTRODUCTION

This Airplane Flight Manual has been prepared in order to provide pilots and instructors with all the information required for the safe and efficient operation of the airplane.

The Airplane Flight Manual includes all the data which must be made available to the pilot according to the AWM 523 requirement. Beyond this, it contains further data and operating instructions which, in the manufacturer's opinion, could be of value to the pilot.

This Airplane Flight Manual is valid for all serial numbers. Equipment and modification level (design details) of the airplane may vary from serial number to serial number. Therefore, some of the information contained in this manual is applicable depending on the respective equipment and modification level. The exact equipment of your serial number is recorded in the Equipment Inventory in Section 6.5. The modification level is recorded in the following table (as far as necessary for this manual).

Modification	Source	Installed	
		<input type="checkbox"/> yes	<input type="checkbox"/> no
RH Emergency Window	MÄM 40-048	<input type="checkbox"/> yes	<input type="checkbox"/> no
Modified MLG Strut	MÄM 40-123/e	<input type="checkbox"/> yes	<input type="checkbox"/> no
1200 kg Maximum Take-Off Mass	MÄM 40-227	<input type="checkbox"/> yes	<input type="checkbox"/> no
Garmin G1000 NXi	MÄM 40-1008	<input type="checkbox"/> yes	<input type="checkbox"/> no
USB Ports	MÄM 40-1051	<input type="checkbox"/> yes	<input type="checkbox"/> no
Autopilot	OÄM 40-061	<input type="checkbox"/> yes	<input type="checkbox"/> no
Tow-Plane Operation	OÄM 40-063/b	<input type="checkbox"/> yes	<input type="checkbox"/> no
Emergency Switch	OÄM 40-067	<input type="checkbox"/> yes	<input type="checkbox"/> no
Essential Bus	OÄM 40-068	<input type="checkbox"/> yes	<input type="checkbox"/> no
Long Range Tank	OÄM 40-071/b	<input type="checkbox"/> yes	<input type="checkbox"/> no
Alternate Static Valve	OÄM 40-072	<input type="checkbox"/> yes	<input type="checkbox"/> no
SlickSTART Ignition System	OÄM 40-073	<input type="checkbox"/> yes	<input type="checkbox"/> no
MT P-420-10 Governor	OÄM 40-077	<input type="checkbox"/> yes	<input type="checkbox"/> no

Modification	Source	Installed	
		<input type="checkbox"/> yes	<input type="checkbox"/> no
Operation with Winter Kit	OÄM 40-078	<input type="checkbox"/> yes	<input type="checkbox"/> no
Door Locking System	OÄM 40-081	<input type="checkbox"/> yes	<input type="checkbox"/> no
NLG Speedkit	OÄM 40-105	<input type="checkbox"/> yes	<input type="checkbox"/> no
MLG Speedkit	OÄM 40-106	<input type="checkbox"/> yes	<input type="checkbox"/> no
Essential Tie Relay Bypass	OÄM 40-126	<input type="checkbox"/> yes	<input type="checkbox"/> no
Baggage Extension	OÄM 40-163	<input type="checkbox"/> yes	<input type="checkbox"/> no
Baggage Tray*	OÄM 40-164	<input type="checkbox"/> yes	<input type="checkbox"/> no
Winter Baffle Fresh Air Inlet	OÄM 40-183	<input type="checkbox"/> yes	<input type="checkbox"/> no
Nose Landing Gear Tie-Down	OÄM 40-200	<input type="checkbox"/> yes	<input type="checkbox"/> no
Electrical Rudder Pedal Adjustment	OÄM 40-251	<input type="checkbox"/> yes	<input type="checkbox"/> no
Front Seats with Adjustable Backrest	OÄM 40-252	<input type="checkbox"/> yes	<input type="checkbox"/> no
CO Monitor	OÄM 40-253	<input type="checkbox"/> yes	<input type="checkbox"/> no
Autopilot Static Source	OÄM 40-267	<input type="checkbox"/> yes	<input type="checkbox"/> no
Tall Main Landing Gear	OÄM 40-283	<input type="checkbox"/> yes	<input type="checkbox"/> no
ELT Artex ME 406 "ACE"	OÄM 40-284	<input type="checkbox"/> yes	<input type="checkbox"/> no
MT P-860-23 Governor	OÄM 40-289	<input type="checkbox"/> yes	<input type="checkbox"/> no
Emergency Axe	OÄM 40-326	<input type="checkbox"/> yes	<input type="checkbox"/> no
Front seats with adjustable backrest - Hydrolok	OÄM 40-375	<input type="checkbox"/> yes	<input type="checkbox"/> no
Emergency Egress Hammer	OÄM 40-401	<input type="checkbox"/> yes	<input type="checkbox"/> no
GTX 345R	OÄM 40-1003	<input type="checkbox"/> yes	<input type="checkbox"/> no
MD302 Standby Attitude Module	OÄM 40-1025	<input type="checkbox"/> yes	<input type="checkbox"/> no

\* For installation of the Baggage Tray the Baggage Extension must be installed.

This Airplane Flight Manual must be kept on board the airplane at all times. Its designated place is the side bag of the forward left seat.



## NOTE

draws the attention to any special item not directly related to safety but which is important or unusual.

## 1.4 DIMENSIONS

### 1.4.1 OVERALL DIMENSIONS

Span	:	appr. 11.94 m	appr. 39 ft 2 in
Length	:	appr. 8.01 m	appr. 26 ft 3 in
Height	:	appr. 1.97 m	appr. 6 ft 6 in

### 1.4.2 WING

Airfoil	:	Wortmann FX 63-137/20 - W4	
Wing Area	:	appr. 13.54 m <sup>2</sup>	appr. 145.7 sq. ft.
Mean aerodynamic chord (MAC)	:	appr. 1.121 m	appr. 3 ft 8.1 in
Aspect ratio	:	appr. 10.53	
Dihedral	:	appr. 5°	
Leading edge sweep	:	appr. 1°	

### 1.4.3 AILERON

Area (total, left + right)	:	appr. 0.654 m <sup>2</sup>	appr. 7.0 sq. ft.
----------------------------	---	----------------------------	-------------------

### 1.4.4 WING FLAPS

Area (total, left + right)	:	appr. 1.56 m <sup>2</sup>	appr. 16.8 sq. ft.
----------------------------	---	---------------------------	--------------------

### 1.4.5 HORIZONTAL TAIL

Area	:	appr. 2.34 m <sup>2</sup>	appr. 25.2 sq. ft.
Elevator area	:	appr. 0.665 m <sup>2</sup>	appr. 7.2 sq. ft.
Angle of incidence	:	appr. -3.0° relative to longitudinal axis of airplane	

### **1.4.6 VERTICAL TAIL**

Area	:	appr. 1.60 m <sup>2</sup>	appr. 17.2 sq. ft.
Rudder area	:	appr. 0.47 m <sup>2</sup>	appr. 5.1 sq. ft.

### **1.4.7 LANDING GEAR**

Track	:	appr. 2.97 m	appr. 9 ft 9 in
Wheelbase	:	appr. 1.68 m	appr. 5 ft 6 in
Nose wheel	:	5.00-5; 6 PR, 120 mph	
Main wheel	:	(a) 6.00-6; 6 PR, 120 mph in combination with any MLG strut	
		(b) 6.00-6; 8 PR, 120 mph in combination with any MLG strut	
		(c) 15 x 6.0-6; 6 PR, 160 mph (OÄM 40-124; only in combination with the “thin”/“18 mm” [MÄM 40-123] or the “tall” [OÄM 40-283] MLG strut)	

## **1.5 DEFINITIONS AND ABBREVIATIONS**

### **1.5.1 AIRSPEEDS**

CAS:	Calibrated Airspeed. Indicated airspeed, corrected for installation and instrument errors. CAS equals TAS at standard atmospheric conditions at MSL.
IAS:	Indicated Airspeed as shown on an airspeed indicator.
KCAS:	CAS in knots.
KIAS:	IAS in knots.
TAS:	True Airspeed. The speed of the airplane relative to the air. TAS is CAS corrected for errors due to altitude and temperature.

---

$V_A$ :	Maneuvering Speed. Full or abrupt control surface movement is not permissible above this speed.
$V_{FE}$ :	Max. Flaps Extended Speed. This speed must not be exceeded with the given flap setting.
$V_{NE}$ :	Never Exceed Speed in smooth air. This speed must not be exceeded in any operation.
$V_{NO}$ :	Maximum Structural Cruising Speed. This speed may be exceeded only in smooth air, and then only with caution.
$V_S$ :	Stalling Speed, or the minimum continuous speed at which the airplane is still controllable in the given configuration.
$V_{SO}$ :	Stalling Speed, or the minimum continuous speed at which the airplane is still controllable in the landing configuration.
$V_X$ :	Best Angle-of-Climb Speed.
$V_Y$ :	Best Rate-of-Climb Speed.

### **1.5.2 METEOROLOGICAL TERMS**

ISA:	International Standard Atmosphere. Conditions at which air is identified as an ideal dry gas. The temperature at mean sea level is 15 °C (59 °F), air pressure at MSL is 1013.25 hPa (29.92 inHg); the temperature gradient up to the altitude at which the temperature reaches -56.5 °C (-69.7 °F) is -0.0065 °C/m (-0.00357 °F/ft), and above this 0 °C/m (0 °F/ft).
MSL:	Mean Sea Level.
OAT:	Outside Air Temperature.
QNH:	Theoretical atmospheric pressure at MSL, calculated from the elevation of the measuring point above MSL and the actual atmospheric pressure at the measuring point.

Indicated Pressure Altitude:

Altitude reading with altimeter set to 1013.25 hPa (29.92 inHg).

Pressure Altitude: Altitude above MSL, indicated by a barometric altimeter which is set to 1013.25 hPa (29.92 inHg). The Pressure Altitude is the Indicated Pressure Altitude corrected for installation and instrument errors.

In this Airplane Flight Manual altimeter instrument errors are regarded as zero.

Density Altitude: Altitude in ISA conditions at which the air density is equal to the current air density.

Wind: The wind speeds which are shown as variables in the diagrams in this manual should be regarded as headwind or downwind components of the measured wind.

### **1.5.3 FLIGHT PERFORMANCE AND FLIGHT PLANNING**

Demonstrated Crosswind Component:

The speed of the crosswind component at which adequate maneuverability for take-off and landing has been demonstrated during type certification.

MET: Weather, weather advice.

NAV: Navigation, route planning.

### **1.5.4 MASS AND BALANCE (M&B, W&B)**

DP: Datum Plane; an imaginary vertical plane from which all horizontal distances for center of gravity calculations are measured.

Moment Arm: The horizontal distance from the Datum Plane to the Center of Gravity of a component.

Moment: The mass of a component multiplied by its moment arm.

**CG:** Center of Gravity, also called “center of mass.” Imaginary point in which the airplane mass is assumed to be concentrated for mass and balance calculations. Its distance from the Datum Plane is equal to the Center of Gravity Moment Arm.

**Center of Gravity Moment Arm:**

The Moment Arm which is obtained if one divides the sum of the individual moments of the airplane by its total mass.

**Center of Gravity Limits:**

The Center of Gravity range within which the airplane, at a given mass, must be operated.

**Usable Fuel:** The quantity of fuel available for flight planning.

**Unusable Fuel:** The quantity of fuel remaining in the tank which cannot be used for flight.

**Empty Mass:** The mass of the airplane including unusable fuel, all operating consumables and the maximum quantity of oil.

**Useful Load:** The difference between take-off mass and empty mass.

**Maximum Take-off Mass:**

The maximum permissible mass for take-off.

**Maximum Landing Mass:**

The highest mass for landing conditions at the maximum descent velocity. This velocity was used in the strength calculations to determine the landing gear loads during a particularly hard landing.

### **1.5.5 ENGINE**

Take-off Power: Maximum permissible engine output power for take-off.

Maximum Continuous Power:

Maximum permissible engine output power used continuously during flight.

CHT: Cylinder Head Temperature.

EGT: Exhaust Gas Temperature.

### **1.5.6 DESIGNATION OF THE CIRCUIT BREAKERS ON THE INSTRUMENT PANEL**

#### (a) Asymmetric Instrument Panel (Circuit Breakers Right Hand Side)

##### *Avionics:*

ADF	Automatic Direction Finder
AUDIO	Audio Panel / Intercom
AUTOPILOT	Autopilot
AVIONIC BUS	Avionic Bus
DME	Distance Measuring Equipment
ESSENTIAL AVIONIC	Essential Avionic Bus
GPS	Global Positioning System
GPS2	Global Positioning System #2
NAV/COM1	Navigation/Communication #1
NAV/COM2	Navigation/Communication #2
STRIKE	Strike Finder
XPDR	Transponder

##### *Engine:*

IGNITION	Ignition
INST. 1	Engine Instrument VM 1000
START	Starter

**|** *Lighting:*

FLOOD	Flood Light
INST.	Instrument Lights
LANDING	Landing Light
POSITION	Position Lights
STROBE	Strobe Light (Anti Collision Lights, ACLs)
TAXI/MAP	Taxi Light/Map Light

**|** *Systems:*

ANNUN.	Annunciator Panel
DG	Directional Gyro
FAN/OAT	Fan/Outside Air Temperature Indicator
FLAPS	Flaps
FUEL PUMP	Fuel Pump
HORIZON	Artificial Horizon (Attitude Gyro)
PITOT HEAT	Pitot Heating System
T&B	Turn & Bank Indicator

**|** *Electrical:*

ALT.	Alternator
ALT. CONT.	Alternator Control
ALT. PROT.	Alternator Protection
BATT.	Battery
ESSENTIAL TIE	Bus Interconnection
MAIN TIE	Bus Interconnection
MASTER CONTROL	Master Control (avionic master switch, essential bus switch, essential avionics relay, bus interconnection relay, avionics master relay)

**(b) Symmetric Instrument Panel (Circuit Breakers Bottom Side)****Main bus:**

ALT.	Alternator
ALT. CONT.	Alternator Control
ALT. PROT.	Alternator Protection
AV. BUS	Avionic Bus
DG	Directional Gyro
FAN/OAT	Fan/Outside Air Temperature Indicator
FUEL PUMP	Fuel Pump
IGNITION	Ignition
INST.	Instrument Lights
MAIN TIE	Bus Interconnection
POSITION	Position Lights
START	Starter
STROBE	Strobe Lights (Anti Collision Lights, ACLs)
T & B	Turn & Bank Indicator
TAXI/MAP	Taxi Light/Map Light

**Main AV. bus (main avionics bus):**

ADF	Automatic Direction Finder
AUDIO	Audio Panel / Intercom
AUTO PILOT	Autopilot
COM2	Communication #2
COM/NAV2	Communication / Navigation #2
DME	Distance Measuring Equipment
GPS2	Global Positioning System #2
GPS/NAV2	Global Positioning System/Navigation #2
STRIKE	Strike Finder
Wx 500	Stormscope

TAS Traffic Advisory System

ESS. AV. bus (essential avionic-bus):

COM1 Communication #1  
 COM/NAV1 Communication/Navigation #1  
 GPS1 Global Positioning System #1  
 GPS/NAV1 Global Positioning System/Navigation #1  
 XPDR Transponder

Essential bus:

ANNUN. Annunciator Panel  
 BATT. Battery  
 ESS. AV. Essential Avionic-Bus  
 ESS TIE Bus Interconnection  
 FLAPS Flaps  
 FLOOD Flood Light  
 HORIZON Artificial Horizon (Attitude Gyro)  
 INST. 1 Engine Instrument VM 1000  
 LANDING Landing Light  
 MASTER CONTROL Master Control (avionic master switch, essential bus switch, essential avionics relay, bus interconnection relay, avionics master relay)  
 PITOT Pitot Heating System

**1.5.7 EQUIPMENT**

ELT: Emergency Locator Transmitter.

**1.5.8 DESIGN CHANGE ADVISORIES**

MÄM: Mandatory Design Change Advisory.

OÄM: Optional Design Change Advisory.

**1.5.9 MISCELLANEOUS**

ATC:	Air Traffic Control.
CFRP:	Carbon Fiber Reinforced Plastic.
GFRP:	Glass Fiber Reinforced Plastic.
JC/VP:	Joint Certification/Validation Procedure.
PCA:	Primary Certification Authority.

## 1.6 UNITS OF MEASUREMENT

### 1.6.1 CONVERSION FACTORS

Dimension	SI-Units	US Units	Conversion
Length	[mm] millimeters	[in] inches	$[mm] / 25.4 = [in]$
	[m] meters	[ft] feet	$[m] / 0.3048 = [ft]$
	[km] kilometers	[NM] nautical miles	$[km] / 1.852 = [NM]$
Volume	[l] liters	[US gal] US gallons	$[l] / 3.7854 = [US\ gal]$
		[qts] US quarts	$[l] / 0.9464 = [qts]$
Speed	[km/h] kilometers per hour	[kts] knots	$[km/h] / 1.852 = [kts]$
	[m/s] meters per second	[mph] miles per hour	$[km/h] / 1.609 = [mph]$
		[fpm] feet per minute	$[m/s] \times 196.85 = [fpm]$
Speed of rotation	[RPM] revolutions per minute		--
Mass	[kg] kilograms	[lb] pounds	$[kg] \times 2.2046 = [lb]$
Force, weight	[N] newtons	[lbf] pounds force	$[N] \times 0.2248 = [lbf]$
Pressure	[hPa] hectopascals	[inHg] inches of mercury	$[hPa] = [mbar]$
	[mbar] millibars		$[hPa] / 33.86 = [inHg]$
	[bar] bars	[psi] pounds per square inch	$[bar] \times 14.504 = [psi]$
Temperature	[°C] degrees Celsius	[°F] degrees Fahrenheit	$[°C] \times 1.8 + 32 = [°F]$
			$([°F] - 32) / 1.8 = [°C]$

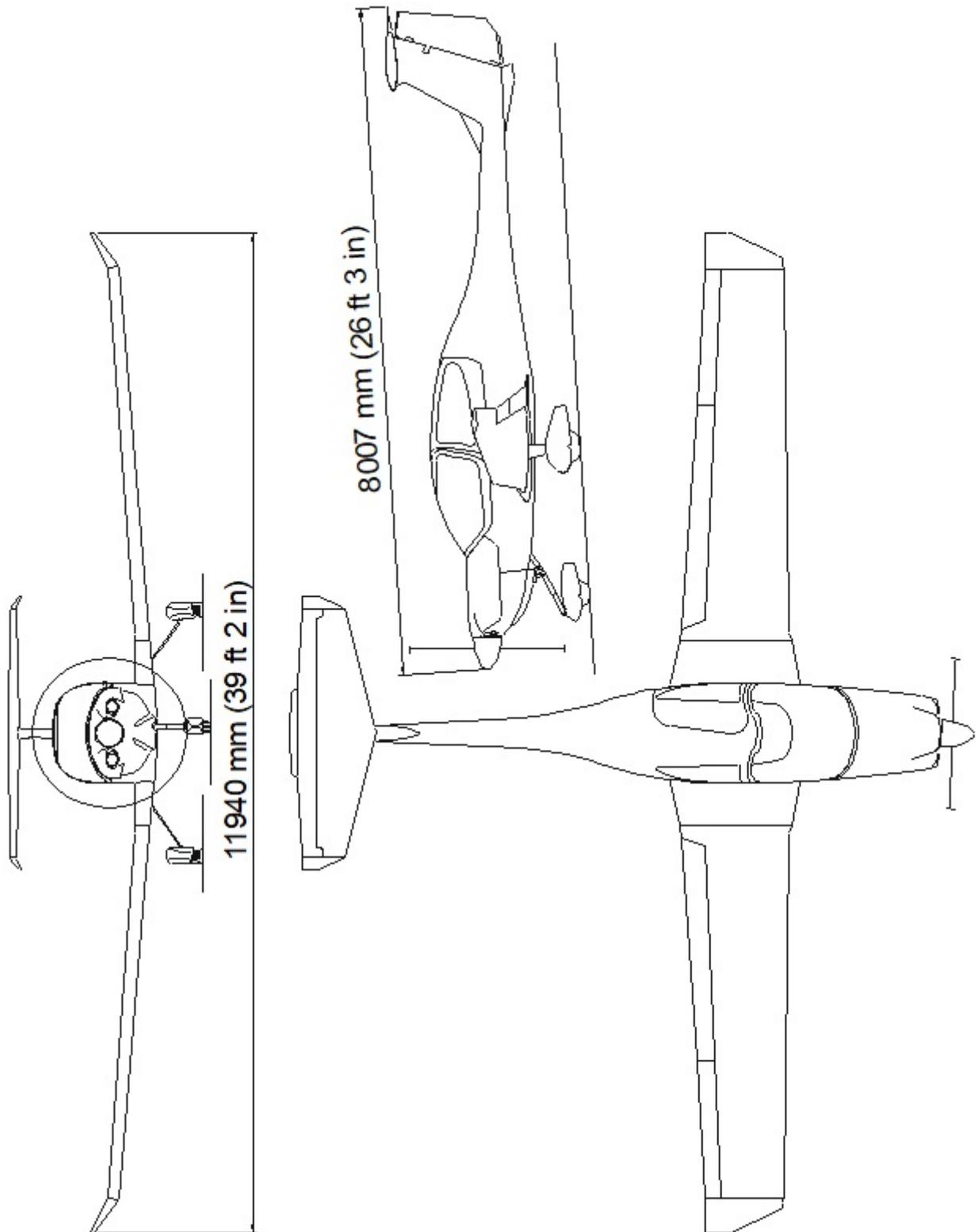
Dimension	SI-Units	US Units	Conversion
Intensity of electric current	[A] ampères		--
Electric charge (battery capacity)	[Ah] ampère-hours		--
Electric potential	[V] volts		--
Time	[sec] seconds		--

**1.6.2 CONVERSION CHART LITERS / US GALLONS**

Liters	US Gallons
5	1.3
10	2.6
15	4.0
20	5.3
25	6.6
30	7.9
35	9.2
40	10.6
45	11.9
50	13.2
60	15.9
70	18.5
80	21.1
90	23.8
100	26.4
110	29.1
120	31.7
130	34.3
140	37.0
150	39.6
160	42.3
170	44.9
180	47.6

US Gallons	Liters
1	3.8
2	7.6
4	15.1
6	22.7
8	30.3
10	37.9
12	45.4
14	53.0
16	60.6
18	68.1
20	75.7
22	83.3
24	90.9
26	98.4
28	106.0
30	113.6
32	121.1
34	128.7
36	136.3
38	143.8
40	151.4
45	170.3
50	189.3

**1.7 THREE-VIEW DRAWING**



## **1.8 SOURCE DOCUMENTATION**

This Section lists documents, manuals and other literature that were used as sources for the Airplane Flight Manual, and indicates the respective publisher. However, only the information given in the Airplane Flight Manual is valid.

### **1.8.1 ENGINE**

Address:       Textron Lycoming  
                  652 Oliver Street  
                  WILLIAMSPORT, PA 17701  
                  USA

Phone:         +1-570-323-6181

Webpage:      [www.lycoming.textron.com](http://www.lycoming.textron.com)

Documents:    a) Textron Lycoming Operator's Manual, Aircraft Engines  
                  60297-12 (Part No.)  
  
                  b) Service Bulletins (SB)  
                  Service Instructions (SI); (e.g. SI 1014, SI 1070)  
                  Service Letters (SL); (e.g. SL114 (subscriptions))

**1.8.2 PROPELLER**

Address: mt-Propeller  
Airport Straubing Wallmühle  
D-94348 ATTING  
GERMANY

Phone: +49-9429-9409-0  
E-mail: sales@mt-propeller.com  
Webpage: www.mt-propeller.de

Documents: E-124, Operation and Installation Manual  
Hydraulically controlled variable pitch propeller  
MTV -5, -6, -9, -11, -12, -14, -15, -16, -21, -22, -25

**1.8.3 ENGINE INSTRUMENTS**

Address: VISION MICROSYSTEMS, INC.  
ADVANCED ELECTRONIC INSTRUMENTATION  
4071 Hannegan Road, Suite T  
BELLINGHAM, WA 98226  
USA

Phone: +1-360-714-8203

Documents: 5010002 REV F, VM 1000 Owner's Manual

#### 1.8.4 IGNITION CONTROL UNIT

The electronic ignition control unit LASAR is optional equipment.

Address: UNISON Industries  
7575 Baymeadows Way  
JACKSONVILLE, FL 32256  
USA

Phone: +1-904-739-4066

Webpage: [www.unisonindustries.com](http://www.unisonindustries.com)

Documents: L-1502  
LASAR Installation, Operation, and Troubleshooting Manual

## CHAPTER 2

# OPERATING LIMITATIONS

		Page
2.1	INTRODUCTION . . . . .	2-3
2.2	AIRSPEED . . . . .	2-4
2.3	AIRSPEED INDICATOR MARKINGS . . . . .	2-5
2.4	POWER-PLANT LIMITATIONS . . . . .	2-5
2.5	ENGINE INSTRUMENT MARKINGS . . . . .	2-8
2.6	WARNING, CAUTION AND STATUS LIGHTS . . . . .	2-10
2.6.1	COLOR AND SIGNIFICANCE OF THE WARNING LIGHTS (RED) . . . . .	2-10
2.6.2	COLOR AND SIGNIFICANCE OF THE CAUTION LIGHTS (AMBER) . . . . .	2-11
2.6.3	COLOR AND SIGNIFICANCE OF THE STATUS LIGHTS (WHITE) . . . . .	2-11
2.7	MASS (WEIGHT) . . . . .	2-12
2.8	CENTER OF GRAVITY . . . . .	2-13
2.8.1	DATUM PLANE . . . . .	2-13
2.8.2	CENTER OF GRAVITY LIMITATIONS . . . . .	2-13
2.9	APPROVED MANEUVERS . . . . .	2-14
2.10	MANEUVERING LOAD FACTORS . . . . .	2-15
2.10.1	NORMAL CATEGORY . . . . .	2-15
2.10.2	UTILITY CATEGORY . . . . .	2-15
2.11	OPERATING ALTITUDE . . . . .	2-16
2.12	FLIGHT CREW . . . . .	2-16
2.13	KINDS OF OPERATION . . . . .	2-16
2.13.1	MINIMUM OPERATIONAL EQUIPMENT (SERVICEABLE) . . . . .	2-16
2.14	FUEL . . . . .	2-19
2.14.1	FUEL GRADE . . . . .	2-19



---

2.14.2 FUEL QUANTITY .....	2-19
2.15 LIMITATION PLACARDS .....	2-20
2.16 OTHER LIMITATIONS .....	2-26
2.16.1 TEMPERATURE .....	2-26
2.16.2 BATTERY CHARGE .....	2-27
2.16.3 EMERGENCY SWITCH .....	2-27
2.16.4 OPERATION TIME OF ELECTRICAL EQUIPMENT .....	2-27
2.16.5 DOOR LOCKING DEVICE .....	2-27
2.16.6 ELECTRONIC EQUIPMENT .....	2-28
2.16.7 USE OF THE SUN VISORS .....	2-28

## 2.1 INTRODUCTION

Chapter 2 of this Airplane Flight Manual includes operating limitations, instrument markings, and placards necessary for safe operation of the airplane, its power-plant, standard systems and standard equipment.

The limitations included in this Chapter are approved.

### **WARNING**

Operation of the airplane outside of the approved operating limitations is not permissible.

## 2.2 AIRSPEED

	Airspeed	IAS	Remarks
$V_A$	Maneuvering speed	<p>108 KIAS (above 980 kg / 2161 lb up to 1150 kg / 2535 lb)</p> <p>94 KIAS (780 kg / 1720 lb up to 980 kg / 2161 lb)</p> <p>If MÄM 40-227 is carried out: 111 KIAS (above 1036 kg / 2284 lb up to 1200 kg / 2646 lb)</p> <p>94 KIAS (780 kg / 1720 lb up to 1036 kg / 2284 lb)</p>	Do not make full or abrupt control surface movement above this speed.
$V_{FE}$	Max. flaps extended speed	LDG: 91 KIAS T/O: 108 KIAS	Do not exceed these speeds with the given flap setting.
$V_{NO} = V_C$	Max. structural cruising speed	129 KIAS	Do not exceed this speed except in smooth air, and then only with caution.
$V_{NE}$	Never exceed speed in smooth air	178 KIAS	Do not exceed this speed in any operation.

## 2.3 AIRSPEED INDICATOR MARKINGS

Marking	IAS	Significance
White arc	49 KIAS - 91 KIAS	Operating range with flaps fully extended.
Green arc	52 KIAS - 129 KIAS	Normal operating range.
Yellow arc	129 KIAS - 178 KIAS	Caution range - only in smooth air.
Red line	178 KIAS	Maximum speed for all operations - $V_{NE}$ .

## 2.4 POWER-PLANT LIMITATIONS

- a) Engine manufacturer : Textron Lycoming
- b) Engine designation : IO-360-M1A
- c) RPM limitations
  - Max. take-off RPM : 2700 RPM
  - Max. continuous RPM : 2400 RPM
- d) Manifold pressure limitations
  - Maximum : FULL throttle
- e) Oil pressure
  - Minimum (IDLE) : 25 PSI / 1.72 bar
  - Maximum : 98 PSI / 6.76 bar
  - Normal operating range : 55 to 95 PSI / 3.8 to 6.55 bar
- f) Oil quantity
  - Minimum : 4 qts
  - Maximum : 8 qts
- g) Oil temperature
  - Maximum : 245 °F (118 °C)

- h) Fuel pressure  
Minimum : 14 PSI / 0.97 bar  
Maximum : 35 PSI / 2.4 bar
- i) Cylinder head temperature  
Maximum : 500 °F (260 °C)
- j) Propeller manufacturer : mt-Propeller
- k) Propeller designation : MTV-12-B/180-17 or  
MTV-12-B/180-17f
- l) Propeller diameter : 1.80 m (+ 0 mm, - 50 mm)  
5 ft 10.9 in (+ 0.0 in, - 2.0 in)
- m) Propeller pitch angle (0.75 R) : 10.5° to 30°

## n) Oil specification:

Airplane engine oil should be used which meets SAEJ1899 (MIL-L-22851) Standard (ashless dispersant type). During the first 50 hours of operation of a new or newly overhauled engine, or after replacement of a cylinder, airplane engine oil should be used which meets SAEJ1966 (MIL-L-6082) Standard (straight mineral type). The viscosity should be selected according to the recommendation given in the following table:

<b>OAT at Ground Level</b>	<b><i>During the first 50 hours:</i></b> <b>SAEJ1966 / MIL-L-6082 Mineral Oil</b>	<b><i>After 50 hours:</i></b> <b>SAEJ1899 / MIL-L-22851 Ashless Dispersant Oil</b>
All temperatures	--	SAE 15-W50, SAE 20-W50
above 80 °F (above 27 °C)	SAE 60	SAE 60
above 60 °F (above 16 °C)	SAE 50	SAE 40 or SAE 50
30 °F to 90 °F (-1 °C to 32 °C)	SAE 40	SAE 40
0 °F to 90 °F (-18 °C to 32 °C)	SAE 20-W50	SAE 20-W50 or SAE 15-W50
0 °F to 70 °F (-18 °C to 21 °C)	SAE 30	SAE 30, SAE 40, or SAE 20-W40
below 10 °F (below -12 °C)	SAE 20	SAE 30 or SAE 20-W30

## 2.5 ENGINE INSTRUMENT MARKINGS

Engine instrument markings and their color code significance are shown in the table below:

### NOTE

When an indication lies in the upper or lower prohibited range, the numerical indication will begin flashing as well.

Indication	Red arc/bar = lower prohibited range	Yellow arc/bar = caution range	Green arc/bar = normal operating range	Yellow arc/bar = caution range	Red arc/bar = upper prohibited range
Manifold pressure	--	--	13 - 30 inHg	--	--
RPM	--	--	500 - 2400 RPM	2400 - 2700 RPM	above 2700 RPM
Oil temp.	--	--	149 - 230 °F	231 - 245 °F	above 245 °F
Cylinder head temp.	--	--	150 - 475 °F	476 - 500 °F	above 500 °F
Oil pressure	below 25 PSI	25 - 55 PSI	56 - 95 PSI	96 - 97 PSI	above 97 PSI
Fuel pressure	below 14 PSI	--	14 - 35 PSI	--	above 35 PSI
Fuel flow	--	--	1 - 20 US gal/hr	--	above 20 US gal/hr
Voltage	below 24.1 V	24.1 - 25 V	25.1 - 30 V	30.1 - 32 V	above 32 V
Ammeter	--	--	2 - 75 A	--	--

Indication	Red arc/bar = lower prohibited range	Yellow arc/bar = caution range	Green arc/bar = normal operating range	Yellow arc/bar = caution range	Red arc/bar = upper prohibited range
Fuel quantity, Standard Tank	0 US gal	--	0 - 15 US gal <sup>1</sup> 0 - 17 US gal <sup>2</sup>	--	--
Fuel quantity, Long Range Tank	0 US gal	--	0 - 16 US gal + 0 - 9 US gal <sup>3</sup>	--	--

<sup>1</sup> up to and including serial number 40.054

<sup>2</sup> serial number 40.055 and subsequent

<sup>3</sup> numerical indication of the *additional* (auxiliary) fuel quantity, for a total fuel quantity on one side in the range between 16 and 25 US gal

## 2.6 WARNING, CAUTION AND STATUS LIGHTS

The following tables show the color and significance of the warning, caution and status lights on the annunciator panel. There are two variants of the annunciator panel, “DAI” and “White Wire” (see Section 7.11).

### NOTE

Section 7.11 includes a detailed description of the lights on the annunciator panel.

#### 2.6.1 COLOR AND SIGNIFICANCE OF THE WARNING LIGHTS (RED)

Warning Lights (Red)			Cause
Variant “DAI”	Variant “White Wire”	Meaning	
OIL PR	OIL PRESS	Oil pressure	Oil pressure below 25 PSI
FUEL PR	FUEL PRESS	Fuel pressure	Fuel pressure below 14 PSI
ALT	ALTERNATOR	Alternator (Generator)	Alternator failure
START	START	Starter	Operation of starter, or failure of the starter motor to disengage from the engine after starting
DOOR	DOORS	Doors	Front canopy and/or rear door not completely closed and locked
	TRIM FAIL	Trim failure	Failure in the automatic trim system of the autopilot (if installed)

## 2.6.2 COLOR AND SIGNIFICANCE OF THE CAUTION LIGHTS (AMBER)

Caution Lights (Amber)			Cause
Variant "DAI"	Variant "White Wire"	Meaning	
L FUEL		Fuel quantity left tank	Fuel quantity in the left tank less than 3 US gal ( $\pm 1$ US gal)
R FUEL		Fuel quantity right tank	Fuel quantity in the right tank less than 3 US gal ( $\pm 1$ US gal)
	LOW FUEL	Fuel quantity	1 <sup>st</sup> caution: fuel quantity in one tank less than 3 US gal ( $\pm 1$ US gal) 2 <sup>nd</sup> caution: fuel quantity in second tank less than 3 US gal ( $\pm 1$ US gal)
VOLT	LOW VOLTS	Voltage	On-board voltage below 24 V
PITOT	PITOT	Pitot heating	Pitot heating not switched ON, or fault in the Pitot heating system

## 2.6.3 COLOR AND SIGNIFICANCE OF THE STATUS LIGHTS (WHITE)

Status Lights (White)			Cause
Variant "DAI"	Variant "White Wire"	Meaning	
IGN	IGNITION	Ignition	Electronic ignition control unit (if installed) not in operation

## 2.7 MASS (WEIGHT)

Maximum take-off mass (Normal Category)	: 1150 kg	2535 lb
if MÄM 40-227 is carried out	: 1200 kg	2646 lb
Maximum take-off mass (Utility Category)	: 980 kg	2161 lb
Maximum landing mass		
Original MLG strut	: 1092 kg	2407 lb
Modified MLG strut (MÄM 40-123/e or OÄM 40-283)	: 1150 kg	2535 lb
Maximum zero fuel mass	: 1150 kg	2535 lb
Max. load in standard baggage compartment	: 30 kg	66 lb
Max. load in baggage tube	: 5 kg	11 lb
Max. load in extended baggage compartment (OÄM 40-163)		
Max. load in forward part	: 45 kg	100 lb
Max. load in aft part	: 18 kg	40 lb
Max. total load forward + aft	: 45 kg	100 lb
Max. surface load for baggage compartments	: 75 kg/m <sup>2</sup>	15.3 lb/ft <sup>2</sup>

### **WARNING**

Exceeding the mass limits will lead to an overstressing of the airplane as well as to a degradation of flight characteristics and flight performance.

### **NOTE**

The maximum landing mass is the highest mass for landing conditions at the maximum descent velocity. This velocity was used in the strength calculations to determine the landing gear loads during a particularly hard landing.

## NOTE

In some countries the beginning of a flight is defined by starting the engine. In those countries a maximum ramp mass 4 kg (9 lb) above the maximum take-off mass is approved. At the time of lift-off the maximum permitted take-off mass must not be exceeded.

## 2.8 CENTER OF GRAVITY

### 2.8.1 DATUM PLANE

The Datum Plane (DP) is a plane which is normal to the airplane's longitudinal axis and in front of the airplane as seen from the direction of flight. The airplane's longitudinal axis is parallel with the upper surface of a 600:31 wedge which is placed on top of the rear fuselage in front of the vertical stabilizer. When the upper surface of the wedge is aligned horizontally, the Datum Plane is vertical. The Datum Plane is located 2.194 meters (86.38 in) forward of the most forward point of the root rib on the stub wing.

### 2.8.2 CENTER OF GRAVITY LIMITATIONS

The center of gravity (CG) for flight conditions must lie between the following limits:

#### (a) Most forward CG:

2.40 m (94.5 in) aft of DP from 780 kg to 980 kg (1720 lb to 2161 lb)

2.46 m (96.9 in) aft of DP at 1150 kg (2535 lb)

linear variation between these values

If MÄM 40-227 is carried out:

2.40 m (94.5 in) aft of DP from 780 kg to 980 kg (1720 lb to 2161 lb)

2.48 m (97.6 in) aft of DP at 1200 kg (2646 lb)

linear variation between these values

#### (b) Most rearward CG:

a) Standard Tank : 2.59 m (102.0 in) aft of DP

b) Long Range Tank : 2.55 m (100.4 in) aft of DP

**WARNING**

Exceeding the center of gravity limitations reduces the controllability and stability of the airplane.

**2.9 APPROVED MANEUVERS**

The airplane is certified in the Normal Category and in the Utility Category in accordance with AWM 523.

**Approved Maneuvers***a) Normal Category:*

- 1) All normal flight maneuvers;
- 2) Stalling (with the exception of dynamic stalling); and
- 3) Lazy Eights, Chandelles, as well as steep turns and similar maneuvers, in which an angle of bank of not more than 60° is attained.

**CAUTION**

Aerobatics, spinning, and flight maneuvers with more than 60° of bank are not permitted in the Normal Category.

*b) Utility Category:*

- 1) All normal flight maneuvers;
- 2) Stalling (with the exception of dynamic stalling); and
- 3) Lazy Eights, Chandelles, as well as steep turns and similar maneuvers, in which an angle of bank of not more than 90° is attained.

**CAUTION**

Aerobatics, spinning, and flight maneuvers with more than 90° of bank are not permitted in the Utility Category.

## CAUTION

The accuracy of the attitude gyro (artificial horizon) and the directional gyro is affected by the maneuvers approved under item 3 if the bank angle exceeds 60°. Such maneuvers may therefore only be flown when the above mentioned instruments are not required for the present kind of operation.

## 2.10 MANEUVERING LOAD FACTORS

Table of maximum structural load factors:

### 2.10.1 NORMAL CATEGORY

	at $v_A$	at $v_{NE}$	With Flaps in T/O or LDG Position
Positive	3.8	3.8	2.0
Negative	-1.52	0	

### 2.10.2 UTILITY CATEGORY

	at $v_A$	at $v_{NE}$	With Flaps in T/O or LDG Position
Positive	4.4	4.4	2.0
Negative	-1.76	-1	

## WARNING

Exceeding the maximum load factors will lead to an overstressing of the airplane.

## **2.11 OPERATING ALTITUDE**

The maximum demonstrated operating altitude is 16,400 ft (5,000 m).

The maximum approved operating altitude for US registered airplanes is 14,000 ft MSL unless an approved supplemental oxygen system is installed.

## **2.12 FLIGHT CREW**

Minimum crew number : 1 (one person)

Maximum number of occupants:

Normal Category : 4 (four persons)

Utility Category : 2 (two persons), both of whom must sit in front

## **2.13 KINDS OF OPERATION**

Provided that national operational requirements are met, the following kinds of operation are approved:

- \* Daytime flights according to Visual Flight Rules (VFR).
- \* With the appropriate equipment: night flights according to Visual Flight Rules (NVFR).
- \* With the appropriate equipment: flights according to Instrument Flight Rules (IFR).

Flights into known or forecast icing conditions are prohibited.

Flights into known thunderstorms are prohibited.

### **2.13.1 MINIMUM OPERATIONAL EQUIPMENT (SERVICEABLE)**

The following table lists the minimum serviceable equipment required by AWM 523. Additional minimum equipment for the intended operation may be required by national operating rules and also depends on the route to be flown.

Minimum Operational Equipment (Serviceable)			
	For Daytime VFR Flights	In Addition for Night VFR Flights	In Addition for IFR Flights
Flight and Navigation Instruments	<ul style="list-style-type: none"> <li>* Airspeed indicator</li> <li>* Altimeter</li> <li>* Magnetic compass</li> </ul>	<ul style="list-style-type: none"> <li>* Vertical speed indicator (VSI)</li> <li>* Attitude gyro (artificial horizon)</li> <li>* Turn &amp; bank indicator</li> <li>* Directional gyro</li> <li>* OAT indicator</li> <li>* Chronometer with indication of hours, minutes, and seconds</li> <li>* VHF radio (COM) with speaker and microphone</li> <li>* VOR receiver</li> <li>* Transponder (XPDR), Mode A and Mode C</li> <li>* 1 headset</li> </ul>	<ul style="list-style-type: none"> <li>* Second VHF radio (COM)</li> <li>* VOR-LOC-GP receiver</li> <li>* Marker beacon receiver</li> </ul>
Engine Instruments	<ul style="list-style-type: none"> <li>* Fuel indicators</li> <li>* Integrated engine instrument</li> <li>* Annunciator panel (all lights, see 2.6)</li> </ul>	<ul style="list-style-type: none"> <li>* Ammeter (included in VM 1000)</li> <li>* Voltmeter (included in VM 1000)</li> </ul>	

Minimum Operational Equipment (Serviceable)			
	For Daytime VFR Flights	In Addition for Night VFR Flights	In Addition for IFR Flights
Lighting		<ul style="list-style-type: none"> <li>* Position lights</li> <li>* Strobe lights (anti collision lights)</li> <li>* Landing light</li> <li>* Instrument lighting</li> <li>* Flood light</li> <li>* Flashlight</li> </ul>	
Other Operational Minimum Equipment	<ul style="list-style-type: none"> <li>* Stall warning system</li> <li>* Fuel quantity measuring device (see 7.10)</li> <li>* Safety belts for each occupied seat</li> <li>* Airplane flight manual</li> </ul>	<ul style="list-style-type: none"> <li>* Pitot heating system</li> <li>* Alternate static valve</li> <li>* Essential bus</li> </ul>	<ul style="list-style-type: none"> <li>* Emergency battery</li> </ul>

**NOTE**

A list of approved equipment can be found in Chapter 6.

