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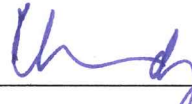
## AIRPLANE FLIGHT MANUAL

### DA 40 NG

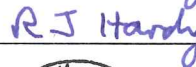
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**Airworthiness Category** : Normal<sup>1</sup>  
**Requirement** : JAR-23  
**Serial Number** : \_\_\_\_\_  
**Registration** : \_\_\_\_\_  
**Doc. No.** : 6.01.15-E  
**Date of Issue** : 01-Apr-2010

Signature :



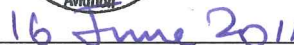
EASA Project Manager :



Stamp :



Date of Approval :



(EASA App. Date)

- This Airplane Flight Manual is approved with EASA Approval No. 10025781.
- This Airplane Flight Manual is FAA approved for U.S. registered aircraft in accordance with the provisions of 14 CFR Section 21.29, and is required by FAA Type Certificate Data
- Sheet no.: A 47CE.

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**FOREWORD**

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

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 NG.

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, the pilot must familiarize himself with the complete contents of this Airplane Flight Manual.

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

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N.A. Otto-Strasse 5  
A-2700 Wiener Neustadt, Austria  
Phone. : +43-2622-26700  
Fax : +43-2622-26780  
E-Mail : [office@diamond-air.at](mailto:office@diamond-air.at)

## **0.1 APPROVAL**

The content of approved chapters is approved by EASA. All other content is approved by DAI under the authority of EASA DOA No. EASA.21J.052 in accordance with Part 21.

## **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 are used to provide information on systems or equipment until the next 'permanent' Revision of the Airplane Flight Manual. When a 'permanent' Revision covers a Mandatory or Optional Design Change Advisory (MÄM or OÄM), then the corresponding Temporary Revision is superseded. For example: if Revision 5 covers OÄM 40-039, then the Temporary Revision TR OÄM-40-039 is superseded by the 'permanent' Revision 5.

Cover pages of Temporary Revisions, if applicable, are inserted behind the cover page of this manual, all other pages are inserted in front of the affected pages of this manual.

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Rev. No.	Reason	Chapter	Page(s)	Date of Revision	Approval Note	Date of Approval	Date Inserted	Signature
1	<p>MÄM 40-415, 40-432, 40-440, 40-448, 40-460, 40-466, 40-447, 40-514,</p> <p>OÄM 40-311, 40-313, 40-314 &amp; 40-316, 40-321, 40-326, 40-327, 40-329, 40-330, 40-331, 40-333,</p> <p>Corrections</p>	all	all, except cover page	15-Mar-2011	Revision 1 of the AFM Doc. No. 6.01.15-E is approved with EASA Approval No. 10034114.	08-Mar-2011		
2	<p>MÄM 40-434 &amp; OÄM 40-310, MÄM 40-451, MÄM40-321/a</p> <p>FAA- Approval</p>	0, 1, 2, 5, 6	0-0, 0-0a, 0-3, 0-5, 0-6, 0-9, 0-10, 1-2, 1-3, 2-24, 5-1, 5-31, 5-32, 6-16 through 6-26	15-Jun-2011	Revision 2 of the AFM Doc. No. 6.01.15-E is approved by EASA under project No. 0010005331.	24-Nov-2011		

Rev. No.	Reason	Chapter	Page(s)	Date of Revision	Approval Note	Date of Approval	Date Inserted	Signature
3	<p><b>MÄM</b>                      40-777/a, 40-766,                      40-765, 40-754,                      40-751, 40-742,                      40-731, 40-710/a,                      40-674, 40-672,                      40-662, 40-638,                      40-631, 40-632,                      40-618/a &amp; OÄM                      40-321/b, 40-574,                      40-563, 40-562,                      40-561, 40-559,                      40-558, 40-547,                      40-533, 40-488,                      40-429/a, 40-551</p> <p><b>OÄM</b>                      40-321/b, 40-237,                      40-183, 40-334/a,                      40-314/d &amp; 40-316/d,                      40-340, 40-341,                      40-336/a, 40-326/a, 40-252, 40-258, 40-312, 40-362, 40-369,                      40-370, 40-371,                      40-377, 40-381,</p> <p>Corrections</p>	all	All, except Cover Page	01-Jul-2014	Revision 3 of the AFM Doc. No. 6.01.15-E is approved under the authority of DOA No. EASA.21J.052	29-Jan-2015		

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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 JAR-23 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	
Exhaust Pipe with Muffler	MÄM 40-434 or OÄM 40-310	<input type="checkbox"/> yes	<input type="checkbox"/> no
Garmin G1000 Avionics System	MÄM 40-447	<input type="checkbox"/> yes	<input type="checkbox"/> no
Long Range Tanks	OÄM 40-130	<input type="checkbox"/> yes	<input type="checkbox"/> no
Baggage Tray (Extended Baggage Compartment)	OÄM 40-164	<input type="checkbox"/> yes	<input type="checkbox"/> no
Baggage Tube	Basic Design	<input type="checkbox"/> yes	<input type="checkbox"/> no
Winter Baffle Fresh Air Inlet	OÄM 40-183	<input type="checkbox"/> yes	<input type="checkbox"/> no
Nose Landing Gear Tie-down	OÄM 40-200	<input type="checkbox"/> yes	<input type="checkbox"/> no
Front Seats with Adjustable Backrest	OÄM 40-252	<input type="checkbox"/> yes	<input type="checkbox"/> no
Maximum Landing Mass 1280 kg	MÄM 40-574	<input type="checkbox"/> yes	<input type="checkbox"/> no

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Modification	Source	Installed	
Shorter NLG Damper	MÄM 40-631	<input type="checkbox"/> yes	<input type="checkbox"/> no
Maximum Take-Off Mass 1310 kg	MÄM 40-662	<input type="checkbox"/> yes	<input type="checkbox"/> no
Conventional Cockpit DA 40 NG Club	OÄM 40-321	<input type="checkbox"/> yes	<input type="checkbox"/> no
Emergency Axe	OÄM 40-326	<input type="checkbox"/> yes	<input type="checkbox"/> no
Retrofit with Autopilot KAP 140	OÄM 40-329	<input type="checkbox"/> yes	<input type="checkbox"/> no
Retrofit without Autopilot GFC 700	OÄM 40-330	<input type="checkbox"/> yes	<input type="checkbox"/> no
Short Baggage Extension	OÄM 40-331	<input type="checkbox"/> yes	<input type="checkbox"/> no
DA 40 NG without Autopilot GFC 700	OÄM 40-333	<input type="checkbox"/> yes	<input type="checkbox"/> no
Landing Gear with Large Tyres and 1280 kg Maximum Landing Mass	OÄM 40-334	<input type="checkbox"/> yes	<input type="checkbox"/> no
Diesel Operation	OÄM 40-370	<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.

### CAUTION

The DA 40 NG 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 EASA. The certification basis is JAR-23, published on 11-Mar-1994 and additional requirements as laid down in CRI A-01.

## **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

### NOTE

All dimensions shown below are approximate.

#### Overall Dimensions

Span	:	11.63 m	38 ft 2 in
Length	:	8.06 m	26 ft 5 in
Height	:	1.97 m	6 ft 6 in

#### Wing

Airfoil	:	Wortmann FX 63-137/20 - W4	
Wing area	:	13.244 m <sup>2</sup>	142.6 sq.ft.
Mean aerodynamic chord (MAC)	:	1.171 m	3 ft 10 in
Aspect ratio	:	10.223	
Dihedral	:	5°	
Leading edge sweep	:	1°	

#### Aileron

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

#### Wing Flaps

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

Horizontal Tail

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

Vertical Tail

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

Landing Gear

Track	:	2.97 m	9 ft 9 in
Wheelbase	:	1.68 m	5 ft 6 in

## ■ Wheelbase (if MÄM 40-574 is installed)

■ : 1.85 m 6 ft 8 in

Nose wheel : 5.00-5; 6 PR, TT, 120 mph

Main wheel : 15x6.0-6; 6 PR, TT, 160 mph

## 1.5 DEFINITIONS AND ABBREVIATIONS

### (a) Airspeeds

CAS: Calibrated Airspeed. Indicated airspeed, corrected for installation and instrument errors. CAS equals TAS at standard atmospheric conditions (ISA) at MSL.

IAS: Indicated Airspeed as shown on an airspeed indicator.

KCAS: CAS in knots.

KIAS: IAS in knots.

TAS: True Airspeed. The speed of the airplane relative to the air. TAS is CAS corrected for errors due to altitude and temperature.

$V_O$ : Operating Maneuvering Speed. Full or abrupt control surface movement is not permissible above this speed.

$V_{FE}$ : Maximum 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.

■  $V_R$ : Rotation Speed. Speed at which the nose wheel lifts off.

■  $V_{50}$ : Speed at 50 ft (15 m) above the take-off surface.

- $v_s$  Stalling Speed, or the minimum continuous speed at which the airplane is still controllable in the given configuration.
- $v_{s0}$ : 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.

(b) 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 1,013.25 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.

Density Altitude:

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

Indicated Pressure Altitude:

Altitude reading with altimeter set to 1,013.25 hPa (29.92 inHg).



**Pressure Altitude:**

Altitude above MSL, indicated by a barometric altimeter which is set to 1,013.25 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.

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

**(c) Flight Performance and Flight Planning**

**AGL:** Above ground level.

**Demonstrated Crosswind Component:**

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

**MET:** Weather, weather advice.

**NAV:** Navigation, route planning.

(d) Mass and Balance

**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.

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

**Empty Mass:**

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

**Maximum Take-off Mass:**

The maximum permissible mass for take-off.

**Maximum Landing Mass:**

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

**Maximum Zero Fuel Mass:**

The highest permissible mass with empty fuel tanks.

**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.

**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.

**Useful Load:**

The difference between take-off mass and empty mass.

**(e) Engine**

**CT:** Coolant Temperature.

**EECU:** Electronic Engine Control Unit.

**GT:** Gearbox Temperature.

**LOAD:** Engine output power in percent of take-off power.

**MED:** Main Engine Display.

**OP:** Oil Pressure (oil pressure in the lubrication system of the engine).

**OT:** Oil Temperature (oil temperature in the lubrication system of the engine).

**RPM:** Revolutions per minute (rotational speed of the propeller).

**SED:** Secondary Engine Display.

**FT:** Fuel Temperature.

(f) Designation of the Circuit Breakers on the Instrument Panel

ADC: Air Data Computer.  
ADF: Automatic Direction Finder.  
AHRS: Attitude and Heading Reference System.  
ANNUN: Annunciator Panel.  
AV/CDU FAN:  
Avionic-, CDU-Cooling Fans.  
AV. BUS: Avionic Bus.  
AUDIO: Audio Panel / Marker Beacon Receiver.  
AUTOPILOT:  
Autopilot System.  
COM: COM Radio.  
COM1: COM Radio No. 1.  
COM2: COM Radio No. 2.  
DG: Directional Gyro.  
DME: Distance Measuring Equipment.  
EECU A: ECU A.  
EECU B: ECU B.  
ENG INST: Engine Instruments.  
ESS TIE: Bus Interconnection.  
FAN/OAT: Fan / Outside Air Temperature.  
FLAPS: Flap System.  
FLOOD: Flood Light.  
FUEL PUMP A:  
ECU A Fuel Pump.  
FUEL PUMP B:  
ECU B Fuel Pump.  
GPS: Global Positioning System.  
GPS/NAV1: Global Positioning System and NAV Receiver No. 1.  
GPS/NAV2: Global Positioning System and NAV Receiver No. 2.  
HORIZON: Artificial Horizon (Attitude Gyro).

INST.1: Engine Instrument.  
INST. LT: Instrument Lights.  
LANDING: Landing Light.  
MAIN TIE: Bus Interconnection.  
MASTER CONTROL:  
                  Master Control (Avionics Relay).  
MFD: Multi Function Display.  
NAV: NAV Receiver.  
PFD: Primary Flight Display.  
PITOT: Pitot Heating System.  
POSITION: Position Lights.  
PWR: Power.  
START: Starter.  
STROBE: Strobe Lights (= Anti Collision Lights).  
T & B: Turn and Bank Indicator.  
TAS: Traffic Advisory System.  
TAXI/MAP: Taxi Light / Map Lights.  
WX500: Stormscope.  
XFR PUMP: Fuel Transfer Pump.  
XPDR Transponder.

(g) Equipment

ELT: Emergency Locator Transmitter.

(h) Design Change Advisories

MÄM: Mandatory Design Change Advisory.

OÄM: Optional Design Change Advisory.

(i) Miscellaneous

ACG: Austro Control GmbH (formerly BAZ, Federal Office of Civil Aviation).

ATC: Air Traffic Control.

CFRP: Carbon Fiber Reinforced Plastic.

EASA: European Aviation Safety Agency.

GFRP: Glass Fiber Reinforced Plastic.

GIA: Garmin Integrated Avionics.

JAR: Joint Aviation Requirements.

## 1.6 UNITS OF MEASUREMENT

### 1.6.1 CONVERSION FACTORS

Dimension	SI-Units	US Units	Conversion
Length	[mm] millimeter	[in] inch	$[mm] / 25.4 = [in]$
	[m] meter	[ft] feet	$[m] / 0.3048 = [ft]$
	[km] kilometer	[NM] nautical mile	$[km] / 1.852 = [NM]$
Volume	[l] liter	[US gal] US gallon	$[l] / 3.7854 = [US\ gal]$
	[ml] milliliter	[qts] US quarts	$[l] / 0.9464 = [qts]$
		[oz] ounce	$[ml] \times 0.033814 = [oz]$
Speed	[km/h] kilometer per hour	[kt] knot	$[km/h] / 1.852 = [kt]$
	[m/s] meter per second	[mph] mile per hour	$[km/h] / 1.609 = [mph]$
		[fpm] feet per minute	$[m/s] \times 196.85 = [fpm]$
Speed of rotation	[RPM] revolutions per minute		--
Mass	[kg] kilogram	[lb] pound	$[kg] \times 2.2046 = [lb]$
Force, weight	[N] newton	[lbf] pound force	$[N] \times 0.2248 = [lbf]$
Pressure	[hPa] hecto-pascal	[inHg] inches of mercury	$[hPa] = [mbar]$
	[mbar] millibar	[psi] pound per square inch	$[hPa] / 33.86 = [inHg]$
	[bar] bar		$[bar] \times 14.504 = [psi]$
Temperature	[°C] degree Celsius	[°F] degree Fahrenheit	$[°C] \times 1.8 + 32 = [°F]$ $([°F] - 32) / 1.8 = [°C]$

Dimension	SI-Units	US Units	Conversion
Intensity of electric current	[A] ampère		--
Electric charge (battery capacity)	[Ah] ampère-hour		--
Electric potential	[V] volt		--
Time	[sec] second		--

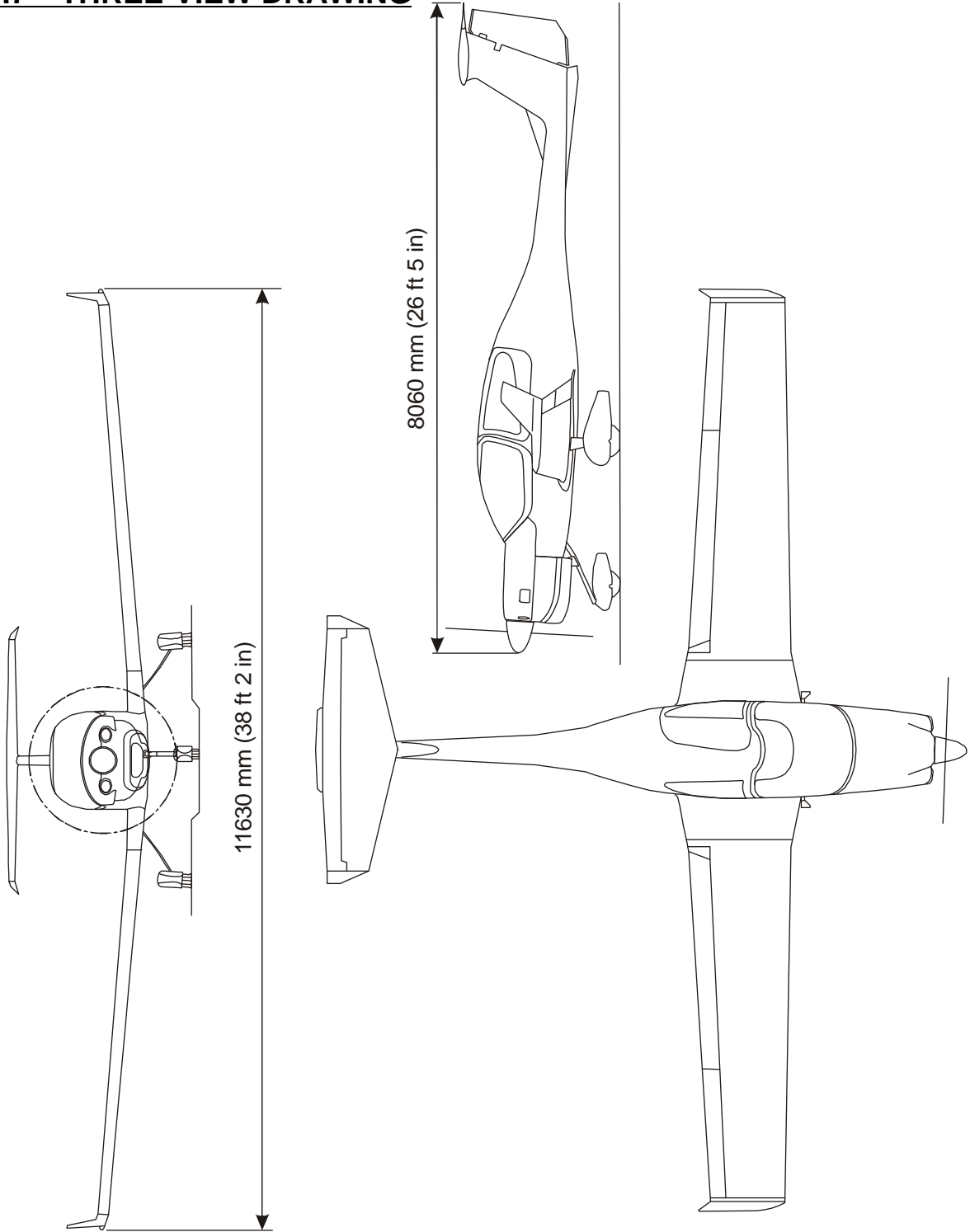


**1.6.2 CONVERSION CHART LITER / US GALLON**

Liter	US Gallon
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 Gallon	Liter
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 AND ENGINE INSTRUMENTS**

Address: Austro Engine GmbH  
Rudolf Diesel-Str. 11  
A-2700 Wiener Neustadt  
AUSTRIA

Phone: +43-2622-23 000  
Fax: +43-2622-23 000 - 2711  
Internet: [www.austroengine.at](http://www.austroengine.at)

Documents: Operation Manual AE300,  
E4.01.01

Maintenance Manual AE300,  
E4.08.04

Installation Manual AE300,  
E4.02.01

**1.8.2 PROPELLER**

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

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

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

## 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		KIAS	Remarks
$V_O$	Operating maneuvering speed	up to 1080 kg (2381 lb)	101 KIAS	Do not make full or abrupt control surface movement above this speed.
		above 1080 kg (2381 lb) to 1180 kg (2601 lb)	108 KIAS	
		above 1180 kg (2601 lb)	113 KIAS	
$V_{FE}$	Max. flaps extended speed	LDG	98 KIAS	Do not exceed these speeds with the given flap setting.
		T/O	110 KIAS	
$V_{NO}$ = $V_C$	Max. structural cruising speed		130 KIAS	Do not exceed this speed except in smooth air, and then only with caution.
$V_{NE}$	Never exceed speed in smooth air		172 KIAS	Do not exceed this speed in any operation.

### 2.3 AIRSPEED INDICATOR MARKINGS

Marking	IAS	Significance
White arc	60 KIAS - 98 KIAS	Operating range with flaps fully extended
Green arc	66 KIAS - 130 KIAS	Normal operating range.
Yellow arc	130 KIAS - 172 KIAS	'Caution' range - "Only in smooth air".
Red line	172 KIAS	Maximum speed for all operations - $v_{NE}$ .



## 2.4 POWER-PLANT LIMITATIONS

a) Engine manufacturer : Austro Engine

b) Engine designation : E4-A

c) RPM limitations (shown as propeller RPM)

Maximum take-off (RPM) : 2300 RPM max. 5 min

Max. continuous power (RPM) : 2100 RPM

Max. overspeed : 2500 RPM max. 20 sec

d) Engine power

Max. take-off power : 100% (123.5 kW) max. 5 min

Max. continuous power : 92% (114 kW)

e) Oil pressure

Minimum at idle : 0.9 bar

Minimum at max.

continuous conditions : 2.5 bar

Maximum : 6.5 bar

Normal range : 2.5 bar - 6.0 bar

f) Oil quantity

Minimum : 5.0 l

Maximum : 7.0 l

Maximum oil consumption : 0.1 liter/hour

g) Oil temperature

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Minimum : - 30 °C  
Maximum : 140 °C  
Normal range : 50 °C - 135 °C

h) Gearbox temperature

Minimum : - 30 °C  
Minimum (full load) : 35 °C  
Maximum : 120 °C

**NOTE**

A cautionary (yellow) gearbox temperature range is not imposed by the engine manufacturer. However, there is a delay between power changes and gearbox temperature. Therefore, a cautionary range has been added to the gearbox temperature instrument solely to make the pilot attentive to the gearbox temperature approaching the maximum allowable limit. There is no specific time limit associated with operating in the cautionary gearbox temperature range.

i) Coolant temperature

Minimum (at start-up) : - 30 °C  
Minimum (full load) : 60 °C  
Maximum : 105 °C

j) Fuel temperature

Minimum : - 25 °C  
Maximum : 60 °C

## k) Fuel pressure (absolute pressure)

Minimum : 4 bar

**NOTE**

The fuel pressure is not indicated; a fuel pressure warning will illuminate on the PFD (if G1000 is installed) or SED (if installed) if the pressure is below the limit.

Maximum : 7 bar

**NOTE**

The fuel pressure is not indicated; the fuel pressure caution ECU A/B FAIL on the PFD (if G1000 is installed) or ECU A/B on the White Wire annunciator panel (if installed) will illuminate if the pressure is above the limit.

## l) Voltage

Minimum : 24.1 V

Maximum : 32.0 V

## m) Amperage

Maximum : 70 A

n) Propeller manufacturer : mt-Propeller

o) Propeller designation : MTV-6-R/190-69

p) Propeller diameter : 190 cm (6 ft 3 in)

q) Prop. pitch angle (@ 0.75 R) : Low Pitch  $14.5^{\circ} \pm 0.2^{\circ}$

High Pitch  $35^{\circ} \pm 1.0^{\circ}$

r) Governor : mt-Propeller P-853-16 electrical governor

s) Oil specification :

Approved Engine Oil Types	SAE Grade
SHELL HELIX ULTRA	5W-30
ADDINOL SUPER POWER MV 0537	5W-30
BP Visco 5000 5W-30	5W-30
REPSOL ELITE Common Rail 5W30	5W-30
Gulf Formula GMX	5W-30
G-Energy F Synth 5W-30	5W-30
QUARTZ 9000 ENERGY 5W-30	5W-30
Gulf Formula GX	5W-30
AEROSHELL Oil Diesel Ultra	5W-30
CASTROL Edge 5W-30 A3	5W-30
CASTROL Edge Professional A3	5W-30
SHELL HELIX ULTRA	5W-40
LIQUI MOLY 5W-40 LEICHTLAUF HIGH TECH	5W-40
megol Motorenoel High Condition	5W-40
PETRONAS Syntium 3000	5W-40
LUKOIL LUXE synthetic	5W-40
CASTROL Edge Professional A3	5W-40
CASTROL Magnatec Professional A3	5W-40
VALVOLINE SynPower HST	5W-40
VALVOLINE SynPower	5W-40
GULF Formula GX	5W-40
Castrol SLX Professional Longtec 0W-40	0W-40

CASTROL Edge 0W-40 A3/B4	0W-40
CASTROL Edge Professional A3	0W-40
SHELL HELIX Ultra	0W-40

### CAUTION

Only engine oils conforming to MB 229.5 specification are approved by Austro Engine GmbH to be used for operation.

### NOTE

It is not recommended to mix different SAE grades.

t) Gearbox oil (propeller gearbox) : SHELL SPIRAX GSX 75W-80

SHELL SPIRAX S6 GXME 75W-80

u) Coolant : Distilled water / Cooler protection (BASF Glysantin Protect Plus / G48):

- Mixture ratio 50% / 50% for freezing point -38°C (-36°F).

- Mixture ratio 40% / 60% (MÄM 40-638 is carried out) freezing point -53 °C (-63°F)

### CAUTION

If the coolant or gearbox oil level is low the reason must be determined and the problem must be corrected by authorized personnel.

- v) Maximum restart altitude : 16,400 ft pressure altitude  
for immediate restarts  
  
10,000 ft pressure altitude  
for restarts within 2 minutes

## 2.5 ENGINE INSTRUMENT MARKINGS

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

Indication	Red arc/bar = lower prohibited range	Yellow arc/bar = caution range	Green arc/bar = normal operating range	Yellow arc/bar = caution range	Red arc/bar = upper prohibited range
RPM	--	--	up to 2100 RPM	2100 to 2300 RPM	above 2300 RPM
Oil pressure	below 0.9 bar	0.9 to 2.5 bar	2.5 to 6.0 bar	6.0 to 6.5 bar	above 6.5 bar
Oil temp.	below -30°C	-30° to 50°C	50° to 135°C	135° to 140°C	above 140°C
Coolant temp.	below -30°C	-30° to 60°C	60° to 95°C	95° to 105°C	above 105°C
Gearbox temp.	below -30°C	-30° to 35°C	35° to 115°C	115° to 120°C	above 120°C
Load	--	--	up to 92%	92 - 100%	--
Fuel temp.	below -25°C	-25° to -20°C	-20° to 55°C	55° to 60°C	above 60°C
Ammeter	--	--	up to 60A	60 to 70A	above 70A
Volt-meter	below 24.1V	24.1 to 25V	25 to 30V	30 to 32V	above 32V
Fuel qty.	below 1 US gal	--	1 to 14 US gal	--	--

## 2.6 WARNING, CAUTION AND STATUS LIGHTS

The following tables show the color and significance of the warning, caution and advisory alert lights. There are two variants: G1000 annunciation or SED, MED and 'White Wire' annunciator panel.

### Color and Significance of the Warning Lights (Red)

Warning Alerts (Red)		Meaning / Cause
G1000 installed	SED, MED, White Wire installed	
WARNING	WARNING	One of the warnings listed below is being indicated.
ENG TEMP	-	Engine coolant temperature is in the upper red range (too high / > 105 °C).
OIL TEMP	-	Engine oil temperature is in the upper red range (too high / > 140 °C).
OIL PRES	-	Engine oil pressure is in the lower red range (too low / < 0.9 bar).
L/R FUEL TEMP	-	Fuel temperature is in the upper red range (too high / > 60 °C).
GBOX TEMP	-	Engine gearbox temperature is in the upper red range (too high / > 120 °C).
FUEL PRESS	FUELPRESS	Engine fuel pressure is low.
ALTN AMPS	-	Engine alternator output is in the upper red range (too high / > 70 A).
ALTN FAIL	ALTERNATOR	Engine alternator has failed.
STARTER	START	Engine starter is engaged.



Warning Alerts (Red)		Meaning / Cause
G1000 installed	SED, MED, White Wire installed	
DOOR OPEN	DOORS	Canopy and/or rear door are/is not closed and locked.
ATTITUDE FAIL	-	Display system is not receiving attitude reference information from the AHRS; accompanied by the removal of sky/ground presentation and a red X over the attitude area.
AIRSPEED FAIL	-	Display system is not receiving airspeed input from the air data computer; accompanied by a red X through the airspeed display.
ALTITUDE FAIL	-	Display system is not receiving altitude input from the air data computer; accompanied by a red X through the altimeter display.
VERT SPEED FAIL	-	Display system is not receiving vertical speed input from the air data computer; accompanied by a red X through the vertical speed display.
HDG	-	Display system is not receiving valid heading input from the AHRS; accompanied by a red X through the digital heading display.
Red X	-	A red X through any display field, such as com frequencies, nav frequencies, or engine data, indicates that display field is not receiving valid data.

Color and Significance of the Caution Lights (Amber)

Caution Alerts (Amber)		Meaning / Cause
G1000 installed	SED, MED, White Wire installed	
CAUTION	CAUTION	One of the cautions below is being indicated.
ECU A FAIL	ECU A	A fault has occurred in the engine ECU A or ECU A is being tested during FADEC-test procedure during the 'Before Take-Off Check'.
ECU B FAIL	ECU B	A fault has occurred in the engine ECU B or ECU B is being tested during FADEC-test procedure during the 'Before Take-Off Check'.
FUEL LOW	LOW FUEL	Left fuel quantity is low.
VOLTS LOW	LOW VOLTS	Engine bus voltage is too low (< 25 V).
COOL LVL	WATERLEV	Engine coolant level is low.
PITOT FAIL	PITOT	Pitot heat has failed.
PITOT HT OFF	-	Pitot heat is OFF.
LOI	-	GPS integrity is insufficient for the current phase of flight.
AHRS ALIGN: Keep Wings Level	-	The AHRS (Attitude and Heading Reference System) is aligning.
-	ENGINE	Engine limit exceeded.

Color and Significance of the Status Lights (White)

Advisory Alerts (White)		Meaning / Cause
G1000 installed	SED, MED, White Wire installed	
GLOW ON	GLOW	Engine glow plug active.
FUEL XFER	FUEL TRANS	Fuel transfer from auxiliary to main tank is in progress.
PFD FAN FAIL	-	Cooling fan for the PFD is inoperative.
MFD FAN FAIL	-	Cooling fan for the MFD is inoperative.
GIA FAN FAIL	-	Cooling fan for the GIAs is inoperative.

## 2.7 MASS (WEIGHT)

Value	Mass (Weight)	
Maximum take-off mass	1280 kg	2822 lb
Maximum take-off mass (if MÄM 40-662 is installed)	1310 kg	2888 lb
Maximum landing mass	1216 kg	2681 lb
if MÄM 40-574 is installed	1280 kg	2822 lb
Minimum flight mass	940 kg	2072 lb
Maximum zero fuel mass	1200 kg	2646 lb
if MÄM 40-574 is installed	1265 kg	2789 lb
Standard:		
Max. load in baggage compartment (between rear seats and baggage frame)	30 kg	66 lb
Max. load in baggage tube compartment (if installed)	5 kg	11 lb
Max. load in short baggage extension (if OÄM 40-331 is installed)	15 kg	33 lb
Extended baggage compartment (if OÄM 40-164 is installed):		
Max. load in cockpit baggage compartment (behind rear seats)	45 kg	100 lb
Max. load in extended baggage compartment (behind cabin baggage compartment)	18 kg	40 lb
Max. load in cockpit baggage compartment and extended baggage compartment	45 kg	100 lb

### WARNING

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

**NOTE**

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

**NOTE**

The maximum zero fuel mass is the highest mass with empty fuel tanks.

## **2.8 CENTER OF GRAVITY**

### Datum Plane

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

### Center of Gravity Limitations

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

#### Most forward CG:

2.40 m (94.5 in) aft of DP from 940 kg to 1080 kg (2072 lb to 2381 lb)

2.46 m (96.9 in) aft of DP at 1280 kg (2822 lb)

■ If MÄM 40-662 is installed:

■ 2.469 m (97.2 in) aft of DP at 1310 kg (2888 lb)

linear variation between these values

#### Most rearward CG:

■ 2.53 m (99.6 in) aft of DP from 940 kg (2072 lb) to 1310 kg (2888 lb)

## **WARNING**

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

## **2.9 APPROVED MANEUVERS**

The airplane is to be operated in the Normal Category in accordance with JAR 23.

### Approved Maneuvers

- 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.

### **CAUTION**

Intentional negative g-maneuvers are not permitted.

## 2.10 MANEUVERING LOAD FACTORS

### WARNING

The table below shows structural limitations. Exceeding the maximum load factors will lead to an overstressing of the airplane.

### CAUTION

Intentional negative g-maneuvers are not permitted.

	at $v_o$	at $v_{NE}$	with flaps in T/O or LDG position
Positive	3.8	3.8	2.0
Negative	-1.52	0	0



## **2.11 OPERATING ALTITUDE**

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

## **2.12 FLIGHT CREW**

Minimum crew : 1 (one person)

Maximum number of occupants : 4 (four persons)

## **2.13 KINDS OF OPERATION**

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

- Daytime flights according to Visual Flight Rules (VFR)
- With the appropriate equipment: night flights according to Visual Flight Rules (NVFR)
- With the appropriate equipment: flights according to Instrument Flight Rules (IFR)
- Take-off and landing on paved surfaces
- Take-off and landing on unpaved surfaces

Flights into known or forecast icing conditions are prohibited.

Flights into known thunderstorms are prohibited.

### Minimum Operational Equipment (Serviceable)

The following table lists the minimum serviceable equipment required by JAR-23. Additional minimum equipment for the intended operation may be required by national operating rules and also depends on the route to be flown.

### **NOTE**

Many of the items of minimum equipment listed in the following table are integrated in the G1000 (if installed).

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	For daytime VFR flights	In addition for night VFR flights	In addition for IFR flights
Flight & navigation instruments	<ul style="list-style-type: none"> <li>• Airspeed indicator</li> <li>• Altimeter</li> <li>• Magnetic compass</li> <li>• 1 headset, used by pilot in command</li> </ul>	<ul style="list-style-type: none"> <li>• Vertical speed indicator (VSI)</li> <li>• Attitude gyro</li> <li>• Turn &amp; bank indicator</li> <li>• Directional gyro</li> <li>• VHF radio (COM)</li> <li>• VOR receiver</li> <li>• Transponder (XPDR)</li> <li>• GPS receiver (part of G1000, if installed)</li> <li>• Second headset (if PM 1000 intercom is installed)</li> </ul>	<ul style="list-style-type: none"> <li>• Second airspeed indicator (on PFD and backup, if G1000 is installed)</li> <li>• Second altimeter</li> <li>• Second attitude gyro (on PFD and backup, if G1000 is installed)</li> <li>• Second VHF radio (COM)</li> <li>• VOR-LOC-GP receiver</li> <li>• Second GPS receiver (part of G1000, if installed)</li> </ul>

	<b>For daytime VFR flights</b>	<b>In addition for night VFR flights</b>	<b>In addition for IFR flights</b>
Engine instruments	<ul style="list-style-type: none"> <li>• Fuel qty.</li> <li>• Oil press.</li> <li>• Oil temp.</li> <li>• Coolant temp.</li> <li>• Coolant level indicator</li> <li>• Gearbox temp.</li> <li>• Load</li> <li>• Prop. RPM</li> <li>• Fuel temp. left &amp; right tank</li> <li>• Fuel flow</li> <li>• Fuel pressure warning</li> <li>• ECU A/B Caution</li> <li>• ENGINE Caution (if White Wire annunciator panel is installed)</li> </ul>	<ul style="list-style-type: none"> <li>• Ammeter</li> <li>• Voltmeter</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>• Alternate means for fuel quantity indication (see Section 7.9)</li> <li>• Safety belts for each occupied seat</li> <li>• Airplane Flight Manual</li> </ul>	<ul style="list-style-type: none"> <li>• Pitot heating system</li> <li>• Alternate static valve</li> </ul>	<ul style="list-style-type: none"> <li>• Emergency battery (for backup attitude gyro and flood light)</li> </ul>

**NOTE**

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

Engine Systems and Equipment

All engine systems and equipment must be functional prior to airplane take-off. Any engine system or equipment failure must be corrected before next flight.

## **2.14 FUEL**

- | Approved fuel grades: JET A, JET A-1 (ASTM D 1655)
- | TS-1 (Russia, GOST 10227-86)
- | TS-1 (Ukraine, GSTU 320.00149943.011-99)
- | RT (Russia, GOST 10227-86)
- | RT (Ukraine, GSTU 320.00149943.007-97)
- | No. 3 Jet Fuel (China, GB 6537-2006)
- | JP-8 (F34) (USA, MIL-DTL-83133G-2010)

and blends of the above listed fuel grades.

### **NOTE**

A minimum cetane number of 37 determined acc. to EN ISO 5165/ASTM D613 is recommended.

### **NOTE**

Use only uncontaminated fuel from reliable sources.

- | Any mixture of the different types of fuel additives is not permitted.

### **OPERATION WITH ANTI-MICROBIAL LIFE FUEL ADDITIVES**

- | The application of the following additives is permitted:

- | - KATHON FP 1.5 : max. 100 ppm
- | - BIOBOR JF : max. 270 ppm for initial treatment
- | max. 135 ppm for permanent use after initial treatment

**CAUTION**

In case of an unknown or an over dosage of the fuel additives the fuel system must be purged until the dosage is within the permitted limits.

**NOTE**

The specified additives are qualified for the operation with the certified fuel grades.

To clean the fuel system of the airplane a higher dosage of the specified additive is allowed under consideration of the instructions of the additive supplier. During cleaning the engine must not be operated.

**NOTE**

The instructions of the fuel additive supplier must be followed.

**OPERATION WITH ANTI-ICING FUEL ADDITIVES**

The application of the following additive is permitted:

- PRIST Hi-Flash : max. 1500 ppm

**CAUTION**

The use of PRIST Hi-Flash fuel additive is only permitted with JET A, JET A-1 (ASTM D 1655) and JP-8 (F34).

**NOTE**

The instructions of the fuel additive supplier must be followed.

Standard Tank Configuration:

Total fuel quantity : 2 x 15.0 US gal (2 x 56.8 liter)

Usable fuel : 2 x 14.0 US gal (2 x 53.0 liter)

Long Range Tank (if installed) Configuration:

Total fuel quantity : 2 x 20.5 US gal (2 x 77.6 liter)

Usable fuel : 2 x 19.5 US gal (2 x 73.8 liter)

Max. indicated fuel quantity : 14 US gal (53 liter) per tank

Max. permissible difference  
between right and left tank : 9 US gal (approx. 34 liter)

**CAUTION**

If an indicator shows 14 US gal, then 19.5 US gal must be assumed for the calculation of the difference between right and left tank.



## 2.15 LIMITATION PLACARDS

All *limitation* placards relevant for the base DA 40 NG airplane are shown below. A list of all placards is included in the Airplane Maintenance Manual (Doc. No. 6.02.15), Chapter 11.

