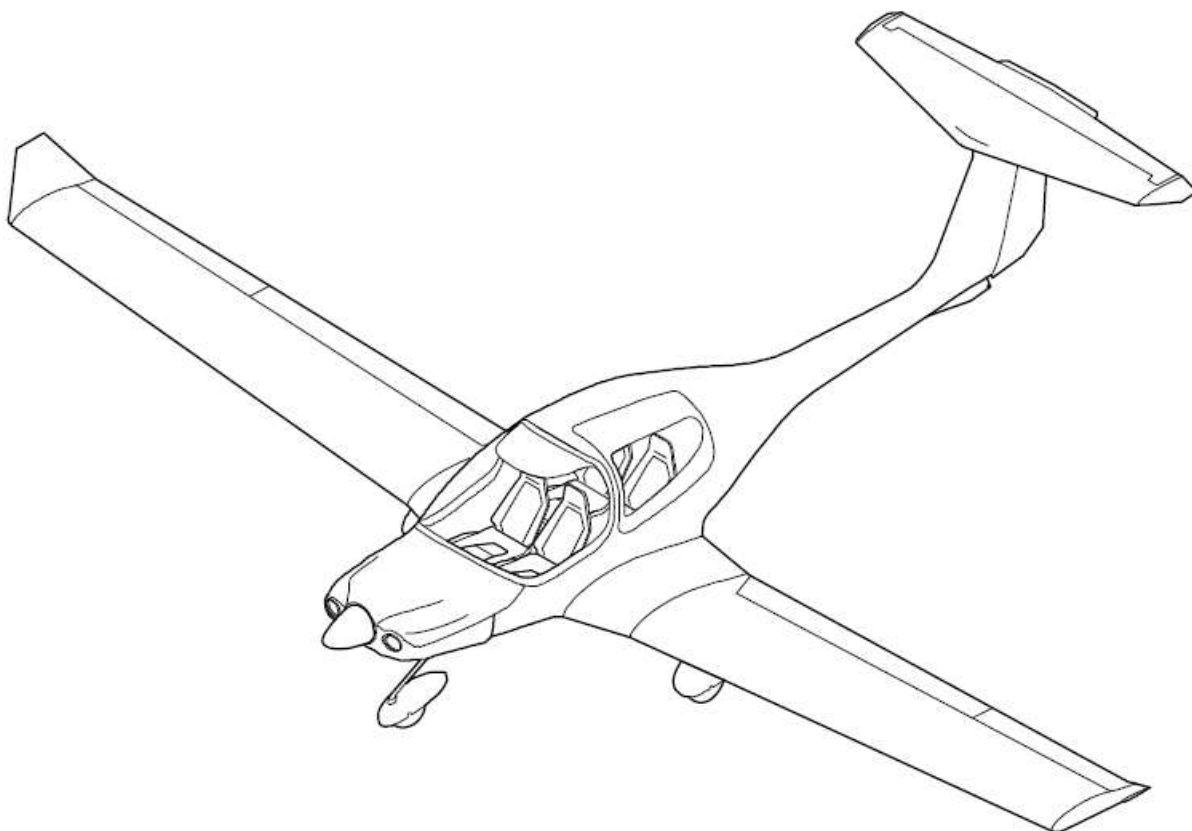


# AIRPLANE FLIGHT MANUAL

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## DA 40 F

Doc. # 6.01.02-E

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

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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.

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# AIRPLANE FLIGHT MANUAL

## DA 40 F

**Category of Airworthiness** : Normal, Utility  
**Requirement** : AWM Chapter 523  
**Serial Number** : \_\_\_\_\_  
**Registration** : \_\_\_\_\_  
**Doc. #** : 6.01.02-E  
**Date of Issue** : 26-Mar-2025

**Signature**

:   
M. Woloshyn

**Authority**

: A/Chief, Flight Test For  
Director, Aircraft Certification  
Transport Canada Civil Aviation

**Date of Approval**

: August 07, 2025

This airplane flight manual is approved in accordance with the Canadian Aviation Regulations.

**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 F.

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 F.

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 a pre-owned DIAMOND DA 40 F, please let us know your address, so that we can supply you with the publications necessary for the safe operation of your airplane.

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## **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.

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.

Rev. No.	Reason	Chapter	Page(s)	Date of Revision	Approval Note	Date of Approval	Date Inserted	Signature
1	Performance Data Update, TR-MÄM 40-174, TR-MÄM 40-183, TR-OÄM 40-220, TR-OÄM 40-221	0, 5, 6, 9	0-4, 0-5 , 0-6, 0-7 through 0-10 Chapter 5: All 6-14 through 6-20 9-3 through 9-6	22-Aug-2005	Revision No. 1 of the AFM Doc. No. 6.01.02-E is approved under the authority of DOA No. EASA.21.J. 052.	[02 Sep 2005 Dipl.-Ing. (FH) Manfred Reichel for DAI]		
2	TR-MÄM 40-  -176, -259, -378, -401, -415, -428, -440, -580, -281 & TR-OÄM 40-222  TR-OÄM 40-  -163a & -164a, -201, -203, -220, -221, -232, -242, -250a, -258, -284, -326, -327  Corrections	All	All, except cover page	15-Jun-2013	Revision No. 2 of the AFM Doc. No. 6.01.02-E is approved under the authority of DOA No. EASA.21.J. 052.	19-Jun-2013		

Rev. No.	Reason	Chapter	Page(s)	Date of Revision	Approval Note	Date of Approval	Date Inserted	Signature
3	MÄM 40-617	0, 2	0-5, 0-6, 2-21, 2-24	26-Aug-2013	Revision No. 3 of the AFM Doc. No. 6.01.02-E is approved by EASA with Approval No. 10046204	28-Aug-2013		
4	TR-MÄM 40-401, -1020, -1087, -1203  TR-MÄM DAIC-0042  TR-17-02  Formatting and administrative changes. Change in type design responsibility.  Corrections.	All	All	26-Mar-2025	Approved by TCCA, National Aircraft Certification	07-Aug-2025		

### 0.3 HIGHLIGHTS

A new cover page was inserted in front of the Approval Page.

The tables that follow highlight the main changes that have been incorporated into Revision 4 of the Airplane Flight Manual.

Revision bars and the date of 26-Mar-2025 will show on the changed pages in the List of Effective Pages (LOEP). Revision bars on the changed pages will show where the content changes were made.

Pages	Highlights
<b>Front Matter</b>	Cover page added. EASA approval page replaced by TC approval page. Diamond Aircraft Industries address changed. Record of Revision for revision 4 added and editorial changes. Highlights added. LEP updated. Editorial changes in the Table of Contents.
<b>Chapter 1 - General</b>	
1-1, 2	Table of contents updated.
1-3	Regulation updated. Editorial improvements. TR-OÄM-40-401, Emergency Egress Hammer, incorporated.
1-4	Certification basis updated.
1-5, 6, 7, 8, 9, 10, 11	Heading level updated. Editorial improvement.
1-12	Heading level updated. Austro Control GmbH abbreviation deleted.
1-17	Abbreviation correction.
<b>Chapter 2 - Operating Limitations</b>	
2-1, 2	Table of contents updated.
2-4, 7, 8, 9	Editorial improvement.
2-10	Heading level updated. TR-MÄM-40-1203, Door Latching and Locking, incorporated.
2-11, 12	Heading level updated. Editorial improvement.
2-13	JAR-23 replaced by AWM 523.
2-14	Heading level updated. Editorial improvement.
2-15	Heading level updated. JAR-23 replaced by AWM 523.
2-16, 17	Editorial improvement.
2-18, 19	Heading level updated. Editorial improvement.
2-21	Editorial improvement.
2-25, 26	TR-MÄM-40-1203, Door Latching and Locking, incorporated.

Pages	Highlights
2-27	Editorial improvement. OÄM number added.
<b>Chapter 3 - Emergency Procedures</b>	
3-1, 2	Table of contents updated.
3-3	Editorial improvement.
3-4	Table header and editorial improvement.
3-5 to 3-16	Editorial improvement.
3-17, 18, 19	Editorial improvement. "Front canopy" changed to "canopy" for consistency throughout the manual.
3-20 to 3-26	Editorial improvement.
3-27	Editorial improvement. "Forward canopy" and "front canopy" changed to "canopy" for consistency throughout the manual.
3-28	TR-MÄM-40-1203, Door Latching and Locking, incorporated.
<b>Chapter 4A - Normal Operating Procedures</b>	
4A-1	Table of contents updated.
4A-2	Intentionally left blank page added.
4A-3	Table header and editorial improvement.
4A-4	"Front canopy & rear door" changed to "canopy & passenger door" for consistency throughout the manual.
4A-5	Following temporary revisions incorporated: - TR-OÄM-40-401, Emergency Egress Hammer - TR-MÄM DAIC-0042, Amerex 337TS Fire Extinguisher - TR-MÄM-40-1203, Door Latching and Locking
4A-6	TR-MÄM-40-1203, Door Latching and Locking, incorporated.
4A-7	Editorial improvement.
4A-8	"Rear cabin door" changed to "passenger door" for consistency throughout the manual.
4A-9, 10	Editorial improvement.
4A-11, 12	TR-MÄM-40-1203, Door Latching and Locking, incorporated. "Front canopy" changed to "canopy" for consistency throughout the manual.
4A-13 to 4A-19	Editorial improvement.
4A-20	Editorial improvement. TR-MÄM-40-1203, Door Latching and Locking, incorporated.
4A-21 to 4A-24	Editorial improvement.
4A-25	Long range tank information added.
4A-26, 28, 29, 30	Editorial improvement.
4A-31	Step 3 wording improved.

Pages	Highlights
4A-34	Intentionally left blank page added.
<b>Chapter 4B - Abnormal Operating Procedures</b>	
4B-1	Table of contents updated.
4B-2	Intentionally left blank page added.
4B-3, 4, 5, 6	Editorial improvement.
4B-7	TR-MÄM-40-1087, Use of Alt. Static Source, incorporated. Action to close air vents in the cabin added.
4B-8	Intentionally left blank page added.
<b>Chapter 5 - Performance</b>	
5-1	Table of contents updated.
5-2	Intentionally left blank page added.
5-6, 5-16 to 5-21	Editorial improvement.
<b>Chapter 6 - Mass and Balance / Equipment List</b>	
6-1	Table of contents updated.
6-2	Intentionally left blank page added.
6-3, 6, 7, 8	Editorial improvement.
6-15	Information for approved combinations of equipment added.
6-16	Audio panel part number added and description improved.
6-18	Baggage items (OÄM 40-163 and OÄM 40-164) added. TR-MÄM DAIC-0042, Amerex 337TS Fire Extinguisher, incorporated.
6-19	Emergency egress hammer part number added according to OÄM-40-401/a. TR-OÄM-40-401, Emergency Egress Hammer, incorporated.
6-24	Engine type correction.
<b>Chapter 7 - Description of the Airplane and its Systems</b>	
7-1, 2	Table of contents updated.
7-3, 4, 5, 6, 8	Editorial improvement.
7-9	Editorial improvement. Parking brake release instruction improved.
7-10	Editorial improvement.
7-11, 12	TR-MÄM-40-1203, Door Latching and Locking, incorporated.
7-13	Editorial improvement.
7-14	TR-OÄM-40-401, Emergency Egress Hammer, incorporated. Illustration added.
7-15 to 7-27	Editorial improvement.
7-28	Illustration improvement. "Horizontal ground" replaced by "level ground".

Pages	Highlights
7-29, 31, 32, 33, 34	Editorial improvement.
7-35	Editorial improvement. "Front canopy and/or the rear door" changed to "canopy and/or the passenger door" for consistency throughout the manual.
7-36, 37	Editorial improvement.
7-38	Intentionally left blank page added.
<b>Chapter 8 - Airplane Handling, Care and Maintenance</b>	
8-1	Table of contents updated.
8-2	Intentionally left blank page added.
8-3, 4	Editorial improvement.
8-6	Note for gust lock illustrations added.
8-7	TR-MÄM-40-1020, Removal of Pilot Gust Lock Mount, incorporated.
8-9	Editorial improvement.
8-10	"Rear door" changed to "passenger door" for consistency throughout the manual.
8-11	Editorial improvement.
8-12	Intentionally left blank page added.
<b>Chapter 9 - Supplements</b>	
9-1	Table of contents updated.
9-2	Intentionally left blank page added.
9-3	Editorial improvement. Supplement list updated.
9-4	Editorial improvement. Supplement list updated. Intentionally left blank page deleted.

Temporary Revisions incorporated into this revision are listed in the table that follows.

Temporary Revision Number	Description of Temporary Revision
TR-MÄM-40-1020	Removal of Pilot Gust Lock Mount
TR-MÄM-40-1087	Use of Alt. Static Source
TR-MÄM DAIC-0042	Amerex 337TS Fire Extinguisher
TR-OÄM-40-401	Emergency Egress Hammer
TR-17-02	Change in Type Design Responsibility
TR-MÄM-40-1203	Door Latching and Locking

## 0.4 LIST OF EFFECTIVE PAGES

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## CHAPTER 1

### GENERAL

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## 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	
Autopilot	OÄM 40-061	<input type="checkbox"/> yes	<input type="checkbox"/> no
Emergency Switch	OÄM 40-067	<input type="checkbox"/> yes	<input type="checkbox"/> no
Alternate Static Valve	OÄM 40-072	<input type="checkbox"/> yes	<input type="checkbox"/> no
Long Range Tank	OÄM 40-071	<input type="checkbox"/> yes	<input type="checkbox"/> no
Door Locking System	OÄM 40-081	<input type="checkbox"/> yes	<input type="checkbox"/> no
MT-Propeller Installation	OÄM 40-203	<input type="checkbox"/> yes	<input type="checkbox"/> no
ELT Artex ME 406 "ACE"	OÄM 40-284	<input type="checkbox"/> yes	<input type="checkbox"/> no
Emergency Axe	OÄM 40-326	<input type="checkbox"/> yes	<input type="checkbox"/> no
Emergency Egress Hammer	OÄM 40-401	<input type="checkbox"/> yes	<input type="checkbox"/> no

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.

This Airplane Flight Manual constitutes an FAA Approved Airplane Flight Manual for U.S. registered airplanes in accordance with FAA regulation 14 CFR, Part 21.29.

## CAUTION

The DA 40 F is a single engine airplane. When the operating limitations and maintenance requirements are complied with, it has the high degree of reliability which is required by the certification basis. Nevertheless, an engine failure is not completely impossible. For this reason, flights during the night, on top, under instrument meteorological conditions (IMC), or above terrain which is unsuitable for a landing, constitute a risk. It is therefore highly recommended to select flight times and flight routes such that this risk is minimized.

## 1.2 CERTIFICATION BASIS

■ This airplane has been type certified in accordance with the procedures established by TCCA.  
■ The certification basis is the Canadian Airworthiness Manual (AWM) Chapter 523, Type Certificate No. A-224.

■ Category of Airworthiness: NORMAL, UTILITY

## 1.3 WARNINGS, CAUTIONS AND NOTES

Special statements in the Airplane Flight Manual concerning the safety or operation of the airplane are highlighted by being prefixed by one of the following terms:

### WARNING

means that the non-observation of the corresponding procedure leads to an immediate or important degradation in flight safety.

### CAUTION

means that the non-observation of the corresponding procedure leads to a minor or to a more or less long term degradation in flight safety.

### 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] 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.

KCAS: CAS in knots.

IAS: Indicated Airspeed as shown on an airspeed indicator.

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<sub>A</sub>: 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.

**Demonstrated Crosswind Component:**

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

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

**MET:** Weather, weather advice.

**NAV:** Navigation, route planning.

### **1.5.4 MASS AND BALANCE (WEIGHT AND BALANCE)**

**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.

### **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) 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
NAV/COM	Navigation/Communication Equipment
XPDR	Transponder

**(b) Engine**

IGNITION	Ignition
INST. 1	Engine Instrument VM 1000
START	Starter

**(c) Lighting**

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

**(d) 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

#### **|** (e) Electrical

ALT.	Alternator
ALT. PROT.	Alternator Protection
ALT. CONT.	Alternator Control
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)

#### **|** 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	$[km/h] / 1.852 = [kts]$
			[mph]	miles per hour	$[km/h] / 1.609 = [mph]$
	[m/s]	meters per second	[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	$[°C] \times 1.8 + 32 = [°F]$ $([°F] - 32) / 1.8 = [°C]$

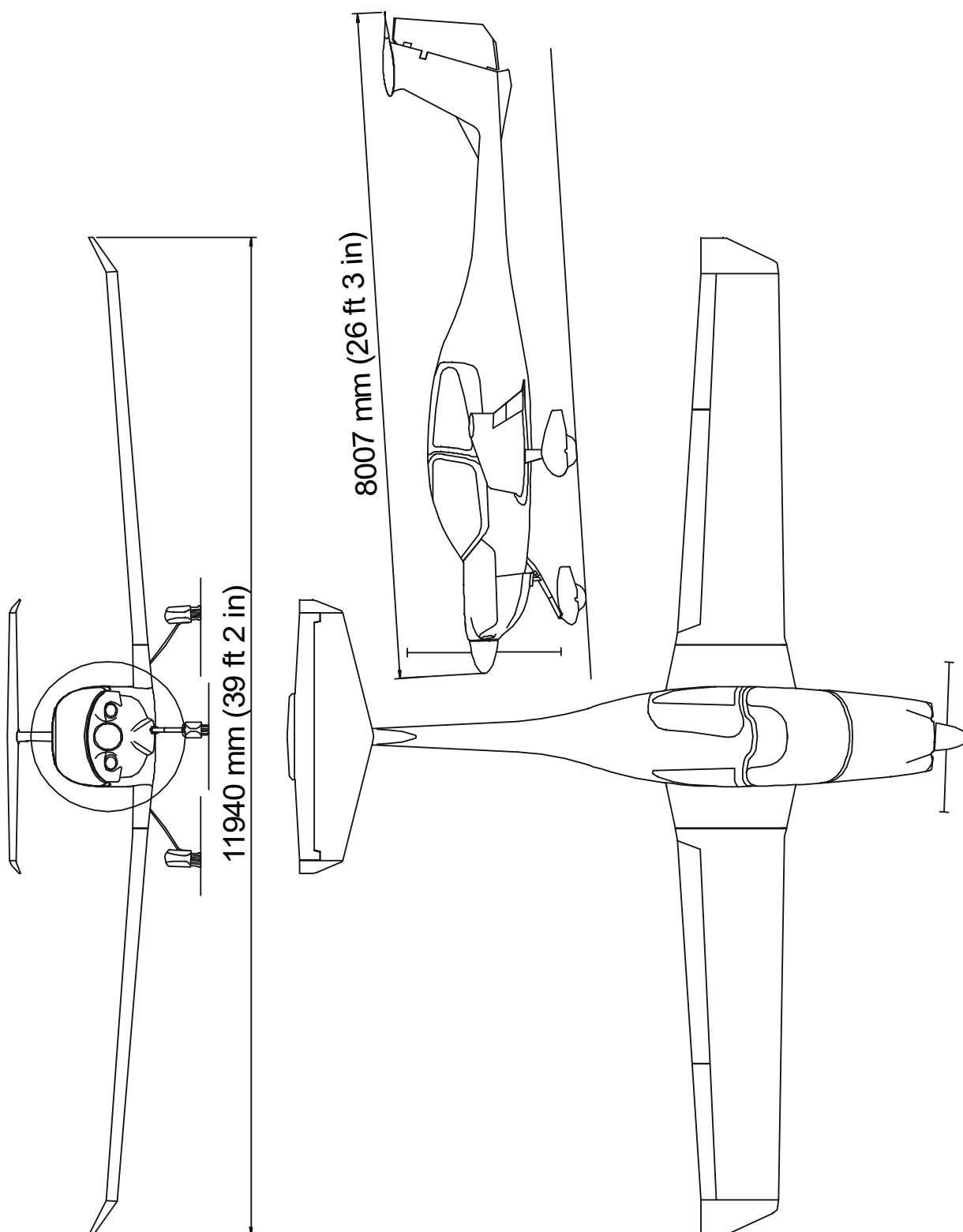
Dimension	SI-Units	US Units	Conversion
Intensity of electric current	[A] ampères		—
Electric charge (battery capacity)	[Ah] ampère-hours		—
Electric potential	[V] volts		—
Time	[sec] seconds		—

**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

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:       Sensenich Propeller Manufacturing Co., Inc.  
                  14 Citation Lane  
                  LITITZ, PA 17543,  
                  USA

Phone:         +1-717-569-0435

Fax:            +1-717-560-3725

If OÄM 40-203 is carried out:

Address: MT-Propeller Entwicklung GmbH  
Flugplatzstr. 1  
D-94348 Atting,  
GERMANY

Phone: +49-(0)9429-94090

Fax: +49-(0)9429-8432

E-mail: sales@mt-propeller.com

Webpage: www.mt-propeller.de

### **1.8.3 ENGINE INSTRUMENTS**

Address: VISION MICROSYSTEMS, INC.  
ADVANCED ELECTRONIC INSTRUMENTATION  
4255 Mitchell Way  
BELLINGHAM, WA 98226,  
USA

Phone: +1-360-714-8203

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

## CHAPTER 2

# OPERATING LIMITATIONS

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## **2.1 INTRODUCTION**

Chapter 2 of this Airplane Flight Manual includes operating limitations, instrument markings, and placards necessary for the 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	108 KIAS (above 980 kg / 2161 lb up to 1150 kg / 2535 lb)  94 KIAS (780 kg / 1720 lb up to 980 kg / 2161 lb)	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.
$V_{NO}$	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 : O-360-A4M
- c) RPM limitations
  - Max. take-off RPM : 2700 RPM
  - Max. continuous RPM : 2700 RPM

The engine should meet the following limits during ground check:

Throttle: IDLE . . . . . 600 - 800 RPM

Throttle: FULL . . . . . minimum 2200 RPM

### **NOTE**

The result of the ground check at full throttle is influenced by a number of environmental factors, e.g. temperature, air pressure and in particular head- or tailwind components. Headwind will cause a higher RPM than tailwind.

- d) Oil pressure
  - Minimum (IDLE) : 25 psi / 1.72 bar
  - Maximum : 97 psi / 6.69 bar
  - Normal operating range : 55 to 95 psi / 3.8 to 6.55 bar
- e) Oil quantity
  - Minimum : 4 qts / 3.8 l before take-off
  - Maximum : 8 qts / 7.6 l
- f) Oil temperature
  - Maximum : 245 °F (118 °C)
- g) Fuel pressure
  - Minimum : 1 psi / 0.069 bar
  - Maximum : 8 psi / 0.552 bar

- 
- |    |                           |                   |                    |
|----|---------------------------|-------------------|--------------------|
| h) | Cylinder head temperature |                   |                    |
|    | Maximum                   | : 500 °F (260 °C) |                    |
| i) | Propeller manufacturer    | : Sensenich       | MT-Propeller       |
|    |                           | (Standard)        | (OÄM 40-203)       |
| j) | Propeller designation     | : 76EM8S10-0-63   | MT 188 R 135 - 4 G |
| k) | Propeller diameter        | : 1.93 m (76 in)  | 1.88 m (74 in)     |
| l) | Propeller pitch (0.75 R)  | : 1.60 m (63 in)  | 1.35 m (53 in)     |

## m) 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> SAEJ1966 / MIL-L-6082 Mineral Oil</b>	<b><i>After 50 Hours:</i> 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 = Lower Caution Range	Green Arc/Bar = Normal Operating Range	Yellow Arc/Bar = Upper Caution Range	Red Arc/Bar = Upper Prohibited Range
Manifold Pressure	--	--	13 - 30 inHg	--	--
RPM	--	--	500 - 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 1 psi	1 - 2 psi	2 - 7 psi	7 - 8 psi	above 8 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 = Lower Caution Range	Green Arc/Bar = Normal Operating Range	Yellow Arc/Bar = Upper Caution Range	Red Arc/Bar = Upper Prohibited Range
Fuel Quantity Standard Tank	0 US gal	--	0 - 17 US gal	--	--
Fuel Quantity Long Range Tank (if installed)	0 US gal	—	0 - 16 US gal plus auxiliary: 3 - 9 US gal	--	--

## **2.6 WARNING, CAUTION AND STATUS LIGHTS**

The following tables show the color and significance of the warning and caution lights on the annunciator panel.