## NOTE

For the upgrade of an airplane for Night VFR or IFR operation it is not sufficient to install the required equipment. The retrofit must be carried out in accordance with the requirements of the manufacturer (see Service Bulletins) and the national Airworthiness Authority. Any additional equipment (equipment which is not listed in the Equipment List in Section 6.5) must also be approved for the intended kind of operation by the national Airworthiness Authority.

## 2.14 FUEL

### 2.14.1 FUEL GRADE

AVGAS 100LL / AVGAS 100/130LL (ASTM D910)

AVGAS 100 / AVGAS 100/130 (ASTM D910)

### 2.14.2 FUEL QUANTITY

#### (a) Standard Tank:

Total fuel quantity : 2 x 20.6 US gal (app. 2 x 78 liter)

Unusable fuel : 2 x 0.5 US gal (app. 2 x 2 liter)

Max. indicated fuel quantity : 15 US gal (app. 57 liter) per tank  
(up to and including S/N 40.054)

: 17 US gal (app. 64 liter) per tank  
(S/N 40.055 & subsequent)

Max. permissible difference : 10 US gal (app. 38 liter)  
between right and left tank

#### (b) Long Range Tank (If Installed):

Total fuel quantity : 2 x 25.5 US gal (app. 2 x 96.5 liter)

Unusable fuel : 2 x 0.5 US gal (app. 2 x 2 liter)

Max. indicated fuel quantity	: 16 US gal (app. 61 liter) per tank
Indicated quantity auxiliary fuel tank	: 0 to 9 US gal (app. 0 to 34 liter) per tank
Max. permissible difference between right and left tank	: 8 US gal (app. 30 liter)

### CAUTION

If a fuel indicator shows 16 US gal and the aux. fuel indicator reads 0 US gal on the same side, then 19 US gal must be assumed for the calculation of the difference between right and left tank.

## 2.15 LIMITATION PLACARDS

All *limitation* placards are shown below. A list of *all* placards is included in the Airplane Maintenance Manual (Doc. No. 6.02.01), Chapter 11.

On the Instrument Panel:

*If MÄM 40-227 is not carried out:*

#### **Maneuvering speed:**

**$v_A = 108$  KIAS (above 980 up to 1150 kg / above 2161 up to 2535 lb)**

**$v_A = 94$  KIAS (780 to 980 kg / 1720 to 2161 lb)**

**This airplane may only be operated in accordance with the Airplane Flight Manual. It can be operated in the “Normal” and “Utility” categories in non-icing conditions. Provided that national operational requirements are met and the appropriate equipment is installed, this airplane is approved for the following kinds of operation: day VFR, night VFR and IFR. All aerobatic maneuvers including spinning are prohibited.**

**For further operational limitations refer to the Airplane Flight Manual.**

**No smoking.**

If MÄM 40-227 is carried out:

**Maneuvering Speed:**  
 $v_A = 111$  KIAS (above 1036 up to 1200 kg, above 2284 up to 2646 lb)  
 $v_A = 94$  KIAS (780 to 1036 kg, 1720 to 2284 lb)

The airplane may only be operated in accordance with the Airplane Flight Manual. It can be operated in the “Normal” and the “Utility” categories in non-icing conditions. Provided that national operational requirements are met and the appropriate equipment is installed, this airplane is approved for the following kinds of operation: day VFR, night VFR and IFR. All aerobatic maneuvers including spinning are prohibited.

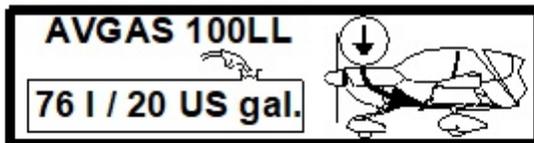
For further operational limitations refer to the Airplane Flight Manual.

**No smoking.**

Next to Each of the Two Fuel Filler Necks:

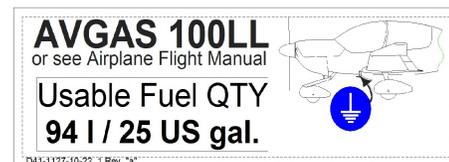
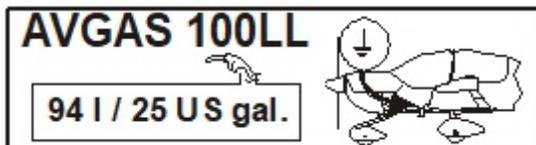
a) *Standard Tank:*

*If MÄM 40-617 is installed:*



b) *Long Range Tank (if installed):*

*If MÄM 40-617 is installed:*



Next to the Fuel Quantity Indication:

- a) *Standard Tank (up to S/N 40.054):*

**max. indicated fuel quantity: 15 US gal**

left and right tank max. 10 US gal difference

For use of max. tank capacity see AFM

- b) *Standard Tank (S/N 40.055 and subsequent):*

**max. indicated fuel quantity: 17 US gal**

left and right tank max. 10 US gal difference

For use of max. tank capacity see AFM

- c) *Long Range Tank (if installed):*

**Fuel qty. indication: 16 + 9 US gal**

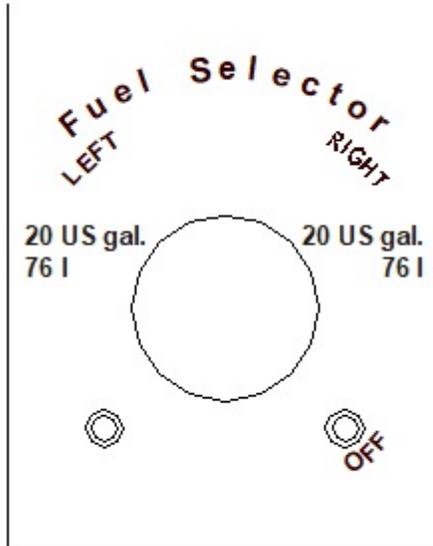
max. difference LH/RH tank: 8 US gal

AUX FUEL QTY switch for LH/RH auxiliary fuel quantity

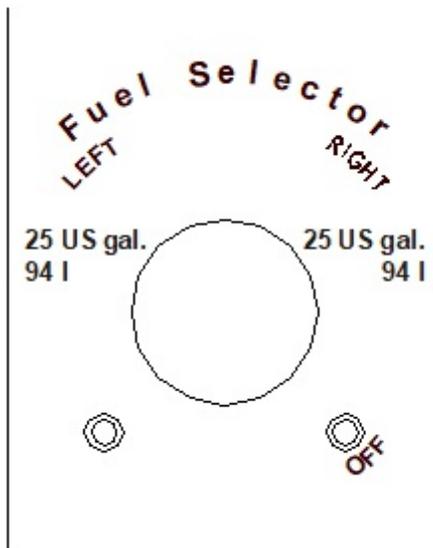
NOTE: See AFM for more information on AUX FUEL

On the Fuel Tank Selector:

a) *Standard Tank:*



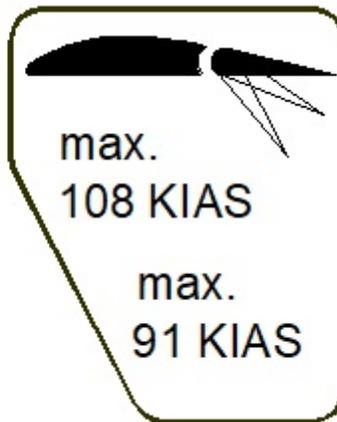
b) *Long Range Tank (if installed):*



In the Cowling, on the Door for the Oil Filler Neck:

<p><b>OIL</b>      1 qt = 0.95 liters</p> <p><b>SAE 15W50</b></p> <p>ashless dispersant aviation grade oil (SAE Standard J-1899) or see AFM Chapter 2</p> <p><b>VFR Min./Max.: 4/8 qts</b> <b>IFR Min./Max.: 6/8 qts</b></p>
--

Next to the Flap Selector Switch:

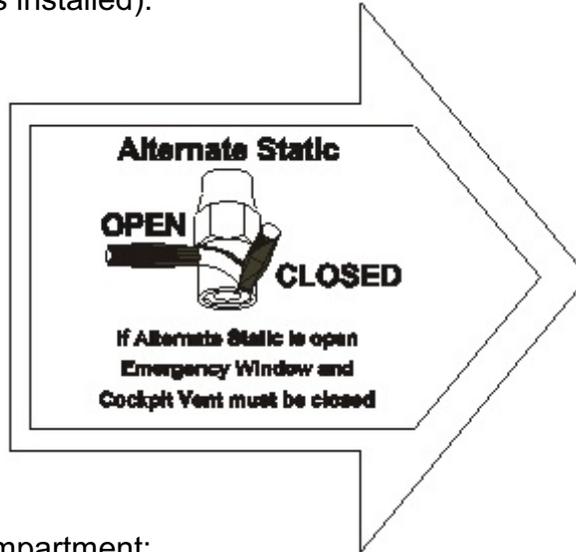


Next to the Essential Bus Switch (if installed):

<p><b>Ess. Bus NOT for normal operation. See AFM.</b></p>
---

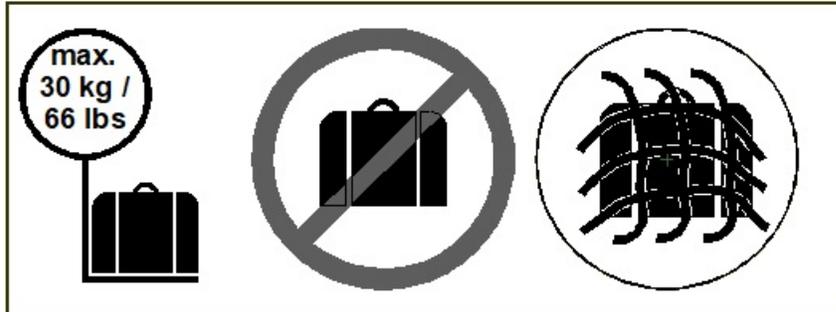
In the Cockpit, on the Left Fuselage Sidewall:

(if alternate static valve is installed):



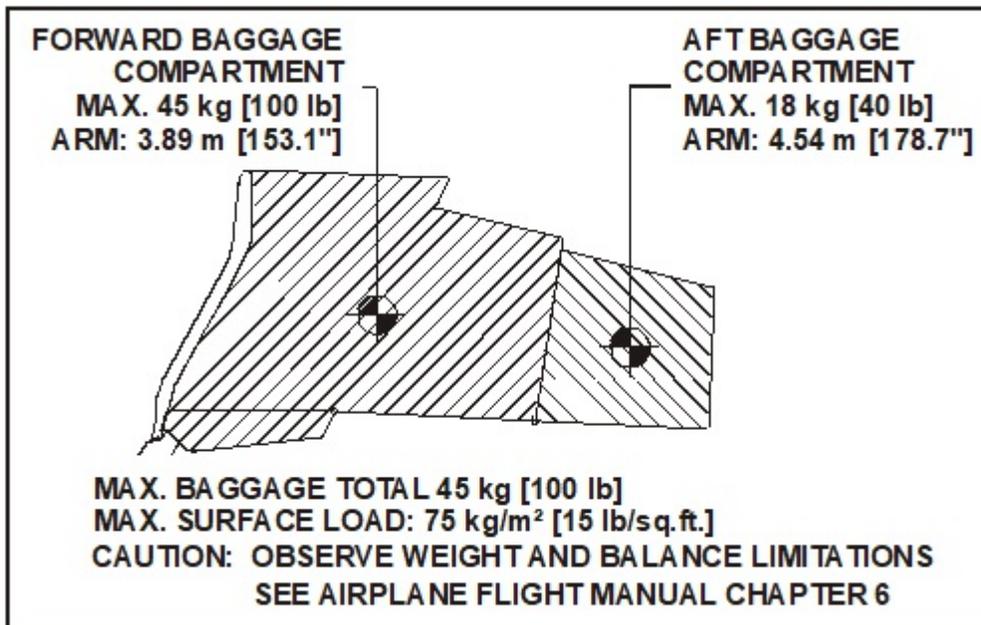
Next to the Baggage Compartment:

a) *Standard Baggage Compartment:*



b) *Extended Baggage Compartment (OÄM 40-163, if installed):*





Beside the Door Locking Device (OÄM 40-081, if installed):

**EMERGENCY EXIT:**  
 The keylock must be unlocked during flight!

Above the NAV #2 CDI (OÄM 40-206, if installed):

**NAV No. 2 not approved  
 for precision approaches**

## **2.16 OTHER LIMITATIONS**

### **2.16.1 TEMPERATURE**

The airplane may only be operated when its temperature prior to operation is not less than -40 °C (-40 °F) and not higher than 54 °C (129 °F).

#### **CAUTION**

For cold weather starting of the engine refer to the latest instructions given by the engine manufacturer.

### **2.16.2 BATTERY CHARGE**

■ Taking off for a Night VFR or IFR flight with a discharged battery is not permitted.

#### **NOTE**

■ The most common indication of a discharged battery is that the engine cannot be started with battery power.

■ The use of an external power supply for engine starting with a discharged airplane battery is not permitted if the subsequent flight is intended to be a Night VFR or IFR flight. In this case the airplane battery must first be charged.

### **2.16.3 EMERGENCY SWITCH**

IFR flights are not permitted when the seal on the emergency switch is broken.

### **2.16.4 OPERATION TIME OF ELECTRICAL EQUIPMENT**

Following an alternator failure and with the essential bus (if installed) switched ON, it can be expected that the systems listed under 3.7.2 - FAILURES IN THE ELECTRICAL SYSTEM are supplied with power for half an hour. After this, electrical power is available for the attitude gyro (artificial horizon) and flood light for another 1.5 hours when the emergency power pack (if installed) is used.

### **2.16.5 DOOR LOCKING DEVICE**

The canopy and the passenger door must not be blocked by the door locking device during operation of the airplane.

### **2.16.6 ELECTRONIC EQUIPMENT**

The use and switching on of electronic equipment other than that which is part of the equipment of the airplane is not permitted, as it could lead to interference with the airplane's avionics.

Examples of undesirable items of equipment are:

- Mobile telephones.
- Remote radio controls.
- Video screens employing CRTs.
- MiniDisc recorders when in the record mode.

This list is not exhaustive.

█ The use of laptop computers, including those with CD-ROM drives, CD and MiniDisc players in the replay mode, cassette players and video cameras is permitted. All this equipment however should be switched off for take-off and landing.

### **2.16.7 USE OF THE SUN VISORS**

The sun visors (if installed, OÄM 40-327) may only be used during cruise. During all other phases of flight the sun visors must be locked in the fully upward position.

█

# CHAPTER 3

## EMERGENCY PROCEDURES

		Page
3.1	INTRODUCTION .....	3-3
	3.1.1 GENERAL .....	3-3
	3.1.2 CERTAIN AIRSPEEDS IN EMERGENCIES .....	3-4
3.2	ENGINE PROBLEMS .....	3-4
	3.2.1 ENGINE PROBLEMS ON THE GROUND .....	3-4
	3.2.2 ENGINE PROBLEMS DURING TAKE-OFF .....	3-5
	3.2.3 ENGINE PROBLEMS IN FLIGHT .....	3-6
	3.2.4 RESTARTING THE ENGINE WITH WINDMILLING .....	3-12
	PROPELLER	
	3.2.5 DEFECTIVE ENGINE CONTROLS .....	3-13
	3.2.6 RESTARTING THE ENGINE WITH STATIONARY .....	3-15
	PROPELLER	
3.3	SMOKE AND FIRE .....	3-16
	3.3.1 SMOKE AND FIRE ON THE GROUND .....	3-16
	3.3.2 SMOKE AND FIRE DURING TAKE-OFF .....	3-17
	3.3.3 SMOKE AND FIRE IN FLIGHT .....	3-19
3.4	GLIDING .....	3-20
3.5	EMERGENCY LANDINGS .....	3-21
	3.5.1 EMERGENCY LANDING WITH ENGINE OFF .....	3-21
	3.5.2 LANDING WITH A DEFECTIVE TIRE ON THE .....	3-22
	MAIN LANDING GEAR	
	3.5.3 LANDING WITH DEFECTIVE BRAKES .....	3-23
3.6	RECOVERY FROM AN UNINTENTIONAL SPIN .....	3-23
3.7	OTHER EMERGENCIES .....	3-24
	3.7.1 ICING .....	3-24
	3.7.2 FAILURES IN THE ELECTRICAL SYSTEM .....	3-25

I 3.7.3 SUSPICION OF CARBON MONOXIDE CONTAMINATION . . . . . 3-29  
IN THE CABIN

I 3.7.4 DOOR OPEN. . . . . 3-30

I 3.7.5 EMERGENCY EXIT . . . . . 3-30

**NOTE**

Procedures for uncritical system faults are given in Chapter 4B -  
ABNORMAL OPERATING PROCEDURES.

## **3.1 INTRODUCTION**

### **3.1.1 GENERAL**

This Chapter contains checklists as well as the description of recommended procedures to be followed in the event of an emergency. Engine failure or other airplane-related emergencies are most unlikely to occur if the prescribed procedures for pre-flight checks and airplane maintenance are followed.

If, nonetheless, an emergency does arise, the guidelines given here should be followed and applied in order to clear the problem.

As it is impossible to foresee all kinds of emergencies and cover them in this Airplane Flight Manual, a thorough understanding of the airplane by the pilot is, in addition to their knowledge and experience, an essential factor in the solution of any problems which may arise.

### **WARNING**

In each emergency, control over the flight attitude and the preparation of a possible emergency landing have priority over attempts to solve the current problem “first fly the aircraft.” Prior to the flight the pilot must consider the suitability of the terrain for an emergency landing for each phase of the flight. For a safe flight the pilot must constantly keep a safe minimum flight altitude. Solutions for various adverse scenarios should be thought over in advance. Thus it should be guaranteed that the pilot is at no time shocked by an engine failure and that he can act calmly and with determination.

**3.1.2 CERTAIN AIRSPEEDS IN EMERGENCIES**

Flight Mass		850 kg	1000 kg	1150 kg	1200 kg
		1874 lb	2205 lb	2535 lb	2646 lb
Event					
Engine failure after take-off (Flaps T/O)		59 KIAS	66 KIAS	72 KIAS	74 KIAS
Airspeed for best glide angle (Flaps UP)		60 KIAS	68 KIAS	73 KIAS	76 KIAS
Emergency landing with engine off	Flaps UP	60 KIAS	68 KIAS	73 KIAS	76 KIAS
	Flaps T/O	59 KIAS	66 KIAS	72 KIAS	74 KIAS
	Flaps LDG	58 KIAS	63 KIAS	71 KIAS	73 KIAS

**3.2 ENGINE PROBLEMS**

**3.2.1 ENGINE PROBLEMS ON THE GROUND**

1. Throttle ..... IDLE
2. Brakes ..... as required
3. Engine ..... switch off, if considered necessary;  
 otherwise establish the cause of the problem and re-establish engine performance

**CAUTION**

If the oil pressure is below the green sector, the engine must be switched off immediately.

**WARNING**

If the problem cannot be cleared, the airplane must not be flown.

**END OF CHECKLIST**





4. Engine instruments . . . . . check
5. Throttle . . . . . check
6. RPM lever . . . . . check
7. Mixture control lever . . . . . set for smooth running
8. Alternate air . . . . . OPEN
9. Ignition status light . . . . . check (only if the electronic ignition control unit is installed)
10. Ignition switch . . . . . check BOTH
11. Ignition circuit breaker (IGN) . . . . . pull (only if the electronic ignition control unit is installed); if rough running is cleared by doing this, the circuit breaker should remain open
12. Throttle/RPM/Mixture . . . . . try various settings

### WARNING

If the problem does not clear itself immediately, and the engine is no longer producing sufficient power, then an emergency landing should be carried out.

### END OF CHECKLIST

#### (b) Loss of Oil Pressure

1. Check oil pressure warning light and oil pressure indicator.
2. Check oil temperature.
  - 2a. If the oil pressure indication drops below the green sector and the oil temperature is normal (oil pressure warning light does not illuminate or flash):
    - \* Monitor the oil pressure warning light: it is probable that the oil pressure indication is defective.
    - \* Monitor the oil and cylinder head temperatures.

### CONTINUED

2b. If the oil pressure indication drops below the green sector while the oil or cylinder head temperature is rising, or

If the oil pressure warning light illuminates or flashes, or

If both of these occur together:

- \* Reduce engine power to the minimum required.
- \* Land as soon as possible.
- \* Be prepared for engine failure and emergency landing.

2c. Oil pressure tending to zero combined with:

Vibration, loss of oil, possibly unusual metallic noise and smoke:

- \* A mechanical failure in the engine is apparent.
- \* Shut off engine immediately and
- \* Carry out emergency landing in accordance with 3.5.1 - EMERGENCY LANDING WITH ENGINE OFF.

## END OF CHECKLIST

### (c) High Oil Pressure

Check oil temperature.

- \* If the oil temperature is normal, it is probable that the fault lies in the oil pressure indication, which should thus be ignored (the airplane should be serviced).

## END OF CHECKLIST

(d) High Oil Temperature

Check cylinder head and exhaust gas temperature.

- \* If neither of these is high, it is probable that the fault lies in the oil temperature indication. The airplane should be serviced. A stable oil temperature indication of 26 °F (-3 °C) or 317 °F (158 °C) suggests a failure of the oil temperature sensor.
- \* If the cylinder head temperature or exhaust gas temperature is also high:
  - Check oil pressure. If the oil pressure is low, proceed as in 3.2.3 (b) - LOSS OF OIL PRESSURE.
  - If the oil pressure is in the green sector:
  - Check mixture setting, enrich mixture if necessary.
  - Reduce power; if this produces no improvement, land at the nearest appropriate airfield.

**END OF CHECKLIST**(e) High Cylinder Head Temperature

Cylinder head temperature in yellow sector or above:

1. Check mixture setting, enrich mixture if necessary.
  2. Check oil temperature.
- \* If the oil temperature is also high:
    - Check oil pressure. If the oil pressure is low, proceed as in 3.2.3 (b) - LOSS OF OIL PRESSURE.
    - If the oil pressure is in the green sector:

**CONTINUED**

- Reduce power; if this produces no improvement, land at the nearest appropriate airfield.
- Be prepared for possible emergency landing.

**END OF CHECKLIST**

(f) High RPM

RPM moves on its own into the yellow sector, or is in the red sector:

1. Check friction adjuster for throttle quadrant.
2. Check oil pressure: Following a loss of oil or oil pressure, the propeller governor sets a high RPM. In this case the RPM should be regulated using the throttle. Proceed as in 3.2.3 (b) - LOSS OF OIL PRESSURE.
3. If oil pressure is normal:
  - \* Pull RPM lever back and listen for an associated drop in RPM:
    - If the indication does not change in spite of an audible drop in RPM, it is probable that the RPM indication is defective, which should thus be ignored (the airplane should be serviced).
    - If there is no audible drop in RPM, it is probable that the governor system is defective. In this case the RPM should be regulated using the throttle.

**END OF CHECKLIST**

(g) Loss of RPM

1. Electrical fuel pump . . . . . check ON
2. Fuel tank selector . . . . . check
3. Friction adjuster for throttle quadrant . . . . . check sufficiently tight
4. RPM lever . . . . . HIGH RPM

**CONTINUED**

- \* Listen for rise in RPM.
  - If there is no audible rise in RPM, it is probable that the governor system is defective. In this case the RPM can be regulated within certain limits using the throttle.
  - Land at the nearest appropriate airfield.
  - Be prepared for possible emergency landing.
  - If the indication does not change in spite of an audible rise in RPM, it is probable that the RPM indication is defective, which should thus be ignored (the airplane should be serviced).

## END OF CHECKLIST

### (h) High Fuel Flow

Fuel flow in the red sector:

1. Electrical fuel pump . . . . . ON
2. Fuel pressure. . . . . check after 10 - 15 sec:
  - \* If the fuel pressure is low, refer to 3.2.3 (i) - LOW FUEL PRESSURE WITH THE ELECTRICAL FUEL PUMP SET TO ON.
  - \* If the fuel pressure is in the green sector, or the fuel pressure warning light is not illuminated, the likely cause is a defective fuel flow indication, which should thus be ignored (the airplane should be serviced). Fuel flow data should be taken from the engine performance table in Chapter 5.
3. Check fuel quantity. A rapid reduction in fuel quantity confirms a high fuel flow.

## END OF CHECKLIST

(i) Low Fuel Pressure with the Electrical Fuel Pump Set to ON

Fuel pressure warning light illuminates, or fuel pressure indication below the green sector:

1. Fuel flow. . . . . check:
  - \* If the fuel flow is high, there is possibly a leak (between the injection system and the injectors). Land on the nearest suitable airfield.
  - \* If the fuel flow is in the green sector and the engine is running smoothly, the likely cause is a defective fuel pressure indication, which should thus be ignored (the airplane should be serviced).

Monitor engine for power loss and rough operation that could indicate fuel starvation. If the engine is no longer producing sufficient power, then an emergency landing should be carried out.

**END OF CHECKLIST**

**3.2.4 RESTARTING THE ENGINE WITH WINDMILLING PROPELLER**

**NOTE**

Restarting the engine is possible at all airspeeds above 70 KIAS up to  $v_{NE}$  and up to the maximum demonstrated operating altitude.

**NOTE**

As long as an airspeed of at least 65 KIAS is maintained, and there is no major engine failure, the propeller will continue to windmill.

1. Airspeed. . . . . 80 KIAS
2. Fuel tank selector. . . . . fullest tank
3. Ignition switch. . . . . check BOTH

**CONTINUED**

4. Mixture control lever . . . . . check appropriate position
5. Electrical fuel pump . . . . . check ON
6. Alternate air . . . . . OPEN

*If Engine Does Not Start:*

7. Mixture control lever . . . . . LEAN
8. Mixture control lever . . . . . push forward slowly until engine starts

### NOTE

If it is not possible to start the engine:

- Adopt glide configuration as in 3.4 - GLIDING.
- Carry out emergency landing as in 3.5.1 - EMERGENCY LANDING WITH ENGINE OFF.

### END OF CHECKLIST

### 3.2.5 DEFECTIVE ENGINE CONTROLS

#### (a) Defective Mixture Control Cable

*Flight and Landing:*

1. Maintain altitude to the nearest airfield.
2. During descent, test the reaction of the engine to a higher power setting. A lean mixture can lead to engine roughness and a loss of power. The landing approach must be planned accordingly.

### WARNING

Go-around may become impossible with the remaining power.

### CONTINUED

**|** *Engine Shut-Down:*

- 1. Parking brake . . . . . set
- 2. Engine instruments . . . . . check
- 3. Avionics master switch . . . . . OFF
- 4. All electrical equipment . . . . . OFF
- 5. Throttle . . . . . IDLE
- 6. Ignition switch . . . . . OFF
- 7. Master switch (ALT/BAT) . . . . . OFF

**END OF CHECKLIST**

**|** (b) Defective Throttle Control Cable

**|** *Sufficient Engine Power Available to Continue Flight:*

- 1. Approach nearest airfield, control engine power with RPM lever.
- 2. Perform landing with shut-down engine.

**|** *No Sufficient Engine Power Available to Continue Flight:*

- 1. Carry out emergency landing as in 3.5.1 - EMERGENCY LANDING WITH ENGINE OFF.

**END OF CHECKLIST**

**|** (c) Defective RPM Lever Control Cable

**|** *Sufficient Engine Power Available to Continue Flight:*

- 1. Approach nearest airfield, control engine power with throttle.
- 2. Perform normal landing.

**|** **CONTINUED**

## WARNING

Go-around may become impossible with the remaining power.

**|** *No Sufficient Engine Power Available to Continue Flight:*

1. Carry out emergency landing as in 3.5.1 - EMERGENCY LANDING WITH ENGINE OFF.

## END OF CHECKLIST

### 3.2.6 RESTARTING THE ENGINE WITH STATIONARY PROPELLER

## NOTE

Restarting the engine is possible at all airspeeds above 80 KIAS up to  $v_{NE}$  and up to the maximum demonstrated operating altitude.

1. Airspeed . . . . . 80 KIAS
2. Electrical equipment . . . . . OFF
3. Avionics master switch . . . . . OFF
4. Master switch (BAT) . . . . . check ON
5. Mixture control lever . . . . . check
6. Fuel tank selector . . . . . check
7. Electrical fuel pump . . . . . check ON
8. Alternate air . . . . . OPEN
9. Ignition switch . . . . . START

## **|** CONTINUED

**NOTE**

By increasing the airspeed above approximately 130 KIAS, the propeller will begin to rotate and the engine can thus be started. For this, the ignition switch should be set at BOTH (see 3.2.4 - RESTARTING THE ENGINE WITH WINDMILLING PROPELLER). An altitude loss of at least 1000 ft (300 meter) must be allowed for.

If it is not possible to start the engine:

- Adopt glide configuration as in 3.4 - GLIDING
- Carry out emergency landing as in 3.5.1 - EMERGENCY LANDING WITH ENGINE OFF.

**CAUTION**

Engine restart following an engine fire should only be attempted if it is unlikely that a safe emergency landing can be made. It must be expected that engine restart is impossible after an engine fire.

**END OF CHECKLIST**

**3.3 SMOKE AND FIRE**

**3.3.1 SMOKE AND FIRE ON THE GROUND**

**(a) Engine Fire When Starting on the Ground**

1. Fuel tank selector . . . . . OFF
2. Cabin heat . . . . . OFF
3. Brakes . . . . . apply

*After Standstill:*

4. Throttle . . . . . MAX PWR
5. Master switch (ALT/BAT) . . . . . OFF

**CONTINUED**

*When the Engine Has Stopped:*

- 6. Ignition switch ..... OFF
- 7. Canopy ..... open
- 8. Airplane ..... evacuate immediately

**END OF CHECKLIST**

(b) Electrical Fire with Smoke on the Ground

- 1. Master switch (ALT/BAT)..... OFF

*If the Engine is Running:*

- 2. Throttle ..... IDLE
- 3. Mixture control lever ..... LEAN - shut off engine

*When the Engine Has Stopped:*

- 4. Ignition switch ..... OFF
- 5. Canopy ..... open
- 6. Airplane ..... evacuate immediately

**END OF CHECKLIST**

**3.3.2 SMOKE AND FIRE DURING TAKE-OFF**

(a) If Take-Off Can Still Be Aborted

- 1. Throttle ..... IDLE
- 2. Cabin heat ..... OFF
- 3. Brakes ..... apply - bring the airplane to a stop
- 4. After stopping ..... proceed as in 3.3.1 - SMOKE AND  
FIRE ON THE GROUND

**END OF CHECKLIST**



### 3.3.3 SMOKE AND FIRE IN FLIGHT

#### **CAUTION**

In the event of smoke or fire, prepare to land the airplane 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 immediately at the nearest suitable airfield or landing site.

#### (a) Engine Fire in Flight

1. Cabin heat . . . . . OFF
2. Select appropriate emergency landing field.

*When it Seems Certain that the Landing Field Will Be Reached:*

3. Fuel tank selector . . . . . OFF
4. Throttle . . . . . MAX PWR
5. Electrical fuel pump . . . . . OFF
6. Master switch (ALT/BAT). . . . . ON
7. Emergency window(s) . . . . . open if required
8. Carry out emergency landing with engine off.

#### **CAUTION**

In case of extreme smoke development, the front canopy may be unlatched during flight. This allows it to partially open, in order to improve ventilation. The canopy will remain open in this position. Flight characteristics will not be affected significantly.

**END OF CHECKLIST**

(b) Electrical Fire with Smoke in Flight

1. Emergency switch . . . . . ON if installed
2. Master switch (ALT/BAT) . . . . . OFF
3. Cabin heat . . . . . OFF
4. Emergency window(s) . . . . . open if required
5. Land at an appropriate airfield as soon as possible.

**CAUTION**

Switching OFF the Master switch (ALT/BAT) will lead to total failure of all electronic and electric equipment. Also affected from this are the backup attitude instruments.

However, by switching the Emergency switch ON (only installed in the IFR model), the emergency battery will supply power to the attitude gyro (artificial horizon) and the flood light.

**CAUTION**

In case of extreme smoke development, the front canopy may be unlatched during flight. This allows it to partially open, in order to improve ventilation. The canopy will remain open in this position. Flight characteristics will not be affected significantly.

**END OF CHECKLIST**

**3.4 GLIDING**

1. Flaps . . . . . UP
2. Airspeed . . . . . 76 KIAS (1200 kg, 2646 lb)  
73 KIAS (1150 kg, 2535 lb)  
68 KIAS (1000 kg, 2205 lb)  
60 KIAS (850 kg, 1874 lb)

**CONTINUED**

## NOTE

The glide ratio is 8.8; i.e., for every 1000 ft (305 meter) of altitude loss the maximum horizontal distance traveled in still air is 1.45 NM (2.68 km). During this the propeller will continue to windmill.

With a stationary propeller the glide ratio is 10.3; this corresponds to a maximum horizontal distance of 1.70 NM (3.14 km) for every 1000 ft altitude. In consideration of a safe airspeed however, this configuration may not be attainable.

## END OF CHECKLIST

### 3.5 EMERGENCY LANDINGS

#### 3.5.1 EMERGENCY LANDING WITH ENGINE OFF

## CAUTION

For emergency landing the adjustable backrests (if installed) must be fixed in the upright position.

1. Adjustable backrests (if installed) . . . . . adjust to the upright position described by a placard on the roll - over bar and verify proper fixation.
2. Select suitable landing area. If no level landing area is available, a landing on an upward slope should be sought.
3. Consider wind.
4. Approach: If possible, fly along a short-cut rectangular circuit. On the downwind leg of the circuit the landing area should be inspected for obstacles from a suitable height. The degree of offset at each part of the circuit will allow the wind speed and direction to be assessed.

## CONTINUED



1. Advise ATC.
2. Land the airplane at the edge of the runway that is located on the side of the intact tire, so that changes in direction which must be expected during roll-out due to the braking action of the defective tire can be corrected on the runway.
3. Land with one wing low. The wing on the side of the intact tire should be held low.
4. Direction should be maintained using the rudder. This should be supported by use of the brake. It is possible that the brake must be applied strongly - if necessary to the point where the wheel locks. The wide track of the landing gear will prevent the airplane from tipping over a wide speed range. There is no pronounced tendency to tip even when skidding.

## END OF CHECKLIST

### 3.5.3 LANDING WITH DEFECTIVE BRAKES

In general, a landing on grass is recommended in order to reduce the landing run by virtue of the greater rolling resistance.

#### CAUTION

If sufficient time is remaining, the risk of fire in the event of a collision can be reduced as follows:

- Fuel tank selector. . . . . OFF
- Mixture control lever. . . . . LEAN - shut off engine
- Ignition switch . . . . . OFF
- Master switch (ALT/BAT). . . . . OFF

## END OF CHECKLIST

### 3.6 RECOVERY FROM AN UNINTENTIONAL SPIN

#### CAUTION

Steps 1 to 4 must be carried out **immediately** and **simultaneously**.

## CONTINUED

- 1. Throttle . . . . . IDLE
- 2. Rudder . . . . . full deflection against direction of spin
- 3. Elevator (control stick) . . . . . fully forward
- 4. Ailerons . . . . . neutral
- 5. Flaps . . . . . UP

*When Rotation Has Stopped:*

- 6. Rudder . . . . . neutral
- 7. Elevator (control stick) . . . . . pull carefully
- 8. Return the airplane from a descending into a normal flight attitude. In so doing do not exceed the “never exceed speed,”  $V_{NE}$ .

**END OF CHECKLIST**

**3.7 OTHER EMERGENCIES**

**3.7.1 ICING**

**(a) Unintentional Flight Into Icing Conditions**

- 1. Leave the icing area (by changing altitude or turning back, in order to reach zones with a higher ambient temperature).
- 2. Pitot heating . . . . . ON
- 3. Cabin heat . . . . . ON
- 4. Air distributor lever . . . . . ▲ (up)
- 5. RPM . . . . . increase, in order to prevent ice build-up on the propeller blades
- 6. Alternate air . . . . . OPEN
- 7. Emergency window(s) . . . . . open if required

**CONTINUED**

**CAUTION**

Ice build-up increases the stalling speed. If required for safety reasons, engine speeds up to 2700 RPM are admissible without time limit.

8. ATC . . . . . advise if an emergency is expected

**CAUTION**

When the Pitot heating fails, and the alternate static valve is installed:

- Alternate static valve . . . . . OPEN
- Emergency window(s) . . . . . close

**END OF CHECKLIST****3.7.2 FAILURES IN THE ELECTRICAL SYSTEM****(a) Complete Failure of the Electrical System**

Due to the strong mechanical design as well as due to the required check of the system during scheduled inspections, a total failure of the electrical system is extremely unlikely. If, nevertheless, a total failure should occur, all circuit breakers should be checked, pulled and re-set. If this does not help:

- Set Emergency switch to ON (if installed).
- When necessary, use the flood light for lighting the instruments as well as levers and switches, etc.
- Set power based on lever positions and engine noise.
- Prepare landing with flaps in the given position.
- Land on the nearest appropriate airfield.

**END OF CHECKLIST**

(b) Alternator Failure

An alternator failure is indicated by an illuminated or flashing alternator warning light (ALT or ALTERNATOR) on the annunciator panel and a flashing ammeter on the Vision Microsystems VM 1000 engine instrument.

**I** *Alternator Failure During Flight*

1. Circuit breakers . . . . . check; if all are OK, proceed with step 2
2. Electrical equipment. . . . . switch OFF all equipment which is not needed
3. Voltmeter . . . . . check regularly

**CAUTION**

Those items of equipment which are not needed for the safe operation and secure landing of the airplane can be switched off with the Essential Bus switch (if installed). When the essential bus is switched ON, only the following items of equipment are supplied with power:

- NAV/COM 1.
- Transponder (XPDR).
- Flood light.
- Attitude gyro (artificial horizon).
- VM 1000 engine instrument.
- Annunciator panel.
- GPS (if installed).
- Landing light.
- Pitot heating system.
- Flaps.

**CONTINUED**

## CAUTION

These items of equipment can be supplied with power by the battery for at least 30 minutes. Economical use, in particular of the Pitot heating, and switching off equipment that is not needed extends the time during which the other equipment remains available. During the 30 minutes period, the airplane must be landed at a suitable airfield.

For cases in which the battery capacity is not sufficient to reach a suitable airfield, an emergency battery is installed in the IFR model, serving as an additional back-up system for the attitude gyro (artificial horizon) and flood light. This battery is switched on with the Emergency switch. It lasts for 1 hour and 30 minutes when the flood light is switched on.

## END OF CHECKLIST

### *Alternator Failure on the Ground*

## NOTE

An alternator failure may also be indicted on ground with the engine running on IDLE.

1. Engine speed. . . . . 1200 RPM
2. Electrical equipment . . . . . OFF
3. Ammeter . . . . . check

If the caution light does not extinguish, and the ammeter flashes and reads zero:

- Terminate flight preparation.

## END OF CHECKLIST

(c) Starter Malfunction

If the starter does not disengage from the engine after starting (starter warning light (START) on the annunciator panel remains illuminated or flashing after the engine has started):

1. Throttle . . . . . IDLE
2. Mixture control lever . . . . . LEAN - shut off engine
3. Ignition switch . . . . . OFF
4. Master switch (ALT/BAT) . . . . . OFF

Terminate flight preparation!

**END OF CHECKLIST**

(d) Overvoltage

If a voltage in the upper red sector (above 32 Volts) is indicated:

1. Essential bus . . . . . ON, if installed
2. Master switch (ALT) . . . . . OFF

**WARNING**

Leave Master switch (BAT) ON!

3. Equipment that is not needed . . . . . OFF  
(in particular Pitot heat)
4. Land on the nearest appropriate airfield.

**END OF CHECKLIST**

### **3.7.3 SUSPICION OF CARBON MONOXIDE CONTAMINATION IN THE CABIN**

Carbon monoxide (CO) is a gas which is developed during the combustion process. It is poisonous and without smell. Since it occurs however usually together with fuel gases, it can be detected. Increased concentration of carbon monoxide in closed spaces can be fatal. The occurrence of CO in the cabin is possible only due to a defect. If a smell similar to exhaust gases is noticed in the cabin, the measures in the checklist below should be taken:

The DA 40 may be equipped with a CO detector (optional equipment, OÄM 40-253). If the visual alert annunciator illuminates in flight, press the TEST/RESET button. If the alert continues with the remote light staying ON or a smell similar to exhaust gases is noticed in the cabin, the following measures should be taken:

1. Cabin heat . . . . . OFF
2. Ventilation . . . . . open
3. Emergency window(s) . . . . . open
4. Forward canopy . . . . . open

■ Be sure the source of contamination is corrected before further flight.

### **CAUTION**

In case of suspicion of carbon monoxide contamination in the cabin, the front canopy may be unlatched during flight. This allows it to partially open, in order to improve ventilation. The canopy will remain open in this position. Flight characteristics will not be affected significantly.

### **NOTE**

The presence of carbon monoxide is indicated by a visual alarm if OÄM 40-253 is carried out.

### **END OF CHECKLIST**

**3.7.4 “DOOR”-WARNING LIGHT ON**

- 1. Airspeed . . . . . reduce immediately
- 2. Canopy . . . . . check visually if closed
- 3. Rear passenger door . . . . . check visually if closed

**(a) Canopy Unlocked**

- 4. Airspeed . . . . . below 140 KIAS
- 5. Land at the next suitable airfield.

**(b) Rear Door Unlocked**

- 4. Airspeed . . . . . below 140 KIAS
- 5. Land at the next suitable airfield.

**WARNING**

Do not try to lock the rear door in flight. The safety latch may disengage and the door opens. Usually this results in a separation of the door from the airplane.

**NOTE**

If the rear door has been lost the airplane can be safely flown to the next suitable airfield.

**END OF CHECKLIST**

**3.7.5 EMERGENCY EXIT**

In case of a roll-over of the airplane on ground, it can be evacuated through the rear door. For this purpose release the front hinge of the rear door. The function is displayed on a placard next to the hinge.

**END OF CHECKLIST**

## CHAPTER 4A

# NORMAL OPERATING PROCEDURES

	Page
4A.1 INTRODUCTION .....	4A-3
4A.2 AIRSPEEDS FOR NORMAL OPERATING PROCEDURES .....	4A-3
4A.3 CHECKLISTS FOR NORMAL OPERATING PROCEDURES .....	4A-3
4A.3.1 PRE-FLIGHT INSPECTION .....	4A-3
4A.3.2 BEFORE STARTING ENGINE .....	4A-11
4A.3.3 STARTING ENGINE .....	4A-13
4A.3.4 BEFORE TAXIING .....	4A-17
4A.3.5 TAXIING .....	4A-19
4A.3.6 BEFORE TAKE-OFF .....	4A-20
4A.3.7 TAKE-OFF .....	4A-23
4A.3.8 CLIMB .....	4A-24
4A.3.9 CRUISE .....	4A-26
4A.3.10 MIXTURE ADJUSTMENT .....	4A-27
4A.3.11 DESCENT .....	4A-28
4A.3.12 LANDING APPROACH .....	4A-29
4A.3.13 GO-AROUND .....	4A-30
4A.3.14 AFTER LANDING .....	4A-30
4A.3.15 ENGINE SHUT-DOWN .....	4A-31
4A.3.16 POST-FLIGHT INSPECTION .....	4A-31
4A.3.17 FLIGHT IN RAIN .....	4A-32
4A.3.18 REFUELING .....	4A-32
4A.3.19 FLIGHT AT HIGH ALTITUDE .....	4A-33

I Intentionally left blank.