On the Instrument Panel:

THIS AIRPLANE MAY ONLY BE OPERATED IN ACCORDANCE WITH THE AIRPLANE FLIGHT MANUAL IN THE "NORMAL" CATEGORY IN NON-ICING CONDITIONS. PROVIDED THAT NATIONAL OPERATIONAL REQUIREMENTS ARE MET AND THE APPROPRIATE EQUIPMENT IS INSTALLED AND OPERATIONAL, THIS AIRPLANE IS APPROVED FOR THE FOLLOWING KINDS OF OPERATION: DAY VFR, NIGHT VFR, IFR. ALL AEROBATIC MANEUVERS INCLUDING SPINNING ARE PROHIBITED. FOR FURTHER OPERATIONAL LIMITATIONS REFER TO THE AIRPLANE FLIGHT MANUAL.

OPERATING MANEUVERING SPEED:

$V_o = 113$  KIAS (ABOVE 1180 KG / 2601 LB)

$V_o = 108$  KIAS (ABOVE 1080 KG / 2381 LB TO 1180 KG / 2601 LB)

$V_o = 101$  KIAS (UP TO 1080 KG / 2381 LB )

On the Instrument Panel, Next to the Fuel Quantity Indication:

Long Range Tank (if installed):

**max. usable fuel: 2 x 19.5 US gal**

- \* Max. indicated fuel quantity: 2 x 14 US gal
- \* Refer to AFM to use entire tank capacity
- \* Max. difference LH/RH tank: 9 US gal

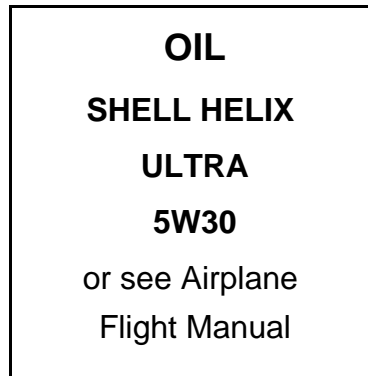
Next to Each of the Two Fuel Filler Necks:

**WARNING**  
**APPROVED FUEL**  
**JET-A1**  
**or see Airplane Flight Manual**

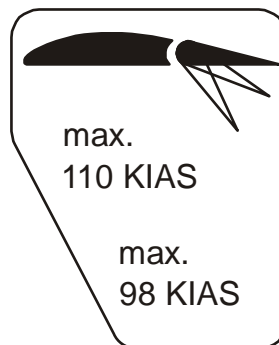
Next to the Essential Bus Switch:

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

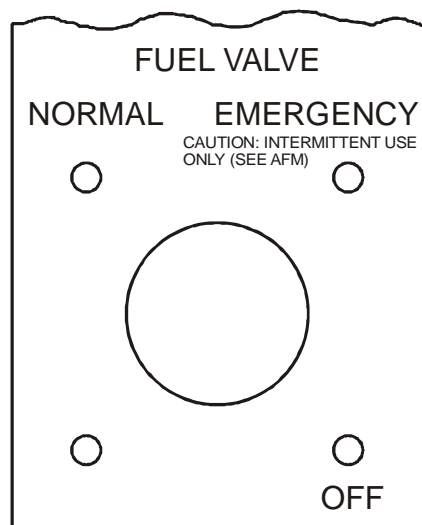
In the Cowling, on the Door for the Oil Filler Neck:



Next to the Flap Selector Switch:



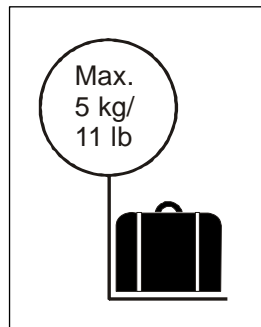
On the Fuel Valve:



Next to the Baggage Compartment:

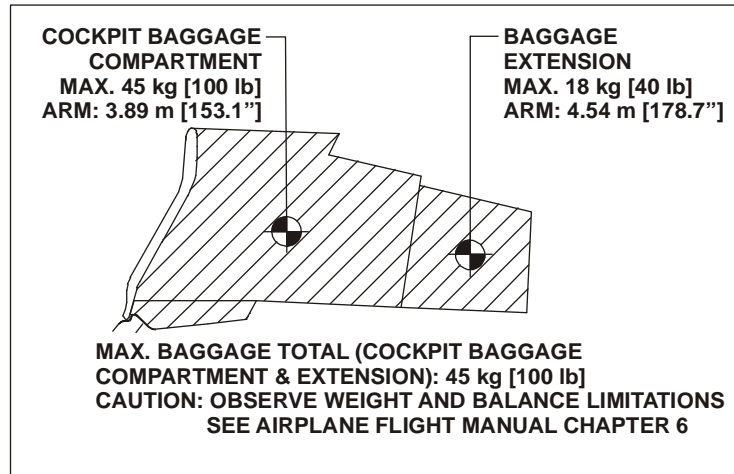


Baggage Tube Compartment:

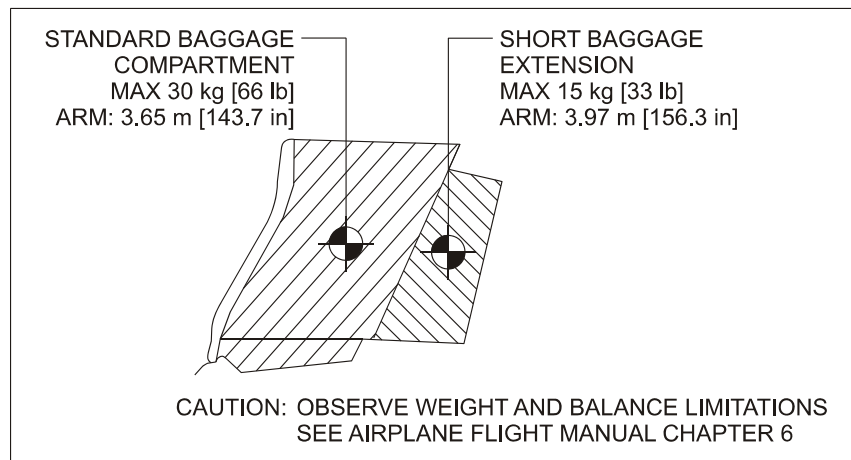


Baggage Tray (if OÄM 40-164 installed, extended baggage compartment):

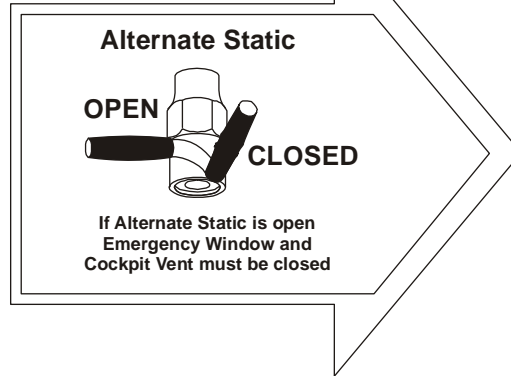




*If Short Baggage Extension (OÄM 40-331) is carried out:*



On the Left Sidewall, Next to the Instrument Panel:



Beside the Door Locking Device:

**EMERGENCY EXIT:**

The keylock must be  
unlocked during flight

On Fuel Cooler Inlet Baffle (if installed):

Remove at Outside  
Temperatures above  
20 °C / 68 °F

On the Instrument Panel:

— NO SMOKING —

## **2.16 OTHER LIMITATIONS**

### **2.16.1 TEMPERATURE**

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

With the airplane cold soaked and its temperature below -20 °C (-4 °F) the use of an external pre-heater for the engine and pilot compartment prior to operation is mandatory.

The airplane may only be operated with the fuel cooler inlet baffle installed when the outside air temperature at take-off does not exceed 20 °C (68 °F).

If the outside air temperature at take-off is below -30°C (-22°F) the coolant radiator inlet baffle (OÄM 40-364) must be installed. The airplane may only be operated with the coolant radiator inlet baffle, if the outside air temperature at take-off does not exceed 0°C (32°F).

With the airplane cold soaked and its temperature below -30°C (-22°F) the batteries must be pre-heated (OÄM 40-363) prior to operation.

### **2.16.2 BATTERY CHARGE**

Take-off for a Night VFR or IFR flight with an empty main battery is not permitted.

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

### **2.16.3 EMERGENCY SWITCH**

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

#### **2.16.4 DOOR LOCKING DEVICE**

The canopy and the passenger door must not be key locked during operation of the airplane.

#### **2.16.5 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.

#### **2.16.6 SMOKING**

Smoking in the airplane is not permitted.

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

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

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## 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 his knowledge and experience, an essential factor in the solution of any problems which may arise.

### **WARNING**

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

**3.1.2 CERTAIN AIRSPEEDS IN EMERGENCIES**

Event		KIAS
Airspeed for best glide angle (Flaps UP)		88 KIAS
Airspeed for emergency landing with engine off	Flaps UP	83 KIAS
	Flaps T/O	78 KIAS
	Flaps LDG	77 KIAS

## **3.2 INSTRUMENT INDICATIONS IN PROHIBITED (RED) RANGE**

### **3.2.1 ENGINE TEMPERATURE**

Engine coolant temperature is in the upper red range (too high / above 105 °C).

Coolant temperatures above the limit value of 105 °C can lead to a total loss of power due to engine failure.

- Check for COOL LVL (if G1000 is installed) or WATERLEV (if SED is installed) caution message (low coolant level).

*COOL LVL (if G1000 is installed) or WATERLEV (if SED is installed) Caution Message  
Not Displayed:*

During climb:

- Reduce power by 10 % or more as required.
- Increase airspeed by 10 KIAS or more as required.
- If the coolant temperature does not reach the green range within 60 seconds, reduce power as far as possible and increase airspeed.

**CONTINUED**

During cruise:

- Reduce power, or
- Increase airspeed, if necessary by initiating a descent.
- Check coolant temperature in green range.

### **CAUTION**

If high coolant temperature is indicated and the COOL LVL (if G1000 is installed) or WATERLEV (if SED is installed) caution message is not displayed, it can be assumed that there is no technical defect in the cooling system and that the above mentioned procedure can decrease the temperature(s). This might not be the case if the coolant temperature does not return to the green range. In this case perform a precautionary landing on the nearest suitable airfield. Prepare for an engine failure in accordance with 3.3.4 - ENGINE FAILURE IN FLIGHT.

*COOL LVL (if G1000 is installed) or WATERLEV (if SED is installed) Caution Message Displayed:*

- Reduce power.
- Expect loss of coolant.

### **WARNING**

A further increase in coolant temperature must be expected. Prepare for an engine failure in accordance with 3.3.4 - ENGINE FAILURE IN FLIGHT.

**END OF CHECKLIST**

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### **3.2.2 OIL TEMPERATURE**

Engine oil temperature is in the upper red range (too high / above 140 °C).

Oil temperatures above the limit value of 140 °C can lead to a total loss of power due to engine failure.

- Check oil pressure.

*If the Oil Pressure Is Outside of the Green Range (Lower Limit):*

- Reduce power.
- Expect loss of engine oil.

### **WARNING**

A further increase in oil temperature must be expected.  
Prepare for an engine failure in accordance with 3.3.4 -  
ENGINE FAILURE IN FLIGHT.

*If the Oil Pressure Is Within the Green Range:*

- Reduce power.
- Increase airspeed.

**CONTINUED**

**CAUTION**

If high oil temperature is announced and the oil pressure indication is within the green range, it can be assumed that there is no technical defect in the engine oil system and that the above mentioned procedure can decrease the temperature(s). This might not be the case if the oil temperature does not return to the green range. In this case perform a precautionary landing on the nearest suitable airfield. Prepare for an engine failure in accordance with 3.3.4 - ENGINE FAILURE IN FLIGHT.

**END OF CHECKLIST**



**3.2.3 OIL PRESSURE**

Engine oil pressure is in the lower red range (too low / below 0.9 bar).

Oil pressures below the limit value of 0.9 bar can lead to a total loss of power due to engine failure.

- Reduce power.
- Expect loss of oil.

**WARNING**

Land at the nearest suitable airfield. Prepare for an engine failure in accordance with 3.3.4 - ENGINE FAILURE IN FLIGHT.

**END OF CHECKLIST**

### **3.2.4 GEARBOX TEMPERATURE**

Engine gearbox temperature is in the upper red range (too high / above 120 °C).

Gearbox temperatures above the limit value of 120 °C can lead to a total loss of power due to engine failure.

- Reduce power.
- Increase airspeed.

### **CAUTION**

At high ambient temperature conditions and/or at low airspeeds with high power settings, it can be assumed that there is no technical defect in the gearbox and that the above mentioned procedure will decrease the temperature(s). This might not be the case if the gearbox temperature does not return to the green range. In this case perform a precautionary landing on the nearest suitable airfield. Prepare for an engine failure in accordance with 3.3.4 - ENGINE FAILURE IN FLIGHT.

**END OF CHECKLIST**

### **3.2.5 L/R FUEL TEMPERATURE**

Fuel temperature is in the upper red range (too high / above 60 °C).

Fuel temperatures above the limit value of 60 °C can lead to a noticeable reduction of the high pressure pump efficiency.

- Reduce power.
- Increase airspeed.

### **CAUTION**

At high ambient temperature conditions and/or at low airspeeds with high power settings and low fuel quantities, it can be assumed that the above mentioned procedure will decrease the temperature(s). If the fuel temperature does not return to the green range, perform a precautionary landing on the nearest suitable airfield.

### **NOTE**

Increased fuel temperature can occur when the fuel quantity in the main tank is low. The fuel temperature can be decreased by transferring fuel from the auxiliary to the main tank.

**END OF CHECKLIST**

### 3.2.6 FUEL PRESSURE

Engine fuel pressure is low.

1. Fuel quantity ..... check
2. Fuel valve ..... check ON
3. Fuel pumps ..... ON

*If FUEL PRESS (if G1000 is installed) or FUELPRESS (if SED is installed) Warning Remains:*

4. Fuel valve ..... EMERGENCY
5. Fuel pumps ..... OFF

*If FUEL PRESS (if G1000 is installed) or FUELPRESS (if SED is installed) Warning Still Remains:*

### **WARNING**

Imminent engine failure must be expected. Prepare for an engine failure in accordance with 3.3.4 - ENGINE FAILURE IN FLIGHT.

**END OF CHECKLIST**

**3.2.7 ALTERNATOR AMPS**

Engine alternator output is in the upper red range (too high / above 70 A).

█ This warning is indicated when the consumption of electrical power is too high.

█ Possible reasons are:

█ - A fault in wiring or equipment.

█ 1. Electrical equipment . . . . . switch OFF as necessary and  
█ possible to reduce electric load

█ *If the problem does not clear itself:*

█ 2. Land on the nearest suitable airfield.

**END OF CHECKLIST**

### 3.2.8 ALTERNATOR FAIL

Engine alternator has failed.

The batteries are the last remaining source of electrical power for about 30 minutes.

1. Circuit breakers . . . . . check
2. ESSENTIAL BUS . . . . . ON
3. Electrical equipment . . . . . switch OFF all equipment which  
is not needed
4. Land on the nearest suitable airfield.

### **WARNING**

The ECU which is absolutely necessary for engine operation needs electrical power. It is recommended to switch off all electrical consumers and to land as soon as possible. Be prepared for an engine failure and an emergency landing. For a severe electrical failure a ECU backup battery system is installed.

### **CAUTION**

For cases in which the battery capacity is not sufficient to reach a suitable airfield, an emergency battery is installed, serving as an additional back-up system for the backup attitude gyro (artificial horizon) and flood light. This battery is switched on with the EMERGENCY switch, located on the top left side of the instrument panel.

**END OF CHECKLIST**

### **3.3 ENGINE PROBLEMS**

#### **3.3.1 ENGINE PROBLEMS ON GROUND**

1. POWER lever ..... IDLE
2. Brakes ..... as required

#### **NOTE**

If considered necessary, the engine must be shut down. Otherwise the cause of the problem must be established in order to re-establish engine performance.

#### **CAUTION**

If the oil pressure is in the red range, the engine must be shut down immediately.

#### **WARNING**

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

**END OF CHECKLIST**

### **3.3.2 ENGINE PROBLEMS DURING TAKE-OFF**

(a) Take-Off Can Still Be Aborted (Sufficient Runway Length Available)

*Land Straight Ahead:*

1. POWER lever ..... IDLE

*On the Ground:*

2. Brakes ..... as required

### **WARNING**

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

- Fuel valve ..... OFF
- ENGINE MASTER ..... OFF
- ELECTRIC MASTER ..... OFF

**END OF CHECKLIST**



(b) Take-Off Can No Longer Be Aborted

- 1. Airspeed ..... immediate pitch down to avoid  
airspeed reduction

**WARNING**

If, in the event of an engine problem occurring during take-off, the take-off can no longer be aborted and a safe height has not been reached, then a straight-ahead emergency landing should be considered. Do not attempt to turn back to the airfield. Turning back can be fatal.

*If Time Allows:*

- 2. POWER lever ..... check MAX
- 3. Fuel pumps ..... check ON
- 5. VOTER switch ..... check AUTO

**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 in accordance with 3.7.1 - EMERGENCY LANDING WITH ENGINE OFF.

**END OF CHECKLIST**

### 3.3.3 ENGINE TROUBLESHOOTING IN FLIGHT

#### **WARNING**

Control over the flight attitude has priority over attempts to solve the current problem ("first fly the airplane").

1. Airspeed ..... 88 KIAS
2. POWER lever ..... MAX

#### **NOTE**

If the loss of power was due to unintentional setting of the POWER lever, you may adjust the friction lock and continue your flight.

#### If ECU A and ECU B Cautions Appear Simultaneously

- If the indicated LOAD remains unchanged, and
  - if the perceived thrust is reduced, and
  - if the engine noise level changes or the engine is running rough:
3. POWER lever ..... IDLE for 1 second
  4. POWER lever ..... slowly increase to 1975 RPM

#### *If the engine shows a power loss during the POWER lever increase:*

5. POWER lever ..... IDLE for 1 second
6. POWER lever ..... slowly increase, stop prior to the previously observed engine power loss RPM

#### **CONTINUED**

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**WARNING**

Do not increase the POWER lever past the propeller speed of 1975 RPM or the setting determined in step 6. An increase of engine power beyond this setting leads into another power loss.

**NOTE**

With this power setting the engine can provide up to 65 % load at the maximum propeller speed of 1975 RPM.

- 7. Land at the next suitable airfield.

Otherwise:

Depending on the situation the following attempts can be made to restore normal engine operation:

- 3. Circuit breakers . . . . . check / reset if necessary

If normal engine operation is restored continue flight and land as soon as possible.

*Otherwise:*

- 4. VOTER switch . . . . . swap between ECU A and B

If either ECU A or B setting restores normal engine operation then maintain ECU setting and land as soon as possible.

**CONTINUED**

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*Otherwise:*

- 5. VOTER switch ..... switch back to AUTO to retain ECU redundancy

If normal engine operation is restored continue flight and land as soon as possible.

*Otherwise:*

- 6. Fuel valve ..... EMERGENCY

If normal engine operation is restored continue flight and land as soon as possible. Remain within maximum allowable lateral imbalance.

*Otherwise:*

- 7. Fuel valve ..... NORMAL
- 8. Alternate air ..... OPEN
- 9. POWER lever ..... apply power as required

If normal engine operation is restored continue flight and land as soon as practicable.

If normal engine operation could not be restored by following the procedures in this section prepare for 3.3.4 - ENGINE FAILURE IN FLIGHT and land as soon as possible.

**END OF CHECKLIST**

**3.3.4 ENGINE FAILURE IN FLIGHT**

**WARNING**

Control over the flight attitude has priority over attempts to solve the current problem ("first fly the airplane").

**NOTE**

As long as there is no major mechanical engine defect, the propeller will continue to windmill.

- 1. Airspeed ..... 88 KIAS
- 2. Flaps ..... UP

*If the Remaining Altitude is Sufficient for an Restart Attempt:*

Try to restart the engine, refer to 3.3.5 - RESTARTING THE ENGINE IN FLIGHT.

*If the Remaining Altitude is NOT Sufficient for an Restart Attempt:*

Carry out an emergency landing in accordance with 3.7.1 - EMERGENCY LANDING WITH ENGINE OFF.

**END OF CHECKLIST**

**3.3.5 RESTARTING THE ENGINE IN FLIGHT**

**NOTE**

With a failed engine the propeller continues to windmill. A stopped propeller indicates a major mechanical engine defect. Starter assisted restart shall not be considered.

Maximum restart altitude:

- 16,400 ft pressure altitude . . . . . for immediate restarts
- 10,000 ft pressure altitude . . . . . for restarts within two minutes

**NOTE**

If the engine is allowed to cool down for more than two minutes, a successful restart may not be possible.

1. Airspeed . . . . . 88 KIAS
2. POWER lever . . . . . IDLE
3. VOTER switch . . . . . check AUTO
4. Fuel valve . . . . . check NORMAL
5. Alternate air . . . . . as required
6. Fuel quantity . . . . . check
7. Fuel transfer pump . . . . . as required
8. ELECTRIC MASTER . . . . . check ON
9. ENGINE MASTER . . . . . check ON

**CONTINUED**

*If Engine Does Not Start:*

- 10. Fuel valve ..... EMERGENCY

*If Engine Does Not Start Adopt Glide Configuration:*

- 11. Flaps ..... UP
- 12. ..... Airspeed 88 KIAS

**NOTE**

The glide ratio is 9.7; i.e., for every 1000 ft (305 m) of altitude loss the maximum horizontal distance traveled in still air is 1.59 NM (2.94 km). During this the propeller will continue to windmill.

Carry out an emergency landing in accordance with 3.7.1 - 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.

- 13. AVIONIC MASTER ..... ON, if required

**END OF CHECKLIST**

**3.3.6 DEFECTIVE RPM REGULATING SYSTEM**

**WARNING**

In case of defective RPM regulating system, reduced engine performance should be anticipated.

**CAUTION**

Following a failure of the governor the RPM should be adjusted with the POWER lever.

**CAUTION**

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

(a) Oscillating RPM

1. Power setting ..... change

*If the Problem Does Not Clear:*

2. VOTER switch ..... swap between ECU A and B

*If the Problem Does Not Clear:*

3. VOTER switch ..... AUTO
4. Land on the nearest suitable airfield.

**END OF CHECKLIST**

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(b) Propeller Overspeed

**CAUTION**

Climb performance will be reduced.

**NOTE**

The propeller now works like a fixed pitch propeller. RPM is controlled by the engine power setting. Flight to the nearest airfield can be continued with a lower power setting and at a lower airspeed. Climb and go-around may not be possible under all conditions.

1. POWER lever . . . . . reduce to not exceed 2300 RPM
2. Airspeed . . . . . 88 KIAS
3. Flaps . . . . . check UP

*After RPM has Stabilized Below 2300 RPM:*

4. Airspeed . . . . . as required, do not exceed 2300 RPM
5. POWER lever . . . . . as required, do not exceed 2300 RPM

*If the Problem Does Not Clear:*

6. VOTER switch . . . . . swap between ECU A and B

**NOTE**

If selecting ECU A or ECU B does not solve the problem, switch back to AUTO. Keep controlling the climb/sink rate with the POWER lever and do not exceed 2300 RPM.

**CONTINUED**

*If the Problem Does Not Clear:*

7. Land on the nearest suitable airfield.

*If an Increased Climb Rate is Required:*

8. Flaps ..... T/O position
9. Airspeed ..... 72 KIAS
10. POWER lever ..... as required, do not exceed 2300 RPM

**END OF CHECKLIST**

(c) Propeller Underspeed

1. POWER lever ..... as required

*If the Problem Does Not Clear*

2. VOTER switch ..... swap between ECU A and B

*If the Problem Does Not Clear:*

3. VOTER switch ..... AUTO
4. POWER lever ..... as required

**WARNING**

Due to this problem the propeller RPM will drop. There may be no climb performance and no go-around power available.

5. Land on the nearest suitable airfield.

**END OF CHECKLIST**

**3.3.7 FUEL TRANSFER PUMP FAILURE**

1. Fuel quantity ..... check

*If Main Tank Fuel Quantity Low:*

2. Fuel valve ..... EMERGENCY
3. Fuel pumps ..... OFF

**WARNING**

The fuel valve must be switched back to NORMAL before the auxiliary tank indication reads zero! Otherwise, the engine will stop during flight when the auxiliary tank is empty.

**WARNING**

When the fuel pump takes in air (e.g. when the fuel valve is not switched back and the auxiliary tank is empty), an inspection of the pump is necessary prior to next flight.

**CAUTION**

When set to EMERGENCY, fuel is transferred from the auxiliary tank to the main tank at a rate of approximately 45 US gal/h (170 liter/h).

4. AUX tank ..... monitor quantity
5. MAIN tank ..... monitor quantity

**CONTINUED**

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**NOTE**

AUX tank quantity must not be less than 1 US gal and  
MAIN tank quantity must not be more than 14 US gal.

- 6. Fuel valve ..... NORMAL
- 7. Land as soon as practicable.

**END OF CHECKLIST**

### **3.4 FAILURES IN THE ELECTRICAL SYSTEM**

#### **3.4.1 COMPLETE FAILURE OF THE ELECTRICAL SYSTEM**

1. Circuit breakers . . . . . check IN
2. ESSENTIAL BUS . . . . . ON

*If There Is Still No Electrical Power Available:*

2. EMERGENCY switch (if installed) . . . . . ON
3. Flood light, if necessary . . . . . ON
4. POWER . . . . . set based on lever positions  
and engine noise
5. Prepare landing with flaps in the given position. Refer to 4B.5 - FAILURES IN FLAP  
OPERATING SYSTEM.
6. Land on the nearest suitable airfield.

#### **WARNING**

Engine stoppage may occur, depending on the failure mode.  
A backup battery is installed for the ECU to provide electrical  
power solely to ECU B and its system for at least 30 minutes.

#### **NOTE**

The backup artificial horizon and the flood light will have  
electrical power for at least 1.5 hours.

If G1000 is installed make use of the stand-by airspeed indicator and altimeter. Engine  
power can be set via visual reference of the POWER lever position.

**END OF CHECKLIST**

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**3.4.2 HIGH CURRENT**

If HIGH CURRENT (> 70 A) is indicated on the G1000 (if installed) or SED (if installed):

1. ESSENTIAL BUS ..... ON
2. ENGINE SYSTEM DISPLAY  
(if G1000 is installed) ..... select by pressing ENGINE and  
SYSTEM softkey on MFD
3. Circuit breakers ..... check IN
4. Ammeter/Voltmeter ..... monitor
5. Land on the nearest suitable airfield.

**END OF CHECKLIST**

### **3.4.3 STARTER MALFUNCTION**

If the starter does not disengage from the engine after starting (Starter engaged warning (STARTER) on the G1000 (if installed) or START on the White Wire annunciator (if installed) illuminates after the engine has started):

*On Ground:*

1. POWER lever ..... IDLE
2. ENGINE MASTER ..... OFF
3. ELECTRIC MASTER ..... OFF

Terminate flight preparation!

*In Flight:*

Land as soon as possible.

**END OF CHECKLIST**



**3.5 SMOKE AND FIRE**

**3.5.1 SMOKE AND FIRE ON GROUND**

(a) Engine Fire When Starting on the Ground

- 1. Fuel valve ..... OFF
- 2. Fuel transfer pump ..... OFF
- 3. ENGINE MASTER ..... OFF
- 4. Fuel pumps ..... OFF
- 5. ELECTRIC MASTER ..... OFF

*After Standstill:*

- 6. Canopy ..... open
- 7. Airplane ..... evacuate immediately

**END OF CHECKLIST**

(b) Electrical Fire with Smoke on the Ground

1. ELECTRIC MASTER ..... OFF

*If the Engine Is Running:*

2. POWER lever ..... IDLE
3. ENGINE MASTER ..... OFF
4. Fuel pumps ..... OFF

*When the Engine Has Stopped:*

6. Canopy ..... open
7. Airplane ..... evacuate immediately

**END OF CHECKLIST**

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

(a) If Take-Off Can Still Be Aborted

- 1. POWER lever ..... IDLE
- 2. Cabin heat ..... OFF
- 3. Brakes ..... apply - bring the airplane to a stop
- 4. Fuel valve ..... OFF
- 5. Fuel transfer pump ..... OFF
- 6. ENGINE MASTER ..... OFF
- 7. Fuel pumps ..... OFF
- 8. ELECTRIC MASTER ..... OFF

*After Standstill:*

- 9. Canopy ..... open
- 10. Airplane ..... evacuate immediately

**END OF CHECKLIST**

(b) If Take-Off Cannot Be Aborted

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 aborted and a safe height has not been reached, then a straight-ahead emergency landing should be carried out. Do not attempt to turn back to the airfield. Turning back can be fatal. Refer to 3.3.2 - ENGINE PROBLEMS DURING TAKE-OFF.

*After Climbing to a Height From Which the Selected Landing Area Can Be Reached Safely:*

3. Fuel valve . . . . . OFF
4. Fuel transfer pump . . . . . OFF
5. Cabin heat . . . . . OFF
6. ENGINE MASTER . . . . . OFF
7. Fuel pumps . . . . . OFF
8. ELECTRIC MASTER . . . . . OFF
9. Emergency windows . . . . . open if necessary
10. Carry out an emergency landing with engine off. Allow for increased landing distance due to the flap position. Refer to 3.7.1 - EMERGENCY LANDING WITH ENGINE OFF.

**CONTINUED**

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**CAUTION**

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

*When Airplane Has Stopped:*

- 11. Canopy ..... open
- 12. Airplane ..... evacuate immediately

**END OF CHECKLIST**

**3.5.3 SMOKE AND FIRE IN FLIGHT**

**WARNING**

In the event of smoke or fire, prepare to land the airplane without delay while completing fire suppression and/or smoke evacuation procedures. If it cannot be visually verified that the fire has been completely extinguished, whether the smoke has cleared or not, land immediately.

**(a) Engine Fire in Flight**

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

*When it Seems Certain That the Landing Area Will Be Reached:*

3. Fuel valve . . . . . OFF
4. POWER lever . . . . . MAX
5. Emergency windows . . . . . open if required
6. Land immediately. Refer to 3.7.1 - EMERGENCY LANDING WITH ENGINE OFF.

**CAUTION**

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

*When Airplane Has Stopped:*

7. Canopy . . . . . open
8. Airplane . . . . . evacuate immediately

**END OF CHECKLIST**

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(b) Electrical Fire with Smoke in Flight

1. EMERGENCY switch (if installed) . . . . . ON
2. AVIONIC MASTER . . . . . OFF
3. ELECTRIC MASTER . . . . . OFF
4. Cabin heat . . . . . OFF
5. Emergency windows . . . . . open if required
6. Land immediately. Refer to 3.7.1 - EMERGENCY LANDING WITH ENGINE OFF.

**WARNING**

Switching OFF the ELECTRIC MASTER will lead to total failure of all electronic and electric equipment. Also affected from this is the attitude gyro (artificial horizon).

However, by switching the EMERGENCY switch ON, if installed, the emergency battery, if installed will supply power to the attitude gyro (artificial horizon) and the flood light.

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

*When Airplane Has Stopped:*

7. Canopy . . . . . open
8. Airplane . . . . . evacuate immediately

**END OF CHECKLIST**

### **3.6 GLIDING**

1. Flaps ..... UP
2. Airspeed ..... 88 KIAS

#### **NOTE**

The glide ratio is 9.7; i.e., for every 1000 ft (305 m) of altitude loss the maximum horizontal distance traveled in still air is 1.59 NM (2.94 km). During this the propeller will continue to windmill.

#### **NOTE**

For operation without wheel fairings the glide ratio is reduced to 9.4; i.e., for every 1000 ft (305 m) of altitude loss the maximum horizontal distance traveled in still air is 1.54 NM (2.85 km). During this the propeller will continue to windmill.

**END OF CHECKLIST**



**3.7 EMERGENCY LANDINGS**

**NOTE**

For all airspeed tables in the following sections apply linear variations between weights.

**3.7.1 EMERGENCY LANDING WITH ENGINE OFF**

**CAUTION**

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

- 1. Adjustable backrests (if installed) . . . . . adjust to the upright position described by a placard on the roll-over bar and verify proper fixation
- 2. ENGINE MASTER . . . . . check OFF
- 3. Fuel transfer pump . . . . . OFF
- 4. Fuel pumps . . . . . OFF
- 5. Fuel valve . . . . . OFF
- 6. AVIONIC MASTER . . . . . OFF
- 7. Safety harnesses . . . . . check fastened and tightened

*When Sure of Making Landing Area:*

- 8. FLAPS . . . . . T/O or LDG, as required

**NOTE**

Extending the flaps to LDG will increase drag and incur a high sink rate. When the landing area can be reached safely, landing with flaps LDG is advisable.

**CONTINUED**

9. Approach speed ..... see table below:

<b>Flaps</b>	<b>940 kg (2072 lb)</b>	<b>1000 kg (2205 lb)</b>	<b>1080 kg (2381 lb)</b>	<b>1160 kg (2557 lb)</b>	<b>1216 kg (2681 lb)</b>	<b>up to 1280 kg (2822 lb)</b>
T/O	68 KIAS	70 KIAS	73 KIAS	76 KIAS	77 KIAS	78 KIAS
LDG	66 KIAS	69 KIAS	72 KIAS	74 KIAS	76 KIAS	77 KIAS

10. ELECTRIC MASTER ..... OFF

11. Touch down ..... lowest practical speed

**END OF CHECKLIST**

**3.7.2 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**

### 3.7.3 LANDING WITH DEFECTIVE BRAKES

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

#### **WARNING**

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

- Fuel valve . . . . . OFF
- ENGINE MASTER . . . . . OFF
- Fuel pumps . . . . . OFF
- ELECTRIC MASTER . . . . . OFF

**END OF CHECKLIST**

### 3.8 RECOVERY FROM AN UNINTENTIONAL SPIN

#### CAUTION

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

1. POWER lever ..... IDLE
2. Ailerons ..... neutral
3. Rudder ..... full deflection against  
direction of spin
4. Elevator (control stick) ..... fully forward

*When Rotation Has Stopped:*

5. Flaps ..... UP
6. Rudder ..... neutral
7. Elevator (control stick) ..... pull carefully
8. Return the airplane from a descending into a normal flight attitude. Do not exceed the 'never exceed speed',  $v_{NE} = 172$  KIAS.

**END OF CHECKLIST**

### **3.9 OTHER EMERGENCIES**

#### **3.9.1 ICING**

##### 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. Cabin air ..... DEFROST
5. POWER lever ..... increase power, in order to prevent  
ice build-up on the propeller blades  
apply power changes periodically
  
6. Alternate air ..... OPEN
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 expect loss of airspeed indication.

**END OF CHECKLIST**

**3.9.2 SUSPICION OF CARBON MONOXIDE CONTAMINATION IN THE CABIN**

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

1. Cabin heat . . . . . OFF
2. Ventilation . . . . . open
3. Emergency windows . . . . . open
4. Forward canopy . . . . . unlatch, push up and lock in  
'Cooling Gap' position

**CAUTION**

The maximum demonstrated airspeed for opening the front canopy in flight is 117 KIAS.

**NOTE**

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

**END OF CHECKLIST**

**3.9.3 UNLOCKED DOORS**

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

Canopy Unlocked

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

**END OF CHECKLIST**

Rear Door Unlocked

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

**WARNING**

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

**NOTE**

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

**END OF CHECKLIST**



## CHAPTER 4A

# NORMAL OPERATING PROCEDURES

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## 4A.1 INTRODUCTION

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

## 4A.2 AIRSPEEDS FOR NORMAL OPERATING PROCEDURES

### NOTE

For all airspeed tables in the following Sections apply linear variations between weights.

Flight Mass	940 kg (2072 lb)	1000 kg (2205 lb)	1100 kg (2425 lb)	1200 kg (2646 lb)	1280 kg (2822 lb) and above
Airspeed for rotation (Take-off run, $v_R$ ) (Flaps T/O)	56 KIAS	58 KIAS	61 KIAS	65 KIAS	67 KIAS
Airspeed for initial climb ( $v_{50}$ ) (Flaps T/O)	62 KIAS	65 KIAS	67 KIAS	70 KIAS	72 KIAS
Airspeed for take-off climb (best rate-of-climb speed $v_Y$ ) (Flaps T/O)	72 KIAS	72 KIAS	72 KIAS	72 KIAS	72 KIAS
Airspeed for cruise climb (Flaps UP)	88 KIAS	88 KIAS	88 KIAS	88 KIAS	88 KIAS

Flight Mass	940 kg (2072 lb)	1100 kg (2425 lb)	1200 kg (2646 lb)	1216 kg (2681 lb)	1280 kg (2822 lb)
Approach speed for normal landing (Flaps LDG)	66 KIAS	72 KIAS	76 KIAS	76 KIAS	77 KIAS
Minimum speed during go-around (Flaps T/O)	72 KIAS	72 KIAS	72 KIAS	72 KIAS	72 KIAS

### 4A.3 FLIGHT CHARACTERISTICS

The DA 40 NG is to be flown with "the feet on the pedals", meaning that coordinated flight in all phases and configurations shall be supported by dedicated use of the rudder and ailerons together.

### 4A.4 DAILY CHECK

Before the first flight of a day it must be ensured that the following checks are performed:

- On-condition check of the canopy, the rear door for cracks and major scratches.
- On-condition check of the lever arms of the canopy and the hinges of the rear door.
- Visual inspection of the locking bolts for proper movement with no backlash.
- Visual inspection of the rear door safety hook.
- Tire inflation pressure check :

main wheels: 3.3 bar (48 PSI)

nose wheel : 3.1 bar (45 PSI)

nose wheel (if MÄM 40-631 is carried out): 2.4 bar (35 PSI)

- Visual inspection of the spinner and its attachment (including screws).

## **4A.5 CHECKLISTS FOR NORMAL OPERATING PROCEDURES**

### **4A.5.1 PRE-FLIGHT INSPECTION**

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

- a) MET, NAV, Mass & CG . . . . . flight planning completed
- b) Airplane documents . . . . . complete and up-to-date
- c) ELECTRIC MASTER . . . . . OFF, pull out key
- d) ENGINE MASTER . . . . . check OFF
- e) VOTER switch . . . . . check AUTO
- f) Fuel valve . . . . . locked, in NORMAL position
- g) Front canopy & rear door . . . . . clean, undamaged,  
check locking mechanism function
- h) All electrical equipment . . . . . OFF
- i) Circuit breakers . . . . . check all IN (if one has popped:  
investigate)
- j) POWER lever . . . . . check condition, freedom of  
movement, full travel and friction  
adjustment
- k) POWER lever . . . . . IDLE
- l) ELECTRIC MASTER . . . . . ON
- m) Fuel quantity . . . . . check, use alternate mean

#### **NOTE**

If the fuel quantity indicator reads 14 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 14 US gal.

