Diamond AIRCRAFT

AIRPLANE FLIGHT MANUAL
DA 40 NG

Airworthiness Category	:	**Normal**
Requirement	:	**JAR-23**
Serial Number	:	________
Registration	:	________
Doc. No.	:	**6.01.15-E**
Date of Issue	:	**01-Apr-2010**

Signature	:	
EASA Project Manager	:	R J HARDY
Stamp	:	European Aviation Safety Agency General Aviation
Date of Approval (EASA App. Date)	:	19 April 2010

This Airplane Flight Manual is approved with EASA Approval No. 10025781.

DIAMOND AIRCRAFT INDUSTRIES GMBH
N.A. OTTO-STR. 5
A-2700 WIENER NEUSTADT
AUSTRIA

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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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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.

Rev. No.	Reason	Cha p-ter	Page(s)	Date of Revision	Approval Note	Date of Approval	Date Inserted	Signature

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0.3 LIST OF EFFECTIVE PAGES

Ch.	Page	Date
0	0-0	01-Apr-2010
	0-0a	01-Apr-2010
	0-1	01-Apr-2010
	0-2	01-Apr-2010
	0-3	01-Apr-2010
	0-4	01-Apr-2010
	0-5	01-Apr-2010
	0-6	01-Apr-2010
	0-7	01-Apr-2010
	0-8	01-Apr-2010
	0-9	01-Apr-2010
	0-10	01-Apr-2010
	0-11	01-Apr-2010
	0-12	01-Apr-2010
	0-13	01-Apr-2010
	0-14	01-Apr-2010
	0-15	01-Apr-2010
	0-16	01-Apr-2010

Ch.	Page	Date
1	1-1	01-Apr-2010
	1-2	01-Apr-2010
	1-3	01-Apr-2010
	1-4	01-Apr-2010
	1-5	01-Apr-2010
	1-6	01-Apr-2010
	1-7	01-Apr-2010
	1-8	01-Apr-2010
	1-9	01-Apr-2010
	1-10	01-Apr-2010
	1-11	01-Apr-2010
	1-12	01-Apr-2010
	1-13	01-Apr-2010
	1-14	01-Apr-2010
	1-15	01-Apr-2010
	1-16	01-Apr-2010
	1-17	01-Apr-2010
	1-18	01-Apr-2010
	1-19	01-Apr-2010
	1-20	01-Apr-2010
	1-21	01-Apr-2010
	1-22	01-Apr-2010

Ch.	Page	Date
2	appr. 2-1	01-Apr-2010
	appr. 2-2	01-Apr-2010
	appr. 2-3	01-Apr-2010
	appr. 2-4	01-Apr-2010
	appr. 2-5	01-Apr-2010
	appr. 2-6	01-Apr-2010
	appr. 2-7	01-Apr-2010
	appr. 2-8	01-Apr-2010
	appr. 2-9	01-Apr-2010
	appr. 2-10	01-Apr-2010
	appr. 2-11	01-Apr-2010
	appr. 2-12	01-Apr-2010
	appr. 2-13	01-Apr-2010
	appr. 2-14	01-Apr-2010
	appr. 2-15	01-Apr-2010
	appr. 2-16	01-Apr-2010
	appr. 2-17	01-Apr-2010
	appr. 2-18	01-Apr-2010
	appr. 2-19	01-Apr-2010
	appr. 2-20	01-Apr-2010
	appr. 2-21	01-Apr-2010
	appr. 2-22	01-Apr-2010
	appr. 2-23	01-Apr-2010
	appr. 2-24	01-Apr-2010
	appr. 2-25	01-Apr-2010
	appr. 2-26	01-Apr-2010
	appr. 2-27	01-Apr-2010

Ch.	Page	Date
2	appr. 2-28	01-Apr-2010
	appr. 2-29	01-Apr-2010
	appr. 2-30	01-Apr-2010
	appr. 2-31	01-Apr-2010
	appr. 2-32	01-Apr-2010
	appr. 2-33	01-Apr-2010
	appr. 2-34	01-Apr-2010
	appr. 2-35	01-Apr-2010
	appr. 2-36	01-Apr-2010
	appr. 2-37	01-Apr-2010
	appr. 2-38	01-Apr-2010
	appr. 2-39	01-Apr-2010
	appr. 2-40	01-Apr-2010