## 4A.1 INTRODUCTION

Chapter 4A contains checklists and describes extended procedures for the normal operation of the airplane.

## 4A.2 AIRSPEEDS FOR NORMAL OPERATING PROCEDURES

Event	Flight Mass	850 kg	1000 kg	1150 kg	1200 kg
		1874 lb	2205 lb	2535 lb	2646 lb
Airspeed for take-off climb (best rate-of-climb speed $v_Y$ ) (Flaps T/O)		54 KIAS	60 KIAS	66 KIAS	67 KIAS
Airspeed for cruise climb (Flaps UP)		60 KIAS	68 KIAS	73 KIAS	76 KIAS
Approach speed for normal landing (Flaps LDG)		58 KIAS	63 KIAS	71 KIAS	73 KIAS
Minimum speed during touch & go (Flaps T/O)		54 KIAS	60 KIAS	66 KIAS	67 KIAS

## 4A.3 CHECKLISTS FOR NORMAL OPERATING PROCEDURES

### 4A.3.1 PRE-FLIGHT INSPECTION

#### (a) Cabin Check

- a) MET, NAV, mass & CG . . . . . flight planning completed
- b) Airplane documents . . . . . complete and up-to-date
- c) Ignition key . . . . . pulled out
- d) Front canopy and rear door . . . . . clean, undamaged, check locking mechanism function
- e) All electrical equipment . . . . . OFF

#### CONTINUED

- f) Circuit breakers . . . . . set in (if one has been pulled, check reason)
- g) Engine control levers . . . . . check condition, freedom of movement and full travel of throttle, RPM and mixture levers
- h) Throttle . . . . . IDLE
- i) Mixture control lever . . . . . LEAN
- j) RPM lever . . . . . HIGH RPM
- k) Master switch (BAT) . . . . . ON
- l) Annunciator panel (if equipped) . . . . . check function (see 7.11)
- m) PFD annunciations (if G1000 is installed) . . . check
- n) Fuel quantity . . . . . check

**NOTE**

Standard Tank (conventional instrument panel):

Depending on the type of fuel probes installed, the indicator can read a maximum of 15 US gal or 17 US gal (refer to Section 7.10 for details). When the fuel quantity indicator reads the maximum amount of fuel detectable, the correct fuel quantity must be determined with the fuel quantity measuring device. If this measurement is not carried out, the fuel quantity available for flight planning is the indicated amount.

Standard Tank (G1000 instrument panel):

When the fuel indicator reads 17 US gal, the correct fuel quantity must be determined with the fuel quantity measuring device. If this measurement is not carried out, the fuel quantity available for flight planning is 17 US gal.

**CONTINUED**

## NOTE

Long Range Tank (conventional instrument panel):

At an indication of 16 US gal the quantity of auxiliary fuel can be determined by switching the AUX FUEL QTY switch to the respective position (LH or RH). The auxiliary fuel quantity is added to the 16 US gal.

An auxiliary fuel quantity of less than 3 US gal cannot be indicated by the system. In this case the quantity must be determined by means of the fuel quantity measuring device (see Section 7.10 - FUEL SYSTEM).

Long Range Tank (G1000 instrument panel):

When the fuel indicator reads 16 US gal the correct fuel quantity must be determined with the fuel quantity measuring device. There are 3 US gal of ungauged fuel from 16 to 19 US gal. If this measurement is not carried out, the fuel quantity available for flight is 16 US gal.

## CAUTION

Long Range Tank (conventional instrument panel):

The correct indication of the fuel quantity takes 2 minutes after actuation of the switch.

- o) Position lights, strobe lights (ACLs) . . . . . check
- p) Master switch (BAT) . . . . . OFF
- q) Check for loose items . . . . . complete
- r) Flight controls and trim . . . . . free to move and correct
- s) Baggage . . . . . stowed and secure
- t) Emergency axe (if OÄM 40-326 installed) . . . stowed and secure

**CONTINUED**

- u) Emergency egress hammer . . . . . stowed and secure  
(if OÄM 40-401 installed)
- v) Fire extinguisher. . . . . charged and secure

**END OF CHECKLIST**

**(b) Walk-Around Check, Visual Inspection**

**CAUTION**

A visual inspection means: examination for damage, cracks, delamination, excessive play, load transmission, correct attachment and general condition. In addition control surfaces should be checked for freedom of movement.

**CAUTION**

In low ambient temperatures the airplane must be completely cleared of ice, snow and similar accumulations. For approved de-icing fluids refer to Section 8.6 - DE-ICING ON THE GROUND.

**CAUTION**

Prior to flight, remove such items as control surfaces gust lock, Pitot cover, tow bar, etc.

***Left Main Landing Gear:***

- a) Landing gear strut . . . . . visual inspection
- b) Strut fairing (if installed) . . . . . visual inspection
- c) Wheel fairing . . . . . visual inspection
- d) Tire inflation pressure (2.5 bar/36 PSI) . . . . . check
- e) Wear, tread depth of tire . . . . . check
- f) Tire, wheel, brake. . . . . visual inspection
- g) Brake line connection. . . . . check for leaks
- h) Slip marks . . . . . visual inspection

**CONTINUED**

- i) Chocks . . . . . remove

### Left Wing:

- a) Entire wing surface . . . . . visual inspection
- b) Step . . . . . visual inspection
- c) Air intake on lower surface . . . . . visual inspection
- d) Openings on lower surface . . . . . check for traces of fuel (if tank is full, fuel may spill over through the tank vent)
- e) Tank drain . . . . . drain off a small quantity, check for water and sediment
- f) Stall warning . . . . . check (suck on opening)
- g) Tank filler . . . . . visual inspection, fuel quantity must agree with indicator
- h) Tank air outlet in lower surface . . . . . visual inspection
- i) 2 stall strips on wing . . . . . visual inspection
- j) Pitot probe . . . . . clean, orifices open
- k) Landing/taxi light . . . . . visual inspection
- l) Wing tip . . . . . visual inspection
- m) Position light, strobe light (ACL) . . . . . visual inspection
- n) Mooring . . . . . check, clear
- o) Aileron and linkage . . . . . visual inspection
- p) Aileron hinges and safety pin. . . . . visual inspection
- q) Foreign objects in aileron paddle . . . . . visual inspection
- r) Flap and linkage . . . . . visual inspection
- s) Flap hinges and safety pin. . . . . visual inspection

### Fuselage, Left Side:

- a) Canopy, left side . . . . . visual inspection
- b) Rear cabin door & window. . . . . visual inspection

### CONTINUED

- c) Fuselage skin . . . . . visual inspection
- d) Antennas . . . . . visual inspection
- e) Autopilot static source . . . . . check for blockage  
(if OÄM 40-267 installed)

**Empennage:**

- a) Stabilizers and control surfaces . . . . . visual inspection
- b) Hinges . . . . . visual inspection
- c) Elevator trim tab . . . . . visual inspection, check locking  
wire
- d) Rudder trim tab . . . . . visual inspection
- e) Mooring on fin . . . . . check, clear
- f) Tail skid and lower fin . . . . . visual inspection
- g) Towing assembly, if fitted . . . . . visual inspection

**Fuselage, Right Side:**

- a) Fuselage skin . . . . . visual inspection
- b) Window . . . . . visual inspection
- c) Canopy, right side . . . . . visual inspection
- d) Autopilot static source . . . . . check for blockage  
(if OÄM 40-267 installed)

**Right Wing:**

- a) Flap and linkage . . . . . visual inspection
- b) Flap hinges and safety pin . . . . . visual inspection
- c) Aileron and linkage . . . . . visual inspection
- d) Aileron hinges and safety pin . . . . . visual inspection
- e) Foreign objects in aileron paddle . . . . . visual inspection
- f) Wing tip . . . . . visual inspection

**CONTINUED**

- g) Position light, strobe light (ACL) . . . . . visual inspection
- h) Mooring . . . . . check, clear
- i) Entire wing surface . . . . . visual inspection
- j) 2 stall strips on wing . . . . . visual inspection
- k) Tank air outlet in lower surface . . . . . visual inspection
- l) Tank filler . . . . . visual check, fuel quantity must  
agree with indicator
- m) Openings on lower surface . . . . . check for traces of fuel (if tank is  
full, fuel may spill over through the  
tank vent)
- n) Tank drain . . . . . drain off a small quantity, check for  
water and sediment
- o) Step . . . . . visual inspection

#### ■ *Right Main Landing Gear:*

- a) Landing gear strut . . . . . visual inspection
- b) Strut fairing (if installed) . . . . . visual inspection
- c) Wheel fairing . . . . . visual inspection
- d) Tire inflation pressure (2.5 bar/36 PSI) . . . . . check
- e) Wear, tread depth of tires . . . . . check
- f) Tire, wheel, brake . . . . . visual inspection
- g) Brake line connection . . . . . check for leaks
- h) Slip marks . . . . . visual inspection
- i) Chocks . . . . . remove

#### ■ *Front Fuselage:*

- a) Oil level . . . . . check dipstick,  
min. 4 qts for VFR operation  
min. 6 qts for IFR operation
- b) Cowling . . . . . visual inspection

#### ■ **CONTINUED**

- c) 3 air intakes . . . . . clear
- d) Propeller. . . . . visual inspection; blade shake:  
max. 3 mm (1/8 in); angular play  
of blade: max. 2°

**WARNING**

Never move the propeller by hand while the ignition is switched on, as it may result in serious personal injury.

- e) Spinner including attachment screws. . . . . visual inspection
- f) Nose landing gear . . . . . visual inspection
- g) Tire and wheel . . . . . visual inspection
- h) Slip marks . . . . . visual inspection
- i) Nose landing gear strut fairing (if installed) . . visual inspection
- j) Nose landing gear tie-down (if installed) . . . . check, clear
- k) Wear, tread depth of tire . . . . . check
- l) Wheel fairing . . . . . visual inspection
- m) Tow bar . . . . . removed
- n) Tire inflation pressure (2.0 bar/29 PSI) . . . . . check
- o) Chocks . . . . . remove
- p) Exhaust . . . . . visual inspection
- q) Forward cabin air inlets (if installed). . . . . clear
- r) Winter baffle for fresh air inlet (if installed). . . visual inspection

**WARNING**

The exhaust can cause burns when it is hot.

*Underside:*

- s) Antennas (if fitted) . . . . . visual inspection
- t) Gascolator . . . . . drain off a small quantity of fuel,  
check for water and sediment

**CONTINUED**

- u) Venting pipes . . . . . check for blockage
- v) Fuselage underside . . . . . check for excessive contamination  
particularly by oil, fuel, and other fluids

## END OF CHECKLIST

### 4A.3.2 BEFORE STARTING ENGINE

#### CAUTION

For take-off the adjustable backrests (if installed) must be fixed in the upright position.

#### NOTE

The pilot must ensure that a passenger sitting on a front seat is instructed in the operation of the adjustable backrest (if installed).

1. Pre-flight inspection . . . . . complete
2. Rudder pedals . . . . . adjusted
3. Passengers . . . . . instructed
4. Adjustable backrests (if installed) . . . . . adjust to the upright position described  
by a placard on the roll-over bar and  
verify proper fixation
5. Safety harnesses . . . . . all on and fastened
6. Baggage . . . . . check, secured
7. Rear door . . . . . closed and locked
8. Door lock (if installed) . . . . . unblocked, key removed

## CONTINUED

**CAUTION**

When operating the canopy, ensure that there are no obstructions between the canopy and the mating frame, for example seat belts, clothing, etc. When operating the locking handle do NOT apply undue force.

A slight downward pressure on the canopy may be required to ease handle operation.

- 9. Front canopy . . . . . position 1 or 2 (cooling gap)
- 10. Canopy lock (if installed) . . . . . unblocked, key removed
- 11. Parking brake . . . . . set
- 12. Flight controls . . . . . free movement
- 13. Trim wheel . . . . . T/O
- 14. Throttle . . . . . IDLE
- 15. RPM lever . . . . . HIGH RPM
- 16. Mixture control lever . . . . . LEAN
- 17. Friction device, throttle quadrant . . . . . adjusted
- 18. Alternate air . . . . . CLOSED
- 19. Alternate static valve . . . . . CLOSED, if installed
- 20. Avionics Master switch . . . . . OFF
- 21. Essential Bus switch . . . . . OFF, if installed

**CAUTION**

When the essential bus is switched ON, the battery will not be charged unless the essential tie relay bypass (OÄM 40-126) is installed.

- 22. Master switch (BAT) . . . . . ON (if G1000 is equipped, wait until power-up is complete, press ENT on MFD to acknowledge)

**CONTINUED**

23. Annunciator panel . . . . . test (see Section 7.11)
24. Fuel tank selector . . . . . on full tank

### WARNING

Never move the propeller by hand while the ignition is switched on, as it may result in serious personal injury.

Never try to start the engine by hand.

### END OF CHECKLIST

#### 4A.3.3 STARTING ENGINE

##### (a) Cold Engine

1. Strobe light (ACL) . . . . . ON
2. Electrical fuel pump . . . . . ON, note pump noise (functional check of pump)
3. Throttle . . . . . 3 cm (1.2 in) forward from IDLE (measured from rear of slot)
4. Mixture control lever . . . . . RICH for 3 - 5 sec, then LEAN
5. Throttle . . . . . 1 cm (0.4 in) forward from IDLE (measured from rear of slot)

### WARNING

Before starting the engine the pilot must ensure that the propeller area is free, and no persons can be endangered.

### CAUTION

Do not overheat the starter motor. Do not operate the starter motor for more than 10 seconds. After operating the starter motor, let it cool off for 20 seconds. After 6 attempts to start the engine, let the starter cool off for half an hour.

### CONTINUED

**CAUTION**

Before starting the engine and until the engine is shut down, the canopy must be closed and latched in position 1 or 2 (cooling gap), and the door must be closed and latched.

During engine operation, it is prohibited to enter or exit the airplane.

**CAUTION**

The use of an external pre-heater and external power source is recommended whenever possible, in particular at ambient temperatures below 0 °C (32 °F), to reduce wear and abuse to the engine and electrical system. Refer to 4B.8 - STARTING THE ENGINE WITH EXTERNAL POWER. Pre-heat will thaw the oil trapped in the oil cooler, which can be congealed in extremely cold temperatures. After a warm-up period of approximately 2 to 5 minutes (depending on the ambient temperature) at 1500 RPM, the engine is ready for take-off if it accelerates smoothly and the oil pressure is normal and steady.

- 6. Ignition switch. . . . . START

*When Engine Fires:*

- 7. Mixture control lever. . . . . rapidly move to RICH
- 8. Oil pressure . . . . . green sector within 15 sec
- 9. Electrical fuel pump . . . . . OFF

**WARNING**

If the oil pressure has not moved into the green sector within 15 seconds after starting, SWITCH OFF ENGINE and investigate problem.

- 10. Master switch (ALT). . . . . ON

**CONTINUED**

- 11. Ammeter . . . . . check
- 12. Fuel pressure. . . . . check (14 PSI to 35 PSI)
- 13. Annunciator panel . . . . . check

**END OF CHECKLIST**

(b) Warm Engine

- 1. Strobe light (ACL) . . . . . ON
- 2. Electrical fuel pump . . . . . ON, note pump noise and fuel pressure increase
- 3. Throttle . . . . . 3 cm (1.2 in) forward from IDLE (measured from rear of slot)
- 4. Mixture control lever . . . . . RICH for 1 - 3 sec, then LEAN

**WARNING**

Before starting the engine the pilot must ensure that the propeller area is free and no persons can be endangered.

**CAUTION**

Do not overheat the starter motor. Do not operate the starter motor for more than 10 seconds. After operating the starter motor, let it cool off for 20 seconds. After 6 attempts to start the engine, let the starter cool off for half an hour.

**CAUTION**

Before starting the engine and until the engine is shut down, the canopy must be closed and latched in position 1 or 2 (cooling gap), and the door must be closed and latched.

During engine operation, it is prohibited to enter or exit the airplane.

- 5. Ignition switch . . . . . START

**CONTINUED**

*When Engine Fires:*

- 6. Mixture control lever. . . . . rapidly move to RICH
- 7. Oil pressure . . . . . green sector within 15 sec

**WARNING**

If the oil pressure has not moved into the green sector within 15 seconds after starting, SWITCH OFF ENGINE and investigate problem.

- 8. Electrical fuel pump . . . . . OFF
- 9. Master switch (ALT) . . . . . ON
- 10. Ammeter . . . . . check
- 11. Fuel pressure . . . . . check (14 PSI to 35 PSI)
- 12. Annunciator panel . . . . . check

**END OF CHECKLIST**

**I** (c) Engine Will Not Start After Injection (Flooded Engine)

- 1. Strobe light (ACL). . . . . ON
- 2. Electrical fuel pump . . . . . OFF
- 3. Mixture control lever. . . . . LEAN, fully aft
- 4. Throttle. . . . . at mid position

**WARNING**

Before starting the engine the pilot must ensure that the propeller area is free and no persons can be endangered.

**CAUTION**

Do not overheat the starter motor. Do not operate the starter motor for more than 10 seconds. After operating the starter motor, let it cool off for 20 seconds. After 6 attempts to start the engine, let the starter cool off for half an hour.

**CONTINUED**

## CAUTION

Before starting the engine, and until the engine is shut down, the canopy must be closed and latched in position 1 or 2 (cooling gap), and the door must be closed and latched.

During engine operation, it is prohibited to enter or exit the airplane.

5. Ignition switch . . . . . START

### *When Engine Fires:*

6. Throttle . . . . . pull back towards IDLE
7. Mixture control lever . . . . . rapidly move to RICH
8. Oil pressure . . . . . green sector within 15 sec

## WARNING

If the oil pressure has not moved into the green sector within 15 seconds after starting, SWITCH OFF ENGINE and investigate problem.

9. Master switch (ALT). . . . . ON
10. Ammeter . . . . . check
11. Fuel pressure. . . . . check (14 PSI to 35 PSI)
12. Annunciator panel . . . . . check

## END OF CHECKLIST

### 4A.3.4 BEFORE TAXIING

1. Avionics Master switch . . . . . ON
2. Electrical equipment . . . . . ON as required
3. Flaps . . . . . UP - T/O - LDG - T/O (indicator and visual check)
4. Flight instruments and avionics . . . . . set, test function, as required

## CONTINUED

- 5. Flood light . . . . . ON, test function, as required
- 6. Ammeter . . . . . check, if required increase RPM
- 7. Fuel tank selector . . . . . change tanks, confirm that engine also runs on other tank (at least 1 minute at 1500 RPM)
- 8. Pitot heating . . . . . ON, test function; ammeter must show rise, and if G1000 is equipped, no yellow PITOT FAIL annunciation
- 9. Pitot heating . . . . . OFF if not required, check annunciation, if G1000 is equipped, yellow PITOT HT OFF annunciation
- 10. Strobe lights (ACLs). . . . . check ON, as required
- 11. Position lights, landing and taxi lights. . . . . ON, as required

**CAUTION**

When taxiing at close range to other aircraft, or during night flight in clouds, fog or haze, the strobe lights should be switched OFF. The position lights must always be switched ON during night flight.

- 12. Idle RPM . . . . . check, 600 to 800 RPM

If G1000 is equipped:

**NOTE**

The GFC 700 AFCS system automatically conducts a preflight self-test upon initial power application. The preflight test is indicated by a white boxed PFT on the PFD. Upon successful completion of the preflight test, the PFT is removed, the red AFCS annunciation is removed, and the autopilot disconnect tone sounds.

- 13. Primary flight display. . . . . NO AUTOPILOT ANNUNCIATIONS (if autopilot GFC 700 is installed)

**CONTINUED**

- 14. Autopilot disconnect tone . . . . . NOTE (if autopilot GFC 700 is installed)
- 15. MANUAL ELECTRIC TRIM - TEST as follows (if autopilot GFC 700 is installed):  
Press the AP DISC button down, and hold while commanding trim. Manual electric trim should not operate either nose up or down.
- 16. AUTOPILOT (if installed). . . . . engage by pressing AP button
- 17. AP DISC switch . . . . . press, verify that the autopilot disconnects, check tone (if GFC 700 is installed)
- 18. TRIM . . . . . set to take-off position manually

#### END OF CHECKLIST

#### 4A.3.5 TAXIING

- 1. Parking brake . . . . . release
- 2. Brakes . . . . . test on moving off
- 3. Flight instrumentation and avionics . . . . . check for correct indications (particularly directional gyro and turn and bank indicator)

#### CAUTION

When taxiing on a poor surface select the lowest possible RPM to avoid damage to the propeller from stones or similar items.

#### CONTINUED

**CAUTION**

Following extended operation on the ground, or at high ambient temperatures, the following indications of fuel vapor lock may appear:

- Arbitrary changes in idle RPM and fuel flow.
- Slow reaction of the engine to operation of throttle.
- Engine will not run with throttle in IDLE position.

*Remedy:*

1. For about 1 to 2 minutes, or until the engine settles, run at a speed of 1800 to 2000 RPM. Oil and cylinder head temperatures must stay within limits.
2. Pull throttle back to IDLE to confirm smooth running.
3. Set throttle to 1200 RPM and mixture for taxiing, i.e., use mixture control lever to set the maximum RPM attainable.
4. Immediately before the take-off run set the mixture for take-off, apply full throttle and hold this position for 10 seconds.

**NOTE**

Vapor lock can be avoided if the engine is run at speeds of 1800 RPM or more. This results in lower fuel temperatures.

**END OF CHECKLIST****4A.3.6 BEFORE TAKE-OFF****CAUTION**

Before take-off, the engine must run on each tank for at least 1 minute at 1500 RPM.

**CONTINUED**

### CAUTION

For take-off the adjustable backrests (if installed) must be fixed in the upright position.

1. Position airplane into wind if possible.
2. Parking brake . . . . . set
3. Adjustable backrests (if installed) . . . . . verify upright position and proper fixation
4. Safety harnesses . . . . . on and fastened
5. Rear door . . . . . check closed and locked
6. Front canopy . . . . . closed and locked

### CAUTION

When operating the canopy, ensure that there are no obstructions in between the canopy and the mating frame, for example seat belts, clothing, etc. When operating the locking handle do NOT apply undue force.

A slight downward pressure on the canopy may be required to ease handle operation.

7. Door warning light . . . . . check OFF (DOOR, DOORS, or DOOR OPEN)
8. Fuel tank selector . . . . . fullest tank
9. Engine instruments . . . . . in green sector
10. Circuit breakers . . . . . pressed in
11. Fuel pressure indicator . . . . . check (approx. 14 - 35 PSI)
12. Electrical fuel pump . . . . . ON
13. Mixture control lever . . . . . RICH (below 5000 ft)

**CONTINUED**

**NOTE**

At a density altitude of 5000 ft or above or at high ambient temperatures a fully rich mixture can cause rough running of the engine or a loss of performance. The mixture should be set for smooth running of the engine.

- 14. Flaps . . . . . check T/O
- 15. Trim . . . . . check T/O
- 16. Flight controls. . . . . free movement, correct sense
- 17. Throttle. . . . . 2000 RPM
- 18. RPM lever. . . . . pull back until a drop of 250 to 500 RPM is reached - HIGH RPM; cycle 3 times
- 19. Magneto check. . . . . L - BOTH - R - BOTH  
 Max. RPM drop: 175 RPM  
 Max. difference: 50 RPM  
 If the electronic ignition control unit is installed, the ignition status light must illuminate and extinguish after approximately 20 to 30 sec

**CAUTION**

The lack of an RPM drop suggests a faulty grounding or incorrect ignition timing. In case of doubt the magneto check can be repeated with a leaner mixture, in order to confirm a problem. Even when running on only one magneto the engine should not run unduly roughly.

- 20. Circuit breaker . . . . . check in
- 21. Voltmeter . . . . . check in green range
- 22. Throttle. . . . . IDLE

**CONTINUED**

If G1000 is installed:

- a) Flight plan . . . . . entered
  - b) Altimeter setting (G1000 NXi and standby) . . checked and set
  - c) Altitude preselector . . . . . set
  - d) Radios . . . . . set and checked
  - e) Transponder . . . . . code set
- 
- 23. Parking brake . . . . . release
  - 24. Alternate air . . . . . check CLOSED
  - 25. Landing light . . . . . ON as required
  - 26. Pitot heating . . . . . ON as required

## END OF CHECKLIST

### 4A.3.7 TAKE-OFF

(a) Normal Take-Off Procedure

- 1. Transponder . . . . . ON/ALT
- 2. RPM lever . . . . . check HIGH RPM
- 3. Throttle . . . . . MAX PWR (not abruptly)

## WARNING

The proper performance of the engine at full throttle should be checked early in the take-off procedure, so that the take-off can be aborted if necessary.

A rough engine, sluggish RPM increase, or failure to reach take-off RPM (2680 ± 20 RPM) are reasons for aborting the take-off. If the engine oil is cold, an oil pressure in the yellow sector is permissible.

- 4. Elevator . . . . . neutral
- 5. Rudder . . . . . maintain direction

**CONTINUED**

**NOTE**

In strong crosswinds steering can be augmented by use of the toe brakes. It should be noted, however, that this method increases the take-off roll, and should not generally be used.

- 6. Nose wheel lift-off ..... at  $v_R = 59$  KIAS
- 7. Airspeed..... 67 KIAS (1200 kg, 2646 lb)  
66 KIAS (1150 kg, 2535 lb)  
60 KIAS (below 1000 kg, 2205 lb)

*Above a Safe Height:*

- 8. RPM lever ..... 2400 RPM
- 9. Electrical fuel pump ..... OFF
- 10. Landing light..... OFF

**END OF CHECKLIST**

**4A.3.8 CLIMB**

**| (a) Procedure for Best Rate of Climb**

- 1. Flaps ..... T/O
- 2. Airspeed..... 67 KIAS (1200 kg, 2646 lb)  
66 KIAS (1150 kg, 2535 lb)  
60 KIAS (1000 kg, 2205 lb)  
54 KIAS (850 kg, 1874 lb)
- 3. RPM lever ..... 2400 RPM
- 4. Throttle..... MAX PWR
- 5. Mixture control lever..... RICH, above 5000 ft hold EGT constant
- 6. Engine instruments ..... in green sector
- 7. Trim ..... as required
- 8. Electrical fuel pump ..... ON at high altitudes

**| CONTINUED**

### CAUTION

Operation at high altitudes with the electrical fuel pump OFF may cause vapor bubbles, resulting in intermittent low fuel pressure indications, sometimes followed by high fuel flow indications.

### END OF CHECKLIST

#### (b) Cruise Climb

1. Flaps . . . . . UP
2. Airspeed . . . . . 76 KIAS (1200 kg, 2646 lb)  
73 KIAS (1150 kg, 2535 lb)  
68 KIAS (1000 kg, 2205 lb)  
60 KIAS (850 kg, 1874 lb)
3. RPM lever . . . . . 2400 RPM
4. Throttle . . . . . MAX PWR
5. Mixture control lever . . . . . RICH, above 5000 ft hold EGT  
constant
6. Engine instruments . . . . . in green sector
7. Trim . . . . . as required
8. Electrical fuel pump . . . . . ON at high altitudes

### CAUTION

Operation at high altitudes with the electrical fuel pump OFF may cause vapor bubbles, resulting in intermittent low fuel pressure indications, sometimes followed by high fuel flow indications.

### END OF CHECKLIST

**4A.3.9 CRUISE**

- 1. Flaps ..... UP
- 2. Throttle ..... set performance according to table
- 3. RPM lever ..... 1800 - 2400 RPM

**NOTE**

Favorable combinations of manifold pressure and RPM are given in Chapter 5.

**NOTE**

To optimize engine life the cylinder head temperature (CHT) should lie between 150 °F (66 °C) and 400 °F (204 °C) in continuous operation, and not rise above 435 °F (224 °C) in fast cruise.

**NOTE**

The oil temperature in continuous operation should lie between 165 °F (74 °C) and 220 °F (104 °C). If possible, the oil temperature should not remain under 180 °F (82 °C) for long periods, so as to avoid accumulation of condensation.

- 4. Mixture ..... set in accordance with 4A.3.10 - MIXTURE ADJUSTMENT
- 5. Trim ..... as required
- 6. Fuel tank selector ..... as required  
(max. difference 10 US gal with Standard Tank, 8 US gal with Long Range Tank)
- 7. Electrical fuel pump ..... ON at high altitudes

**CONTINUED**

**CAUTION**

Operation at high altitudes with the electrical fuel pump OFF may cause vapor bubbles, resulting in intermittent low fuel pressure indications, sometimes followed by high fuel flow indications.

**NOTE**

While switching from one tank to the other, the electrical fuel pump should be switched ON.

**END OF CHECKLIST****4A.3.10 MIXTURE ADJUSTMENT****CAUTION**

1. The maximum permissible cylinder head temperature (500 °F (260 °C)) must never be exceeded.
2. The mixture control lever should always be moved slowly.
3. Before selecting a higher power setting the mixture control lever should, on each occasion, be moved slowly to fully RICH.
4. Care should always be taken that the cylinders do not cool down too quickly. The cooling rate should not exceed 50 °F (22.8 °C) per minute.

**| (a) Best Economy Mixture**

The best economy mixture setting may only be used up to a power setting of 75 %. In order to obtain the lowest specific fuel consumption at a particular power setting proceed as follows: Slowly pull the mixture control lever back towards LEAN until the engine starts to run roughly. Then push the mixture control lever forward just far enough to restore smooth running. At the same time the exhaust gas temperature (EGT) should reach a maximum.

The exact value of EGT can be obtained by pressing the far left button on the engine instrument unit VM 1000. In the Lean mode one bar represents 10 °F (4.6 °C).

**CONTINUED**

**(b) Best Power Mixture**

The mixture can be set for maximum performance at all power settings. The mixture should first be set as for “best economy.” The mixture should then be enriched until the exhaust gas temperature is approximately 100 °F (55 °C) lower.

This mixture setting produces the maximum performance for a given manifold pressure and is mainly used for high power settings (approximately 75 %).

**END OF CHECKLIST**

**4A.3.11 DESCENT**

1. Mixture control lever. . . . . adjust as required for the altitude,  
operate slowly
2. RPM lever . . . . . 1800 - 2400 RPM
3. Throttle. . . . . as required
4. Electrical fuel pump . . . . . ON at high altitudes

**CAUTION**

When reducing power, the change in cylinder head temperature should not exceed 50 °F (22.8 °C) per minute. This is normally guaranteed by the “self-adapting inlet.” An excessive cooling rate may occur however, when the engine is very hot and the throttle is reduced abruptly in a fast descent. This will be indicated by a flashing cylinder head temperature indication.

**CAUTION**

Operation at high altitudes with the electrical fuel pump OFF may cause vapor bubbles, resulting in intermittent low fuel pressure indications, sometimes followed by high fuel flow indications.

**END OF CHECKLIST**

#### 4A.3.12 LANDING APPROACH

### CAUTION

For landing the adjustable backrests (if installed) must be fixed in the upright position.

1. Adjustable backrests (if installed) . . . . . adjust to the upright position described by a placard on the roll-over bar and verify proper fixation.
2. Fuel selector . . . . . fullest tank
3. Electrical fuel pump . . . . . ON
4. Safety harnesses . . . . . fastened
5. Airspeed . . . . . reduce to operate flaps (108 KIAS)
6. Flaps . . . . . T/O
7. Trim . . . . . as required
8. Landing light . . . . . as required

#### (a) Before Landing

9. Mixture control lever . . . . . RICH
10. RPM lever . . . . . HIGH RPM
11. Throttle . . . . . as required
12. Airspeed . . . . . reduce to operate flaps (91 KIAS)
13. Flaps . . . . . LDG
14. Approach speed . . . . . 73 KIAS (1200 kg, 2646 lb)  
71 KIAS (1150 kg, 2535 lb)  
67 KIAS (1092 kg, 2407 lb)  
63 KIAS (1000 kg, 2205 lb)  
58 KIAS (850 kg, 1874 lb)

### CAUTION

In conditions such as strong winds, wind shear, or turbulence, a higher approach speed should be selected.

#### CONTINUED

**NOTE**

In case of airplanes with a maximum landing mass less than the maximum permitted flight mass, a landing with a higher mass constitutes an abnormal operating procedure. Refer to Sections 2.7 - MASS (WEIGHT) and 4B.7 - LANDING WITH HIGH LANDING MASS.

**END OF CHECKLIST**

**4A.3.13 GO-AROUND**

- 1. Throttle . . . . . MAX PWR
- 2. Airspeed . . . . . 67 KIAS (1200 kg, 2646 lb)  
66 KIAS (1150 kg, 2535 lb)  
60 KIAS (1000 kg, 2205 lb)  
54 KIAS (850 kg, 1874 lb)
- 3. Flaps . . . . . T/O

**I (a) Above a Safe Height**

- 4. RPM lever . . . . . 2400 RPM
- 5. Airspeed . . . . . 76 KIAS (1200 kg, 2646 lb)  
73 KIAS (1150 kg, 2535 lb)  
68 KIAS (1000 kg, 2205 lb)  
60 KIAS (850 kg, 1874 lb)
- 6. Flaps . . . . . UP
- 7. Electrical fuel pump . . . . . OFF

**END OF CHECKLIST**

**4A.3.14 AFTER LANDING**

- 1. Throttle . . . . . IDLE
- 2. Brakes . . . . . as required
- 3. Electrical fuel pump . . . . . OFF

**I CONTINUED**

4. Transponder . . . . . OFF / STBY
5. Pitot heating . . . . . OFF
6. Avionics . . . . . as required
7. Lights . . . . . as required
8. Flaps . . . . . UP

## END OF CHECKLIST

### 4A.3.15 ENGINE SHUT-DOWN

1. Parking brake . . . . . set
2. Engine instruments . . . . . check
3. Avionics Master switch . . . . . OFF
4. All electrical equipment . . . . . OFF
5. Throttle . . . . . 1000 RPM
6. Ignition check. . . . . OFF until RPM drops noticeably,  
then immediately BOTH again
7. Mixture control lever . . . . . LEAN - shut engine off
8. Ignition switch . . . . . OFF

## CAUTION

If the G1000 NXi is installed, wait until the engine indications on the MFD are red X'd or yellow X'd prior to switching the Master switch off. This ensures that the engine and flight data can be written to non-volatile memory before removing electrical power.

9. Master switch (ALT/BAT) . . . . . OFF

## END OF CHECKLIST

### 4A.3.16 POST-FLIGHT INSPECTION

1. Ignition switch . . . . . OFF, remove key
2. Master switch (BAT) . . . . . ON

## CONTINUED

3. Avionics Master switch . . . . . ON
4. ELT . . . . . check inactive: listen on 121.5 MHz
5. Avionics Master switch . . . . . OFF
6. Master switch (BAT) . . . . . OFF
7. Parking brake . . . . . release, use chocks
8. Airplane . . . . . moor, if unsupervised for extended period

### NOTE

If the airplane is not operated for more than 5 days, the long-term parking procedure should be applied. If the airplane is not operated for more than 30 days, the storage procedure should be applied. Both procedures are described in the Airplane Maintenance Manual (Doc. No. 6.02.01) in Chapter 10.

## END OF CHECKLIST

### 4A.3.17 FLIGHT IN RAIN

### NOTE

Performance deteriorates in rain; this applies particularly to the take-off distance and to the maximum horizontal speed. The effect on the flight characteristics is minimal. Flight through very heavy rain should be avoided because of the associated visibility problems.

### 4A.3.18 REFUELING

### CAUTION

Before refueling, the airplane must be connected to electrical ground. Grounding points: unpainted areas (latches) on steps, left and right.

**4A.3.19 FLIGHT AT HIGH ALTITUDE**

At high altitudes the provision of oxygen for the occupants is necessary. Legal requirements for the provision of oxygen should be adhered to.

Also see Section 2.11 - OPERATING ALTITUDE.

I Intentionally left blank.

## CHAPTER 4B

# ABNORMAL OPERATING PROCEDURES

	Page
4B.1 PRECAUTIONARY LANDING . . . . .	4B-3
4B.2 INSTRUMENT INDICATIONS OUTSIDE OF GREEN RANGE. . . . .	4B-4
4B.2.1 HIGH OIL PRESSURE WHEN STARTING IN LOW . . . . .	4B-4
AMBIENT TEMPERATURES	
4B.2.2 HIGH MANIFOLD PRESSURE. . . . .	4B-4
4B.2.3 OIL TEMPERATURE . . . . .	4B-4
4B.2.4 CYLINDER HEAD TEMPERATURE AND EXHAUST . . . . .	4B-4
GAS TEMPERATURE	
4B.3 FAILURES IN THE ELECTRICAL SYSTEM . . . . .	4B-5
4B.3.1 LOW VOLTAGE CAUTION. . . . .	4B-5
4B.3.2 ELECTRONIC IGNITION CONTROL UNIT . . . . .	4B-6
4B.4 TAKE-OFF FROM A SHORT GRASS STRIP . . . . .	4B-6
4B.5 FAILURES IN FLAP OPERATING SYSTEM. . . . .	4B-7
4B.5.1 FAILURE IN POSITION INDICATION OR FUNCTION. . . . .	4B-7
4B.5.2 MODIFIED APPROACH PROCEDURE DEPENDING ON . . . . .	4B-7
THE AVAILABLE FLAP SETTING	
4B.6 FAILURES IN ELECTRICAL RUDDER PEDAL ADJUSTMENT . . . . .	4B-8
4B.7 LANDING WITH HIGH LANDING MASS . . . . .	4B-8
4B.8 STARTING THE ENGINE WITH EXTERNAL POWER. . . . .	4B-9
4B.9 STATIC SOURCE BLOCKED . . . . .	4B-11

I Intentionally left blank.



**CAUTION**

If sufficient time is remaining, the risk of fire in the event of a collision with obstacles can be reduced as follows:

- Fuel tank selector . . . . . OFF
- Ignition switch . . . . . OFF
- Master switch (ALT/BAT) . . . . . OFF

**END OF CHECKLIST****4B.2 INSTRUMENT INDICATIONS OUTSIDE OF GREEN RANGE****4B.2.1 HIGH OIL PRESSURE WHEN STARTING IN LOW AMBIENT TEMPERATURES**

- Reduce RPM and re-check oil pressure at a higher oil temperature.
- If on reducing the RPM the indicated oil pressure does not change, it is probable that the fault lies in the oil pressure indication. Terminate flight preparation.

**4B.2.2 HIGH MANIFOLD PRESSURE**

If the manifold pressure indicator is clearly above the green range, the reading is faulty. In this case the performance settings should be undertaken by means of the lever settings. The airplane should be serviced.

**4B.2.3 OIL TEMPERATURE**

A constant reading of the oil temperature of 26 °F (-3 °C) or 317 °F (158 °C) suggests a faulty oil temperature sensor. The airplane should be serviced.

**4B.2.4 CYLINDER HEAD TEMPERATURE AND EXHAUST GAS TEMPERATURE**

A very low reading of CHT or EGT for a single cylinder may be the result of a loose sensor. In this case the reading will indicate the temperature of the engine compartment. The airplane should be serviced.

**END OF CHECKLIST**

## **4B.3 FAILURES IN THE ELECTRICAL SYSTEM**

### **4B.3.1 LOW VOLTAGE CAUTION**

This caution is indicated when the normal on-board voltage (28 V) drops below 24 V.

Possible reasons are:

- A fault in the power supply.
- RPM too low.

#### **(a) "Low Voltage" Caution on the Ground**

1. Engine speed . . . . . 1200 RPM
2. Electrical equipment . . . . . OFF
3. Ammeter . . . . . check

If the caution light does not go out, and the ammeter flashes and reads zero:

- Terminate flight preparation.

#### **(b) "Low Voltage" Caution During Flight**

1. Electrical equipment . . . . . OFF if not needed
2. Ammeter . . . . . check

If the caution light does not go out, and the ammeter flashes and reads zero:

- Follow procedure in 3.7.2 (b) - ALTERNATOR FAILURE.

#### **(c) "Low Voltage" Caution During Landing**

- Follow (a) after landing.

**END OF CHECKLIST**

**4B.3.2 ELECTRONIC IGNITION CONTROL UNIT**

If the electronic ignition control unit is installed but inoperative, the white status light for the ignition (IGN or IGNITION) will be illuminated, and the conventional magneto ignition will take over the ignition control.

The flight can be continued normally. However, fuel consumption will slightly increase, and engine starting will become difficult.

**END OF CHECKLIST**

**4B.4 TAKE-OFF FROM A SHORT GRASS STRIP**

- 1. Brakes ..... apply
- 2. Flaps ..... T/O
- 3. Throttle ..... MAX PWR
- 4. Elevator (control stick) ..... fully aft
- 5. Brakes ..... release
- 6. Hold direction ..... using rudder

**NOTE**

In strong crosswinds steering can be augmented by use of the toe brakes. It should be noted, however, that this method increases the take-off roll, and should not generally be used.

- 7. Elevator (control stick) ..... release slowly, when nose wheel has lifted allow airplane to lift off as soon as possible and increase speed at low level

**CONTINUED**

- |                                |                               |
|--------------------------------|-------------------------------|
| 8. Airspeed .....              | 67 KIAS (1200 kg, 2646 lb)    |
|                                | 66 KIAS (1150 kg, 2535 lb)    |
|                                | 60 KIAS (1000 kg, 2205 lb)    |
|                                | 54 KIAS (850 kg, 1874 lb)     |
| 9. RPM lever .....             | 2400 RPM, above safe altitude |
| 10. Flaps .....                | UP, above safe altitude       |
| 11. Electrical fuel pump ..... | OFF, above safe altitude      |
| 12. Landing light .....        | as required                   |

## END OF CHECKLIST

### 4B.5 FAILURES IN FLAP OPERATING SYSTEM

#### 4B.5.1 FAILURE IN POSITION INDICATION OR FUNCTION

- Check flap position visually.
- Keep airspeed in white sector.
- Re-check all positions of the flap switch.

#### 4B.5.2 MODIFIED APPROACH PROCEDURE DEPENDING ON THE AVAILABLE FLAP SETTING

##### (a) Only UP or T/O Available

- |                |                            |
|----------------|----------------------------|
| Airspeed ..... | 76 KIAS (1200 kg, 2646 lb) |
|                | 73 KIAS (1150 kg, 2535 lb) |
|                | 68 KIAS (1000 kg, 2205 lb) |
|                | 60 KIAS (850 kg, 1874 lb)  |

Land at a flat approach angle, use throttle to control airplane speed and rate of descent.

##### (b) Only LDG Available

Perform normal landing.

## END OF CHECKLIST

**4B.6 FAILURES IN ELECTRICAL RUDDER PEDAL ADJUSTMENT**

**I (a) Runaway of Electrical Rudder Pedal Adjustment (Optional Equipment, OÄM 40-251)**

**NOTE**

The circuit breaker for the rudder pedal adjustment is located below the related switch, on the rear wall of the leg room.

- 1. Circuit breaker . . . . . pull

**END OF CHECKLIST**

**4B.7 LANDING WITH HIGH LANDING MASS**

**NOTE**

This Section only applies to airplanes with a maximum landing mass less than the maximum flight mass. All landings with a current flight mass not exceeding the maximum permissible landing mass constitutes a normal operating procedure. Refer to Sections 2.7 - MASS (WEIGHT) and 4A.3.12 - LANDING APPROACH.