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- n) Position lights, strobe lights (ACL) . . . . . check OFF
- o) Taxi lights, landing lights . . . . . check OFF
- p) ELECTRIC MASTER . . . . . OFF
- q) Foreign objects . . . . . check
- r) Controls and trim . . . . . free and correct
- █ s) Emergency axe (if installed) . . . . . stowed and secured
- █ t) Baggage . . . . . stowed and secured

**END OF CHECKLIST**

II. Walk-Around Check, Visual Inspection

**CAUTION**

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

**CAUTION**

In low ambient temperatures the airplane 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 or fairing (if installed) . . . . visual inspection
- b) Wear, tread depth of tire . . . . . check
- c) Tire, wheel, brake . . . . . visual inspection
- d) Brakes . . . . . check for leaks
- e) Slip marks . . . . . visual inspection
- f) Chocks . . . . . remove

**CONTINUED**

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2. Left Wing:

- a) Entire wing surface . . . . . visual inspection
- b) Step . . . . . visual inspection
- c) Air intake on lower wing surface . . . . . visual inspection
- d) Winter baffle of air intake on lower wing surface (if installed) . . . . . consider removal depending on outside air temperature and verify proper mounting
- e) Openings on lower surface . . . . . check for foreign objects and for traces of fuel (if tank is full, fuel may spill over through the tank vent)
- f) Tank drain . . . . . drain to check for water and sediment (drain until free of contamination)
- g) Stall warning . . . . . check function (suction)
- h) Tank filler . . . . . check closed (for fuel qty. check use alternate means)
- i) Tank air outlet in lower surface . . . . . visual inspection
- j) Pitot probe . . . . . clean, orifices clear, attachment secure (no loose or missing screws)
- k) Landing/taxi light . . . . . visual inspection
- l) Winglet . . . . . visual inspection
- m) Position light, strobe light (ACL) . . . . . visual inspection
- n) Tie-down . . . . . check, clear
- o) 2 stall strips on wing . . . . . visual inspection
- p) Aileron and linkage . . . . . visual inspection
- q) Aileron hinges and safety pin . . . . . visual inspection

**CONTINUED**

- r) Foreign objects in aileron paddle . . . . . visual inspection
- s) Trim tab . . . . . visual inspection
- t) Flap and linkage . . . . . visual inspection
- u) Flap hinges and safety pin . . . . . visual inspection
- v) Static discharger . . . . . visual inspection
- w) Fuel cooler inlet baffle (if installed) . . . . . verify that the outside air temperature  
permits the use
- x) Fuel cooler inlet baffle (if installed) . . . . . check for improper mounting or  
obvious damage

**3. Fuselage, Left Side:**

- a) Canopy, left side . . . . . visual inspection
- b) Door lock (if installed) . . . . . unlocked, key removed
- c) Rear cabin door & window . . . . . visual inspection
- d) Fuselage skin . . . . . visual inspection
- e) Antennas . . . . . visual inspection
- f) Static source . . . . . check for blockage

**4. Empennage:**

- a) Stabilizers and control surfaces . . . . . visual inspection
- b) Hinges . . . . . visual inspection
- c) Elevator trim tab . . . . . visual inspection, check for movement  
and safety wire
- d) Rudder tab . . . . . visual inspection
- e) Tie-down . . . . . check, clear
- f) Tail skid and lower fin . . . . . visual inspection
- g) Static dischargers . . . . . visual inspection

**CONTINUED**



**5. Fuselage, Right Side:**

- a) Fuselage skin . . . . . visual inspection
- b) Static source . . . . . check for blockage
- c) Rear window . . . . . visual inspection
- d) Canopy, right side . . . . . visual inspection

**6. Right Wing:**

- a) Flap and linkage . . . . . visual inspection
- b) Flap hinges and safety pin . . . . . visual inspection
- c) Aileron and linkage . . . . . visual inspection
- d) Aileron hinges and safety pin . . . . . visual inspection
- e) Foreign objects in aileron paddle . . . . . visual inspection
- f) Wing let . . . . . visual inspection
- g) Position light, strobe light (ACL) . . . . . visual inspection
- h) Tie-down . . . . . 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 (for fuel qty. check use alternate means)
- m) Openings on lower surface . . . . . check for foreign objects and for traces of fuel (if tank is full, fuel may spill over through the tank vent)
- n) Tank drain . . . . . drain to check for water and sediment (drain until free of contamination)
- o) Step . . . . . visual inspection
- p) Static discharger . . . . . visual inspection

**CONTINUED**

7. *Right Main Landing Gear:*

- a) Landing gear strut or fairing (if installed) . . . . visual inspection
- b) Wear, tread depth of tires . . . . . check
- c) Tire, wheel, brake . . . . . visual inspection
- d) Brakes . . . . . check for leaks
- e) Slip marks . . . . . visual inspection
- f) Chocks . . . . . remove

8. *Front Fuselage:*

- a) Engine oil level . . . . . check dipstick  
(inspection door on left side)
- b) Gearbox oil level . . . . . check visually  
(inspection door on left side)
- c) Cowling . . . . . visual inspection
- d) 4 air intakes on front cowling . . . . . check
- e) 2 air intakes on RH fuselage and cowling . . . check
- f) 1 air intake on LH fuselage . . . . . check
- g) Propeller . . . . . visual inspection

**WARNING**

Never rotate the propeller by hand.

- h) Spinner including attachment screws . . . . . visual inspection
- i) Nose landing gear strut . . . . . visual inspection
- j) Tie-down (if installed) . . . . . check, clear
- k) Tire and wheel . . . . . visual inspection,  
check slip marks

**CONTINUED**

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- l) Wear, tread depth of tire ..... check
- m) Wheel fairing (if installed) ..... visual inspection
- n) Tow bar ..... removed
- o) Chocks ..... remove
- p) Exhaust ..... visual inspection

**WARNING**

The exhaust can cause burns when it is hot.

9. *Underside:*

- a) Antennas ..... visual inspection
- b) Gascolator ..... pull down on drain to check for water and sediment (drain until free of contamination)
- c) Venting pipes ..... check for blockage
- d) Fuselage underside ..... check for excessive contamination particularly by oil, fuel or other fluids

**END OF CHECKLIST**

**4A.5.2 BEFORE STARTING ENGINE**

**CAUTION**

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

**NOTE**

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

1. Pre-flight inspection ..... complete
2. Rudder pedals ..... adjusted and locked
3. Passengers ..... instructed
4. Adjustable backrests (if installed) ..... adjust to the upright position described  
..... on the roll-over bar and verify proper  
..... fixation
5. Safety harnesses ..... all fastened
6. Rear door ..... closed and locked
7. Door lock (if installed) ..... unlocked, key removed
8. Front canopy ..... Position 1 or 2 (“cooling gap”)
9. Canopy lock (if installed) ..... unlocked, key removed

**CAUTION**

When operating the canopy, pilots / operators are to 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.

**CONTINUED**

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**NOTE**

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

- █ 10. Parking brake . . . . . set
- █ 11. Flight controls . . . . . free movement
- █ 12. Trim wheel . . . . . T/O
- █ 13. POWER lever . . . . . check IDLE
- █ 14. Friction device on POWER lever . . . . . adjusted
- █ 15. Alternate air . . . . . check CLOSED
- █ 16. Alternate static valve . . . . . check CLOSED
- █ 17. VOTER switch . . . . . check AUTO
- █ 18. Fuel pumps . . . . . check OFF
- █ 19. AVIONIC MASTER . . . . . check OFF
- █ 20. ELECTRIC MASTER . . . . . ON
- █ 21. G1000 (if installed) . . . . . wait until power-up completed.  
Press ENT on MFD to  
acknowledge

**NOTE**

- █ If the G1000 avionics system is installed, the engine instruments are only available on the MFD after item 21 has been completed.
- █ 22. White Wire annunciator panel (if installed) . . . check and press acknowledge button
- █ 23. COOL LVL caution on G1000 (if installed) or WATERLEV caution on SED (if installed) . . check OFF
- █ 24. Fuel temperature . . . . . check

**WARNING**

Never rotate the propeller by hand.

**END OF CHECKLIST**

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### 4A.5.3 STARTING ENGINE

#### **CAUTION**

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

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

#### **CAUTION**

Do not operate the engine starter motor for more than 10 seconds, because of possible overheating of the starter motor.

If the STARTER annunciation on the G1000 (if installed) or START on the White Wire annunciator panel (if installed) comes on after the engine has started and the START KEY has been released, set the ENGINE MASTER to OFF and investigate the problem.

#### **WARNING**

If the oil pressure has not moved from the red range within 3 seconds after starting, set the ENGINE MASTER switch to OFF and investigate problem.

#### **NOTE**

At low ambient temperatures it is possible that the engine will not start at the first attempt. In this case wait 60 seconds between the start attempts.

**CONTINUED**

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- 1. Strobe lights (ACL) ..... ON
- 2. ENGINE MASTER ..... ON
- 3. Annunciators / GLOW ON (if G1000 is installed) or GLOW (if White Wire annunciator panel is installed) ..... check ON

**NOTE**

GLOW ON (if G1000 is installed) or GLOW (if White Wire annunciator panel is installed) is indicated only when the engine is cold.

- 4. Annunciators / engine indications ..... check

**WARNING**

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

*After the GLOW ON (if G1000 is installed) or GLOW (if White Wire annunciator panel is installed) indication is extinguished:*

- 5. START KEY ..... START as required / release when engine has started.
- 6. Annunciators / engine indications ..... check OK/normal range

**CONTINUED**

7. Annunciators / STARTER  
(if G1000 is installed) or START (if  
White Wire annunciator panel is installed) . . . check OFF
8. Annunciators / Oil pressure . . . . . check OK
9. Circuit breakers . . . . . check all IN
  
10. Idle RPM . . . . . check, 710 ±30 RPM  
(above 7,000 ft pressure altitude  
idle RPM might be higher)

**I**

**END OF CHECKLIST**



#### **4A.5.4 BEFORE TAXIING**

- 1. AVIONIC MASTER ..... ON
- 2. Power lever ..... as required, max. 50% if engine temperature below green range
- 3. Electrical equipment ..... ON as required
- 4. Flight instruments and avionics ..... set as required
- 5. Flood light ..... ON, test function, as required
- 6. Pitot heating ..... ON, check annunciation and observe an increase in alternator load
- 7. Pitot heating ..... OFF
- 8. Strobe lights (ACLs) ..... check ON
- 9. Position lights, landing and taxi lights ..... as required

#### **CAUTION**

When taxiing at close range to other airplanes, 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.

- 10. Primary flight display (PFD) (if G1000 and autopilot GFC 700 are installed) ..... NO AUTOPILOT ANNUNCIATIONS
- 11. Autopilot disconnect tone (if autopilot GFC 700 is installed) ..... NOTE

#### **CONTINUED**

**NOTE**

If the G1000 avionics system and the autopilot GFC 700 are installed, the AFCS automatically conducts a preflight self-test upon initial power application. The preflight test is indicated by a white boxed PFT on the PFD. Upon successful completion of the preflight test, the PFT is removed, the red AFCS annunciation is removed, and the autopilot disconnect tone sounds. If AFCS annunciation remains on or a failure of the preflight test is indicated terminate flight preparation and investigate the problem.

- 12. MANUAL ELECTRIC TRIM - TEST as follows (if G1000 and autopilot GFC 700 are installed):

Press the AP DISC button down and hold while commanding trim.  
Manual electric trim should not operate either nose up or nose down.

- 13. AUTOPILOT (if G1000 and autopilot GFC 700 are installed) . . . . . engage by pressing AP button

- 14. AP DISC switch (if G1000 and autopilot GFC 700 are installed) . . . . . press. verify that the autopilot disconnects, check tone

- 15. TRIM . . . . . set to take-off position manually

**END OF CHECKLIST**

**4A.5.5 TAXIING**

- 1. Parking brake . . . . . release
- 2. Brakes . . . . . test
- 3. Flight instrumentation and avionics . . . . . check for correct indications
- 4. Fuel pumps . . . . . check OFF

**CAUTION**

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

**CAUTION**

Avoid prolonged permanent braking while taxiing. Prolonged permanent braking while taxiing will overheat the brakes and may cause loss of brake capacity and subsequent damage to the airplane.

**END OF CHECKLIST**

**4A.5.6 BEFORE TAKE-OFF**

**CAUTION**

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

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

**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.

6. Front canopy . . . . . closed and locked
7. Door warning (DOOR OPEN (if G1000 is installed) DOORS (if White Wire annunciator panel is installed) . . . . . check no indication
8. Annunciators / engine indications . . . . . check OK / normal range  
(except oil pressure may be in the yellow range with a warm engine and POWER lever set to IDLE)
9. Circuit breakers . . . . . check pressed in
10. Longitudinal trim . . . . . set T/O

- 11. Fuel valve . . . . . check NORMAL
- 12. FLAPS . . . . . check function & indicator /  
set T/O
- 13. Flight controls . . . . . unrestricted free movement,  
correct sense
- 14. Pitot heating . . . . . ON, if required
- 15. Landing light . . . . . ON, if required

*ECU / Fuel Pump Test Sequence:*

### CAUTION

If the ECU A/B FAIL (if G1000 is installed) or ECU A/B (if White Wire annunciator panel is installed) indicators do not illuminate during the test sequence there is a malfunction in the engine control system. Terminate flight preparation.

The whole test procedure must be completed without any error (ECU A/B FAIL (if G1000 is installed) or ECU A/B (if White Wire annunciator panel is installed) extinguished after test completion). In case the test procedure aborts with an error indication (one or both ECU A/B FAIL (if G1000 is installed) or ECU A/B (if White Wire annunciator panel is installed) indicators remain ON) terminate flight preparation, even if the engine seems to run smoothly after the test procedure.

### CAUTION

During the test sequence the engine will produce thrust therefore the parking brake must be set.

**CONTINUED**

**NOTE**

! The engine oil / gearbox temperature has to be in the green  
! range before starting the test sequence. Efficient engine warm  
! up may require higher power settings (max. 50% engine  
! power). Releasing the ECU TEST BUTTON or manipulating  
the POWER lever before the test sequence is completed will  
abort the test sequence. During the following ECU and fuel  
pump test, a shake of the engine might occur.

- 1. POWER lever . . . . . IDLE
- 2. Propeller RPM . . . . . check below 1000 RPM
- 3. Fuel pumps . . . . . check OFF
- 4. VOTER switch . . . . . check AUTO

**NOTE**

If the VOTER switch is not in the AUTO position, the ECU  
test will not start.

- 5. All engine temperatures . . . . . check in the green range
- 6. Parking brake . . . . . check set
- 7. ECU TEST button . . . . . press and hold

**NOTE**

The ECU test consists of the following sequence: the propeller  
RPM will increase to above 1900 RPM. This is followed by  
a slight RPM drop, than a recovery before returning to idle  
RPM. At this point the ECU switches back to the other ECU  
channel and the sequence is repeated. At the end of the test,  
the control of the engine is returned to the initially active ECU  
channel. A slight shake of the engine may occur during ECU  
switching.

**CONTINUED**

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- 8. ECU A/B FAIL (if G1000 is installed) or  
ECU A/B (if White Wire annunciator  
panel is installed) lights ..... verify both OFF

Test sequence completed.

- 9. ECU TEST button ..... release

**NOTE**

By switching between ECU A and B the two independent electrical fuel pumps are switched over as well.

- 10.VOTER switch ..... ECU A
- 11.Engine ..... check running without a change  
(shake may occur)
- 12.VOTER switch ..... AUTO
- 13.Engine ..... check running without a change  
(shake may occur)
- 14.VOTER switch ..... ECU B
- 15.Engine ..... check running without a change  
(shake may occur)
- 16.VOTER switch ..... AUTO

**CAUTION**

Running the engine with the VOTER switch on ECU A or ECU B, other than for this test or in an emergency is prohibited. The engine control system redundancy is only given with the VOTER switch set to AUTO.

**CONTINUED**

Available Power Check:

1. POWER lever . . . . . MAX for 10 seconds
2. Annunciators . . . . . check OK / normal range
3. Instruments . . . . . check within normal range
4. RPM . . . . . stabilizes at 2200 to 2300 RPM, min.  
2100 RPM below -10°C (14°F)
5. LOAD indication . . . . . stabilizes at 88% to 100%

**CAUTION**

The load indications in the table below are minimum values to be indicated with the airplane stationary in no wind conditions. If the engine does not stabilize at the target RPM and the required load indication, terminate flight preparation.

Altitude [ft]	OAT								
	-35°C -31°F	-20°C -4°F	-10°C 14°F	0°C 32°F	10°C 50°F	20°C 68°F	30°C 86°F	40°C 104°F	50°C 122°F
0	94%						95%	92%	90%
2000	94%						95%	92%	/
4000	94%						95%	92%	/
6000	96%						95%	92%	/
8000	96%						95%	94%	91%
10000	96%			94%	93%	91%	88%	/	/

6. POWER lever . . . . . IDLE
7. Engine instruments . . . . . check in green range

**NOTE**

With the POWER lever in IDLE the oil pressure may be in the low yellow range. This is acceptable to continue flight.

8. Fuel pumps . . . . . ON
9. Parking brake . . . . . release

**END OF CHECKLIST**



**4A.5.7 TAKE-OFF**

Normal Take-Off Procedure

1. Transponder . . . . . as required
2. POWER lever . . . . . MAX

**WARNING**

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

3. Elevator . . . . . neutral
4. 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, and should not generally be used.

**NOTE**

For soft field take-off hold elevator back pressure during take-off roll until nose lift-off. Accelerate to initial climb speed after lift-off.

5. Nose wheel lift-off ( $v_R$ ) . . . . . see table below:

<b>940 kg</b>	<b>1000 kg</b>	<b>1100 kg</b>	<b>1200 kg</b>	<b>1280 kg (2822 lb)</b>
<b>(2072 lb)</b>	<b>(2205 lb)</b>	<b>(2425 lb)</b>	<b>(2646 lb)</b>	<b>and above</b>
56 KIAS	58 KIAS	61 KIAS	65 KIAS	67 KIAS

**CONTINUED**

**NOTE**

A spurious activation of the stall warning during take-off in crosswind conditions, operation on unpaved surfaces and gusty conditions may occur.

6. Airspeed for initial climb . . . . . see table below:

<b>940 kg (2072 lb)</b>	<b>1000 kg (2205 lb)</b>	<b>1100 kg (2425 lb)</b>	<b>1200 kg (2646 lb)</b>	<b>1280 kg (2822 lb) and above</b>
62 KIAS	65 KIAS	67 KIAS	70 KIAS	72 KIAS

*Above a Safe Height:*

- 7. Landing light . . . . . OFF
- 8. Fuel pumps . . . . . OFF
- 9. POWER lever . . . . . reduce to 92% load

**END OF CHECKLIST**

#### **4A.5.8 CLIMB**

##### Procedure for Take-Off Climb

1. Flaps ..... T/O
2. Airspeed ..... 72 KIAS
3. POWER lever ..... 92% or maximum 2100 RPM
4. Annunciations / engine indications ..... monitor
5. Rudder ..... as required

#### **CAUTION**

If the oil temperature and/or coolant temperature reaches the yellow range during climb, flight should be continued with an airspeed increased by 5 kt and power reduced by 10 % (reduced climb rate) for better engine cooling.

#### **NOTE**

Operating in the gearbox cautionary range is permitted. However, prolonged operation is not recommended.

#### **END OF CHECKLIST**

##### Cruise Climb

1. Flaps ..... UP
2. Airspeed ..... 88 KIAS
3. POWER lever ..... 92% or maximum 2100 RPM
4. Annunciations / engine indications ..... monitor
5. Rudder ..... as required

#### **END OF CHECKLIST**

**4A.5.9 CRUISE**

1. Flaps ..... UP
2. POWER lever ..... up to 92% or maximum 2100 RPM
3. Trim ..... as required
4. Fuel transfer ..... repeat as required (in accordance with 4A.5.10 - FUEL TRANSFER)

**NOTE**

The engine manufacturer recommends a cruise power setting of 75 %.

**NOTE**

Proper operation of the transfer pump must be checked by monitoring the fuel quantities (increasing in the MAIN tank, decreasing in the AUX tank, approx. 1 US gal per minute).

**END OF CHECKLIST**

**4A.5.10 FUEL TRANSFER**

**CAUTION**

During normal operation fuel is taken from the main tank only. Therefore fuel must be transferred from the auxiliary tank to the main tank by activating the fuel transfer pump. The transfer rate is approximately 60 US gal/h (227 liter/h).

- 1. Fuel transfer switch ..... ON

**NOTE**

The transfer pump turns off automatically to avoid overfilling the main tank. The switch remains in its position. If the pump is not turned off, it will continue pumping each time the fuel level in the main tank drops, but only as long as there is fuel in the auxiliary tank. The fuel transfer status light is illuminated only while the pump is running.

- 2. Fuel transfer switch ..... OFF, if required

**NOTE**

If the fuel transfer status light starts to blink, the fuel transfer pump must be switched off.

**END OF CHECKLIST**

**4A.5.11 DESCENT**

1. POWER lever ..... as required
2. Airspeed ..... as required
3. Trim ..... as required
4. Annunciations / engine indications ..... monitor

**END OF CHECKLIST**

**4A.5.12 APPROACH & LANDING**

*Approach:*

**NOTE**

| If MÄM 40-574 is NOT carried out, a landing with a mass  
 | between 1216 kg (2681 lb) and 1280 kg (2822 lb) constitutes  
 | an abnormal operating procedure. Refer to Section 4B.7 -  
 | LANDING WITH HIGH LANDING MASS.

**CAUTION**

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

- | 1. Adjustable backrests (if installed) . . . . . adjust to the upright  
 | position described by a placard  
 | on the roll-over bar and verify  
 | proper fixation
- | 2. Safety harnesses . . . . . check fastened and tightened
- | 3. Controls . . . . . no interference by foreign objects
- | 4. Landing light . . . . . as required
- | 5. Fuel pumps . . . . . ON
- | 6. Parking brake . . . . . check released
- | 7. Trim . . . . . as required

**CONTINUED**

*Before Landing:*

- 8. Airspeed ..... see table below:

<b>Flaps</b>	<b>940 kg (2072 lb)</b>	<b>1000 kg (2205 lb)</b>	<b>1100 kg (2425 lb)</b>	<b>1200 kg (2646 lb)</b>	<b>1216 kg (2681 lb)</b>	<b>1280 kg (2822 lb)</b>
T/O	68 KIAS	70 KIAS	74 KIAS	77 KIAS	77 KIAS	78 KIAS
LDG	66 KIAS	68 KIAS	72 KIAS	76 KIAS	76 KIAS	77 KIAS

- 9. FLAPS ..... as required
- 10. POWER lever ..... as required
- 11. Trim ..... as required
- 12. Final approach speed ..... see table below:

<b>Flaps</b>	<b>940 kg (2072 lb)</b>	<b>1000 kg (2205 lb)</b>	<b>1100 kg (2425 lb)</b>	<b>1200 kg (2646 lb)</b>	<b>1216 kg (2681 lb)</b>	<b>1280 kg (2822 lb)</b>
LDG	66 KIAS	68 KIAS	72 KIAS	76 KIAS	76 KIAS	77 KIAS

**NOTE**

Higher approach speeds result in a significantly longer landing distance during flare.

**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.5.13 GO-AROUND**

1. POWER lever ..... MAX
2. Airspeed ..... 72 KIAS
3. Flaps ..... T/O

*Above a Safe Height:*

4. Airspeed ..... 88 KIAS
5. Flaps ..... UP

**END OF CHECKLIST**

**4A.5.14 AFTER LANDING**

1. POWER lever ..... IDLE
2. Brakes ..... as required
3. Transponder ..... OFF / STBY
4. Pitot heating ..... OFF
5. Avionics ..... as required
6. Lights ..... as required
7. Flaps ..... UP
8. Fuel pumps ..... OFF

**END OF CHECKLIST**

#### 4A.5.15 ENGINE SHUT-DOWN

1. Parking brake . . . . . set
2. POWER lever . . . . . up to 10 % load for 1 minute
3. Engine indications . . . . . check
4. ELT . . . . . check not transmitting on  
121.5 MHz
5. AVIONIC MASTER . . . . . OFF
6. Electrical consumers . . . . . OFF
7. ENGINE MASTER . . . . . OFF
8. Strobe . . . . . OFF

#### **CAUTION**

After turning the ENGINE MASTER OFF, wait until the engine indications on the G1000 MFD (if installed) or MED (if installed) disappear prior to switching the ELECTRIC MASTER OFF. This ensures that engine and flight data can be written to non-volatile memory before removing electrical power.

9. ELECTRIC MASTER . . . . . OFF

#### **CAUTION**

Do not shut down an engine by placing the FUEL VALVE in the OFF position. The high pressure fuel pump can otherwise be damaged.

#### **NOTE**

Before shut-down the engine must run for at least 1 minute with the POWER lever set up to 10% load to avoid heat damage of the turbo charger.

#### **END OF CHECKLIST**

**4A.5.16 POST FLIGHT INSPECTION**

1. Record any problem found in flight and during the post-flight check in the log book.
2. Park the airplane.
3. If necessary, moor the airplane.

**END OF CHECKLIST**

**4A.5.17 PARKING**

1. Parking brake ..... release, use chocks
2. Airplane ..... moor, if unsupervised for  
extended period
3. Pitot probe ..... cover

**END OF CHECKLIST**

**4A.5.18 FLIGHT IN RAIN****NOTE**

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

**4A.5.19 REFUELING****CAUTION**

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

**Use of Fuel Additives****CAUTION**

Only approved fuel additives not exceeding the approved concentrations may be used; refer to Section 2.14 FUEL. The instructions of the fuel additive supplier must be followed. Failure to exactly follow the fuel additive mixing procedures during refueling can result in incorrect fuel additive concentrations, fuel system contamination and possible engine stoppage.

Fuel additives may have been already mixed into the fuel when stored. In this case make sure that the brand is approved and the concentration does not exceed the approved values.

Anti-microbial life fuel additives may be manually batch-blended into the fuel tanks. In this case introduce the additive while filling the tank after approximately the half tank is filled.

Anti-icing fuel additives should not be batch-blended into the fuel tank. The fuel additive should be injected into a stream of fuel.

Record the brand and amount of fuel additives in the airplane log every time fuel additives are added.

*Typical Dosing Quantities:*

(a) KATHON FP 1.5

Fuel Quantity				Fuel Additive *	
				KATHON FP 1.5 (100 ppm)	
Liter	US gal	kg	lb	ml	oz
50	13.2	40.2	88.68	3.9	0.13
100	26.4	80.4	177.37	7.7	0.26
150	39.6	120.6	266.05	11.6	0.39

\* Densities used for calculation: Fuel: 0.804 kg/l, KATHON FP 1.5: 1.04 kg/l

(b) BIOBOR JF

Fuel Quantity				Fuel Additive BIOBOR JF*			
				135 ppm		270 ppm	
Liter	US gal	kg	lb	ml	oz	ml	oz
50	13.2	40.2	88.68	5.2	0.18	10.4	0.35
100	26.4	80.4	177.37	10.4	0.35	20.9	0.71
150	39.6	120.6	266.05	15.6	0.53	31.3	1.06

\* Calculation according to SB No. 982, 'Instructions for use of BIOBOR JF'

(c) PRIST Hi-Flash

Fuel Quantity				Fuel Additive *, ** PRIST Hi-Flash (1500 ppm)	
Liter	US gal	kg	lb	ml	oz
50	13.2	40.2	88.68	58.9	1.99
100	26.4	80.4	177.37	117.9	3.99
150	39.6	120.6	266.05	176.8	5.98

\* Densities used for calculation: Fuel: 0.804 kg/l, PRIST Hi-Flash: 1.05 kg/l

\*\* Do not batch blend

**4A.5.20 FLIGHT AT HIGH ALTITUDE**

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

Also see Section 2.11 - OPERATING ALTITUDE.

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## CHAPTER 4B

### ABNORMAL OPERATING PROCEDURES

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

### **NOTE**

A landing of this type is only necessary when there is a reasonable suspicion that due to operational factors such as fuel shortage, weather conditions, etc. the possibility of endangering the airplane and its occupants by continuing the flight cannot be excluded. The pilot is required to decide whether or not a controlled landing in a field represents a lower risk than the attempt to reach the nearest airfield under all circumstances.

### **NOTE**

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

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. ATC ..... advise

Perform procedures according to Normal Procedures 4A.5.12 - APPROACH & LANDING.

5. Touchdown ..... with the lowest possible airspeed

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**CAUTION**

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

- 6. ENGINE MASTER ..... OFF
- 7. Fuel valve ..... OFF
- 8. ELECTRIC MASTER ..... OFF

**END OF CHECKLIST**

## **4B.2 INSTRUMENT INDICATIONS OUTSIDE OF GREEN RANGE**

### **4B.2.1 RPM**

#### High RPM

1. Reduce power.
2. Keep RPM within the green range using the POWER lever.

#### **NOTE**

An RPM in the yellow range is permissible for up to 5 minutes if required, e.g. for go-around or take-off.

If the above mentioned measures do not solve the problem refer to Section 3.3.6 - DEFECTIVE RPM REGULATING SYSTEM.

3. Land at the nearest suitable airfield.

**END OF CHECKLIST**

**4B.2.2 COOLANT TEMPERATURE****(a) High Coolant Temperature**

Proceed according to:

Section 3.2.1 - ENGINE TEMPERATURE.

**(b) Low Coolant Temperature**

- Check for COOL LVL (if G1000 is installed) or WATERLEV (if SED is installed) caution message (low coolant level).

**NOTE**

During an extended descent from high altitudes with a low power setting coolant temperature may decrease. In this case an increase in power and a decrease in airspeed can help.

*COOL LVL (if G1000 is installed) or WATERLEV (if SED is installed) Caution Message Displayed:*

- Reduce power.
- Expect loss of coolant.

**WARNING**

A further decrease in coolant temperature must be expected. Prepare for an engine failure in accordance with Section 3.3.3 - ENGINE TROUBLESHOOTING IN FLIGHT.

**END OF CHECKLIST**

**4B.2.3 OIL TEMPERATURE**

a) High Oil Temperature

Proceed according to:

Section 3.2.2 - OIL TEMPERATURE.

(b) Low Oil Temperature

**NOTE**

During an extended descent from high altitudes with a low power setting oil temperature may decrease. In this case an increase in power can help.

- Increase power.
- Reduce airspeed.

**END OF CHECKLIST**

**4B.2.4 OIL PRESSURE**High Oil Pressure

- - Check oil temperature.
- - Check coolant temperature.

■ *If the temperature is within the green range:*

- - Expect false oil pressure indication. Keep monitoring temperatures.

■ *If the temperature is outside of the green range:*

- - Reduce power on engine.

**WARNING**

■ Land at the nearest suitable airfield. Prepare for an engine failure in accordance with 3.7.1 - EMERGENCY LANDING WITH ENGINE OFF.

**NOTE**

■ At low oil temperature high oil pressure may occur which could lead to an oil pressure warning. In this case reduce the power setting until the warning disappears and conduct the warm up with this reduced setting.

**END OF CHECKLIST**

#### **4B.2.5 GEARBOX TEMPERATURE**

##### High Gearbox Temperature

Proceed according to:

Section 3.2.4 - GEARBOX TEMPERATURE.

#### **NOTE**

A cautionary (yellow) gearbox temperature range is not imposed by the engine manufacturer. However, there is a delay between power changes and gearbox temperature. Therefore, a cautionary range has been added to the G1000 (if installed) or MED (if installed) gearbox temperature instrument solely to make the pilot attentive to the gearbox temperature approaching the maximum allowable limit. There is no specific time limit associated with operating in the cautionary gearbox temperature range.

**END OF CHECKLIST**



**4B.2.6 FUEL TEMPERATURE****(a) High Fuel Temperature**

Proceed according to:

Section 3.2.5 - L/R FUEL TEMPERATURE.

**(b) Low Fuel Temperature**

- Increase power.
- Reduce airspeed.

**CAUTION**

At low ambient temperature conditions and/or at high airspeeds with low power settings, it can be assumed that the above mentioned procedure will increase the temperature(s). If the fuel temperature does not return to the green range perform a precautionary landing on the nearest suitable airfield. Prepare for an engine failure in accordance with Section 3.3.4 - ENGINE FAILURE IN FLIGHT.

**END OF CHECKLIST**

**4B.2.7 VOLTAGE**

(a) Low Voltage Indication on the Ground with Engine Running

- Terminate flight preparation.

(b) Low Voltage During Flight

1. Circuit breakers ..... check
2. Electrical equipment ..... OFF if not needed

*If Low Voltage Condition Still Exists:*

- Follow procedure in Section 3.2.8 - ALTERNATOR FAIL.

**NOTE**

This procedure is applicable if either the voltmeter is out of the green range or VOLTS LOW (if G1000 is installed) or LOW VOLTS (if White Wire annunciator panel is installed) is indicated.

**END OF CHECKLIST**

**4B.2.8 CURRENT**

This caution is indicated when the consumption of electric power exceeds 60 A.

1. Electrical equipment . . . . . switch OFF as necessary and possible to reduce electric load

*If the problem does not clear:*

2. Land on nearest suitable airfield.

**END OF CHECKLIST**

## **4B.3 CAUTION-ALERTS**

### **4B.3.1 ECU A FAILURE**

- \* Engine ECU A has failed or
- \* is being tested during FADEC test procedure before take-off check.

Depending on the type of failure, the ECU failure cautions are either 'non latched', i.e. the caution message disappears after the cause of the caution is no longer present or 'latched', i.e. the caution message remains until cleared through maintenance action. A 'non-latched' caution clears itself only on the active ECU. 'Non latched' caution messages can be cleared on the passive ECU by switching to that ECU with the voter switch.

#### (a) ECU A Caution on the Ground

1. ALTERNATE AIR ..... check CLOSED
2. Fuel pump ..... OFF
3. VOTER switch ..... check AUTO
4. ECU B caution ..... check OFF
5. VOTER switch ..... ECU A
6. Wait ..... 5 seconds
7. VOTER switch ..... AUTO

If the ECU A caution persists: - terminate flight preparation.

#### (b) ECU A Caution During Flight

### **NOTE**

In case of a failure in the electronic ECU (Engine Control Unit) 'A' the system automatically switches to ECU 'B'.

- 1. ALTERNATE AIR ..... OPEN
- 2. Fuel pump ..... ON
- 3. Circuit breakers ..... check / reset if necessary
- 4. VOTER switch ..... AUTO

If the ECU A caution persists: - land at the next suitable airfield. After landing, you may use (a) ECU A Caution on the ground as ECU caution clearing procedure.

**NOTE**



An ECU FAIL caution is caused by various types of malfunctions. These include internal ECU problems, sensor failure or insufficient performance of air-, fuel- or electrical supply system (e.g. air filter icing).

**NOTE**

If additional engine problems are observed refer to Section 3.3.3 - ENGINE TROUBLESHOOTING IN FLIGHT.

**END OF CHECKLIST**

### 4B.3.2 ECU B FAILURE

- \* Engine ECU B has failed or
- \* is being tested during FADEC test procedure before take-off check.

Depending on the type of failure, the ECU failure cautions are either 'non latched', i.e. the caution message disappears after the cause of the caution is no longer present or 'latched', i.e. the caution message remains until cleared through maintenance action. A 'non-latched' caution clears itself only on the active ECU. 'Non latched' caution messages can be cleared on the passive ECU by switching to that ECU with the voter switch.

#### (a) ECU B Caution on the Ground

- 1. ALTERNATE AIR ..... check CLOSED
- 2. Fuel Pump ..... OFF
- 3. VOTER switch ..... check AUTO
- 4. ECU A caution ..... check OFF
- 5. VOTER switch ..... ECU B
- 6. Wait ..... 5 seconds
- 7. VOTER switch ..... AUTO

If the ECU B caution persists: - terminate flight preparation.

#### (b) ECU B Caution During Flight

### **NOTE**

In case of a failure in the electronic ECU (Engine Control Unit) 'B' the system automatically switches to ECU 'A'.

**CONTINUED**

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- 1. ALTERNATE AIR ..... OPEN
- 2. Fuel pump ..... ON
- 3. Circuit breakers ..... check / reset if necessary
- 4. VOTER switch ..... AUTO

If the ECU B caution persists: - land at the next suitable airfield. After landing, you may use (a) ECU B Caution on the ground as ECU caution clearing procedure.

**NOTE**

An ECU FAIL caution is caused by various types of malfunctions. These include internal ECU problems, sensor failure or insufficient performance of air-, fuel- or electrical supply system (e.g. air filter icing).

**NOTE**

If additional engine problems are observed refer to Section 3.3.3 - ENGINE TROUBLESHOOTING IN FLIGHT.

**END OF CHECKLIST**

**4B.3.3 FUEL QUANTITY LOW**

Left fuel quantity is low.

1. Fuel transfer pump . . . . . ON
2. Fuel quantity . . . . . check

**CAUTION**

As soon as the amount of usable fuel in the main tank is low, a caution message is displayed. 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.

*If FUEL LOW (if G1000 is installed) or LOW FUEL (if White Wire Annunciator Panel is installed) Caution Is Caused By Un-Coordinated Flight:*

**CAUTION**

Prolonged un-coordinated flight can cause fuel starvation to the engine resulting in a loss of power.

3. Return to coordinated flight (not more than approx. half a ball sideslip, 3° - 5° bank)

*If the Caution Does Not Extinguish:*

- Expect loss of fuel.
4. Fuel valve . . . . . EMERGENCY
  5. Fuel transfer pump . . . . . OFF

**CONTINUED**



*If the Caution Does Not Extinguish:*

- Be prepared for an emergency landing.
- Proceed in accordance with Section 3.7.1 - EMERGENCY LANDING WITH ENGINE OFF.

### **WARNING**

If air enters the high pressure fuel pump (e.g. empty fuel tank), an inspection of the pump is necessary prior to next flight.

**END OF CHECKLIST**

**4B.3.4 COOLANT LEVEL**

Engine coolant level is low.

A low coolant caution alert may indicate a loss of coolant. This will subsequently lead to decreased engine cooling capability/loss of engine power due to engine failure.

1. Annunciations / engine instruments . . . . . monitor

Refer to Section 4B.2.2 - COOLANT TEMPERATURE.

**NOTE**

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.