### **NOTE**

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

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

<b>Warning Lights (Red)</b>		<b>Cause</b>
OIL PRESS	Oil pressure	Oil pressure below 25 psi
FUEL PRESS	Fuel pressure	Fuel pressure below 1 psi
ALTERNATOR	Alternator (generator)	Alternator failure
START	Starter	Operation of starter or failure of the starter motor to disengage from the engine after starting
DOORS	Doors	Canopy and/or passenger door not completely closed and latched
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
LOW FUEL	Fuel quantity	1 <sup>st</sup> caution: fuel quantity in one tank less than 3 US gal (±1 US gal) 2 <sup>nd</sup> caution: fuel quantity in second tank less than 3 US gal (±1 US gal)
LOW VOLTS	Voltage	On-board voltage below 24.1 V
PITOT	Pitot heating	Pitot heating not switched ON, or fault in the Pitot heating system

## 2.7 MASS (WEIGHT)

Maximum take-off mass (Normal Category)	: 1150 kg	2535 lb
Maximum take-off mass (Utility Category)	: 980 kg	2161 lb
Maximum landing mass	: 1150 kg	2535 lb
Max. load in forward baggage compartment alone	: 45 kg	100 lb
Max. load in aft baggage compartment alone	: 18 kg	40 lb
Max. load, both baggage compartments together	: 45 kg	100 lb
Max. surface load in baggage compartments	: 75 kg/m <sup>2</sup>	15 lb/sq. ft.

### 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.

## **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

#### **(b) Most rearward CG**

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

Long Range Tank (if installed) : 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**

Tables 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	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	-1.0	0

## **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 meters).

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 (VFR)
- \* 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.

	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>	

	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>* CO detector/alarm</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 (refer to 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 (approx. 156 liters)

Unusable fuel : 2 x 0.5 US gal (approx. 3.8 liters)

Max. indicated fuel quantity : 17 US gal (approx. 64 liters) per tank

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

**CAUTION**

If a fuel indicator shows 17 US gal, then 20 US gal must be assumed for the calculation of the difference between right and left tank.

**(b) Long Range Tank (If Installed)**

Total fuel quantity	: 2 x 25.5 US gal (approx. 193 liters)
Unusable fuel	: 2 x 0.5 US gal (approx. 3.8 liters)
Max. indicated fuel quantity	: 16 US gal (approx. 61 liters) per tank
Indicated auxiliary fuel quantity	: 3 to 9 US gal (approx. 11 to 34 liters) per tank
Max. permissible difference between right and left tank	: 8 US gal (approx. 30.3 liters)

**CAUTION**

If a fuel indicator shows 16 US gal and the aux. fuel indicator shows 0 US gal for the same fuel tank, then 16 or 19 US gal must be assumed for the calculation of the difference between right and left tank, whichever leads to the greater imbalance.

## **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:

**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.**

Next to the carbon monoxide detector:

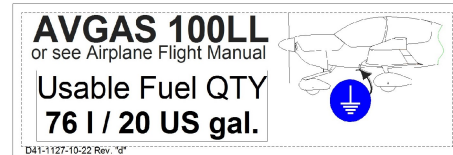
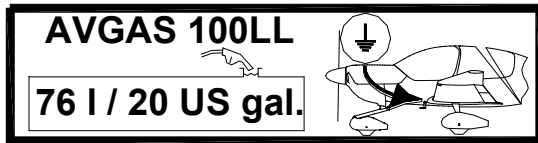


Next to each of the two fuel filler necks:

a) *Standard Tank:*

or

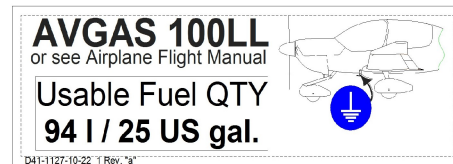
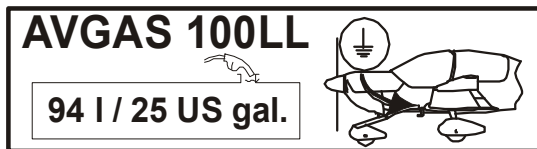
(if MÄM 40-617 is carried out):



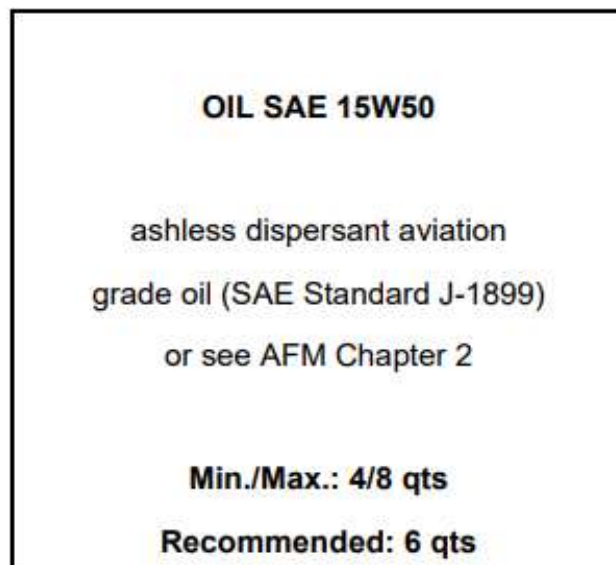
b) *Long Range Tank (if installed):*

or

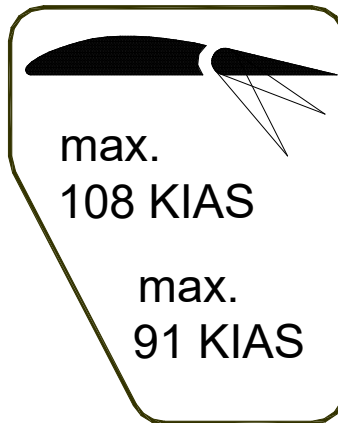
(if MÄM 40-617 is carried out):



In the cowling, on the door for the oil filler neck:



Next to the flap selector switch:



Next to the essential bus switch (if installed):

**Ess. Bus NOT for normal operation. See AFM.**

Next to the fuel quantity indication:

*a) Standard Tank:*

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

left and right tank max. 10 US gal difference

For use of max. tank capacity see AFM

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

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

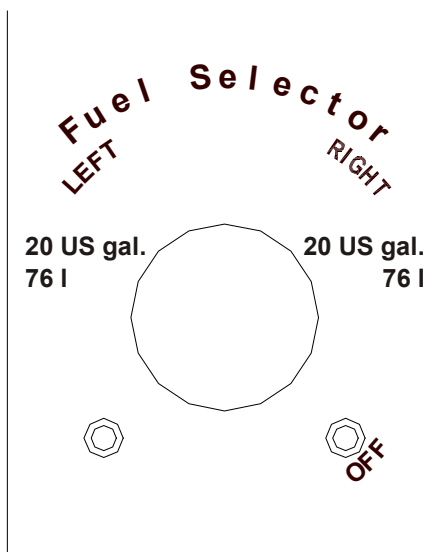
max. difference LH/RH tank: 8 US gal

AUX FUEL QTY switch for LH/RH auxiliary fuel quantity

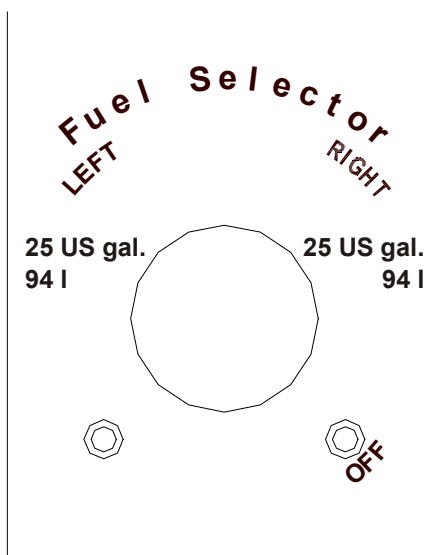
NOTE: See AFM for more information on AUX FUEL

On the fuel tank selector:

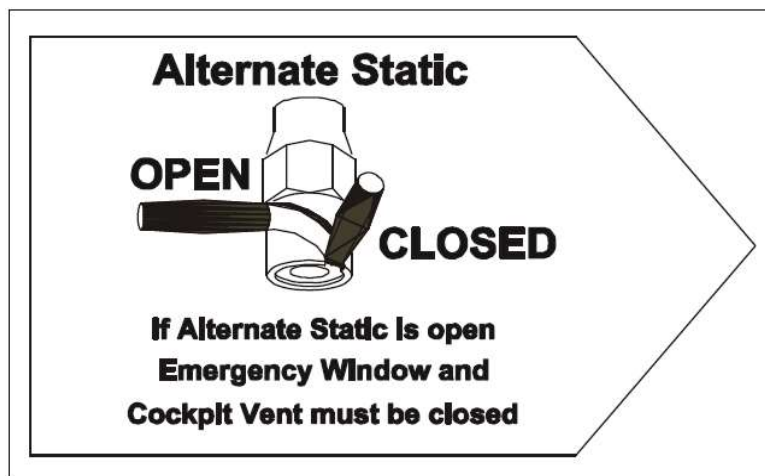
*a) Standard Tank:*



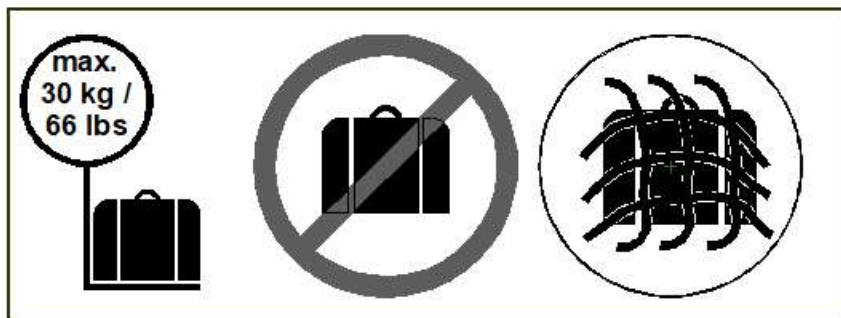
*b) Long Range Tank (if installed):*



In the cockpit, on the left fuselage sidewall (if alternate static valve is installed):

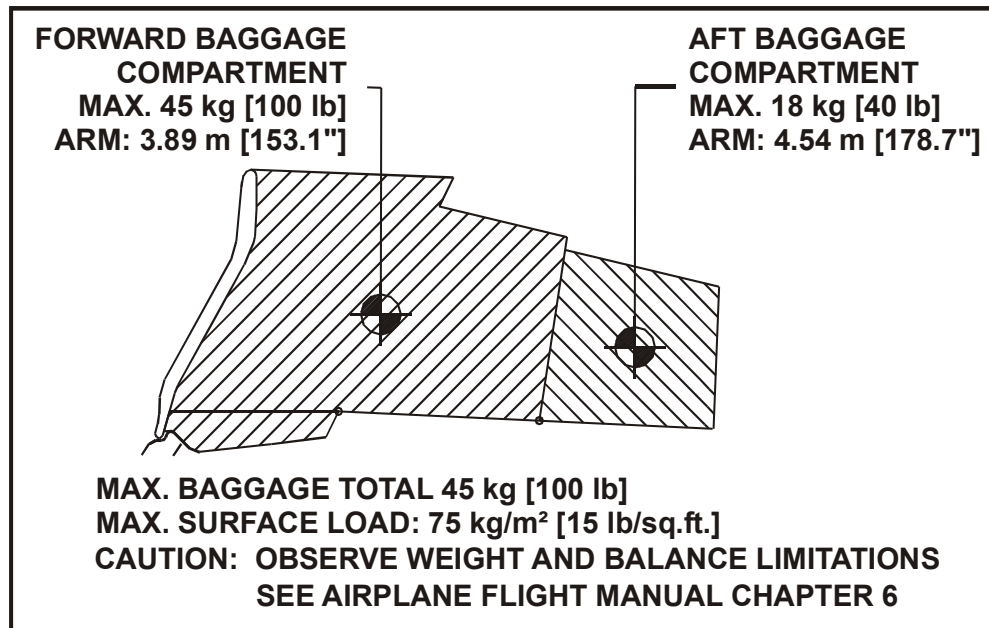


Next to the baggage compartment:



On the baggage extension:





Beside the door locking device (if installed):

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

On the passenger door frame:

**WARNING**  
Do NOT touch safety hook during flight  
Do NOT close the door  
if found open during flight

## **2.16 OTHER LIMITATIONS**

### **2.16.1 TEMPERATURE**

The airplane may only be operated when its temperature is not less than -40 °C (-40 °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 an empty battery is not permitted.

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 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 passenger door must not be locked by the key lock 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 SMOKING**

Smoking in the airplane is not permitted.

#### **2.16.8 USE OF PERSONAL PARACHUTES**

If personal parachutes are used by the flight crew, it must be ensured that all operating controls can be safely operated.

#### **2.16.9 USE OF THE SUN VISORS**

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

Intentionally left blank.

## CHAPTER 3

# EMERGENCY PROCEDURES

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### 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 airplane's flight attitude and the preparation for a possible emergency landing have priority over attempts to solve the current problems ("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 maintain a safe minimum flight altitude. Solutions for potential problems should be thought over in advance. Thus it should be guaranteed that the pilot is at no time taken unaware by an engine failure and that they can act logically and with determination.

### 3.1.2 CERTAIN AIRSPEEDS IN EMERGENCIES

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

## 3.2 ENGINE PROBLEMS

### NOTE

For carburetor fire situations refer to Section 3.3 - SMOKE AND FIRE.

### 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.

**CONTINUED**

**WARNING**

If the problem cannot be cleared, the airplane must not be flown.  
Unscheduled maintenance is necessary.

**END OF CHECKLIST****3.2.2 ENGINE PROBLEMS DURING TAKE-OFF****(a) Take-Off Can Still Be Abandoned (Sufficient Runway Length Available)**

*Land straight ahead:*

1. Throttle ..... IDLE

*On the ground:*

2. Brakes ..... as required

**CAUTION**

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

- Fuel tank selector. .... OFF
- Mixture control lever. .... LEAN - shut engine off
- Ignition switch ..... OFF
- Battery / Alternator switch ..... OFF

**(b) Take-Off Can No Longer Be Abandoned**

1. Airspeed ..... 72 KIAS (1150 kg, 2535 lb)  
66 KIAS (1000 kg, 2205 lb)  
59 KIAS (850 kg, 1874 lb)

**CONTINUED**

**WARNING**

If, in the event of an engine problem occurring during take-off, the take-off cannot be abandoned and a safe height has not been reached, then a straight-ahead emergency landing should be carried out. Turning back can be fatal.

*If time allows the following procedure can be carried out in order to re-establish engine power:*

2. Fuel tank selector. . . . . check selected tank
3. Electrical fuel pump . . . . . check ON
4. Ignition switch. . . . . check BOTH
5. Throttle. . . . . check MAX PWR / fully forward
6. Mixture control lever . . . . . check RICH (leaner above 5000 ft)
7. Carburetor heat . . . . . ON

**WARNING**

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

**END OF CHECKLIST****3.2.3 ENGINE PROBLEMS IN FLIGHT****(a) Engine Running Roughly****WARNING**

An engine which is running very roughly can lead to the loss of the propeller. Only if there is no other alternative should a rough running engine remain switched on.

**CONTINUED**

1. Airspeed ..... 73 KIAS (1150 kg, 2535 lb)  
68 KIAS (1000 kg, 2205 lb)  
60 KIAS (850 kg, 1874 lb)
2. Electrical fuel pump ..... check ON
3. Fuel tank selector ..... check selected tank
4. Engine instruments ..... check
5. Throttle ..... check
6. Mixture control lever ..... set for smooth running
7. Carburetor heat ..... ON
8. Ignition switch ..... check BOTH
9. Throttle / Mixture ..... try various settings

### CAUTION

Carburetor icing:

Under certain moist atmospheric conditions it is possible for ice to form in the induction system, even in summer weather.

This is due to the high air velocity through the carburetor venturi, its liquid water content and the absorption of heat from this air by vaporization of fuel.

To avoid this, a carburetor preheat system is provided in order to replace the heat lost by vaporization. The Carburetor Heat should be set fully ON when carburetor icing is encountered (reduction of engine power, rough running engine etc.) Be aware of power reduction caused by switching ON the carburetor heat.

Adjust the mixture for maximum smoothness.

---

**CONTINUED**

**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) Low Oil Pressure

1. Oil pressure ..... check
2. Throttle ..... reduce as far as possible
3. Oil temperature ..... check
4. Cylinder head temperature ..... check

Land as soon as possible.

Be prepared for an engine failure.

If necessary carry out an emergency landing in accordance with 3.5.1 - EMERGENCY LANDING WITH ENGINE OFF.

**CAUTION**

In case of vibration, loss of oil, unusual metallic noise and smoke the engine should be shut down immediately.

**END OF CHECKLIST**(c) High Oil Pressure

1. Oil temperature ..... check

**CONTINUED**

**NOTE**

If the oil temperature is normal, the oil pressure sensor might be faulty. Continue flight and have the airplane inspected before the next flight.

**END OF CHECKLIST**(d) High Oil Temperature

1. Oil pressure . . . . . check

*If oil pressure is low:*

Proceed acc. to 3.2.3 (b) - Low Oil Pressure and prepare for forced landing.

*If oil pressure is normal:*

2. Cylinder head temperature . . . . . check
3. Mixture . . . . . check, enrich if necessary
4. Throttle . . . . . reduce
5. Airspeed . . . . . increase

Land as soon as practicable.

**NOTE**

Have the airplane inspected before next flight.

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

1. Mixture . . . . . check and adjust if necessary
2. Oil pressure . . . . . check

**CONTINUED**

*If oil pressure is low:*

Proceed acc. to 3.2.3 (b) - Low Oil Pressure.

*If oil pressure is normal:*

3. Mixture . . . . . check, enrich if necessary
4. Throttle . . . . . reduce
5. Airspeed . . . . . increase

## END OF CHECKLIST

### (f) Loss of RPM

1. Electrical fuel pump . . . . . check ON
2. Fuel tank selector . . . . . check
3. Friction adjuster of throttle quadrant . . . . . check sufficiently tight

## END OF CHECKLIST

### (g) High Fuel Flow

1. Fuel pressure . . . . . check

*Low fuel pressure indicates a possible leak in the fuel system:*

2. Fuel quantity . . . . . check and monitor
3. Power setting . . . . . check

Land as soon as practicable. Consider the reduced range and endurance due to possible loss of fuel.

## NOTE

Have the airplane inspected before next flight.

## END OF CHECKLIST

(h) Low Fuel Pressure

1. Electric fuel pump . . . . . ON
2. Fuel quantity . . . . . check
3. Fuel selector . . . . . check
4. Mixture . . . . . check, adjust if necessary

Land as soon as practicable. Prepare for engine failure (see: 3.5.1 - EMERGENCY LANDING WITH ENGINE OFF).

**| END OF CHECKLIST****3.2.4 RESTARTING THE ENGINE WITH WINDMILLING PROPELLER****NOTE**

Restarting the engine has been demonstrated at all airspeeds above 70 KIAS up to 130 KIAS and up to 11000 ft Pressure 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 . . . . . 70 - 130 KIAS
2. Fuel tank selector . . . . . fullest tank
3. Ignition switch . . . . . check BOTH
4. Mixture control lever . . . . . check appropriate position
5. Electrical fuel pump . . . . . check ON
6. Carburetor heat . . . . . ON

**| CONTINUED**

*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.

### CAUTION

A go-around may become impossible with the remaining power.

*Engine shut-down:*

1. Parking brake. . . . . set
2. Engine instruments . . . . . check
3. Avionics master switch. . . . . OFF

## CONTINUED

4. All electrical equipment . . . . . OFF
5. Throttle . . . . . IDLE
6. Ignition switch . . . . . OFF
7. Battery / Alternator switch . . . . . OFF

### CAUTION

This procedure leaves the engine in a “hot prop” status. Do not touch / rotate the propeller blades by hand. This might lead to serious injury or death.

### END OF CHECKLIST

#### (b) Defective Throttle Control Cable

*Sufficient engine power available to continue flight:*

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

*Insufficient engine power available to continue flight:*

1. Carry out an 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 has been demonstrated at airspeeds above 70 KIAS up to 75 KIAS and up to 10000 ft pressure altitude.

1. Airspeed . . . . . 70 - 75 KIAS
2. Electrical equipment . . . . . OFF

### CONTINUED

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. Carburetor heat . . . . . ON
9. Ignition switch. . . . . START

### NOTE

By increasing the airspeed above approximately 130 KIAS, the propeller will begin to rotate and the engine can thus be started. 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 meters) must be allowed for.

If it is not possible to start the engine:

- Adopt glide configuration as in 3.4 - GLIDING.
- Carry out an 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 / Carburetor Fire When Starting on the Ground**

1. Starter . . . . . crank engine

*If engine fires:*

2. Throttle . . . . . set RPM to 1800 for 4 minutes
3. Cabin heat . . . . . OFF
4. Brakes . . . . . apply

*If engine does not fire:*

5. Mixture . . . . . LEAN
6. Throttle . . . . . FULL
7. Electrical fuel pump . . . . . OFF
8. Fuel selector . . . . . OFF
9. Battery / Alternator switch . . . . . OFF

*When the engine has stopped:*

10. Ignition switch . . . . . OFF
11. Canopy . . . . . open
12. Airplane . . . . . evacuate immediately

**| END OF CHECKLIST**

(b) Electrical Fire with Smoke on the Ground

1. Battery / Alternator switch . . . . . OFF
2. Brakes . . . . . apply

*If the engine is running:*

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

*When the engine has stopped:*

5. Ignition switch . . . . . OFF
6. Canopy . . . . . open
7. Airplane . . . . . evacuate immediately

**CAUTION**

Unscheduled maintenance is necessary.

**END OF CHECKLIST****3.3.2 SMOKE AND FIRE DURING TAKE-OFF**(a) If Take-Off Can Still Be Abandoned

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**

(b) If Take-Off Cannot Be Abandoned

1. Cabin heat . . . . . OFF
2. If possible, fly along a short-cut traffic circuit and land on the airfield.

**WARNING**

If, in the event of an engine problem occurring during take-off, the take-off can no longer be abandoned and a safe height has not been reached, then a straight-ahead emergency landing should be carried out. Turning back can be fatal.

3. Airspeed for best glide angle . . . . . 73 KIAS (1150 kg, 2535 lb)  
68 KIAS (1000 kg, 2205 lb)  
60 KIAS (850 kg, 1874 lb)

*After climbing to a height from which the selected landing area can be reached safely:*

4. Fuel tank selector . . . . . OFF
5. Electrical fuel pump . . . . . OFF
6. Cabin heat . . . . . OFF
7. Battery / Alternator switch . . . . . OFF
8. Emergency windows . . . . . open if required
9. Carry out emergency landing with engine off. Allow for increased landing distance due to the flap position.

**CAUTION**

In case of extreme smoke development, the 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.

**CONTINUED**

**CAUTION**

Unscheduled maintenance is necessary.

**END OF CHECKLIST****3.3.3 SMOKE AND FIRE IN FLIGHT****(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 / Battery/ Alternator switch . . . ON
7. Emergency windows . . . . . open if required
8. Carry out an emergency landing with engine off.
9. Evacuate after stand-still.

**CAUTION**

In case of extreme smoke development, the 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 / Battery/ Alternator switch . . . OFF

**CONTINUED**

3. Cabin heat . . . . . OFF
4. Emergency windows . . . . . open if required
5. Land at an appropriate airfield as soon as possible.

### CAUTION

Switching OFF the Master switch (BAT) will lead to total failure of all electronic and electric equipment. Also affected are - if installed - the attitude gyro (artificial horizon) and the directional gyro.

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.

In case of extreme smoke development, the 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.

## **3.4 GLIDING**

1. Flaps . . . . . UP
2. Airspeed for best glide angle (flaps UP) . . . . 73 KIAS (1150 kg, 2535 lb)  
68 KIAS (1000 kg, 2205 lb)  
60 KIAS (850 kg, 1874 lb)

### NOTE

The glide ratio is 8.9; i.e., for every 1000 ft (305 meters) of altitude loss the maximum horizontal distance traveled in still air is 1.46 NM (2.71 km). During this time the propeller will continue to windmill.

## **END OF CHECKLIST**

### **3.5 EMERGENCY LANDINGS**

#### **3.5.1 EMERGENCY LANDING WITH ENGINE OFF**

1. Select a suitable landing area. If no level landing area is available, a landing on an upward slope should be attempted.
2. Consider the wind.
3. Approach: If possible, fly 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.
4. Airspeed for best glide angle (flaps UP). . . . . 73 KIAS (1150 kg, 2535 lb)  
68 KIAS (1000 kg, 2205 lb)  
60 KIAS (850 kg, 1874 lb)
5. ATC . . . . . advise, if time allows
6. Fuel tank selector. . . . . OFF

When it is certain that the landing field will be reached:

7. Flaps . . . . . LDG
8. Safety harnesses . . . . . tighten

### **CAUTION**

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

- Ignition switch . . . . . OFF
- Master switch / Battery/ Alternator switch. . OFF

9. Touchdown . . . . . with the lowest possible airspeed.

### **END OF CHECKLIST**

**3.5.2 LANDING WITH A DEFECTIVE TIRE ON THE MAIN LANDING GEAR****CAUTION**

A defective (e.g. burst) tire is not usually easy to detect. The damage normally occurs during take-off or landing, and is hardly noticeable during fast taxiing. It is only during the roll-out after landing or at lower taxiing speeds that a tendency to swerve occurs. Rapid and determined action is then required.