**NOTE**

The maximum landing mass given in Chapter 2 is the highest mass for landing conditions at the maximum descent velocity. This velocity was used in the strength calculations to determine the landing gear loads during a particularly hard landing.

Perform landing approach and landing according to Chapter 4A, but maintain an increased airspeed during landing approach.

- Approach speed . . . . . 73 KIAS (1200 kg, 2646 lb)
- 71 KIAS (1150 kg, 2535 lb)

**I CONTINUED**

### WARNING

Damage to the landing gear can result from a hard landing with a flight mass above the maximum landing mass.

### END OF CHECKLIST

## 4B.8 STARTING THE ENGINE WITH EXTERNAL POWER

### WARNING

The use of an external power supply for engine starting with an empty airplane battery is not permitted if the subsequent flight is intended to be an IFR flight. In this case the airplane battery must be charged first.

### WARNING

The external power supply must be operated by a person made aware of the associated procedures. Special care is required due to the proximity of the propeller area.

### NOTE

Starting the engine with external power is recommended in particular at ambient temperatures below 0 °C (32 °F), to reduce wear and abuse to the engine and electrical system.

1. Pre-flight inspection . . . . . complete
2. Rudder pedals . . . . . adjusted
3. Passengers . . . . . instructed
4. Safety harnesses . . . . . all on and fastened
5. Baggage . . . . . check, secured
6. Rear door . . . . . closed and locked
7. Door lock (if installed) . . . . . unblocked, key removed

### CONTINUED

### CAUTION

When operating the canopy, ensure that there are no obstructions between the canopy and the mating frame, for example seat belts, clothing, etc. When operating the locking handle do NOT apply undue force.

A slight downward pressure on the canopy may be required to ease handle operation.

- |     |  |                               |
|-----|--|-------------------------------|
| 8.  | Front canopy . . . . .                       | position 1 or 2 (cooling gap) |
| 9.  | Canopy lock (if installed) . . . . .         | unblocked, key removed        |
| 10. | Parking brake . . . . .                      | set                           |
| 11. | Flight controls . . . . .                    | free movement                 |
| 12. | Trim wheel . . . . .                         | T/O                           |
| 13. | Throttle . . . . .                           | IDLE                          |
| 14. | RPM lever . . . . .                          | HIGH RPM                      |
| 15. | Mixture control lever . . . . .              | LEAN                          |
| 16. | Friction device, throttle quadrant . . . . . | adjusted                      |
| 17. | Alternate air . . . . .                      | CLOSED                        |
| 18. | Alternate static valve . . . . .             | CLOSED, if installed          |
| 19. | Avionics Master switch . . . . .             | OFF                           |
| 20. | Essential Bus switch . . . . .               | OFF, if installed             |

### CAUTION

When the essential bus is switched ON, the battery will not be charged unless the essential tie relay bypass (OÄM 40-126) is installed.

- |     |                              |         |
|-----|------------------------------|---------|
| 21. | External power . . . . .     | connect |
| 22. | Master switch (BAT). . . . . | ON      |

**CONTINUED**

- 23. Annunciator panel . . . . . test (see Section 7.11)
- 24. Fuel tank selector . . . . . on full tank

### WARNING

Never move the propeller by hand while the ignition is switched on,  
as it may result in serious personal injury.

Never try to start the engine by hand.

- 25. Starting engine procedure . . . . . execute (see Section 4A.3.3 -  
STARTING ENGINE)
- 26. External power. . . . . disconnect, close access panel
- 27. Ammeter . . . . . check
- 28. Master switch (ALT). . . . . OFF, note decrease of ammeter  
reading
- 29. Master switch (ALT). . . . . ON

### END OF CHECKLIST

### 4B.9 ERRONEOUS INDICATIONS OF AIRSPEED OR ALTITUDE

Erroneous indications on the airspeed indicator, altimeter, vertical speed indicator, or erroneous behavior of the autopilot (if equipped) may be the result of a static source blockage.

- 1. Alternate static source . . . . . OPEN
- 2. Pitot heat . . . . . ON
- 3. Emergency window(s) . . . . . CLOSE

### END OF CHECKLIST

I Intentionally left blank.

## CHAPTER 5

# PERFORMANCE

		Page
5.1	INTRODUCTION .....	5-3
5.2	USE OF THE PERFORMANCE TABLES AND DIAGRAMS .....	5-3
5.3	PERFORMANCE TABLES AND DIAGRAMS .....	5-4
5.3.1	AIRSPPEED CALIBRATION .....	5-4
5.3.2	TABLE FOR SETTING ENGINE PERFORMANCE .....	5-5
5.3.3	PRESSURE ALTITUDE - DENSITY ALTITUDE .....	5-8
5.3.4	STALLING SPEEDS .....	5-9
5.3.5	WIND COMPONENTS .....	5-10
5.3.6	TAKE-OFF DISTANCE .....	5-11
5.3.7	CLIMB PERFORMANCE - TAKE-OFF CLIMB .....	5-14
5.3.8	CLIMB PERFORMANCE - CRUISE CLIMB .....	5-16
5.3.9	CRUISING TRUE AIRSPEED (TAS) .....	5-18
5.3.10	LANDING DISTANCE - FLAPS LDG .....	5-19
5.3.11	LANDING DISTANCE - FLAPS UP .....	5-22
5.3.12	GRADIENT OF CLIMB ON GO-AROUND .....	5-25
5.3.13	APPROVED NOISE DATA .....	5-25

I

Intentionally left blank.

## **5.1 INTRODUCTION**

The performance tables and diagrams on the following pages are presented so that, on the one hand, you can see what performance you can expect from your airplane, while on the other they allow comprehensive and sufficiently accurate flight planning. The values in the tables and the diagrams were obtained in the framework of the flight trials using an airplane and power-plant in good condition, and corrected to the conditions of the International Standard Atmosphere (ISA = 15 °C / 59 °F and 1013.25 hPa / 29.92 inHg at sea level).

The performance diagrams do not take into account variations in pilot experience or a poorly maintained airplane. The performances given can be attained if the procedures quoted in this manual are applied, and the airplane has been well maintained.

## **5.2 USE OF THE PERFORMANCE TABLES AND DIAGRAMS**

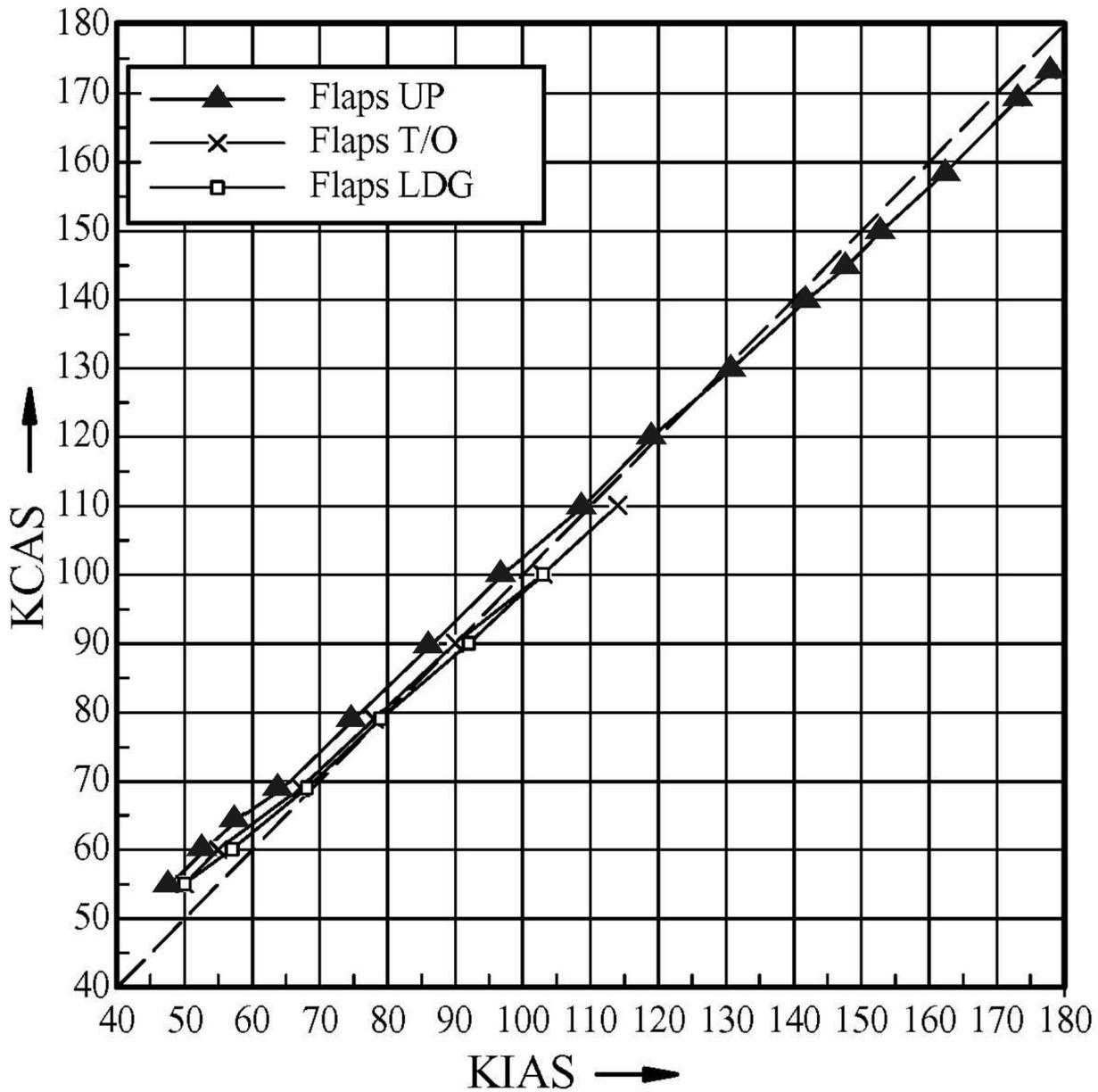
In order to illustrate the influence of a number of different variables, the performance data is reproduced in the form of tables or diagrams. These contain sufficiently detailed information so that conservative values can be selected and used for the determination of adequate performance data for the planned flight.

Where appropriate, any flight performance degradation resulting from the absence of wheel fairings is given as a percentage.

The installation of the optional fairings on the main landing gear struts and/or nose landing gear strut has only minor effects on the flight performance of the DA 40. Therefore, no change applies to the performance tables and diagrams.

### 5.3 PERFORMANCE TABLES AND DIAGRAMS

#### 5.3.1 AIRSPEED CALIBRATION



**5.3.2 TABLE FOR SETTING ENGINE PERFORMANCE****NOTE**

| If the Long Range Tank is installed (conventional panel):

Auxiliary fuel below 3 US gal cannot be indicated by the system. If a fuel indicator shows 16 US gal and the auxiliary fuel indicator reads 0 US gal on the same side, for in-flight fuel consumption / flight planning a fuel quantity available of 16 US gal must be assumed.

| If the Long Range Tank is installed (G1000 instrument panel):

| When the fuel indicator reads 16 US gal the correct fuel quantity must be determined with the fuel quantity measuring device. There are 3 US gal of ungauged fuel from 16 to 19 US gal. If this measurement is not carried out, the fuel quantity available for flight is 16 US gal.

			Engine Power as % of Max. Take-Off Power						
			45 %				55 %		
		RPM	1800	2000	2200	2400	2000	2200	2400
Fuel Flow [US gal/h]	Best Economy		5.8	6	6.3	6.6	7	7.2	7.5
	Best Power		-	-	7.3	7.7	-	8.5	8.7
ISA	[°C]	[°F]	Manifold Pressure (MP) [inHg]						
MSL	15	59	<b>22.7</b>	21.3	20.2	19.0	<b>23.9</b>	22.4	21.2
1000	13	55	<b>22.4</b>	21.0	19.9	18.7	<b>23.6</b>	22.2	21.0
2000	11	52	<b>22.1</b>	20.7	19.6	18.4	<b>23.3</b>	21.9	20.7
3000	9	48	<b>21.8</b>	20.4	19.3	18.2	<b>23.0</b>	21.6	20.4
4000	7	45	<b>21.5</b>	20.2	19.0	17.9	<b>22.7</b>	21.2	20.1
5000	5	41	<b>21.2</b>	19.9	18.7	17.6	<b>22.3</b>	20.9	19.8
6000	3	38	<b>20.9</b>	19.6	18.4	17.4	<b>22.0</b>	20.6	19.5
7000	1	34	<b>20.5</b>	19.3	18.2	17.1	<b>21.7</b>	20.3	19.3
8000	-1	31	<b>20.2</b>	19.0	17.9	16.9	<b>21.3</b>	<b>20.0</b>	19.0
9000	-3	27	<b>19.9</b>	18.7	17.6	16.6	<b>21.1</b>	<b>19.7</b>	18.7
10000	-5	23	<b>19.6</b>	<b>18.4</b>	17.3	16.3	-	<b>19.4</b>	<b>18.4</b>
11000	-7	19	<b>19.3</b>	<b>18.2</b>	17.0	16.1		<b>19.1</b>	<b>18.1</b>
12000	-9	16	-	<b>17.9</b>	<b>16.7</b>	15.8		-	<b>17.8</b>
13000	-11	12		<b>17.6</b>	<b>16.4</b>	15.5			<b>17.6</b>
14000	-13	9		-	<b>16.1</b>	15.3			-
15000	-15	6			<b>15.8</b>	<b>15.0</b>			
16000	-17	2			<b>15.5</b>	<b>14.7</b>			
17000	-19	-2			-	<b>14.5</b>			

			Engine Power as % of Max. Take-Off Power				
			65 %			75 %	
RPM		2000	2200	2400	2200	2400	
Fuel Flow [US gal/h]	Best Economy	7.9	8.2	8.5	9.2	9.5	
	Best Power	-	9.5	9.8	10.7	11	
ISA	[°C]	[°F]	Manifold Pressure (MP) [inHg]				
MSL	15	59	26.8	24.9	23.4	27.3	25.8
1000	13	55	26.4	24.5	23.2	26.8	25.5
2000	11	52	26.0	24.2	22.9	26.5	25.2
3000	9	48	25.7	23.8	22.6	26.1	24.8
4000	7	45	25.4	23.5	22.3	-	24.5
5000	5	41	-	23.1	22.0		24.1
6000	3	38		22.8	21.7		-
7000	1	34		22.4	21.4		
8000	-1	31		-	21.0		
9000	-3	27			20.7		
10000	-5	23			-		

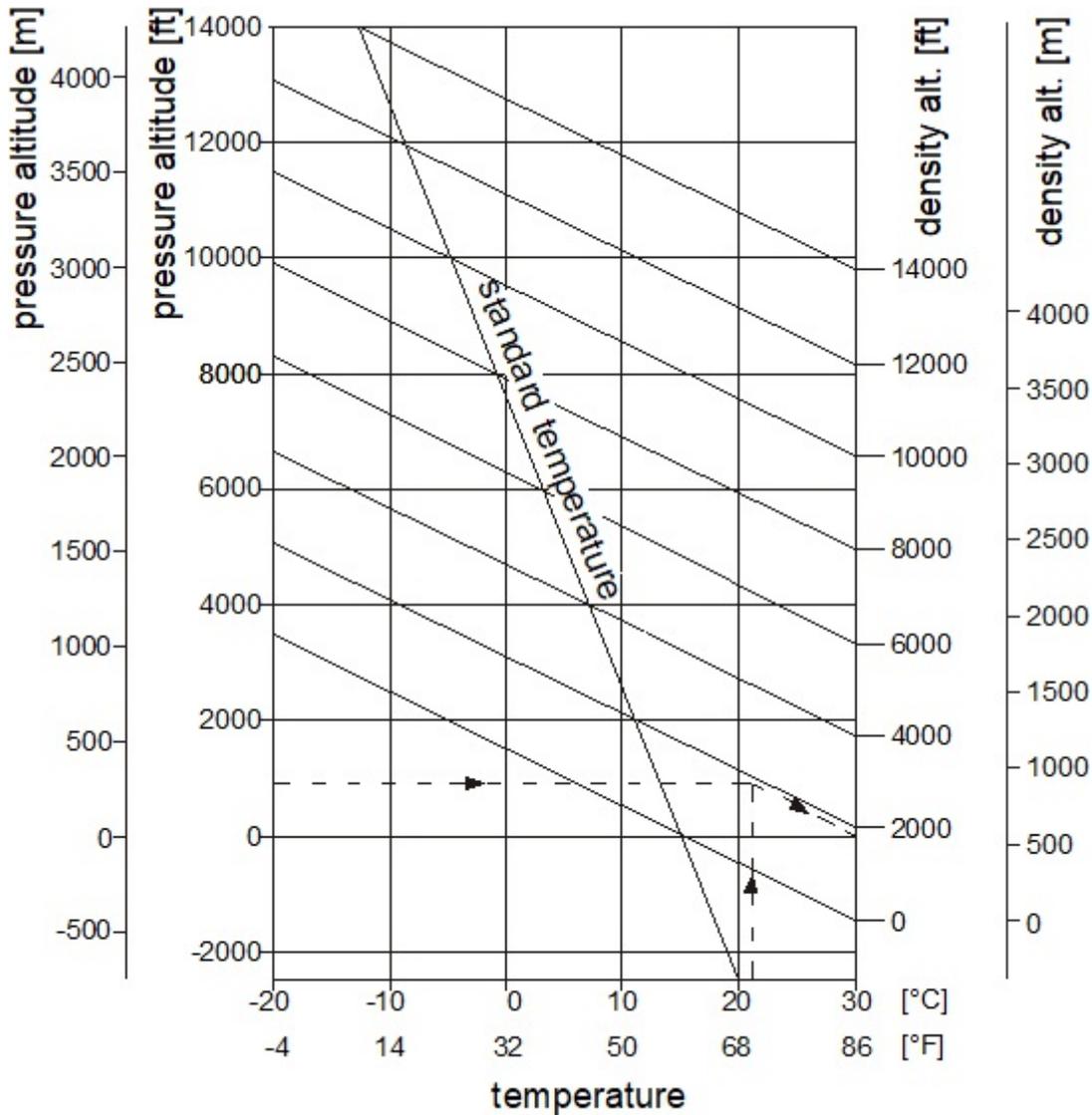
The areas shaded grey under each RPM heading are the recommended bands.

Correcting the table for variation from standard temperature:

- At ISA + 15 °C (ISA + 27 °F) the performance values fall by approx. 3 % of the power selected according to the above table.
- At ISA - 15 °C (ISA - 27 °F) the performance values rise by approx. 3 % of the power selected according to the above table.

**5.3.3 PRESSURE ALTITUDE - DENSITY ALTITUDE**

Conversion from pressure altitude to density altitude.



- Example:
1. Set 1013.25 hPa on altimeter and read pressure altitude (900 ft).
  2. Establish ambient temperature (+21 °C (70 °F)).
  3. Read off density altitude (1800 ft).

Result: From a performance calculation standpoint the airplane is at 1800 ft.

### 5.3.4 STALLING SPEEDS

Airspeeds in KIAS

(a) Mass: 980 kg (2161 lb)

980 kg		Bank Angle			
		0°	30°	45°	60°
Flaps	UP	47	52	58	73
	T/O	44	51	58	72
	LDG	42	49	57	71

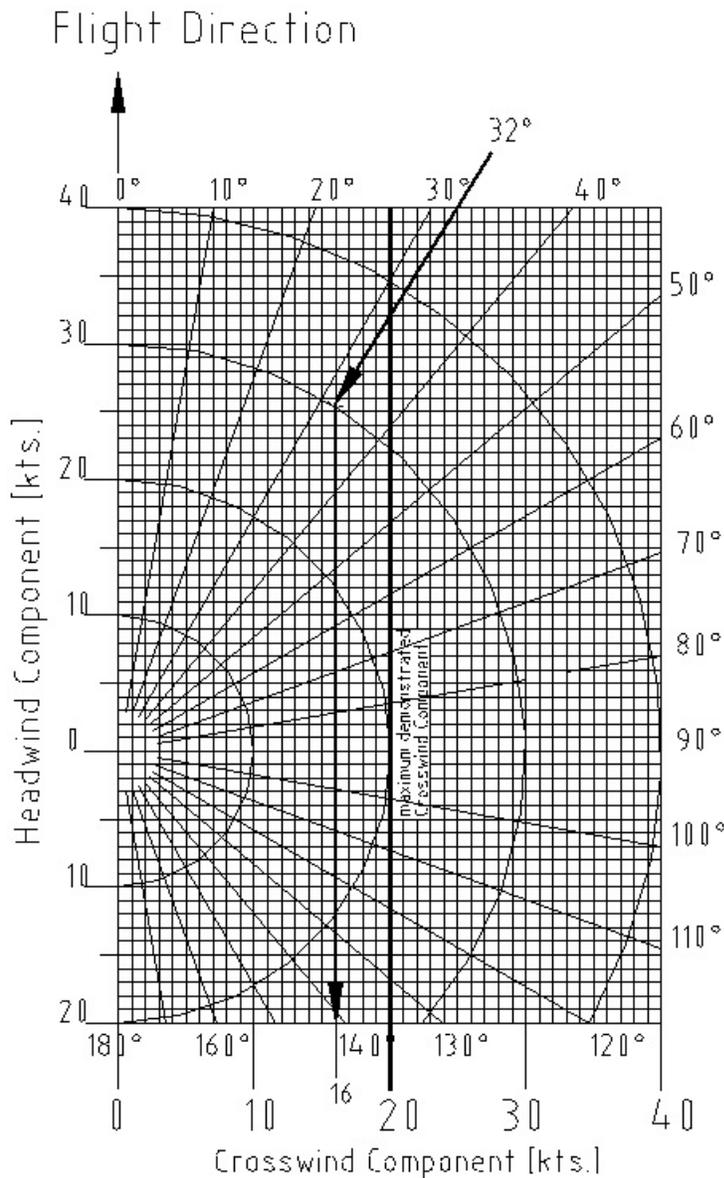
(b) Mass: 1150 kg (2535 lb)

1150 kg		Bank Angle			
		0°	30°	45°	60°
Flaps	UP	52	57	66	79
	T/O	51	55	64	78
	LDG	49	55	62	76

(c) Mass: 1200 kg (2646 lb) (if MÄM 40-227 is carried out)

1200 kg		Bank Angle			
		0°	30°	45°	60°
Flaps	UP	53	58	68	83
	T/O	52	57	67	81
	LDG	52	57	66	80

**5.3.5 WIND COMPONENTS**



Example: Flight direction : 360°  
 Wind : 32°/30 kts  
 Result: Crosswind component : 16 kts  
 Max. demonstrated crosswind component : 20 kts

**5.3.6 TAKE-OFF DISTANCE**

- Conditions:
- Throttle . . . . . MAX PWR
  - RPM lever . . . . . 2700 RPM
  - Flaps . . . . . T/O
  - Lift-off speed . . . . . approx. 59 KIAS
  - Climb-out speed . . . . . 67 KIAS (1200 kg, 2646 lb)  
66 KIAS (1150 kg, 2535 lb)  
60 KIAS (below 1000 kg, 2205 lb)
  - Runway . . . . . level, asphalt surface

**WARNING**

Poor maintenance condition of the airplane, deviation from the given procedures as well as unfavorable external factors (high temperature, rain, unfavorable wind conditions, including cross-wind) will increase the take-off distance.

**CAUTION**

For a safe take-off the take-off run available (TORA) should be at least equal to the take-off distance over a 50 ft (15 m) obstacle.

**CAUTION**

The figures in the following NOTE are typical values. On wet ground or wet soft grass covered runways the take-off roll may become significantly longer than stated below. In any case the pilot must allow for the condition of the runway to ensure a safe take-off.

**NOTE**

For take-off from dry, short-cut grass covered runways, the following corrections must be taken into account, compared to paved runways (typical values, see CAUTION above):

- Grass up to 5 cm (2 in) long: 10 % increase in take-off roll.
- Grass 5 to 10 cm (2 to 4 in) long: 15 % increase in take-off roll.
- Grass longer than 10 cm (4 in): at least 25 % increase in take-off roll.
- Grass longer than 25 cm (10 in): take-off should not be attempted.

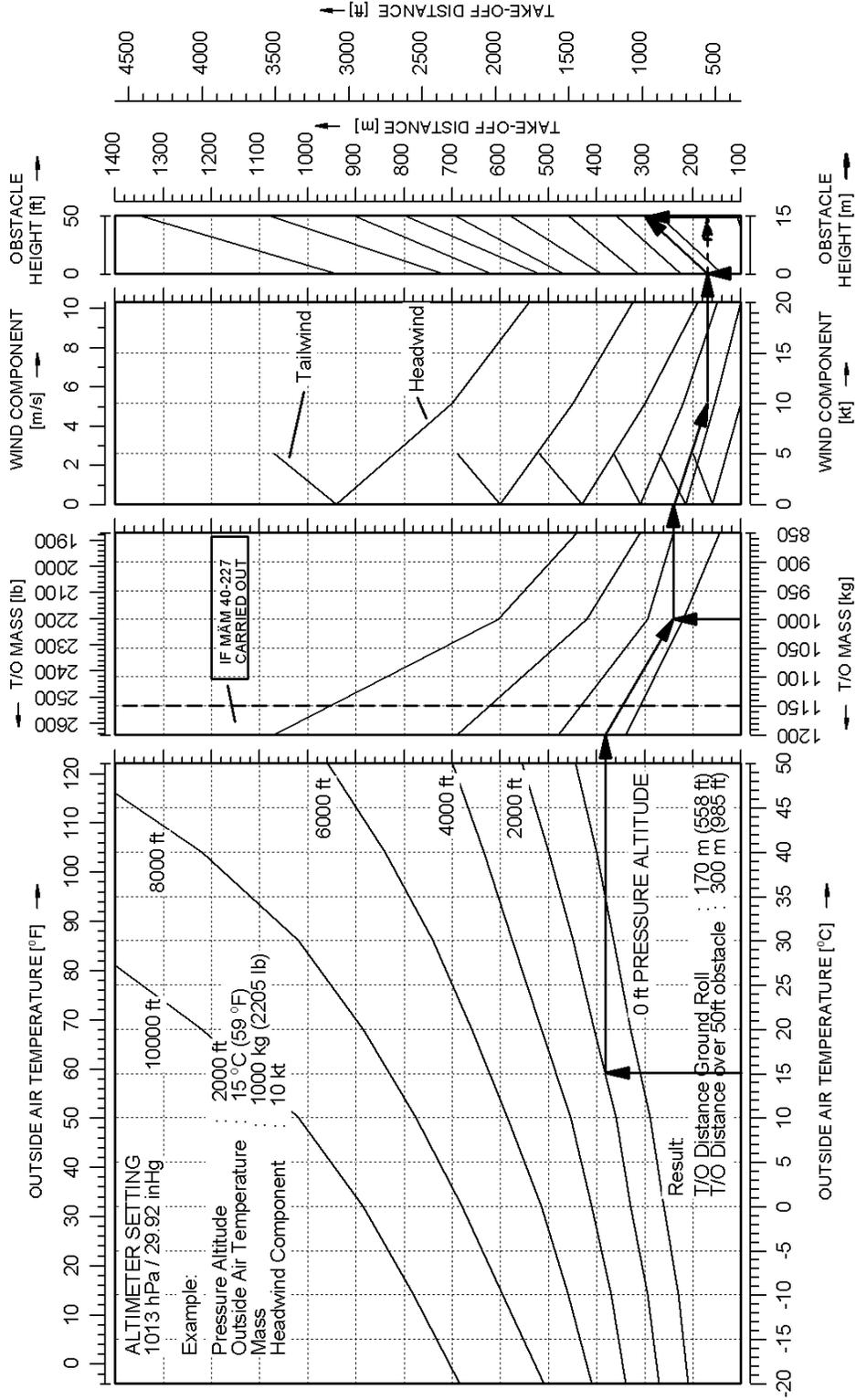
**NOTE**

On wet grass, a further 10 % increase in take-off roll must be expected.

**NOTE**

An uphill slope of 2 % (2 m per 100 m, or 2 ft per 100 ft) results in an increase in the take-off distance of approximately 10 %. The effect on the take-off roll can be greater.

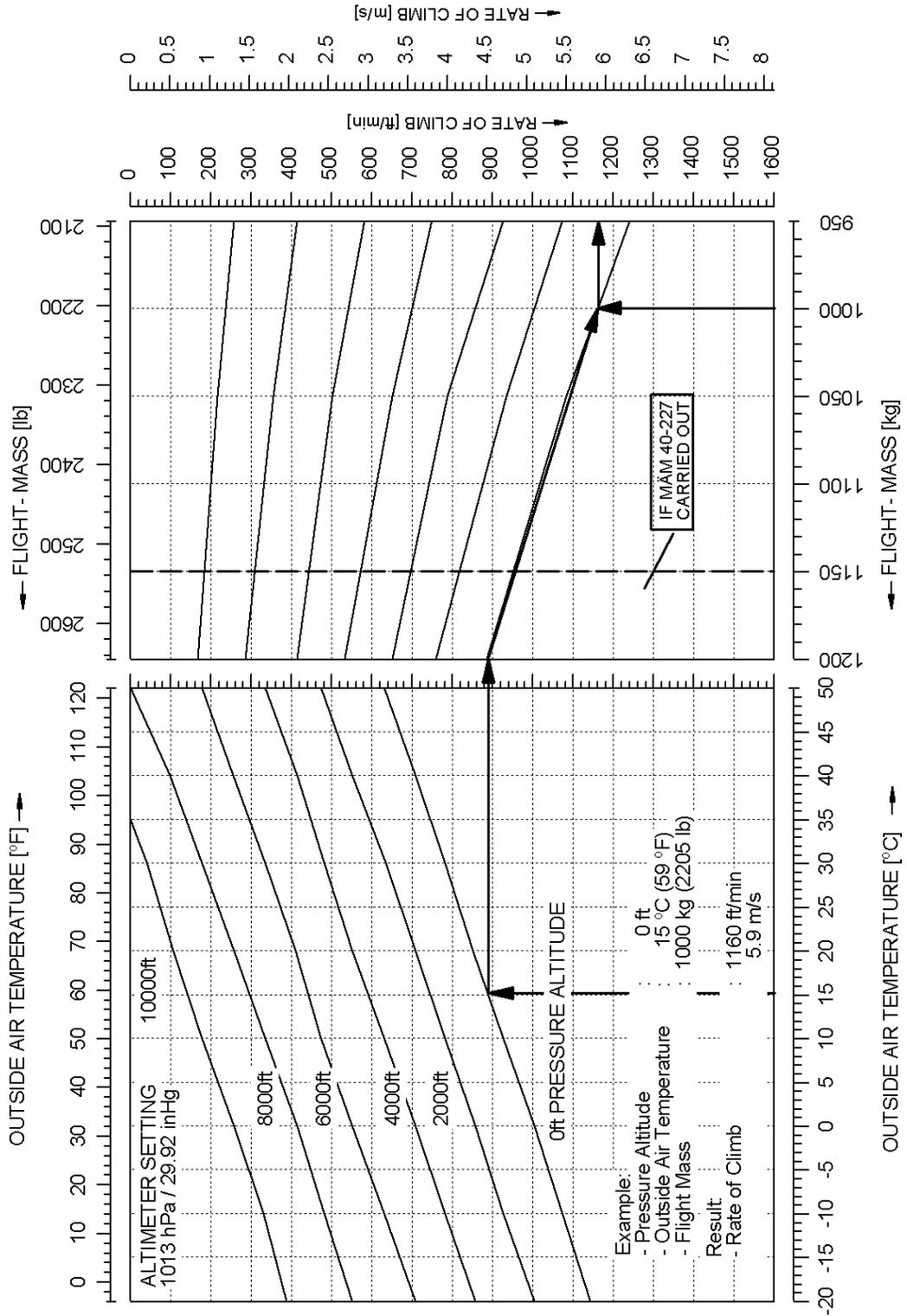
# DA 40 - TAKE-OFF DISTANCES



**5.3.7 CLIMB PERFORMANCE - TAKE-OFF CLIMB**

- Conditions:
- Throttle. . . . . MAX PWR
  - RPM lever . . . . . 2400 RPM
  - Flaps . . . . . T/O
  - Airspeed. . . . . 67 KIAS (1200 kg, 2646 lb)  
66 KIAS (1150 kg, 2535 lb)  
60 KIAS (1000 kg, 2205 lb)  
54 KIAS (850 kg, 1874 lb)

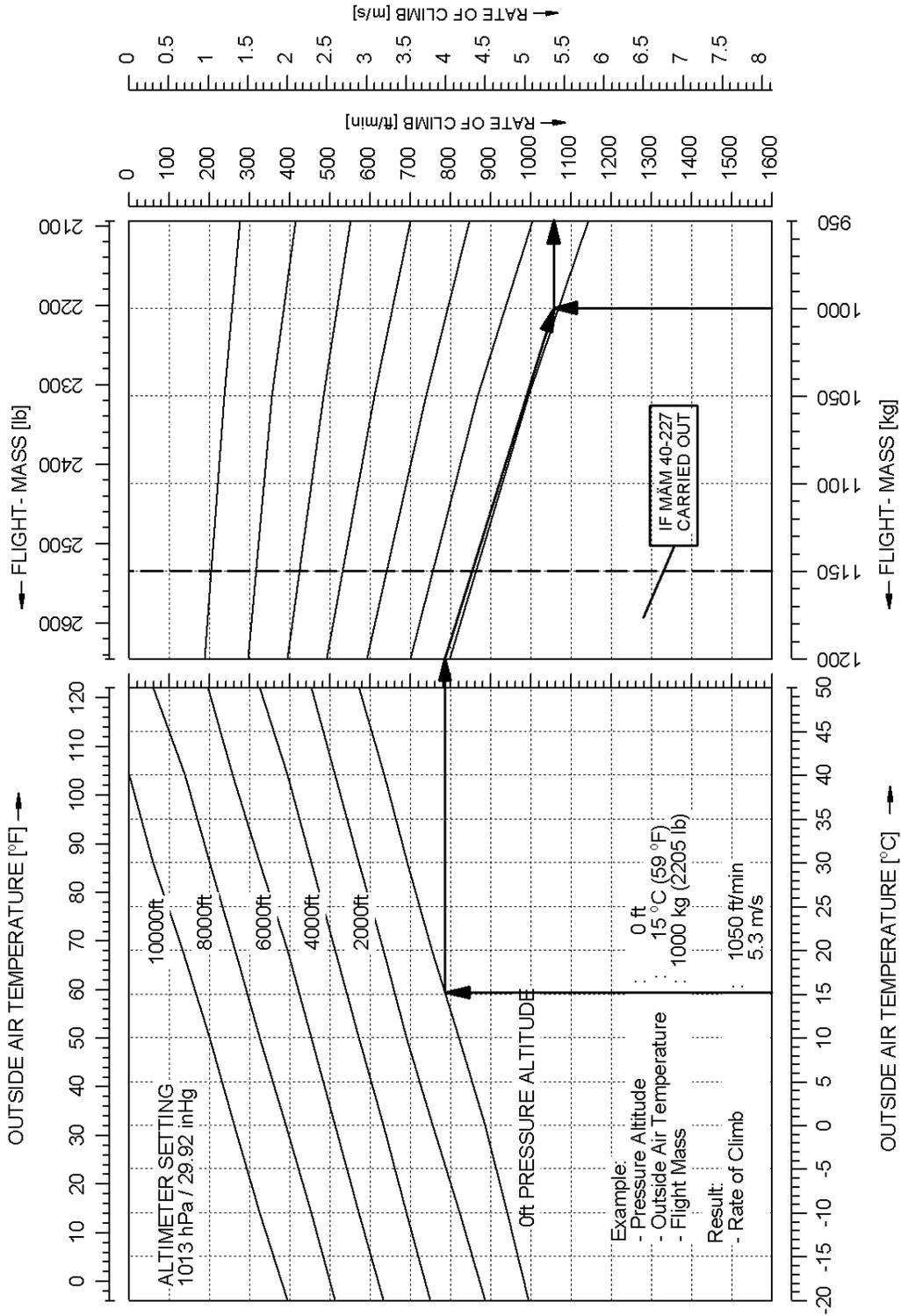
# DA 40 - CLIMB PERFORMANCE - TAKE OFF CLIMB



**5.3.8 CLIMB PERFORMANCE - CRUISE CLIMB**

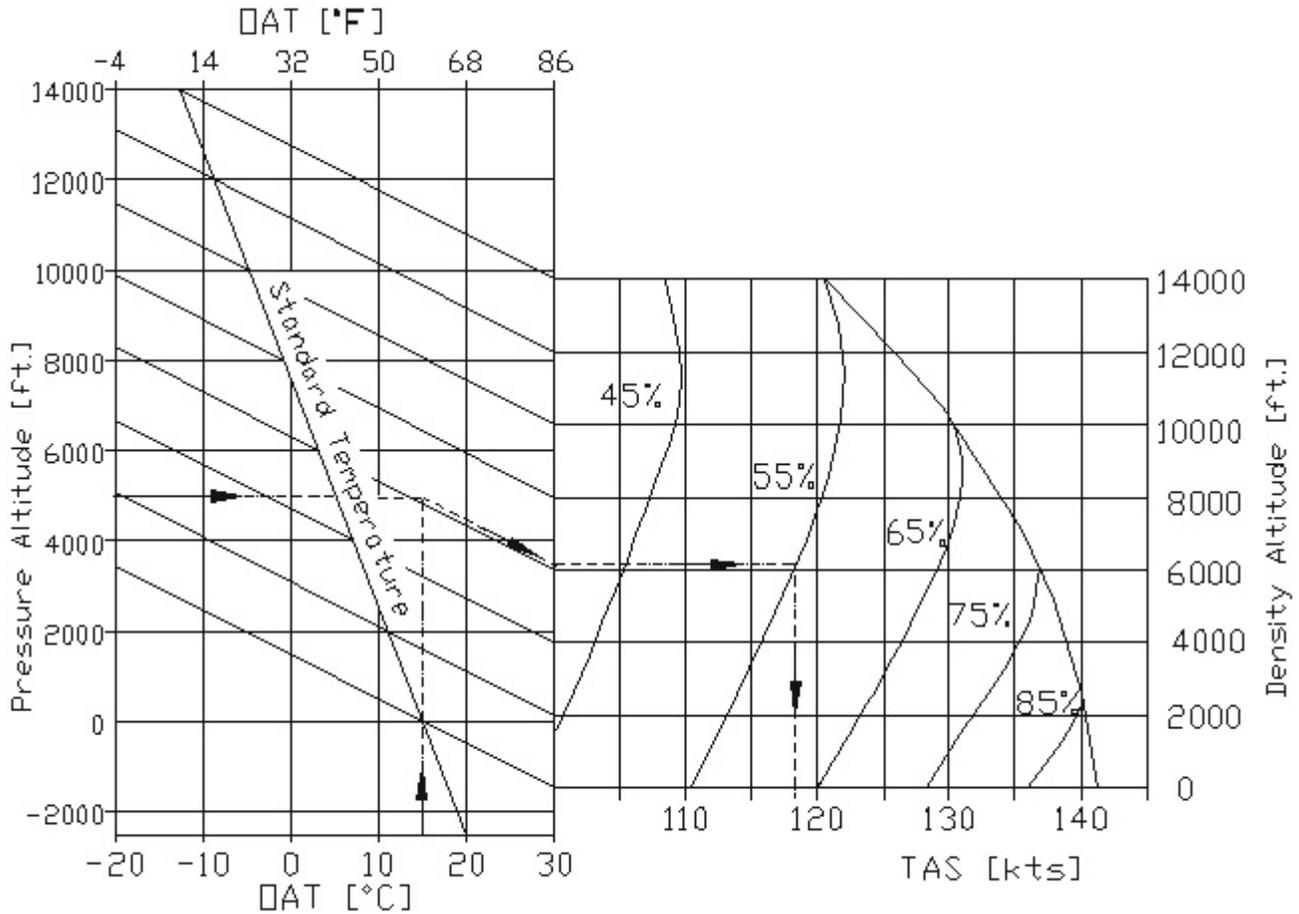
- Conditions:
- Throttle. . . . . MAX PWR
  - RPM lever . . . . . 2400 RPM
  - Flaps . . . . . UP
  - Airspeed. . . . . 76 KIAS (1200 kg, 2646 lb)  
73 KIAS (1150 kg, 2535 lb)  
68 KIAS (1000 kg, 2205 lb)  
60 KIAS (850 kg, 1874 lb)

# DA 40 - CLIMB PERFORMANCE - CRUISE CLIMB



**5.3.9 CRUISING TRUE AIRSPEED (TAS)**

Diagram to establish true airspeed (TAS) at a given power setting.



Example:                      Pressure altitude . . . . . 5000 ft  
                                     Temperature . . . . . 15 °C (59 °F)  
                                     Power setting . . . . . 55 %

Result:                         True Airspeed (TAS) . . . . . 118 kts

**CAUTION**

In case of operation without wheel fairings the cruising speed reduces by approximately 5 %.



**CAUTION**

For a safe landing the landing distance available (LDA) should be at least equal to the landing distance over a 50 ft (15 m) obstacle.

**CAUTION**

The figures in the following NOTE are typical values. On wet ground or wet soft grass covered runways the landing distance may become significantly longer than stated below. In any case the pilot must allow for the condition of the runway to ensure a safe landing.

**NOTE**

For landings on dry, short-cut grass covered runways, the following corrections must be taken into account, compared to paved runways (typical values, see CAUTION above):

- Grass up to 5 cm (2 in) long: 5 % increase in landing roll.
- Grass 5 to 10 cm (2 to 4 in) long: 15 % increase in landing roll.
- Grass longer than 10 cm (4 in): at least 25 % increase in landing roll.