**END OF CHECKLIST**

**4B.3.5 PITOT HEATING FAILURE**

Pitot heating system has failed.

*If in Icing Conditions:*

- 1. Expect loss of airspeed indication.
- 2. Leave icing zone / refer to Section 3.9.1 - ICING.

**END OF CHECKLIST**

**4B.3.6 ENGINE CAUTION (IF WHITE WIRE ANNUNCIATOR PANEL IS INSTALLED)**

Engine limit exceeded.

- 1. Engine indications . . . . . check
- 2. Acknowledge button . . . . . press

**NOTE**

If an indication is near the end of the green range, it may happen that it switches over to the yellow or red range for a short time. This will also cause the ENGINE caution light to illuminate.

**NOTE**

If an indication is outside of the green range, proceed in accordance with 4B.2 - INSTRUMENT INDICATIONS OUTSIDE OF THE GREEN RANGE.

**END OF CHECKLIST**

#### 4B.4 CANOPY IN COOLING GAP POSITION

##### **CAUTION**

If take-off was inadvertently done with the canopy in the cooling gap position, do not attempt to close the canopy in flight. Land the airplane and close the canopy on ground.

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

Failure in Position Indication or Function

1. FLAPS position . . . . . check visually
2. Airspeed . . . . . keep in white range  
(max. 98 KIAS)
3. FLAPS switch . . . . . re-check all positions

█ Modified Approach Procedure Depending on the Available Flap Setting

**NOTE**

For landing distances with an abnormal flap position refer to 5.3.12 - LANDING DISTANCE - ABNORMAL FLAP POSITION.

(a) *Only UP Available:*

Airspeed . . . . . see table below:

<b>940 kg (2072 lb)</b>	<b>1000 kg (2205 lb)</b>	<b>1100 kg (2425 lb)</b>	<b>1200 kg (2646 lb)</b>	<b>1216 kg (2681 lb)</b>	<b>1280 kg (2822 lb) and above</b>
71 KIAS	73 KIAS	78 KIAS	82 KIAS	82 KIAS	83 KIAS

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

**CONTINUED**

(b) *Only T/O Available:*

Airspeed ..... see table below:

<b>940 kg (2072 lb)</b>	<b>1000 kg (2205 lb)</b>	<b>1100 kg (2425 lb)</b>	<b>1200 kg (2646 lb)</b>	<b>1216 kg (2681 lb)</b>	<b>1280 kg (2822 lb) and above</b>
<b>68 KIAS</b>	<b>70 KIAS</b>	<b>74 KIAS</b>	<b>77 KIAS</b>	<b>77 KIAS</b>	<b>78 KIAS</b>

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

(c) *Only LDG Available:*

Perform normal landing.

**END OF CHECKLIST**

## **4B.6 LIGHTNING STRIKE**

1. Airspeed ..... as low as practicable, do not exceed  $v_O$  (refer to Section 2.2)
2. Grasp airplane controls firmly
3. Autopilot (if installed) ..... disengage (check)
4. PFD (if G1000 is installed) /  
 backup instruments ..... verify periodically
5. Continue flight below  $v_O$  (refer to Section 2.2)
6. Land on the next suitable airfield

### **CAUTION**

Due to possible damage to the airplane obey the following instructions:

- Avoid abrupt or full control surface movements.
- Avoid high g-loads on the airframe.
- Avoid high yaw angles.
- Avoid turbulent air as far as possible (e.g. lee effects).
- Do not fly into areas of known or forecast icing.

**END OF CHECKLIST**

**4B.7 LANDING WITH MASS ABOVE MAXIMUM LANDING MASS**

**NOTE**

Refer to Section 4A.5.12 - APPROACH AND LANDING for landings with a mass up to 1216 kg (2681 lb), and if MÄM 40-574 is carried out for landings with a mass up to 1280 kg (2822 lb).

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

Approach speed ..... 77 KIAS for a mass above 1280 kg  
..... (2822 lb), flaps LDG

**END OF CHECKLIST**



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

### **4B.8.1 BEFORE STARTING ENGINE**

1. Pre-flight inspection . . . . . complete
2. Rudder pedals . . . . . adjusted and locked
3. Passengers . . . . . instructed
4. Safety harnesses . . . . . all fastened
5. Rear door . . . . . closed and locked
6. Door lock (if installed) . . . . . unlocked, key removed
7. Front canopy . . . . . Position 1 or 2 (“cooling gap”)
8. Canopy lock (if installed) . . . . . unlocked, key removed

### **CAUTION**

When operating the canopy, pilots / operators are to 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.

### **NOTE**

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

9. Parking brake . . . . . set
10. Flight controls . . . . . free movement
11. Trim wheel . . . . . T/O
12. POWER lever . . . . . check IDLE

**CONTINUED**

- 13. Friction device on POWER lever . . . . . adjusted
- 14. Alternate air . . . . . check CLOSED
- 15. Alternate static valve . . . . . check CLOSED
- 16. VOTER switch . . . . . check AUTO
- 17. Fuel pumps . . . . . check OFF
- 18. ELECTRIC MASTER . . . . . check OFF
- 19. AVIONIC MASTER . . . . . check OFF
- 20. External power . . . . . connect
- 21. ELECTRIC MASTER . . . . . ON
- 22. G1000 (if installed) . . . . . wait until power-up completed.  
Press ENT on MFD to  
acknowledge

**NOTE**

If the G1000 avionics system is installed, the engine instruments are only available on the MFD after item 22 has been completed.

- 23. White Wire annunciator panel (if installed) . . . check and press acknowledge button
- 24. COOL LVL caution on G1000 (if installed) or  
WATERLEV caution on SED (if installed) . . check OFF
- 25. Fuel temperature . . . . . check

**WARNING**

Never rotate the propeller by hand.

**END OF CHECKLIST**

**4B.8.2 STARTING ENGINE**

**CAUTION**

Do not operate the engine starter motor for more than 10 seconds, because of possible overheating of the starter motor.

If the STARTER annunciation on the G1000 (if installed) or START on the White Wire annunciator panel (if installed) comes on after the engine has started and the START KEY has been released, set the ENGINE MASTER to OFF and investigate the problem.

**WARNING**

If the oil pressure has not moved from the red range within 3 seconds after starting, set the ENGINE MASTER switch to OFF and investigate problem.

**NOTE**

At low ambient temperatures it is possible that the engine will not start at the first attempt. In this case wait 60 seconds between the start attempts.

- 1. Strobe lights (ACL) ..... ON
- 2. ENGINE MASTER ..... ON

**CONTINUED**

- 3. Annunciators / GLOW ON (if G1000 is installed) or GLOW (if White Wire annunciator panel is installed) . . . . . check ON

**NOTE**

GLOW ON (if G1000 is installed) or GLOW (if White Wire annunciator panel is installed) is indicated only when the engine is cold.

- 4. Annunciators / engine indications . . . . . check

**WARNING**

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

*After the GLOW ON (if G1000 is installed) or GLOW (if White Wire annunciator panel is installed) indication is extinguished:*

- 5. START KEY . . . . . START as required / release when engine has started.
- 6. Annunciators / engine indications . . . . . check OK/normal range
- 7. Annunciators / STARTER (if G1000 is installed) or START (if White Wire annunciator panel is installed) . . check OFF

**CONTINUED**

- 8. Annunciations / Oil pressure ..... check OK
  - 9. Circuit breakers ..... check all IN
  - 10. Idle RPM ..... check, 710 ±30 RPM  
..... (above 7,000 ft pressure altitude  
..... idle RPM might be higher)
  - 11. External power ..... disconnect
  - 12. External power unit ..... check disconnected and  
..... moved clear of the airplane
- END OF CHECKLIST**

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## CHAPTER 5

# PERFORMANCE

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## **5.1 INTRODUCTION**

The performance tables and diagrams on the following pages are presented so that, on the one hand, you can see what performance you can expect from your airplane, while on the other they allow comprehensive and sufficiently accurate flight planning. The values in the tables and the diagrams were obtained in the framework of the flight trials using an airplane and power-plant in good condition, and corrected to the conditions of the International Standard Atmosphere (ISA = 15 °C / 59 °F and 1,013.25 hPa / 29.92 inHg at sea level).

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

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

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

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

- For a conversion of units see Chapter 1.6 - UNITS OF MEASUREMENT.
- For temperatures, altitudes and weights between those provided, use a linear interpolation between the neighboring values.
- For weights below 1100 kg (2425 lb), use data for the lowest weight.



- For operation at outside air temperatures lower than provided in these tables, use data for lowest temperature shown.
- Use extreme caution for operation at outside air temperatures higher than provided in the tables (areas are indicated with a diagonal line).

### 5.3 PERFORMANCE TABLES AND DIAGRAMS

#### 5.3.1 AIRSPEED CALIBRATION

Airspeed Indicator Calibration			
Indicated Airspeed [KIAS]	Calibrated Airspeed [KCAS] at Various Flap Settings		
	UP	T/O	LDG
65	Not applicable	64	64
70	70	69	69
75	75	74	74
80	79	79	78
85	84	84	83
90	89	89	89
95	93	94	94
100	98	99	100
105	103	104	Not applicable
110	108	109	
120	118		
130	128		
140	138		
150	149		
160	159		
170	170		

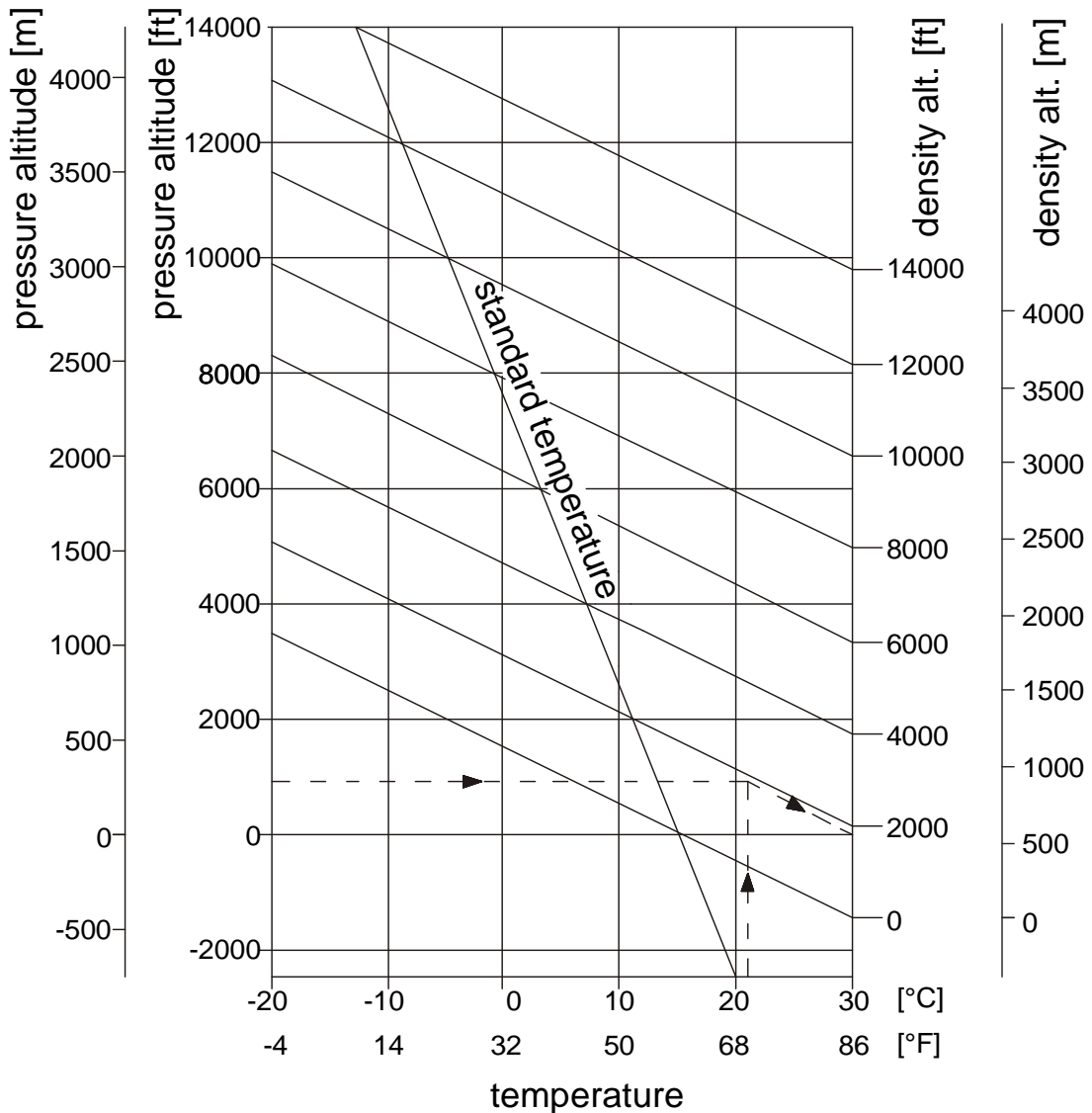
**5.3.2 FUEL FLOW****NOTE**

The fuel calculations on the FUEL CALC portion of the G1000 MFD do not use the airplane's fuel quantity indicators. The values shown are numbers which are calculated from the last fuel quantity update done by the pilot and actual fuel flow data. Therefore, the endurance and range data is for information only, and must not be used for flight planning.

Fuel Flow		
Power Setting [%]	Fuel Flow [US gal / h]	Fuel Flow [Liter / h]
30	2.9	11.0
35	3.3	12.5
40	3.7	14.0
45	4.0	15.5
50	4.4	16.5
55	4.7	18.0
60	5.1	19.5
65	5.6	21.5
70	6.1	23.0
75	6.6	25.0
80	7.1	27.0
85	7.6	28.5
90	8.1	30.5
92	8.3	31.5
100	9.4	35.5

### 5.3.3 PRESSURE ALTITUDE - DENSITY ALTITUDE

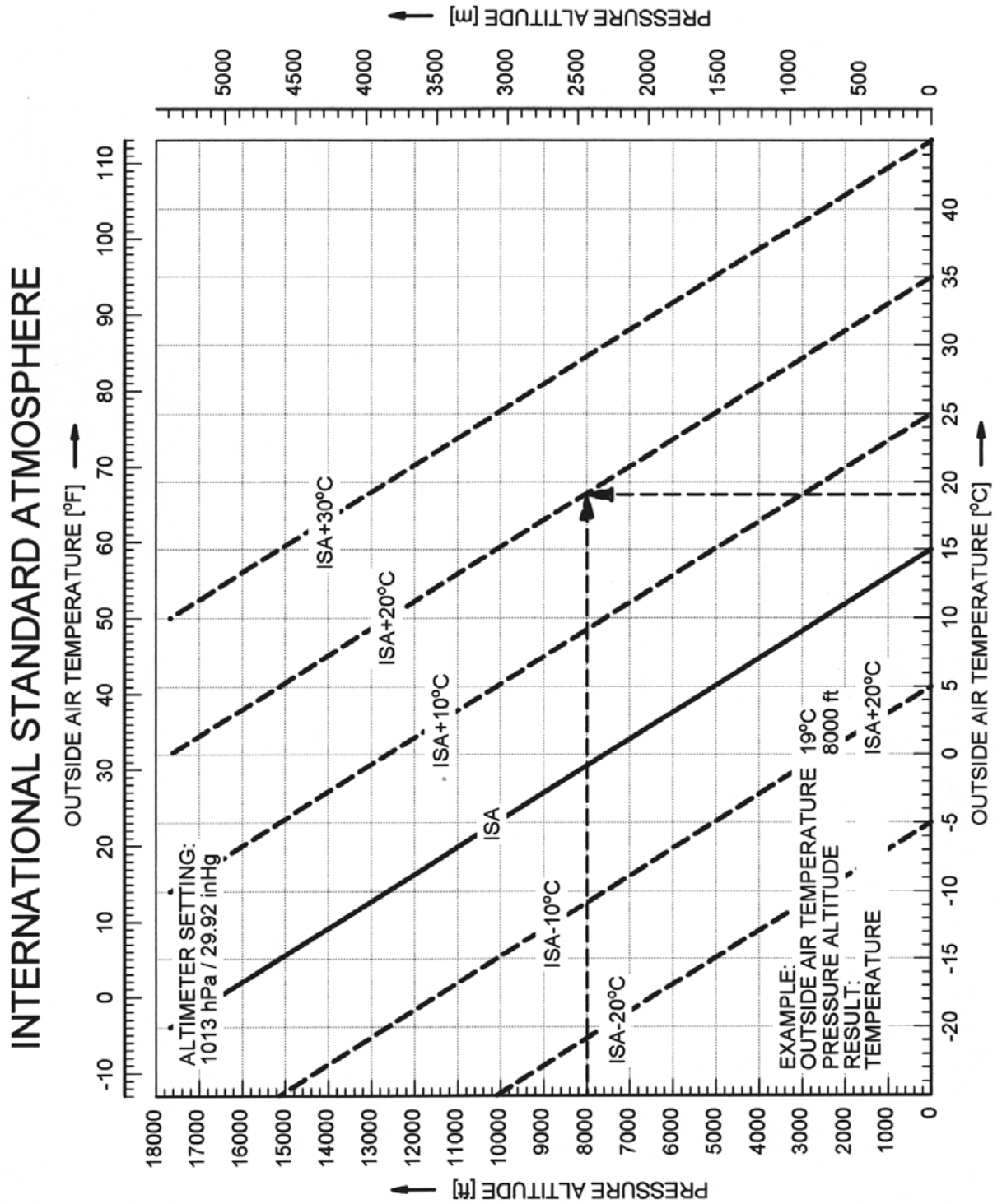
Conversion from pressure altitude to density altitude.



- Example:
1. Set 1,013.25 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.

5.3.4 INTERNATIONAL STANDARD ATMOSPHERE



### 5.3.5 STALLING SPEEDS

#### Stalling Speeds at Various Flight Masses

Indicated airspeed may not be accurate at stall.

Airspeeds, most forward CG, power off:

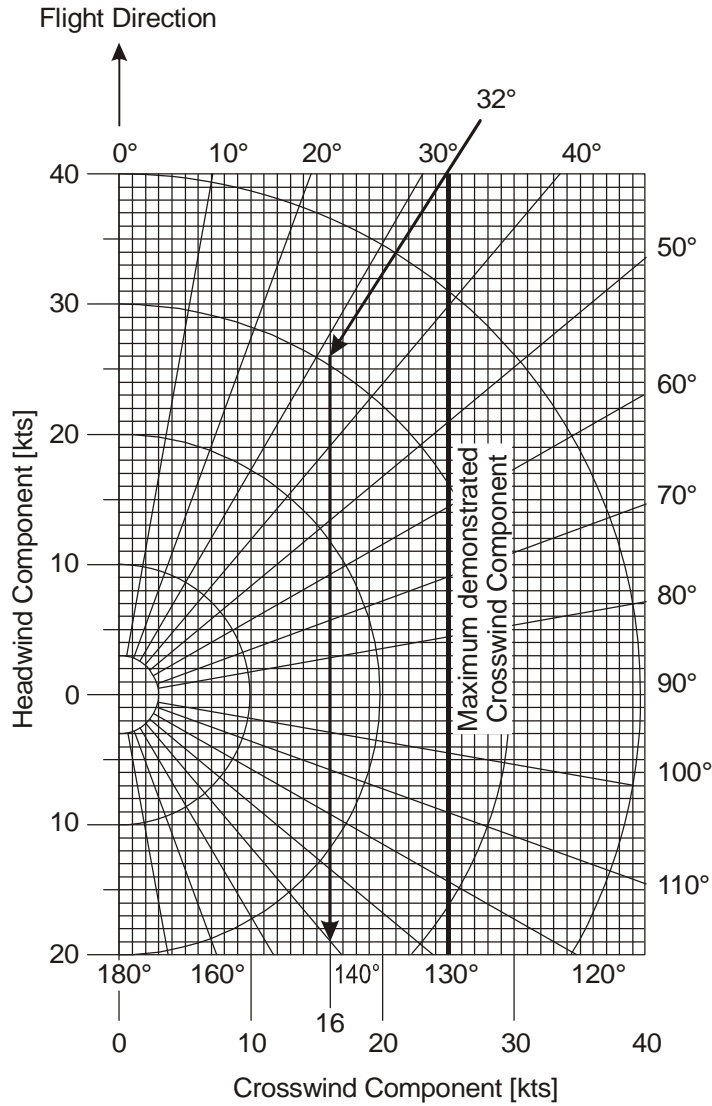
1000 kg (2205 lb)	Bank Angle							
	0°		30°		45°		60°	
Flaps	KIAS	KCAS	KIAS	KCAS	KIAS	KCAS	KIAS	KCAS
UP	58	56	59	60	64	66	76	79
T/O	54	53	58	57	63	63	75	74
LDG	55	52	56	55	61	61	72	73

1100 kg (2425 lb)	Bank Angle							
	0°		30°		45°		60°	
Flaps	KIAS	KCAS	KIAS	KCAS	KIAS	KCAS	KIAS	KCAS
UP	61	59	63	64	70	71	83	84
T/O	56	55	60	60	66	66	79	78
LDG	57	54	59	58	65	65	77	77

1200 kg (2646 lb)	Bank Angle							
	0°		30°		45°		60°	
Flaps	KIAS	KCAS	KIAS	KCAS	KIAS	KCAS	KIAS	KCAS
UP	64	61	67	66	73	73	86	87
T/O	60	57	64	62	69	68	82	81
LDG	59	56	62	61	68	67	81	80

1310 kg (2888 lb)	Bank Angle							
	0°		30°		45°		60°	
Flaps	KIAS	KCAS	KIAS	KCAS	KIAS	KCAS	KIAS	KCAS
UP	66	63	68	68	74	75	88	89
T/O	62	59	65	63	71	70	84	83
LDG	60	58	63	62	69	69	82	82

**5.3.6 WIND COMPONENTS**



Example: Flight direction : 360°  
 Wind : 32°/30 kt  
 Result: Crosswind component : 16 kt  
 Max. demonstrated crosswind component : 25 kt



**5.3.7 TAKE-OFF DISTANCE**

Conditions:

- POWER lever ..... MAX
- Flaps ..... T/O
- Runway ..... dry, paved, level
- Nose wheel lift-off ..... @  $v_R$
- Airspeed for initial climb ..... @  $v_{50}$

The following factors are to be applied to the computed take-off distance for the noted condition:

- Headwind: Decrease by 10% for each 12 kt (6.2 m/s) headwind.
- Tailwind: Increase by 10% for each 2 kt (1.0 m/s) tailwind.
- Grass runway, dry, 5 cm (2 in) long: Increase the ground roll by 10%.
- Grass runway, dry, 5 cm (2 in) to 10 cm (3.9 in) long: Increase the ground roll by 30%.
- Grass runway, dry, 25 cm (9.8 in) long: Increase the ground roll by 45%.
- Grass runway, longer than 25 cm (9.8 in): A take-off should not be attempt.
- Grass runway, wet: Increase the dry grass runway distance calculation by 20%.
- Soft ground: Increase the ground roll by 50% (in addition to the grass runway distance calculation, if applicable)
- Uphill slope: Increase the ground roll by 15% for each 1% (1 m per 100 m or 1 ft per 100 ft) slope.
- Without wheel fairings: Increase ground roll by 20 m.  
Increase take - off distance over a 50 ft obstacle by 30 m.

If brakes are not held while applying power, distances apply where full power setting is complete.

### 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, uneven runway, as well as unfavorable external factors ( rain, unfavorable wind conditions, including cross-wind) will increase the take-off distance.

### CAUTION

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

The above corrections for runway slope should be used with caution since published runway slope data is usually the net slope from one end of the runway to the other. Runways may have positions at their length at greater or lesser slopes than published slope, lengthening (or shortening) the take-off roll estimated with these tables.

### NOTE

The effect of 50% of the headwind component and 150% of the tailwind component is already incorporated in the head- and tailwind factors.

**Take-Off Distance - Normal Procedure - 1310 kg / 2888 lb**

Weight: 1310 kg / 2888 lb

Flaps: T/O

 $V_R$ : 67 KIAS

Power: MAX

 $V_{50}$ : 72 KIAS

Runway: dry, paved, level

Press. Alt. [ft] / [m]	Distance [m]	Outside Air Temperature - [°C] / [°F]						ISA
		0 / 32	10 / 50	20 / 68	30 / 86	40 / 104	50 / 122	
SL	Ground Roll	365	385	410	430	460	495	397
	15 m / 50 ft	550	580	610	640	680	720	590
1000 305	Ground Roll	390	410	435	465	500	535	418
	15 m / 50 ft	580	610	640	680	730	770	616
2000 610	Ground Roll	415	440	465	500	540	575	439
	15 m / 50 ft	610	640	680	730	780	830	646
3000 914	Ground Roll	440	470	500	540	580	625	463
	15 m / 50 ft	650	680	720	780	840	890	677
4000 1219	Ground Roll	470	500	540	590	630	680	490
	15 m / 50 ft	690	720	780	840	900	960	708
5000 1524	Ground Roll	505	535	585	640	685	/	519
	15 m / 50 ft	730	770	840	910	970	/	745
6000 1829	Ground Roll	540	585	640	700	750	/	549
	15 m / 50 ft	770	830	900	980	1040	/	783
7000 2134	Ground Roll	580	640	700	765	820	/	585
	15 m / 50 ft	820	900	980	1060	1130	/	828
8000 2438	Ground Roll	635	700	770	845	900	/	628
	15 m / 50 ft	890	970	1060	1160	1230	/	881
9000 2743	Ground Roll	695	770	850	915	990	/	674
	15 m / 50 ft	970	1060	1160	1250	1330	/	937
10000 3048	Ground Roll	765	850	910	995	/	/	729
	15 m / 50 ft	1050	1160	1240	1340	/	/	1000

For the distance in [ft] divide by 0.3048 or multiply by 3.28.

**Take-Off Distance - Normal Procedure - 1280 kg / 2822 lb**

Weight: 1280 kg / 2822 lb

Flaps: T/O

v<sub>R</sub>: 67 KIAS

Power: MAX

v<sub>50</sub>: 72 KIAS

Runway: dry, paved, level

Press. Alt. [ft] / [m]	Distance [m]	Outside Air Temperature - [°C] / [°F]						ISA
		0 / 32	10 / 50	20 / 68	30 / 86	40 / 104	50 / 122	
SL	Ground Roll	365	385	405	425	460	490	391
	15 m / 50 ft	540	570	600	630	670	710	581
1000 305	Ground Roll	385	410	430	460	495	530	413
	15 m / 50 ft	580	600	630	670	720	760	609
2000 610	Ground Roll	410	435	460	495	535	570	436
	15 m / 50 ft	610	640	670	720	770	820	636
3000 914	Ground Roll	435	465	495	535	580	620	460
	15 m / 50 ft	640	670	710	770	820	880	668
4000 1219	Ground Roll	470	495	535	585	625	675	486
	15 m / 50 ft	680	720	770	830	890	950	701
5000 1524	Ground Roll	500	535	580	635	680		513
	15 m / 50 ft	720	760	830	890	950		735
6000 1829	Ground Roll	535	580	635	695	740		544
	15 m / 50 ft	760	820	890	970	1030		772
7000 2134	Ground Roll	575	635	695	760	810		581
	15 m / 50 ft	810	890	970	1050	1120		820
8000 2438	Ground Roll	630	695	765	840	895		623
	15 m / 50 ft	880	960	1050	1150	1220		870
9000 2743	Ground Roll	690	765	845	910	980		668
	15 m / 50 ft	960	1050	1150	1230	1320		927
10000 3048	Ground Roll	765	845	905	985			723
	15 m / 50 ft	1040	1140	1230	1330			992

For the distance in [ft] divide by 0.3048 or multiply by 3.28.

**Take-Off Distance - Normal Procedure - 1200 kg / 2645 lb**

Weight: 1200 kg / 2645 lb

Flaps: T/O

 $V_R$ : 65 KIAS

Power: MAX

 $V_{50}$ : 70 KIAS

Runway: dry, paved, level

Press. Alt. [ft] / [m]	Distance [m]	Outside Air Temperature - [°C] / [°F]						ISA
		0 / 32	10 / 50	20 / 68	30 / 86	40 / 104	50 / 122	
SL	Ground Roll	325	345	365	385	410	440	352
	15 m / 50 ft	490	520	540	570	610	640	524
1000 305	Ground Roll	345	365	390	415	445	475	371
	15 m / 50 ft	520	550	570	610	650	690	548
2000 610	Ground Roll	365	390	415	445	480	515	391
	15 m / 50 ft	550	580	610	650	700	740	576
3000 914	Ground Roll	390	415	445	485	520	560	413
	15 m / 50 ft	580	610	650	700	750	800	602
4000 1219	Ground Roll	420	445	480	525	565	610	438
	15 m / 50 ft	610	640	700	750	800	860	633
5000 1524	Ground Roll	450	480	525	575	615	/	462
	15 m / 50 ft	650	690	750	810	870	/	666
6000 1829	Ground Roll	480	525	575	630	670	/	491
	15 m / 50 ft	690	740	810	880	940	/	700
7000 2134	Ground Roll	520	570	630	690	735	/	524
	15 m / 50 ft	740	800	880	960	1010	/	741
8000 2438	Ground Roll	570	630	695	760	810	/	563
	15 m / 50 ft	800	870	960	1040	1110	/	789
9000 2743	Ground Roll	625	695	765	830	895	/	606
	15 m / 50 ft	870	950	1050	1120	1200	/	839
10000 3048	Ground Roll	690	765	825	900	/	/	656
	15 m / 50 ft	950	1040	1110	1210	/	/	899

For the distance in [ft] divide by 0.3048 or multiply by 3.28.

**Take-Off Distance - Normal Procedure - 1100 kg / 2425 lb**

Weight: 1100 kg / 2425 lb

Flaps: T/O

V<sub>R</sub>: 61 KIAS

Power: MAX

V<sub>50</sub>: 67 KIAS

Runway: dry, paved, level

Press. Alt. [ft] / [m]	Distance [m]	Outside Air Temperature - [°C] / [°F]						ISA
		0 / 32	10 / 50	20 / 68	30 / 86	40 / 104	50 / 122	
SL	Ground Roll	280	295	310	330	355	380	303
	15 m / 50 ft	430	450	470	490	530	560	457
1000 305	Ground Roll	295	315	335	355	385	410	318
	15 m / 50 ft	450	470	500	530	570	600	478
2000 610	Ground Roll	315	335	355	385	415	445	336
	15 m / 50 ft	480	500	530	570	600	650	498
3000 914	Ground Roll	340	360	385	415	450	480	356
	15 m / 50 ft	500	530	560	610	650	690	523
4000 1219	Ground Roll	360	385	415	455	490	525	377
	15 m / 50 ft	530	560	600	650	700	750	549
5000 1524	Ground Roll	385	415	455	495	530		399
	15 m / 50 ft	560	600	650	710	750		578
6000 1829	Ground Roll	415	455	495	545	580		423
	15 m / 50 ft	600	650	700	770	820		608
7000 2134	Ground Roll	450	495	545	600	640		452
	15 m / 50 ft	640	700	770	830	890		644
8000 2438	Ground Roll	490	545	605	660	705		485
	15 m / 50 ft	690	760	840	910	970		684
9000 2743	Ground Roll	540	600	665	725	780		523
	15 m / 50 ft	760	830	910	980	1050		730
10000 3048	Ground Roll	600	665	715	785			567
	15 m / 50 ft	830	910	970	1060			786

For the distance in [ft] divide by 0.3048 or multiply by 3.28.

### **5.3.8 CLIMB PERFORMANCE - TAKE-OFF CLIMB**

- Conditions:
- POWER lever ..... 92% or max. 2100 RPM
  - Flaps ..... T/O
  - Airspeed ..... 72 KIAS

#### **NOTE**

The tables on the following pages show the *rate* of climb. The *gradient* of climb can be calculated using the following formulae:

$$Gradient [\%] = \frac{ROC [fpm]}{TAS [KTAS]} \cdot 0.98$$

#### **NOTE**

For operation without wheel fairings a climb rate decreased by 20 ft/min must be expected.

#### **NOTE**

If MÄM 40-662 is installed, the rate of climb at MTOM (1310 kg / 2888 lb) with a power setting of 100% at MSL and ISA conditions: 714 ft/min (3,6 m/s).

Take - Off Climb - Flaps T/O											
Flaps: T/O										Power: 92% or max. 2100 RPM	
v <sub>y</sub> : 72 KIAS											
Weight [kg] / [lb]	Press. Alt. [ft]	Press. Alt. [m]	Rate of Climb - [ft/min]								
			Outside Air Temperature - [°C] / [°F]								ISA
			-20 -4	-10 14	0 32	10 50	20 68	30 86	40 104	50 122	
1310 / 2888	SL		660	650	640	630	620	615	590	550	629
	2000	610	640	630	620	610	605	595	555	515	613
	4000	1219	620	610	600	595	585	560	520	475	597
	6000	1829	600	590	580	570	555	520	475	/	580
	8000	2438	580	570	555	540	525	480	435	/	557
	10000	3048	555	540	525	510	480	435	/	/	533
	12000	3658	525	510	495	480	435	400	/	/	509
	14000	4267	500	485	475	460	425	360	/	/	492
	16000	4877	490	470	440	385	325	/	/	/	487
	16400	4999	475	450	420	370	305	/	/	/	471
1280 / 2822	SL		675	665	655	645	635	625	600	560	643
	2000	610	655	645	635	625	615	605	570	525	627
	4000	1219	635	625	615	605	595	575	530	485	611
	6000	1829	615	605	595	580	570	535	485	/	593
	8000	2438	595	580	565	550	535	490	445	/	570
	10000	3048	565	550	535	520	490	445	/	/	545
	12000	3658	535	520	505	490	445	410	/	/	520
	14000	4267	510	495	485	470	430	370	/	/	503
	16000	4877	500	480	450	395	330	/	/	/	498
	16400	4999	485	460	430	375	310	/	/	/	482



Take - Off Climb - Flaps T/O											
Flaps: T/O										Power: 92% or max. 2100 RPM	
v <sub>y</sub> : 72 KIAS											
Weight [kg] / [lb]	Press. Alt. [ft]	Press. Alt. [m]	Rate of Climb - [ft/min]								
			Outside Air Temperature - [°C] / [°F]								ISA
			-20 -4	-10 14	0 32	10 50	20 68	30 86	40 104	50 122	
1200 / 2645	SL		740	730	720	710	700	690	665	620	707
	2000	610	720	710	700	690	680	670	630	585	691
	4000	1219	700	690	680	670	660	635	590	540	675
	6000	1829	680	670	660	645	630	595	545		657
	8000	2438	660	645	630	615	600	545	500		633
	10000	3048	630	615	600	585	550	500			607
	12000	3658	595	580	565	550	505	460			581
	14000	4267	575	560	545	530	490	420			564
	16000	4877	560	540	510	450	380				560
	16400	4999	545	520	490	430	360				543
1100 / 2425	SL		835	825	815	800	795	785	755	705	800
	2000	610	815	805	790	780	770	760	715	665	782
	4000	1219	795	780	770	760	750	725	670	615	765
	6000	1829	770	760	750	735	720	680	625		747
	8000	2438	750	735	720	705	685	630	575		722
	10000	3048	720	700	685	670	635	580			695
	12000	3658	685	665	650	635	585	535			667
	14000	4267	660	645	630	615	570	495			649
	16000	4877	650	625	590	530	455				646
	16400	4999	630	605	570	505	430				627

For the rate of climb in [m/s] divide by 196.8 or multiply by 0.00508.

### **5.3.9 CLIMB PERFORMANCE - CRUISE CLIMB**

- Conditions:
- POWER lever ..... 92% or max. 2100 RPM
  - Flaps ..... UP
  - Airspeed ..... 88 KIAS

#### **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:

$$Gradient [\%] = \frac{ROC [fpm]}{TAS [KTAS]} \cdot 0.98$$

#### **NOTE**

For operation without wheel fairings a climb rate decreased by 40 ft/min must be expected.

Cruise Climb - Flaps UP											
Flaps: UP										Power: 92% or max. 2100 RPM	
v <sub>y</sub> : 88 KIAS											
Weight [kg] / [lb]	Press. Alt. [ft]	Press. Alt. [m]	Rate of Climb - [ft/min]								
			Outside Air Temperature - [°C] / [°F]								ISA
			-20 -4	-10 14	0 32	10 50	20 68	30 86	40 104	50 122	
1310 / 2888	SL		665	660	655	650	645	645	620	585	651
	2000	610	655	650	645	640	635	630	595	555	644
	4000	1219	645	640	635	630	620	605	565	525	633
	6000	1829	635	630	620	615	605	580	540	/	621
	8000	2438	620	615	605	600	590	550	505	/	609
	10000	3048	605	600	590	580	555	510	/	/	596
	12000	3658	590	580	570	560	520	480	/	/	581
	14000	4267	575	565	555	540	500	445	/	/	568
	16000	4877	560	550	520	470	405	/	/	/	561
	16400	4999	545	535	500	450	380	/	/	/	546
1280 / 2822	SL		690	685	680	675	670	665	645	605	674
	2000	610	680	675	670	665	660	655	615	575	667
	4000	1219	670	665	660	650	645	630	590	545	656
	6000	1829	660	650	645	635	630	600	560	/	644
	8000	2438	645	635	630	620	610	570	525	/	632
	10000	3048	630	620	615	605	580	535	/	/	619
	12000	3658	615	605	590	580	540	500	/	/	604
	14000	4267	595	585	580	560	525	465	/	/	591
	16000	4877	585	575	545	490	425	/	/	/	583
	16400	4999	570	555	525	470	400	/	/	/	568

Cruise Climb - Flaps UP											
Flaps: UP										Power: 92% or max. 2100 RPM	
v <sub>y</sub> : 88 KIAS											
Weight [kg] / [lb]	Press. Alt. [ft]	Press. Alt. [m]	Rate of Climb - [ft/min]								
			Outside Air Temperature - [°C] / [°F]								ISA
			-20 -4	-10 14	0 32	10 50	20 68	30 86	40 104	50 122	
1200 / 2645	SL		750	750	745	740	735	730	705	665	739
	2000	610	745	740	735	730	725	720	680	635	732
	4000	1219	735	730	725	715	710	690	650	605	721
	6000	1829	725	715	710	700	695	660	620	/	709
	8000	2438	710	700	695	685	675	630	585	/	697
	10000	3048	695	685	680	670	640	590	/	/	684
	12000	3658	680	665	655	645	600	560	/	/	668
	14000	4267	660	650	640	625	585	520	/	/	655
	16000	4877	650	640	605	550	480	/	/	/	648
	16400	4999	635	620	585	525	455	/	/	/	632
1100 / 2425	SL		845	840	835	830	825	825	795	750	831
	2000	610	835	830	825	820	815	810	765	715	824
	4000	1219	825	820	815	810	800	785	735	685	814
	6000	1829	815	810	800	795	785	750	700	/	801
	8000	2438	800	795	785	780	765	715	665	/	788
	10000	3048	785	775	770	760	730	675	/	/	775
	12000	3658	770	760	745	735	685	640	/	/	759
	14000	4267	750	740	730	715	665	600	/	/	746
	16000	4877	740	730	695	630	555	/	/	/	739
	16400	4999	725	705	675	605	525	/	/	/	722

For the rate of climb in [m/s] divide by 196.8 or multiply by 0.00508.