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 remains, 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 / Battery/ Alternator switch .OFF

#### **END OF CHECKLIST**

### **3.6 RECOVERY FROM AN UNINTENTIONAL SPIN**

#### **CAUTION**

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

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

#### **CONTINUED**

8. Recover the airplane from a descent 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. Carburetor heat. . . . . ON
7. Emergency windows. . . . . open if required

### CAUTION

Ice build-up increases the stalling speed.

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 windows . . . . . close

## END OF CHECKLIST

### **3.7.2 FAILURES IN THE ELECTRICAL SYSTEM**

#### **(a) Complete Failure of the Electrical System**

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 solve the problem:

- Set the Emergency switch to ON (if installed).
- When necessary, use the flood light for lighting the instruments as well as the levers and switches, etc.
- Set power based on lever positions and engine noise.
- Prepare for a 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.

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

### **CONTINUED**

## CAUTION

Those items of equipment which are not needed for the safe operation and secure landing of the airplane can be switched OFF by means of the Essential Bus switch. 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

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

Where the battery capacity is not sufficient to power equipment before a suitable airfield is reached, 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 by means of the Emergency switch. It provides power for a minimum of 1 hour and 30 minutes when the flood light is switched on.

## 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 / Battery/ Alternator switch . . . 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
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 odourless. Increased concentration of carbon monoxide in closed spaces can be fatal. Since it occurs usually as part of the exhaust gases, it can be detected. Increased concentrations of carbon monoxide in closed spaces can be fatal. The occurrence of CO in the cabin is possible only due to a defect.

The DA 40 F is equipped with a CO detector. If the visual alert annunciator illuminates in flight, press the TEST/RESET button. If the alert continues with the red light staying ON or an odour 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. Canopy . . . . . open

**CAUTION**

In case of suspicion of carbon monoxide contamination in the cabin, the 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.

**END OF CHECKLIST**

**3.7.4 UNLATCHED DOORS****WARNING**

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

**NOTE**

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

1. Airspeed. . . . . reduce immediately
2. Canopy. . . . . check visually if closed  
and latched
3. Passenger door . . . . . check visually if closed  
and latched

**(a) Canopy or Passenger Door Unlatched**

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

**END OF CHECKLIST**

## CHAPTER 4A

### NORMAL OPERATING PROCEDURES

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

## 4A.3 MIXTURE SETTINGS FOR NORMAL OPERATING PROCEDURES

Pressure Altitude	Flight Phase	Mixture Setting
5000 ft and below	Climb	FULL RICH
	Cruise Power setting 75% and below	FULL RICH
	Cruise Power setting above 75%	As required
	Descent	FULL RICH
Above 5000 ft	All	As required

Refer to Section 4A.4.10 - MIXTURE ADJUSTMENT for mixture adjustment procedures.

## **4A.4 CHECKLISTS FOR NORMAL OPERATING PROCEDURES**

### **4A.4.1 PRE-FLIGHT INSPECTION**

#### **I. Cabin Check**

- a) MET, NAV, Mass & CG . . . . . flight planning completed
- b) Airplane documents . . . . . complete and up-to-date
- c) Ignition key . . . . . pulled out
- d) Canopy & passenger door . . . . . clean, undamaged, check locking mechanism function
- e) All electrical equipment . . . . . OFF
- 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 and mixture levers
- h) Throttle . . . . . IDLE
- i) Mixture control lever . . . . . LEAN
- j) Master switch (BAT) . . . . . ON
- k) Annunciator panel . . . . . check function (see 7.11)
- l) Fuel quantity . . . . . check with fuel qty. measuring device

*a) Standard Tank:*

### **NOTE**

When the fuel quantity 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**

*b) Long Range Tank:***NOTE**

When the fuel quantity indicator reads 16 US gal, read the auxiliary fuel quantity by setting the AUX FUEL QTY switch to the appropriate position (LH or RH), and add the auxiliary fuel quantity to the 16 US gal.

**NOTE**

An auxiliary fuel quantity below 3 US gal cannot be indicated by the system. For auxiliary fuel quantities below 3 US gal the correct fuel quantity must be determined with the fuel quantity measuring device (see section 7.10 - FUEL SYSTEM).

**CAUTION**

After selecting a fuel tank, a time of 2 minutes will elapse before a correct fuel quantity is indicated.

- m) Position lights, strobe lights (ACLs) . . . . . check
- n) Check for loose items . . . . . complete
- o) Flight controls and trim . . . . . check free and correct movement  
up to full deflection
- p) Baggage . . . . . stowed and secure
- q) Emergency axe (if OÄM 40-326 installed) . . . stowed and secure
- r) Emergency egress hammer . . . . . stowed and secure  
(if OÄM 40-401 installed)
- s) Fire extinguisher . . . . . charged and secure

*Door open - (DOOR or DOORS) warning check:*

- t) All doors. . . . . close and latch  
(passenger door, canopy)
- u) DOOR (or DOORS) warning light . . . . . check extinguished

**CONTINUED**

- v) Passenger door . . . . . unlatch
- w) DOOR (or DOORS) warning light . . . . . check active
- x) Pull on outer passenger door handle . . . . . the safety hook must hold the  
passenger door in the closed  
position
- y) Passenger door . . . . . check front and rear locking bolt  
(firmly mounted and  
undamaged)
- z) Passenger door . . . . . check push-button  
Push-button returns freely to the  
fully extended position after  
pressing and releasing
- aa) Master switch (BAT) . . . . . OFF

**END OF CHECKLIST**

II. Walk-Around Check, Visual Inspection**CAUTION**

A visual inspection consists of: 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 should be completely cleared of ice, snow and similar accumulations.

**CAUTION**

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

*1. Left Main Landing Gear:*

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

*2. Left Wing:*

- a) Entire wing surface . . . . . visual inspection
- b) Step . . . . . visual inspection
- c) Air intake on lower surface . . . . . visual inspection

**CONTINUED**

- 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 (red + white), strobe light . . . . . visual inspection (ACL)
- n) Mooring . . . . . check, clear
- o) Aileron and linkage. . . . . visual inspection
- p) Aileron hinges and safety pins . . . . . visual inspection
- q) Foreign objects in aileron paddle . . . . . visual inspection
- r) Flap and linkage. . . . . visual inspection
- s) Flap hinges and safety pins . . . . . visual inspection

### 3. Fuselage, Left Side:

- a) Canopy, left side . . . . . visual inspection
- b) Passenger door & window . . . . . visual inspection
- c) Fuselage skin. . . . . visual inspection
- d) Antennas . . . . . visual inspection

### 4. Empennage:

- a) Stabilizers and control surfaces . . . . . visual inspection
- b) Hinges . . . . . visual inspection

**CONTINUED**

- c) Elevator trim tab . . . . . visual inspection, check safetying
- 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

#### 5. Fuselage, Right Side:

- a) Fuselage skin . . . . . visual inspection
- b) Window . . . . . visual inspection
- c) Canopy, right side . . . . . visual inspection

#### 6. Right Wing:

- a) Flap and linkage . . . . . visual inspection
- b) Flap hinges and safety pins . . . . . visual inspection
- c) Aileron and linkage . . . . . visual inspection
- d) Aileron hinges and safety pins . . . . . visual inspection
- e) Foreign objects in aileron paddle . . . . . visual inspection
- f) Wing tip . . . . . visual inspection
- g) Position light (green + white), strobe light . . . visual inspection  
(ACL)
- 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

**CONTINUED**

- o) Step . . . . . visual inspection

### 7. Right Main Landing Gear:

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

### 8. Front Fuselage:

- a) Oil level . . . . . check dipstick,  
min. 4 qts for VFR operation  
min. 6 qts for IFR operation
- b) Cowling . . . . . visual inspection
- c) 3 air intakes . . . . . clear
- d) Propeller. . . . . visual inspection

## WARNING

Never move the propeller by hand while the ignition is switched on, as this 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, check slip marks
- h) Wear, tread depth of tire . . . . . check
- i) Wheel fairing . . . . . visual inspection (if installed)
- j) Tow bar . . . . . removed
- k) Tire inflation pressure (2.0 bar/29 psi) . . . . . check

**CONTINUED**

- l) Chocks . . . . . remove
- m) Exhaust . . . . . visual inspection

### WARNING

The exhaust manifold can cause burns when it is hot.

#### *Underside:*

- n) Antennas (if fitted) . . . . . visual inspection
- o) Gascolator . . . . . drain off a small quantity of fuel,  
check for water and sediment
- p) Venting pipes . . . . . check for blockage
- q) Fuselage underside . . . . . check for excessive contamination  
particularly by oil, fuel, and other fluids

## END OF CHECKLIST

### 4A.4.2 BEFORE STARTING ENGINE

- 1. Pre-flight inspection . . . . . complete
- 2. Rudder pedals . . . . . adjusted and locked
- 3. Passengers . . . . . instructed

### NOTE

Ensure all the passengers have been fully briefed on the use of the seat belts, doors and emergency exits and the ban on smoking.

Advise the passengers that after closing the passenger door, latching requires a separate action. Instruct the passengers not to latch an unlatched passenger door in flight. Instead inform the pilot.

- 4. Safety harnesses . . . . . all on and fastened

## CONTINUED

5. Passenger door . . . . . closed and latched

### CAUTION

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

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

6. Door lock (if installed). . . . . unblocked, key removed  
7. Canopy. . . . . position 1 or 2 (cooling gap)

### CAUTION

When operating the canopy, pilots / operators must 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 the handle operation.

8. Canopy lock (if installed) . . . . . unblocked, key removed  
9. Parking brake . . . . . set  
10. Flight controls. . . . . free movement, correct sense  
11. Trim wheel . . . . . T/O  
12. Throttle. . . . . IDLE  
13. Mixture control lever. . . . . LEAN  
14. Friction device, throttle quadrant . . . . . adjusted  
15. Carburetor heat . . . . . COLD

**CONTINUED**

- 16. Alternate static valve . . . . . CLOSED, if installed
- 17. Avionics master switch . . . . . OFF
- 18. Essential Bus switch . . . . . OFF, if installed
- 19. ELT . . . . . armed

### CAUTION

When the essential bus is switched ON, the battery will not be charged.

- 20. Master switch (BAT) . . . . . ON
- 21. Annunciator panel . . . . . test (see Section 7.11)
- 22. Fuel tank selector . . . . . on full tank

### WARNING

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

Never try to start the engine by hand.

## END OF CHECKLIST

### 4A.4.3 STARTING ENGINE

#### (a) Cold Engine

- 1. Strobe light (ACL) . . . . . ON
- 2. Mixture . . . . . fully RICH
- 3. Fuel pump . . . . . ON
- 4. Throttle . . . . . 1/4 travel OPEN
- 5. Prime . . . . . 1-4 seconds (electrical pump)

## CONTINUED

**WARNING**

Use the primer system to prepare the engine for a starting attempt. Do not use the throttle to pump fuel through the carburetor to the engine for priming since this may lead to carburetor fire. The primer system delivers fuel to the cylinders directly.

**CAUTION**

The priming system is not intended for operation in flight.

**WARNING**

Before starting the engine the pilot must ensure that the propeller area is free with no persons in the vicinity.

**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, allow the starter to cool off for half an hour.

**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. Pre-heat will liquify 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.

**| CONTINUED**

6. Starter . . . . . engage

*When engine fires:*

7. Oil pressure . . . . . green sector within 15 sec
8. Throttle . . . . . set 1000 RPM
9. Electrical fuel pump . . . . . OFF

### **WARNING**

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

10. Master switch (ALT). . . . . ON
11. Ammeter . . . . . check
12. Fuel pressure. . . . . check
13. Annunciator panel . . . . . check

## **| END OF CHECKLIST**

### (b) Warm Engine

1. Strobe light (ACL) . . . . . ON
2. Mixture . . . . . fully RICH
3. Fuel pump . . . . . ON
4. Throttle . . . . . 1/4 travel OPEN

### **WARNING**

Before starting the engine the pilot must ensure that the propeller area is free with no persons in the vicinity.

## **| CONTINUED**

**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, allow the starter to cool off for half an hour.

5. Starter . . . . . engage

*When engine fires:*

6. Oil pressure . . . . . green sector within 15 sec  
7. Throttle . . . . . set 1000 RPM  
8. Electrical fuel pump . . . . . OFF

**WARNING**

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

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

**| END OF CHECKLIST**

**|** (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 . . . . . fully OPEN

**WARNING**

Before starting the engine the pilot must ensure that the propeller area is free with no persons in the vicinity.

**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, allow the starter to cool off for half an hour.

5. Starter . . . . . engage

*When engine fires:*

- |**
6. Throttle . . . . . pull back towards IDLE
  7. Oil pressure . . . . . green sector within 15 sec

**WARNING**

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

8. Throttle . . . . . set 1000 RPM
9. Master switch (ALT). . . . . ON
10. Ammeter . . . . . check
11. Fuel pressure. . . . . check
12. Annunciator panel . . . . . check

**|** **END OF CHECKLIST**

**4A.4.4 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
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
9. Pitot heating . . . . . OFF if not required
10. Strobe lights (ACLs) . . . . . check ON, test function, as required
11. Position lights, landing and taxi lights. . . . . ON, test function, 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.

**| END OF CHECKLIST**

**4A.4.5 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.

**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.

**CONTINUED**

**NOTE**

Vapor lock can be avoided if the engine is run at speeds of 1800 RPM or more.

**END OF CHECKLIST****4A.4.6 BEFORE TAKE-OFF****CAUTION**

Before take-off, the engine must run on each tank for at least 1 minute at 1500 RPM. This can be carried out during taxiing and during the start check.

1. Position airplane into wind if possible.
2. Parking brake . . . . . set
3. Safety harnesses . . . . . on and fastened
4. Passenger door . . . . . check closed and latched
5. Canopy. . . . . closed and latched

**CAUTION**

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

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

6. Door warning light (DOOR or DOORS) . . . . . check no indication
7. Fuel tank selector. . . . . fullest tank
8. Engine instruments . . . . . in green sector
9. Circuit breakers . . . . . pressed in
10. Fuel pressure indicator. . . . . check (approx. 2 - 6 psi)

**CONTINUED**

- 11. Electrical fuel pump . . . . . ON
- 12. Mixture control lever . . . . . RICH (below 5000 ft)

### NOTE

At a density altitude of 5000 ft or above 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.

- 13. Flaps . . . . . check T/O
  - 14. Trim . . . . . check T/O
  - 15. Flight controls . . . . . free movement, correct sense
  - 16. Throttle . . . . . 1800 RPM
  - 17. Magneto check . . . . . L - BOTH - R - BOTH
- Max. RPM drop: 175 RPM
- Max. difference: 50 RPM

### CAUTION

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

- 18. Carburetor heat . . . . . check function
- 19. Mixture . . . . . check function, set RICH (below 5000 ft)
- 20. Throttle . . . . . IDLE, 600 - 800 RPM
- 21. Throttle . . . . . FULL, minimum 2200 RPM

**CONTINUED**

**NOTE**

The result of the ground check at full throttle depends on a number of environmental factors, e.g. temperature, ambient air pressure and in particular head- or tailwind components. Headwind will cause a higher RPM than tailwind.

22. Throttle . . . . . set 1000 RPM
23. Carburetor heat . . . . . check OFF
24. Landing light . . . . . ON as required
25. Parking brake . . . . . release

**END OF CHECKLIST****4A.4.7 TAKE-OFF****(a) Normal Take-Off Procedure**

1. Transponder . . . . . ON/ALT
2. Brakes . . . . . apply
3. Throttle . . . . . FULL
4. Brakes . . . . . release

**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 abandoned if necessary.

A rough engine, sluggish RPM increase, or failure to reach take-off RPM (approximately 2200 RPM static) are reasons for abandoning the take-off. If the engine oil is cold, oil pressure in the upper yellow sector is permissible.

**CONTINUED**

5. Elevator . . . . . neutral
6. Rudder . . . . . maintain direction

### 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.

7. Nose wheel lift-off . . . . . at  $v_R = 59$  KIAS
8. Airspeed . . . . . 66 KIAS (1150 kg, 2535 lb)  
60 KIAS (1000 kg, 2205 lb)  
54 KIAS (850 kg, 1874 lb)

*Above a safe height:*

9. Electrical fuel pump . . . . . OFF
10. Landing light . . . . . OFF

## END OF CHECKLIST

### 4A.4.8 CLIMB

#### (a) Procedure for Best Rate of Climb

1. Flaps . . . . . T/O
2. Airspeed . . . . . 66 KIAS (1150 kg, 2535 lb)  
60 KIAS (1000 kg, 2205 lb)  
54 KIAS (850 kg, 1874 lb)
3. Throttle . . . . . FULL
4. Mixture control lever . . . . . RICH, above 5000 ft keep EGT  
constant
5. Engine instruments . . . . . in green sector
6. Trim . . . . . as required

## CONTINUED

**CAUTION**

When the fuel pressure warning light illuminates, or the fuel pressure indication is below the green sector, the electrical fuel pump must be switched ON.

**END OF CHECKLIST****I** (b) Cruise Climb

1. Flaps ..... UP
2. Airspeed ..... 73 KIAS (1150 kg, 2535 lb)  
68 KIAS (1000 kg, 2205 lb)  
60 KIAS (850 kg, 1874 lb)
3. Throttle ..... FULL
4. Mixture control lever ..... RICH, above 5000 ft keep EGT  
constant
5. Engine instruments ..... in green sector
6. Trim ..... as required

**I** **END OF CHECKLIST****4A.4.9 CRUISE**

1. Flaps ..... UP
2. Throttle ..... set performance according to table,  
as required

**NOTE**

Power settings are given in Chapter 5.

**I** **CONTINUED**

**NOTE**

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

**NOTE**

The oil temperature in continuous operation should indicate between 160 °F and 180 °F. If possible, the oil temperature should not remain under 140 °F for long periods, so as to avoid accumulation of condensation. Maximum permissible oil temperature is 245 °F.

3. Mixture . . . . . set in accordance with 4A.4.10 -  
MIXTURE ADJUSTMENT
4. Trim . . . . . as required
5. Fuel tank selector . . . . . as required  
(max. difference 10 US gal with  
standard tank, 8 US gal with long  
range tank)

**NOTE**

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

**CAUTION**

When the fuel pressure warning light illuminates, or the fuel pressure indication is below the green sector, the electrical fuel pump must be switched ON.

**END OF CHECKLIST**

**4A.4.10 MIXTURE ADJUSTMENT****CAUTION**

1. The maximum permissible cylinder head temperature (500 °F) 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 per minute.

**NOTE**

For maximum service life cylinder head temperature should be kept below 435 °F (high performance cruise) and below 400 °F (for economy cruise).

**I** (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.

**I** (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 50 °F lower. This mixture setting produces the maximum performance for a given manifold pressure and is mainly used for high power settings (approximately 75 %).

Alternatively, the best power setting can be established by adjusting the mixture for maximum RPM.

### **NOTE**

For climb it is recommended that the mixture is set to FULL RICH below 5000 ft pressure altitude. Lean mixture to best power above 5000 ft pressure altitude.

However, during take-off from a high elevation airfield or during climb, roughness or loss of power may result from over-richness. In such a case adjust mixture control for smooth operation not for best economy.

**4A.4.11 DESCENT**

1. Mixture control lever . . . . . enrich as required for the altitude,  
operate slowly
2. Carburetor heat . . . . . ON, as required
3. Throttle . . . . . as required

**CAUTION**

When reducing power, the change in cylinder head temperature should not exceed 50 °F per minute. This is normally guaranteed by the “self-adapting inlet.” An excessive cooling rate may occur however, if the engine is very hot and the throttle is reduced abruptly in a fast descent. Shock-cooling shortens engine life.

**CAUTION**

When the fuel pressure warning light illuminates, or the fuel pressure indication is below the green sector, the electrical fuel pump must be switched ON.

**CAUTION**

Prior to a prolonged descent with low power settings and suspected icing conditions, FULL carburetor heat should be applied before reducing engine power. Throttle should be retarded and mixture control leaned as required. Power response should be verified approximately every 30 seconds by partially opening and then closing the throttle. When leveling off, enrich the mixture, set power as required and select carburetor heat OFF unless carburetor icing conditions are suspected.

**END OF CHECKLIST**

**4A.4.12 LANDING APPROACH**

1. Electrical fuel pump . . . . . ON
2. Fuel selector . . . . . fullest tank
3. Safety harnesses . . . . . fastened
4. Airspeed . . . . . reduce to operate flaps (108 KIAS)
5. Flaps . . . . . T/O
6. Trim . . . . . as required
7. Landing light . . . . . as required
8. Carburetor heat . . . . . ON

**(a) Before Landing**

9. Mixture control lever . . . . . RICH
10. Throttle . . . . . as required
11. Airspeed . . . . . reduce to operate flaps (91 KIAS)
12. Flaps . . . . . LDG
13. Approach speed . . . . . 70 KIAS (1150 kg, 2535 lb)  
63 KIAS (1000 kg, 2205 lb)  
58 KIAS (850 kg, 1874 lb)

**(b) On Final Approach**

14. Carburetor heat . . . . . OFF

**CAUTION**

In conditions such as (e.g.) strong wind, danger of wind shear or turbulence a higher approach speed should be selected.

**END OF CHECKLIST**

**4A.4.13 GO-AROUND**

1. Throttle . . . . . FULL
2. Airspeed . . . . . 66 KIAS (1150 kg, 2535 lb)  
60 KIAS (1000 kg, 2205 lb)  
54 KIAS (850 kg, 1874 lb)
3. Mixture . . . . . check fully RICH
4. Carburetor heat . . . . . check OFF
5. Flaps . . . . . T/O

**| (a) Above a Safe Height**

6. Airspeed . . . . . 73 KIAS (1150 kg, 2535 lb)  
68 KIAS (1000 kg, 2205 lb)  
60 KIAS (850 kg, 1874 lb)
7. Flaps . . . . . UP
8. Electrical fuel pump . . . . . OFF

**| END OF CHECKLIST****4A.4.14 AFTER LANDING**

1. Throttle . . . . . 1000 RPM
2. Brakes . . . . . as required
3. Electrical fuel pump . . . . . OFF
4. Transponder . . . . . OFF / SBY
5. Pitot heating . . . . . OFF
6. Avionics . . . . . as required
7. Lights . . . . . as required
8. Flaps . . . . . UP
9. Carburetor heat . . . . . OFF

**| END OF CHECKLIST**

**4A.4.15 ENGINE SHUT-DOWN**

1. Parking brake . . . . . set
2. Engine instruments . . . . . check
3. ELT . . . . . check inactive, listen on 121.5 MHz
4. Avionics master switch . . . . . OFF
5. All electrical equipment . . . . . OFF
6. Throttle . . . . . 1000 RPM
7. Ignition check. . . . . OFF until RPM drops noticeably,  
then immediately BOTH again
8. Mixture control lever . . . . . LEAN - shut engine off
9. Ignition switch . . . . . OFF
10. Master switch / Battery+Alternator. . . . . OFF
11. Strobe lights (ACLs). . . . . OFF

**END OF CHECKLIST****4A.4.16 POST-FLIGHT INSPECTION**

1. Parking brake . . . . . release, use chocks
2. 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.4.17 FLIGHT IN RAIN****NOTE**

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

**CAUTION**

Carburetor icing:

Under certain moist atmospheric conditions it is possible for ice to form in the induction system, even in summer weather.

This is due to the high air velocity through the carburetor venturi, its liquid water content and the absorption of heat from this air by vaporization of fuel.

To avoid this, a carburetor preheat system is provided in order to replace the heat lost by vaporization. The carburetor heat should be set fully ON when carburetor icing is encountered (reduction of engine power, rough running engine etc.). Be aware of power reduction caused by switching ON the carburetor heat.

Adjust the mixture for maximum smoothness.

**NOTE**

If carburetor icing occurs, the carburetor heat must be switched ON. Be aware of the power reduction caused by switching ON the carburetor heat.

**4A.4.18 REFUELING****CAUTION**

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

**4A.4.19 FLIGHT AT HIGH ALTITUDE**

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

Also see Section 2.11 - OPERATING ALTITUDE.