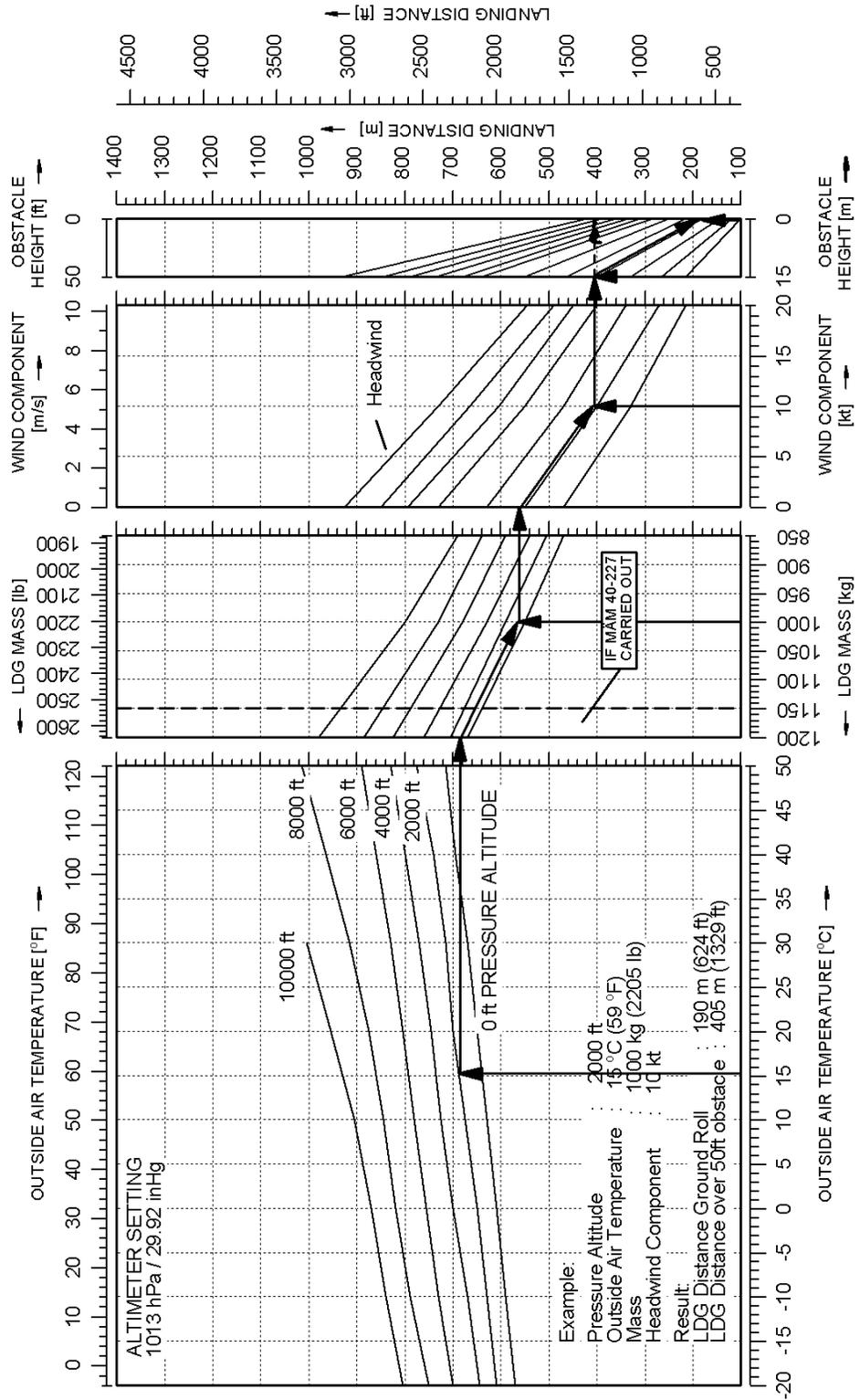
**NOTE**

On wet grass, a further 10 % increase in landing roll must be expected.

**NOTE**

A downhill slope of 2 % (2 m per 100 m, or 2 ft per 100 ft) results in an increase in the landing distance of approximately 10 %. The effect on the landing roll can be greater.

DA 40 - LANDING DISTANCES - FLAPS LDG





**CAUTION**

For a safe landing the landing distance available (LDA) should be at least equal to the landing distance over a 50 ft (15 m) obstacle.

**CAUTION**

The figures in the following NOTE are typical values. On wet ground or wet soft grass covered runways the landing distance may become significantly longer than stated below. In any case the pilot must allow for the condition of the runway to ensure a safe landing.

**NOTE**

For landings on dry, short-cut grass covered runways, the following corrections must be taken into account, compared to paved runways (typical values, see CAUTION above):

- Grass up to 5 cm (2 in) long: 5 % increase in landing roll.
- Grass 5 to 10 cm (2 to 4 in) long: 15 % increase in landing roll.
- Grass longer than 10 cm (4 in): at least 25 % increase in landing roll.

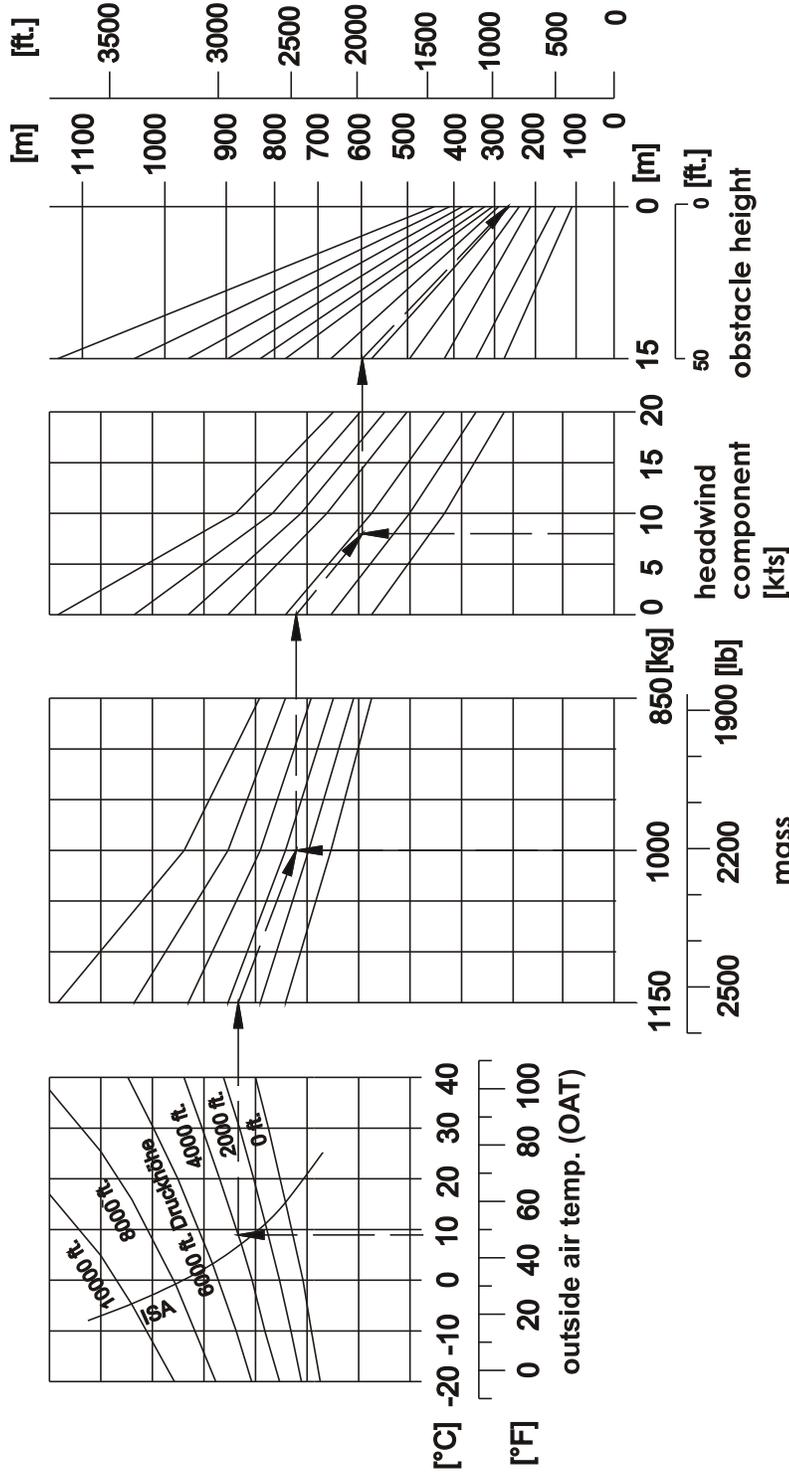
**NOTE**

On wet grass, a further 10 % increase in landing roll must be expected.

**NOTE**

A downhill slope of 2 % (2 m per 100 m or 2 ft per 100 ft) results in an increase in the landing distance of approximately 10 %. The effect on the landing roll can be greater.

Landing Distance - Flaps UP



Example:

Pressure altitude : 4000 ft  
 OAT : 8 °C (46 °F)  
 Mass : 1000 kg (2205 lb)  
 Headwind comp. : 8 kts

Result:

Landing distance over 50 ft obstacle : approx. 580 m (1903 ft)  
 Ground roll : approx. 270 m (886 ft)

### **5.3.12 GRADIENT OF CLIMB ON GO-AROUND**

The DA 40 reaches a constant gradient of climb of 7.0 % in the following condition:

- Mass ..... max. flight mass (1150 kg, 2535 lb)
- Power setting ..... Take-off
- Flaps ..... LDG
- Airspeed ..... 70 KIAS
- ISA, MSL

If MÄM 40-227 is carried out:

The DA 40 reaches a constant gradient of climb of 7.0 % in the following condition:

- Mass ..... max. flight mass (1200 kg, 2646 lb)
- Power setting ..... Take-off
- Flaps ..... LDG
- Airspeed ..... 73 KIAS
- ISA, MSL

### **5.3.13 APPROVED NOISE DATA**

ICAO Annex 16 Chapter X : 69.28 dB(A)

■ If MÄM 40-227 is carried out:

ICAO Annex 16 Chapter X : 78.4 dB(A)

I Intentionally left blank.

## CHAPTER 6

# MASS AND BALANCE

		Page
6.1	INTRODUCTION .....	6-3
6.2	DATUM PLANE .....	6-4
6.3	MASS AND BALANCE REPORT .....	6-4
6.4	FLIGHT MASS AND CENTER OF GRAVITY .....	6-6
6.4.1	EMPTY MASS .....	6-6
6.4.2	OIL .....	6-6
6.4.3	BAGGAGE .....	6-7
6.4.4	FUEL .....	6-7
6.4.5	MOMENTS .....	6-8
6.4.6	TOTAL MASS AND CG .....	6-8
6.4.7	GRAPHICAL METHOD .....	6-9
6.4.8	MOMENT ARMS .....	6-10
6.4.9	LOADING DIAGRAM .....	6-11
6.4.10	CALCULATION OF LOADING CONDITION .....	6-12
6.4.11	PERMISSIBLE CENTER OF GRAVITY RANGE .....	6-14
6.4.12	PERMISSIBLE MOMENT RANGE .....	6-16
6.5	EQUIPMENT LIST AND EQUIPMENT INVENTORY .....	6-17

I Intentionally left blank.

## **6.1 INTRODUCTION**

In order to achieve the performance and flight characteristics described in this Airplane Flight Manual and for safe flight operation, the airplane must be operated within the permissible mass and balance envelope.

The pilot is responsible for adhering to the permissible values for loading and center of gravity (CG). In this, they should note the movement of the CG due to fuel consumption. The permissible CG range during flight is given in Chapter 2.

The procedure for determining the flight mass CG position at any point in time is described in this Chapter. Over and above this there is a comprehensive list of the equipment approved for this airplane (Equipment List), and also a list of the equipment installed when the airplane was weighed (Equipment Inventory).

Before the airplane is delivered the empty mass and the corresponding CG position are determined, and entered in Section 6.3 - MASS AND BALANCE REPORT.

### **NOTE**

Following equipment changes the new empty mass and the corresponding CG position must be determined by calculation or by weighing.

Following repairs or repainting the new empty mass and the corresponding CG position must be determined by weighing.

Empty mass, empty mass CG position, and the empty mass moment must be certified in the Mass and Balance Report by an authorized person.

### **NOTE**

Refer to Section 1.6 - UNITS OF MEASUREMENT for conversion of SI units to US units and vice versa.

## **6.2 DATUM PLANE**

The Datum Plane (DP) is a plane which is normal to the airplane's longitudinal axis and in front of the airplane as seen from the direction of flight. The airplane's longitudinal axis is parallel with the upper surface of a 600:31 wedge which is placed on top of the rear fuselage in front of the vertical stabilizer. When the upper surface of the wedge is aligned horizontally, the Datum Plane is vertical. The Datum Plane is located 2.194 meter (86.38 in) forward of the most forward point of the root rib on the stub wing.

## **6.3 MASS AND BALANCE REPORT**

The empty mass and the corresponding CG position established before delivery are the first entries in the Mass and Balance Report. Every change in permanently installed equipment, and every repair to the airplane which affects the empty mass or the empty mass CG must be recorded in the Mass and Balance Report.

For the calculation of flight mass and corresponding CG position (or moment), the *current* empty mass and the corresponding CG position (or moment) in accordance with the Mass and Balance Report must always be used.

Condition of the airplane for establishing the empty mass:

- Equipment as per Equipment Inventory (see Section 6.5)
- Including brake fluid, lubricant (7.6 liter = 8 qts), plus unusable fuel (4 liter = approx. 1 US gal).



## **6.4 FLIGHT MASS AND CENTER OF GRAVITY**

The following information enables you to operate your DA 40 within the permissible mass and balance limits. For the calculation of the flight mass and the corresponding CG position the following tables and diagrams are required:

- | 6.4.8 - MOMENT ARMS
- | 6.4.9 - LOADING DIAGRAM
- | 6.4.10 - CALCULATION OF LOADING CONDITION
- | 6.4.11 - PERMISSIBLE CENTER OF GRAVITY RANGE
- | 6.4.12 - PERMISSIBLE MOMENT RANGE

The diagrams should be used as follows, taking the fuel tank size into account:

### **6.4.1 EMPTY MASS**

Take the empty mass and the empty mass moment of your airplane from the Mass and Balance Report, and enter the figures in the appropriate boxes under the column marked “Your DA 40” in the table under 6.4.10 - CALCULATION OF LOADING CONDITION.

### **6.4.2 OIL**

The difference between the actual amount of oil in the engine (check with dipstick) and the maximum oil quantity is called “Oil not added”; this mass and its related moment are counted as negative. The empty mass of the airplane is established with the maximum amount of oil in the engine, thus the “missing” oil must be subtracted. If the airplane is flown with maximum oil, the “Oil not added” entry should be zero.

In our example 6.0 qts have been measured on the dip-stick. We are thus 2.0 qts short of the maximum, which equates to 1.9 liter. Multiplying this quantity by the mass density of 0.89 kilograms per liter gives a mass of “Oil not added” of 1.7 kg. (in US units: 2.0 qts multiplied by the mass density of 1.86 lb/qts gives a mass of 3.7 lb).

**6.4.3 BAGGAGE**

The DA 40 may be equipped with one of the following baggage compartment variants:

- (a) Standard baggage compartment.
- (b) Standard baggage compartment with “baggage tube.”
- (c) Extended baggage compartment (OÄM 40-163). It consists of a forward and an aft part.

Depending on the baggage compartment variant installed in your DA 40 the following calculations must be done in the table under 6.4.10 - CALCULATION OF LOADING CONDITION:

- For variants (a) and (b) . . . . . use row 5 of the table; row 6 is filled with “0”
- For variant (c) . . . . . use row 6 of the table; row 5 is filled with “0”

**6.4.4 FUEL**

**(a) Standard Tank**

The fuel quantity can be read on the fuel indicators.

**NOTE**

(Conventional and G1000 instrument panels):

Depending on the type of fuel probes installed, the indicator can read a maximum of 15 US gal or 17 US gal (refer to Section 7.10 for details). When the fuel quantity indicator reads the maximum amount of fuel detectable, a fuel quantity up to 20 US gal can be in the fuel tank. In this case the fuel quantity must be measured with the fuel quantity measuring device (see Section 7.10 - FUEL SYSTEM).

**|** (b) Long Range Tank

Read the fuel quantity indicated on the fuel quantity indicators.

**NOTE****|** Conventional instrument panel:

At an indication of 16 US gal the amount of auxiliary fuel can be determined by switching the AUX FUEL QTY switch to the respective position (LH or RH). The indicated auxiliary fuel quantity is added to the 16 US gal.

An auxiliary fuel quantity of less than 3 US gal cannot be indicated by the system. In this case the quantity must be determined by means of the fuel quantity measuring device (see Section 7.10 - FUEL SYSTEM).

**|** G1000 instrument panel:**|** When the fuel indicator reads 16 US gal the correct fuel quantity must be determined with the fuel quantity measuring device. There are 3 US gal of ungauged fuel from 16 to 19 US gal. If this measurement is not carried out, the fuel quantity available for flight is 16 US gal.  
**|**  
**|**  
**|**  
**|****CAUTION****|** Conventional instrument panel:

The correct indication of the fuel quantity takes 2 minutes after actuation of the switch.

**|** **6.4.5 MOMENTS**

Multiply the individual masses by the moment arms quoted to obtain the moment for every item of loading, and enter these moments in the appropriate boxes in the table under 6.4.10 - CALCULATION OF LOADING CONDITION.

### **6.4.6 TOTAL MASS AND CG**

Add up the masses and moments in the respective columns. The CG position is calculated by dividing the total moment by the total mass (using row 7 for the condition with empty fuel tanks, and row 9 for the pre take-off condition). The resulting CG position must be within the limits.

### **CAUTION**

For airplanes equipped with the optional Long Range Tank, a restricted range of permitted CG positions applies.

As an illustration the total mass and the CG position are entered on the diagram in 6.4.11 - PERMISSIBLE CENTER OF GRAVITY RANGE. This checks graphically that the current configuration of the airplane is within the permissible range.

### **6.4.7 GRAPHICAL METHOD**

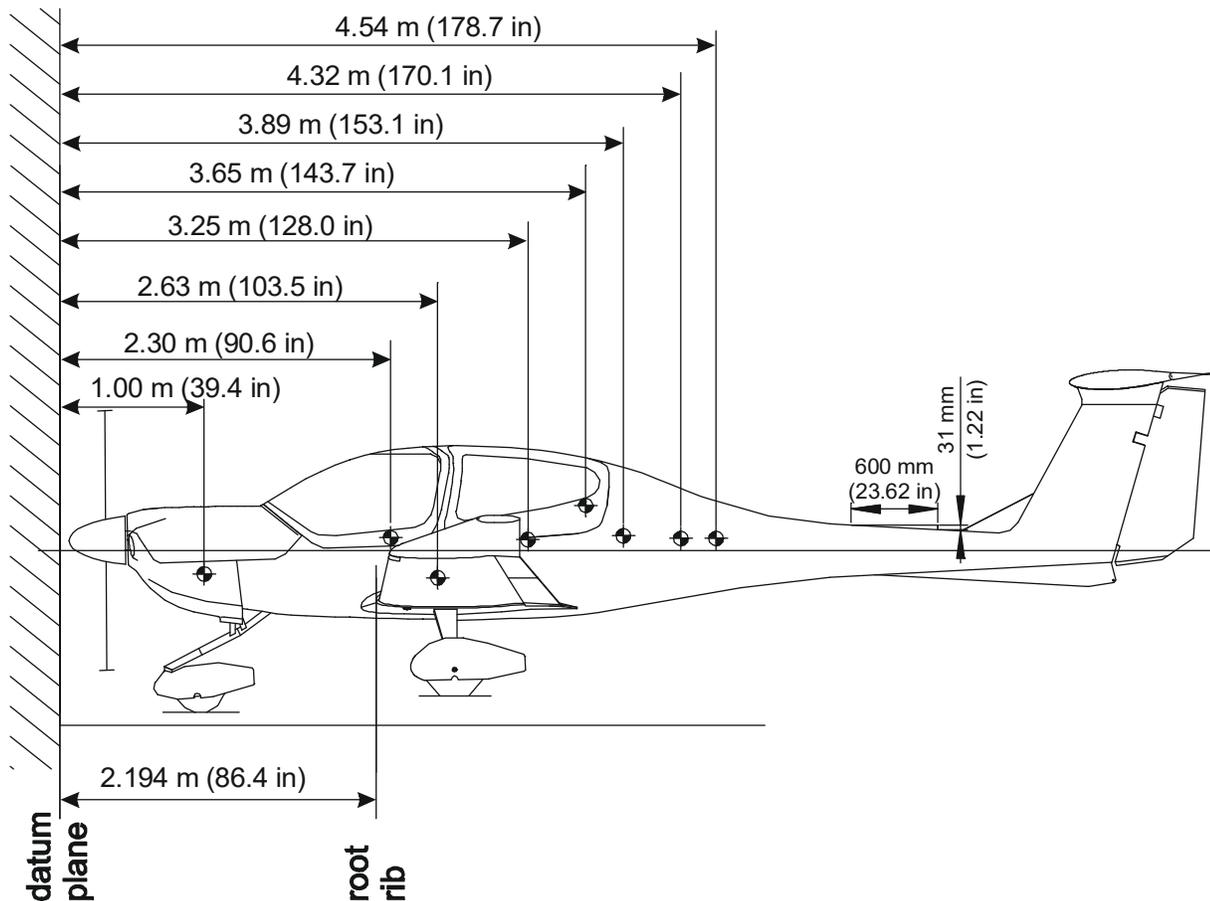
The diagram under 6.4.9 - LOADING DIAGRAM is used to determine the moments. The masses and moments for the individual items of loading are added. Then, the diagram under 6.4.12 - PERMISSIBLE MOMENT RANGE is used to check whether the total moment associated with the total mass is in the admissible range.

The result found with the graphical method is less precise. In doubtful cases, the result must be verified using the exact method given above.

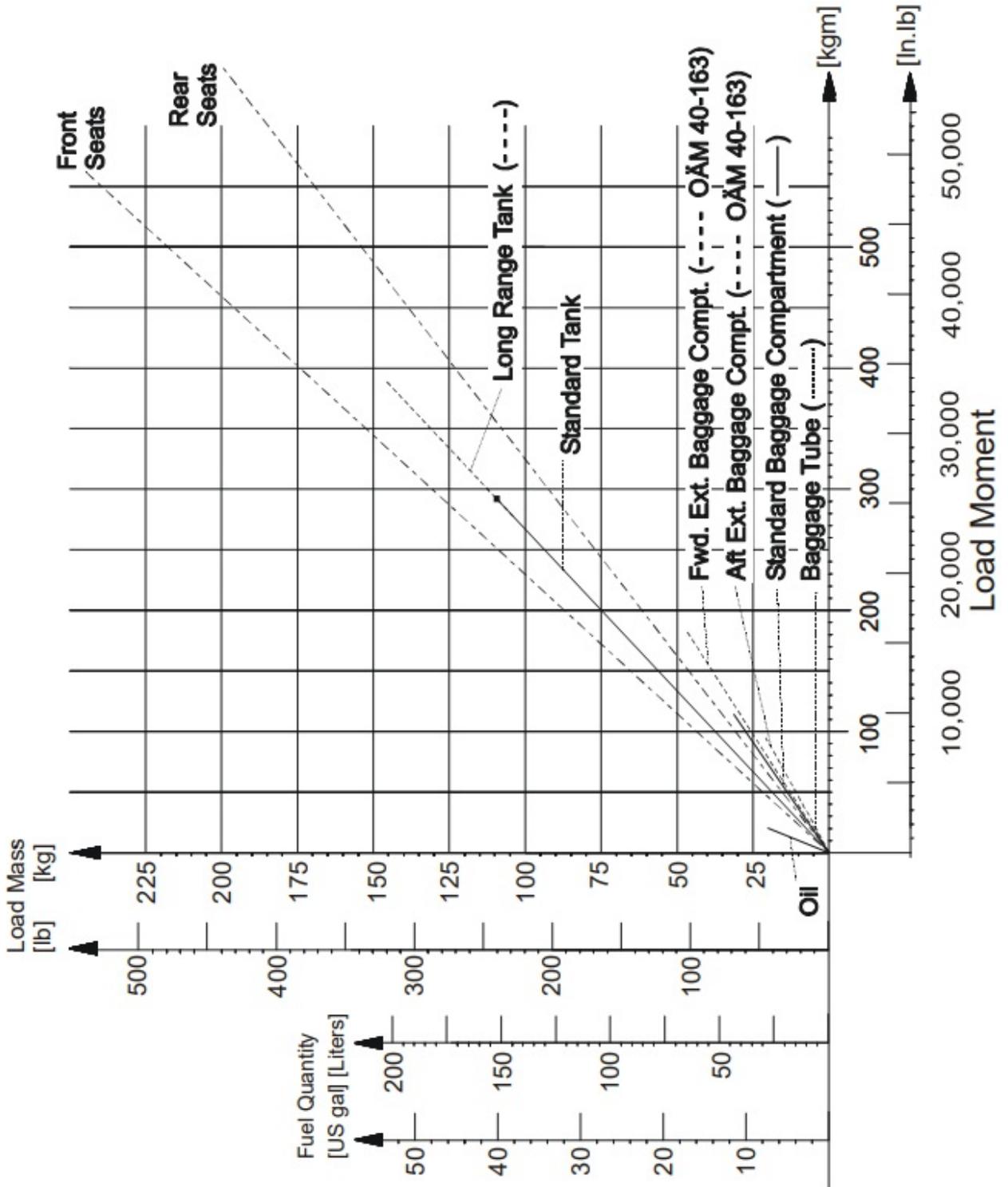
### 6.4.8 MOMENT ARMS

The most important lever arms aft of the Datum Plane:

- Oil : 1.00 m 39.4 in
- Front seats : 2.30 m 90.6 in
- Rear seats : 3.25 m 128.0 in
- Wing tanks (Standard & Long Range) : 2.63 m 103.5 in
- Baggage in standard baggage compartment : 3.65 m 143.7 in
- baggage in baggage tube : 4.32 m 170.1 in
- Baggage in extended baggage compartment
  - forward part : 3.89 m 153.1 in
  - aft part : 4.54 m 178.7 in



6.4.9 LOADING DIAGRAM



**6.4.10 CALCULATION OF LOADING CONDITION****CAUTION**

For airplanes equipped with the optional Long Range Tank, a restricted range of permitted CG positions applies.

**NOTE**

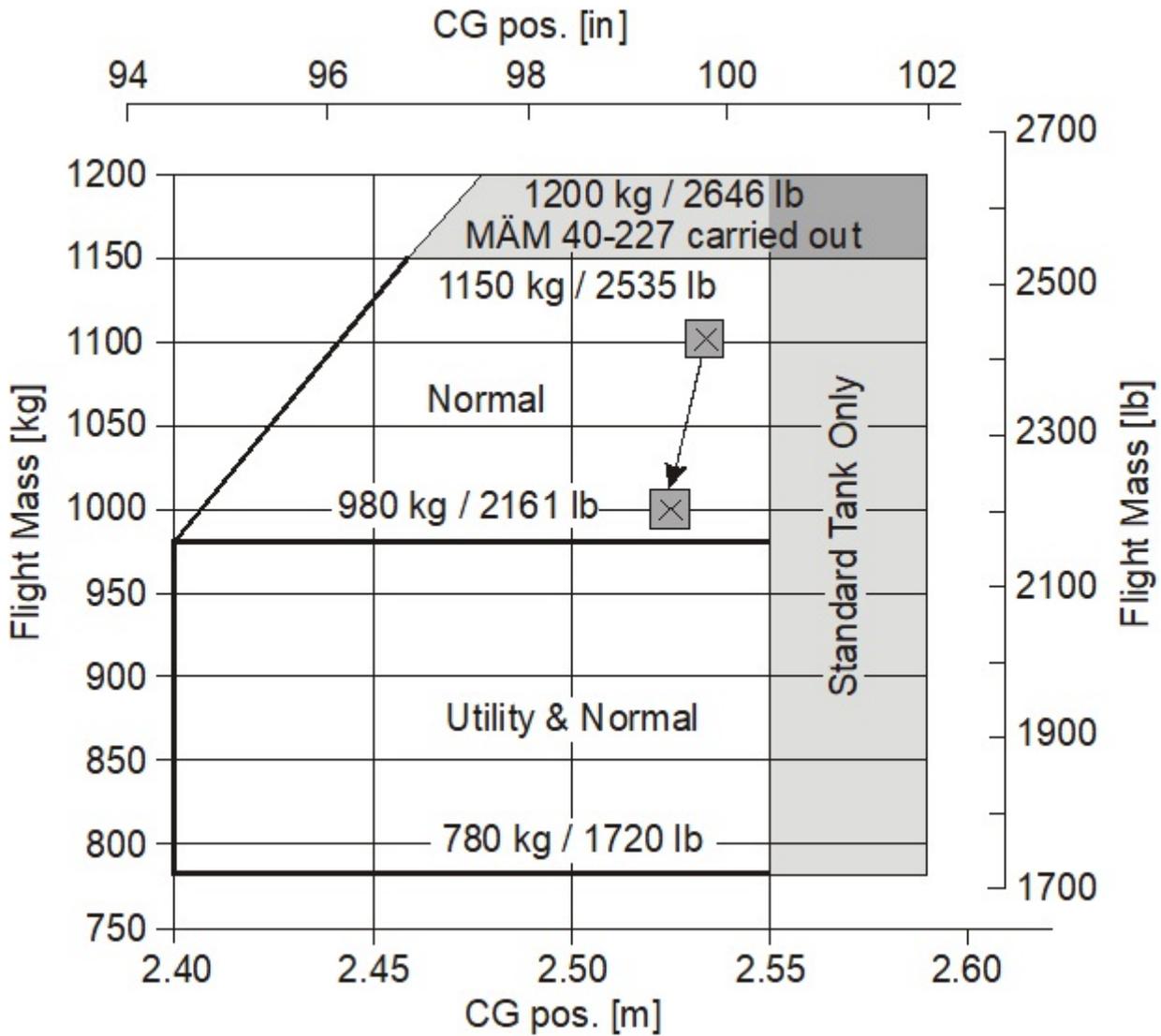
For the mass (weight) of the fuel, a density of 0.72 kg/liter (6.01 lb/US gal) is assumed. For the mass (weight) of the engine oil, a density of 0.89 kg/liter (1.86 lb/US qt, 0.84 kg/US qt) is assumed.

**NOTE**

In the following example it is assumed that the fuel tank is not full at take-off.

		DA 40 (Example)		Your DA 40	
		Mass [kg] [lb]	Moment [kg m] [in lb]	Mass [kg] [lb]	Moment [kg m] [in lb]
1	Empty mass (from Mass and Balance Report)	735 1620	1760 152,762		
2	Oil not added Lever arm: 1.00 m (39.4 in)	-1.7 -4	-1.7 -158		
3	Front seats Lever arm: 2.30 m (90.6 in)	150 331	345 29,989		
4	Rear seats Lever arm: 3.25 m (128.0 in)	75 165	243.8 21,120		
5	Standard baggage compt. Lever arm: 3.65 m (143.7 in)	0 0	0 0		
	Baggage tube Lever arm: 4.32 m (170.1 in)	0 0	0 0		
6	Fwd. extended baggage compartment Lever arm: 3.89 m (153.1 in)	27 60	105 9,186		
	Aft extended baggage compartment Lever arm: 4.54 m (178.7 in)	18 40	81.7 7,148		
7	Total mass & total moment with empty fuel tanks (Total of 1.-6.)	1003.3 2212	2533.8 220,047		
8	Usable fuel Lever arm: 2.63 m (103.5 in)	99.4 219	261.4 22,667		
9	Total mass & total moment including fuel (7. plus 8.)	1102.7 2431	2795.2 242,714		
10	<p>The total moments from rows 7 and 9 (2533.8 and 2795.2 kgm) (220,047 and 242,714 in.lb) must be divided by the related total mass (1003.3 and 1102.7 kg respectively) (2212 and 2431 lb) and then located in 6.4.11 - PERMISSIBLE CENTER OF GRAVITY RANGE.</p> <p>As in our example CG positions (2.525 m and 2.535 m respectively) (99.48 and 99.84 in) and masses fall into the permitted area, this loading condition is allowable.</p>				

**6.4.11 PERMISSIBLE CENTER OF GRAVITY RANGE**



The CGs shown in the diagram are those that from the example in 6.4.10 - CALCULATION OF LOADING CONDITION.

*Forward Flight CG Limit:*

2.40 m (94.5 in) aft of Datum Plane at 780 to 980 kg (1720 to 2161 lb)

2.46 m (96.9 in) aft of Datum Plane at 1150 kg (2535 lb)

linear variation between these values

If MÄM 40-227 is carried out:

2.40 m (94.5 in) aft of Datum Plane at 780 kg to 980 kg (1720 lb to 2161 lb)

2.48 m (97.6 in) aft of Datum Plane at 1200 kg (2646 lb)

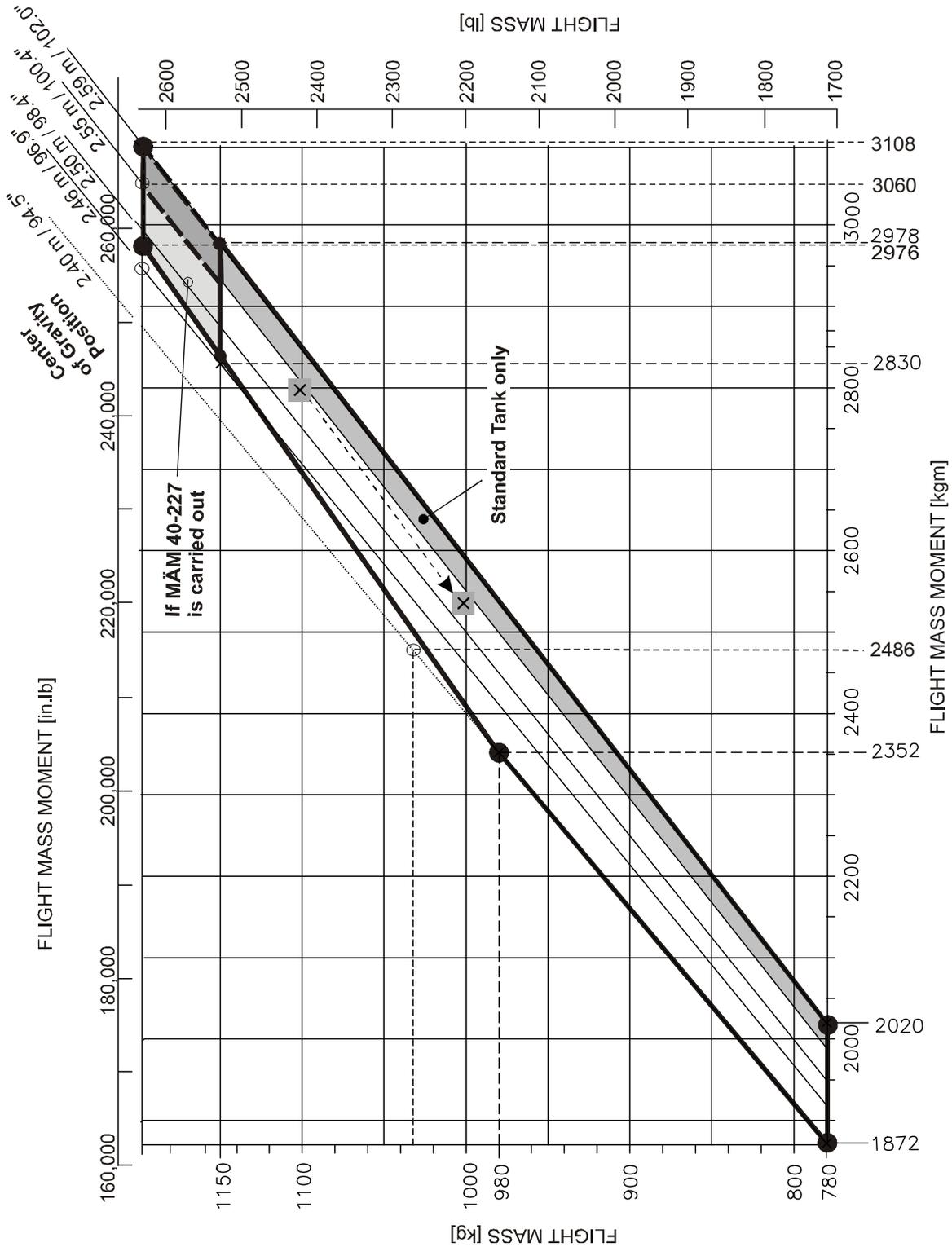
linear variation between these values

*Rearward Flight CG Limit:*

2.59 m (102.0 in) aft of Datum Plane (Standard Tank)

2.55 m (100.4 in) aft of Datum Plane (with Long Range Tank installed)

**6.4.12 PERMISSIBLE MOMENT RANGE**



## **6.5 EQUIPMENT LIST AND EQUIPMENT INVENTORY**

All equipment that is approved for installation in the DA 40 is shown in the *Equipment List* below.

The items of equipment installed in your particular airplane are indicated in the appropriate column. The set of items marked as “installed” constitutes the *Equipment Inventory*.

### **NOTE**

The equipment listed below cannot be installed in any arbitrary combination. The airplane manufacturer must be contacted before removing or installing equipment, with the exception of replacing a unit by an identical unit.

Airplane Serial No.:		Registration:		Date:		Mass		Lever Arm	
Description	Type	Part No.	Manufacturer	S/N	Installed	lb	kg	in	m
<b>AVIONICS COOLING</b>									
Cooling fan	Cyclone 21-3 Port	CRB122253	Lone Star Aviation						
Cooling fan	ACF 328	ACF 328	Sandia Aerospace						
<b>COMMUNICATION</b>									
COMM #1 antenna	CI 291		Comant			0.5	0.227	177.16	4.500
COMM #2 antenna	CI 292-2		Comant			0.5	0.227	161.42	4.100
COMM #1 antenna	DMC63-1/A		DM						
COMM #2 antenna	DMC63-2		DM						
COMM #1	KX 125	069-01028-1101	Bendix/King			11.46	5.2	70.08	1.78
COMM #1	KX 155A	069-01032-0201	Bendix/King			3.7	1.68	70.08	1.78
COMM #1	KX 165	069-01025-0025	Bendix/King			5.65	2.56	70.08	1.78
COMM #1	KX 165A	069-01033-0101	Bendix/King			4.0	1.81	70.08	1.78
COMM #1	KX 165A/ 8.33 kHz	069-01033-0201	Bendix/King			4.0	1.81	70.08	1.78
COMM #1	GNS 430	011-00280-00	Garmin			5.1	2.31	70.08	1.78
COMM #1	GNS 430	011-00280-10	Garmin			5.1	2.31	70.08	1.78
COMM #1	GNS 530	011-00550-00	Garmin			6.8	3.08	70.08	1.78
COMM #1	GNS 530	011-00550-10	Garmin			6.8	3.08	70.08	1.78
COMM #2	KX 155A	069-01032-0201	Bendix/King			3.7	1.68	70.08	1.78
COMM #2	GNS 430	011-00280-00	Garmin			5.1	2.31	70.08	1.78
COMM #2	GNS 430	011-00280-10	Garmin			5.1	2.31	70.08	1.78

Airplane Serial No.:		Registration:		Date:		Mass		Lever Arm	
Description	Type	Part No.	Manufacturer	S/N	Installed	lb	kg	in	m
Audio Panel / Marker / ICS	KMA 28	066-01176-0101	Bendix/King			1.5	0.68	70.08	1.78
Audio Panel / Marker / ICS	GMA 340	011-00401-10	Garmin			1.2	0.54	70.08	1.78
Audio Panel / Marker / ICS	GMA 1360	011-03568-00	Garmin			1.86	0.84	70.08	1.78
ICS	PM1000 II	11922	PS Engineering			0.75	0.34	70.08	1.78
Headset, pilot	Echelon 100		Telex						
Headset, co-pilot	Echelon 100		Telex						
Headset, LH pax	Echelon 100		Telex						
Headset, RH pax	Echelon 100		Telex						
Speaker	FRS8 / 4 Ohms		Visaton						
Handmic	100TRA	62800-001	Telex						
<b>AUTOPILOT SYSTEM</b>									
Autopilot system	KAP 140		Bendix/King						
Flight computer (w/o alt. preselect)	KC 140	065-00176-5402 (without MÄM 40-099 or MSB 40-018)	Bendix/King			2.02	0.918	70.08	1.78
Flight computer (with alt. preselect)	KC 140	065-00176-7702 (without MÄM 40-099 or MSB 40-018)	Bendix/King			2.02	0.918	70.08	1.78
Flight computer (w/o alt. preselect)	KC 140	065-00176-5403 (with MÄM 40-099 or MSB 40-018)	Bendix/King			2.02	0.918	70.08	1.78

Airplane Serial No.:		Registration:		Date:		Mass		Lever Arm	
Description	Type	Part No.	Manufacturer	S/N	Installed	lb	kg	in	m
Flight computer (with alt. preselect)	KC 140	065-00176-7703 (with MÄM 40-099 or MSB 40-018)	Bendix/King			2.02	0.918	70.08	1.78
Flight computer	KC 140	065-00176-7904	Bendix/King			2.02	0.918	70.08	1.78
Pitch servo	KS 270 C	065-00178-2500	Bendix/King			2.7	1.224	154.0	3.93
Pitch servo mount	KM 275	065-00030-0000	Bendix/King			1.08	0.488	154.0	3.93
Roll servo	KS 271 C	065-00179-0300	Bendix/King			2.3	1.044	120.0	3.06
Roll servo mount	KM 275	065-00030-0000	Bendix/King			2.7	1.224	120.0	3.06
Trim servo	KS 272 C	065-00180-3500	Bendix/King			2.22	1.005	87.2	2.21
Trim servo mount	KM 277	065-00041-0000	Bendix/King			1.09	0.494	87.2	2.21
Configuration module	KCM 100	071-00073-5000	Bendix/King			0.06	0.026	70.08	1.78
Sonalert	SC	SC 628	Mallory						
Control stick		DA4-2213-12-90	Diamond						
CWS switch		031-00514-0000	Bendix/King						
AP-disc switch		031-00428-0000	Bendix/King						
Trim switch assy		200-09187-0000	Bendix/King						
<b>ELECTRICAL POWER</b>									
Battery	CB24-11M (G243)		Concorde (Gill)			28.0	12.7	47.0	1.19
Battery	RG24-11M		Concorde			26.4	11.97	47.0	1.19
Battery	RG24-15M		Concorde			29.5	13.38	47.0	1.19
Emergency battery (28 pcs.)	MN 1500 AA		Duracell			1.52	0.69	70.08	1.78

Airplane Serial No.:		Registration:		Date:		Mass		Lever Arm	
Description	Type	Part No.	Manufacturer	S/N	Installed	lb	kg	in	m
Emergency battery (Lithium)		D41-2560-93-00	Excell			0.564	0.256	66.5	1.69
Ammeter	VM1000	4010050	Vision Microsyst.						
Ammeter current sensor	VM1000	3010022	Vision Microsyst.						
Voltmeter	VM1000	4010050	Vision Microsyst.						
Voltage regulator		VR2000-28-1 (D)	Electrosyst., Inc.						
External power connector			Diamond						
Alternator	ALU-8521LS	ALU-8521LS	Electrosyst., Inc.						
DC-AC Inverter	MD 26	MD 26-28	Mid Continent						
<b>EQUIPMENT</b>									
Safety belt, pilot	5-01-() Series	5-01-1C0701	Schroth			3.36	1.524	92.52	2.35
Safety belt, co-pilot	5-01-() Series	5-01-1C5701	Schroth			3.36	1.524	92.52	2.35
Safety belt, LH pax	5-01-() Series	5-01-1B5701	Schroth			3.0	1.36	126.7	3.22
Safety belt, RH pax	5-01-() Series	5-01-1B0701	Schroth			3.0	1.36	126.7	3.22
Safety belt receptacle, pilot			Schroth			0.54	0.245	92.52	2.35
Safety belt receptacle, co-pilot			Schroth			0.54	0.245	92.52	2.35
Safety belt receptacle, LH pax			Schroth			0.54	0.245	126.7	3.22
Safety belt receptacle, RH pax			Schroth			0.54	0.245	126.7	3.22
ELT unit		E-01	ACK			3	1.36	173.2	4.40
ELT remote switch		E0105	ACK						
ELT antenna		E0109	ACK						