### **5.3.10 TIME, FUEL AND DISTANCE TO CLIMB**

Conditions:

- Power lever ..... 92% or max. 2100 RPM
- Flaps ..... UP
- Airspeed ..... 88 KIAS

#### **NOTE**

Distances shown are based on zero wind. Fuel for start, taxi and take-off not included. Add 5% to the time and fuel and 10% to the distance for each 10° C (18° F) increase in OAT.

*Example:*

- OAT at take-off ..... 11°C (52°F)
- Airfield pressure altitude ..... 2000 ft (1200 m)
- Initial climb weight ..... 1310 kg (2888 lb)
- OAT at cruise ..... -17° C (2° F)
- Cruise altitude ..... 16000 ft (4900 m)

Time, fuel and distance to climb at airfield: 3 min, 0.4 US gal and 5 NM (1)

Time, fuel and distance to climb at cruise: 26 min, 3.7 US gal and 43 NM (2)

Subtract (1) from (2) to obtain time, fuel and distance to climb from airfield to cruise:

Time to cruise altitude: 26 min - 3 min = 23 min

Fuel to cruise altitude: 3.7 US gal - 0.4 US gal = 3.3 US gal

Distance to cruise altitude: 43 NM - 5 NM = 38 NM

## Time, Fuel and Distance to Climb

Flaps: UP

Power: 92% or max. 2100  
RPMv<sub>y</sub>: 88 KIAS

Weight [kg] / [lb]	Press. Alt.	Press. Alt.	OAT	OAT	TAS	RoC	RoC	Time	Fuel	Distance
	[ft]	[m]	[°C]	[°F]	[kt]	[ft/min]	[m/s]	[min]	[US gal]	[NM]
1310 / 2888	SL		15	59	87	650	3.3	0	0.0	0
	2000	600	11	52	88	645	3.3	3	0.4	5
	4000	1219	7	45	90	645	3.3	6	0.9	9
	6000	1829	3	38	91	640	3.2	9	1.3	14
	8000	2438	-1	30	92	630	3.2	13	1.8	19
	10000	3048	-5	23	94	625	3.2	16	2.2	25
	12000	3658	-9	16	95	620	3.2	19	2.7	31
	14000	4267	-13	9	97	615	3.1	23	3.1	37
	16000	4877	-17	2	98	605	3.1	26	3.7	43
1280 / 2825	SL		15	59	87	675	3.4	0	0.0	0
	2000	600	11	52	88	670	3.4	3	0.4	4
	4000	1219	7	45	90	665	3.4	6	0.8	9
	6000	1829	3	38	91	660	3.4	9	1.3	14
	8000	2438	-1	30	92	655	3.3	12	1.7	19
	10000	3048	-5	23	94	650	3.3	15	2.1	24
	12000	3658	-9	16	95	645	3.3	19	2.6	29
	14000	4267	-13	9	97	635	3.2	22	3.0	36
	16000	4877	-17	2	98	630	3.2	25	3.5	41

## Time, Fuel and Distance to Climb

Flaps: UP

Power: 92% or max. 2100  
RPMv<sub>y</sub>: 88 KIAS

Weight [kg] / [lb]	Press. Alt.	Press. Alt.	OAT	OAT	TAS	RoC	RoC	Time	Fuel	Distance
	[ft]	[m]	[°C]	[°F]	[kt]	[ft/min]	[m/s]	[min]	[US gal]	[NM]
1200 / 2645	SL		15	59	87	740	3.8	0	0.0	0
	2000	600	11	52	88	735	3.7	3	0.4	4
	4000	1219	7	45	90	730	3.7	5	0.8	8
	6000	1829	3	38	91	725	3.7	8	1.1	13
	8000	2438	-1	30	92	720	3.7	11	1.5	17
	10000	3048	-5	23	94	715	3.6	14	1.9	22
	12000	3658	-9	16	95	710	3.6	17	2.3	27
	14000	4267	-13	9	97	700	3.6	20	2.8	32
	16000	4877	-17	2	98	695	3.5	23	3.2	38
1100 / 2425	SL		15	59	87	830	4.2	0	0.0	0
	2000	600	11	52	88	830	4.2	2	0.3	4
	4000	1219	7	45	90	825	4.2	5	0.7	7
	6000	1829	3	38	91	820	4.2	7	1.0	11
	8000	2438	-1	30	92	810	4.1	10	1.4	15
	10000	3048	-5	23	94	805	4.1	12	1.7	19
	12000	3658	-9	16	95	800	4.1	15	2.1	24
	14000	4267	-13	9	97	795	4.0	18	2.4	28
	16000	4877	-17	2	98	785	4.0	20	2.8	33

**5.3.11 CRUISE PERFORMANCE**

**NOTE**

For operation without wheel fairings a performance reduction of 4% TAS at all power settings must be expected.

**Conditions:**

- Flaps ..... UP
- Landing gear ..... retracted
- Weight ..... 1310 kg (2888 lb)

For conversion of OAT to delta-ISA temperatures refer to Chapter 5.3.3 - INTERNATIONAL STANDARD ATMOSPHERE.



Cruise Performance															
Press. Alt. [ft] / [m]	Outside Air Temperature - [°C]														
	ISA-10			ISA			ISA+10			ISA+20			ISA+30		
	Pwr [%]	FF [US gal/h]	TAS [kt]	Pwr [%]	FF [US gal/h]	TAS [kt]	Pwr [%]	FF [US gal/h]	TAS [kt]	Pwr [%]	FF [US gal/h]	TAS [kt]	Pwr [%]	FF [US gal/h]	TAS [kt]
2000 610	92	8.3	134	92	8.3	136	92	8.3	137	92	8.3	138	92	8.3	140
	75	6.6	123	75	6.6	125	75	6.6	126	75	6.6	127	75	6.6	128
	60	5.1	112	60	5.1	113	60	5.1	114	60	5.1	115	60	5.1	116
	45	4.0	95	45	4.0	96	45	4.0	97	45	4.0	97	45	4.0	98
4000 1219	92	8.3	137	92	8.3	138	92	8.3	140	92	8.3	141	92	8.3	142
	75	6.6	126	75	6.6	127	75	6.6	128	75	6.6	129	75	6.6	131
	60	5.1	113	60	5.1	114	60	5.1	116	60	5.1	117	60	5.1	118
	45	4.0	96	45	4.0	97	45	4.0	98	45	4.0	98	45	4.0	99
6000 1829	92	8.3	139	92	8.3	141	92	8.3	142	92	8.3	144	89	8.0	143
	75	6.6	128	75	6.6	129	75	6.6	130	75	6.6	132	75	6.6	133
	60	5.1	115	60	5.1	116	60	5.1	117	60	5.1	118	60	5.1	119
	45	4.0	98	45	4.0	98	45	4.0	99	45	4.0	99	45	4.0	100
8000 2438	92	8.3	142	92	8.3	143	92	8.3	145	92	8.3	146	89	8.0	146
	75	6.6	130	75	6.6	131	75	6.6	133	75	6.6	134	75	6.6	135
	60	5.1	117	60	5.1	118	60	5.1	119	60	5.1	120	60	5.1	121
	45	4.0	99	45	4.0	99	45	4.0	100	45	4.0	100	45	4.0	100
10000 3048	92	8.3	144	92	8.3	146	92	8.3	148	92	8.3	149	90	8.1	149
	75	6.6	132	75	6.6	134	75	6.6	135	75	6.6	136	75	6.6	138
	60	5.1	119	60	5.1	120	60	5.1	121	60	5.1	122	60	5.1	123
	45	4.0	99	45	4.0	100	45	4.0	100	45	4.0	101	45	4.0	101
12000 3658	92	8.3	147	92	8.3	149	92	8.3	150	92	8.3	152	90	8.1	152
	75	6.6	135	75	6.6	136	75	6.6	137	75	6.6	139	75	6.6	140
	60	5.1	121	60	5.1	122	60	5.1	123	60	5.1	124	60	5.1	125
	45	4.0	100	45	4.0	100	45	4.0	101	45	4.0	101	45	4.0	100
14000 4267	92	8.4	150	92	8.4	151	92	8.4	153	85	7.6	149	80	7.1	147
	75	6.6	137	75	6.6	138	75	6.6	140	75	6.6	141	75	6.6	142
	60	5.1	123	60	5.1	124	60	5.1	125	60	5.1	126	60	5.1	127
	45	4.0	101	45	4.0	101	50	4.4	111	50	4.4	111	50	4.4	112
16000 4877	92	8.4	153	92	8.4	154	90	8.2	155	84	7.5	151	79	7.0	149
	75	6.6	139	75	6.6	141	75	6.6	142	75	6.6	144	75	6.6	145
	60	5.1	124	60	5.1	126	60	5.1	127	60	5.1	127	60	5.1	128
	50	4.4	111	50	4.4	111	50	4.4	112	50	4.4	112	50	4.4	112

**5.3.12 LANDING DISTANCES**

Conditions:

- Power lever ..... IDLE
- Flaps ..... LDG, T/O or UP
- Runway ..... dry, paved, level
- Approach speed .....  $V_{REF}$

The following factors are to be applied to the computed landing distance for the noted condition:

- Headwind: Decrease by 10% for each 20 kt (10.3 m/s) headwind.
- Tailwind: Increase by 10% for each 3 kt (1.5 m/s) tailwind.
- Paved runway, wet: Increase by 15%.
- Grass runway, dry, 5 cm (2 in) long: Increase the ground roll by 30%.
- Grass runway, dry, longer than 5 cm (2 in): Increase the ground roll at least by 45 %.
- Grass runway, wet or soft runway: Increase the ground roll by 15%.
- Downhill slope: Increase the ground roll by 10% for each 1% (1 m per 100 m or 1 ft per 100 ft) slope.

**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, uneven runway, as well as unfavorable external factors (rain, unfavorable wind conditions, including cross-wind) will increase the landing distance.

**CAUTION**

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

The above corrections for runway slope should be used with caution since published runway slope data is usually the net slope from one end of the runway to the other. Runways may have positions at their length at greater or lesser slopes than published slope, lengthening (or shortening) the landing roll estimated with these tables.

**NOTE**

The effect of 50% of the headwind component and 150% of the tailwind component is already incorporated in the head- and tailwind factors.

**NOTE**

Higher approach speeds result in a significant longer landing distance during flare.

**Landing Distance - Flaps LDG - 1310 kg / 2888 lb**
**Weight:** 1310 kg / 2888 lb

**Flaps:** LDG

**V<sub>REF</sub>:** 77 KIAS

**Power:** IDLE

**Runway:** dry, paved, level

Press. Alt. [ft] / [m]	Distance [m]	Outside Air Temperature - [°C] / [°F]						ISA
		0 / 32	10 / 50	20 / 68	30 / 86	40 / 104	50 / 122	
<b>SL</b>	<b>Ground Roll</b>	305	315	325	335	355	375	318
	<b>15 m / 50 ft</b>	620	650	670	680	720	760	650
<b>1000</b> 305	<b>Ground Roll</b>	315	325	335	350	370	395	327
	<b>15 m / 50 ft</b>	640	660	680	700	740	790	660
<b>2000</b> 610	<b>Ground Roll</b>	325	335	350	370	390	415	336
	<b>15 m / 50 ft</b>	650	670	690	730	770	810	670
<b>3000</b> 914	<b>Ground Roll</b>	335	350	365	385	410	435	345
	<b>15 m / 50 ft</b>	670	690	710	750	800	840	681
<b>4000</b> 1219	<b>Ground Roll</b>	350	360	380	405	430	455	356
	<b>15 m / 50 ft</b>	680	700	740	780	830	870	692
<b>5000</b> 1524	<b>Ground Roll</b>	360	375	400	425	450		366
	<b>15 m / 50 ft</b>	700	720	770	810	860		704
<b>6000</b> 1829	<b>Ground Roll</b>	375	395	420	445	475		378
	<b>15 m / 50 ft</b>	710	750	790	840	890		717
<b>7000</b> 2134	<b>Ground Roll</b>	400	430	460	485	515		404
	<b>15 m / 50 ft</b>	750	790	840	890	940		746
<b>8000</b> 2438	<b>Ground Roll</b>	455	485	520	550	585		452
	<b>15 m / 50 ft</b>	810	870	920	970	1020		806
<b>9000</b> 2743	<b>Ground Roll</b>	520	555	585	625	660		508
	<b>15 m / 50 ft</b>	890	950	1000	1060	1120		875
<b>10000</b> 3048	<b>Ground Roll</b>	580	620	655	695			565
	<b>15 m / 50 ft</b>	970	1030	1090	1140			936

For the distance in [ft] divide by 0.3048 or multiply by 3.28.

**Landing Distance - Flaps LDG - 1280 kg / 2822 lb**
**Weight: 1280 kg / 2822 lb**
**Flaps: LDG**
**V<sub>REF</sub>: 77 KIAS**
**Power: IDLE**
**Runway: dry, paved, level**

Press. Alt. [ft] / [m]	Distance [m]	Outside Air Temperature - [°C] / [°F]						ISA
		0 / 32	10 / 50	20 / 68	30 / 86	40 / 104	50 / 122	
<b>SL</b>	<b>Ground Roll</b>	295	305	320	330	345	365	310
	<b>15 m / 50 ft</b>	610	630	650	670	710	750	639
<b>1000</b> 305	<b>Ground Roll</b>	305	320	330	340	365	385	320
	<b>15 m / 50 ft</b>	630	650	670	690	730	770	647
<b>2000</b> 610	<b>Ground Roll</b>	320	330	340	360	380	405	329
	<b>15 m / 50 ft</b>	640	660	680	720	750	800	657
<b>3000</b> 914	<b>Ground Roll</b>	330	340	355	375	400	425	338
	<b>15 m / 50 ft</b>	650	670	700	740	780	830	667
<b>4000</b> 1219	<b>Ground Roll</b>	340	355	375	395	420	445	348
	<b>15 m / 50 ft</b>	670	690	720	770	810	860	679
<b>5000</b> 1524	<b>Ground Roll</b>	355	370	390	415	440		359
	<b>15 m / 50 ft</b>	680	710	750	800	840		690
<b>6000</b> 1829	<b>Ground Roll</b>	365	385	415	440	465		370
	<b>15 m / 50 ft</b>	700	740	780	830	870		702
<b>7000</b> 2134	<b>Ground Roll</b>	395	420	450	475	505		396
	<b>15 m / 50 ft</b>	730	780	820	870	920		732
<b>8000</b> 2438	<b>Ground Roll</b>	450	480	510	540	570		445
	<b>15 m / 50 ft</b>	800	850	900	950	1010		792
<b>9000</b> 2743	<b>Ground Roll</b>	510	545	580	615	650		501
	<b>15 m / 50 ft</b>	880	930	990	1040	1100		861
<b>10000</b> 3048	<b>Ground Roll</b>	575	610	650	685			557
	<b>15 m / 50 ft</b>	960	1010	1070	1130			925

For the distance in [ft] divide by 0.3048 or multiply by 3.28.

**Landing Distance - Flaps LDG - 1200 kg / 2645 lb**
**Weight: 1200 kg / 2645 lb**
**Flaps: LDG**
**V<sub>REF</sub>: 76 KIAS**
**Power: IDLE**
**Runway: dry, paved, level**

Press. Alt. [ft] / [m]	Distance [m]	Outside Air Temperature - [°C] / [°F]						ISA
		0 / 32	10 / 50	20 / 68	30 / 86	40 / 104	50 / 122	
<b>SL</b>	<b>Ground Roll</b>	280	290	300	310	325	345	293
	<b>15 m / 50 ft</b>	600	620	640	660	690	730	626
<b>1000</b> 305	<b>Ground Roll</b>	290	300	310	320	340	360	301
	<b>15 m / 50 ft</b>	610	630	650	680	720	760	633
<b>2000</b> 610	<b>Ground Roll</b>	300	310	320	340	360	380	310
	<b>15 m / 50 ft</b>	620	640	660	700	740	780	639
<b>3000</b> 914	<b>Ground Roll</b>	310	320	335	355	375	400	319
	<b>15 m / 50 ft</b>	630	650	680	720	760	800	649
<b>4000</b> 1219	<b>Ground Roll</b>	320	335	350	375	395	420	329
	<b>15 m / 50 ft</b>	650	670	700	740	790	830	657
<b>5000</b> 1524	<b>Ground Roll</b>	335	345	370	395	415		338
	<b>15 m / 50 ft</b>	660	690	730	770	810		668
<b>6000</b> 1829	<b>Ground Roll</b>	345	365	390	415	435		348
	<b>15 m / 50 ft</b>	680	710	750	800	840		679
<b>7000</b> 2134	<b>Ground Roll</b>	370	400	425	450	475		373
	<b>15 m / 50 ft</b>	710	750	790	840	890		707
<b>8000</b> 2438	<b>Ground Roll</b>	425	455	485	515	545		423
	<b>15 m / 50 ft</b>	780	820	870	920	980		768
<b>9000</b> 2743	<b>Ground Roll</b>	490	525	555	590	620		482
	<b>15 m / 50 ft</b>	860	910	960	1020	1070		839
<b>10000</b> 3048	<b>Ground Roll</b>	560	590	630	665			540
	<b>15 m / 50 ft</b>	930	990	1050	1100			905

For the distance in [ft] divide by 0.3048 or multiply by 3.28.

**Landing Distance - Flaps LDG - 1100 kg / 2425 lb**

**Weight:** 1100 kg / 2425 lb      **Flaps:** LDG  
**V<sub>REF</sub>:** 72 KIAS      **Power:** IDLE  
**Runway:** dry, paved, level

Press. Alt. [ft] / [m]	Distance [m]	Outside Air Temperature - [°C] / [°F]						ISA
		0 / 32	10 / 50	20 / 68	30 / 86	40 / 104	50 / 122	
<b>SL</b>	<b>Ground Roll</b>	255	265	275	285	300	320	270
	<b>15 m / 50 ft</b>	590	610	630	640	680	720	612
<b>1000</b> 305	<b>Ground Roll</b>	265	275	285	295	315	335	278
	<b>15 m / 50 ft</b>	590	610	630	660	690	730	615
<b>2000</b> 610	<b>Ground Roll</b>	275	285	295	310	330	350	286
	<b>15 m / 50 ft</b>	600	620	640	670	710	750	617
<b>3000</b> 914	<b>Ground Roll</b>	285	295	310	330	345	370	294
	<b>15 m / 50 ft</b>	610	630	650	690	730	770	623
<b>4000</b> 1219	<b>Ground Roll</b>	295	305	325	345	365	385	302
	<b>15 m / 50 ft</b>	620	640	670	710	750	800	630
<b>5000</b> 1524	<b>Ground Roll</b>	305	320	340	360	385		311
	<b>15 m / 50 ft</b>	630	650	690	730	780		637
<b>6000</b> 1829	<b>Ground Roll</b>	320	335	355	380	405		321
	<b>15 m / 50 ft</b>	640	680	720	760	800		644
<b>7000</b> 2134	<b>Ground Roll</b>	345	365	390	415	440		345
	<b>15 m / 50 ft</b>	670	710	750	800	840		671
<b>8000</b> 2438	<b>Ground Roll</b>	400	425	450	480	510		394
	<b>15 m / 50 ft</b>	740	790	840	880	930		736
<b>9000</b> 2743	<b>Ground Roll</b>	465	495	525	560	590		457
	<b>15 m / 50 ft</b>	830	880	930	980	1030		810
<b>10000</b> 3048	<b>Ground Roll</b>	535	565	600	635			518
	<b>15 m / 50 ft</b>	910	960	1010	1070			880

For the distance in [ft] divide by 0.3048 or multiply by 3.28.

### 5.3.13 LANDING DISTANCE - ABNORMAL FLAP POSITION

Landing Distance - Abnormal Flap Position - 1310 kg / 2888 lb								
Weight: 1310 kg / 2888 lb			Flaps: T/O or UP					
V <sub>REF</sub> : 78 KIAS (Flaps T/O)			Power: IDLE					
83 KIAS Flaps UP)			Runway: dry, paved, level					
Press. Alt. [ft] / [m]	Distance [m]	Outside Air Temperature - [°C] / [°F]						ISA
		0 / 32	10 / 50	20 / 68	30 / 86	40 / 104	50 / 122	
SL	Ground Roll	355	365	380	390	415	440	372
	15 m / 50 ft	790	810	840	870	920	970	822
1000 305	Ground Roll	365	380	395	420	445	475	382
	15 m / 50 ft	800	820	860	910	960	1020	827
2000 610	Ground Roll	380	400	425	450	480	510	401
	15 m / 50 ft	810	850	900	950	1010	1060	849
3000 914	Ground Roll	400	430	455	485	515	545	425
	15 m / 50 ft	840	890	940	1000	1060	1120	881
4000 1219	Ground Roll	430	460	490	520	550	580	450
	15 m / 50 ft	880	940	990	1060	1120	1180	917
5000 1524	Ground Roll	460	490	525	555	590		476
	15 m / 50 ft	930	990	1050	1110	1170		954
6000 1829	Ground Roll	495	525	560	595	630		503
	15 m / 50 ft	980	1040	1100	1170	1240		992
7000 2134	Ground Roll	545	580	615	655	695		547
	15 m / 50 ft	1040	1110	1180	1240	1310		1046
8000 2438	Ground Roll	620	660	705	745	790		615
	15 m / 50 ft	1150	1220	1290	1370	1440		1141
9000 2743	Ground Roll	710	755	800	850	900		696
	15 m / 50 ft	1270	1350	1420	1500	1590		1243
10000 3048	Ground Roll	800	850	900	955			776
	15 m / 50 ft	1380	1460	1550	1630			1340

For the distance in [ft] divide by 0.3048 or multiply by 3.28.



**Landing Distance - Abnormal Flap Position - 1280 kg / 2822 lb**
**Weight:** 1280 kg / 2822 lb

**Flaps:** T/O or UP

**V<sub>REF</sub>:** 78 KIAS (Flaps T/O)

**Power:** IDLE

83 KIAS (Flaps UP)

**Runway:** dry, paved, level

Press. Alt. [ft] / [m]	Distance [m]	Outside Air Temperature - [°C] / [°F]						ISA
		0 / 32	10 / 50	20 / 68	30 / 86	40 / 104	50 / 122	
<b>SL</b>	<b>Ground Roll</b>	350	360	370	385	410	430	364
	15 m / 50 ft	770	790	820	850	900	950	803
<b>1000</b> 305	<b>Ground Roll</b>	360	375	390	415	440	465	374
	15 m / 50 ft	780	800	840	890	940	990	808
<b>2000</b> 610	<b>Ground Roll</b>	370	390	415	445	470	500	393
	15 m / 50 ft	790	830	880	930	980	1040	829
<b>3000</b> 914	<b>Ground Roll</b>	395	420	445	475	505	535	416
	15 m / 50 ft	820	870	930	980	1040	1090	863
<b>4000</b> 1219	<b>Ground Roll</b>	420	450	480	510	540	570	441
	15 m / 50 ft	860	920	970	1030	1090	1150	895
<b>5000</b> 1524	<b>Ground Roll</b>	450	480	515	545	580		467
	15 m / 50 ft	910	970	1020	1080	1150		931
<b>6000</b> 1829	<b>Ground Roll</b>	485	515	550	585	620		492
	15 m / 50 ft	960	1020	1080	1140	1210		972
<b>7000</b> 2134	<b>Ground Roll</b>	535	570	605	645	680		537
	15 m / 50 ft	1020	1080	1150	1220	1290		1022
<b>8000</b> 2438	<b>Ground Roll</b>	610	650	690	735	780		606
	15 m / 50 ft	1130	1200	1270	1340	1410		1117
<b>9000</b> 2743	<b>Ground Roll</b>	700	745	790	835	885		685
	15 m / 50 ft	1250	1320	1400	1480	1550		1223
<b>10000</b> 3048	<b>Ground Roll</b>	790	840	890	940			766
	15 m / 50 ft	1360	1440	1520	1610			1319

For the distance in [ft] divide by 0.3048 or multiply by 3.28.

**Landing Distance - Abnormal Flap Position 1200 kg / 2645 lb**

**Weight:** 1200 kg / 2645 lb      **Flaps:** T/O or UP  
**V<sub>REF</sub>:** 78KIAS (Flaps T/O)      **Power:** IDLE  
 82 KIAS (Flaps UP)      **Runway:** dry, paved, level

Press. Alt. [ft] / [m]	Distance [m]	Outside Air Temperature - [°C] / [°F]						ISA
		0 / 32	10 / 50	20 / 68	30 / 86	40 / 104	50 / 122	
<b>SL</b>	<b>Ground Roll</b>	330	340	350	365	385	410	345
	<b>15 m / 50 ft</b>	760	780	810	840	880	930	790
<b>1000</b> 305	<b>Ground Roll</b>	340	350	370	390	415	440	354
	<b>15 m / 50 ft</b>	760	790	820	870	920	970	790
<b>2000</b> 610	<b>Ground Roll</b>	350	370	395	420	445	470	371
	<b>15 m / 50 ft</b>	770	810	860	910	960	1020	811
<b>3000</b> 914	<b>Ground Roll</b>	375	400	420	450	475	505	394
	<b>15 m / 50 ft</b>	800	850	900	950	1010	1060	837
<b>4000</b> 1219	<b>Ground Roll</b>	400	425	455	480	510	540	416
	<b>15 m / 50 ft</b>	840	890	940	1000	1060	1110	870
<b>5000</b> 1524	<b>Ground Roll</b>	425	455	485	515	545		441
	<b>15 m / 50 ft</b>	880	930	990	1050	1110		901
<b>6000</b> 1829	<b>Ground Roll</b>	460	490	520	550	585		466
	<b>15 m / 50 ft</b>	920	980	1040	1100	1170		937
<b>7000</b> 2134	<b>Ground Roll</b>	505	540	575	610	645		508
	<b>15 m / 50 ft</b>	980	1040	1110	1170	1240		988
<b>8000</b> 2438	<b>Ground Roll</b>	580	620	660	700	740		577
	<b>15 m / 50 ft</b>	1090	1160	1230	1300	1370		1083
<b>9000</b> 2743	<b>Ground Roll</b>	670	715	760	805	850		660
	<b>15 m / 50 ft</b>	1210	1280	1360	1430	1510		1187
<b>10000</b> 3048	<b>Ground Roll</b>	765	815	860	910			740
	<b>15 m / 50 ft</b>	1330	1400	1490	1560			1289

For the distance in [ft] divide by 0.3048 or multiply by 3.28.

**Landing Distance - Abnormal Flap Position 1100 kg / 2425 lb**

**Weight:** 1100 kg / 2425 lb      **Flaps:** T/O or UP  
**V<sub>REF</sub>:** 74 KIAS (Flaps T/O)      **Power:** IDLE  
 78 KIAS (Flaps UP)      **Runway:** dry, paved, level

Press. Alt. [ft] / [m]	Distance [m]	Outside Air Temperature - [°C] / [°F]						ISA
		0 / 32	10 / 50	20 / 68	30 / 86	40 / 104	50 / 122	
<b>SL</b>	<b>Ground Roll</b>	305	315	325	335	355	380	319
	<b>15 m / 50 ft</b>	750	770	790	820	870	920	777
<b>1000</b> 305	<b>Ground Roll</b>	315	325	340	360	385	405	328
	<b>15 m / 50 ft</b>	750	770	800	850	900	950	780
<b>2000</b> 610	<b>Ground Roll</b>	325	345	365	390	410	435	343
	<b>15 m / 50 ft</b>	760	780	830	880	930	980	783
<b>3000</b> 914	<b>Ground Roll</b>	345	370	390	415	440	465	364
	<b>15 m / 50 ft</b>	760	810	860	920	970	1020	804
<b>4000</b> 1219	<b>Ground Roll</b>	370	395	420	445	470	500	386
	<b>15 m / 50 ft</b>	800	850	900	950	1010	1060	829
<b>5000</b> 1524	<b>Ground Roll</b>	395	420	450	475	505		408
	<b>15 m / 50 ft</b>	840	890	940	1000	1050		857
<b>6000</b> 1829	<b>Ground Roll</b>	425	450	480	510	540		431
	<b>15 m / 50 ft</b>	870	930	990	1040	1100		887
<b>7000</b> 2134	<b>Ground Roll</b>	470	500	535	565	600		471
	<b>15 m / 50 ft</b>	930	990	1050	1110	1170		936
<b>8000</b> 2438	<b>Ground Roll</b>	545	580	620	655	695		542
	<b>15 m / 50 ft</b>	1040	1100	1170	1240	1300		1031
<b>9000</b> 2743	<b>Ground Roll</b>	640	680	720	765	805		627
	<b>15 m / 50 ft</b>	1170	1230	1310	1380	1450		1141
<b>10000</b> 3048	<b>Ground Roll</b>	735	780	825	870			712
	<b>15 m / 50 ft</b>	1280	1360	1430	1510			1242

For the distance in [ft] divide by 0.3048 or multiply by 3.28.

### 5.3.14 GO-AROUND CLIMB PERFORMANCE

Conditions:

- Power lever ..... MAX
- Flaps ..... LDG
- Airspeed .....  $V_{REF}$

The climb performance charts show the rate of climb. The gradient and angle of climb can be calculated using the following formula:

$$\text{Gradient} [\%] = \frac{ROC [fpm]}{TAS [KTAS]} \cdot 0.98$$

#### NOTE

The angles of climb at MSL and ISA condition are:

3.0° for Maximum Take-Off Mass / Maximum Landing  
Mass (1280 kg / 2822 lb)

3.6° for Maximum Landing Mass (1216 kg / 2645 lb)

If MÄM 40-662 is carried out:

2.9° for Maximum Take-Off Mass (1310 kg / 2888 lb)

## Go-Around Climb Performance

Flaps: LDG

Power: MAX

$V_{REF}$ : 77 KIAS at 1280 kg (2822 lb) and 1310 kg (2888 lb)  
76 KIAS at 1200 kg (2645 lb)  
72 KIAS at 1100 kg (2425 lb)

Weight [kg] / [lb]	Press. Alt. [ft]	Press. Alt. [m]	Rate of Climb - [ft/min]								
			Outside Air Temperature - [°C] / [°F]								ISA
			-20	-10	0	10	20	30	40	50	
			-4	14	32	50	68	86	104	122	
1310 / 2888	SL		410	405	395	390	385	375	360	335	388
	2000	610	395	390	380	375	370	360	340	310	376
	4000	1219	380	375	365	360	350	340	315	285	364
	6000	1829	365	360	350	345	335	315	285	/	351
	8000	2438	350	345	335	320	310	280	250	/	336
	10000	3048	330	320	310	295	275	240	/	/	315
1280 / 2822	SL		425	415	410	400	395	385	370	345	400
	2000	610	410	400	395	385	380	370	350	320	387
	4000	1219	395	385	380	370	365	350	325	295	375
	6000	1829	380	370	360	355	345	325	295	/	361
	8000	2438	360	355	345	330	320	290	260	/	346
	10000	3048	345	330	320	305	285	250	/	/	326
1200 / 2645	SL		505	500	495	490	480	475	460	425	488
	2000	610	495	490	480	475	465	460	435	400	475
	4000	1219	480	475	465	455	450	435	410	375	462
	6000	1829	465	455	450	440	435	410	380	/	448
	8000	2438	450	440	430	425	410	380	345	/	434
	10000	3048	430	420	410	395	375	335	/	/	418

Go-Around Climb Performance											
Flaps: LDG						Power: MAX					
V <sub>REF</sub> :		77 KIAS at 1280 kg (2822 lb) and 1310 kg (2888 lb) 76 KIAS at 1200 kg (2645 lb) 72 KIAS at 1100 kg ( 2425 lb)									
Weight [kg] / [lb]	Press. Alt. [ft]	Press. Alt. [m]	Rate of Climb - [ft/min]								
			Outside Air Temperature - [°C] / [°F]								
			-20	-10	0	10	20	30	40	50	ISA
			-4	14	32	50	68	86	104	122	
1100 / 2425	SL		615	615	610	605	605	595	575	535	607
	2000	610	610	605	605	595	585	580	550	510	596
	4000	1219	605	595	585	580	570	555	520	480	582
	6000	1829	585	575	570	560	550	525	490	/	568
	8000	2438	570	560	550	540	530	495	455	/	553
	10000	3048	550	540	530	520	495	450	/	/	537

### I 5.3.15 GLIDE

The following table shows the glide ratio and the resulting maximum horizontal distance in nautical miles per 1000 ft (305 m) of altitude loss in a glide traveled in still air.

	<b>Glide ratio</b>	<b>Maximum horizontal distance per 1000 ft (305 m) altitude loss</b>
Windmilling propeller	1 : 9.7	1.59 NM (2.94 km)

Conditions:

- Flaps ..... UP
- Airspeed ..... 88 KIAS

#### **CAUTION**

The propeller will keep windmilling under all expected conditions. Do not attempt to stop the propeller intentionally.

#### **NOTE**

In case of stationary propeller the given numbers are conservative.

#### **NOTE**

For operation without wheel fairings the glide ratio is reduced to 9.4; i.e., for every 1000 ft (305m) of altitude loss the maximum horizontal distance traveled in still air is 1.54 NM (2.85 km). During this the propeller will continue to windmill.

■ **5.3.16 APPROVED NOISE DATA**

■ Maximum Flight Mass 1280 kg (2825 lb):

ICAO Annex 16 Chapter X ..... 74.5 dB(A)

CS-36 Subpart C ..... 74.5 dB(A)

■ If the Exhaust Pipe with Muffler MÄM 40-434 or OÄM 40-310 is installed:

■ ICAO Annex 16, Chapter X ..... 71.5 dB(A)

■ CS-36 Subpart C ..... 71.5 dB(A)

■ Maximum Flight Mass 1310 kg (2888 lb):

■ ICAO Annex 16 Chapter X ..... 71.4 dB(A)

■ CS-36 Subpart C ..... 71.4 dB(A)



## CHAPTER 6

# MASS AND BALANCE / EQUIPMENT LIST

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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.

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

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

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

### **NOTE**

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

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

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

## NOTE

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

## 6.2 DATUM PLANE

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

## 6.3 MASS AND BALANCE REPORT

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

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

Condition of the airplane for establishing the empty mass:

- Equipment as per Equipment Inventory (see Section 6.5)
- - Including brake fluid, lubricant (1.0 liter / 1.06 qts), coolant, gearbox oil, engine oil (7.0 liter / 7.4 qts), plus unusable fuel (2.0 US gal / approx. 7.6 liter).



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

The following information enables you to operate your DA 40 NG 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 NG' in Table 6.4.3 - CALCULATION OF LOADING CONDITION.
2. Read the fuel quantity indicators to determine the fuel quantity. If an indicator shows 14 US gal, up to 19.5 US gal can be in the Long Range Tank. In this case, the exact quantity must be determined with the alternate means for fuel quantity indication.
3. 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.
4. 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 9 for the condition with empty fuel tanks, and row 11 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.

5. Graphical method:

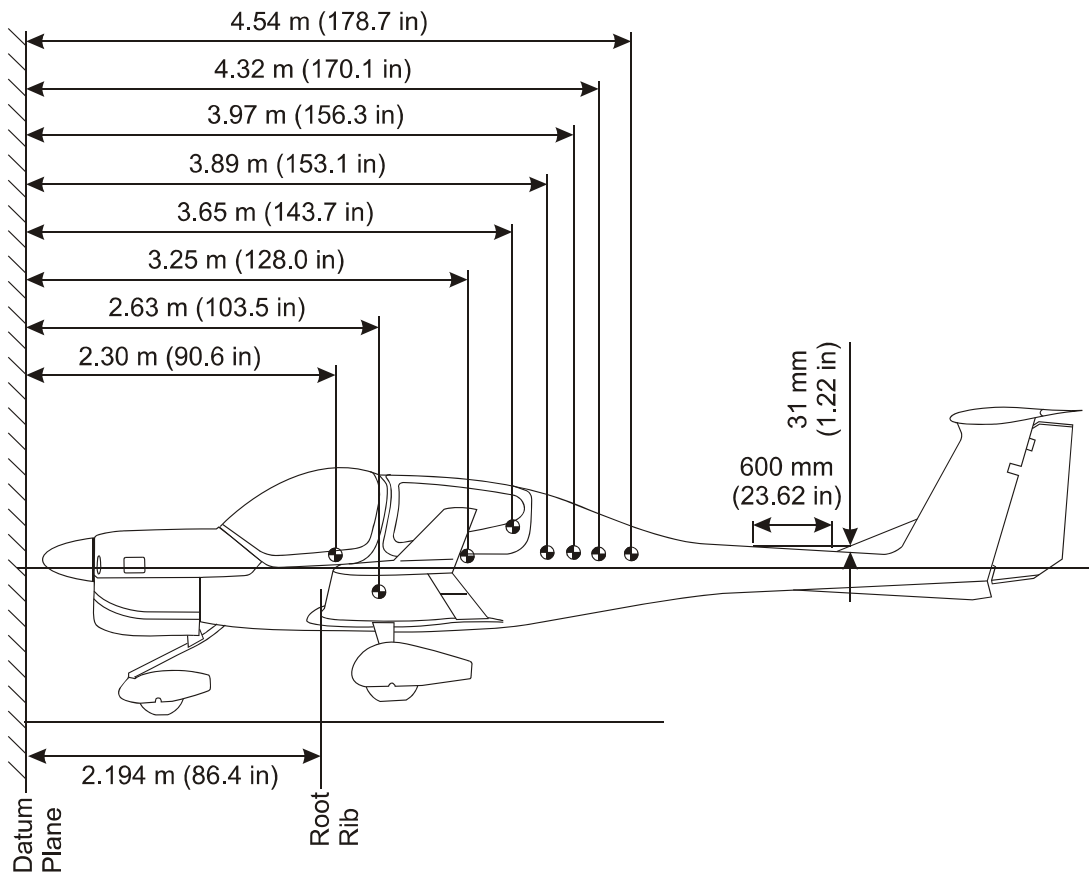
Diagram 6.4.2 - LOADING DIAGRAM is used to determine the moments. The masses and moments for the individual items of loading are added. Then Diagram 6.4.5 - PERMISSIBLE MOMENT RANGE is used to check whether the total moment associated with the total mass is in the admissible range.