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## CHAPTER 4B

# ABNORMAL OPERATING PROCEDURES

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## **4B.1 PRECAUTIONARY LANDING**

### **NOTE**

A precautionary landing is only necessary when there is a reasonable suspicion that, due to fuel shortage, weather conditions, or at nightfall, the possibility of endangering the airplane and its occupants by continuing the flight cannot be excluded. The pilot must decide whether or not a controlled landing in a field represents a lower risk than the attempt to reach the target airfield under all circumstances.

### **NOTE**

If no level landing area is available, a landing on an upward slope should be attempted.

1. Select appropriate landing area.
2. Consider wind.
3. Approach: If possible, the landing area should be overflown at a suitable height in order to recognize obstacles. The degree of offset at each part of the circuit will allow the wind speed and direction to be assessed.
4. Airspeed ..... 73 KIAS (1150 kg, 2535 lb)  
68 KIAS (1000 kg, 2205 lb)  
60 KIAS (850 kg, 1874 lb)
5. ATC ..... advise

On final approach:

6. Flaps ..... LDG
7. Safety harnesses ..... tighten
8. Touchdown ..... with the lowest possible airspeed

**CONTINUED**

## CAUTION

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

- Fuel tank selector . . . . . OFF
- Ignition switch . . . . . OFF
- Master switch / Battery/ Alternator switch. . . . . 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 OIL TEMPERATURE

A constant reading of the oil temperature of 26 °F or 317 °F suggests a faulty oil temperature sensor. The airplane should be serviced.

#### 4B.2.3 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.

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

#### **4B.3.1 LOW VOLTAGE CAUTION (VOLT OR LOW VOLTS)**

This caution is indicated when the normal on-board voltage (28 V) drops below 24.1 V. Possible reasons are:

- A fault in the power supply.
- RPM too low.
- Alternator switched OFF inadvertently.

##### **(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 extinguish, 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 extinguish, 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.4 TAKE-OFF FROM A SHORT GRASS STRIP**

1. Brakes . . . . . apply
2. Flaps . . . . . T/O
3. Throttle . . . . . FULL
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.

7. Elevator (control stick) . . . . . release slowly, when nose wheel has lifted. Allow the airplane to lift off as soon as possible and increase speed at low level.
8. Airspeed . . . . . 66 KIAS (1150 kg, 2535 lb)  
60 KIAS (1000 kg, 2205 lb)  
54 KIAS (850 kg, 1874 lb)
9. Flaps . . . . . UP, above safe altitude
10. Electrical fuel pump . . . . . OFF, above safe altitude
11. 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 . . . . . 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 the throttle to control airplane speed and rate of descent.

**(b) Only LDG Available**

Perform normal landing.

**END OF CHECKLIST****4B.6 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
4. Air vents in cabin . . . . . CLOSE

**END OF CHECKLIST**

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## CHAPTER 5

### PERFORMANCE

#### PROPELLER TYPE SENSENICH 76EM8S10-0-63 INSTALLED

#### IF TR-OÄM 40-203 IS CARRIED OUT: PROPELLER TYPE MT 188 R 135 - 4 G INSTALLED

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## **5.1 INTRODUCTION**

The performance data presented in this chapter corresponds to airplanes without the optional wheel fairings and equipped with a Sensenich 76EM8S10-0-63 propeller or a MT 188 R 135 - 4 G propeller (optional, OÄM 40-203).

### **NOTE**

The performance data is valid for both propeller types, the Sensenich and the MT-Propeller.

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 for comprehensive and accurate flight planning. The values in the tables and the diagrams were obtained by means of 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).

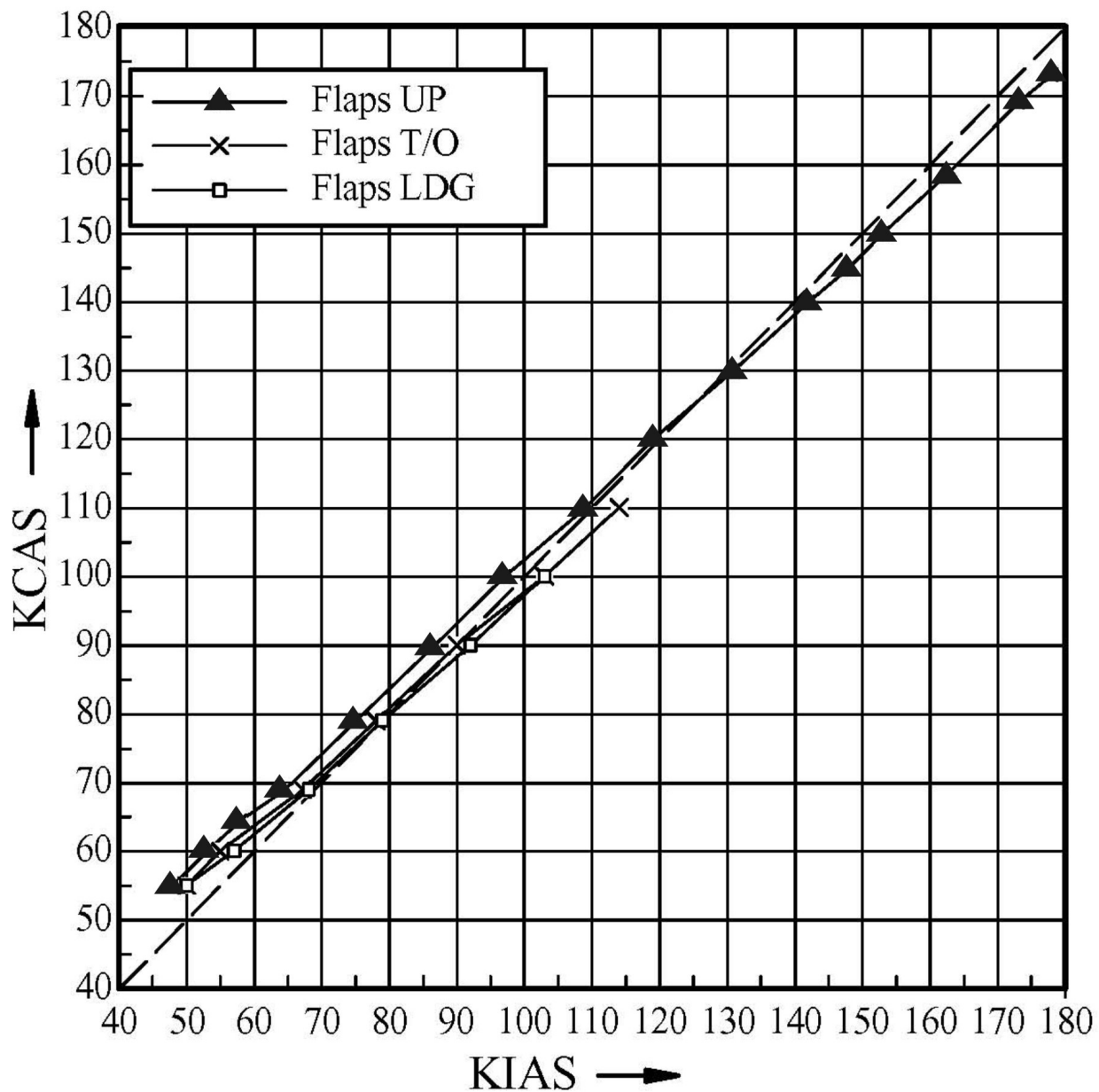
The performance diagrams do not take into account variations in pilot experience or a poorly maintained airplane. The performance given can be attained if the procedures quoted in this manual are applied and the airplane has been well maintained.

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

In order to illustrate the influence of a number of different variables, 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.

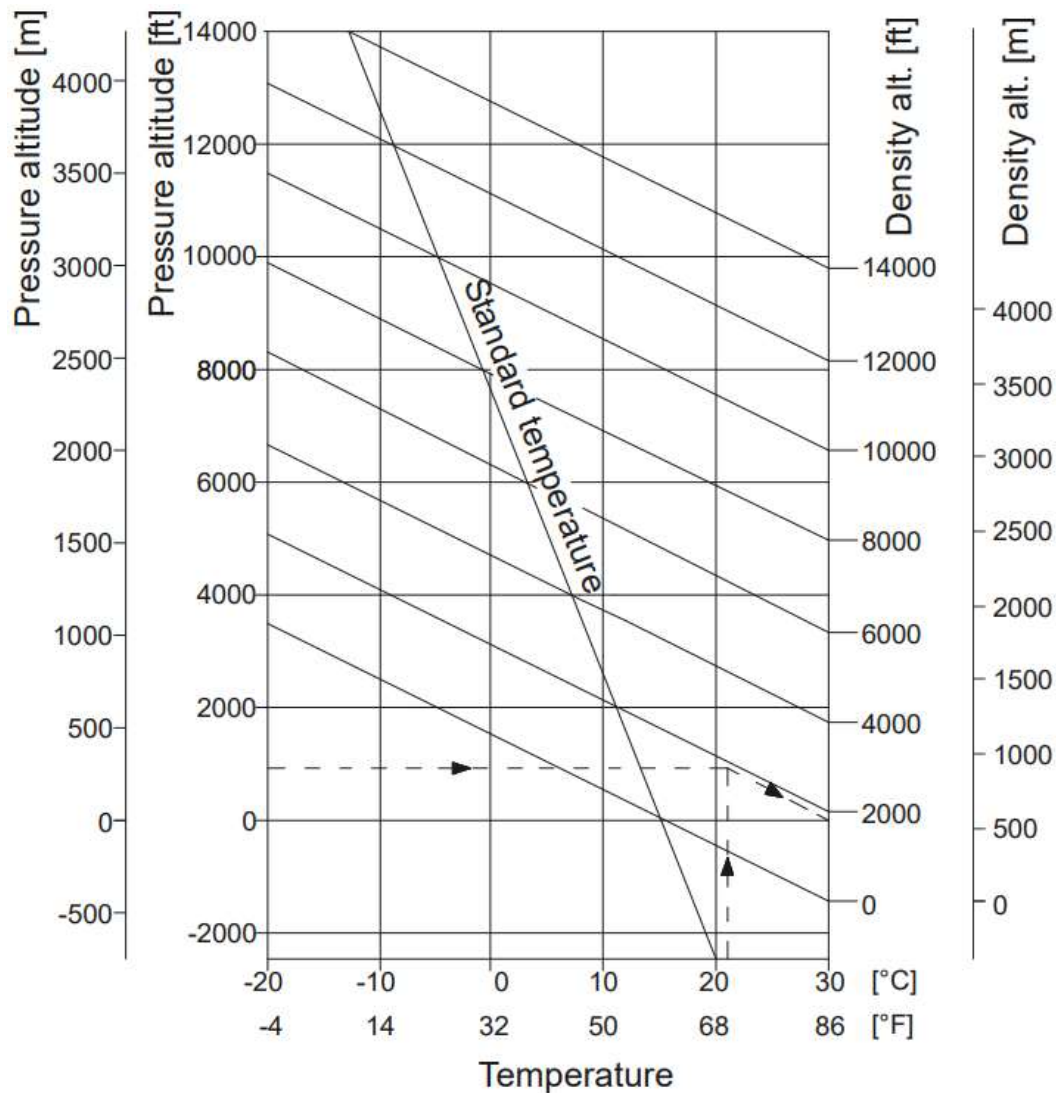
## 5.3 PERFORMANCE TABLES AND DIAGRAMS

### 5.3.1 AIRSPEED CALIBRATION



### 5.3.2 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).
3. Read off density altitude (1800 ft).

Result:

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

### 5.3.3 STALLING SPEEDS

(a) Mass: 980 kg (2161 lb)

Airspeeds in KIAS.

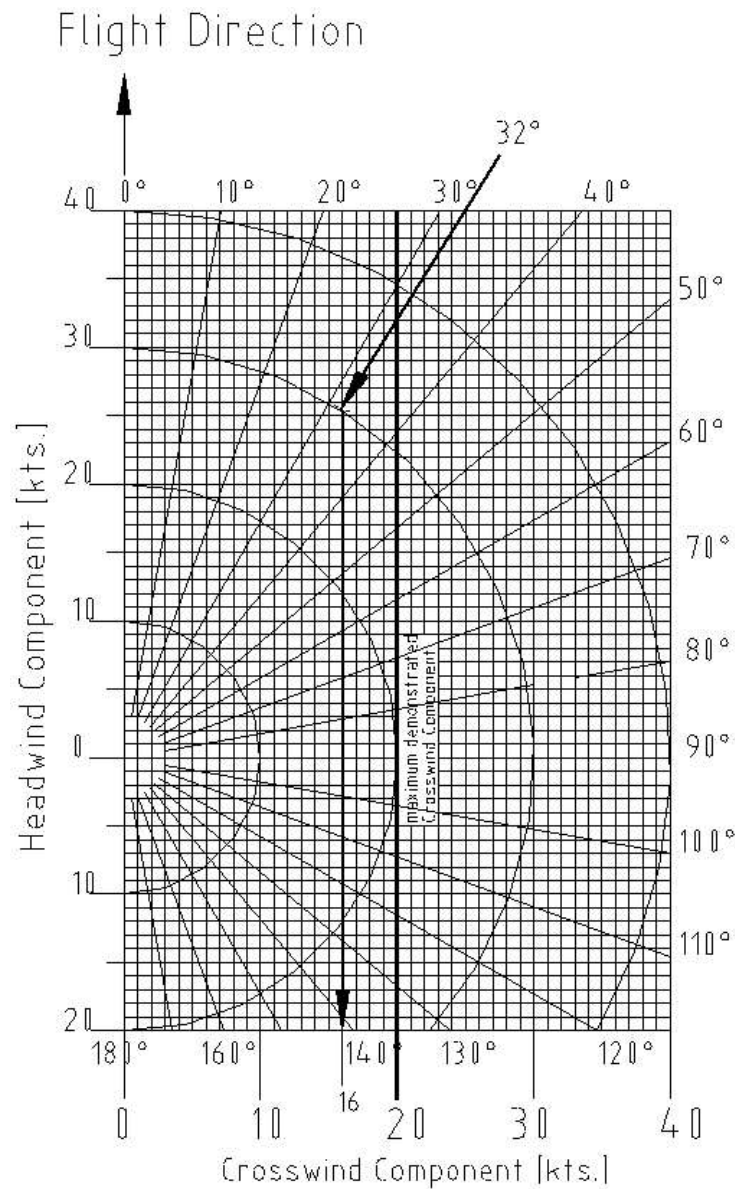
980 kg 2161 lb		Bank Angle			
		0°	30°	45°	60°
Flaps	UP	47	52	58	73
	T/O	44	51	58	72
	LDG	42	49	57	71

(b) Mass: 1150 kg (2535 lb)

Airspeeds in KIAS.

1150 kg 2535 lb		Bank Angle			
		0°	30°	45°	60°
Flaps	UP	52	57	66	79
	T/O	51	55	64	78
	LDG	49	55	62	76

### 5.3.4 WIND COMPONENTS



Example: Flight direction : 360°  
 Wind : 032°/30 kts  
 Result: Crosswind component : 16 kts  
 Max. demonstrated crosswind component : 20 kts

### **5.3.5 TAKE-OFF DISTANCE**

Conditions:

- Throttle . . . . . FULL
- Mixture . . . . . RICH (below 5000 ft)
- Carburetor heat . . . . . OFF
- Flaps . . . . . T/O
- Lift-off speed . . . . . approx. 59 KIAS
- Climb-out speed . . . . . 66 KIAS (1150 kg, 2535 lb)  
60 KIAS (1000 kg, 2205 lb)  
54 KIAS (850 kg, 1874 lb)
- Runway . . . . . level, asphalt surface

#### **WARNING**

For a safe take-off, the available runway length must be at least equal to the take-off distance over a 50 ft (15 m) obstacle.

#### **WARNING**

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

#### **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.

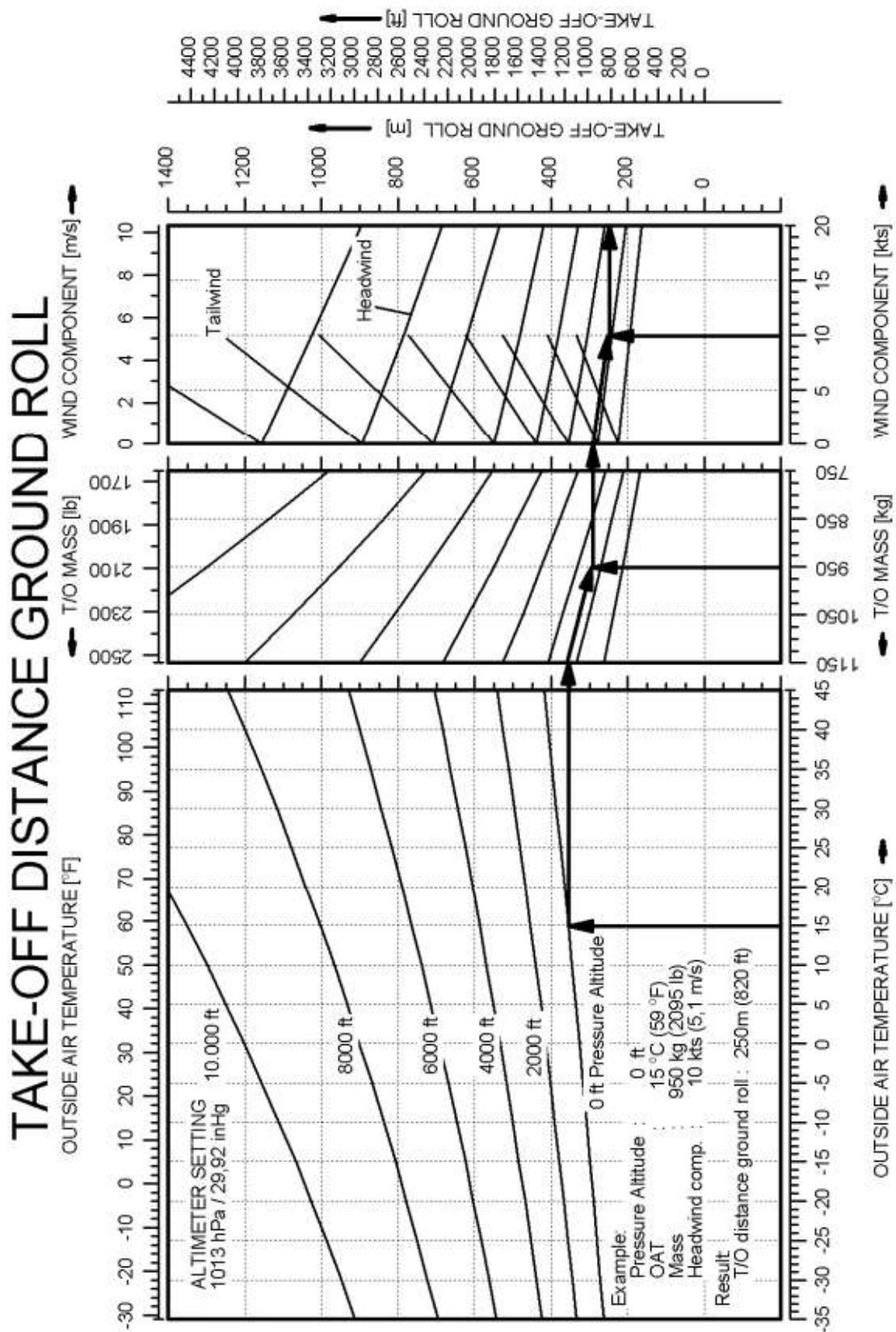
**NOTE**

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):

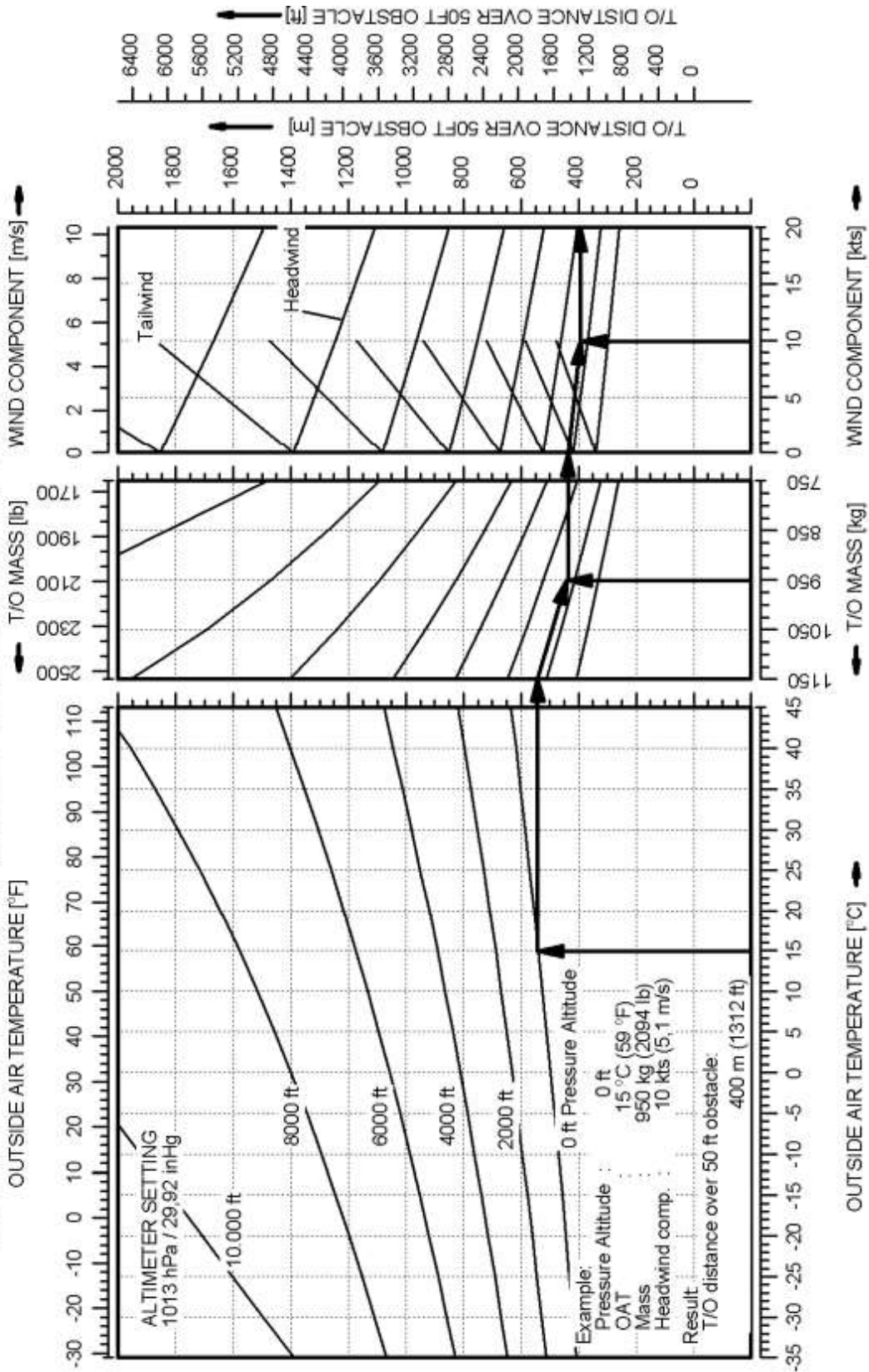
- Grass up to 5 cm (2 in) long: 10% increase in take-off roll.
- Grass 5 to 10 cm (2 to 4 in) long: 15% increase in take-off roll.
- Grass longer than 10 cm (4 in): at least 25% increase in take-off roll.