Airplane Serial No.:		Registration:		Date:		Mass		Lever Arm	
Description	Type	Part No.	Manufacturer	S/N	Installed	lb	kg	in	m
ELT unit	JE2-NG	JE-1978-1NG	Jolliet			2.43	1.1	173.2	4.40
ELT remote switch		JE-1978-16	Jolliet						
ELT antenna		JE-1978-73	Jolliet						
ELT unit	ME 406	453-6603	Artex			2	0.91	173.2	4.40
ELT buzzer		452-6505	Artex						
ELT antenna	WHIP	110-773	Artex						
ELT remote switch (ACE)		453-0023	Artex						
ELT module interface		453-1101	Artex						
Winter baffle		DA4-2157-00-00	Diamond						
Armrest		DA4-5210-50-91	Diamond						
Baggage extension (OÄM 40-163)									
Baggage net (OÄM 40-163)									
Baggage tray (OÄM 40-164)									
USB Ports						0.050	0.023	70.08	1.780
<b>FLIGHT CONTROLS</b>									
Flaps control unit (instr. panel)		430550	Diamond						
Flaps actuator assy		430555	Diamond						
Stall warning horn assy	"A"	DA4-2739-10-00	Diamond						
Stall warning horn assy	"B"	DA4-2739-10-00X01	Diamond						
Stall warning horn assy	"C"	DA4-2739-10-00X02	Diamond						



Airplane Serial No.:		Registration:		Date:		Mass		Lever Arm	
Description	Type	Part No.	Manufacturer	S/N	Installed	lb	kg	in	m
Stall warning horn assy	"D"	DA4-2739-10-00X03	Diamond						
Stall warning horn assy	"E"	DA4-2739-10-00X04	Diamond						
Stall warning horn assy	"F"	DA4-2739-10-00X05	Diamond						
<b>SAFETY EQUIPMENT</b>									
Fire extinguisher, portable		HAL 1	AIR Total			4.85	2.2	110.0	2.794
Fire extinguisher, portable <sup>1)</sup>		A 620 T	Amerex			2.43	1.1	110.0	2.794
Fire extinguisher, portable		337TS	Amerex			3.17	1.44	110.0	2.794
First aid kit									
Emergency axe		G45912	Fiskars			1.23	0.558	78.74	2.00
Emergency egress hammer		D64-2560-70-50	Diamond						
Emergency egress hammer		D67-2560-80-50	Diamond						
<b>FUEL</b>									
Fuel qty indicator	VM1000	4010028	Vision Microsyst.						
Fuel qty sensor LH	VM1000	30100-11	Vision Microsyst.						
Fuel qty sensor RH	VM1000	30100-11	Vision Microsyst.						
Fuel qty sensor LH (auxiliary fuel)	VM1000	30100-50	Vision Microsyst.						
Fuel qty sensor RH (auxiliary fuel)	VM1000	30100-50	Vision Microsyst.						
Alternate means for fuel qty. II		D4D-2807-90-00_01	Diamond Aircraft						

Airplane Serial No.:		Registration:		Date:		Mass		Lever Arm	
Description	Type	Part No.	Manufacturer	S/N	Installed	lb	kg	in	m
<b>HYDRAULIC</b>									
Master cylinder		10-54 A	Cleveland						
Parking valve		60-5D	Cleveland						
Brake assembly		30-239 B	Cleveland						
<b>INDICATING / REC. SYSTEM</b>									
Digital chronometer	LC-2	AT420100	Astro Tech						
Digital chronometer	Model 803		Davtron						
Flight timer		85000-12	Hobbs						
Flight timer		85094-12	Hobbs						
Annunciator panel (system)			Diamond						
Annunciator panel	WW-IDC 001		White Wire						
CO detector	Model 452-201		CO Guardian LLC						
Primary flight display (PFD)	GDU 1050	011-03470-00	Garmin						
Multi function display (MFD)	GDU 1050	011-03470-00	Garmin						
Multi function display (MFD)	GDU 1054	011-03470-60	Garmin						
<b>LANDING GEAR</b>									
<b>LANDING GEAR STANDARD FAIRINGS</b>									
MLG wheel fairing LH		D41-3213-91-00	Diamond Aircraft						

Airplane Serial No.:		Registration:		Date:		Mass		Lever Arm	
Description	Type	Part No.	Manufacturer	S/N	Installed	lb	kg	in	m
MLG wheel fairing RH		D41-3213-92-00	Diamond Aircraft						
NLG wheel pant shell LH		D41-3223-91-00_1	Diamond Aircraft						
NLG wheel pant shell RH		D41-3223-92-00_1	Diamond Aircraft						
NLG strut fairing assy		DA4-3227-90-00	Diamond Aircraft						
<i>LANDING GEAR SPEEDKIT</i>									
MLG speed cover LH		DA4-3219-27-00_1	Diamond Aircraft						
MLG speed cover RH		DA4-3219-28-00_1	Diamond Aircraft						
MLG sheet cover LH		DA4-3219-25-00	Diamond Aircraft						
MLG sheet cover RH		DA4-3219-26-00	Diamond Aircraft						
MLG cover speed LH		DA4-3219-21-00	Diamond Aircraft						
MLG cover speed RH		DA4-3219-22-00	Diamond Aircraft						
MLG strut cover LH		DA4-3219-23-00	Diamond Aircraft						
MLG strut cover RH		DA4-3219-24-00	Diamond Aircraft						
NLG wheel pant shell LH		D41-3223-91-00_1	Diamond Aircraft						
NLG wheel pant shell RH		D41-3223-92-00_1	Diamond Aircraft						
NLG strut cover		DA4-3229-29-00	Diamond Aircraft						
<i>LANDING GEAR SMALL TIRES AND FAIRINGS or LANDING GEAR TALL MLG WITH FAIRINGS FOR SMALL TIRES</i>									
MLG wheel fairing assy small tire LH		DA4-3215-91-00	Diamond Aircraft						
MLG wheel fairing assy small tire RH		DA4-3215-92-00	Diamond Aircraft						
NLG wheel fairing shell LH		DA4-3225-91-00	Diamond Aircraft						
NLG wheel fairing shell RH		DA4-3225-92-00	Diamond Aircraft						

Airplane Serial No.:		Registration:		Date:		Mass		Lever Arm	
Description	Type	Part No.	Manufacturer	S/N	Installed	lb	kg	in	m
Bracket assy LH MLG wheel fairing		DA4-3215-31-00	Diamond Aircraft						
Bracket assy RH MLG wheel fairing		DA4-3215-32-00	Diamond Aircraft						
Brake cover MLG wheel frame LH		DA4-3215-93-00	Diamond Aircraft						
Brake cover MLG wheel frame RH		DA4-3215-94-00	Diamond Aircraft						
NLG strut fairing assy		DA4-3227-90-00	Diamond Aircraft						
<i>LANDING GEAR SMALL TIRES AND FAIRINGS WITH MAINTENANCE ACCESS or LANDING GEAR TALL MLG WITH FAIRINGS FOR SMALL TIRES WITH MAINTENANCE ACCESS</i>									
MLG wheel fairing assy access door LH		DA4-3215-91-00X01	Diamond Aircraft						
MLG wheel fairing assy access door RH		DA4-3215-92-00X01	Diamond Aircraft						
NLG wheel fairing shell LH		DA4-3225-91-00X01	Diamond Aircraft						
NLG wheel fairing shell RH		DA4-3225-92-00	Diamond Aircraft						
Bracket assy LH MLG wheel fairing		DA4-3215-31-00	Diamond Aircraft						
Bracket assy RH MLG wheel fairing		DA4-3215-32-00	Diamond Aircraft						
Brake cover MLG wheel frame LH		DA4-3215-93-00	Diamond Aircraft						
Brake cover MLG wheel frame RH		DA4-3215-94-00	Diamond Aircraft						
NLG strut fairing assy		DA4-3227-90-00	Diamond Aircraft						
<b>LIGHTS</b>									
Map / Reading light assy crew		W1461.0.010	Rivoret						
Cabin Light		W1461.0.010	Rivoret						

Airplane Serial No.:		Registration:		Date:		Mass		Lever Arm	
Description	Type	Part No.	Manufacturer	S/N	Installed	lb	kg	in	m
Instr./radio lights dimmer assy		WW-LCM-002	White Wire						
Glareshield lamp assy		DA4-3311-10-01	Diamond Aircraft						
Glareshield light inverter		APVL328-8-3-L-18QF	Quantaflux						
Strobe / Pos. light assy LH	A600-PR-D-28	01-0790006-05	Whelen						
Strobe / Pos. light assy RH	A600-PG-D-28	01-0790006-07	Whelen						
Strobe / Pos. light assy LH	0R6002R	01-0771733-12	Whelen						
Strobe / Pos. light assy RH	0R6002G	01-0771733-11	Whelen						
Strobe light power supply LH/RH	A490ATS-CF-14/28	01-0770062-05	Whelen			1.592	0.722	101.0	2.566
Halogen Taxi light	70346-01	01-0770346-05	Whelen			0.28	0.13	79.920	2.030
Halogen Landing light	70346-01	01-0770346-03	Whelen			0.28	0.13	79.920	2.030
Electro luminescent lamps	Quantaflux 1600		Quantaflux						
Ballast	GENS D1,24V	37776	Newark						
Ballast	GENS D1,24V	37776	Newark						
Taxi light	HID LAMP D15	39663	Newark						
Landing light	HID LAMP D15	39663	Newark						
LED Taxi light	71125	01-0771125-23	Whelen			0.3	0.14	79.920	2.030
LED Landing light	71125	01-0771125-20	Whelen			0.3	0.14	79.920	2.030
<b>NAVIGATION</b>									
Pitot/static probe, heated		DAI-9034-57-00	Diamond						
P/S probe HTR fail sensor		DA4-3031-01-00	Diamond						
Altimeter inHg/mbar, primary		5934PD-3	United Instruments			1.9	0.86	70.08	1.78
Altimeter inHg/mbar, primary	LUN 1128	1128-14B6	Mikrotechna			1.39	0.63	70.08	1.78
Altimeter inHg/mbar, secondary		5934PD-3	United Instruments			1.9	0.86	70.08	1.78
Altimeter inHg/mbar, secondary	LUN 1128	1128-14B6	Mikrotechna			1.39	0.63	70.08	1.78

Airplane Serial No.:		Registration:		Date:		Mass		Lever Arm	
Description	Type	Part No.	Manufacturer	S/N	Installed	lb	kg	in	m
Vertical speed indicator		7000	United Instruments			1.2	0.54	70.08	1.78
Vertical speed indicator	LUN 1144	1144-A4B4	Mikrotechna			0.9	0.4	70.08	1.78
Airspeed indicator		8025	United Instruments			0.7	0.32	70.08	1.78
Airspeed indicator	LUN 1116	1116-B4B3	Mikrotechna			0.77	0.35	70.08	1.78
Outside air temp. indication		301F(C)	Davtron			0.27	0.124	70.08	1.78
Magnetic compass		C2400L4P	Airpath			0.65	0.293	70.08	1.78
Compass system C/O	KCS 55A		Bendix/King						
Slaved gyro	KG 102 A	060-00015-0000	Bendix/King			4.3	1.95	70.08	1.78
HSI	KI 525A	066-03046-0007	Bendix/King			3.38	1.53	70.08	1.78
Slaving unit (vertical)	KA 51B	071-01242-0001	Bendix/King			0.2	0.09	70.08	1.78
Slaving unit (horizontal)	KA 51B	071-01242-06	Bendix/King			0.2	0.09	70.08	1.78
Flux valve	KMT 112	071-01052-0000	Bendix/King			0.3	0.14	101.0	2.566
Directional gyro, free	AIM2051BLD	505-0031-931	BF-Goodrich			2.6	1.18	70.08	1.78
Attitude indicator	AIM1100-28L(0F)	504-0111-936	BF-Goodrich			2.20	1.0	70.08	1.78
Attitude indicator	AIM1100-28LK(0F)	504-0111-938	BF-Goodrich			2.20	1.0	70.08	1.78
Attitude indicator	AIM1100-28LK(2F)	504-0111-941	BF-Goodrich			2.20	1.0	70.08	1.78
Turn coordinator w/o AP pickup	1394T100-(3Z)		Mid Continent Instr.			0.822	0.373	70.08	1.78
Turn coordinator	1394T100-(12RZ)		Mid Continent Instr.			1.41	0.64	70.08	1.78
Turn coordinator	1394T100-(12RA)		Mid Continent Instr.			1.41	0.64	70.08	1.78
Turn coordinator	1394T100-(12RB)		Mid Continent Instr.			1.41	0.64	70.08	1.78
Marker antenna	CI102		Comant						
DME	KN 62A	066-01068-0004	Bendix/King			2.6	1.18	70.08	1.78
DME	KN 63	006-1070-01	Bendix/King			2.800	1.270	141.100	3.580
DME antenna	KA60	071-01174-0000	Bendix/King						
DME antenna	KA60	071-01591-0001	Bendix/King						
DME antenna	KA61	071-00221-0010	Bendix/King						

Airplane Serial No.:		Registration:		Date:		Mass		Lever Arm	
Description	Type	Part No.	Manufacturer	S/N	Installed	lb	kg	in	m
Transponder	KT 76A	066-1062-10	Bendix/King			0.85	0.39	70.08	1.78
Transponder	KT 76C	066-01156-0101	Bendix/King			0.2	0.09	70.08	1.78
Transponder	GTX 327	011-00490-00	Garmin			2.4	1.09	70.08	1.78
Transponder	GTX 330	011-00455-00	Garmin			3.4	1.54	70.08	1.78
Transponder	GTX 335 R	011-03301-00	Garmin						
Transponder	GTX 345 R	011-03303-00	Garmin						
XPDR antenna	KA60	071-01174-0000	Bendix/King						
XPDR antenna	KA60	071-01591-0001	Bendix/King						
XPDR antenna	KA61	071-00221-0010	Bendix/King						
Altitude digitizer		D120-P2-T	TCI						
Altitude data system	SAE5-35	305154-00	Sandia Aerospace						
ADF	KR87	066-01072-0004	Bendix/King			2.9	1.32	70.08	1.78
ADF antenna	KA44B	071-01234-0000	Bendix/King						
ADF indicator	KI227	066-03063-0001	Bendix/King			0.7	0.32	70.08	1.78
ADF indicator	KI227	066-03063-00	Bendix/King			0.7	0.32	70.08	1.78
NAV antenna coupler	CI505		Comant						
NAV/GS antenna coupler	CI507		Comant			0.20	0.089	106.1	2.685
dual NAV/dual GS antenna coupler	CI 1125		Comant						
VOR/LOC/GS antenna	CI157P		Comant						
NAV/COM #1	KX 125	069-01028-1101	Bendix/King			11.46	5.2	70.08	1.78
NAV/COM #1 volt conv.	KA39	071-01041-001	Bendix/King						
NAV/COM #1	KX155A	069-01032-0201	Bendix/King			3.7	1.68	70.08	1.78
NAV/COM #1	KX 165	069-01025-0025	Bendix/King			5.65	2.56	70.08	1.78
NAV/COM #1	KX 165A	069-01033-0101	Bendix/King			4.0	1.81	70.08	1.78
NAV/COM #1	KX 165A, 8.33 kHz	069-01033-0201	Bendix/King			4.0	1.81	70.08	1.78

Airplane Serial No.:		Registration:		Date:		Mass		Lever Arm	
Description	Type	Part No.	Manufacturer	S/N	Installed	lb	kg	in	m
NAV/COM #2	KX155A	069-01032-0201	Bendix/King			3.7	1.68	70.08	1.78
NAV/COM/GPS #1	GNS 430	011-00280-00	Garmin			6.5	2.95	70.08	1.78
NAV/COM/GPS #1	GNS 430	011-00280-10	Garmin			6.5	2.95	70.08	1.78
NAV/COM/GPS #1	GNS 530	011-00550-00	Garmin			8.5	3.86	70.08	1.78
NAV/COM/GPS #1	GNS 530	011-00550-10	Garmin			8.5	3.86	70.08	1.78
NAV/COM/GPS #2	GNS 430	011-00280-00	Garmin			6.5	2.95	70.08	1.78
NAV/COM/GPS #2	GNS 430	011-00280-10	Garmin			6.5	2.95	70.08	1.78
CDI, VOR/LOC #1	KI 208	066-03056-0000	Bendix/King			1	0.45	70.08	1.78
CDI, VOR/LOC #2	KI 208	066-03056-0000	Bendix/King			1	0.45	70.08	1.78
CDI, VOR/LOC/GS #1	GI 106A	013-00049-01	Garmin			1.4	0.64	70.08	1.78
CDI, VOR/LOC/GS #2	GI 106A	013-00049-01	Garmin			1.4	0.64	70.08	1.78
GPS	KLN 89 B	066-01148-0102	Bendix/King			3	1.36	70.08	1.78
GPS	KLN 94	069-01034-0101	Bendix/King			3	1.36	70.08	1.78
GPS antenna	KA 92	071-01553-0200	Bendix/King						
GPS antenna #1	GA 56	011-00134-00	Garmin						
GPS antenna #2	GA 56	011-00134-00	Garmin						
GPS annunciation unit	MD41-1488		Mid Continent						
GPS / AP switch assy	MD41-528		Mid Continent						
Multifunction display / GPS	KMD 150	066-01174-0101	Bendix/King			3.3	1.5	70.08	1.78
Stormscope	WX-500	805-11500-001	Goodrich						
Stormscope antenna	NY-163	805-10930-001	Goodrich						
Strike finder display	SF 2000	2000-009	Insight						
Strike finder sensor	SF 2000	2000-022	Insight						
TAS processor	TAS 600	70-2420-x TAS600	Avidyne/Ryan						
TAS processor	TAS 610	70-2420-x TAS610	Avidyne/Ryan						

Airplane Serial No.:		Registration:		Date:		Mass		Lever Arm	
Description	Type	Part No.	Manufacturer	S/N	Installed	lb	kg	in	m
TAS processor	TAS 620	70-2420-x TAS620	Avidyne/Ryan						
TAS processor	TAS 600A	700-00185-000	Avidyne/Ryan						
TAS processor	TAS 605A	700-00185-001	Avidyne/Ryan						
TAS processor	TAS 615A	700-00185-003	Avidyne/Ryan						
TAS processor	TAS 620A	700-00185-004	Avidyne/Ryan						
Transponder coupler		70-2040	Avidyne/Ryan						
TAS antenna, top		S72-1750-31L	Sensor Systems						
TAS antenna, bottom		S72-1750-32L	Sensor Systems						
Digital air data system	GDC 72	011-03734-00	Garmin						
Attitude/Heading reference syste,	GRS 79	011-03732-00	Garmin						
Integrated avionics #1	GIA 64W	011-03711-00	Garmin			5.400	2.450	154.900	3.935
Integrated avionics #2	GIA 64W	011-03711-00	Garmin			5.400	2.450	154.900	3.935
Data link processor	GDL 69A SXM	010-01294-11	Garmin			1.720	0.780	155.000	3.937
GPS antenna #1	GA 36	013-00244-00	Garmin						
GPS antenna #1	GA 37	013-00245-00	Garmin						
Standby attitude module	MD302	6420302-1	Mid Continent Instr.			1.60	0.730	70.08	1.780
<b>ENGINE</b>									
<b>ENGINE INDICATING</b>									
Engine	IO-360-M1A		Textron Lycoming						
Engine/Airframe unit	GEA 71B	011-03682-00	Garmin			1.800	0.820	70.08	1.78
<b>ENGINE FUEL CONTROL</b>									
Fuel flow transmitter	VM1000	3010032	Vision Microsyst.						
Fuel pressure transmitter	VM1000	3010017	Vision Microsyst.						

Airplane Serial No.:		Registration:		Date:		Mass		Lever Arm	
Description	Type	Part No.	Manufacturer	S/N	Installed	lb	kg	in	m
<i>ENGINE IGNITION SYSTEM</i>									
SlickSTART booster	SS1001		Unison						
Lasar ignition controller	LC-1002-03	LC-1002-03	Unison						
Lasar ignition harness	LH-1004-43		Unison						
Magneto RH/LH	4370/4347		Slick						
Magneto RH/LH	4770/4771		Slick						
RPM sensor	VM1000	3010005	Vision Microsyst.						
Manifold pressure sensor	VM1000	3010016	Vision Microsyst.						
Cyl. head temp. probes (4 each)	VM1000	1020061	Vision Microsyst.						
EGT probes	VM1000	1020060	Vision Microsyst.						
Data processing unit	DPU	4010067	Vision Microsyst.						
Data processing unit	DPU	4010081	Vision Microsyst.						
Integr. engine data display	VM1000	4010050	Vision Microsyst.						
I/O board assy		3020003	Vision Microsyst.						
I/O board assy		3020018	Vision Microsyst.						
<i>ENGINE OIL</i>									
Oil temperature sensor	VM1000	3010021	Vision Microsyst.						
Oil pressure transducer	VM1000	3010018	Vision Microsyst.						
<i>ENGINE STARTING</i>									
Starter	149-24LS		Skytec						
<i>PROPELLER SYSTEM</i>									
Propeller	MTV-12-B/180-17		mt-Propeller						
						47.0	21.32	15.0	0.381



Airplane Serial No.:		Registration:		Date:		Mass		Lever Arm	
Description	Type	Part No.	Manufacturer	S/N	Installed	lb	kg	in	m
Propeller	MTV-12-B/180-17f		mt-Propeller			47.0	21.32	15.0	0.381
Propeller governor	C-210776		Woodward			3.05	1.385	29.4	0.747
Propeller governor	MT-P-420-10		mt-Propeller			2.0	0.907	29.4	0.747
Propeller governor	MT-P860-23	P-860-23	mt-Propeller			2.05	0.93	29.4	0.747
<b>AIRPLANE FLIGHT MANUAL</b>		Doc. No. 6.01.01(-E)	Diamond						

- 1) The Amerex A 620 T fire extinguisher is UL approved, and can be used in airplanes registered in Canada and the USA. For airplanes registered in other countries, refer to the national Airworthiness Authority.

Place: \_\_\_\_\_ Date: \_\_\_\_\_ Signature: \_\_\_\_\_

I

Intentionally left blank.

# CHAPTER 7

## DESCRIPTION OF THE AIRPLANE AND ITS SYSTEMS

Page

7.1	INTRODUCTION .....	7-3
7.2	AIRFRAME .....	7-3
	7.2.1 FUSELAGE .....	7-3
	7.2.2 WINGS .....	7-3
	7.2.3 EMPENNAGE .....	7-3
7.3	FLIGHT CONTROLS .....	7-3
	7.3.1 AILERONS .....	7-3
	7.3.2 FLAPS .....	7-4
	7.3.3 ELEVATOR .....	7-5
	7.3.4 RUDDER .....	7-5
	7.3.5 ELEVATOR TRIM .....	7-6
	7.3.6 PEDAL ADJUSTMENT .....	7-6
7.4	INSTRUMENT PANEL .....	7-7
	7.4.1 INSTRUMENT PANEL VARIANTS .....	7-7
	7.4.2 COCKPIT VENTILATION .....	7-10
7.5	LANDING GEAR .....	7-10
	7.5.1 WHEEL BRAKES .....	7-10
	7.5.2 PARKING BRAKE .....	7-10
7.6	SEATS AND SAFETY HARNESSSES .....	7-12
7.7	BAGGAGE COMPARTMENT .....	7-14
	7.7.1 STANDARD BAGGAGE COMPARTMENT .....	7-15
	7.7.2 BAGGAGE TUBE (IF INSTALLED) .....	7-15
	7.7.3 EXTENDED BAGGAGE COMPARTMENT (OÄM 40-163 .....	7-15
	AND OÄM 40-164, IF INSTALLED)	

7.8	CANOPY, REAR DOOR, AND CABIN INTERIOR. . . . .	7-15
	7.8.1 FRONT CANOPY . . . . .	7-15
	7.8.2 REAR DOOR. . . . .	7-16
	7.8.3 HEATING AND VENTILATION . . . . .	7-16
	7.8.4 EMERGENCY AXE . . . . .	7-17
	7.8.5 EMERGENCY EGRESS HAMMER. . . . .	7-18
7.9	POWER PLANT . . . . .	7-18
	7.9.1 ENGINE, GENERAL . . . . .	7-18
	7.9.2 OPERATING CONTROLS . . . . .	7-19
	7.9.3 PROPELLER . . . . .	7-21
	7.9.4 ENGINE INSTRUMENTS. . . . .	7-22
7.10	FUEL SYSTEM . . . . .	7-26
	7.10.1 STANDARD TANK . . . . .	7-26
	7.10.2 LONG RANGE TANK . . . . .	7-27
	7.10.3 FUEL PUMPS . . . . .	7-28
	7.10.4 FUEL TANK SELECTOR . . . . .	7-28
	7.10.5 FUEL TANKS . . . . .	7-29
	7.10.6 FUEL QUANTITY MEASURING DEVICE . . . . .	7-32
7.11	ELECTRICAL SYSTEM . . . . .	7-37
	7.11.1 GENERAL . . . . .	7-39
	7.11.2 DAI ANNUNCIATOR PANEL (WARNING, CAUTION AND ADVISORY MESSAGES)	7-42
	7.11.3 WHITE WIRE ANNUNCIATOR PANEL (WARNING, CAUTION AND STATUS LIGHTS)	7-44
7.12	PITOT-STATIC SYSTEM. . . . .	7-47
7.13	STALL WARNING . . . . .	7-47
7.14	AVIONICS . . . . .	7-48
7.15	CO-MONITOR (IF INSTALLED). . . . .	7-48
	7.15.1 SELF TEST SEQUENCE. . . . .	7-48
	7.15.2 IN-FLIGHT CO ALARM . . . . .	7-48
	7.15.3 UNIT FAILURE INDICATION. . . . .	7-48

## **7.1 INTRODUCTION**

Chapter 7 contains a description of the airplane and its systems, together with operating instructions. For details about optional equipment see Chapter 9.

## **7.2 AIRFRAME**

### **7.2.1 FUSELAGE**

The GFRP fuselage is of semi monocoque molded construction. The fire protection on the firewall is of a special fire-resistant matting, which is covered on the engine side by stainless steel cladding. The two main bulkheads are GFRP/CFRP items.

### **7.2.2 WINGS**

The wings have a front and rear spar; each wing has a top shell and a bottom shell - a “fail safe” concept. The wings, as well as the ailerons and flaps, are made of GFRP/CFRP, and are principally of sandwich construction. An aluminum fuel tank is installed in each of the wings.

### **7.2.3 EMPENNAGE**

The airplane has a T-tail of GFRP semi monocoque construction. Both the stabilizers have twin spars and a skin with no sandwich. Rudder and elevator are of sandwich construction.

## **7.3 FLIGHT CONTROLS**

The ailerons, elevator and wing flaps are operated through control rods, while the rudder is controlled by cable. The flaps are electrically operated. Elevator forces can be balanced by a trim tab on the elevator, which is operated by a Bowden cable.

### **7.3.1 AILERONS**

Construction: GFRP/CFRP composite sandwich

Hinges: There are 4 hinges, which are hinge pins mounted in an aluminum bracket. They are secured in position by a roll pin. The absence of this roll pin can lead to the loss of the hinge pin and a consequent loss of flight safety.

**Operation:** A rod-end bearing is screwed into a steel push rod and locked by means of a nut which has locking varnish applied to it. Damage to this varnish can indicate a twisting and thus a change to the adjustment. The connection between the rod-end bearing and the control horn is a bolt, the nut of which is likewise sealed with locking varnish.

The aluminum control horn is attached to the aileron with 3 screws.

### **7.3.2 FLAPS**

**Construction:** GFRP/CFRP composite sandwich

**Hinges:** There are 6 hinges, which are hinge pins mounted in an aluminum bracket. They are secured in position by a roll pin. The absence of this roll pin can lead to the loss of the hinge pin and a consequent loss of flight safety. Another aluminum fitting is located at the fuselage and is attached to a torsion tube. The torsion tube is located in the fuselage, creating a connection between the left and right flaps.

**Operation:** A rod-end bearing is screwed into a steel push rod and locked by means of a nut which has locking varnish applied to it. Damage to this varnish can indicate a twisting and thus a change to the adjustment. The connection between the rod-end bearing and the control horn is a bolt, the nut of which is likewise sealed with locking varnish.

The flap control horn is attached to the flap with 3 screws.

The flaps are driven by an electric motor and have 3 settings:

- Cruise (UP), totally retracted
- Take-off (T/O), and
- Landing (LDG).

The flaps are operated by means of a 3-position flap selector switch on the instrument panel. The positions of the switch correspond to the positions of the flaps, the Cruise position of the switch being at the top. If the switch is moved to another position, the flaps continue to travel automatically until they have reached the position selected on the switch. The UP and LDG

positions are additionally protected by a limit switch to guard against over-running the end positions. The electrical flap drive has an automatic circuit breaker which can also be operated manually.

Flap Position Indicator:

The current flap position is indicated by means of three lights beside the flap selector switch.

When the upper light (green) is illuminated, the flaps are in the Cruise position (UP);

When the center light (white) is illuminated, the flaps are in Take-off position (T/O);

When the lower light (white) is illuminated, the flaps are in Landing position (LDG).

When two lights are illuminated simultaneously, the flaps are between the two indicated positions.

This is the case only when the flaps are traveling.

### **| 7.3.3 ELEVATOR**

Construction: GFRP sandwich

Hinges: 5 hinges

**| Operation:** Steel push-rods

Two of the bellcrank bearings are accessible to visual inspection next to the lower hinge of the rudder. The elevator horn and its bearing, as well as the connection to the push-rod, can be visually inspected at the upper end of the rudder.

### **| 7.3.4 RUDDER**

Construction: GFRP sandwich

**| Hinges:** Upper hinge: One bolt

Lower hinge: Bearing bracket including rudder stops, held by 4 screws to the rear web of the vertical stabilizer. The mating part on the rudder is a bracket which is attached to the rudder by 2 bolts. The bolts and nuts are accessible to visual inspection.

Operation: Steel cables, the eyes of which are connected to the bolts on the bracket.

**I** 7.3.5 ELEVATOR TRIM

The trim control is a black wheel in the center console to the rear of the engine controls. To guard against over-rotating, the trim wheel incorporates a friction device. A mark on the wheel shows the take-off (T/O) position.

Turn wheel to the front = nose down

Turn wheel to the rear = nose up

**I** 7.3.6 PEDAL ADJUSTMENT**NOTE**

The pedals may only be adjusted on the ground!

The pedals are unlocked by pulling the black T-grip handle, which is located behind the rear attachment, straight back.

**NOTE**

When adjusting rudder pedals to install the control surfaces gust lock pull straight back on T-grip, do not pull up.

**I** (a) Forward Adjustment

Whilst keeping the handle pulled, push the pedals forward with your feet. Release the handle and allow the pedals to lock into place.

**I** (b) Rearward Adjustment

Using the unlocking handle, pull the pedals back to the desired position. Release the handle and push the pedals forward with your feet until they lock into place.

█ (c) Electrical Pedal Adjustment (Optional Equipment, OÄM 40-251)

█ **NOTE**

The pedals may only be adjusted on the ground!

The pedals are adjusted using a rocker switch, located on the rear wall of the leg room. The related circuit breaker is located below the switch.

*Forward Adjustment*

█ To move the pedals forward, depress the lower side of switch. When the pedals are in the correct position, release switch.

*Rearward Adjustment*

█ To move the pedals in the rearward direction, depress the upper side of switch. When the pedals are in the correct position, release switch.

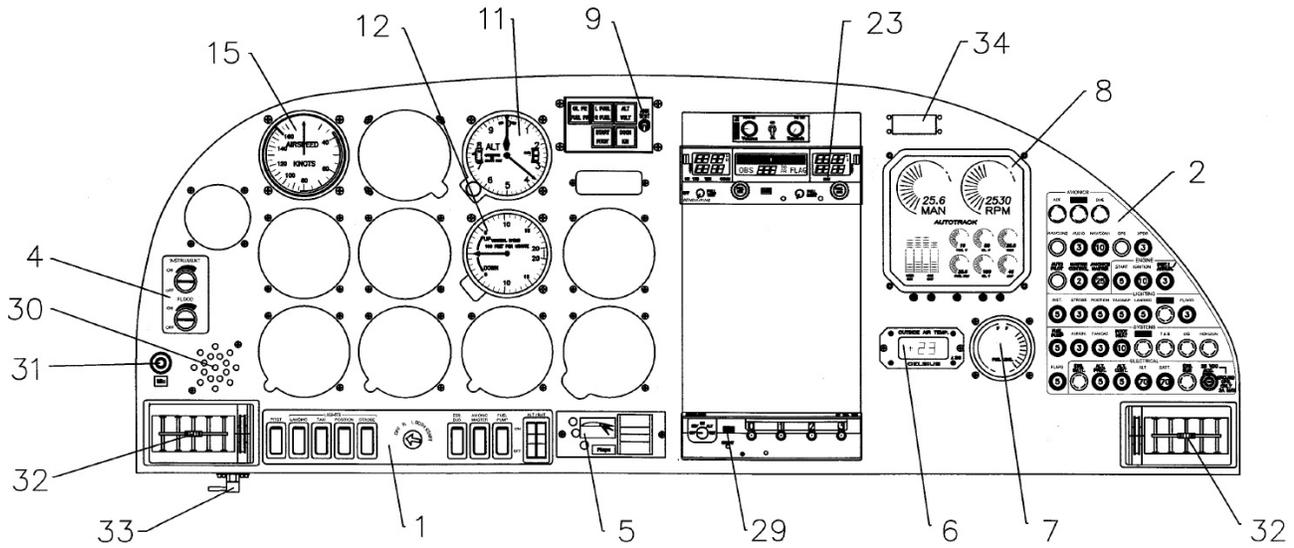
*Locking*

█ Upon release the switch moves automatically to the “power off” position, locking the pedals in position.

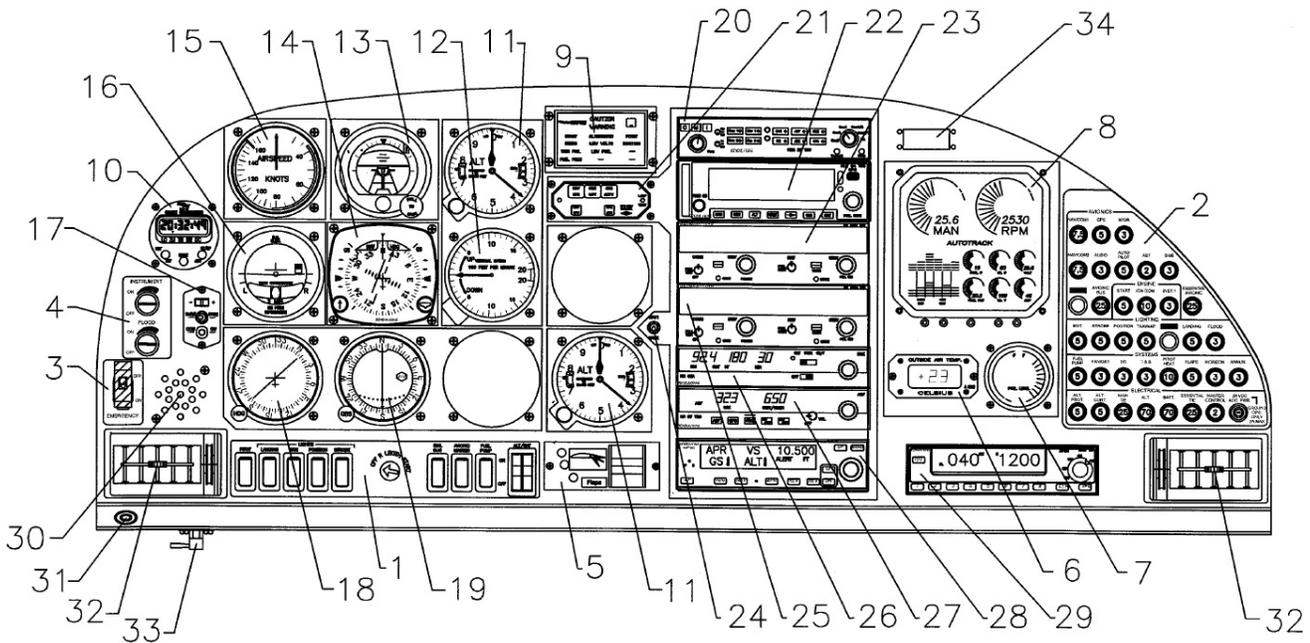
## **7.4 INSTRUMENT PANEL**

### **7.4.1 INSTRUMENT PANEL VARIANTS**

The DA 40 can be equipped with one of numerous instrument panel variants. Therefore only two example variants (VFR and IFR) are described in this section. The equipment that is actually installed in a particular airplane is listed in the Equipment Inventory in Section 6.5. The airplane manufacturer must be contacted before removing or installing equipment, with the exception of replacing a unit by an identical unit.



VFR instrument panel (example)



IFR instrument panel (example)

Major Instruments and Controls			
1	Electrical switches, ignition switch	18	ADF indicator
2	Circuit breakers*	19	Course deviation indicator (CDI)
3	Emergency switch	20	Audio amplifier / intercom / marker beacon receiver
4	Rotary buttons for instrument lighting and flood light	21	GPS annunciation control unit
5	Flap selector switch	22	GPS
6	OAT indicator	23	Radio / VOR, No. 1
7	Fuel quantity indicator	24	Remote DME switch
8	Engine instruments	25	Radio / VOR, No. 2
9	Lights (annunciator panel)	26	DME
10	Chronometer	27	ADF receiver
11	Altimeter	28	Autopilot control unit (optional)
12	Vertical speed indicator (VSI)	29	Transponder
13	Attitude gyro (artificial horizon)	30	Stall warning horn
14	Horizontal situation indicator (HSI)	31	Microphone socket
15	Airspeed indicator	32	Ventilation nozzles
16	Turn & bank indicator	33	Alternate static valve (optional for VFR version)
17	Slaving meter	34	ELT operating unit (RCPI)

\*) Designations and abbreviations used to identify the circuit breakers are explained in Section 1.5 - DEFINITIONS AND ABBREVIATIONS.

## **7.4.2 COCKPIT VENTILATION**

Ventilation in the front is provided by the movable ventilation nozzles (32) in the instrument panel. Furthermore there are spherical nozzles in the roll bar on the left and right side next to the front seats as well as on the central console above the passengers' heads. The spherical nozzles are opened and closed by twisting.

## **7.5 LANDING GEAR**

The landing gear consists of a main landing gear of sprung steel struts, and a free-castering nose wheel which is sprung by an elastomer package.

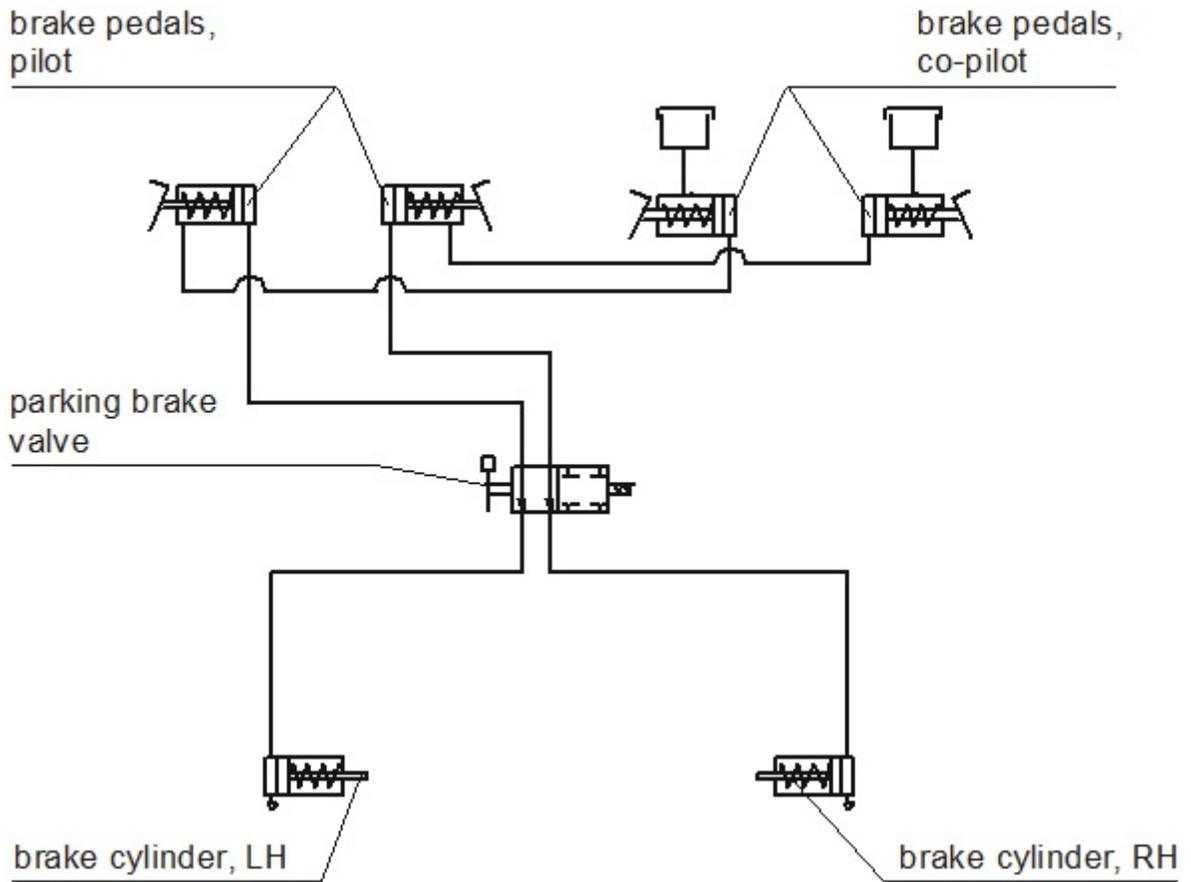
The wheel fairings are removable. When flying without wheel fairings, it should be noted that there is a reduction in some areas of performance (see Chapter 5).

### **7.5.1 WHEEL BRAKES**

Hydraulically operating disk brakes act on the wheels of the main landing gear. The wheel brakes are individually operated by means of toe pedals.

### **7.5.2 PARKING BRAKE**

The parking brake lever is located on the small center console under the instrument panel, and is in the upper position when the brakes are released. To operate the parking brake pull the lever downwards until it catches. Brake pressure is built up by multiple operation of the toe brake pedals, and is maintained until the parking brake is released. To release, apply toe pressure to the brakes, and push the lever upwards.



**Hydraulic system schematic**

## 7.6 SEATS AND SAFETY HARNESSSES

To increase passive safety, the seats are constructed using a carbon fiber/Kevlar hybrid material and GFRP. The seats are removable to facilitate the maintenance and inspection of the underlying controls. Covers on the control sticks prevent loose objects from falling into the area of the controls.

If front seats with adjustable backrests are installed (OÄM 40-252 or OÄM 40-375), the angle of the backrest, and the lumbar support, can be adjusted for best comfort. The backrest control lever is situated on the outboard side of the backrest if OÄM 40-252 is installed. The backrest release button in the case of OÄM 40-375, is situated on the upper side of the seat's side frame. However, during take-off, landing, and emergency landings, the backrests must be fixed in the upright position designated by a placard on the roll-over bar.

The lumbar support can be adjusted by operating the lumbar support lever mounted on the outboard side of the seat pan.

### **CAUTION**

Before the backrest lever is lifted in order to unlock the backrest, lean back towards the backrest to counteract the spring load. Otherwise, the backrest may snap forward.

### **CAUTION**

Before adjusting the angle, lean against the backrest to counteract the spring load. Otherwise, the backrest may snap forward.

### **CAUTION**

Do not apply a load of more than 90 N (202 lbf) to the top of the backrest. Otherwise, damage to the adjustment mechanism may result.