Ch.	Page	Date
3	3-1	01-Apr-2010
	3-2	01-Apr-2010
	3-3	01-Apr-2010
	3-4	01-Apr-2010
	3-5	01-Apr-2010
	3-6	01-Apr-2010
	3-7	01-Apr-2010
	3-8	01-Apr-2010
	3-9	01-Apr-2010
	3-10	01-Apr-2010
	3-11	01-Apr-2010
	3-12	01-Apr-2010
	3-13	01-Apr-2010
	3-14	01-Apr-2010
	3-15	01-Apr-2010
	3-16	01-Apr-2010
	3-17	01-Apr-2010
	3-18	01-Apr-2010
	3-19	01-Apr-2010
	3-20	01-Apr-2010
	3-21	01-Apr-2010
	3-22	01-Apr-2010
	3-23	01-Apr-2010
	3-24	01-Apr-2010
	3-25	01-Apr-2010
	3-26	01-Apr-2010
	3-27	01-Apr-2010
	3-28	01-Apr-2010

Ch.	Page	Date
3	3-29	01-Apr-2010
	3-30	01-Apr-2010
	3-31	01-Apr-2010
	3-32	01-Apr-2010
	3-33	01-Apr-2010
	3-34	01-Apr-2010
	3-35	01-Apr-2010
	3-36	01-Apr-2010
	3-37	01-Apr-2010
	3-38	01-Apr-2010
	3-39	01-Apr-2010
	3-40	01-Apr-2010
	3-41	01-Apr-2010
	3-42	01-Apr-2010
	3-43	01-Apr-2010
	3-44	01-Apr-2010
	3-45	01-Apr-2010
	3-46	01-Apr-2010
	3-47	01-Apr-2010
	3-48	01-Apr-2010
	3-49	01-Apr-2010
	3-50	01-Apr-2010
	3-51	01-Apr-2010
	3-52	01-Apr-2010
	3-53	01-Apr-2010
	3-54	01-Apr-2010
	3-55	01-Apr-2010
	3-56	01-Apr-2010

Ch.	Page	Date
4A	4A-1	01-Apr-2010
	4A-2	01-Apr-2010
	4A-3	01-Apr-2010
	4A-4	01-Apr-2010
	4A-5	01-Apr-2010
	4A-6	01-Apr-2010
	4A-7	01-Apr-2010
	4A-8	01-Apr-2010
	4A-9	01-Apr-2010
	4A-10	01-Apr-2010
	4A-11	01-Apr-2010
	4A-12	01-Apr-2010
	4A-13	01-Apr-2010
	4A-14	01-Apr-2010
	4A-15	01-Apr-2010
	4A-16	01-Apr-2010
	4A-17	01-Apr-2010
	4A-18	01-Apr-2010
	4A-19	01-Apr-2010
	4A-20	01-Apr-2010
	4A-21	01-Apr-2010
	4A-22	01-Apr-2010
	4A-23	01-Apr-2010
	4A-24	01-Apr-2010
	4A-25	01-Apr-2010
	4A-26	01-Apr-2010
	4A-27	01-Apr-2010

Ch.	Page	Date
4A	4A-28	01-Apr-2010
	4A-29	01-Apr-2010
	4A-30	01-Apr-2010
	4A-31	01-Apr-2010
	4A-32	01-Apr-2010
	4A-33	01-Apr-2010
	4A-34	01-Apr-2010
	4A-35	01-Apr-2010
	4A-36	01-Apr-2010
	4A-37	01-Apr-2010
	4A-38	01-Apr-2010
	4A-39	01-Apr-2010
	4A-40	01-Apr-2010
	4A-41	01-Apr-2010
	4A-42	01-Apr-2010
	4A-43	01-Apr-2010
	4A-44	01-Apr-2010
	4A-45	01-Apr-2010
	4A-46	01-Apr-2010
	4A-47	01-Apr-2010
	4A-48	01-Apr-2010
	4A-49	01-Apr-2010
	4A-50	01-Apr-2010
	4A-51	01-Apr-2010
	4A-52	01-Apr-2010
	4A-53	01-Apr-2010
	4A-54	01-Apr-2010