**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.



# TAKE-OFF DISTANCE OVER 50 ft OBSTACLE

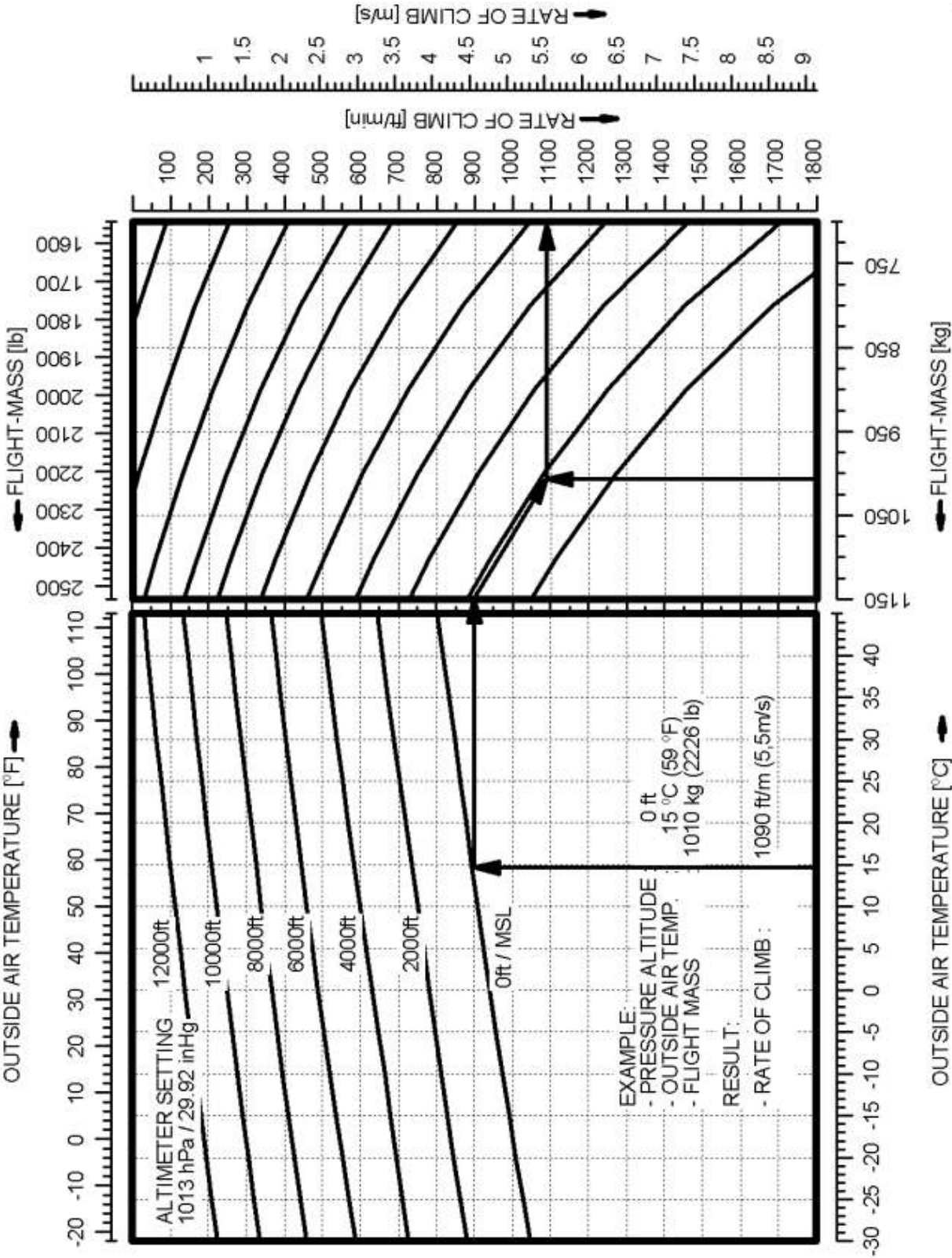


**5.3.6 CLIMB PERFORMANCE - TAKE-OFF CLIMB**

Conditions:

- Throttle . . . . . FULL
- Mixture . . . . . RICH (below 5000 ft)
- Carburetor heat . . . . . OFF
- Flaps . . . . . T/O
- Airspeed . . . . . 66 KIAS (1150 kg, 2535 lb)  
60 KIAS (1000 kg, 2205 lb)  
54 KIAS (850 kg, 1874 lb)

CLIMB PERFORMANCE - TAKE-OFF CLIMB



### **5.3.7 CLIMB PERFORMANCE - CRUISE CLIMB**

Conditions:

- Throttle . . . . . FULL
- Mixture . . . . . RICH (below 5000 ft)
- Carburetor heat . . . . . OFF
- Flaps . . . . . UP
- Airspeed . . . . . 73 KIAS (1150 kg, 2535 lb)  
68 KIAS (1000 kg, 2205 lb)  
60 KIAS (850 kg, 1874 lb)

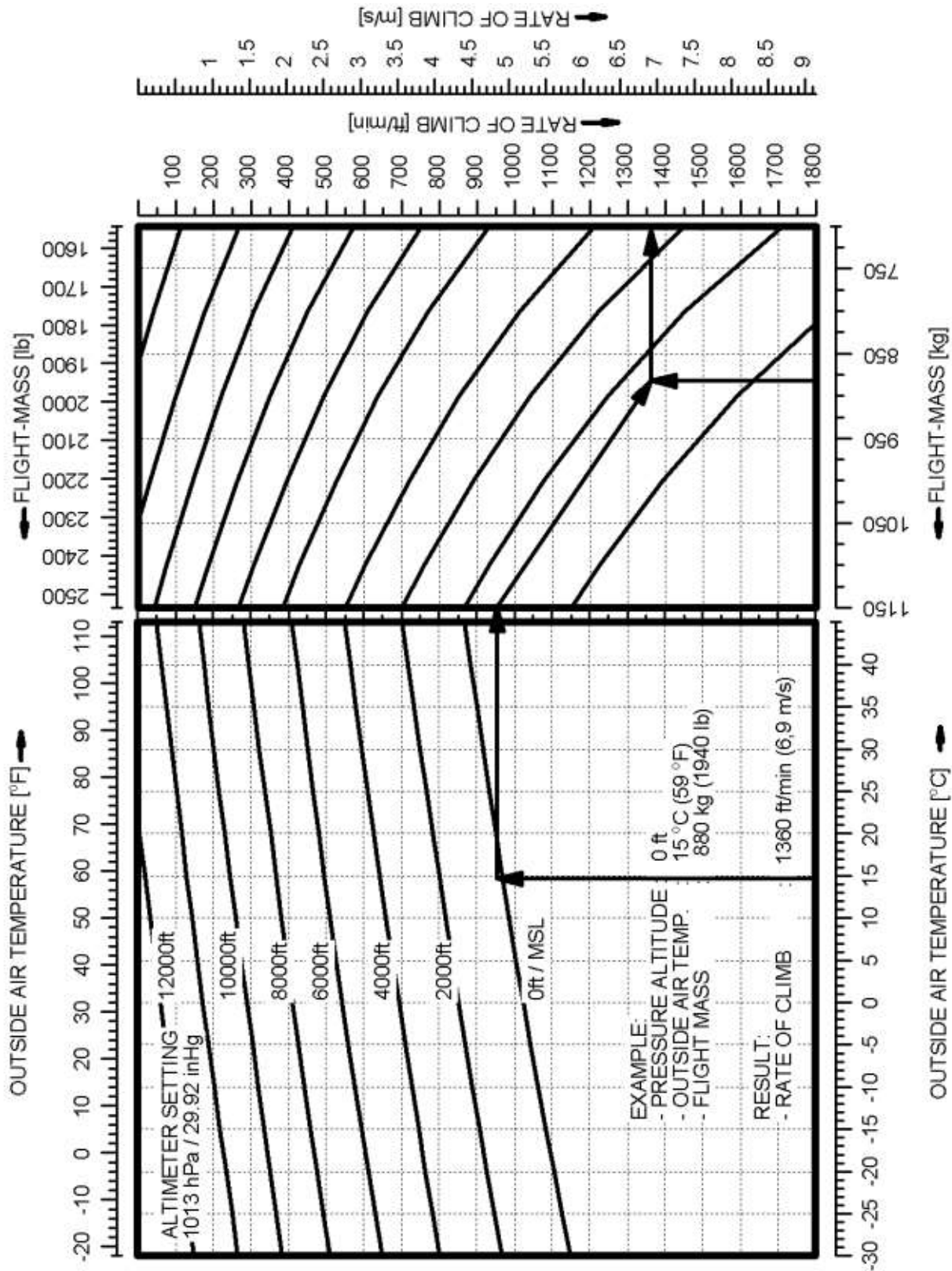
#### **NOTE**

The graph on the following page shows the **rate** of climb. The **gradient** of climb cannot easily be determined with a graph, but it can be calculated using the following formulae:

$$\text{Gradient [\%]} = \frac{\text{ROC [fpm]}}{\text{TAS [KTAS]}} \cdot 0.95$$

$$\text{Gradient [\%]} = \frac{\text{ROC [m/s]}}{\text{TAS [KTAS]}} \cdot 190$$

# CLIMB PERFORMANCE - CRUISE CLIMB



**5.3.8 ENGINE POWER SETTING, TRUE AIRSPEED, FUEL CONSUMPTION**

The table on the following page can be used to adjust best power settings and determine the resulting level-flight speeds and fuel consumption. The following steps should be followed when reading the table:

- Determine the OAT at the desired flight altitude and identify the appropriate column in the table. Refer to Section 5.3.2. for the definition of the standard atmosphere.
- Determine the pressure altitude and identify the appropriate rows in the table.
- Use appropriate RPM values from the table to arrive at desired engine power setting, airspeed and fuel consumption.

Example:

OAT: ISA + 7.5 °C (ISA + 13.5 °F)  
Pressure Altitude: 4000 ft  
Power Setting: 75%

Result:

RPM: 2550 RPM  
Airspeed: 129 KTAS  
Fuel Flow: 12.1 US gal/h

## CRUISE PERFORMANCE

Pressure Altitude	Power Settings	OAT: ISA - 15 °C (ISA - 27 °F)		OAT According to ISA		OAT: ISA + 15 °C (ISA + 27 °F)	
		RPM	Airspeed	RPM	Airspeed	RPM	Airspeed
[ft]	[%]		[KTAS]		[KTAS]		[KTAS]
MSL	FOT*	2700	137	2700	139	2700	140
	85%	2440	120	2510	125	2570	130
	75%	2300	110	2370	115	2430	120
	65%	2150	99	2220	104	2280	109
2000	FOT*	2700	139	2700	140	2700	140
	85%	2510	125	2580	131	2650	136
	75%	2380	115	2440	121	2510	126
	65%	2230	104	2290	110	2360	115
4000	FOT*	2700	140	2700	140	2700	140
	85%	2590	131	2660	137	2700	140
	75%	2450	121	2520	127	2580	131
	65%	2300	110	2370	116	2440	121

\* Full open throttle, unless limited by max. RPM (best power setting).

Pressure Altitude	Power Settings	OAT: ISA - 15 °C (ISA - 27 °F)		OAT According to ISA		OAT: ISA + 15 °C (ISA + 27 °F)	
		RPM	Airspeed	RPM	Airspeed	RPM	Airspeed
[ft]	[%]		[KTAS]		[KTAS]		[KTAS]
6000	FOT*	2700	140	2700	140	2700	139
	85%	2660	137	2700	140	-	-
	75%	2530	127	2590	132	2660	136
	65%	2380	116	2460	122	2510	125
8000	FOT*	2700	140	2700	139	2690	138
	85%	2700	140	-	-	-	-
	75%	2600	132	2670	137	2690	138
	65%	2460	122	2520	126	2570	129
10000	FOT*	2690	139	2690	138	2690	137
	85%	-	-	-	-	-	-
	75%	2670	137	2690	138	-	-
	65%	2520	126	2590	130	2610	131

\* Full open throttle, unless limited by max. RPM (best power setting).

Pressure Altitude	Power Settings	OAT: ISA - 15 °C (ISA - 27 °F)		OAT According to ISA		OAT: ISA + 15 °C (ISA + 27 °F)	
		FF Best Power	FF Best Econ.	FF Best Power	FF Best Econ.	FF Best Power	FF Best Econ.
[ft]	[%]	[US gal/hr]	[US gal/hr]	[US gal/hr]	[US gal/hr]	[US gal/hr]	[US gal/hr]
MSL	FOT*	14.2	12.9	14.5	13.2	14.5	13.2
	85%	12.6	11.6	12.8	11.7	13.1	11.8
	75%	11.7	10.3	11.8	10.4	11.9	10.5
	65%	10.6	9.0	10.7	9.1	10.7	9.2
2000	FOT*	14.5	13.2	14.5	13.2	14.2	12.8
	85%	12.8	11.7	13.1	11.8	13.2	11.9
	75%	11.8	10.4	11.9	10.4	12.0	10.6
	65%	10.7	9.1	10.7	9.2	10.7	9.3
4000	FOT*	14.5	13.2	14.2	12.7	13.7	12.2
	85%	13.1	11.8	13.3	12.0	13.5	12.1
	75%	11.9	10.5	12.0	10.6	12.1	10.7
	65%	10.7	9.2	10.7	9.3	10.7	9.4

\* Full open throttle, unless limited by max. RPM (best power setting).

Pressure Altitude	Power Settings	OAT: ISA - 15 °C (ISA - 27 °F)		OAT According to ISA		OAT: ISA + 15 °C (ISA + 27 °F)	
		FF Best Power	FF Best Econ.	FF Best Power	FF Best Econ.	FF Best Power	FF Best Econ.
[ft]	[%]	[US gal/hr]	[US gal/hr]	[US gal/hr]	[US gal/hr]	[US gal/hr]	[US gal/hr]
6000	FOT*	14.2	12.7	13.5	12.2	13.0	11.6
	85%	13.3	12.0	13.5	12.1	-	-
	75%	12.0	10.6	12.1	10.7	12.2	10.8
	65%	10.7	9.3	10.7	9.4	10.7	9.5
8000	FOT*	13.5	12.2	12.9	11.5	12.2	10.7
	85%	13.5	12.1	-	-	-	-
	75%	12.2	10.7	12.3	10.8	12.3	-
	65%	10.7	9.5	10.7	9.6	10.8	9.7
10000	FOT*	12.9	11.5	12.1	10.7	11.1	9.8
	85%	-	-	-	-	-	-
	75%	12.3	10.8	12.4	-	-	-
	65%	10.7	9.6	10.8	9.7	10.8	9.7

\* Full open throttle, unless limited by max. RPM (best power setting).

**NOTE**

As a result of propeller blade angle tolerances, level-flight airspeeds can vary from the book data up to 10%.

**NOTE**

The fuel flow data corresponds to the best power mixture setting. Best economy mixture setting decreases fuel consumption by approximately 10%.

**NOTE**

The leaning procedure can be reviewed in Section 4A.4.10 - Mixture Adjustment.

**NOTE**

In case of operation with wheel fairings the cruising speed increases by approximately 3%.

**NOTE**

An auxiliary fuel below 3 US gal cannot be indicated by the system. If a fuel indicator shows 17 US gal and the auxiliary fuel indicator 0 US gal for the same fuel tank, for in-flight consumption / flight planning a fuel quantity available of 17 US gal must be assumed.

**5.3.9 LANDING DISTANCE - FLAPS LDG**

Conditions:

- Throttle . . . . . IDLE
- Mixture . . . . . RICH (below 5000 ft)
- Carburetor heat . . . . . OFF
- Flaps . . . . . LDG
- Approach speed . . . . . 71 KIAS (1150 kg, 2535 lb)  
63 KIAS (1000 kg, 2205 lb)  
58 KIAS (850 kg, 1874 lb)
- Runway . . . . . level, asphalt surface

Values for ISA and MSL, at 1150 kg (2535 lb)	
Landing distance over a 50 ft (15 m) obstacle	approx. 817 m (2680 ft)
Ground roll	approx. 466 m (1529 ft)

**WARNING**

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

**WARNING**

Poor maintenance condition of the airplane, deviation from the given procedures as well as unfavorable outside conditions (high temperature, rain, unfavorable wind conditions, including crosswind) will increase the landing distance.

**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**

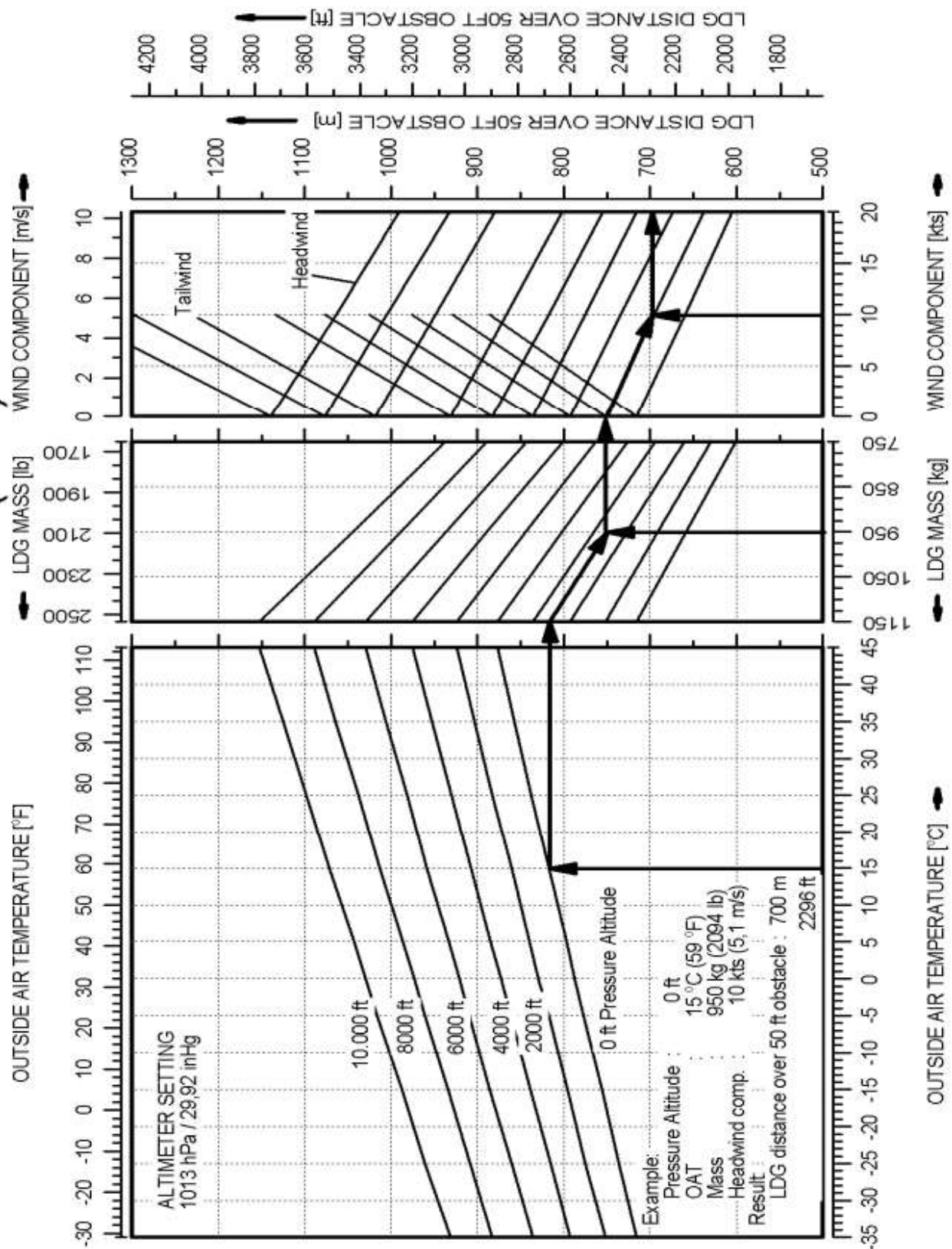
For landings on dry, short-cut grass covered runways, the following corrections must be taken into account, compared to paved runways (typical values, see CAUTION above):

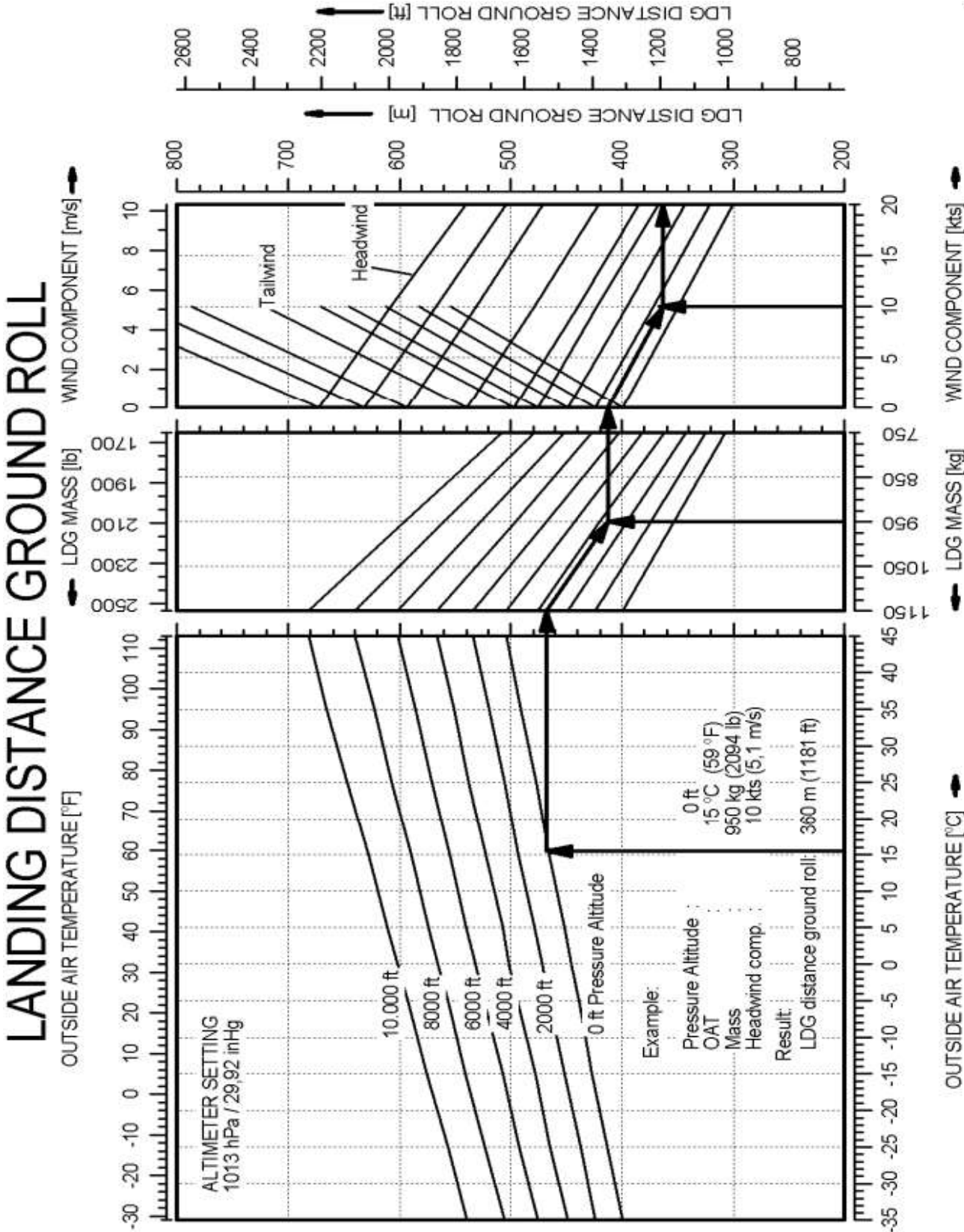
- Grass up to 5 cm (2 in) long: 5% increase in landing roll.
- Grass 5 to 10 cm (2 to 4 in) long: 15% increase in landing roll.
- Grass longer than 10 cm (4 in): at least 25% increase in landing roll.

**NOTE**

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 OVER 15 m (50 ft) OBSTACLE





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

The DA 40 F reaches a constant gradient of climb of 8.2% in the following condition:

- Mass . . . . . max. flight mass (1150 kg, 2235 lb)
- Throttle . . . . . FULL
- Mixture . . . . . RICH
- Carburetor heat . . . . . OFF
- Flaps . . . . . LDG
- Airspeed . . . . . 70 KIAS
- ISA, MSL

### **5.3.11 APPROVED NOISE DATA**

ICAO Annex 16, Volume 1, Part II, Chapter X : 74.8 dB(A)

FAR 36 Appendix G : 74.91 dB(A)

If the MT 188 R 135 - 4 G propeller is installed (OÄM 40-203):

ICAO Annex 16, Volume 1, Part II, Chapter X : 75.8 dB(A)

FAR 36 Appendix G : 75.8 dB(A)

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

**CHAPTER 6**  
**MASS AND BALANCE**

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## **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.

■ Pilots are responsible for adhering to the permissible values for loading and center of gravity (CG). In this, pilots should note the movement of the CG due to fuel consumption. The permissible CG range during flight is given in Section 6.4.4.

■ 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.

The extended baggage compartment allows a baggage mass of 45 kg (100 lb) to be carried when the baggage net is installed. The permissible mass and balance envelope is not changed.

### **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 meters (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 liters = 8 qts), plus unusable fuel (4 liters = approx. 1 US gal).