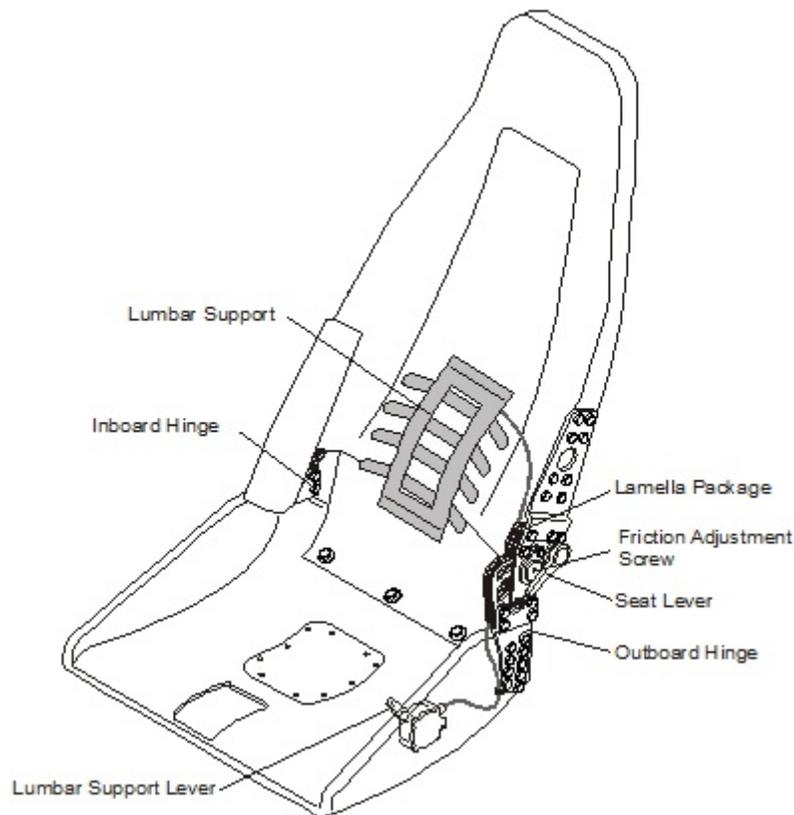
For adjustment, lift the backrest lever, or press the button, and bend the backrest forward or backward to the desired backrest angle. For fixing the position, press down the backrest lever, or release the button.

- If OÄM 40-252 is installed, and in case of a defective adjustment mechanism, the outboard friction adjustment screw can be tightened with a 10 mm hexagon nut in clockwise direction in order to fix the backrest in the upright position.
- If possible, set the backrest lever to the “locked” position. The mechanism must be repaired at the next scheduled inspection.
- If OÄM 40-375 is installed, and in case of a malfunction of the release button, the backrest can be moved into the upright position by pulling (480 N) the backrest forward.

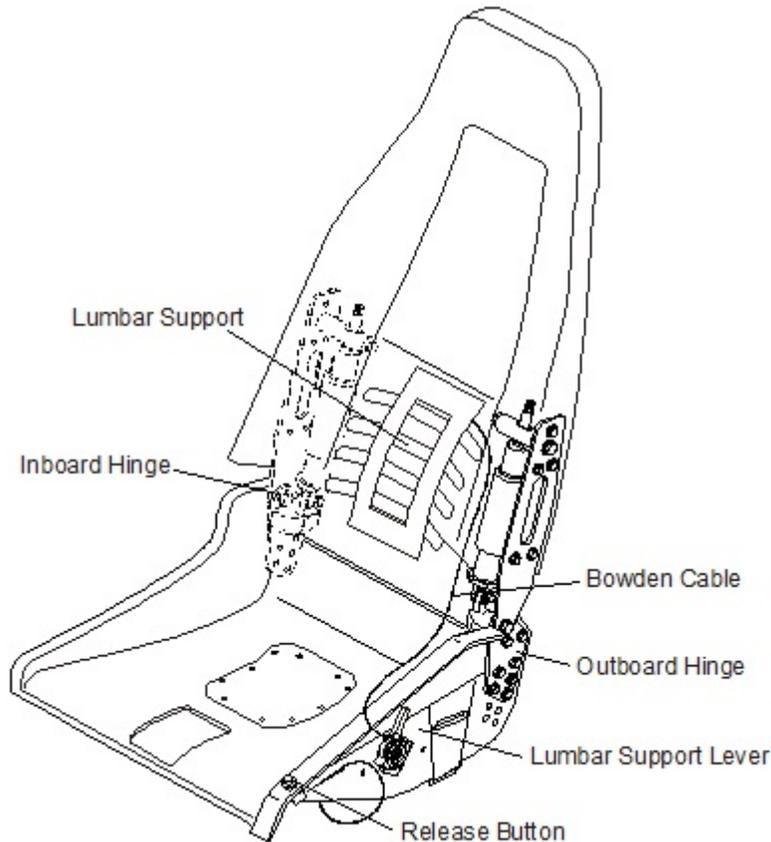
The seats have removable furnishings and are equipped with energy-absorbing foam elements. The seats are fitted with three-point safety harnesses. The harnesses are fastened by inserting the end of the belts in the belt lock, and are opened by pressing the release on the belt lock.

The backs of the rear seats can be laid forward after pulling upwards on the knob of the locking bolt.

If seats with adjustable backrests are installed (OÄM-40-252):



If seats with adjustable backrest - Hydrolok are installed (OÄM 40-375):



## **7.7 BAGGAGE COMPARTMENT**

The DA 40 may be equipped with one of the following baggage compartment variants:

- (a) Standard baggage compartment.
- (b) Standard baggage compartment with “baggage tube.”
- (c) Extended baggage compartment (OÄM 40-163). It consists of a forward and an aft part.

Without a baggage net, no baggage may be loaded.

### **7.7.1 STANDARD BAGGAGE COMPARTMENT**

The baggage compartment is located behind the rear seats.

### **7.7.2 BAGGAGE TUBE (IF INSTALLED)**

On the back side of the standard baggage compartment the baggage tube may be installed. It is separated by a cloth cover.

### **7.7.3 EXTENDED BAGGAGE COMPARTMENT (OÄM 40-163 AND OÄM 40-164, IF INSTALLED)**

The extended baggage compartment consists of the standard baggage compartment behind the rear seats and the baggage extension mounted between the baggage compartment frame and ring frame No. 1.

The baggage extension has a door that may be hinged up to keep items from sliding aft or hinged down to carry long items.

The baggage tray may be installed in the bottom of the standard baggage compartment. The lid of the baggage tray and the bottom of the baggage extension form a flat loading surface. The lid has mounting provisions for the tow bar. The space under the lid may be used to carry small items such as the gust lock and the fuel quantity measuring device.

## **7.8 CANOPY, REAR DOOR, AND CABIN INTERIOR**

### **7.8.1 FRONT CANOPY**

The front canopy is closed by pulling down on the canopy frame, following which it is locked by means of a handle on the left hand side of the frame. On locking, steel bolts lock into mating holes in polyethylene blocks.

“Cooling gap” position: A second setting allows the bolts to lock in, leaving a gap under the front canopy.

The front canopy can be blocked by a locking device (optional) on the left side near the canopy opening lever by turning the key clockwise. The closed and blocked canopy can be opened from inside by pulling the lever inside the opening handle.

## WARNING

The airplane may be operated with the front canopy in the “cooling gap” position on the ground only. Before take-off the front canopy must be completely closed and locked, but not blocked with the locking device.

A window on the left hand side of the canopy can be opened for additional ventilation or as an emergency window. Some serial numbers have another window on the right hand side of the canopy.

### **7.8.2 REAR DOOR**

The rear door is closed in the same way, by pulling down on the frame or on the handle (if installed) and locking it with the handle. A gas pressure damper prevents the door from dropping; in strong winds the assembly must be held. The rear door is protected against unintentional opening by an additional lever.

The door can be blocked by a locking device (optional) on the left side near the door opening lever by turning the key clockwise. The closed and blocked door can be opened from inside by pulling the lever inside the opening handle.

## WARNING

The rear door must be closed and locked, but not blocked with the locking device before the engine is started.

### **7.8.3 HEATING AND VENTILATION**

Heating and ventilation are operated using two levers located on the small center console under the instrument panel.

Left lever:

up = heating ON  
down = heating OFF

Central lever (air distribution lever):

up = airflow to canopy (▲)

down = airflow to floor (▼)

#### **7.8.4 EMERGENCY AXE**

If OÄM 40-326 is incorporated an emergency axe is installed on the floor panel under the pilot's seat (see figure below).

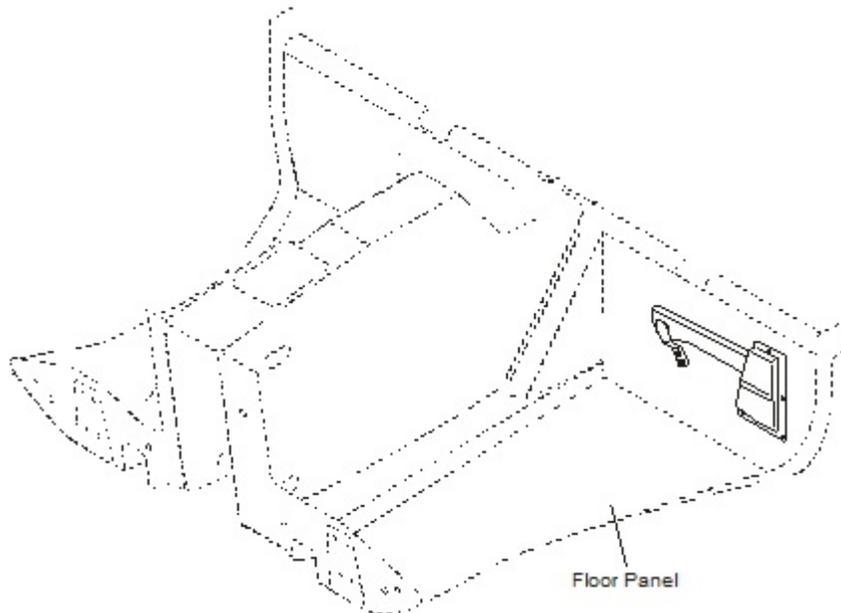
If the canopy can not be opened in case of an emergency use the emergency axe to break through the canopy.

#### **WARNING**

Make sure not to harm other persons by using the emergency axe.

#### **WARNING**

Beware of sharp edges and fragments of the broken canopy.



### **7.8.5 EMERGENCY EGRESS HAMMER**

If OÄM 40-401 is incorporated, the emergency egress hammer is installed on the floor panel under the pilot's seat.

If the canopy cannot be opened in case of an emergency, use the emergency egress hammer to break through the canopy.

#### **WARNING**

Make sure not to harm other persons by using the emergency egress hammer.

#### **WARNING**

Beware of sharp edges and fragments of the broken canopy.

## **7.9 POWER PLANT**

### **7.9.1 ENGINE, GENERAL**

Lycoming IO-360-M1A: Air-cooled four-cylinder four-stroke engine. Horizontally-opposed direct-drive engine with fuel injection and underslung exhaust.

Displacement: 5916 cm<sup>3</sup> (361 in<sup>3</sup>).

Max. power: 180 HP (134.2 kW) at 2700 RPM at sea level and ISA.

Max. continuous power: 160 HP (119.3 kW) at 2400 RPM at sea level and ISA.

The principal engine accessories at the front of the engine are the propeller governor, the starter motor, and the alternator. The ignition (optionally controlled by an electronic control unit), the twin magneto system and the mechanical fuel pump are at the rear of the engine. Fuel is supplied via a fuel injection system.

Further information should be obtained from the engine operating manual.

The engine instruments are on the right hand side of the instrument panel.

The ignition switch is designed as a key-operated lock. The ignition is switched on by moving the switch to the right from the OFF position to the L-R-BOTH positions. A further turn to the right to the START position will operate the starter motor.

### **7.9.2 OPERATING CONTROLS**

The engine performance is controlled by means of three levers: throttle, RPM lever and mixture control lever, situated together as a group on the large center console (also referred to as the throttle quadrant). Front and rear are defined in relation to the direction of flight.

#### **(a) Throttle**

- Left hand lever with large, black knob.

This lever is used to set the manifold pressure (MP). When the throttle is furthest forward, the engine is being provided with extra fuel for high performance settings.

Lever forward (MAX PWR) = Full throttle, higher MP

Lever to rear (IDLE) = Idle, low MP

High manifold pressure means that a large quantity of fuel-air mixture is being supplied to the engine, while low manifold pressure means a lesser quantity of fuel-air mixture is being supplied.

#### **(b) RPM Lever**

- Central lever with blue handle.

Lever forward (HIGH RPM) = High RPM, fine pitch

Lever to rear (LOW RPM) = Low RPM, coarse pitch

By means of this lever the propeller governor controls the propeller pitch and thus engine RPM = propeller RPM. A selected RPM is held constant by the governor independent of the airspeed and the throttle setting “constant speed.”

The propeller governor is flanged onto the front of the engine. It regulates the supply of engine oil to the propeller. The propeller governor oil circulation is an integral part of the engine oil circulation system. Following a defect in governor or oil system, the blades go to the finest possible pitch (maximum RPM), thus allowing continuation of the flight.

**CAUTION**

Following failure of the governor or a serious drop in oil pressure, the RPM should be adjusted using the throttle. Every effort should be made not to exceed 2700 RPM.

**CAUTION**

The throttle and RPM lever should be moved slowly, in order to avoid over-speeding and excessively rapid RPM changes. The light wooden propeller blades produce more rapid RPM changes than metal blades.

**I** (c) Mixture Control Lever

- Right hand lever with red handle and lock to avoid inadvertent operation.

This lever is used to set the proportions in the fuel-air mixture which is supplied to the engine.

Lever forward (RICH) = Mixture rich (in fuel)

Lever to rear (LEAN) = Mixture lean (in fuel)

If the lever is at the forward stop, extra fuel is being supplied to the engine which at higher performance settings contributes to engine cooling. In cruise, the mixture should be made leaner in order to reach the appropriate fuel-air mixture. The leaning procedure is given in Chapter 4.

To shut off the engine the mixture control lever is pulled to the rear stop. Air without fuel is thus drawn into the cylinders and the engine dies. When the engine is stationary there is thus no fuel in the cylinders.

**I** (d) Alternate Air

In the event of the loss of manifold pressure because of icing or blocking of the air filter, there is the possibility of drawing air from the engine compartment. The operating lever for alternate air is located under the instrument panel to the left of the center console. To open alternate air the lever is pulled to the rear. Normally, alternate air is closed, with the lever in the forward position.

Placard on the lever, forward position:

**ALTERNATE AIR**

Placard on the lever, visible when lever is in the rearward position:

**ALTERNATE AIR  
ON**

### **7.9.3 PROPELLER**

- An mt-Propeller MTV-12-B/180-17 type or MTV-12-B/180-17f type, hydraulically-regulated 3-bladed constant speed propeller is installed. It has wood-composite blades with fiber-reinforced plastic coating and stainless steel edge cladding; in the region of the propeller hub the leading edge is coated with adhesive PU foil. These blades combine the lowest weight while minimizing vibration.

### **CAUTION**

Operation on the ground at high RPM should be avoided as far as possible, as the blades could suffer stone damage. For this reason a suitable site for engine runs (magneto and propeller checks) should be selected, where there are no loose stones or similar items.

### **WARNING**

Never move the propeller by hand while the ignition is switched ON, as it may result in serious personal injury.

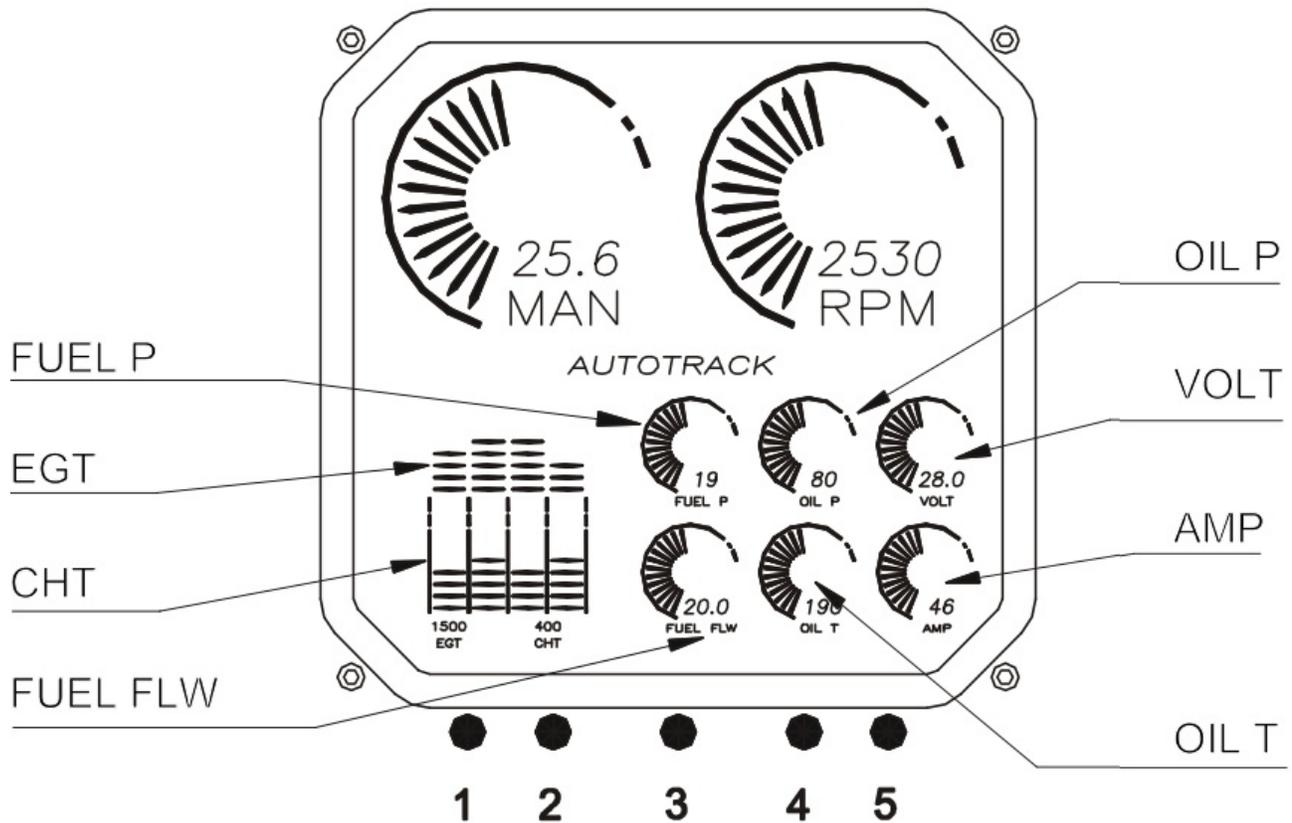
Never try to start the engine by hand.

#### ■ (a) Governor

One of the following governors may be installed:

Woodward C-210776 Governor, MT P-420-10 Governor (OÄM 40-077) or MT P-860-23 Governor (OÄM 40-289).

## 7.9.4 ENGINE INSTRUMENTS



Button 1: Lean mode

Button 2: Digital exhaust gas / cylinder head temperature mode

Button 3: Switch in autotrack. Button 3 has an additional function on switch-on: Display mode.

Button 4: Fuel computer mode

Button 5: Engine data recorder

(a) Sweep Mode or Pointer Mode

If the switch-on button (button 3) is kept pressed until the display transfers from activating all bars/pointers to indicating the actual values, the type of presentation can be selected. In one case the circular instruments show the values with a pointer as in conventional analog instruments, whilst in the other case the circular instruments fill with pointers/bars up to the current value. It remains for the pilot to select his preferred presentation.

### (b) Indications on the Vision Microsystems VM 1000 Engine Instrument

Designation	Indication	Unit
MAN	Manifold pressure	inHg
RPM	RPM	RPM
EGT	Exhaust gas temperature	°F
CHT	Cylinder head temperature	°F
FUEL P	Fuel pressure	PSI
FUEL FLW	Fuel flow	US gal/hr
OIL P	Oil pressure	PSI
OIL T	Oil temperature	°F
VOLT	Voltage	V
AMP	Intensity of current	A

### (c) Button 1 - Lean Mode

Upon powering up the unit the Normal mode is shown. Between the colored sector markings the cylinder head temperatures of the individual cylinders are shown by bars. Above those are bars showing the exhaust gas temperatures of the individual cylinders.

In the event of the failure of a sensor the relevant indication remains empty. A flashing cylinder head temperature indication means either that the cylinder is too hot, or that it is being cooled too rapidly (shock-cooling).

The operation of button 1 causes the display to move to Lean mode. This is confirmed by two half-bars appearing to the left and right of the bar blocks. In this mode all bars which previously showed cylinder head and exhaust gas temperature are used for exhaust gas temperature only. One bar represents 10 °F (4.6 °C). If the columns are completely filled with bars before the mixture is lean, button 1 should be pressed twice so that the bars start again at the base of the indicator.

A flashing bar column indicates that the relevant cylinder has reached the hottest exhaust gas temperature. This point will be marked with a single bar, which can be used as a reference for

enriching the mixture. As an option, the numerical indication can be used additionally for this purpose.

■ (d) Button 2 - Digital Exhaust Gas / Cylinder Head Temperature Mode

Using this button, the numerical indication for exhaust gas and cylinder head temperature underneath the graphical representation of these figures is set. Following each sequential operation of the button the exhaust gas and cylinder head temperatures of an individual cylinder are displayed. In this, the display jumps automatically from the number of the current cylinder to its current temperature. After the fourth cylinder the display switches to the Automatic mode, which gives both the number of the cylinder with the highest exhaust gas temperature as well as (beside it) the number of the hottest cylinder. Alternating with this, the associated temperatures are displayed.

■ (e) Button 3 - Switch in Autotrack

In the Autotrack mode changes in the engine values are shown. If button 3 is operated in flight, variations from the current values will be displayed, in that the relevant circular instrument and the annotation AUTOTRACK will start to flash.

In order to leave the mode, button 3 must be operated. The mode is left automatically if there is a critical value to be indicated.

■ (f) Button 4 - Fuel Computer Mode

By operating button 4 the display is switched from fuel flow (FUEL FLW) to a numerical indication underneath it. There are 4 modes, which are called up by pressing button 4 in sequence. The modes are:

REM: The remaining fuel is shown in US gal. The steps in this are 0.1 US gal. This mode is only available if the ADD mode - add up fuel - has previously been activated.

HRS: This mode shows the remaining flight time (in hours) on the basis of the current fuel flow. The steps in this indication are tenths of hours. This mode is also only available if the ADD mode - add up fuel - has previously been activated.

BRN: This mode shows the amount of fuel used (in US gal) since the equipment was switched on. The steps in this are 0.1 US gal.

ADD: This mode can be used after refueling to bring the fuel quantity, which the equipment uses for its calculations, up to date. In order to utilize the REM and HRS modes, the computer needs to be told how much fuel has been taken on. 10 US gal are added by pressing button 3, while pressing button 5 adds one US gal to the total. The quantity is confirmed by pressing button 4. In doing this, the quantity which has been entered in ADD is added to the previous total under REM. To check the fuel quantity button 4 should be pressed until REM is shown. If too much has been added, button 4 should not be pressed for confirmation. After approx. 20 seconds the computer automatically leaves the ADD mode.

### CAUTION

Incorrect use of the computer in the fuel-computer mode will result in false statements in the “REM - remaining fuel” and the “HRS - remaining flight time” modes. Before using the fuel computer mode in flight the pilot must be certain that he has understood the operation and use of the equipment. Beyond this, use of the fuel computer must not be regarded as a substitute for fuel planning for a flight.

#### (g) Button 5 - Engine Data Recorder

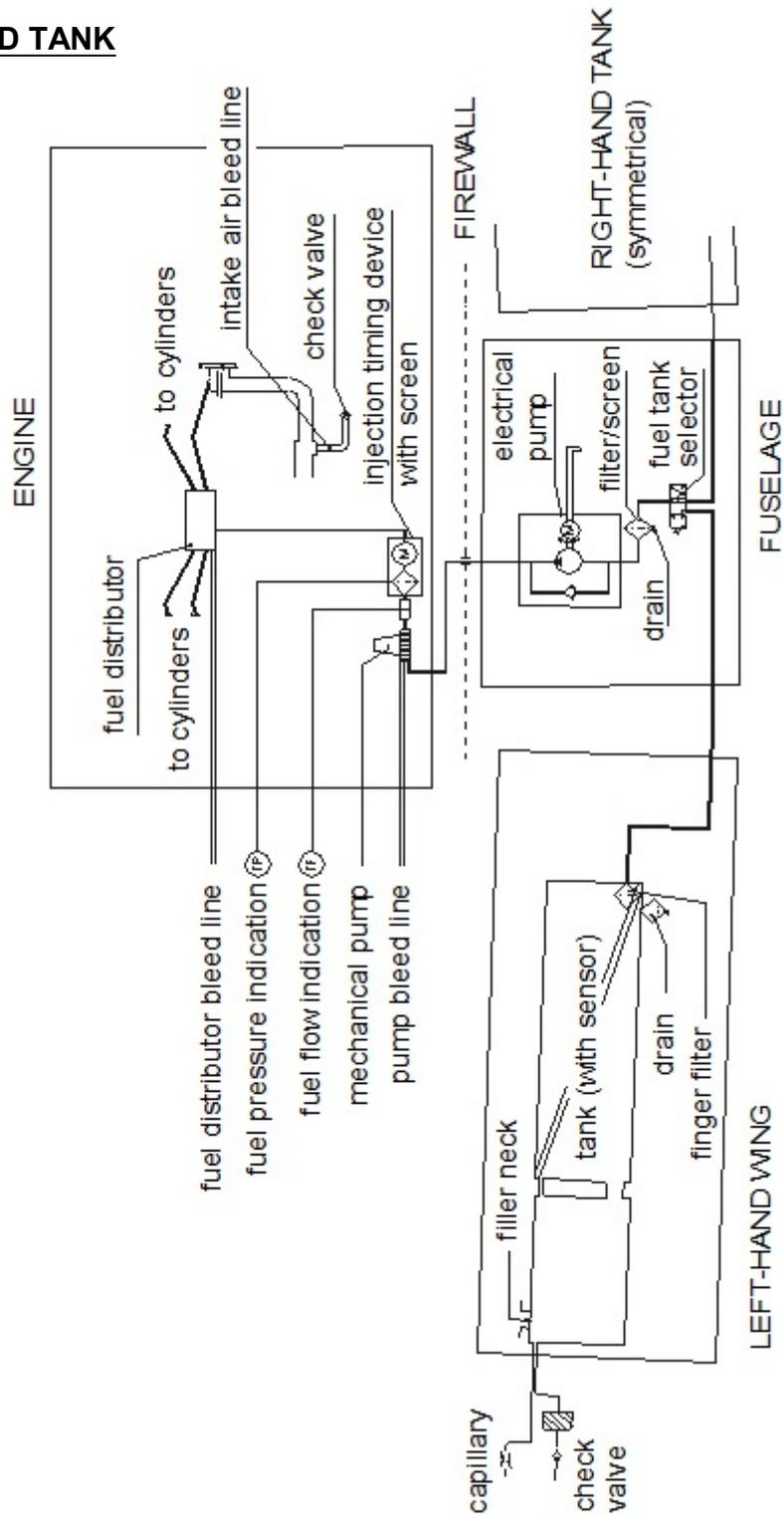
Operating button 5 will activate the engine data recorder. The digital values shown are the minimum values recorded by the engine instrument unit during operation, such as lowest voltage, lowest fuel pressure, etc. The numerical RPM indicator will indicate the total operating hours.

Pressing button 5 again will show the maximum values encountered. Pressing button 5 still another time will turn off the engine data recorder and the display will return to the original mode. If button 5 is not pressed for approximately 20 seconds, the display will automatically return to the original mode.

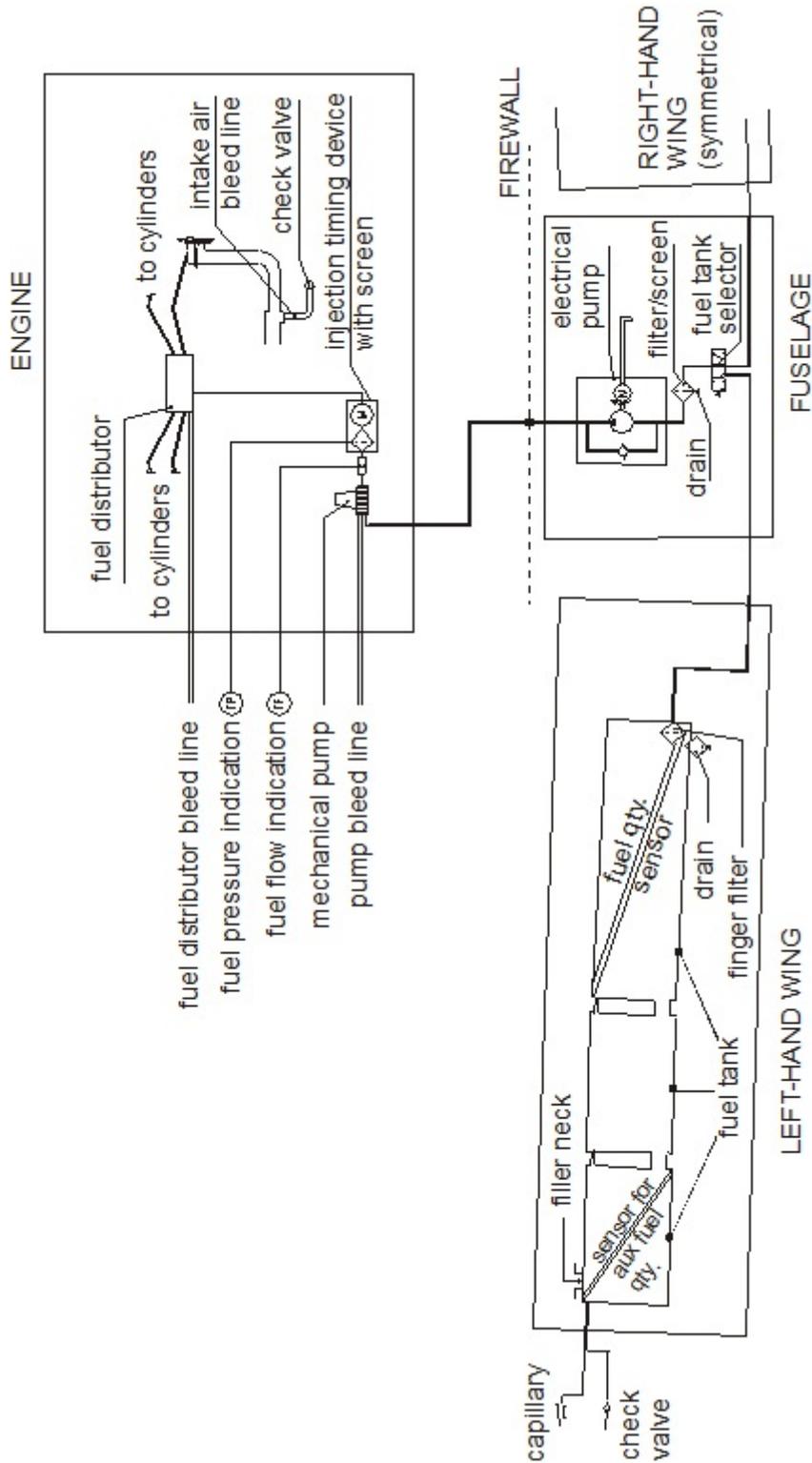
Data of the engine data recorder can be called during or immediately after flight only. With each new flight the old data will be overwritten.

## 7.10 FUEL SYSTEM

### 7.10.1 STANDARD TANK



**7.10.2 LONG RANGE TANK**



### **7.10.3 FUEL PUMPS**

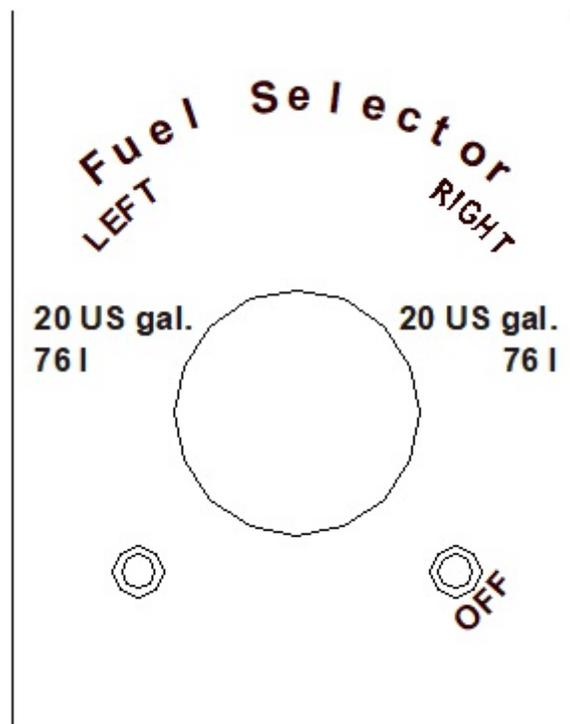
The fuel system is equipped with a mechanical and an electrical fuel pump. The mechanical pump provides for the normal fuel supply.

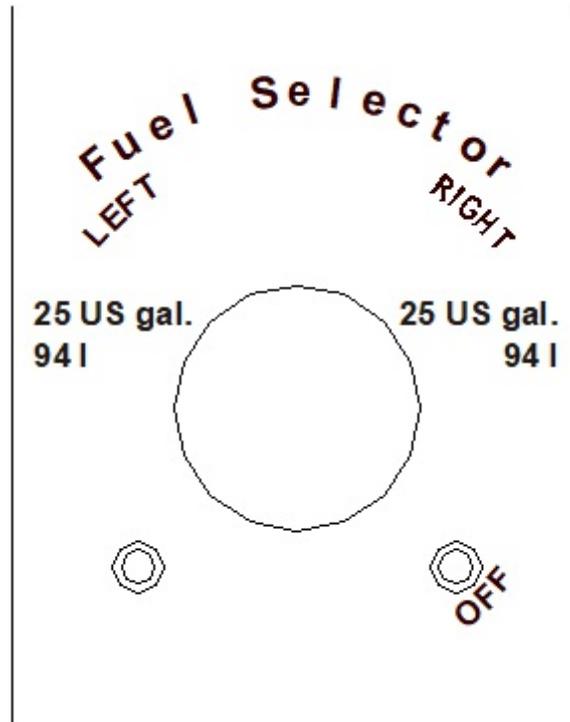
The electrical fuel pump is provided as an auxiliary and emergency pump, which does not operate under normal circumstances. It is operated with the FUEL PUMP switch on the row of switches on the instrument panel. It is checked during engine start, and is used as a safety back-up during take-off and landing, as well as when switching fuel tanks. It is also switched on for safety in the event of a decrease in fuel pressure.

### **7.10.4 FUEL TANK SELECTOR**

The fuel tank selector is situated on the center console. Its positions are LEFT (tank), RIGHT (tank) and OFF. The OFF position is reached by turning the selector to the right while pulling up the safety catch of the fuel tank selector. This is to ensure that an OFF selection is not made unintentionally.

#### (a) Standard Tank



(b) Long Range Tank**7.10.5 FUEL TANKS**

Each of the two wing tanks consists of two (standard tank) or three (long range tank) aluminum chambers which are joined by a piece of flexible hose and two independent vent hoses. There are two separate vents per tank. The hose terminations are situated on the underside of the wing, approx. 2 meter (7 ft) from the wing tip. One vent acts as a capillary, both to equalize the air pressure, and to provide a safety factor in the event of a failure of the other vent. The second vent is a check valve, to allow air to enter the tank, but prevent flow to the outside.

A coarse filter (finger filter) is fitted before the outlet. To allow draining of the tank, there is an outlet valve at its lowest point. A gascolator sits at the lowest point in the fuel system. A drain valve is fitted to the gascolator, which can be used to remove water and sediment which has collected in the fuel system. This valve is fitted centrally on the underside of the fuselage, approximately 30 cm (1 ft) forward of the wing leading edge.

**I** (a) Fuel Quantity Indication**I** *Standard tank*

A capacity probe ascertains fuel quantity in the tank. When the fuel quantity indicator reads zero, only the unusable fuel remains in the tank. The total capacity of each tank is 20 US gal (approximately 76 liter). The maximum quantity that can be indicated is either 15 US gal (up to serial number 40.054) or 17 US gal (serial number 40.055 and subsequent). The indication up to this quantity is correct. At an actual quantity above 15 US gal / 17 US gal the indication remains at 15 US gal / 17 US gal.

**NOTE**

When the fuel quantity indicator reads 15 US gal / 17 US gal, the correct fuel quantity must be determined with the fuel quantity measuring device. If this measurement is not carried out, the fuel quantity available for flight planning is 15 US gal / 17 US gal.

**I** *Long range tank*

For ascertaining fuel quantity in the enlarged tanks an additional capacitive probe is used on each side (LH/RH). When the fuel quantity indicator reads zero, only the unusable fuel remains in the tank. The usable capacity of each tank is 25 US gal (approximately 94 liter).

Up to an actual fuel quantity of 16 US gal the fuel quantity is measured by the standard probes and is brought to indication on the left and right side of the instrument in increments of 1 US gal.

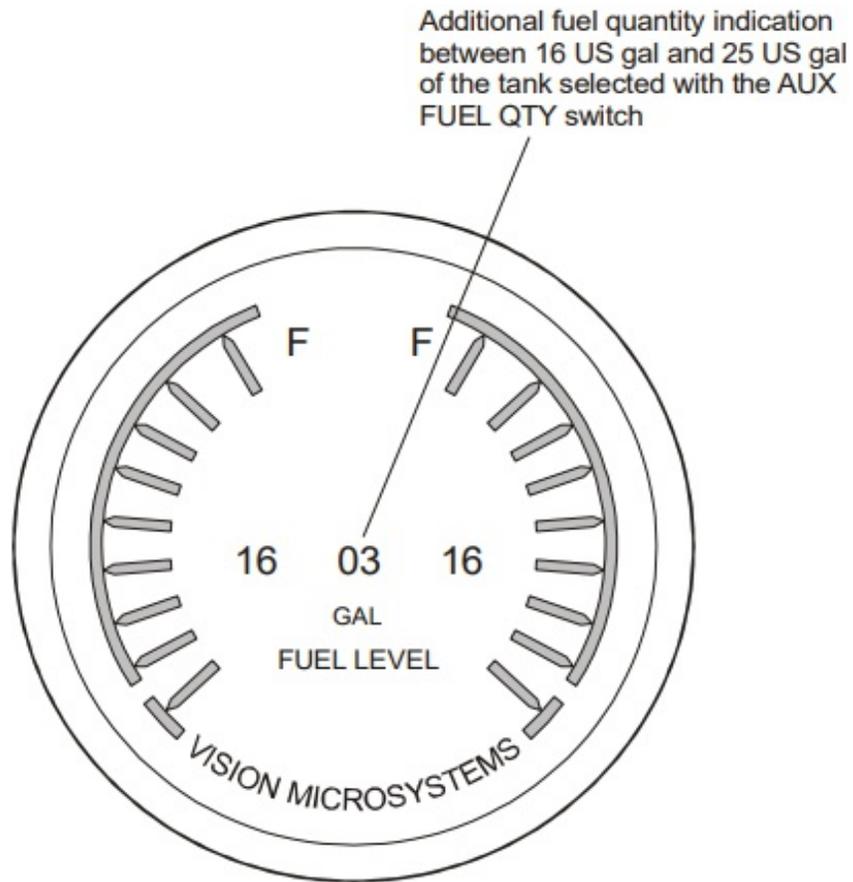
A fuel quantity between 16 US gal and 25 US gal is ascertained by the additional probes and is brought to indication in the central area of the fuel quantity indicator. The indication is numerical in 3 US gal steps (in the range from 0 to 3 US gal) and 1 US gal steps (in the range above 3 US gal up to max. 9 US gal). The side to be indicated can be selected by the AUX FUEL QTY switch (see figure below) which is located next to the indicator. The indication on the left and right side of the instrument (0 US gal to max. 16 US gal) is not affected by the switch.

The actual fuel quantity in the respective tank (LH/RH) is the sum of the central indication and the corresponding indication on the left or right side.



**CAUTION**

The correct indication of the fuel quantity takes 2 minutes after actuation of the AUX FUEL QTY switch.



**7.10.6 FUEL QUANTITY MEASURING DEVICE**

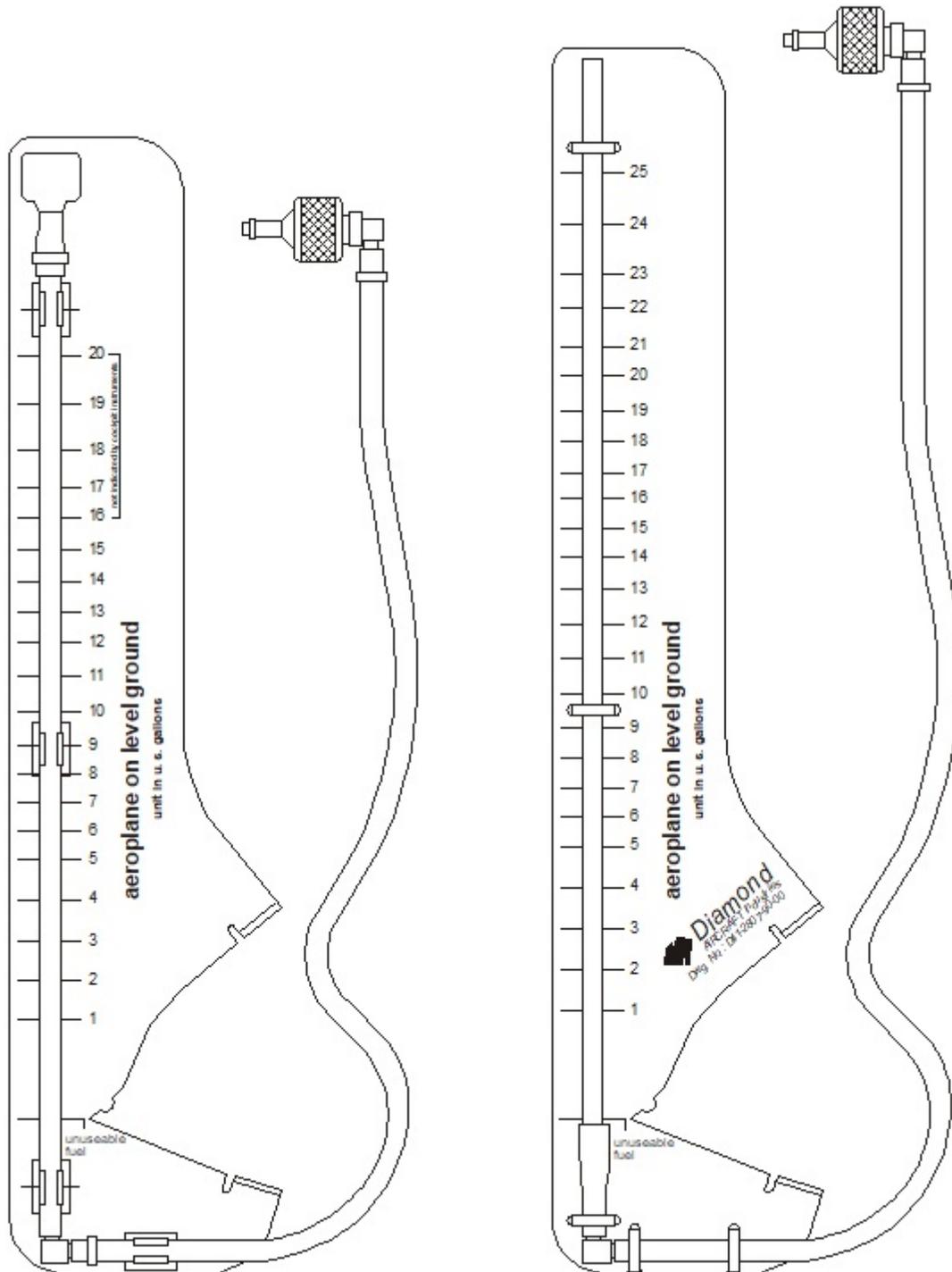
The fuel quantity measuring device allows the fuel quantity in the tank to be determined during the pre-flight inspection. It functions according to the principle of communicating containers. The fuel quantity measuring device has a recess which fits the airfoil of the wing. With this recess the device is held against the stall strip at the leading edge of the wing. The exact position is marked by a bore in the stall strip. Then the metal connector is pressed against the drain of the tank. The amount of fuel in the tank can now be read off from the vertical ascending pipe.