Ch.	Page	Date
4A	4A-55	01-Apr-2010
	4A-56	01-Apr-2010
	4A-57	01-Apr-2010
	4A-58	01-Apr-2010

Ch.	Page	Date
4B	4B-1	01-Apr-2010
	4B-2	01-Apr-2010
	4B-3	01-Apr-2010
	4B-4	01-Apr-2010
	4B-5	01-Apr-2010
	4B-6	01-Apr-2010
	4B-7	01-Apr-2010
	4B-8	01-Apr-2010
	4B-9	01-Apr-2010
	4B-10	01-Apr-2010
	4B-11	01-Apr-2010
	4B-12	01-Apr-2010
	4B-13	01-Apr-2010
	4B-14	01-Apr-2010
	4B-15	01-Apr-2010
	4B-16	01-Apr-2010
	4B-17	01-Apr-2010
	4B-18	01-Apr-2010
	4B-19	01-Apr-2010
	4B-20	01-Apr-2010
	4B-21	01-Apr-2010
	4B-22	01-Apr-2010
	4B-23	01-Apr-2010
	4B-24	01-Apr-2010
	4B-25	01-Apr-2010
	4B-26	01-Apr-2010
	4B-27	01-Apr-2010

Ch.	Page	Date
4B	4B-28	01-Apr-2010
	4B-29	01-Apr-2010
	4B-30	01-Apr-2010
	4B-31	01-Apr-2010
	4B-32	01-Apr-2010

Ch.	Page	Date
5	5-1	01-Apr-2010
	5-2	01-Apr-2010
	5-3	01-Apr-2010
	5-4	01-Apr-2010
	5-5	01-Apr-2010
	5-6	01-Apr-2010
	5-7	01-Apr-2010
	5-8	01-Apr-2010
	5-9	01-Apr-2010
	5-10	01-Apr-2010
	5-11	01-Apr-2010
	5-12	01-Apr-2010
	5-13	01-Apr-2010
	5-14	01-Apr-2010
	5-15	01-Apr-2010
	5-16	01-Apr-2010
	5-17	01-Apr-2010
	5-18	01-Apr-2010
	5-19	01-Apr-2010
	5-20	01-Apr-2010
	5-21	01-Apr-2010
	5-22	01-Apr-2010
	5-23	01-Apr-2010
	5-24	01-Apr-2010
	5-25	01-Apr-2010
	5-26	01-Apr-2010
	5-27	01-Apr-2010

Ch.	Page	Date
5	5-28	01-Apr-2010
	5-29	01-Apr-2010
	5-30	01-Apr-2010

Ch.	Page	Date
6	6-1	01-Apr-2010
	6-2	01-Apr-2010
	6-3	01-Apr-2010
	6-4	01-Apr-2010
	6-5	01-Apr-2010
	6-6	01-Apr-2010
	6-7	01-Apr-2010
	6-8	01-Apr-2010
	6-9	01-Apr-2010
	6-10	01-Apr-2010
	6-11	01-Apr-2010
	6-12	01-Apr-2010
	6-13	01-Apr-2010
	6-14	01-Apr-2010
	6-15	01-Apr-2010
	6-16	01-Apr-2010
	6-17	01-Apr-2010
	6-18	01-Apr-2010
	6-19	01-Apr-2010
	6-20	01-Apr-2010
	6-21	01-Apr-2010
	6-22	01-Apr-2010
	6-23	01-Apr-2010
	6-24	01-Apr-2010