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

The following information enables you to operate your DA 40 F 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:

- 6.4.1 - MOMENT ARMS
- 6.4.2 - LOADING DIAGRAM
- 6.4.3 - CALCULATION OF LOADING CONDITION
- 6.4.4 - PERMISSIBLE CENTER OF GRAVITY RANGE
- 6.4.5 - PERMISSIBLE MOMENT RANGE

The diagrams should be used as follows:

1. 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 F" in Table 6.4.3 - CALCULATION OF LOADING CONDITION.
2. Read the fuel quantity indicators to determine the fuel quantity.

### **(a) Standard Tank**

#### **NOTE**

If an indicator shows 17 US gal, up to 20 US gal can be in the tank. In this case, the exact quantity must be determined with the fuel quantity measuring device. If this measurement is not carried out, the fuel quantity for mass and CG calculation must be assumed to be 20 US gal.

### **(b) Long Range Tank (if Installed)**

#### **NOTE**

When the fuel quantity indicator reads 16 US gal, read the auxiliary fuel quantity by setting the AUX FUEL QTY switch to the appropriate position (LH or RH), and add the auxiliary fuel quantity to the 16 US gal.

**NOTE**

An auxiliary fuel quantity below 3 US gal cannot be indicated by the system. For auxiliary fuel quantities below 3 US gal, the correct fuel quantity must be determined with the fuel quantity measuring device (see section 7.10 - FUEL SYSTEM). If this measurement is not carried out, the fuel quantity for mass and CG calculation must be assumed to be 20 US gal.

3. 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 liters. 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 U.S. units: 2.0 qts multiplied by the mass density of 1.86 lb/qts gives a mass of 3.7 lb.)

4. 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 Table 6.4.3 - CALCULATION OF LOADING CONDITION.
5. Add up the masses and moments in the respective columns. The total moments may be rounded to whole numbers. 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 inside the limits.

As an illustration the total mass and the CG position are entered on Diagram 6.4.4 - PERMISSIBLE CENTER OF GRAVITY RANGE. This checks graphically that the current configuration of the airplane is within the permissible range.

6. Graphical method:

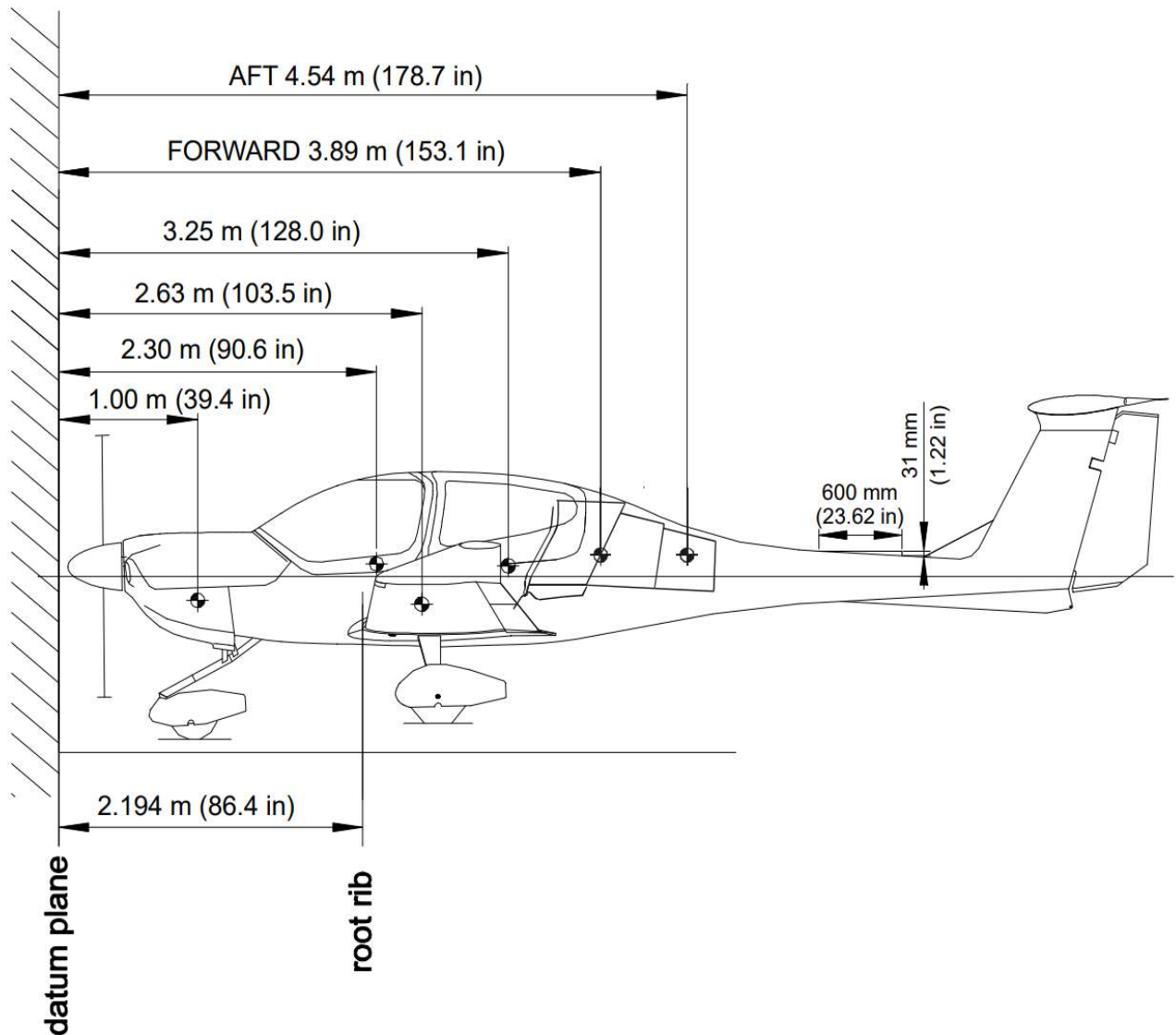
Diagram 6.4.2 - LOADING DIAGRAM is used to determine the moments. The masses and moments for the individual items of loading are added. Then Diagram 6.4.5 - PERMISSIBLE MOMENT RANGE is used to check whether the total moment associated with the total mass is in the admissible range.

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

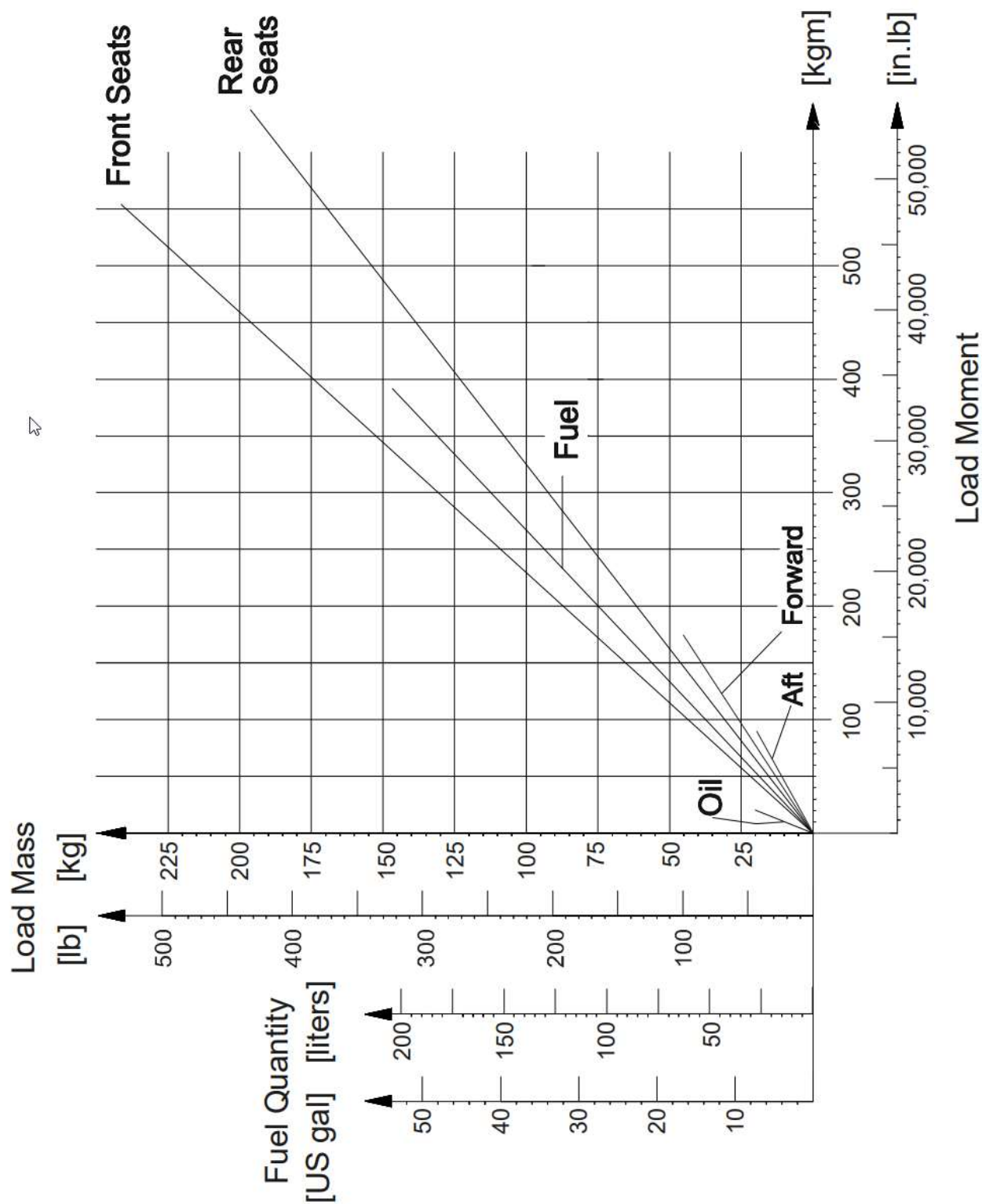
### 6.4.1 MOMENT ARMS

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 tank   | : | 2.63 m      | 103.5 in |
| - Baggage     | : | see diagram |          |



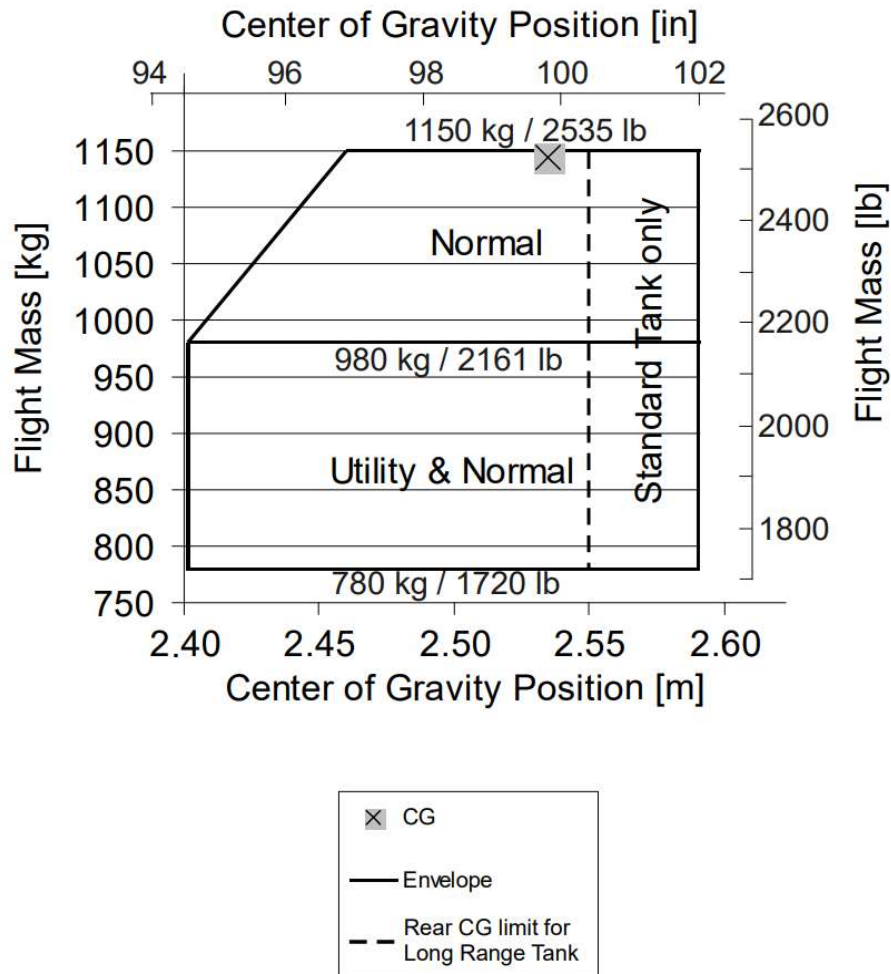
## 6.4.2 LOADING DIAGRAM



**6.4.3 CALCULATION OF LOADING CONDITION**

<b>CALCULATION OF LOADING CONDITION</b>		<b>DA 40 F (Example)</b>		<b>Your DA 40 F</b>	
		<b>Mass [kg] [lb]</b>	<b>Moment [kgm] [in.lb]</b>	<b>Mass [kg] [lb]</b>	<b>Moment [kgm] [in.lb]</b>
1.	Empty mass (from Mass and Balance Report)	781.1 1722	1898.1 164,750		
2.	Oil not added Lever arm: 1.00 m (39.4 in)	-1.7 -3.7	-1.7 -146		
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)	70 154	227.5 19,712		
5.	Forward baggage compt. Lever arm: 3.89 m (153.1 in)	25 55.0	97.2 8,421		
6.	Aft baggage compartment Lever arm: 4.54 m (178.7 in)	10 22	45.4 3,931		
7.	Total mass and total moment with empty fuel tanks (Total of 1.-6.)	1034.4 2280.3	2611.5 226,657		
8.	On-board usable fuel (0.72 kg/liter) (6.01 lb/US gal) Lever arm: 2.63 m (103.5 in)	109.4 241	287.7 24,944		
9.	Total mass and total moment with full fuel tanks (Total 7. plus 8.)	1143.8 2521.3	2899.2 251,600		
10.	<p>The total moments from rows 7 and 9 (2611.5 and 2899.2 kgm) (226,657 and 251,600 in.lb) must be divided by the related total mass (1034.4 and 1143.8 kg respectively) (2280.3 and 2521.3 lb) and then located in Diagram 6.4.4 - PERMISSIBLE CENTER OF GRAVITY RANGE.</p> <p>As in our example CG positions (2.525 m and 2.535 m respectively) (99.4 and 99.8 in) and masses fall into the permitted area, this loading condition is allowable.</p>				

#### 6.4.4 PERMISSIBLE CENTER OF GRAVITY RANGE



The CG shown in the diagram is that from the example in Table 6.4.3 - CALCULATION OF LOADING CONDITION, row 9 (pre take-off condition).

The flight CG position must lie within the following limits:

Most forward flight CG:

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

Most rearward flight CG:

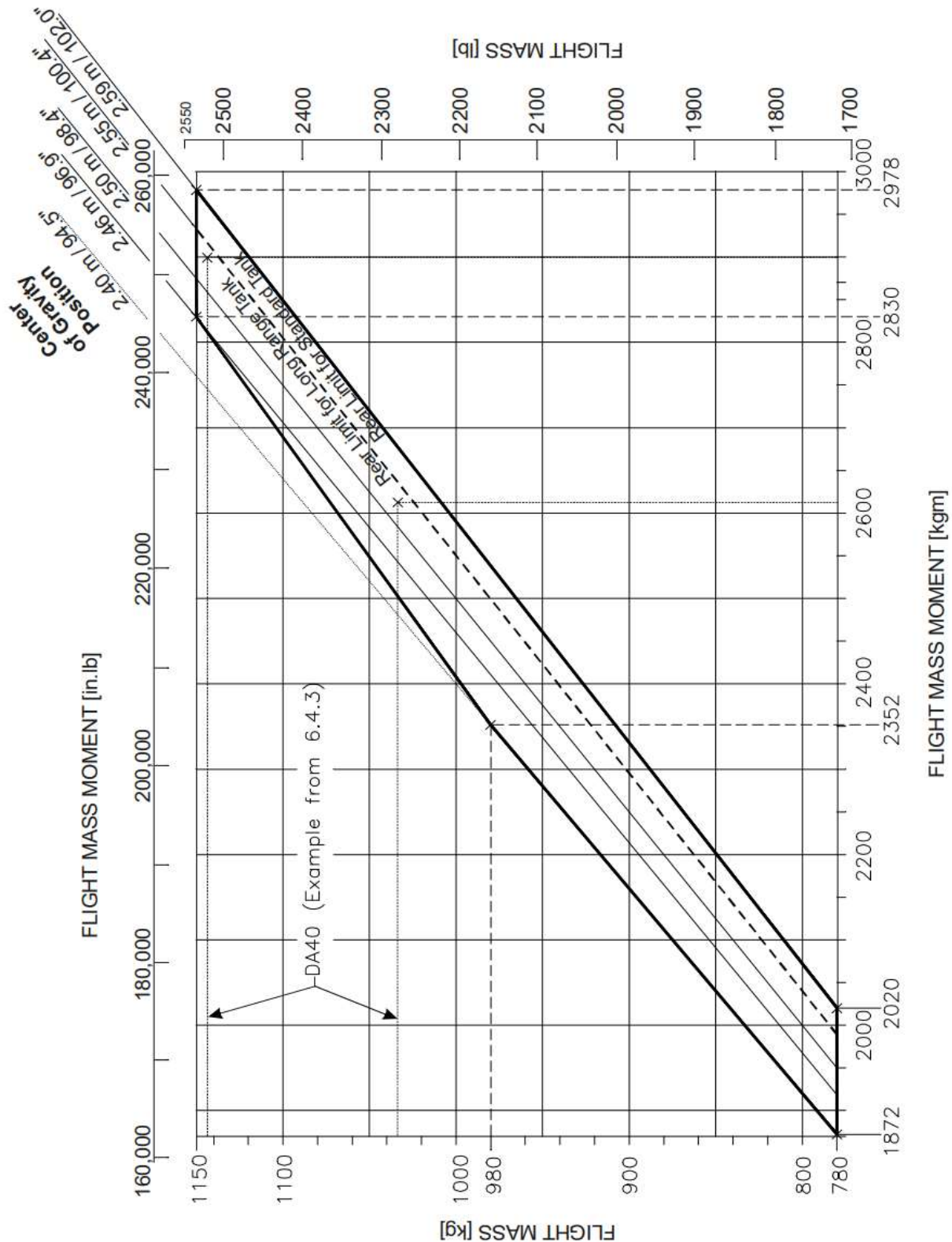
*a) Standard Tank:*

2.59 m (102.0 in) aft of Datum Plane

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

2.55 m (100.4 in) aft of Datum Plane

### 6.4.5 PERMISSIBLE MOMENT RANGE



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

All equipment that is approved for installation in the DA 40 F 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**

This equipment cannot be installed in any arbitrary combination. Contact Diamond Aircraft before changing the combination and / or the location of equipment. Approved combinations of equipment are shown in Section 7.4 INSTRUMENT PANEL of the Airplane Flight Manual.

Description	Type	Part No.	Manufacturer	Installed	Mass		Lever Arm	
					lb	kg	in	m
<b>AVIONICS COOLING</b>								
Cooling fan	ACF 328	ACF 328	Sandia Aerospace					
<b>COMMUNICATION</b>								
COMM #1 antenna	DMC63-1/A		DM					
COMM #2 antenna	DMC63-2		DM					
COMM #1	GNS 430	36853	Garmin		5.10	2.31	70.08	1.78
COMM #1	GNS 430	40505	Garmin		5.10	2.31	70.08	1.78
COMM #2	GNS 430	36853	Garmin		5.10	2.31	70.08	1.78
COMM #2	GNS 430	40505	Garmin		5.10	2.31	70.08	1.78
COMM #2	GNS 430	011-00280-00	Garmin		5.10	2.31	70.08	1.78
COMM #2	GNS 430	011-00280-10	Garmin		5.10	2.31	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 (full kit)	GMA 340	010-00152-00	Garmin					
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					

Description	Type	Part No.	Manufacturer	Installed	Mass		Lever Arm	
					lb	kg	in	m
<b>ELECTRICAL POWER</b>								
Battery	CB24-11M (G243)		Concorde (Gill)		28.0	12.7	47.0	1.19
Ammeter current sensor	VM1000	3010022	Vision Microsyst.					
Voltage regulator		VR2000-28-1	Electrosyst., Inc.					
External power connector			Diamond					
Alternator	ALU-8521LS	ALU-8521LS	Electrosyst., Inc.					
<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		3.00	1.36	126.7	3.22
Safety belt, RH pax	5-01-() Series	5-01-1B0701	Schroth		3.00	1.36	126.7	3.22
ELT unit		E-01	ACK		3.00	1.36	173.2	4.40
ELT remote switch		E0105	ACK					
ELT antenna		E0109	ACK					
ELT unit	ME 406	453-6603	Artex		2.00	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					
MLG SPK LH		DA4-3219-01-00	Diamond					

Description	Type	Part No.	Manufacturer	Installed	Mass		Lever Arm	
					lb	kg	in	m
MLG SPK RH		DA4-3219-02-00	Diamond					
NLG SPK		DA4-3229-00-00	Diamond					
Baggage extension (OÄM 40-163)								
Baggage net (OÄM 40-163)								
Baggage tray and lid (OÄM 40-164)								
<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					
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		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

Description	Type	Part No.	Manufacturer	Installed	Mass		Lever Arm	
					lb	kg	in	m
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.					
<b>HYDRAULIC</b>								
Master cylinder		10-54A	Cleveland					
Parking valve		60-5D	Cleveland					
Brake assembly		30-239B	Cleveland					
<b>INDICATING / REC. SYSTEM</b>								
Digital chronometer	Model 803		Davtron					
Flight timer		85000-12	Hobbs					
Flight timer		85094-12	Hobbs					
Annunciator panel	WW-IDC 001		White Wire					

Description	Type	Part No.	Manufacturer	Installed	Mass		Lever Arm	
					lb	kg	in	m
CO detector	Model 452-201		CO Guardian LLC					
<b>LANDING GEAR</b>								
<i>LANDING GEAR STANDARD FAIRINGS</i>								
MLG wheel fairing LH		D41-3213-91-00	Diamond					
MLG wheel fairing RH		D41-3213-92-00	Diamond					
NLG wheel pant shell LH		D41-3223-91-00_1	Diamond					
NLG wheel pant shell RH		D41-3223-92-00_1	Diamond					
NLG strut fairing assy		DA4-3227-90-00	Diamond					
<i>LANDING GEAR SPEEDKIT</i>								
MLG speed cover LH		DA4-3219-27-00_1	Diamond					
MLG speed cover RH		DA4-3219-28-00_1	Diamond					
MLG sheet cover LH		DA4-3219-25-00	Diamond					
MLG sheet cover RH		DA4-3219-26-00	Diamond					
MLG cover speed LH		DA4-3219-21-00	Diamond					
MLG cover speed RH assembly		DA4-3219-22-00	Diamond					
MLG strut cover LH		DA4-3219-23-00	Diamond					
MLG strut cover RH		DA4-3219-24-00	Diamond					
NLG wheel pant shell LH		D41-3223-91-00_1	Diamond					
NLG wheel pant shell RH		D41-3223-92-00_1	Diamond					
NLG strut cover		DA4-3229-29-00	Diamond					

Description	Type	Part No.	Manufacturer	Installed	Mass		Lever Arm	
					lb	kg	in	m
LANDING GEAR SMALL TIRES AND FAIRINGS								
MLG wheel fairing assy small tire LH		DA4-3215-91-00	Diamond					
MLG wheel fairing assy small tire RH		DA4-3215-92-00	Diamond					
NLG wheel fairing shell LH		DA4-3225-91-00	Diamond					
NLG wheel fairing shell RH		DA4-3225-92-00	Diamond					
Bracket assy LH MLG wheel fairing		DA4-3215-31-00	Diamond					
Bracket assy RH MLG wheel fairing		DA4-3215-32-00	Diamond					
Brake cover MLG wheel frame LH		DA4-3215-93-00	Diamond					
Brake cover MLG wheel frame RH		DA4-3215-94-00	Diamond					
NLG strut fairing assy		DA4-3227-90-00	Diamond					
LANDING GEAR SMALL TIRES AND FAIRINGS WITH MAINTENANCE ACCESS								
MLG wheel fairing assy access door LH		DA4-3215-91-00X01	Diamond					
MLG wheel fairing assy access door RH		DA4-3215-92-00X01	Diamond					
NLG wheel fairing shell LH		DA4-3225-91-00X01	Diamond					
NLG wheel fairing shell RH		DA4-3225-92-00	Diamond					
Bracket assy LH MLG wheel fairing		DA4-3215-31-00	Diamond					
Bracket assy RH MLG wheel fairing		DA4-3215-32-00	Diamond					
Brake cover MLG wheel frame LH		DA4-3215-93-00	Diamond					
Brake cover MLG wheel frame RH		DA4-3215-94-00	Diamond					
NLG strut fairing assy		DA4-3227-90-00	Diamond					