For a correct indication the airplane must be placed on level ground and the fuel filler must have been opened before.

The designated place for the fuel quantity measuring device is the bag on the rear side of the pilot's seat.

**CAUTION**

Different fuel measuring devices are used for the standard tank and the long range tank. The use of the wrong device results in a wrong indication.

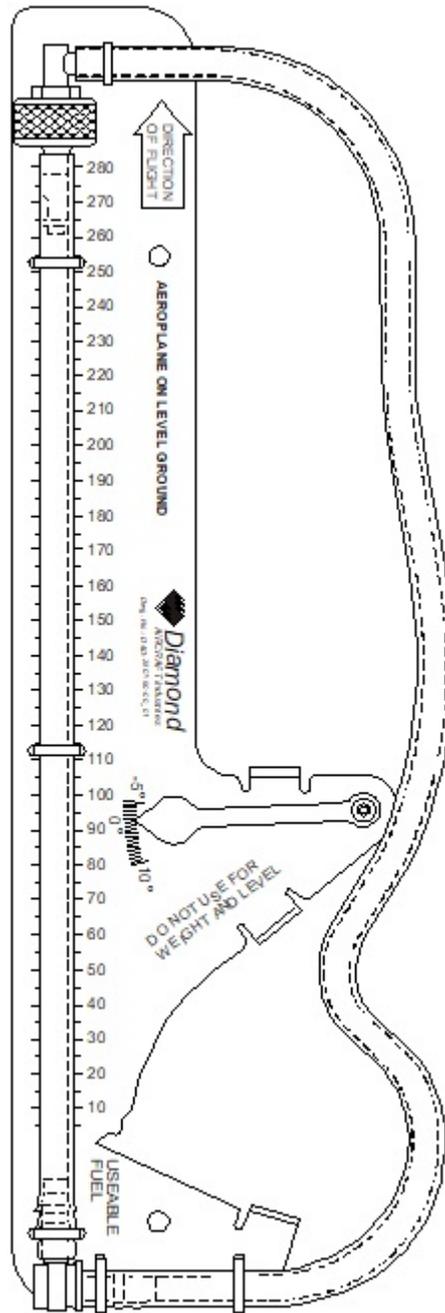


**I Fuel quantity measuring device for standard tank (left) and long range tank (right)**

**(a) Alternate Means for Fuel Quantity Indication with Fuel Indicator II (for Standard Tank Configuration Only)**

For an exact indication, the airplane must stand on horizontal ground with the wings level.

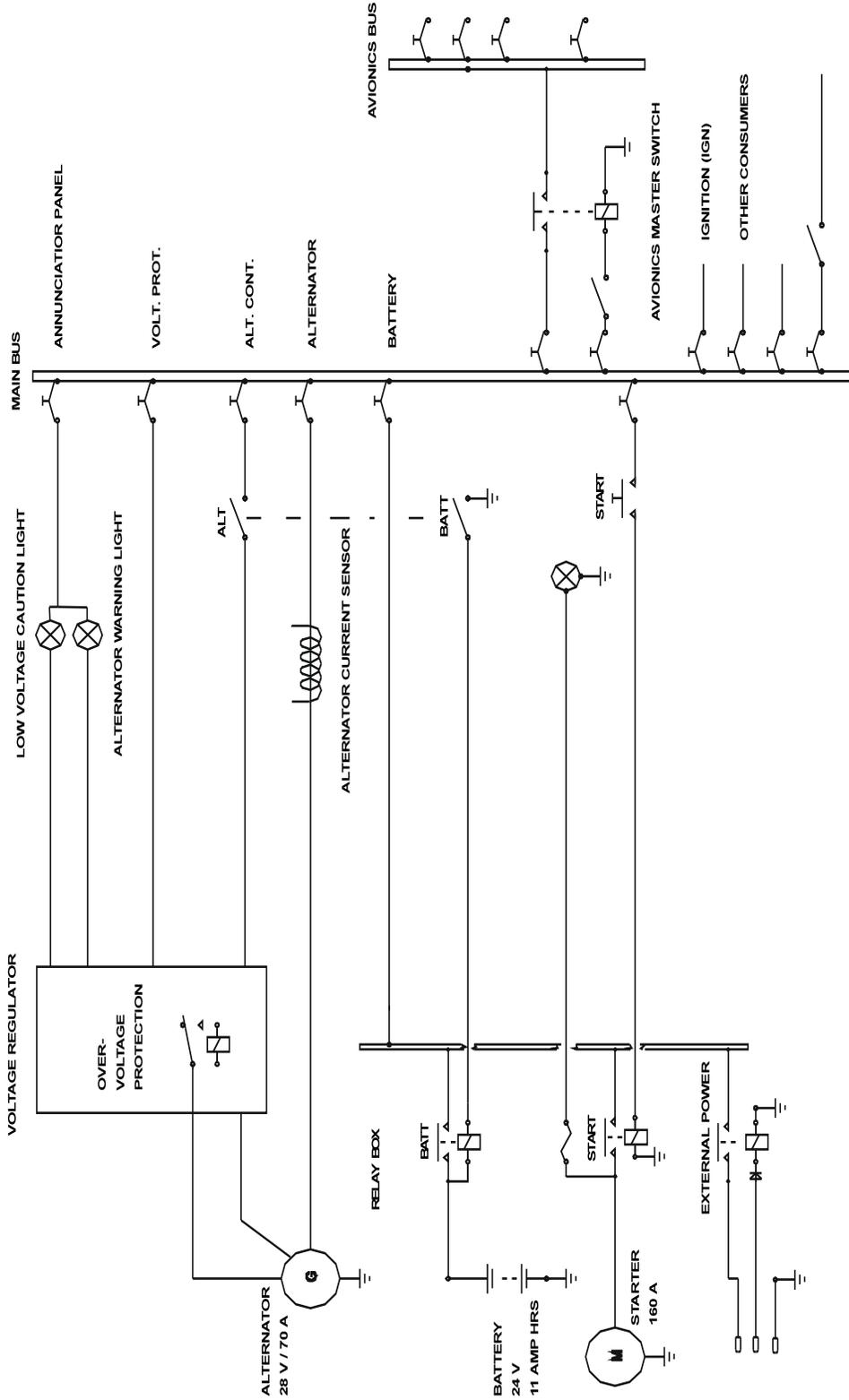
The fuel indicator II includes a protractor for an additional pitch angle measurement. The fuel indicator II is placed on top of the fuselage tube just in front of the vertical tail. The lower edge of the fuel indicator II must be supported by the fuselage for its entire length. Read the pitch angle on the fuel indicator II, and read the exact fuel quantity on the tables provided.



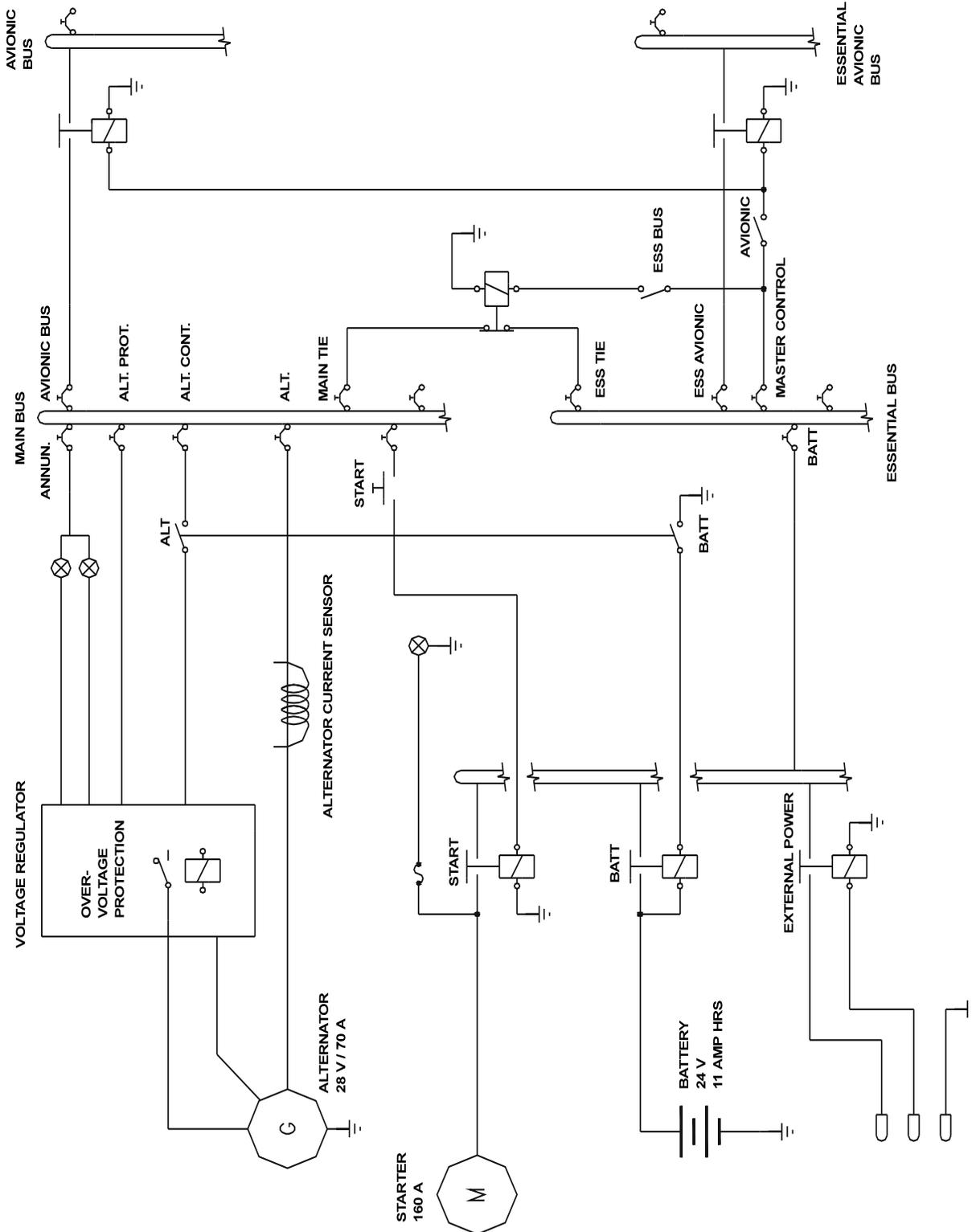
**Fuel Quantity Indicator II - standard tank configuration only**

Fuel Quantity Indicator II Pitch Angle Reading					Usable Fuel Quantity	
1°	2°	3°	4°	5°	US gal	Liter
up to 5	up to 5	up to 5	up to 5	up to 0	0	0
35	25	16	8	1	1	3.8
45	36	30	20	15	2	7.6
65	48	40	35	28	3	11.3
75	68	55	47	39	4	15.1
92	80	72	66	55	5	18.9
110	90	78	70	65	6	22.7
118	108	95	87	77	7	26.5
130	123	110	100	90	8	30.3
140	132	115	102	95	9	34.1
148	136	129	122	113	10	37.8
162	149	138	130	118	11	41.6
174	158	150	138	131	12	45.4
180	171	162	156	146	13	49.2
185	180	175	166	156	14	53.0
200	195	184	176	168	15	56.8
217	205	196	189	181	16	60.6
232	220	215	204	196	17	64.4
248	238	230	221	214	18	68.1

**7.11 ELECTRICAL SYSTEM**



Simplified wiring diagram for serial numbers without Essential Bus



Simplified wiring diagram for serial numbers with Essential Bus

### 7.11.1 GENERAL

The DA 40 has 28 Volt DC system, which can be sub-divided into:

- Power generation
- Storage
- Distribution
- Consumers

#### (a) Power Generation

The 70 Ampère alternator (generator) is mounted on the front of the engine. It is driven by a V-belt, and charges the battery. In the event of alternator failure, the battery provides the system with electrical energy. Given the provision of these two independent sources of electrical power, the complete failure of the electrical system is extremely unlikely.

#### (b) Storage

Power is stored in a lead-acid battery which is mounted in the right-hand side of the engine compartment. It has a capacity of 10 Ampère-hour or more, depending on the battery type. The battery is connected to the airplane electrical system via the main (70 Ampère) circuit breaker.

In addition, a non-rechargeable dry battery or a lithium battery pack is installed in the IFR model as a further source of power for the backup instruments, and the flood light. When the emergency switch is set to ON, these two systems are supplied with power for 1 hour and 30 minutes, independent of all other electrical consumers.

#### (c) Distribution

Electrical power is distributed via the main bus and, if installed, the essential bus.

#### (d) Master Switch (ALT/BAT)

The Master switch is divided into a Master switch (ALT) on the left and a Master switch (BAT) on the right. Both switches together are known as the Master switch (ALT/BAT).

**I** (e) Consumers

The individual consumers (e.g. radio, electrical fuel pump, position lights, etc.) are connected to the main bus via automatic circuit breakers.

Designations and abbreviations used to identify the circuit breakers are explained in Section 1.5 - DEFINITIONS AND ABBREVIATIONS.

**I** (f) Ignition

The basic version of the DA 40 is equipped with the electric start boost system SlickSTART. This system improves the start characteristics by delivering more spark energy during the engine start sequence. After engine starting the ignition is controlled by the conventional retard breaker magneto system.

As an option, the LASAR electronic ignition control unit can be installed instead of the SlickSTART system. This unit measures manifold pressure and RPM and uses these parameters to optimize the ignition timing. This provides for smooth engine running and improved starting behavior. If the electronic ignition control is not in operation, the status light for the ignition illuminates and the conventional magneto ignition takes over the ignition control. Also, during operation of the engine on only one magneto, for example during the magneto check, the ignition is not controlled electronically and the status light for the ignition should illuminate. For engine restart in flight without the electronic ignition control being operative an engine speed of more than 500 RPM is necessary. The magneto ignition is independent of the electrical network, therefore providing safe engine operation even in the event of a power failure.

**I** (g) Voltmeter

The voltmeter displays the potential on the main bus. If the alternator is operating, the alternator voltage is shown, otherwise it is that provided by the battery.

**I** (h) Ammeter

The ammeter displays the current with which the alternator is being loaded.

**I** (i) Landing and Taxi Lights

Landing and taxi lights are built into the left wing, and are each operated by means of a switch (LANDING, TAXI) on the row of switches on the instrument panel.

**I** (j) Position and Strobe Lights

Combined position and strobe lights (anti collision lights) are installed on both wing tips. Each system is operated by a switch (POSITION, STROBE) on the row of switches on the instrument panel.

**I** (k) Flood Light

A two-dimensional light emitter is mounted above the instrument panel. It illuminates the instrument panel as well as all levers, switches, etc. With a rotary button (FLOOD) in the left-hand section of the instrument panel the flood light is switched on and its brightness is adjusted.

**I** (l) Instrument Lighting

With a rotary button (INSTRUMENT) in the left-hand section of the instrument panel the internal lighting of the instruments is switched on and its brightness is adjusted.

**I** (m) Pitot Heating

The Pitot probe, which provides measurement for the Pitot-static system, is electrically heated. The heating is activated with a switch (PITOT) on the row of switches on the instrument panel. The temperature is automatically kept constant by means of a thermal switch on the Pitot probe, and as an additional safety measure a thermal fuse is built in. If this thermal fuse is activated, the Pitot heating can no longer be switched on, and the Pitot heating caution will be displayed. In this case the system should be serviced.

**NOTE**

The Pitot heating caution will also be displayed whenever the Pitot heating system is switched OFF.

---

### **7.11.2 DAI ANNUNCIATOR PANEL (WARNING, CAUTION AND STATUS LIGHTS)**

There are two variants of the annunciator panel (“DAI” and “White Wire”). The “DAI” variant, which is described below, can be identified by the lights in the shape of a square.

#### **(a) Testing the Annunciator Panel**

In the process of the pre-flight check the lights of the annunciator panel must be checked by operating the test switch. This is to check that the lights have not failed. All lights must be serviceable.

#### **(b) Alternator Warning Light (ALT)**

The alternator warning light illuminates on alternator failure. The only remaining source of electrical power is the battery. The color is red.

The procedure to be followed upon alternator warning is given in 3.7.2 - FAILURES IN THE ELECTRICAL SYSTEM.

#### **(c) Low Voltage Caution Light (VOLT)**

This caution light illuminates when the on-board voltage drops below 24 Volts. It goes out again when the voltage exceeds 25 Volts. The color is amber.

The procedure to be followed upon low voltage caution is given in 4B.3 - FAILURES IN THE ELECTRICAL SYSTEM.

#### **(d) Fuel Pressure Warning Light (FUEL PR)**

The fuel pressure warning light illuminates when the fuel pressure drops below 14 PSI. The color is red.

#### **(e) Low Fuel Caution Lights (L FUEL and R FUEL)**

Each tank has its own caution light. It starts to flash when the fuel quantity becomes low, and illuminates permanently when the quantity of usable fuel in the respective tank drops below 3 US gal ( $\pm 1$  US gal). The indication is calibrated for straight and level flight. The light may illuminate during turns which are flown with slip, or while taxiing in curves. The color is amber.

**|** (f) Oil Pressure Warning Light (OIL PR)

The oil pressure warning light illuminates when the oil pressure drops below 25 PSI. The color is red.

The procedure to be followed upon oil pressure warning is given in 3.2.3 - ENGINE PROBLEMS IN FLIGHT.

**|** (g) Door Warning Light (DOOR)

The door warning light illuminates when the front canopy and/or the rear door is not closed and locked. The color is red.

The procedure to be followed upon door warning is given in 3.7.4 - DOOR OPEN.

**|** (h) Status Light for the Ignition (IGN)

This light is only used when the electronic ignition control unit is installed.

The status light for the ignition illuminates when the electronic ignition control is not operating. In this case the conventional magneto ignition will be in use. The color is white.

The procedure to be followed upon illumination of the ignition status light is given in 4B.3 - FAILURES IN THE ELECTRICAL SYSTEM.

**|** (i) Starter Warning Light (START)

The starter warning light illuminates when the starter is being operated or when the connection between the starter motor and the engine has not been broken. This occurs when the pinion of the starter motor remains engaged with the propeller flywheel. The color is red.

The procedure to be followed upon starter warning is given in 3.7.2 - FAILURES IN THE ELECTRICAL SYSTEM.

**|** (j) Pitot Heating Caution Light (PITOT)

The Pitot heating caution light is illuminated when the Pitot heating is not switched on, or when there is a failure of the Pitot heating system. The color is amber.

Prolonged operation of the Pitot heating on the ground can also cause the Pitot heating caution light to illuminate. In this case it indicates the activation of the thermal switch, which prevents

overheating of the Pitot heating system on the ground. This is a normal function of the system. After a cooling period, the heating system will be switched on again automatically.

### **7.11.3 WHITE WIRE ANNUNCIATOR PANEL (WARNING, CAUTION AND STATUS LIGHTS)**

- There are two variants of the annunciator panel (“DAI” and “White Wire”). The “White Wire” variant, which is described below, can be identified by the flat front panel and the “White Wire” logo on the display in the upper left corner.

#### **(a) Testing the Annunciator Panel**

In the process of the pre-flight check, proper functioning of the annunciator panel must be verified. This functional check is automatically started after switching the battery master switch ON. All lights are flashed, and the aural alert is muted. By pressing the “acknowledge” button, the lights are extinguished, and a momentary aural alert is sounded. This test verifies functionality of the microprocessor, the lights, and the aural signal.

- The pilot may initiate additional system tests by holding the “acknowledge” button for 2 seconds. All lights will begin flashing, and the aural alert will sound continuously.

#### **(b) Warning Messages**

A warning is indicated by a continuous aural alert (sounded in the airplane’s intercom system), flashing of the red WARNING light, and flashing of the red warning light associated with the affected system.

- By pressing the “acknowledge” button, which is now illuminated green, the aural alert will be terminated, and the WARNING light will be extinguished. The warning light associated with the affected system will change from flashing to solid illumination.

#### **(c) Caution Messages**

A caution is indicated by a momentary aural alert (sounded in the airplane’s intercom system), flashing of the amber CAUTION light, and flashing of the amber caution light associated with the affected system.

By pressing the “acknowledge” button, which is now illuminated green, the CAUTION light will be extinguished. The caution light associated with the affected system will change from flashing to solid illumination.

The LOW FUEL caution message is displayed in a slightly different manner (extended functionality), which is described below.

■ (d) Alternator Warning Message (ALTERNATOR)

The alternator warning message is displayed on alternator failure. The only remaining source of electrical power is the battery.

The procedure to be followed upon alternator warning is given in 3.7.2 - FAILURES IN THE ELECTRICAL SYSTEM.

■ (e) Low Voltage Caution Message (LOW VOLTS)

The low voltage caution message is displayed when the on-board voltage drops below 24 Volts. It is terminated when the voltage exceeds 25 Volts again.

The procedure to be followed upon low voltage caution is given in 4B.3 - FAILURES IN THE ELECTRICAL SYSTEM.

■ (f) Fuel Pressure Warning Message (FUEL PRESS)

The fuel pressure warning message is displayed when the fuel pressure drops below 14 PSI.

■ (g) Low Fuel Caution Message (LOW FUEL)

As soon as the amount of usable fuel *in one tank* is less than 3 US gal ( $\pm 1$  US gal), a caution message is displayed in the usual manner (momentary aural alert, flashing CAUTION light, flashing LOW FUEL caution light). Termination of the message is also done as usual (“acknowledge,” CAUTION light is extinguished, LOW FUEL caution light changes to solid illumination).

As soon as the amount of usable fuel *in the second tank* is also less than 3 US gal ( $\pm 1$  US gal), a caution message is displayed in a different manner. A *continuous* aural alert is sounded in the airplane’s intercom system, the amber CAUTION light is flashed, and the amber LOW FUEL caution light is flashed.

■ By pressing the “acknowledge” button, which is now illuminated green, the aural alert will be terminated, and the CAUTION light will be extinguished. The LOW FUEL caution light will continue to be flashed.

The indication is calibrated for straight and level flight. The caution message may be triggered during turns which are flown with slip, or while taxiing in curves.

█ (h) Oil Pressure Warning Message (OIL PRESS)

The oil pressure warning message is displayed when the oil pressure drops below 25 PSI.

The procedure to be followed upon oil pressure warning is given in 3.2.3 - ENGINE PROBLEMS IN FLIGHT.

█ (i) Door Warning Message (DOORS)

The door warning message is displayed when the front canopy and/or the rear door is not closed and locked.

█ The procedure to be followed upon door warning is given in 3.7.4 - DOOR OPEN.

█ (j) Status Light for the Ignition (IGN)

This light is only used when the electronic ignition control unit is installed.

The status light for the ignition is illuminated when the electronic ignition control is not operating. In this case the conventional magneto ignition will be in use. The color is white.

The WARNING light, the CAUTION light, and the aural alert will *not* be activated.

The procedure to be followed upon illumination of the ignition status light is given in 4B.3 - FAILURES IN THE ELECTRICAL SYSTEM.

█ (k) Starter Warning Message (START)

The starter warning message is displayed when the connection between the starter motor and the engine has not been broken. This occurs when the pinion of the starter motor remains engaged with the propeller flywheel.

Furthermore, the START warning light is illuminated continuously as long as the starter is being operated. In this case the WARNING light and the aural alert will not be activated.

The procedure to be followed upon starter warning is given in 3.7.2 - FAILURES IN THE ELECTRICAL SYSTEM.

**l) Pitot Heating Caution Message (PITOT)**

The Pitot heating caution message is displayed when the Pitot heating is not switched on, or when there is a failure of the Pitot heating system.

Prolonged operation of the Pitot heating on the ground can also cause the Pitot heating caution message to be displayed. In this case it indicates the activation of the thermal switch, which prevents overheating of the Pitot heating system on the ground. This is a normal function of the system. After a cooling period, the heating system will be switched on again automatically.

**m) Trim Failure Warning Message (TRIM FAIL)**

The White Wire annunciator panel is prepared for the installation of an autopilot in the DA 40. When the autopilot is installed and ready for operation, this warning message indicates a failure of the automatic trim system of the autopilot. For further details, refer to the Supplement to the AFM for the autopilot (if installed).

**n) Unused Lights**

The White Wire annunciator panel has two lights for possible future use. These lights are currently unused.

**7.12 PITOT-STATIC SYSTEM**

Total pressure is measured at the leading edge of a Pitot probe under the left wing. Static pressure is measured at two orifices at the lower rear edges of the Pitot probe. To protect against dirt and condensation there are filters in the system, which are accessible from the wing root. The Pitot probe is electrically heated.

In addition, some serial numbers have an alternate static valve installed on the underside of the instrument panel. With this valve, the static pressure in the cabin can be used as the static pressure source in the event of a failure of the Pitot-static system.

If an autopilot system is installed, additional static sources may be installed (OÄM 40-267).

**7.13 STALL WARNING**

If airspeed drops below approximately 10 to minimum 5 knots above the stalling speed, the stall warning horn, located in the instrument panel, will sound. The horn becomes progressively louder

the closer one gets to stalling speed. Suction at an orifice on the left wing leading edge activates the horn via a hose. The orifice for the stall warning in the left wing is marked by a red ring.

## **7.14 AVIONICS**

The radio and navigation equipment is located in the central part of the instrument panel. A transmit switch for the radio is mounted on the end of each control stick. There are connection facilities for up to 4 headsets between the front seats.

## **7.15 CO-MONITOR (IF INSTALLED)**

The airplane may be equipped with a CO detector (OÄM 40-253).

### **7.15.1 SELF TEST SEQUENCE**

When power is applied to the CO detector, a self-test routine begins. The test checks for functionality of the critical components such as the CO sensor, temperature sensor, and the integrity of the total CO detector system.

The remote alert light will flash twice. Then the remote light will remain OFF until there is another CO alert or until a failure of the unit occurs.

### **7.15.2 IN-FLIGHT CO ALARM**

If the CO detector visual alert annunciator illuminates in flight, press the TEST/RESET button.

If the alert continues with the remote light staying ON, proceed with the emergency procedure 3.7.3 - SUSPICION OF CARBON MONOXIDE CONTAMINATION IN THE CABIN.

## **NOTE**

The remote light will stay on until the CO level goes below 50 PPM.

### **7.15.3 UNIT FAILURE INDICATION**

A failure of the CO sensor, temperature sensor, or the micro-controller will result in the following failure indications:

■ The remote light will flash at a rate of approximately one flash every four seconds until the failure is cleared or power is removed from the unit.

## CHAPTER 8

# AIRPLANE HANDLING, CARE AND MAINTENANCE

		Page
	8.1 INTRODUCTION .....	8-3
	8.2 AIRPLANE INSPECTION INTERVALS .....	8-3
	8.3 AIRPLANE ALTERATIONS OR REPAIRS .....	8-3
	8.4 GROUND HANDLING / ROAD TRANSPORT .....	8-4
	8.4.1 GROUND HANDLING WITHOUT TOW BAR .....	8-4
	8.4.2 GROUND HANDLING WITH TOW BAR .....	8-4
	8.4.3 PARKING .....	8-5
	8.4.4 MOORING .....	8-7
	8.4.5 JACKING .....	8-7
	8.4.6 ALIGNMENT .....	8-7
	8.4.7 ROAD TRANSPORT .....	8-8
	8.5 CLEANING AND CARE .....	8-9
	8.5.1 PAINTED SURFACES .....	8-9
	8.5.2 CANOPY AND REAR DOOR .....	8-9
	8.5.3 PROPELLER .....	8-10
	8.5.4 ENGINE .....	8-10
	8.5.5 INTERIOR SURFACES .....	8-10
	8.6 DE-ICING ON THE GROUND .....	8-11

I Intentionally left blank.

## **8.1 INTRODUCTION**

Chapter 8 contains the manufacturer's recommended procedures for proper ground handling and servicing of the airplane. The Airplane Maintenance Manual (Doc. No. 6.02.01) lists certain inspection and maintenance requirements which must be followed if the airplane is to retain a new plane performance and reliability.

## **8.2 AIRPLANE INSPECTION INTERVALS**

For maintenance work on engine and propeller, the currently effective Operator's Manuals, Service Instructions, Service Letters and Service Bulletins of Lycoming and mt-Propeller must be followed. For airframe inspections, the currently effective checklists/manuals of the manufacturer must be followed.

### **CAUTION**

Unscheduled maintenance checks are required after:

- Hard landings.
- Propeller strike.
- Engine fire.
- Lightning strike.
- Occurrence of other malfunctions and damage.

Unscheduled maintenance checks are described in the Airplane Maintenance Manual (Doc. No. 6.02.01; Section 05-50).

## **8.3 AIRPLANE ALTERATIONS OR REPAIRS**

Alterations or repairs of the airplane may be carried out only according to the Airplane Maintenance Manual, Doc. No. 6.02.01, and only by authorized personnel.

## **8.4 GROUND HANDLING / ROAD TRANSPORT**

### **8.4.1 GROUND HANDLING WITHOUT TOW BAR**

During forward traversing the nose wheel will follow the movement of the airplane. Change in direction is achieved by pulling on the propeller near the spinner. To traverse in the rear direction, the tail section of the airplane should be pushed down until the nose wheel is clear of the ground. This method can also be used to turn the airplane around its main landing gear.

### **8.4.2 GROUND HANDLING WITH TOW BAR**

For pushing or pulling the airplane on the ground, it is recommended to use the tow bar which is available from the manufacturer. The tow bar is bent apart and engaged in the appropriate holes in the nose wheel fairing as shown in the picture below. The arresting knob must be fully engaged.

#### **WARNING**

The tow bar must be removed before starting the engine.

#### **CAUTION**

The tow bar may only be used for moving the airplane on the ground by hand. After moving the airplane, the tow bar must be removed.

#### **NOTE**

When moving the airplane rearward, the tow bar must be held firmly to prevent abrupt sideward deflection of the nose wheel.



### **8.4.3 PARKING**

For short term parking, the airplane must be positioned into the wind, the parking brake must be engaged and the wing flaps must be in the retracted position. For extended and unattended parking, as well as in unpredictable wind conditions, the airplane must be anchored to the ground or placed in a hangar. Parking in a hangar is recommended.

#### **(a) Control Surfaces Gust Lock**

The manufacturer offers a control surfaces gust lock which can be used to block the primary controls. It is recommended that the control surfaces gust lock be used when parking outdoors, because the control surfaces can hit the stops in strong tail winds. This can lead to excessive wear or damage.

## WARNING

The control surfaces gust lock must be removed before flight.

The control surfaces gust lock is installed as follows:

1. Move the rudder pedals fully rearward.
2. Engage the control surfaces gust lock with the pedals.
3. Engage the stick, wrap straps around stick once.
4. Attach the locks and tighten the straps.

For removal, reverse the sequence.

## NOTE

The figures below show the gust lock installed in a DA 42. Nevertheless, the figures are an accurate depiction of the gust lock installed correctly in the DA 40.





#### **8.4.4 MOORING**

The tail fin of the airplane has a hole which can be used to tie-down the airplane to the ground. Also on each wing near the wing tip, an eyelet with a metric M8 thread can be installed and used as tie-down points.

#### **8.4.5 JACKING**

The DA 40 can be jacked at the two jackpoints located on the lower side of the fuselage's LH and RH root ribs as well as at the tail fin.

#### **8.4.6 ALIGNMENT**

For alignment push down on the tail section at the fuselage/vertical tail junction until the nose wheel is clear of the ground. With the nose wheel free, the DA 40 can be turned around the main landing gear. After turning the airplane into the correct position, release the tail section until the nose wheel is back on the ground.

### 8.4.7 ROAD TRANSPORT

For transporting the airplane on the road it is recommended that an open trailer be used. All airplane components must be stored on a cushioned surface and secured to avoid any movement during transportation.

#### (a) Fuselage

The fuselage should stand on the main and nose landing gear. It must be ensured that the fuselage will not move in a forward, backward or upward direction. Furthermore, it must be ensured that the propeller has sufficient clearance so that it cannot be damaged due to fuselage movement during transportation.

#### (b) Wings

For transportation, both wings must be removed from the fuselage. To avoid any damage, the wings are stored in an upright position on the leading edge with the root rib area positioned on an upholstered profiled surface with a width of at least 400 mm (1.3 ft). The outside wing area (approximately 3 m (10 ft) from the root rib area) is placed on an upholstered profiled surface with a minimum width of 300 mm (1 ft).

The wings must be secured to avoid any sliding movement to the rear.

#### (c) Horizontal Stabilizer

The horizontal stabilizer is stored flat on the trailer and secured with straps, or in an upright position sitting on the leading edge on a profiled surface. All storing surfaces must be upholstered with felt or cellular rubber.

## **8.5 CLEANING AND CARE**

### **CAUTION**

The airplane must be kept clean. The bright surface prevents the structure from overheating.

### **CAUTION**

Excessive dirt deteriorates the flight performance.

#### **8.5.1 PAINTED SURFACES**

The entire surface of the airplane is painted with a white weatherproof two component paint. Nevertheless, it is advantageous to protect the airplane against moisture and dampness. It is recommended to park the airplane in a hangar for prolonged storage. Moisture that has penetrated must be removed by storing the affected parts in a dry place and turning them over several times.

Dirt, insects, etc. can be removed with water alone and if necessary with a mild detergent. An automotive paint cleaner can be used for stubborn spots. For best results, clean the airplane after the day's flying is ended, so that the dirt will not become ingrained.

Oil stains, exhaust stains, etc. on the lower fuselage skin can be removed with a cold detergent. Before starting, ensure that the detergent does not affect the surface finish. Use commercial automotive preservatives without silicone additives to conserve the paint finish.

#### **8.5.2 CANOPY AND REAR DOOR**

■ The canopy and rear door should be cleaned with “Plexiklar” or any other acrylic glass detergent if available; otherwise use lukewarm water. Final cleaning should be done with a clean piece of chamois-leather or soft cloth. Never rub or polish dry acrylic glass.

### **8.5.3 PROPELLER**

Damage and malfunctions during operation must be inspected by authorized personnel.

#### **(a) Surface**

The manufacturer uses PU paint or acrylic paint which is resistant to almost any solvent. The blades may be treated with commercial automotive cleaning agents or preservatives. The penetration of moisture into the wooden core must be avoided by all means. Should doubts arise, an appropriately rated inspector must be consulted.

### **8.5.4 ENGINE**

Engine cleaning is part of the scheduled inspections.

#### **CAUTION**

Do not use acidic detergents (e.g. automotive wheel cleaners) for cleaning the exhaust system.

### **8.5.5 INTERIOR SURFACES**

The interior should be cleaned using a vacuum cleaner. All loose items (pens, bags etc.) should be removed or properly stored and secured.

All instruments can be cleaned using a soft dry cloth, plastic surfaces should be wiped clean using a damp cloth without any cleaning agents.

The leather interior should be treated with leather sealer within 3 months since new, and then at intervals of 3 to 6 months. Clean the leather interior with an appropriate mild leather cleaning agent and a soft cleaning brush for leather.

Note that the acrylic glass windows transmit the ultraviolet radiation from the sun.

## 8.6 DE-ICING ON THE GROUND

### (a) Approved De-Icing Fluids

<b>Manufacturer</b>	<b>Product</b>
Kilfrost	TKS 80
Aeroshell	Compound 07
Any source	AL-5 (DTD 406B)

### (b) De-Icing Procedure

1. Remove any snow from the airplane using a soft brush.
2. Spray de-icing fluid onto ice-covered surfaces using a suitable spray bottle.
3. Use a soft piece of cloth to wipe the airplane dry.

I Intentionally left blank.

---

# CHAPTER 9

## SUPPLEMENTS

	Page
I 9.1 INTRODUCTION .....	9-3
9.2 LIST OF SUPPLEMENTS .....	9-3

I

Intentionally left blank.

## 9.1 INTRODUCTION

Chapter 9 contains information concerning additional (optional) equipment of the DA 40.

Unless otherwise stated, the procedures given in the Supplements must be applied in addition to the procedures given in the main part of the Airplane Flight Manual.

All approved supplements are listed in the List of Supplements in this Chapter.

The Airplane Flight Manual contains exactly those Supplements which correspond to the installed equipment according to the Equipment Inventory of Section 6.5.

## 9.2 LIST OF SUPPLEMENTS

Airplane S/N:		Registration:		Date:	
Sup. No.	Title	Rev. No.	Date	Applicable	
				YES	NO
A1	COMM/NAV, KX 125 Bendix/King	1	20-Apr-2001	<input type="checkbox"/>	<input type="checkbox"/>
A2	Intercom System, Model PM 1000 II PS Engineering, Inc.	2	15-Mar-2005	<input type="checkbox"/>	<input type="checkbox"/>
A3	Transponder, KT 76A Bendix/King	1	20-Apr-2001	<input type="checkbox"/>	<input type="checkbox"/>
A4	GPS, KLN 89B Bendix/King	1	20-Apr-2001	<input type="checkbox"/>	<input type="checkbox"/>
A5	Course Deviation Indicator, KI 208 Bendix/King	1	20-Apr-2001	<input type="checkbox"/>	<input type="checkbox"/>
A6	GPS, KLN 94 (VFR Operation) Bendix/King	2	09-Sep-2001	<input type="checkbox"/>	<input type="checkbox"/>
A7	Audio Amplifier / Intercom / Marker Beacon Receiver, KMA 28 Bendix/King	1	20-Apr-2001	<input type="checkbox"/>	<input type="checkbox"/>
A8	VHF Communication/Navigation Transceivers, KX 155A and KX 165A Bendix/King	2	03-Oct-2001	<input type="checkbox"/>	<input type="checkbox"/>

Airplane S/N:		Registration:		Date:	
Sup. No.	Title	Rev. No.	Date	Applicable	
				YES	NO
A9	Automatic Direction Finder, KR 87 Bendix/King	2	17-Feb-2003	<input type="checkbox"/>	<input type="checkbox"/>
A10	Distance Measuring Equipment, KN 62A Bendix/King	2	17-Feb-2003	<input type="checkbox"/>	<input type="checkbox"/>
A11	Compass System, KCS 55A Bendix/King	4	15-Mar-2005	<input type="checkbox"/>	<input type="checkbox"/>
A12	Transponder, KT 76C Bendix/King	2	15-Mar-2005	<input type="checkbox"/>	<input type="checkbox"/>
A13	Autopilot System, KAP 140 Bendix/King	2	15-Mar-2005	<input type="checkbox"/>	<input type="checkbox"/>
A14	GPS, KLN 94 (IFR Operation) Bendix/King	3	15-Mar-2005	<input type="checkbox"/>	<input type="checkbox"/>
A15	GPS Annunciation Control Unit, MD 41 Mid-Continent	2	15-Mar-2005	<input type="checkbox"/>	<input type="checkbox"/>
A16	Multifunction Display / GPS KMD 150, Bendix/King	0	20-Sep-2001	<input type="checkbox"/>	<input type="checkbox"/>
A17	COM / NAV / GPS GNS 430, Garmin	3	22-Jun-2005	<input type="checkbox"/>	<input type="checkbox"/>
A18	Audio Panel, GMA 340, Garmin	2	22-Jun-2005	<input type="checkbox"/>	<input type="checkbox"/>
A19	Transponder, GTX 327, Garmin	1	15-Mar-2005	<input type="checkbox"/>	<input type="checkbox"/>
A20	Course Deviation Indicator, GI 106A, Garmin	1	15-Mar-2005	<input type="checkbox"/>	<input type="checkbox"/>
A21	COM / NAV / GPS, GNS 530, Garmin	1	15-Mar-2002	<input type="checkbox"/>	<input type="checkbox"/>
A22	Strike Finder, SF 2000, Insight	0	10-Oct-2001	<input type="checkbox"/>	<input type="checkbox"/>
A23	GPS Annunciation Unit, MD 41-1488/1484, MID Continent	1	20-Dec-2002	<input type="checkbox"/>	<input type="checkbox"/>
A24	Stormscope, WX-500, Goodrich	2	28-Feb-2003	<input type="checkbox"/>	<input type="checkbox"/>

Airplane S/N:		Registration:		Date:	
Sup. No.	Title	Rev. No.	Date	Applicable	
				YES	NO
A25	Audio Panel, GMA 340, Garmin, VFR	2	15-Mar-2005	<input type="checkbox"/>	<input type="checkbox"/>
A26	COM / NAV / GPS, GNS 430, Garmin, VFR	0	02-Aug-2002	<input type="checkbox"/>	<input type="checkbox"/>
A27	Ground Com #2 Switch	0	05-Apr-2002	<input type="checkbox"/>	<input type="checkbox"/>
A29	Transponder, GTX 330, Garmin	0	25-Jun-2003	<input type="checkbox"/>	<input type="checkbox"/>
A30	Garmin G1000 NXi Avionics System	0	10-Feb-2020	<input type="checkbox"/>	<input type="checkbox"/>
E1	Digital Chronometer, LC-2 AstroTech	1	20-Apr-2001	<input type="checkbox"/>	<input type="checkbox"/>
E2	Attitude Indicator, AIM 1100-28L(0F) BF Goodrich	2	15-Mar-2005	<input type="checkbox"/>	<input type="checkbox"/>
E3	Attitude Indicator, AIM 1100-28LK(0F) DIA BF Goodrich	2	15-Mar-2005	<input type="checkbox"/>	<input type="checkbox"/>
E4	Digital Chronometer, Model 803, Davtron	1	15-Mar-2005	<input type="checkbox"/>	<input type="checkbox"/>
E7	Ventilation Inlet Baffle	1	27-Apr-2005	<input type="checkbox"/>	<input type="checkbox"/>
N023	Operation in Brazil	-	04-Jul-2008	<input type="checkbox"/>	<input type="checkbox"/>
O1	Use of the DA 40 as Tow-Plane	1	28-Nov-2001	<input type="checkbox"/>	<input type="checkbox"/>
O2	Operation of the DA 40 with Winter Kit	0	26-Nov-2001	<input type="checkbox"/>	<input type="checkbox"/>
S1	Emergency Locator Transmitter, Model E-01, ACK	2	15-Mar-2005	<input type="checkbox"/>	<input type="checkbox"/>
S2	Emergency Locator Transmitter, JE2-NG, Jolliet	0	01-Jun-2001	<input type="checkbox"/>	<input type="checkbox"/>
S4	ELT Artex ME 406 'ACE'	1	10-Apr-2007	<input type="checkbox"/>	<input type="checkbox"/>

I

Intentionally left blank.