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

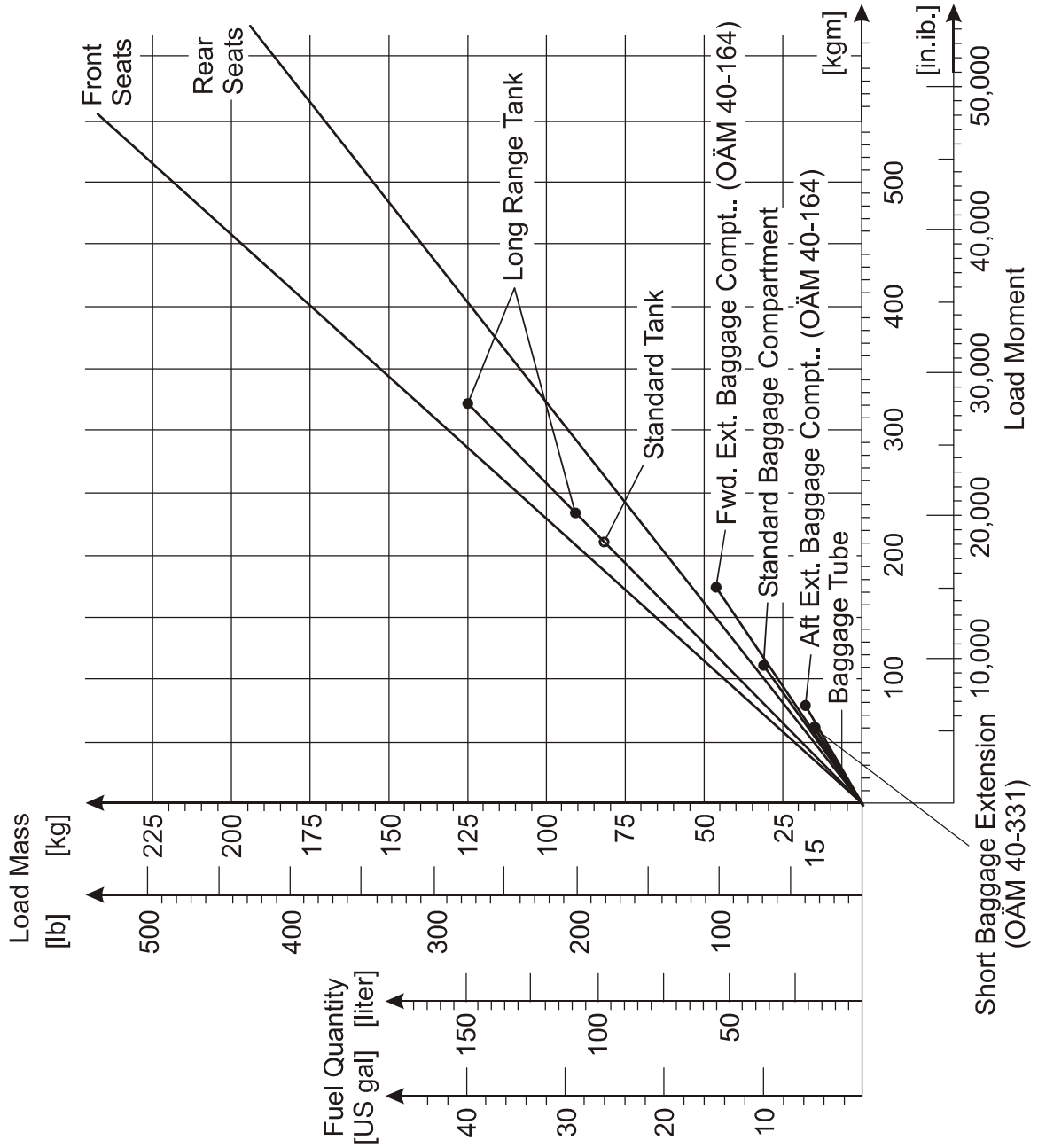
### 6.4.1 MOMENT ARMS

The most important lever arms aft of the Datum Plane:

- Front seats : 2.30 m 90.6 in
- Rear seats : 3.25 m 128.0 in
- Wing tank (Standard & Long Range) : 2.63 m 103.5 in
- Baggage in standard compartment : 3.65 m 143.7 in
  - Baggage in baggage tube : 4.32 m 170.1 in
  - Baggage in short baggage extension  
(if OÄM 40-331 is installed): 3.97 m 156.3 in
- Baggage in baggage extension (if OÄM 40-164 is installed):
  - Forward part : 3.89 m 153.1 in
  - Aft part : 4.54 m 178.7 in



**6.4.2 LOADING DIAGRAM**





### 6.4.3 CALCULATION OF LOADING CONDITION

#### a) Standard Tank Configuration

CALCULATION OF LOADING CONDITION	DA 40 NG (Example)		Your DA 40 NG	
	Mass [kg] [lb]	Moment [kgm] [in.lb]	Mass [kg] [lb]	Moment [kgm] [in.lb]
1. Empty mass (from Mass and Balance Report)	900 1,984	2,180.8 189,253		
2. Front seats Lever arm: 2.30 m (90.6 in)	150 331	345.0 29,989		
3. Rear seats Lever arm: 3.25 m (128.0 in)	0 0	0 0		
4. Standard baggage comp. Lever arm: 3.65 m (143.7 in)	20 44	73.0 6,323		
5. Baggage tube Lever arm: 4.32 m (170.1 in)	0 0	0 0		
6. Short baggage extension (OÄM 40-331 carried out) Lever arm: 3.97 m (156.3 in)	0 0	0 0		
7. Forward extended baggage compartment (OÄM 40-164 carried out) Lever arm: 3.89 m (153.1 in)	0 0	0 0		
8. Aft extended baggage compartment (OÄM 40-164 carried out) Lever arm: 4.54 m (178.7 in)	0 0	0 0		

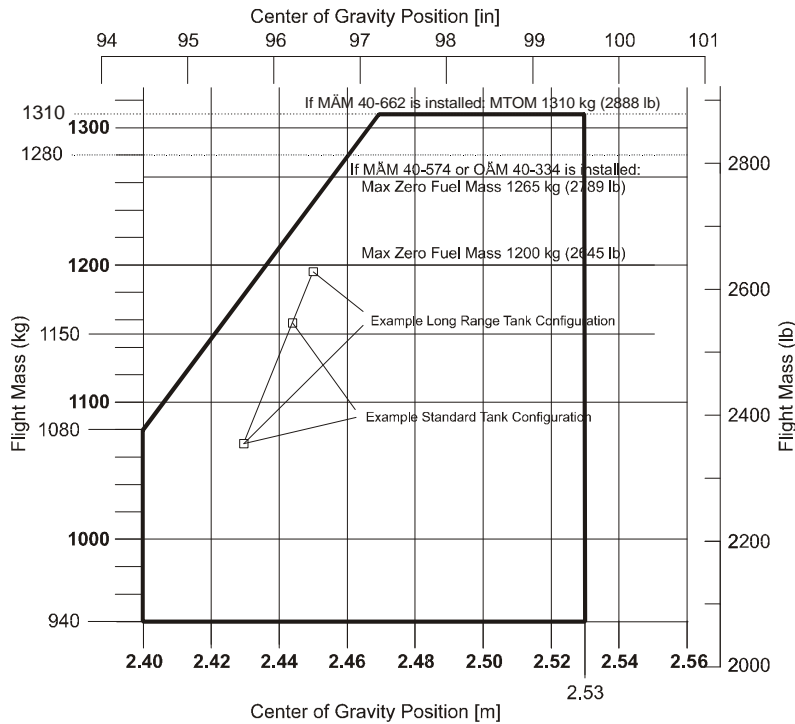
CALCULATION OF LOADING CONDITION	DA 40 NG (Example)		Your DA 40 NG	
	Mass [kg] [lb]	Moment [kgm] [in.lb]	Mass [kg] [lb]	Moment [kgm] [in.lb]
9. Total mass and total moment with empty fuel tanks (Total of 1.-8.)	1,070 2,359	2,598.8 225,565		
10. On-board usable fuel (0.84 kg/liter) (7.01 lb/US gal) Lever arm: 2.63 m (103.5 in)	89 196	234.1 20,286		
11. Total mass and total moment with full fuel tanks (Total 9. plus 10.)	1,159 2,555	2,832.9 245,851		
<p>12. The total moments from rows 9 and 11 2,598.8 and 2,832.9 kgm) (225,565 and 245,851 in.lb) must be divided by the related total mass (1,070 and 1,159 kg respectively) (2,359 and 2,555 lb) and then located in Diagram 6.4.4 - PERMISSIBLE CENTER OF GRAVITY RANGE.</p> <p>As in our example CG positions (2.429 m and 2.444 m respectively) (95.62 and 96.22 in) and masses fall into the permitted area, this loading condition is allowable.</p>				

b) Long Range Tank Configuration

CALCULATION OF LOADING CONDITION	DA 40 NG (Example)		Your DA 40 NG	
	Mass [kg]	Moment [kgm]	Mass [kg]	Moment [kgm]
	[lb]	[in.lb]	[lb]	[in.lb]
1. Empty mass (from Mass and Balance Report)	900 1,984	2,180.8 189,253		
2. Front seats Lever arm: 2.30 m (90.6 in)	150 331	345.0 29,989		
3. Rear seats Lever arm: 3.25 m (128.0 in)	0 0	0 0		
4. Standard baggage comp. Lever arm: 3.65 m (143.7 in)	20 44	73.0 6,323		
5. Baggage tube Lever arm: 4.32 m (170.1 in)	0 0	0 0		
6. Short baggage extension (OÄM 40-331 carried out) Lever arm: 3.97 m (156.3 in)	0 0	0 0		
7. Forward extended baggage compartment (OÄM 40-164 carried out) Lever arm: 3.89 m (153.1 in)	0 0	0 0		
8. Aft extended baggage compartment (OÄM 40-164 carried out) Lever arm: 4.54 m (178.7 in)	0 0	0 0		

CALCULATION OF LOADING CONDITION	DA 40 NG (Example)		Your DA 40 NG	
	Mass [kg] [lb]	Moment [kgm] [in.lb]	Mass [kg] [lb]	Moment [kgm] [in.lb]
9. Total mass and total moment with empty fuel tanks (Total of 1.-8.)	1,070 2,359	2,598.8 225,565		
10. On-board usable fuel (0.84 kg/liter) (7.01 lb/US gal) Lever arm: 2.63 m (103.5 in)	124 273	326.1 28,256		
11. Total mass and total moment with full fuel tanks (Total 9. plus 10.)	1,194 2,632	2,924.9 253,821		
<p>12. The total moments from rows 9 and 11 (2,598.8 and 2,924.9 kgm) (225,565 and 253,821 in.lb) must be divided by the related total mass (1,070 and 1,194 kg respectively) (2,359 and 2,632 lb) and then located in Diagram 6.4.4 - PERMISSIBLE CENTER OF GRAVITY RANGE.</p> <p>As in our example CG positions (2.429 m and 2.450 m respectively) (95.62 and 96.44 in) and masses fall into the permitted area, this loading condition is allowable.</p>				

**6.4.4 PERMISSIBLE CENTER OF GRAVITY RANGE**



The CG's shown in the diagram are from the examples in Tables 6.4.3 - CALCULATION OF LOADING CONDITION a) and b), rows 9 and 11.

The flight CG position must be within the following limits:

Most forward CG:

- 2.40 m (94.5 in) aft of DP from 940 kg to 1080 kg (2072 lb to 2381 lb)
- 2.46 m (96.9 in) aft of DP at 1280 kg (2822 lb)

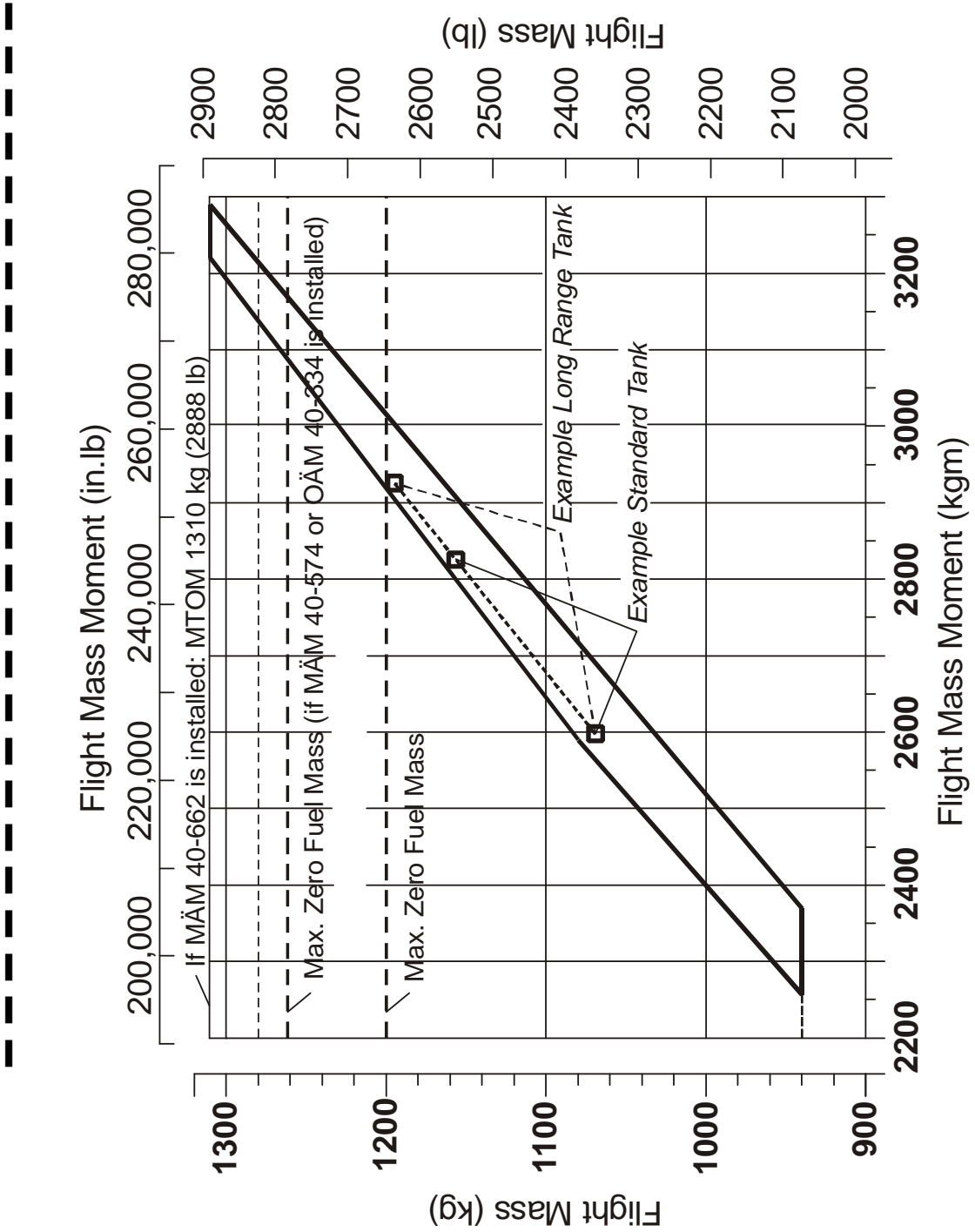
If MÄM 40-662 is installed:

- 2.469 m (97.2 in) aft of DP at 1310 kg (2888 lb)
- linear variation between these values

Most rearward CG:

- 2.53 m (99.6 in) aft of DP from 940 kg (2072 lb) to 1310 kg (2888 lb)

**6.4.5 PERMISSIBLE MOMENT RANGE**



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

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

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

### **NOTE**

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



Airplane Serial No.:		Registration:		Date:		Mass		Lever Arm	
Description	Type	Part No.	Manufacturer	S/N	installed	lb	kg	in	m
<b>AVIONICS COOLING</b>									
Avionics cooling fan	SAFE 328	305 467-00	Sandia Aerospace						
Avionics cooling fan	Cyclone 21-3	CRB-122253	Lone Star Aviation						
PFD cooling fan	SAFE 128	305 468-00	Sandia Aerospace						
MFD cooling fan	SAFE 128	305 468-00	Sandia Aerospace						
<b>AUTOPILOT SYSTEM</b>									
Pitch servo	GSA 81	011-00878-00	Garmin						
Pitch servo	GSA 81	011-00878-20	Garmin						
Pitch servo mount	GSM 85	011-00894-07	Garmin						
Pitch servo mount	GSM 86	011-01904-03	Garmin						
Pitch clutch cartridge		011-02147-15	Garmin						
Roll servo	GSA 81	011-00878-00	Garmin						
Roll servo	GSA 81	011-00878-20	Garmin						
Roll servo mount	GSM 85	011-00894-07	Garmin						
Roll servo mount	GSM 86	011-01904-03	Garmin						
Roll clutch cartridge		011-02147-08	Garmin						
Pitch trim servo	GSA 81	011-00878-00	Garmin						
Pitch trim servo	GSA 81	011-00878-20	Garmin						
Pitch trim servo mount	GSM 85	011-00894-04	Garmin						
Pitch trim servo mount	GSM 86	011-01904-03	Garmin						
Pitch trim clutch cartridge		011-02147-15	Garmin						
Control stick		DA4-2213-12-90	Diamond Aircraft						
CWS switch		031-00514-0000	Bendix/King						





Airplane Serial No.:	Registration:		Date:	Mass		Lever Arm				
	Type	Part No.		Manufacturer	S/N	installed	lb	kg	in	m
Description										
AP-Disc switch		031-00428-0000	Bendix/King							
Trim switch assy		200-09187-0000	Bendix/King							
<b>ELECTRICAL POWER</b>										
Main battery	RG24-15		Concorde							
Emergency battery		D60-2560-91-00	Diamond Aircraft							
ECU backup battery (2 pcs)	LC-R127R2P		Panasonic							
External power connector		DA4-2443-10-00	Diamond Aircraft							
Additional alternator		ES-10024B-2	Kelly Aerospace							
Alternator pulley		D44-2416-00-34X03	Diamond Aircraft							
Alternator pulley		D44-2416-00-70_1	Diamond Aircraft							
Gear box fan assy		D44-2416-20-00	Diamond Aircraft							
Prop. flange pulley support		D44-2416-00-52_1	Diamond Aircraft							
Additional alternator V-belt		ISO 4184 XPZ L862	Diamond Aircraft							
Additional alternator V-belt		ISO 4184 XPZ L987	Diamond Aircraft							
Additional alternator regulator		VR2000-28-1	Electrosystems Inc.							
<b>CABIN COOLING SYSTEM</b>										
Cabin cooling central unit		D44-2151-00-00	Diamond Aircraft							
Cabin cooling central unit		D44-2153-00-00	Diamond Aircraft							



Airplane Serial No.:		Registration:		Date:		Mass		Lever Arm	
Description	Type	Part No.	Manufacturer	SIN	installed	lb	kg	in	m
<b>EQUIPMENT</b>									
Safety belt, pilot	5-01-0 Series	5-01-1C0710	Schroth			2.110	0.960	92.520	2.350
Safety belt, co-pilot	5-01-0 Series	5-01-1C5710	Schroth			2.110	0.960	92.520	2.350
Safety belt, LH pax	5-01-0 Series	5-01-1B5710	Schroth			2.250	1.020	126.800	3.220
Safety belt, RH pax	5-01-0 Series	5-01-1B0710	Schroth			2.250	1.020	126.800	3.220
Safety belt, pilot	5-01-0 Series	5-01-2G0710	Schroth			2.110	0.960	92.520	2.350
Safety belt, co-pilot	5-01-0 Series	5-01-2G5710	Schroth			2.110	0.960	92.520	2.350
Safety belt, LH pax	5-01-0 Series	5-01-2H5710	Schroth			2.250	1.020	126.800	3.220
Safety belt, RH pax	5-01-0 Series	5-01-2H0710	Schroth			2.250	1.020	126.800	3.220
Safety belt, pilot	5-01-0 Series	5-01-2G0701	Schroth			2.110	0.960	92.520	2.350
Safety belt, co-pilot	5-01-0 Series	5-01-2G5701	Schroth			2.110	0.960	92.520	2.350
Safety belt, LH pax	5-01-0 Series	5-01-2H5701	Schroth			2.250	1.020	126.800	3.220
Safety belt, RH pax	5-01-0 Series	5-01-2H0701	Schroth			2.250	1.020	126.800	3.220
Safety belt, pilot	5-01-0 Series	5-01-1C0701	Schroth			2.110	0.960	92.520	2.350
Safety belt, co-pilot	5-01-0 Series	5-01-1C5701	Schroth			2.110	0.960	92.520	2.350
Safety belt, LH pax	5-01-0 Series	5-01-1B5701	Schroth			2.250	1.020	126.800	3.220
Safety belt, RH pax	5-01-0 Series	5-01-1B0701	Schroth			2.250	1.020	126.800	3.220
ELT unit	ME406	453-6603	Artex			2.064	0.936	179.700	4.565
ELT remote switch		345-6196-04	Artex						
ELT antenna		110-773	Artex			0.251	0.114	152.800	3.880
Buzzer		452-6505	Artex						
Winter baffle		DA4-2157-00-00							
Nose gear tie-down		DA4-1001-00-00							



Airplane Serial No.:		Registration:		Date:		Mass		Lever Arm	
Description	Type	Part No.	Manufacturer	S/N	installed	lb	kg	in	m
<b>SAFETY EQUIPMENT</b>									
Fire extinguisher		HAL 1	AIR Total						
Fire extinguisher, portable 1		A 620 T	Amerex						
First aid kit									
Emergency axe		G45912	Fiskars						
<b>FLIGHT CONTROLS</b>									
Flaps actuator assy		43055	Krutz						
Flap control unit		DAI-9031-10-01	Krutz						
Stall warning horn assy	"A"	DA4-2739-10-00	Diamond Aircraft						
Stall warning horn assy	"B"	DA4-2739-10-00X01	Diamond Aircraft						
Stall warning horn assy	"C"	DA4-2739-10-00X02	Diamond Aircraft						
Stall warning horn assy	"D"	DA4-2739-10-00X03	Diamond Aircraft						
Stall warning horn assy	"E"	DA4-2739-10-00X04	Diamond Aircraft						
Stall warning horn assy	"F"	DA4-2739-10-00X05	Diamond Aircraft						
<b>FUEL</b>									
Fuel transfer pump		5100-00-9	Dukes Inc.						
Fuel transfer pump		18002-B	Weldon						
<b>INDICATING / REC. SYSTEM</b>									
Primary flight display (PFD)	GDU 1040	011-00972-03	Garmin			6.400	2.900	70.080	1.780
Primary flight display (PFD)	GDU 1040	011-00972-10	Garmin			6.400	2.900	70.080	1.780



Airplane Serial No.:		Registration:		Date:		Mass		Lever Arm	
Description	Type	Part No.	Manufacturer	SIN	installed	lb	kg	in	m
Primary flight display (PFD)	GDU 1040	011-00972-02	Garmin			6.400	2.900	70.080	1.780
Multi function display (MFD)	GDU 1044	011-01078-01	Garmin			6.400	2.900	70.080	1.780
Multi function display (MFD)	GDU 1044	011-01078-10	Garmin			6.400	2.900	70.080	1.780
Multi function display (MFD)	GDU 1040	011-00972-02	Garmin			6.400	2.900	70.080	1.780
Multi function display (MFD)	GDU 1040	011-00972-03	Garmin			6.400	2.900	70.080	1.780
Multi function display (MFD)	GDU 1040	011-00972-10	Garmin			6.400	2.900	70.080	1.780
Flight timer		85094-12	Hobbs						
Digital chronometer with OAT	M803-28V		Davtron						
Annunciator panel		WW-IDC004	White Wire						
Chronometer		09CH	Adriatica						
<b>HYDRAULIC</b>									
Master cylinder		10-54A	Cleveland						
Parking valve		60-5D	Cleveland						
Brake assembly		30-239B	Cleveland						
Brake assembly		30-239A	Cleveland						
Brake assembly		30-32E	Cleveland						
Speedkit NLG		D44-3229-29-00_1	Diamond Aircraft						
<b>LIGHTS</b>									
Map / Reading light assy crew		W1461.0.010	Rivoret						
Cabin Light		W1461.0.010	Rivoret						
Strobe / Pos. light assy LH	A600-PR-D-28	01-07900006-05	Whelen			0.800	0.363	103.800	2.638
Strobe / Pos. light assy LH	9034004	01-0790340-04	Whelen						
Strobe / Pos. light assy LH	OR6002R	01-0771733-12	Whelen						



Airplane Serial No.:		Registration:		Date:		Mass		Lever Arm	
Description	Type	Part No.	Manufacturer	S/N	installed	lb	kg	in	m
Strobe / Pos. light assy RH	A600-PG-D-28	01-0790006-07	Whelen			0.800	0.363	103.800	2.638
Strobe / Pos. light assy RH	9034003	01-0790340-03	Whelen						
Strobe / Pos. light assy RH	OR6002G	01-0771733-11	Whelen						
Strobe light power supply LH/RH	A490ATS-CF-14/28	01-0770062-05	Whelen						
Halogen Taxi light	7034601	01-0770346-01	Whelen			0.280	0.130	79.920	2.030
Halogen Landing light	7034601	01-0770346-01	Whelen			0.280	0.130	79.920	2.030
Ballast	GEN5 D1, 24V	37776	Newark						
Ballast	GEN5 D1, 24V	37776	Newark						
Taxi light	HID Lamp D1S	39663	Newark						
Landing light	HID Lamp D1S	39663	Newark						
LED Taxi light	71125	01-0771125-23	Whelen			0.300	0.140	79.920	2.030
LED Landing light	71125	01-0771125-20	Whelen			0.300	0.140	79.920	2.030
Glareshield lamp assy		DA4-3311-10-02	Diamond Aircraft						
Glareshield lamp assy		DA4-3311-10-01	Diamond Aircraft						
Glareshield light inverter		APVL328-4-1-L-5QF	Quantaflex						
Glareshield light inverter		APVL328-8-3-L-18QF	Quantaflex						
Placards inverter		APVL328-4-1-L-15QF	Quantaflex						
Map / reading light		RL6980-1	Birk Aerostystems						
Instr. / Radio lights dimmer		WW-LCM002	White Wire						
<b>COMMUNICATION / NAVIGATION</b>									
COMM #1 antenna			DM			0.400	0.180	177.100	4.500
COMM #1 antenna			Comant			0.500	0.227	177.100	4.500
COMM #2 antenna			DM			0.400	0.180	155.100	3.940



Airplane Serial No.:		Registration:		Date:		Mass		Lever Arm	
Description	Type	Part No.	Manufacturer	SIN	installed	lb	kg	in	m
COMM #2 antenna	CI 292-2		Comant			0.500	0.227	155.100	3.940
Audio panel / Marker / ICS	GMA 1347	011-00809-00	Garmin						
Headset, pilot	Echelon 100		Telex						
Headset, pilot	HMEC25-KAP-2	025-230-715	Sennheiser						
Headset, co-pilot	Echelon 100		Telex						
Headset, co-pilot	HMEC25-KAP-2	025-230-715	Sennheiser						
Headset, LH pax	Echelon 100		Telex						
Headset, LH pax	HMEC25-KAP-2	025-230-715	Sennheiser						
Headset, RH pax	Echelon 100		Telex						
Headset, RH pax	HMEC25-KAP-2	025-230-715	Sennheiser						
Speaker	FRS8 / 4 Ohms		Visaton						
Handmic	100 TRA	62800-001	Telex						
Pitot / Static probe, heated	AN5814-2	PST-305	Aeroinstruments						
Alternate static valve		DA4-3111-51-00	Diamond Aircraft						
Backup altimeter		5934PD-3	United Instruments			0.496	0.225	70.080	1.780
Backup airspeed indicator	8025	8025 Code B,908	United Instruments			0.680	0.308	70.080	1.780
Backup artificial horizon	4300	4300-206	Mid Continent Instr.			2.500	1.134	70.080	1.780
Magnetic compass		PG2C-28V	SIRS Navigation						
Magnetic compass		NV2C-2400-28V	SIRS Navigation						
OAT probe	GTP 59	011-00978-00	Garmin						
Digital air data system	GDC74A	011-00882-00	Garmin			1.690	0.770	70.080	1.780
Digital air data system	GDC 74A	011-00882-10	Garmin			1.690	0.770	70.080	1.780
Integrated avionics #1	GIA 63	37207	Garmin			5.290	2.400	154.900	3.935
Integrated avionics #1	GIA 63W	011-01105-01	Garmin			5.290	2.400	154.900	3.935
Integrated avionics #1	GIA 63W	011-01105-20	Garmin			5.290	2.400	154.900	3.935



Airplane Serial No.:		Registration:		Date:		Mass		Lever Arm	
Description	Type	Part No.	Manufacturer	S/N	installed	lb	kg	in	m
Integrated avionics #2	GIA 63	37207	Garmin			5.290	2.400	154.900	3.935
Integrated avionics #2	GIA 63W	011-01105-01	Garmin			5.290	2.400	154.900	3.935
Integrated avionics #2	GIA 63W	011-01105-20	Garmin			5.290	2.400	154.900	3.935
Transponder	GTX 33	011-00779-00	Garmin			5.290	2.400	154.900	3.935
Transponder	GTX 33	011-00779-10	Garmin			3.100	1.410	153.100	3.890
Altitude / Heading reference system GRS 77	GRS 77	011-00868-10	Garmin			2.800	1.270	154.900	3.935
Altitude / Heading reference system GRS 77	GRS 77	011-00868-00	Garmin			2.800	1.270	154.900	3.935
Magnetometer	GMU 44	011-00870-00	Garmin			0.350	0.160	103.800	2.638
Magnetometer	GMU 44	011-00870-10	Garmin			0.350	0.160	103.800	2.638
VOR / LOC / GS antenna	CI 157P		Comant						
Dual VOR / dual GS duplexer	CI 1125		Comant						
Transponder antenna	KA 60	071-01591-0001	Bendix/King						
Transponder antenna	KA 61	071-00221-0010	Bendix/King						
Marker antenna	CI 102		Comant						
GPS #1 antenna	GA 56	011-00134-00	Garmin			0.470	0.210	104.100	2.645
GPS #1 antenna	GA 36	013-00244-00	Garmin			0.470	0.210	104.100	2.645
GPS #2 antenna	GA 56	011-00134-00	Garmin			0.470	0.210	104.100	2.645
GPS #2 antenna	GA 36	013-00244-00	Garmin			0.470	0.210	104.100	2.645
DME	KN 63	066-1070-01	Bendix/King			2.800	1.270	141.100	3.580
DME antenna	KA 60	071-01591-0001	Bendix/King						
DME antenna	KA 61	071-00221-0010	Bendix/King						
Stormscope	WX-500	805-11500-001	L-3						
Stormscope antenna	NY-163	805-10930-001	L-3						
ADF receiver	RA 3502-(01)	0505.757-912	Becker						



Airplane Serial No.:		Registration:		Date:		Mass		Lever Arm	
Description	Type	Part No.	Manufacturer	S/N	installed	lb	kg	in	m
ADF / RMI converter	AC 3504-(01)	0856.010-912	Becker						
ADF antenna	AN 3500	0832.601-912	Becker						
TAS processor	TAS 600	70-2420-x TAS 600	Avidyne/Ryan						
TAS processor	TAS 605	70-2420-x TAS 605	Avidyne/Ryan						
TAS processor	TAS 610	70-2420-x TAS 610	Avidyne/Ryan						
Transponder coupler		70-2420	Avidyne/Ryan						
TAS antenna, top		S72-1750-31L	Sensor Systems						
TAS antenna, bottom		S72-1750-32L	Sensor Systems						
COM/NAV	SL-30	430-6040-303	Garmin						
Intercom	PM1000II	11922	PS Engineering						
Transponder	GTX 328	011-01684-00	Garmin						
Altitude digitizer	SAE5-35	305154-00	Sandia Aerospace						
P/S probe heater fail sensor		DA4-3031-01-00	Diamond Aircraft						
Altimeter inHg/mbar, primary		5934PD-3	United Instruments						
Altimeter inHg/mbar, secondary		5934PD-3	United Instruments						
Airspeed indicator		8025 Code B.908	United Instruments						
Vertical speed indicator		7000	United Instruments						
Magnetic compass		C2400L4P	Airpath						
Directional gyro, free		505-0031-931	L-3 Communications						
Altitude indicator		504-0111-936	L-3 Communications						
Altitude indicator		504-0111-938	L-3 Communications						
Altitude indicator		504-0111-941	L-3 Communications						
Turn coordinator		1394T100-3Z	Mid Continent						
Turn coordinator		1394T100-12RB	Mid Continent						
GPS antenna		GA56	Garmin						





Airplane Serial No.:		Registration:		Date:		Mass		Lever Arm	
Description	Type	Part No.	Manufacturer	S/N	installed	lb	kg	in	m
ENGINE									
Engine	E4A	E4A-00-000-000	Austro Engine						
Engine control unit	EECU-E4-01	E4A-92-100-000 Iss: 020	Austro Engine						
ECU software		Refer to DAI Service Bulletin MSB-40NG-002	Austro Engine						
ENGINE STARTING									
Glow plug control unit		E4A-94-200-000	Austro Engine						
Starter		E4A-93-000-000	Austro Engine						
ELECTRICAL POWER									
Alternator		E4A-91-000-000	Austro Engine						
Alternator		E4A-91-400-000	Austro Engine						
Alternator regulator		E4A-91-100-000	Austro Engine						
Alternator regulator		E4A-91-200-000	Austro Engine						
ENGINE FUEL PUMPS									
Fuel pumps (2x)		0-580-054-001	Bosch						
ENGINE INDICATING									
Engine / Airframe unit	GEA 71	011-00831-00	Garmin						
Main engine display		A1A-10-100-000-010	Austro Engine						
Secondary engine display		A1A-10-200-000-010	Austro Engine						



Airplane Serial No.:		Registration:		Date:		Mass		Lever Arm	
Description	Type	Part No.	Manufacturer	S/N	installed	lb	kg	in	m
ENGINE EXHAUST									
Exhaust pipe		D44-7806-10-01	Diamond Aircraft						
Exhaust pipe with muffler		D44-7806-20-00	Diamond Aircraft						
Exhaust pipe with muffler		D44-7806-20-00_1	Diamond Aircraft						
Exhaust pipe with muffler		D44-7806-20-00_2	Diamond Aircraft						
PROPELLER									
Propeller	MTV-6-R/190-69		mt-propeller						
Governor		P-853-16	mt-propeller						
FUEL TANK SYSTEM									
Fuel probe assy., LH inboard		D4D-2817-13-00x01	Diamond Aircraft						
Fuel probe assy., RH inboard		D4D-2817-13-00x01	Diamond Aircraft						
Alternate means for fuel qty.		D4D-2807-90-00	Diamond Aircraft						
Long range tank		D4D-2807-11-00	Diamond Aircraft						
Long range tank		D4D-2807-12-00	Diamond Aircraft						
Standard tank		D4D-2817-11-00	Diamond Aircraft						
Standard tank		D4D-2817-12-00	Diamond Aircraft						
AIRPLANE FLIGHT MANUAL		Doc. No. 6.01.15-E	Diamond Aircraft						



- 1. Amerex A620T is UL approved and can be used in aircraft registered in Canada and the USA. For aircraft registered in other countries, contact the local airworthiness authority.

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Date: \_\_\_\_\_

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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**

### 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.

### 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.

### 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 cables. The flaps are electrically operated. Elevator forces can be balanced by a trim tab on the elevator, which is operated by a Bowden cable.

#### 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 jam 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.

## 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 jam nut which has locking varnish applied to it. Damage to this varnish can indicate a twisting and thus a change to the adjustment. The connection between the rod-end bearing and the control horn is a bolt, the nut of which is likewise sealed with locking varnish.

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

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

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



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

The electrical flap drive has an automatic circuit breaker which can also be operated manually.

*Flap Position Indicator:*

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

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

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

when the lower light (white) is illuminated, the flaps are in landing position (LDG).

When two lights are illuminated simultaneously, the flaps are between the two indicated positions. This is the case only when the flaps are traveling.

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.

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.

Elevator Trim

The trim control is a black wheel in the center console to the rear of the power lever. 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

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.