Description	Type	Part No.	Manufacturer	Installed	Mass		Lever Arm	
					lb	kg	in	m
<b>LIGHTS</b>								
Map / Reading light assy crew		W1461.0.010	Rivoret					
Cabin Light		W1461.0.010	Rivoret					
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	Quantaflex					
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 light power supply LH/RH	A490ATS-CF-14/28	01-0770062-05	Whelen		1.592	0.722	101.0	2.566
Taxi light	70346	01-0770346-05	Whelen					
Landing light	70346	01-0770346-03	Whelen					
Electro luminescent lamps	Quantaflex 1600		Quantaflex					
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					
<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		1.90	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		1.90	0.86	70.08	1.78
Altimeter inHg/mbar, secondary	LUN 1128	1128-14B6	Mikrotechna		1.39	0.63	70.08	1.78

Description	Type	Part No.	Manufacturer	Installed	Mass		Lever Arm	
					lb	kg	in	m
Vertical speed indicator		7000	United Instruments		1.20	0.54	70.08	1.78
Vertical speed indicator	LUN 1144	1144-A4B4	Mikrotechna		0.90	0.40	70.08	1.78
Airspeed indicator		8025	United Instruments		0.70	0.32	70.08	1.78
Airspeed indicator	LUN 1116	1116-B4B3	Mikrotechna		0.77	0.35	70.08	1.78
Magnetic compass		C2400L4P	Airpath		0.65	0.293	70.08	1.78
Directional gyro, free	AIM2051BLD	505-0031-931	BF-Goodrich		2.60	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
Transponder	GTX 327	011-00490-00	Garmin		2.40	1.09	70.08	1.78
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 data system	SAE5-35	305154-00	Sandia Aerospace					
NAV antenna coupler	CI505		Comant					
VOR/LOC/GS antenna	CI157P		Comant					
NAVCOM/GPS #1	GNS 430	36853	Garmin		6.50	2.95	70.08	1.78
NAVCOM/GPS #1	GNS 430	40505	Garmin		6.50	2.95	70.08	1.78
Dual NAV/Dual GS antenna coupler	CI 1125		Comant					
CDI, VOR/LOC/GS #1	GI 106A	013-00049-01	Garmin		1.40	0.64	70.08	1.78
CDI, VOR/LOC/GS #2	GI 106A	013-00049-01	Garmin		1.40	0.64	70.08	1.78
GPS antenna #1	GA 56	011-00134-00	Garmin					

Description	Type	Part No.	Manufacturer	Installed	Mass		Lever Arm	
					lb	kg	in	m
GPS antenna #2	GA 56	011-00134-00	Garmin					
<b>ENGINE</b>								
Engine	O-360-A4M		Textron Lycoming					
<b>ENGINE FUEL CONTROL</b>								
Fuel flow transmitter	VM1000	3010073	Vision Microsyst.					
Fuel pressure transmitter	VM1000	3010016	Vision Microsyst.					
<b>ENGINE IGNITION SYSTEM</b>								
SlickSTART booster	SS1001		Unison					
Magneto RH/LH	4370/4347		Slick					
Magneto RH/LH	4770/4771		Slick					
<b>ENGINE INDICATING</b>								
RPM sensor	VM1000	3010005	Vision Microsyst.					
Manifold pressure sensor	VM1000	3010015	Vision Microsyst.					
Cyl. head temp. probes (4 each)	VM1000	1020061	Vision Microsyst.					
EGT probes	VM1000	1020060	Vision Microsyst.					
Data processing unit <sup>1</sup>	DPU	4010081	Vision Microsyst.					
Integr. engine data display	VM1000	4010050	Vision Microsyst.					
I/O board assy		3020018	Vision Microsyst.					

Description	Type	Part No.	Manufacturer	Installed	Mass		Lever Arm	
					lb	kg	in	m
<i>ENGINE OIL</i>								
Oil temperature sensor	VM1000	3010018	Vision Microsyst.					
Oil pressure transducer	VM1000	3010041	Vision Microsyst.					
<i>ENGINE STARTING</i>								
Starter	149-24LS		Skytec					
<b>PROPELLER SYSTEM</b>								
Propeller	76EM8S10-0-63		Sensenich					
Propeller	MT 188 R 135 - 4 G		MT-Propeller					
MT-spinner assy	P-742-5-B		MT-Propeller					
<b>AIRPLANE FLIGHT MANUAL</b>		Doc. No. 6.01.02(-E)	Diamond					

<sup>1)</sup> DPU with P/N 4010081 or DPU with P/N 3034241 and software revision V2.002 for the standard tank.

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## CHAPTER 7

# DESCRIPTION OF THE AIRPLANE AND ITS SYSTEMS

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## **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 UP 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 UP 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 while 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.

### **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

### **7.3.6 PEDAL ADJUSTMENT**

#### **NOTE**

The pedals may only be adjusted on the ground!

The pedals are unlocked by pulling the black handle which is located behind the rear attachment.

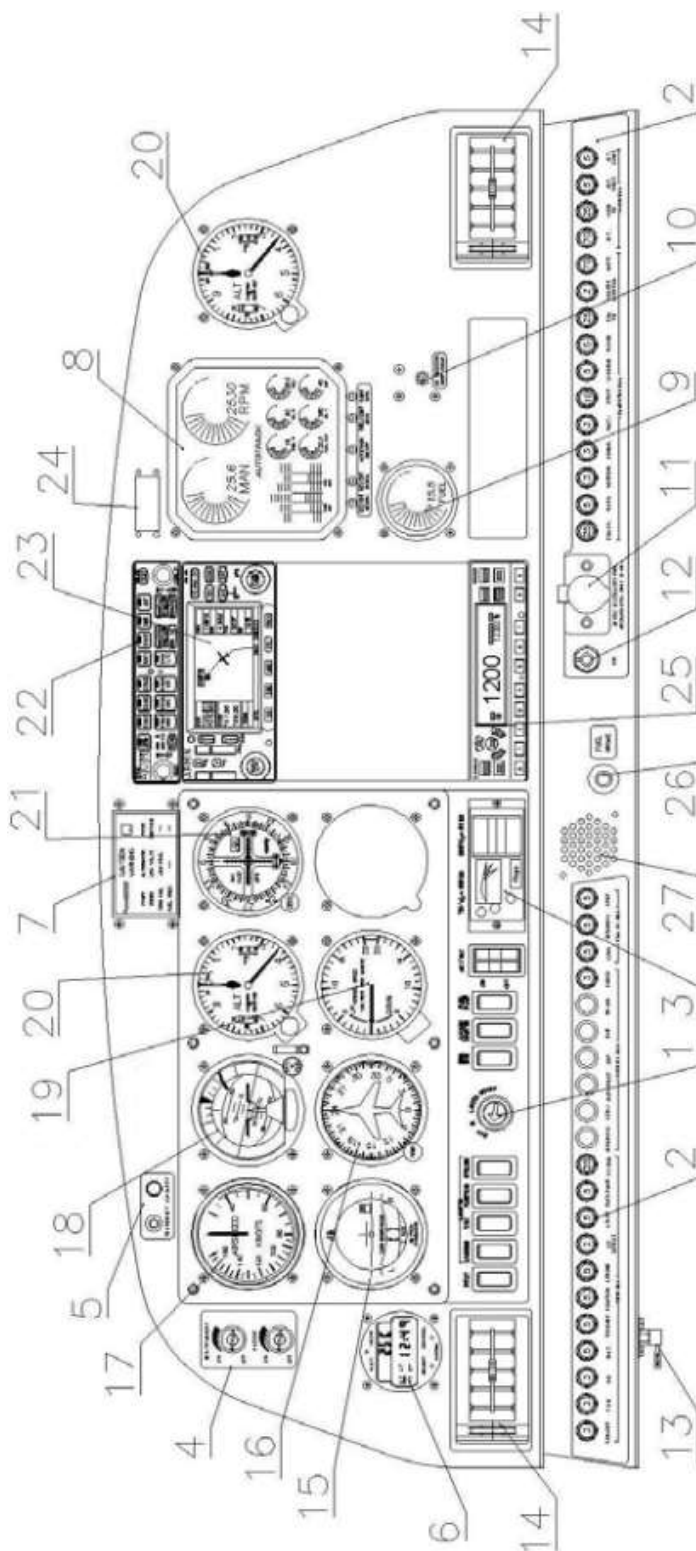
#### **(a) Forward Adjustment**

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

#### **(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.

## 7.4 INSTRUMENT PANEL



Major Instruments and Controls			
1	Electrical switches, ignition switch	15	Turn & bank indicator
2	Circuit breakers*	16	Directional gyro
3	Flap selector switch	17	Airspeed indicator (ASI)
4	Rotary buttons for instrument lighting and flood light	18	Attitude gyro (artificial horizon)
5	Test button for CO-detector	19	Vertical speed indicator (VSI)
6	Chronometer with OAT indicator	20	Altimeter
7	Annunciator panel	21	Course deviation indicator (CDI)
8	Engine instruments	22	Audio panel / Marker / Intercom
9	Fuel quantity indicator	23	COM / NAV / GPS
10	Carbon-Monoxide detector	24	ELT control unit
11	Accessory power socket	25	Transponder
12	Microphone socket	26	Fuel prime button
13	Alternate static valve	27	Stall warning horn
14	Ventilation nozzles		

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

### NOTE

The figures and the table show the typical DA 40 F installation for the equipment. The actual installation may vary due to the approved equipment version.

*If the Long Range Tank is installed:*

The following switch is installed adjacent to the fuel quantity indicator:



#### **7.4.1 COCKPIT VENTILATION**

Ventilation in the front is provided by the movable ventilation nozzles (14) 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 or a silicone damper.

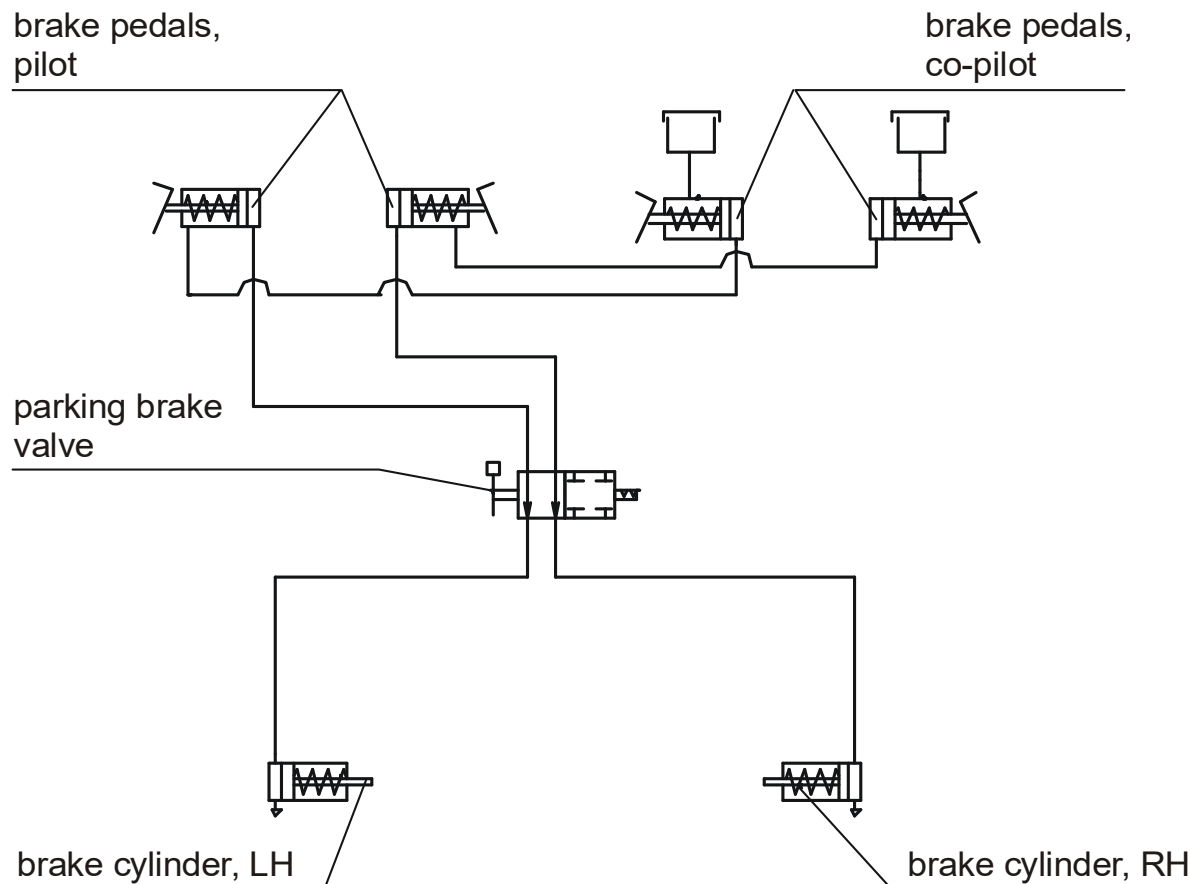
The wheel fairings are removable. When flying without wheel fairings, it should be noted that there is a reduction in some areas of performance (see Chapter 5).

#### **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 parking brake 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.

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 belt's clip into the belt lock, and are opened by pressing the release button on the belt lock.

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

## **7.7 BAGGAGE COMPARTMENT**

The extended baggage compartment consists of the standard baggage compartment behind the rear seats and the baggage extension mounted in the rear bulkhead.

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 extension also has a removable panel in the bottom to allow access for inspection of the rear fuselage area.

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.

Without the baggage net, no baggage may be loaded.

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

### **7.8.1 CANOPY**

The canopy is closed by pulling down on the canopy frame. The canopy is latched with the canopy handle on the left hand side of the canopy frame. On latching, bolts engage into mating holes in plastic blocks.

“Cooling gap” position: the bolts are able to engage in a second setting to leave a gap under the canopy.

The canopy can be locked by a key lock (optional) on the left side near the outside canopy handle by turning the key clockwise. The closed and locked canopy can be unlatched from inside by pulling the lever inside of the canopy handle.

## WARNING

The airplane may be operated with the canopy in the “cooling gap” position on the ground only. Before take-off the canopy must be completely closed and latched.

Do not lock the canopy with the key before flight to assure emergency evacuation from outside.

The windows on both sides of the canopy can be opened for additional ventilation or as emergency windows.

### **7.8.2 PASSENGER DOOR**

The passenger door is closed in the same way, by pulling down on the passenger door frame or on the handle (if installed). The passenger door is latched with the passenger door handle. A gas pressure damper prevents the passenger door from dropping; in strong winds the assembly must be securely held. The passenger door is protected against unintentional opening by the safety hook.

The passenger door can be locked by a key lock (optional) on the left side near the outside passenger door handle by turning the key clockwise. The closed and locked passenger door can be unlatched from inside by pulling the lever inside of the passenger door handle.

## WARNING

Do not lock the passenger door with the key before flight to assure emergency access from outside.

### **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).

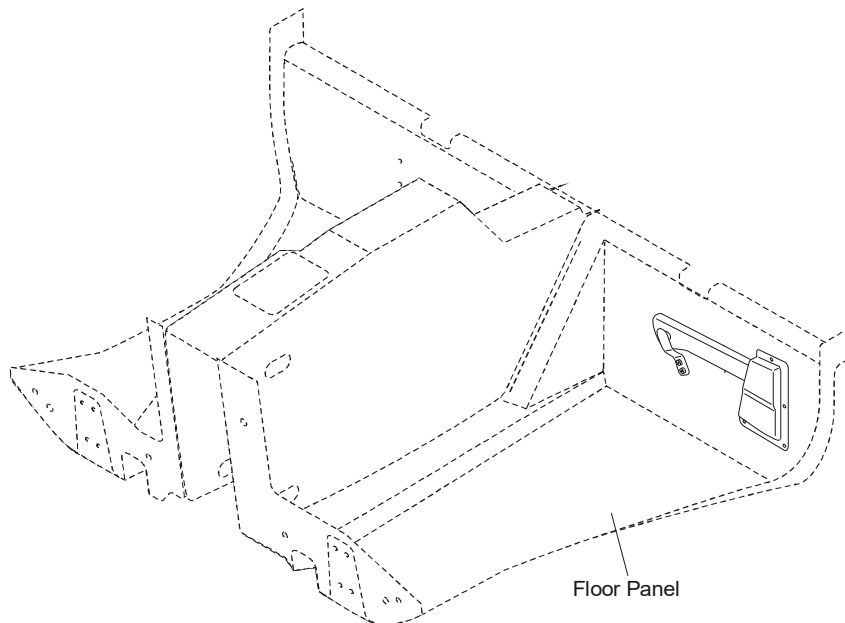
If the canopy can not be opened in case of an emergency use the emergency axe to break through the canopy.

### **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.

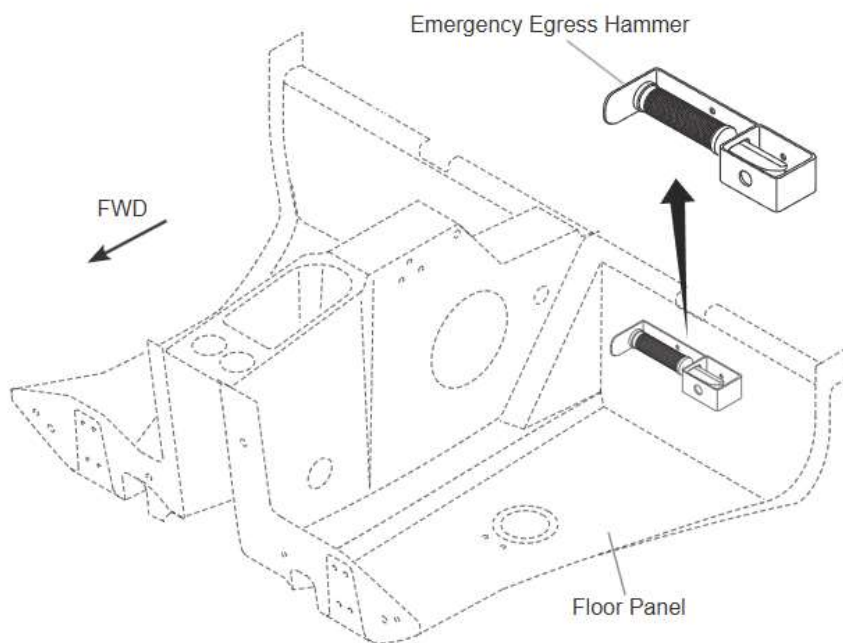
If the canopy can not be opened in case of an emergency use the emergency egress hammer to break through the canopy.

#### **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 O-360-A4M: Air-cooled four-cylinder four-stroke engine. Horizontally-opposed direct-drive engine with carburetor 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

The principal engine accessories at the front of the engine are the starter motor and the alternator. The twin magneto system and the mechanical fuel pump are at the rear of the engine. Fuel is supplied via a carburetor 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 two levers: throttle 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.

#### **I** (b) 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** (c) Carburetor Heat

In the event of the loss of manifold pressure because of carburetor icing or blocking of the air filter, there is the possibility of drawing air from the engine compartment. This air is ducted around the exhaust muffler and preheated. Thus pulling the carburetor heat lever will prevent carburetor icing, but may lead to a reduction of engine power.

### **CAUTION**

Make sure to de-activate the carburetor heat during a misapproach.

The operating lever for carburetor heat is located at the center console, left to the throttle lever. To activate the carburetor heat the lever is pulled to the rear. Normally carburetor heat is de-activated (closed), with the lever in the forward position.

### **7.9.3 PROPELLER**

■ A Sensenich 76EM8S10-0-63 metal propeller or an MT188 R 135-4 G wood-composite propeller (OÄM 40-203) is installed.

#### **CAUTION**

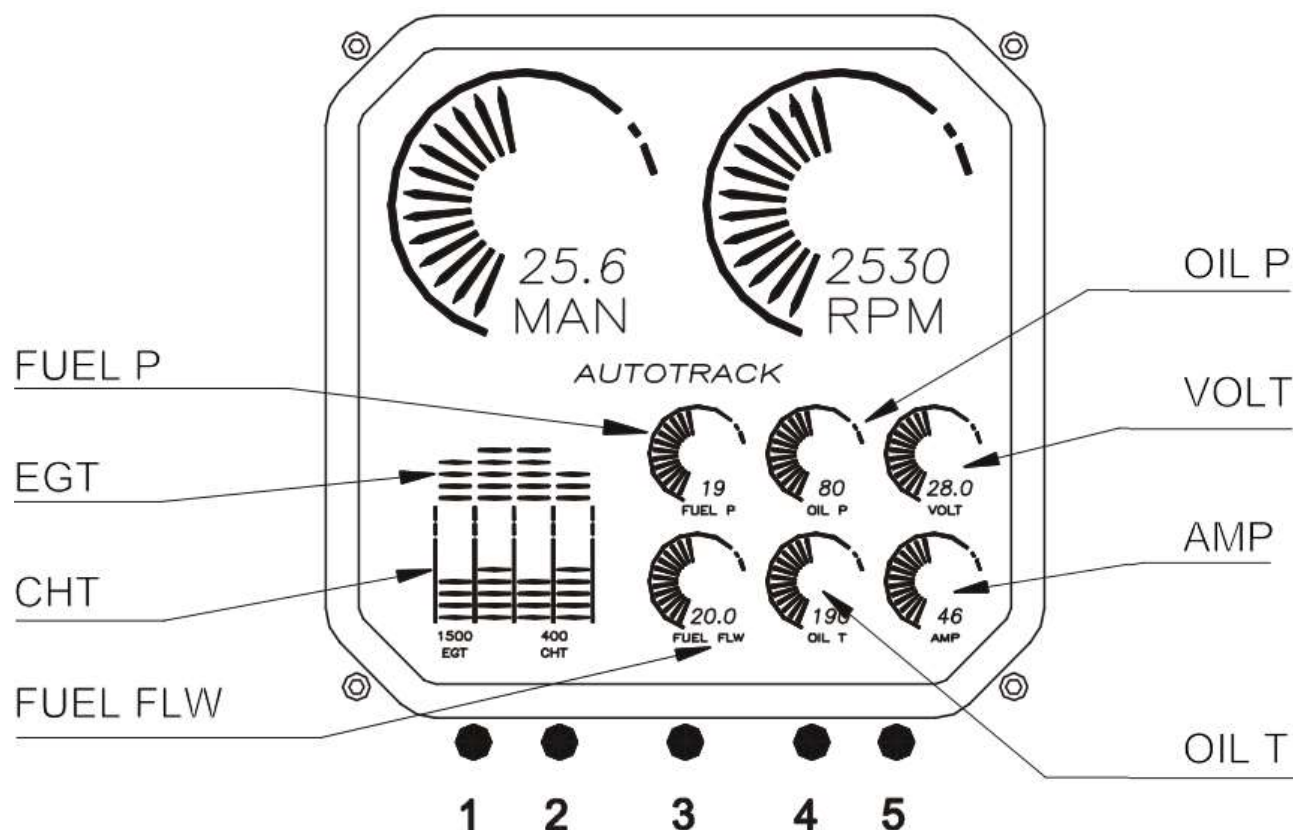
Operation on the ground at high RPM should be avoided as far as possible, as the blades could suffer stone damage. For this reason a suitable site for engine runs (magneto and propeller checks) should be selected, where there are no loose stones or similar items.

#### **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.

### 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 on switch-on 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 the 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	Engine 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 2 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. 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 goes into 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.