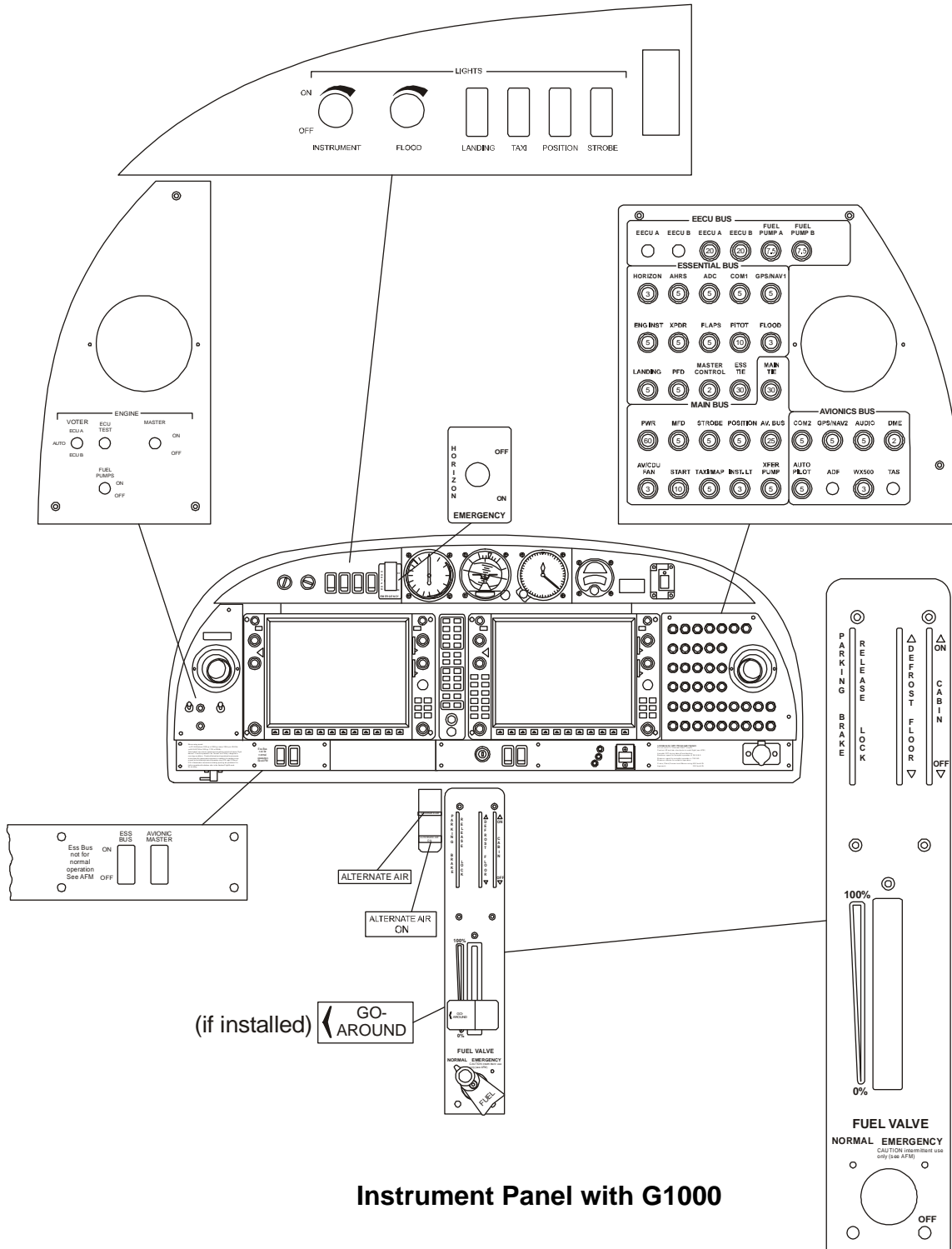
*Forward Adjustment:*

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

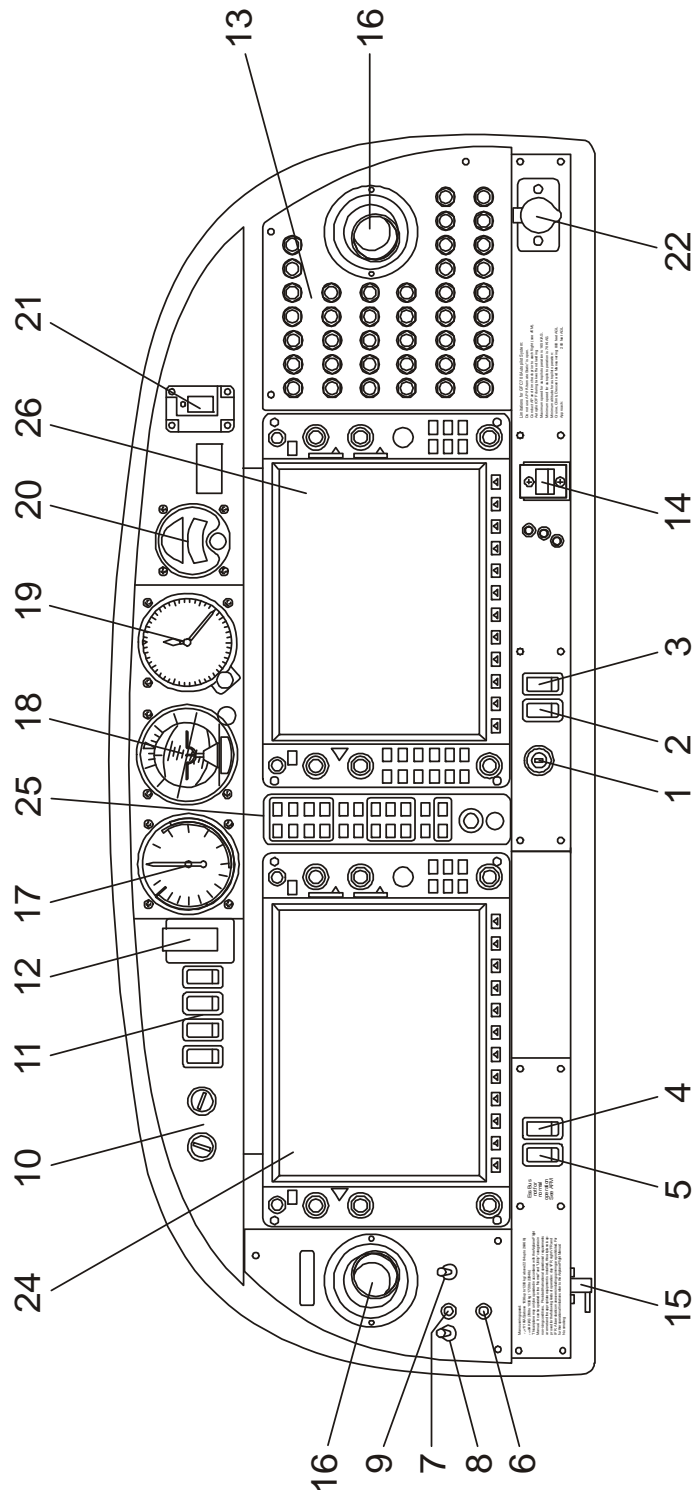
*Rearward Adjustment:*

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.

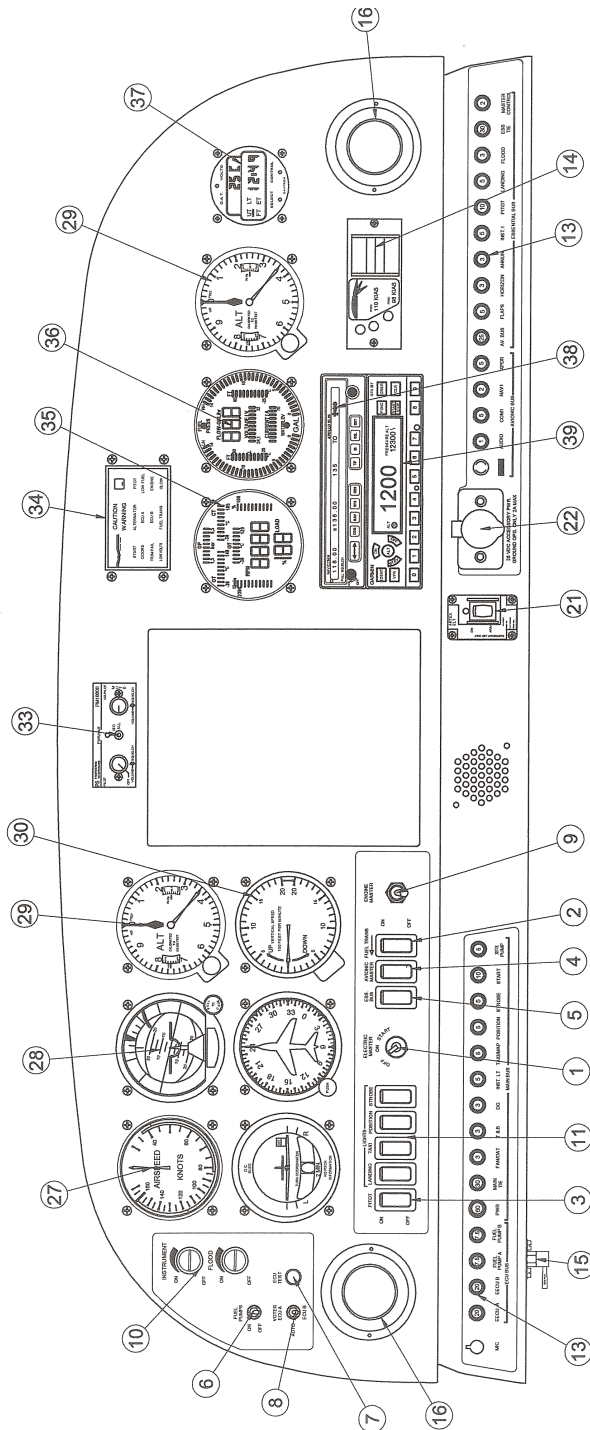
## 7.4 INSTRUMENT PANEL



Instrument Panel with G1000



**Instrument Panel with G1000**



Instrument Panel with SED, MED and White Wire Annunciator Panel

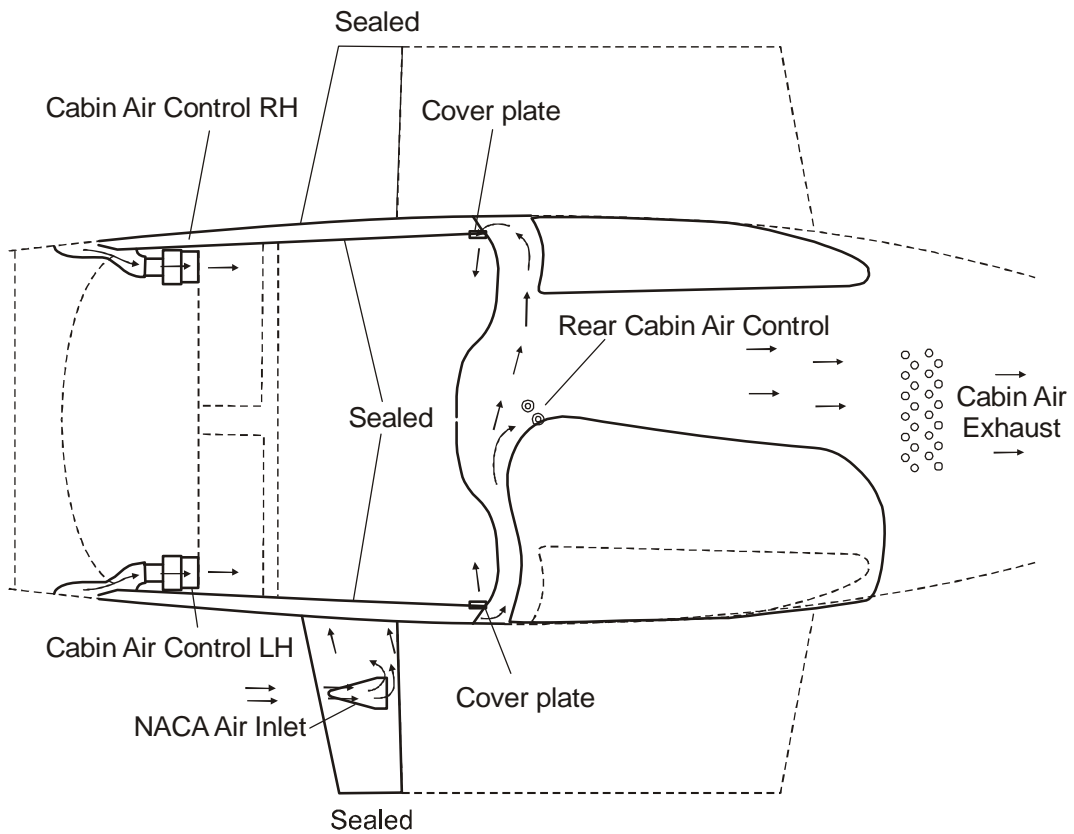
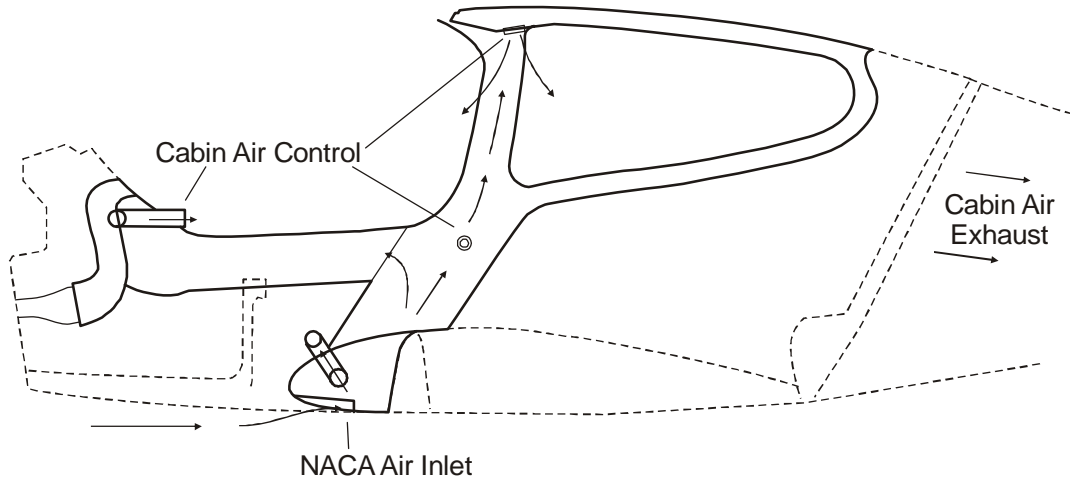
Major Instruments and Controls	
1 Electric Master key switch	21 ELT control unit
2 Fuel Transfer switch	22 Accessory power socket
3 Pitot Heat switch	
4 Avionics Master switch	24 Primary Flight Display (PFD)
5 Essential Bus switch	25 Audio amplifier / Intercom / Marker beacon receiver
6 Fuel pumps switch	26 Multi Function Display (MFD)
7 ECU Test button	27 Airspeed Indicator
8 ECU Voter switch	28 Attitude Gyro (artificial horizon)
9 Engine Master switch**	29 Altimeter
10 Rotary buttons for instrument lighting and flood light	30 Vertical Speed Indicator (VSI)
11 Light switches	31 Directional Gyro
12 Emergency switch**	32 Turn & Bank indicator
13 Circuit breakers*	33 Intercom
14 Flap selector switch	34 Annunciator panel
15 Alternate static valve	35 Main Engine Display (MED)
16 Ventilation nozzles	36 Secondary Engine Display (SED)
17 Backup airspeed indicator	37 Chronometer with OAT Indicator
18 Backup artificial horizon	38 COM/NAV
19 Backup altimeter	39 Transponder
20 Emergency compass	

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

\*\*) The Emergency switch and optionally the Engine Master switch are guarded. Lift the guard prior to actuate the toggle. After switching, lower the Engine Master switch guard with the toggle in the desired position. Do not lower the Emergency switch guard with the toggle in ON position.







## **7.5 LANDING GEAR**

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

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

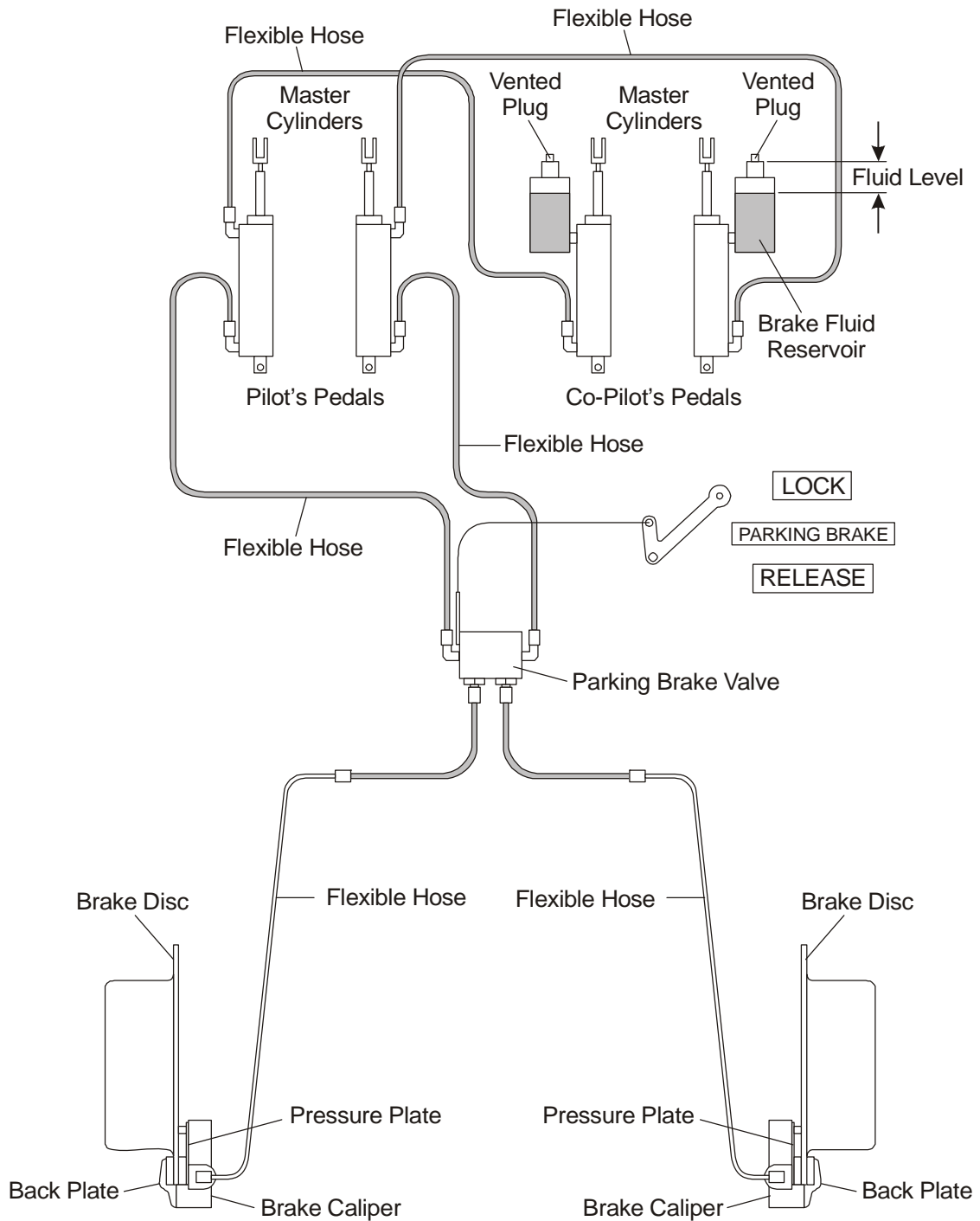
### Wheel Brakes

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

### Parking Brake

The 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, the lever is pushed 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 allow 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 belt clip into the belt lock, and are opened by pressing the red release on the belt lock.

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

If front seats with adjustable backrests are installed (OÄM 40-252), the angle of the backrests can be adjusted for best comfort. The backrest lever is situated on the outboard side of the backrest. However, during take-off, landing and emergency landing the backrests must be fixed in the upright position designated by a placard on the roll-over bar.

### **CAUTION**

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

For adjustment lift the backrest lever and bend forward or backward to the desired backrest angle. Then release and press down the backrest lever.

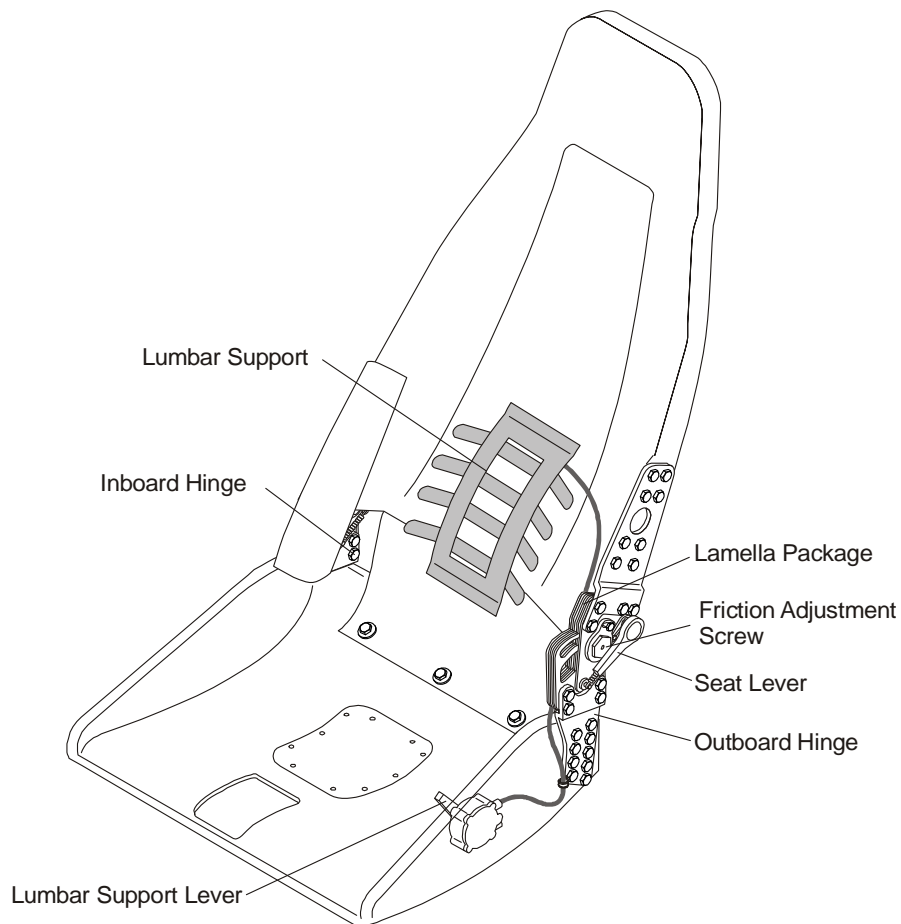
In case of a defective adjustment mechanism the outboard friction adjustment screw can be tightened with a 10 mm hexagon nut in clockwise direction in order to fix the backrest

in the upright position.

If possible, set the backrest lever to the „locked“ position. The mechanism must be repaired at the next scheduled inspection.

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

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



## **7.7 BAGGAGE COMPARTMENT**

The baggage compartment is behind the seat backs of the rear seats. Without a baggage net, no baggage may be loaded.

As options, a baggage tube or a baggage extension (OÄM 40-164) or a short baggage extension (OÄM 40-331) may be installed.

### **NOTE**

If OÄM 40-331 is installed, make sure that the baggage does not block the air vents in the back wall of the short baggage extension.

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

### Front Canopy

The front canopy is closed by pulling down on the canopy frame and locking it with the handle on the left hand side of the canopy frame. On locking, steel bolts catch into mating holes in polyethylene blocks.

"Cooling gap" position: A second setting allows the bolts to lock in, leaving a gap under the forward canopy.

The canopy can be key-locked by a locking mechanism on the left side near the canopy lever by turning the key clockwise. The closed and locked canopy can be opened from inside by pulling the lever inside the opening handle.

### **WARNING**

The airplane may be operated with the front canopy in the "cooling gap" position on the ground only. Before take-off the front canopy must be completely closed and latched, but not key-locked.

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

A window on the left and right hand side of the canopy can be opened for additional ventilation or as emergency window.

### Rear Door

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

The door can be locked by a locking mechanism on the left side near the door opening lever by turning the key clockwise. The closed and locked door can be opened from inside by pulling the lever inside the opening handle. For a better handling an additional handle is mounted.

### **WARNING**

Before starting the engine the door must be closed and latched, but not key-locked.

Do not key-lock the door before flight in order to assure emergency evacuation from outside.

Emergency Axe

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

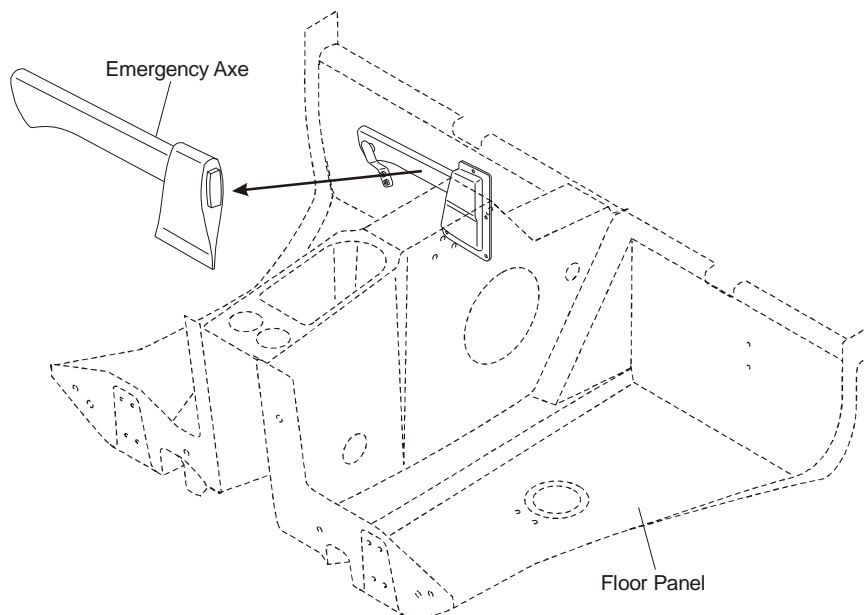
If the canopy can not be opened in case of an emergency use the emergency axe to break through the canopy.

**WARNING**

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

**WARNING**

Beware of sharp edges and fragments of the broken canopy.





## 7.9 POWER PLANT

### 7.9.1 ENGINE, GENERAL

The installed Austro Engine E4-A engine has the following specifications:

- Liquid-cooled four-cylinder four-stroke engine with wet sump lubrication
- Inline construction
- Common rail direct injection
- Propeller speed reducing gear 1:1.69
- Digital engine control with integrated propeller governor (using the gearbox oil system)
- Turbo charger with intercooler

Displacement:

Max. power: 123.5 kW (165.6 DIN-HP) at 2300 RPM  
at sea level and ISA

Max. continuous power: 114.0 kW (152.8 DIN-HP) at 2100 RPM  
at sea level and ISA

The indications for monitoring important engine parameters during operation are integrated within the Garmin G1000 display (if installed) or on the MED and SED (if installed). The engine can only be operated with the ENGINE MASTER switch ON. The engine has an EECU (Electrical Engine Control Unit) which receives its electrical power from the generator when the engine is running. When the engine is not running, the ECU receives its electrical power from the battery.

## 7.9.2 OPERATING CONTROLS

### POWER lever

The engine performance is controlled by the power lever, situated on the large center console. 'Front' and 'rear' are defined in relation to the direction of flight.

This lever is used to set the desired engine power LOAD (%)

Lever forward (MAX) = Full power

Lever to rear (IDLE) = Idle

The ECU controls manifold pressure, injected fuel quantity and propeller speed according to the desired engine power preselected with the power lever.

The propeller governor is attached to the top rear side of the gearbox and uses gearbox oil for propeller pitch regulation. Following a loss of oil pressure the propeller blades go to the low pitch stop (maximum RPM), thus allowing continuation of the flight according to 3.3.6 - DEFECTIVE RPM REGULATING SYSTEM.

ELECTRIC MASTER

The key can be switched into three positions:

- OFF**            Disconnecting battery power.
- ON**             Connecting battery power to the power distribution system.
- START**        Starting the engine.

ENGINE MASTER

The engine can only be cranked with the ENGINE MASTER switched to ON. To shut down the engine the ENGINE MASTER is switched to OFF.

ECU VOTER

For normal operation the switch is set to AUTO. The engine is controlled by either ECU A or ECU B. In case of a failure of the active electrical engine control unit (ECU) there is an automatic switch-over to the other ECU. If the automatic switch over fails, switch over can be done manually by switching to ECU A or ECU B. This procedure should only be applied in an emergency.

ECU TEST

*POWER lever at IDLE:*

By pushing and holding the button until the end of the procedure, the self-test of each engine control unit is started. The procedure is possible on the ground only. Otherwise the test will not start. During the procedure the ECU performs a switch from ECU A to ECU B or ECU B to ECU A, whichever is active at the moment, with the propeller cycling. The propeller RPM is monitored automatically by the ECU. When switching from one ECU to the other, a slight shake of the engine may occur. Finally the ECU switches back. After that both caution lights must extinguish and the engine must run without a change.

Alternate Air

In the event of power loss because of icing or blockage of the air filter, there is the possibility of drawing air from the engine compartment. The ALTERNATE AIR operating lever is located under the instrument panel on the left side of the center console. To open the alternate air source the lever is pulled to the rear. The alternate air source is closed, with the lever being in the forward position.

Placard on the lever, forward position:

**ALTERNATE AIR**

Placard on the lever, visible when lever is in the rearward position (alternate air open):

**ALTERNATE AIR  
ON**

### 7.9.3 PROPELLER

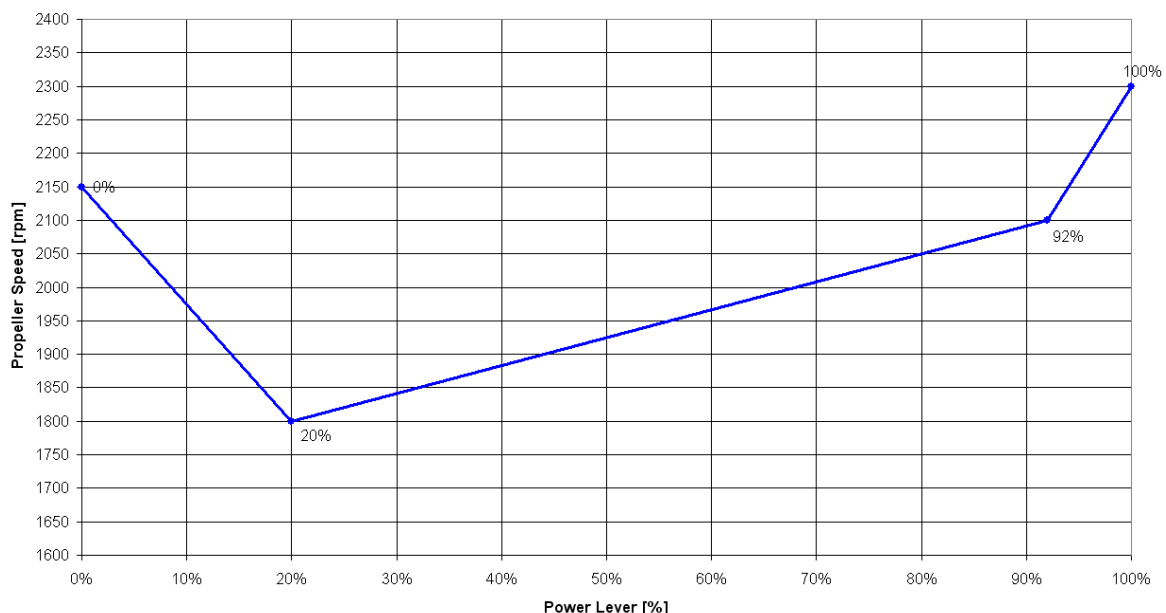
An mt-Propeller MTV-6-R/190-69 hydraulically regulated 3-bladed constant speed propeller is installed. The propeller has wood-composite blades with fiber-reinforced plastic coating and metal leading edge protection; in the region of the propeller hub the leading edge is coated with adhesive PU tape. These blades combine the lowest weight whilst minimizing vibration.

#### Propeller Control

The propeller pitch is controlled by the P-853-16 mt-propeller governor. The pitch is set by the ECU via an electro-mechanical actuator on the governor. To change the blade pitch angle, gearbox oil is pumped into the propeller hub which leads to an increase in pitch and a lower propeller RPM. When oil leaves the propeller hub pitch is reduced and RPM will increase.

In flight depending on the power setting the propeller pitch is adjusted such that the required RPM will be obtained as shown in the following diagram.

Propeller Setpoint Curve



*Ground Operation:*

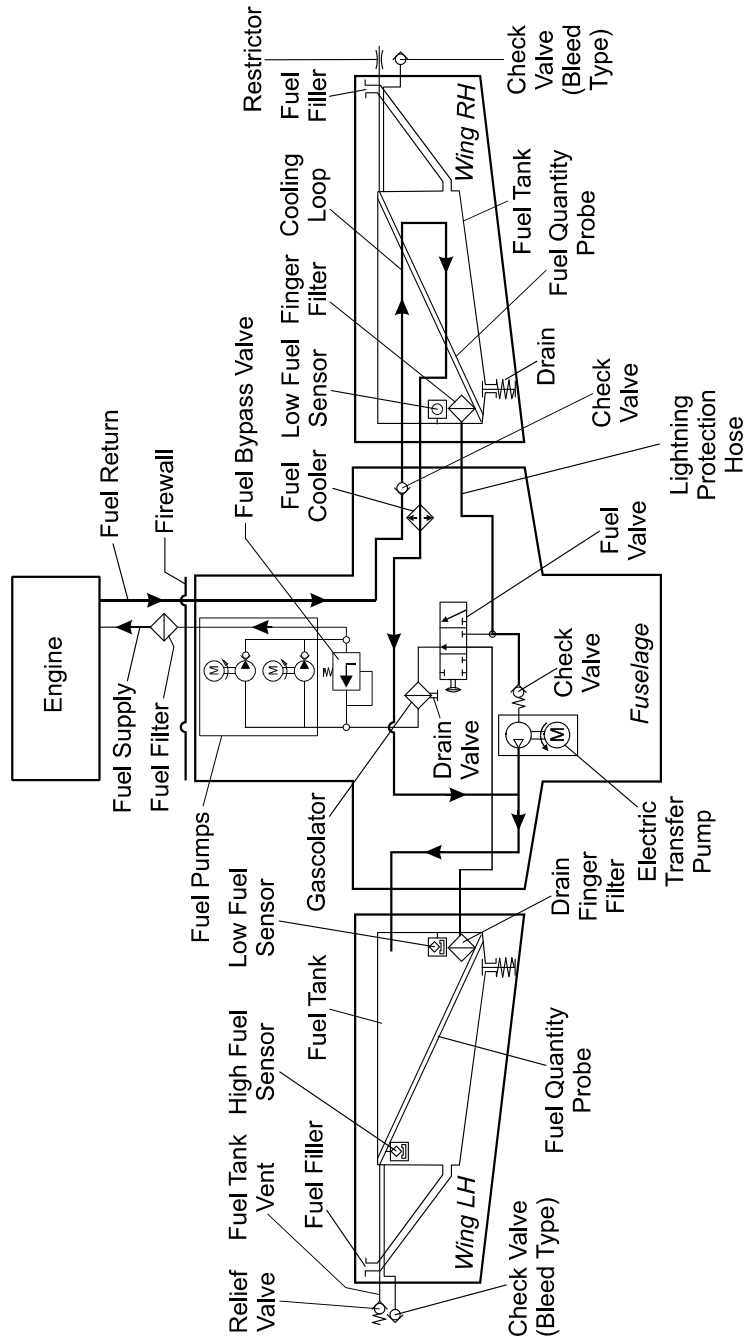
**CAUTION**

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 should be selected, where there are no loose stones or similar items.

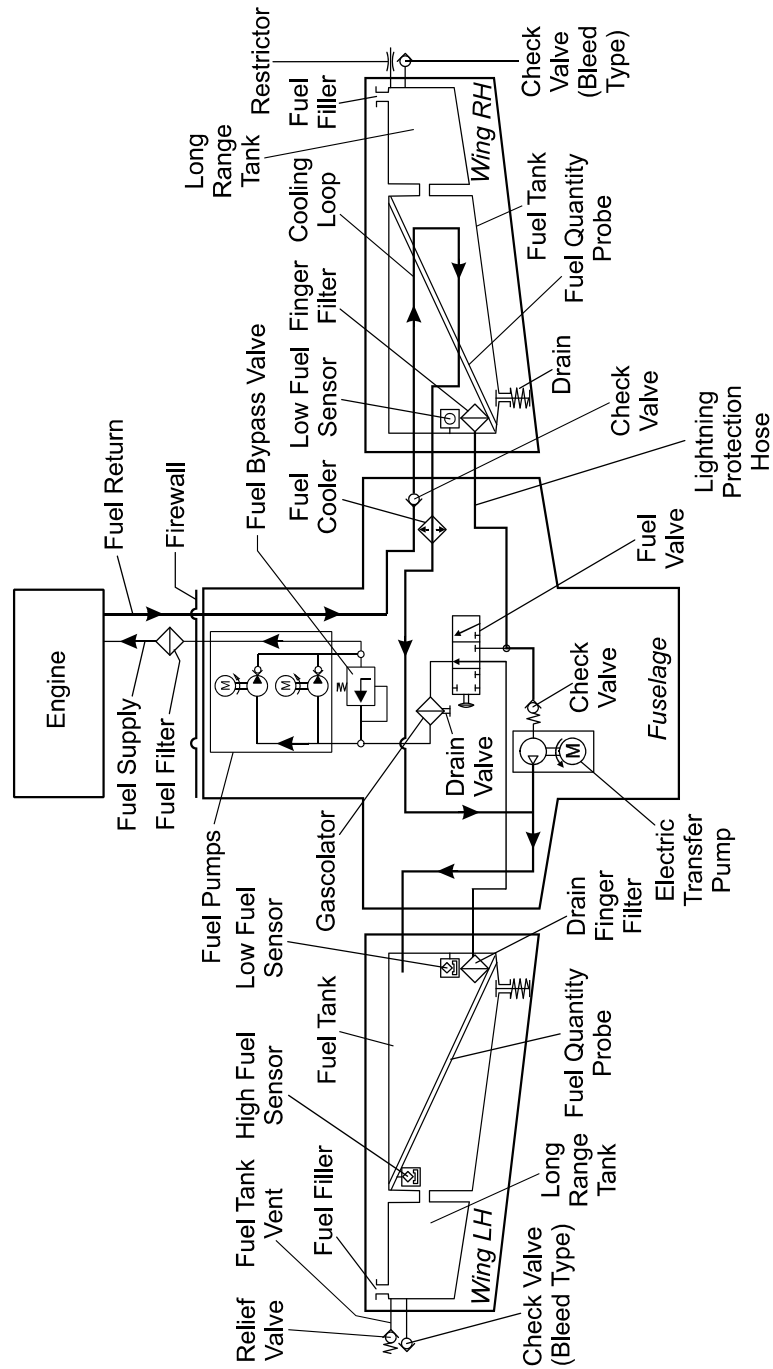
**WARNING**

Never rotate the propeller by hand.

**7.9.4 FUEL SYSTEM**



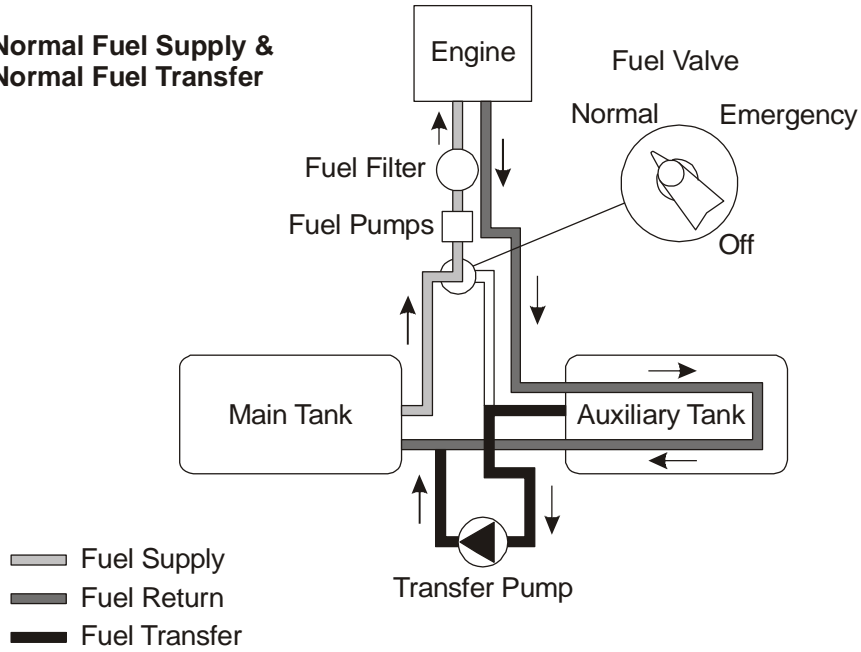
**Standard Tank Schematic**



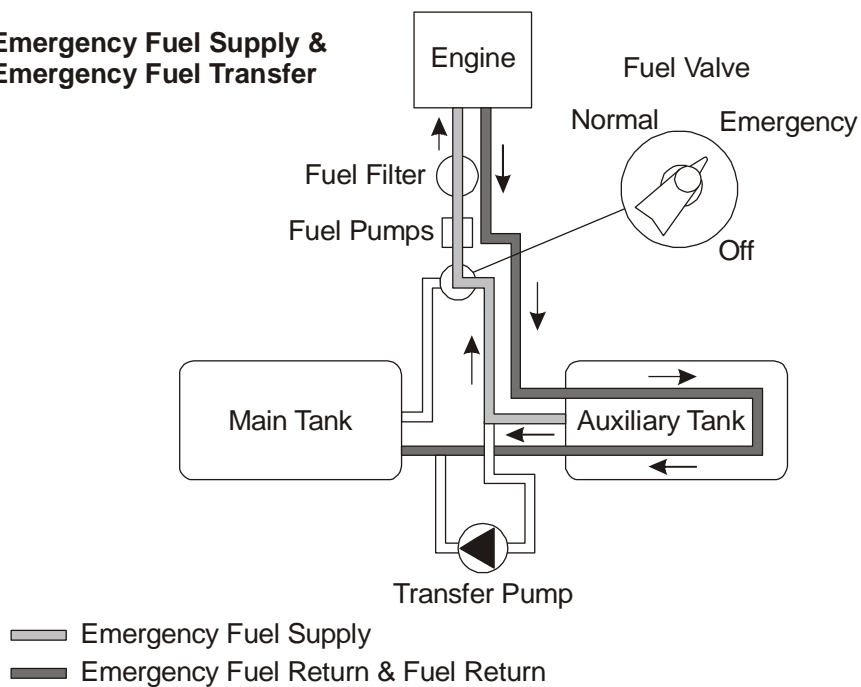
**Long Range Tank Schematic**



**Normal Fuel Supply & Normal Fuel Transfer**



**Emergency Fuel Supply & Emergency Fuel Transfer**



Fuel is stored in the fuel tanks which are located in the wings. Normally fuel is taken from the MAIN tank (left wing).

The fuel is injected with high pressure directly into the combustion chambers. The injection nozzles (one per cylinder) are supplied with fuel by the common rail. Pressure inside the rail is generated by a high pressure pump which receives fuel from two independent low pressure fuel pumps. Both pumps are powered electrically. Depending on the power setting the rail pressure is controlled by the ECU through an electric valve.

Fuel that is not injected into the combustion chambers is routed through the AUX fuel tank (right wing) and fed back into the MAIN fuel tank (left wing). This way hot fuel from the rail is cooled and cold fuel in both tanks is heated.

With the help of an electrical transfer pump fuel can be transferred from the AUX tank (right wing) to the MAIN tank (left wing) manually.

The transfer pump is switched off automatically when the auxiliary tank is empty or the main tank is full.

If fuel transfer with the transfer pump becomes impossible for any reason, fuel can also be taken directly from the AUX tank (right wing) by switching the fuel valve to the EMERGENCY position. As the return line goes back into the MAIN tank (left wing), fuel will then be transferred from right to left fuel tank.

As an option additional long range tanks may be installed.

## CAUTION

Switching the fuel valve to the EMERGENCY position will start the transferring of fuel with the help of the electrically driven and engine driven fuel pumps from the auxiliary tank through the fuel return line to the main tank at a rate of approximately 45 US gal/h (170 liter/h) with FUEL PUMPS switch in OFF position. The fuel valve must be switched back to the NORMAL position before the auxiliary tank indication reads zero. If the fuel valve is not switched back to the NORMAL position, the engine will stop running as soon as the auxiliary tank is empty.

### Fuel Pumps

The engine is supplied with fuel by two parallel installed independent low pressure electrically driven fuel pumps. During normal operation one of the two fuel pumps is always working. In case of a low fuel pressure, the ECU switches automatically to the second fuel pump. During landing and take-off, or in case of a low fuel pressure both fuel pumps can be activated with the FUEL PUMPS switch. If both fuel pumps are set to ON the fuel pressure increases.

Each fuel pump is electrically connected to an ECU BUS and protected by a 7.5 A circuit breaker.

## NOTE

By switching between ECU A and B the two independent electrical fuel pumps are switched over as well. In case of an emergency both pumps can be activated simultaneously by pushing the FUEL PUMPS switch to the ON position.

### Fuel Valve

The fuel valve is located at the center console. The selectable positions are NORMAL, EMERGENCY and OFF. The desired position is reached by turning the valve handle while pulling up the safety latch on the valve handle. This is to ensure that a selection is not made unintentionally.

### Standard Fuel Tanks

#### *Main Tank (Left Wing):*

The main tank consists of an aluminum chamber and a filler tube which are connected by a flexible hose. There are two tank vents. One includes a check valve with a capillary and one includes a pressure relief valve, which operates at 150 mbar (2 PSI) and allows fuel and air to flow to the outside at higher internal pressure. The relief pressure valve protects the tank against high pressure if the tank will be overfilled in case of a fuel transfer failure. The check valve with capillary allows air to enter the tank but prevents flow of fuel to the outside. The capillary equalizes the air pressure during climb. The hose terminations are situated on the underside of the wing, approximately 2 meter (7 ft) from the wing tip.

#### *Auxiliary Tank (Right Wing):*

The auxiliary tank consists of an aluminum chamber and a filler tube which are connected by a flexible hose. There are two tank vents. One includes a check valve with a capillary and one includes a capillary. The check valve with capillary allows air to enter the tank during descent but prevents flow of fuel to the outside. The capillary equalizes the air pressure during climb. The second capillary is installed for additional safety. The hose terminations are situated on the underside of the wing, approximately 2 meter (7 ft) from the wing tip.

In each tank a coarse filter (finger filter) is fitted before the outlet. To allow draining of the tank, an outlet valve (drain valve) is installed at the lowest point of the fuel tank.

A gascolator is located at the bottom side of the fuselage which is the lowest point of the entire fuel system. A drain valve (pull to drain) is mounted to the gascolator, to allow the remove of water and sediment which has collected in the fuel system.

A capacity probe measures the fuel quantity in each tank. The indication is non-linear, therefore proportional calculations to determine the remaining fuel quantity or direct calculations of fuel consumption are not possible. Information about the fuel consumption can be found in Chapter 5 - PERFORMANCE.

#### Long Range Tank (if installed)

The tank chamber has a capacity of approx. 5 US gal (19 liter). The ventilation system of the main and the auxiliary tank remains unchanged.

When the fuel quantity indicator reads zero, only the unusable fuel remains in the tank. The useable capacity of each tank is 19.5 US gal, the maximum quantity that can be indicated is 14 US gal. Up to an actual quantity of 14 US gal the indication is correct. At an actual quantity above 14 US gal the indication remains at 14 US gal.

### NOTE

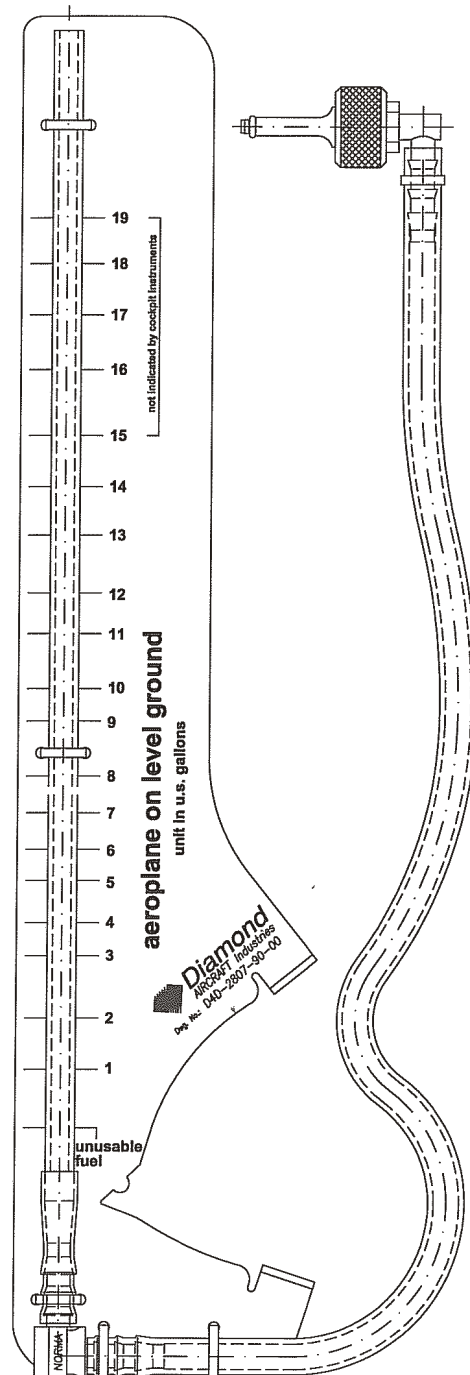
When the fuel quantity indicator reads 14 US gal, the correct fuel quantity must be determined with the alternate mean for fuel quantity indication. If this measurement is not carried out, the fuel quantity available for flight planning is 14 US gal.

Alternate Means For Fuel Quantity Indication

The alternate means for fuel quantity indication 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 a horizontal ground.

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

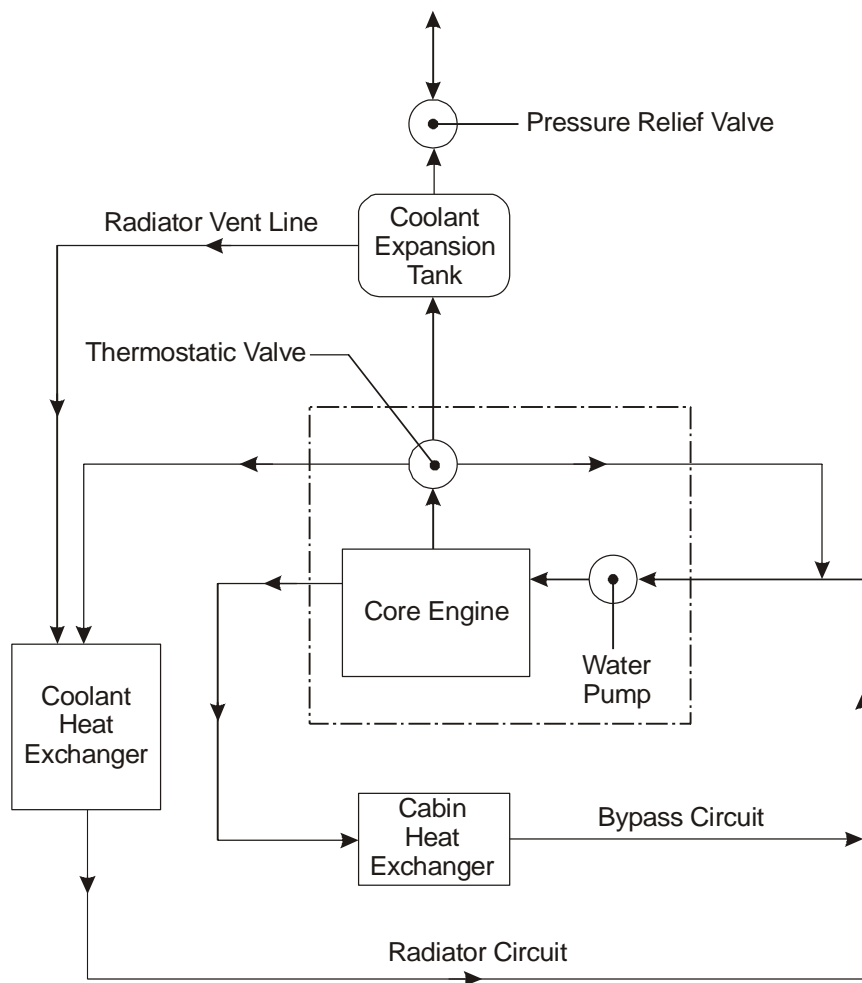


### 7.9.5 COOLING SYSTEM

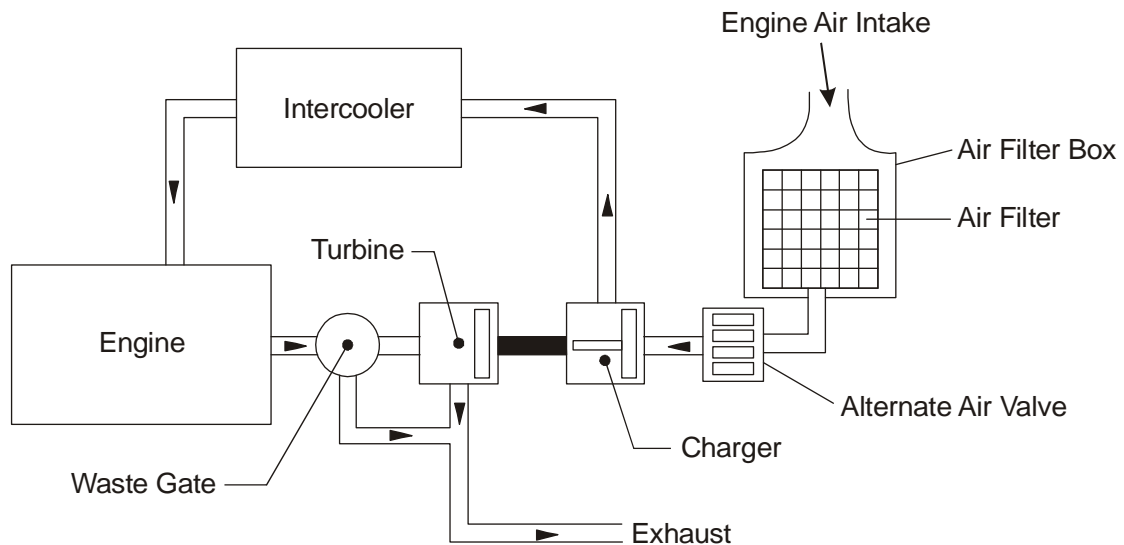
The engine is liquid cooled. The liquid cooling system consists of a radiator circuit (coolant heat exchanger) and a bypass circuit (cabin heat exchanger). The radiator circuit is only open during hot coolant temperatures. This assures that a cold engine will warm up quickly. Upon reaching approximately 80°C (126°F) coolant temperature the radiator circuit is activated by a thermostatic valve.

Integrated in the bypass circuit is a coolant to air heat exchanger (cabin heat exchanger) which provides warm air for the cabin heat system.

An coolant expansion tank allows coolant expansion and pressure adjustment. The coolant system is protected against overpressure by means of a pressure relief valve.



### 7.9.6 TURBO CHARGER SYSTEM



The intake air is compressed in the compressor which is driven by the turbine, and is subsequently cooled down in the intercooler. Cooling the air increases engine efficiency and power through the higher density of cold air. The exhaust system contains a manifold which collects exhaust gases from the outlets of the cylinders and feeds them to the turbine of the turbo charger. Behind the turbine the exhaust gases are guided through an exhaust pipe and exits at the bottom cowling opening. Excess exhaust gases bypass the turbine. The bypass is controlled by the ECU through the waste gate valve. A manifold pressure sensor behind the compressor allows the ECU to calculate the correct position of the waste gate valve. This prevents excessive manifold pressures at low density altitudes.



### **7.9.7 OIL SYSTEMS**

The engine has two separate oil systems.

#### Lubrication System (Engine and Turbo Charger)

The engine lubrication is a wet sump lubrication system. Oil is cooled by a separate cooler on the underside of the engine.

A dip-stick is provided to check the oil quantity through an inspection door on the LH side of the upper cowling. If required, oil can also be filled in there (for specified oil types refer to 2.4 - POWER-PLANT LIMITATIONS).

#### Gearbox and Propeller Governor System

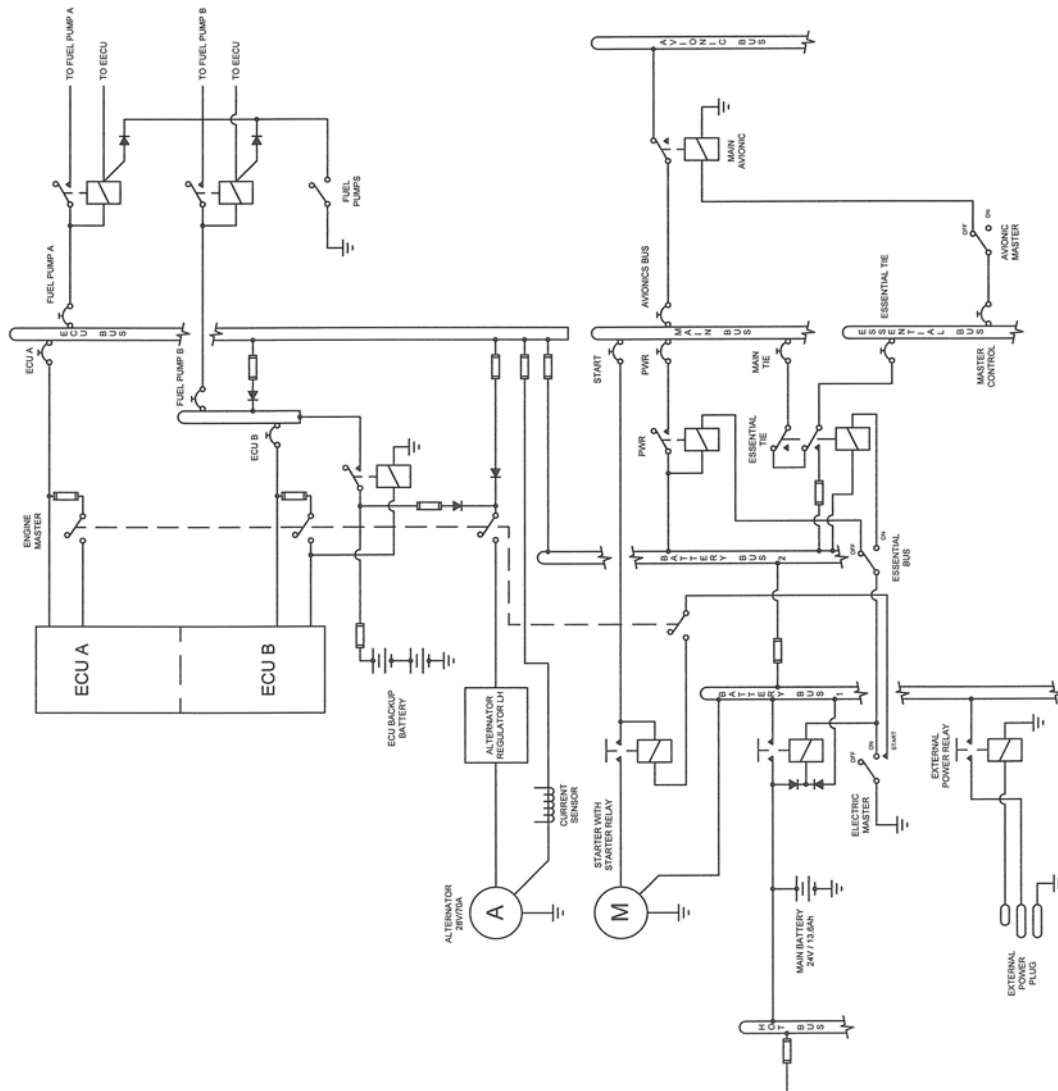
The second oil circuit lubricates the gear and serves the governor system and the regulation of the propeller.

Gear oil quantity can be checked via an inspection glass which can be reached through an inspection door on the LH side of the upper cowling.

### **CAUTION**

If the gear oil quantity is too low, an unscheduled maintenance is necessary (for specified oil types refer to 2.4 - POWER-PLANT LIMITATIONS).

## 7.10 ELECTRICAL SYSTEM



Electrical System Schematic

### 7.10.1 GENERAL

The DA 40 NG has a 28 Volt DC system, which can be sub-divided into:

- Power generation
- Storage
- Distribution
- Consumers

#### Power Generation

Power generation is provided by a 70 Ampère alternator (generator) which is mounted on the bottom left side of the engine. The alternator is driven by a flat-belt.

The power output line of the alternator is connected to the ENG ECU bus via a 100 A fuse, which is installed in the instrument panel. The power output line also runs through the current sensor, which provides an indication of the power being supplied to the electrical system by the alternator including the current for battery charging.

In the event of a main battery failure the field of the alternator is energized by two 12 V, 7.2 Ah sealed-lead-acid batteries (ECU backup batteries) which are installed behind the first ring frame. The ENGINE MASTER switch connects the ECU backup battery to the alternator voltage regulator via a 10 A fuse.

#### *Alternator Control:*

The alternator control unit includes a comprehensive set of diagnostic functions that will warn the operator using a warning message (ALTN FAIL on the G1000 system (if installed) or ALTERNATOR on the White Wire annunciator panel (if installed)) in case of over- or undervoltage as well as a couple of other internal warning levels.

### Storage

Main battery power is stored in a 24 V, 13.6 Ah lead-acid battery mounted behind the baggage compartment frame. The main battery is connected to the battery bus via the battery-relay which is installed in the relay junction box behind the baggage compartment frame.

The battery relay is controlled with the ELECTRIC MASTER key switch which is located in the center of the instrument panel.

In addition, two 12 V, 7.2 Ah sealed-lead-acid batteries (ECU backup-batteries) are installed behind the first ring frame as a further source of electrical power for the Engine Control Unit (ECU B only).

Under normal operating conditions the ECU backup batteries are charged by the ECU bus. In the event of an alternator failure and a depleted main battery the ECU backup batteries automatically supply electrical power to ECU B via a 32 A fuse. This prevents the engine from stopping in the unlikely event of an alternator failure and a totally discharged main battery.

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, 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 pack must be replaced.

### Distribution

Electrical power is distributed via the hot battery bus, the battery bus 1, the battery bus 2, the ECU-bus, the main bus, the essential bus and the avionic bus.

#### *Hot Battery Bus:*

The hot battery bus is directly connected to the main-battery installed in the relay junction box and cannot be disconnected from the main battery. The hot battery bus provides power to the accessory power plug and ELT which are protected by their own fuses.

#### *Battery Bus 1:*

The battery bus 1 is connected to the main-battery via the battery-relay which can be controlled by the ELECTRIC MASTER key switch. The battery bus 1 provides power to the battery bus 2 and heavy duty power to the starter.

The battery bus 1 is also connected to the power input line of the external power plug.

#### *Battery Bus 2:*

The battery bus 2 is connected to the battery bus 1 via a 100 A fuse and provides power to the ECU bus via a 80 A fuse. It also provides power to the main bus via the power relay which can be controlled by the ELECTRIC MASTER key switch and the ESSENTIAL BUS switch. The ELECTRIC MASTER key switch must be set to ON and the ESSENTIAL BUS switch must be set to OFF to connect the battery bus to the main bus.

#### *ECU Bus:*

The ECU bus is connected to the battery bus 2 via a 80 A fuse and provides power for the ECU A and ECU B and their fuel pumps. It is also connected to the power output line of the alternator via a 100 A fuse. It also provides power for charging the ECU backup-battery. The ENGINE MASTER switch must be set to ON to activate the ECU A and ECU B to the ECU bus.

*Main Bus:*

The main bus is connected to the battery bus via the power-relay. It provides power to the consumers directly connected to the main bus and the avionic bus via the avionic master-relay. The AVIONIC MASTER switch must be set to ON to connect the main bus to the avionic bus. Under normal operating conditions the main bus is also connected to the essential bus via the essential tie-relay. In the event of an alternator failure the pilot must switch ON the ESSENTIAL BUS switch (refer to Section 3.4 - FAILURES IN THE ELECTRICAL SYSTEM). This separates the main bus from the battery bus and the essential bus and the equipment connected to the main bus no longer has power.

*Essential Bus:*

Under normal operating conditions the essential bus is connected to the main bus via the essential tie-relay. The essential bus provides power to the consumers connected to the essential bus. The AVIONIC MASTER switch must be set to ON to connect the essential bus to the avionic bus. In the event of an alternator failure the pilot must switch ON the ESSENTIAL BUS switch (refer to Section 3.4 - FAILURES OF THE ELECTRICAL SYSTEM). This separates the essential bus from the main bus. The essential bus is then connected to the battery bus 2 which provides battery power for a limited time to the equipment essential for safe flight and landing.

Consumers

The individual consumers (e.g. radio, electrical fuel transfer pump, position lights, etc.) are connected to the appropriate bus via automatic circuit breakers.

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

### Voltmeter

The voltmeter shows the voltage of the essential bus. Under normal operating conditions the alternator voltage is shown, otherwise it is the voltage of the main battery.

### Ammeter

The ammeter displays the intensity of current which is supplied to the electrical system by the alternator, including the current for battery charging.

### 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.

### Position and Strobe Lights

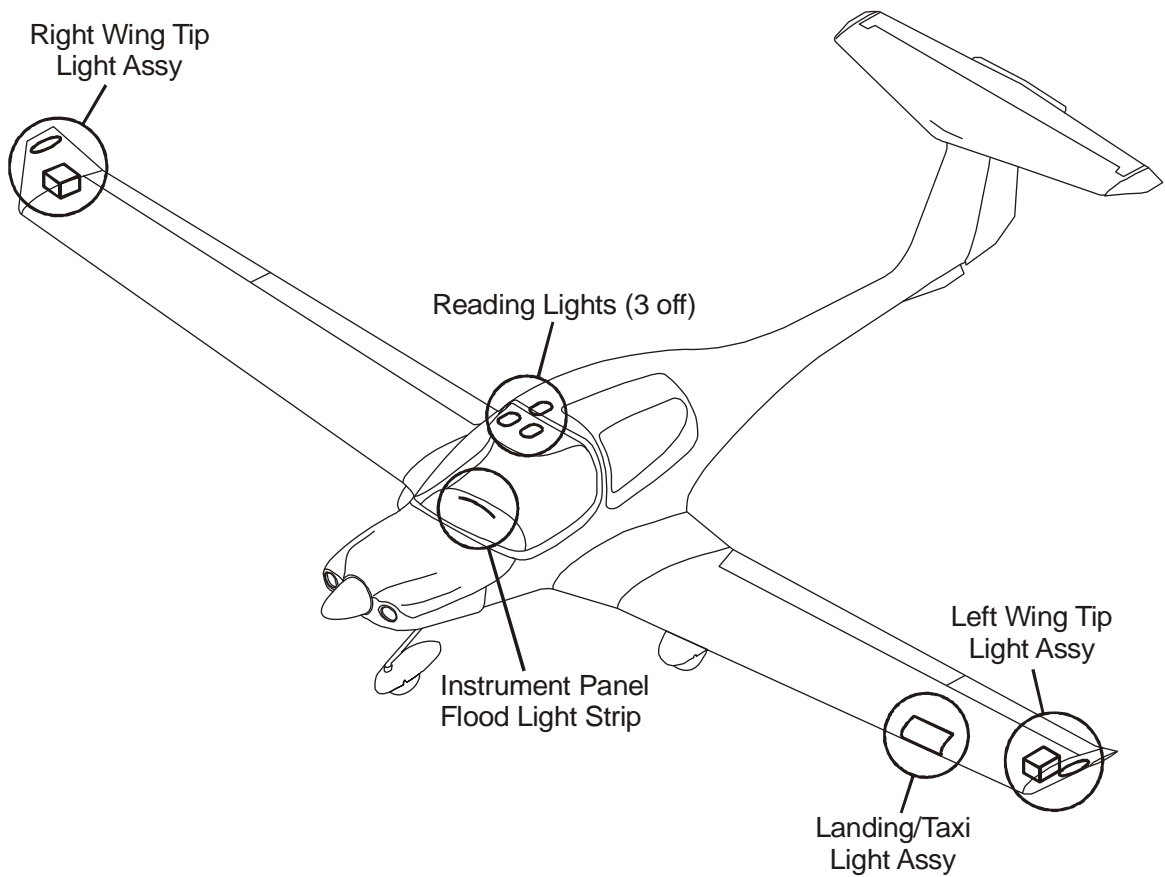
Combined position and strobe lights (anti collision lights) are installed on both wing tips. Each system is operated by a switch (POSITION, STROBE) on the row of switches on the instrument panel.

### 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.

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.





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. PITOT FAIL on the G1000 (if installed) or PITOT on the White Wire annunciator panel (if installed) will be displayed, if the thermal fuse or the thermal switch is activated and the PITOT HT is set to ON. The PITOT HT OFF indication on the G1000 (if installed) is on if the Pitot heating is switched off.

## 7.10.2 ENGINE CONTROL UNIT / ECU

### Engine Control and Regulation

The Electrical ECU is used to control the engine actuator (e.g. fuel injector) according to the engine sensor information. The ECU monitors, controls and regulates all important parameters for engine operation.

Sensors installed are:

- Oil temperature (lubrication system engine) / OIL TEMP (G1000, if installed),  
OT (MED, if installed)
- Oil pressure (lubrication system engine) / OIL PRES (G1000, if installed),  
OP (MED, if installed)
- Coolant temperature / COOLANT TEMP (G1000, if installed),  
CT (MED, if installed)
- Gearbox temperature / GEARBOX (G1000, if installed),  
GT (MED, if installed)
- Camshaft RPM (twice)
- Crankshaft RPM (twice)
- Fuel pressure in the common rail
- Manifold pressure
- Manifold air temperature
- Ambient air pressure
- Propeller governor / oil pressure
- POWER lever position (twice)
- Voltage
- Starter switch signal
- Fuel pressure
- VOTER switch signal
- ECU TEST switch signal

In accordance with the received signals and a comparison with the programmed characteristic diagrams the necessary inputs are calculated and transmitted by the following signal lines to the engine:

- Signal for propeller governor pressure valve
- Signal for the rail-pressure regulation valve
- Signal for each of the 4 injection nozzles
- Activation of the glow plugs
- Signal for the waste gate valve

The following alerts are displayed on the PFD of the G1000 (if installed) or White Wire annunciator panel (if installed):

- Glow sparks active
- Status ECU A
- Status ECU B
- Low fuel pressure warning (on the G1000, if installed)

The Electrical ECU consists of two similar ECUs. A VOTER switch is integrated in the Electrical ECU and proposes an ECU to control the engine regarding the ECU operating hours or in case of a failure the ECU with better engine control capability.

A fault in one of the ECUs is indicated by a caution message (ECU A/B FAIL on the PFD (if G1000 is installed) or ECU A/B on the White Wire annunciator panel (if installed)). After the indication of the ECU A/B FAIL or ECU A/B caution message, the engine must be serviced.

## **7.11 PITOT-STATIC SYSTEM**

Total pressure is measured at the leading edge of a Pitot probe under the left wing. Static pressure is measured through the static ports in the rear fuselage. To protect against dirt and condensation there are filters in the system. The Pitot probe is electrically heated.

With the alternate static valve, the static pressure in the cabin can be used as static pressure source in the event of a failure of the static system.

## **7.12 STALL WARNING SYSTEM**

If airspeed drops, suction on the orifice at the leading edge of the left wing will increase until 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.

## 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. 6.02.15) 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**

Inspections are scheduled every 100, 200 and 1000 hours. Independent of the flight hours an annual inspection must be performed every year. The respective inspection checklists are prescribed in the Airplane Maintenance Manual, Chapter 05.

For maintenance work on engine and propeller, the currently effective Operator's Manuals, Service Instructions, Service Letters and Service Bulletins of Austro Engine and mt-propeller must be followed. For airframe inspections, the currently effective checklists/manuals, Service Bulletins and Service Instructions 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. 6.02.15; 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. 6.02.15, 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 on 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.

- For outdoor parking at temperatures below -38°C (-36.4°F) make sure that the distilled water / coolant mixture ratio is 40 % to 60 %.
- If the battery heating system (OÄM 40-363) is installed, it is recommended to use the system when the airplane is parked at outside air temperature below 0°C (32°F).

#### 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.

### NOTE

It is recommended to cover the canopy when the airplane is parked outdoors, in direct sunlight, at outside air temperatures above +25 °C (77 °F), in order to prevent excessive heat generation within the instrument panel which can cause damage to the equipment. Such a canopy cover is available from Diamond Aircraft Industries, P/N: S\_30172.



**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 airplane 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 airplane can be turned around the main landing gear. After turning the airplane into the correct position, release the tail section slowly 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.

#### **NOTE**

Disassembling and Assembling of the airplane is a maintenance action and requires qualified personnel.

##### *1. Fuselage:*

The fuselage should stand on the main and nose landing gear. It must be ensured that the fuselage will not move in any direction. Furthermore, it must be ensured that the propeller has sufficient clearance so that it cannot be damaged due to fuselage movement during transportation.

##### *2. Wings:*

For transportation, both wings must be removed from the fuselage. To avoid any damage, the wings must be 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) must be 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.

##### *3. Horizontal Stabilizer:*

The horizontal stabilizer must be stored flat on the trailer and secured with straps, or in an upright position sitting on the leading edge on a profiled surface. All storing surfaces must be upholstered with felt or cellular rubber.

## **8.5 CLEANING AND CARE**

### **CAUTION**

The airplane must be kept clean. The bright surface prevents the structure from overheating.

### **CAUTION**

Excessive dirt deteriorates the flight performance.

#### **8.5.1 PAINTED SURFACES**

The entire surface of the airplane is painted with a white weatherproof two component paint. Nevertheless, it is recommended to protect the airplane against moisture and dampness. It is also recommended not to store the airplane outside for long periods of time.

Dirt, insects, etc. can be removed with water alone and if necessary with a mild detergent. An automotive paint cleaner can be used for stubborn spots. For best results, clean the airplane after the day's flying is ended, so that the dirt will not become ingrained.

Oil stains, exhaust stains, etc. on the lower fuselage skin can be removed with a cold detergent. Before starting, ensure that the detergent does not affect the surface finish. Use commercial automotive preservatives without silicone additives to conserve the paint finish.

#### **8.5.2 CANOPY AND REAR DOOR**

The canopy and rear door should be cleaned with 'Plexiklar' or any other acrylic glass detergent if available; otherwise use lukewarm water. Final cleaning should be done with a clean piece of chamois-leather or soft cloth. Never rub or polish dry acrylic glass.

### **8.5.3 PROPELLER**

Damage and malfunctions during operation must be inspected by authorized personnel.

#### Surface

The manufacturer uses PU paint or acrylic paint which is resistant to almost any solvent. The blades may be treated with commercial automotive cleaning agents or preservatives. The penetration of moisture into the wooden core must be avoided by all means. Should doubts arise, an appropriately rated inspector must be consulted.

### **8.5.4 ENGINE**

Engine cleaning is part of the scheduled inspections.

### **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.

### **CAUTION**

The PFD and MFD displays use a lens coated with a special anti-reflective coating that is very sensitive to skin oils, waxes, and abrasive cleaners. CLEANERS CONTAINING AMMONIA WILL HARM THE ANTI-REFLECTIVE COATING. It is very important to clean the lens using a clean, lint-free cloth and an eyeglass lens cleaner that is specified as safe for anti-reflective coatings.



## **8.6 GROUND DE-ICING**

Approved de-icing fluids are:

<b>Manufacturer</b>	<b>Name</b>
„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 NG.

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.

### **NOTE**

The listed Supplements cannot be installed in any arbitrary combination.

## 9.2 LIST OF SUPPLEMENTS

Airplane S/N:		Registration:		Date:	
Sup. No.	Title	Rev. No.	Date	applicable	
				YES	NO
A01	Garmin G1000 Avionics System	1	01 Jul 2014	<input type="checkbox"/>	<input type="checkbox"/>
A02	Intercom PM 1000 II	0	15 Mar 2011	<input type="checkbox"/>	<input type="checkbox"/>
A05	Conventional Cockpit DA 40 NG Club (SED, MED, White Wire Annunciator Panel)	0	15 Mar 2011	<input type="checkbox"/>	<input type="checkbox"/>
A13	Autopilot System KAP 140 Bendix/King	1	15 Mar 2011	<input type="checkbox"/>	<input type="checkbox"/>
A29	Garmin Transponder GTX 328	0	15 Mar 2011	<input type="checkbox"/>	<input type="checkbox"/>
A30	Garmin COM/NAV SL 30	0	15 Mar 2011	<input type="checkbox"/>	<input type="checkbox"/>
A33	Integrated Avionics System Garmin 1000, SBAS and P-RNAV Operation	2	01 Jul 2014	<input type="checkbox"/>	<input type="checkbox"/>
E07	Winter Baffle Fresh Air Inlet	1	01 Jul 2014	<input type="checkbox"/>	<input type="checkbox"/>
S04	ELT ME 406	0	01 Apr 2010	<input type="checkbox"/>	<input type="checkbox"/>
S06	G1000 Synthetic Vision Technology	1	15 Mar 2011	<input type="checkbox"/>	<input type="checkbox"/>
S07	Recirculating Cabin - Air Cooling	5	01 Jul 2014	<input type="checkbox"/>	<input type="checkbox"/>
O01	Use of the DA 40 NG as Tow-Plane	1	01 Jul 2014	<input type="checkbox"/>	<input type="checkbox"/>

Airplane S/N:

Registration:

Date:

Sup. No.	Title	Rev. No.	Date	applicable	
				YES	NO
O02	Landing Gear with Large Tyres and 1280 kg Maximum Landing Mass	2	01 Jul 2014	<input type="checkbox"/>	<input type="checkbox"/>
O03	Cold Weather Operation	1	01 Jul 2014	<input type="checkbox"/>	<input type="checkbox"/>
O04	Diesel Operation	0	06 Dec 2013	<input type="checkbox"/>	<input type="checkbox"/>
				<input type="checkbox"/>	<input type="checkbox"/>
				<input type="checkbox"/>	<input type="checkbox"/>
				<input type="checkbox"/>	<input type="checkbox"/>