#### **I (g) Button 5: Engine Data Recorder**

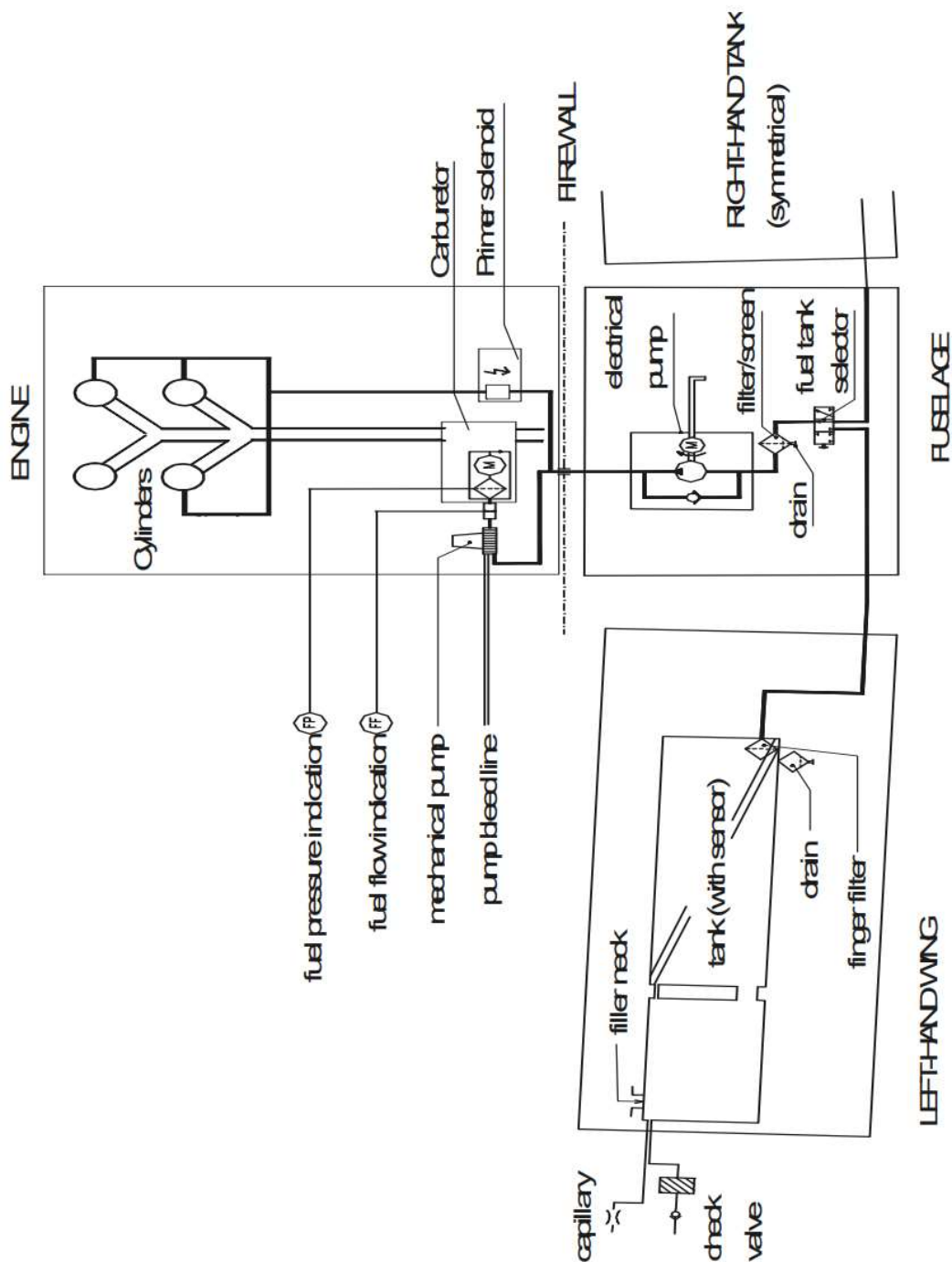
Operating button 5 will activate the engine data recorder. The digital values shown are the minimum values recorded by the engine instrument unit during operation, such as lowest voltage, lowest fuel pressure, etc. The numerical RPM indicator will indicate the total operating hours.

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.

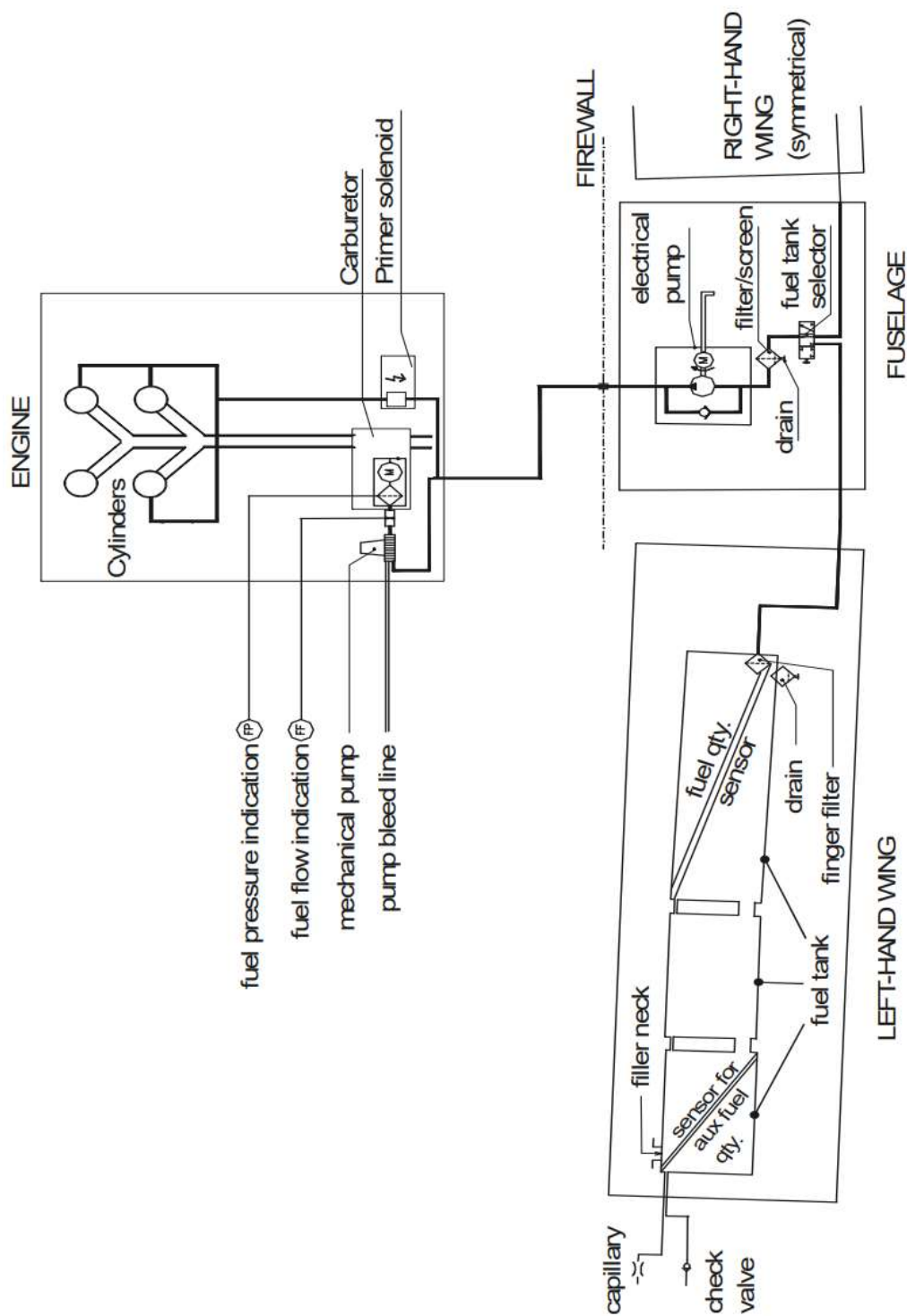
Data of the engine data recorder can be called during or immediately after flight only. With each new flight the old data will be overwritten.

## 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 PRIMER SYSTEM**

The engine is equipped with a primer system. By pushing the primer button in the cockpit a solenoid valve is opened and fuel is pumped into three cylinders. The MAP sensor is installed on the fourth cylinder.

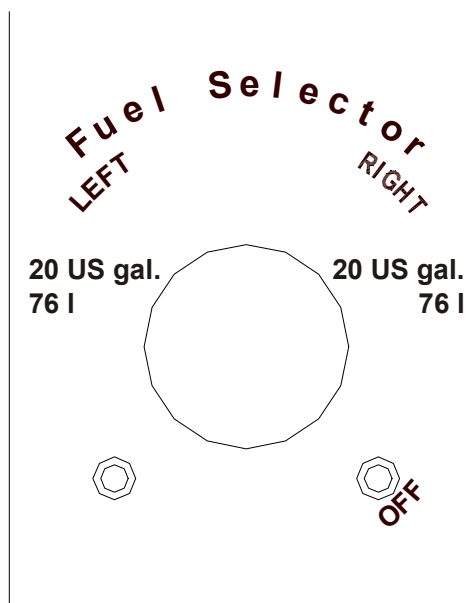
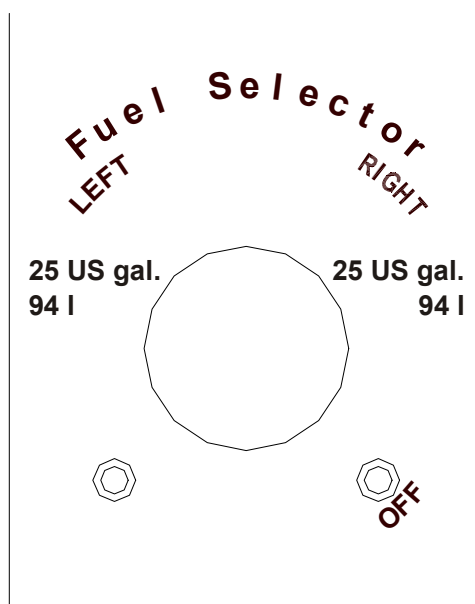
The primer system will only operate with the electrical fuel pump switched on.

### **CAUTION**

The primer system is not intended for operation in flight.

### **7.10.5 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.

**I** (a) Standard Tank**I** (b) Long Range Tank (if Installed)

### **7.10.6 FUEL TANKS**

Each of the two wing tanks consists of two (*three, if the Long Range Tank is installed*) 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 meters (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.

#### **(a) Fuel Quantity Indication**

##### ***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, the maximum quantity that can be indicated is 17 US gal. Up to an actual quantity of 17 US gal the indication is correct. At an actual quantity above 17 US gal the indication remains at 17 US gal.

### **NOTE**

When the fuel quantity 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 and the fuel quantity that must be assumed for mass and CG calculations is 20 US gal.

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

To determine the fuel quantity in the larger tanks an additional capacity probe is installed in each wing tank (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 liters).

Fuel quantities up to 16 US gal (approximately 60 liters) in each wing tank (LH / RH) are measured by the standard sensors and indicated on the fuel quantity indicator either on the left or right side in 1 US gal (approximately 4 liters) increments.

Fuel quantities between 16 US gal (approximately 60 liters) and 25 US gal (approximately 94 liters) are measured by additional sensors and indicated in the center of the fuel quantity indicator. The indication increments are 3 US gal (approximately 11 liters) between 0 and 3 US gal (approximately 11 liters) and 1 US gal (approximately 4 liters) between 3 US gal (approximately 11 liters) and 9 US gal (approximately 34 liters). Which side (LH / RH) is being indicated depends on the position of the AUX FUEL QTY. switch (refer to Section 7.4 - INSTRUMENT PANEL).

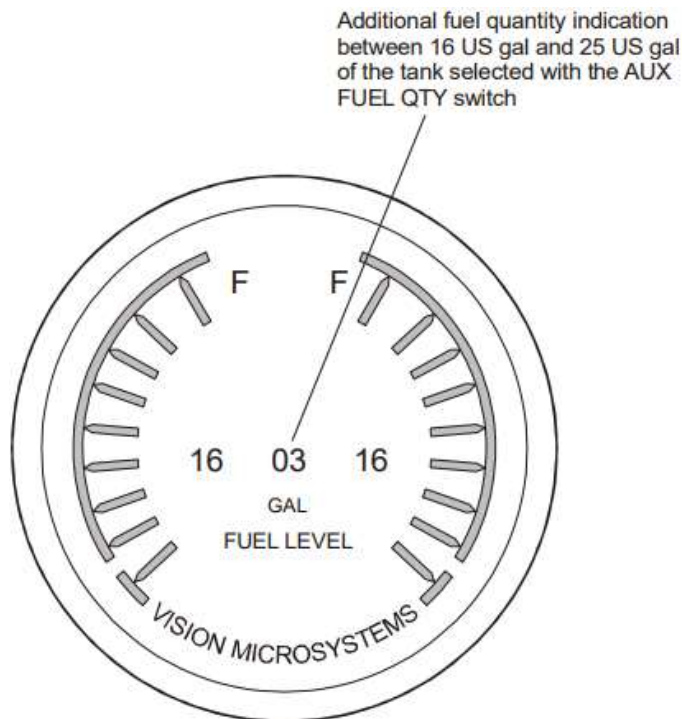
**|** The indications on the left and right sides of the instrument (from 0 US gal to 16 US gal (approximately 60 liters)) will not be affected.

The actual total fuel quantity in each wing tank is the sum of the individual indications.

**CAUTION**

After selecting a fuel tank with the AUX FUEL QTY. switch, the fuel quantity indication will be incorrect for 2 minutes.

**|** Additional fuel quantity indication between 16 US gal (approximately 60 liters) and 25 US gal (approximately 94 liters) of the wing tank is selected with the AUX FUEL QTY. switch.

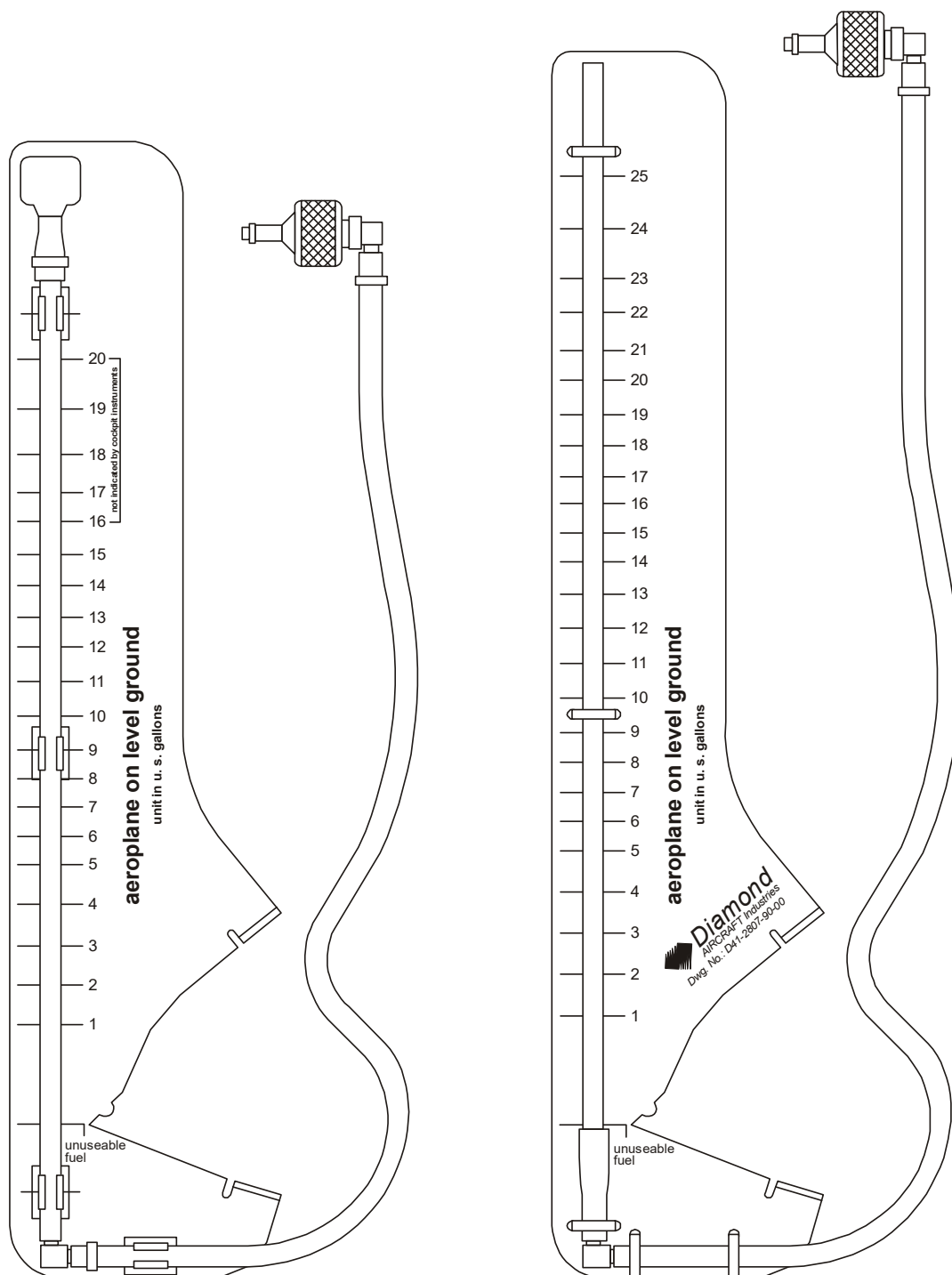


### **7.10.7 FUEL QUANTITY MEASURING DEVICE**

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.

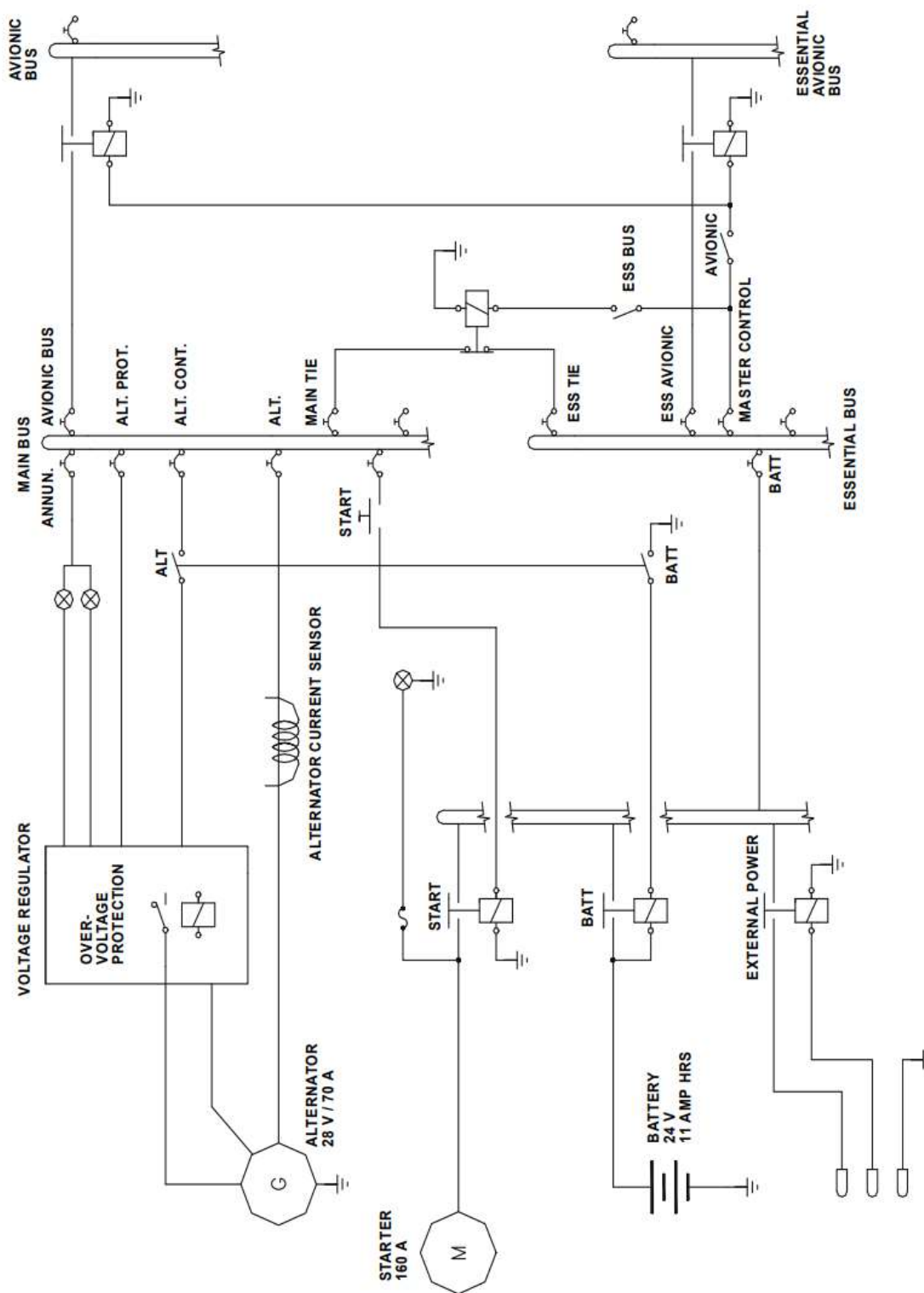
For an exact indication the airplane must stand on level ground.

The designated place for the fuel quantity measuring device is the bag on the rear side of the pilot seat.



Fuel quantity measuring device for standard tank (left) and long range tank (right)

## 7.11 ELECTRICAL SYSTEM



### **7.11.1 GENERAL**

The DA 40 F 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 an 11 ampère-hour lead-acid battery, which is mounted in the right-hand side of the engine compartment. The battery is connected to the airplane electrical system via the main (70 ampère) circuit breaker.

In addition, a non-rechargeable dry battery is installed in the IFR model as a further source of power for the attitude gyro (artificial horizon) 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. During each 100 hour inspection, this battery is checked for proper functioning. Every 2 years or after use (broken seal on the switch) the battery cells must be replaced.

#### **(c) Distribution**

Electrical power is distributed via the “Main Bus” and 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.”

### (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.

### (f) Ignition

The DA 40 F 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.

### (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.

### (h) Ammeter

The ammeter displays the current with which the alternator is being loaded.

### (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.

### (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.

### (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.

### **|** (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.

### **|** (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 WHITE WIRE ANNUNCIATOR PANEL (WARNING, CAUTION AND STATUS LIGHTS)**

#### **|** (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 in 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 1 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 canopy and/or the passenger door is not closed and locked.

#### **I** (j) 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.

#### **I** (k) 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.

#### **I** (l) Trim Failure Warning Message (TRIM FAIL)

The White Wire annunciator panel is prepared for the installation of an autopilot in the DA 40 F. 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).

#### **I** (m) 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 lower and rear edges of the same 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 an alternate static valve is 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.

## **7.13 STALL WARNING**

If airspeed drops below approximately 10 to min. 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.

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## CHAPTER 8

# AIRPLANE HANDLING, CARE AND MAINTENANCE

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## **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 Sensenich 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.

**I** (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 otherwise the control surfaces can hit the stops in strong tail wind. 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.

**I**  
**I**  
**I**  
**I** **NOTE**

The figures on the following page 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 F 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 F 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, the airplane should be protected against moisture and dampness. The airplane should not be stored outdoors for long periods of time. 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 PASSENGER DOOR**

The canopy and passenger 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. Should doubts arise, an appropriately rated inspector must be consulted.

#### **8.5.4 ENGINE**

Engine cleaning is part of the scheduled inspections.

#### **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.

#### **8.6 GROUND DE-ICING**

Approved de-icing fluids are:

Manufacturer	Name
Kilfrost	TKS 80
Aeroshell	Compound 07
Any source	AL-5 (DTD 406B)

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.

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**CHAPTER 9**  
**SUPPLEMENTS**

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## 9.1 INTRODUCTION

Chapter 9 contains information concerning additional (optional) equipment of the DA 40 F.

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
A2	Intercom System, Model PM 1000 II PS Engineering, Inc.	2	15-Mar-2005	<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, 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"/>
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"/>

Airplane S/N:		Registration:		Date:	
Sup. No.	Title	Rev. No.	Date	Applicable	
				YES	NO
A20	Course Deviation Indicator GI 106A Garmin	1	15-Mar-2005	<input type="checkbox"/>	<input type="checkbox"/>
A25	Audio Panel GMA 340 VFR	2	15-Mar-2005	<input type="checkbox"/>	<input type="checkbox"/>
A26	COM/NAV/GPS GNS 430 VFR	1	15-Mar-2005	<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"/>
N023	Operation in Brazil	0	10-Oct-2008	<input type="checkbox"/>	<input type="checkbox"/>
O1	Operation of the DA 40 F with Winter Kit	0	26-Jan-2006	<input type="checkbox"/>	<input type="checkbox"/>
O2	Intentional Spin	0	26-Feb-2007	<input type="checkbox"/>	<input type="checkbox"/>
S01	Emergency Locator Transmitter Model E-01 ACK	2	15-Mar-2005	<input type="checkbox"/>	<input type="checkbox"/>
S04	ELT Artex ME 406 "ACE"	1	10-Apr-2007	<input type="checkbox"/>	<input type="checkbox"/>
S05	Canopy Jettison System	0	24-Jan-2007	<input type="checkbox"/>	<input type="checkbox"/>