Ch.	Page	Date
7	7-1	01-Apr-2010
	7-2	01-Apr-2010
	7-3	01-Apr-2010
	7-4	01-Apr-2010
	7-5	01-Apr-2010
	7-6	01-Apr-2010
	7-7	01-Apr-2010
	7-8	01-Apr-2010
	7-9	01-Apr-2010
	7-10	01-Apr-2010
	7-11	01-Apr-2010
	7-12	01-Apr-2010
	7-13	01-Apr-2010
	7-14	01-Apr-2010
	7-15	01-Apr-2010
	7-16	01-Apr-2010
	7-17	01-Apr-2010
	7-18	01-Apr-2010
	7-19	01-Apr-2010
	7-20	01-Apr-2010
	7-21	01-Apr-2010
	7-22	01-Apr-2010
	7-23	01-Apr-2010
	7-24	01-Apr-2010
	7-25	01-Apr-2010
	7-26	01-Apr-2010
	7-27	01-Apr-2010

Ch.	Page	Date
7	7-28	01-Apr-2010
	7-29	01-Apr-2010
	7-30	01-Apr-2010
	7-31	01-Apr-2010
	7-32	01-Apr-2010
	7-33	01-Apr-2010
	7-34	01-Apr-2010
	7-35	01-Apr-2010
	7-36	01-Apr-2010
	7-37	01-Apr-2010
	7-38	01-Apr-2010
	7-39	01-Apr-2010
	7-40	01-Apr-2010
	7-41	01-Apr-2010
	7-42	01-Apr-2010
	7-43	01-Apr-2010
	7-44	01-Apr-2010
	7-45	01-Apr-2010
	7-46	01-Apr-2010
	7-47	01-Apr-2010
	7-48	01-Apr-2010
	7-49	01-Apr-2010
	7-50	01-Apr-2010
	7-51	01-Apr-2010
	7-52	01-Apr-2010
	7-53	01-Apr-2010
	7-54	01-Apr-2010

Ch.	Page	Date
7	7-55	01-Apr-2010
	7-56	01-Apr-2010
	7-57	01-Apr-2010
	7-58	01-Apr-2010
	7-59	01-Apr-2010
	7-60	01-Apr-2010
	7-61	01-Apr-2010
	7-62	01-Apr-2010

Ch.	Page	Date
8	8-1	01-Apr-2010
	8-2	01-Apr-2010
	8-3	01-Apr-2010
	8-4	01-Apr-2010
	8-5	01-Apr-2010
	8-6	01-Apr-2010
	8-7	01-Apr-2010
	8-8	01-Apr-2010
	8-9	01-Apr-2010
	8-10	01-Apr-2010
	8-11	01-Apr-2010
	8-12	01-Apr-2010

Ch.	Page	Date
9	9-1	01-Apr-2010
	9-2	01-Apr-2010
	9-3	01-Apr-2010
	9-4	01-Apr-2010

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0.4 TABLE OF CONTENTS

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CHAPTER 1
GENERAL

Page

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	
Long Range Tanks	OÄM 40-130	□ yes	□ no
Baggage Tray (extended baggage compartment)	OÄM 40-164	□ yes	□ no
Baggage Tube	Basic Design	□ yes	□ no
Winter Baffle Fresh Air Inlet	OÄM 40-183	□ yes	□ no
Nose Landing Gear Tie-down	OÄM 40-200	□ yes	□ 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 m²	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 m²	7.0 sq.ft.

Wing Flaps

Area (total, left + right)	:	1.56 m²	16.8 sq.ft.

Horizontal Tail

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

Vertical Tail

Area	:	1.60 m^2	17.2 sq.ft.
Rudder area	:	0.47 m^2	5.1 sq.ft.

Landing Gear

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

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).

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

ESSENTIAL BUS

HORIZON	Artificial Horizon (Attitude Gyro)
ADC	Air Data Computer
AHRS	Attitude and Heading Reference System
COM1	COM Radio No. 1
FLOOD	Flood Light
GPS/NAV1	Global Positioning System and NAV Receiver No. 1
XPDR	Transponder
LANDING	Landing Light
PFD	Primary Flight Display
PITOT	Pitot Heating System
FLAPS	Flap System
MASTER CONTROL	Master Control (Avionics Relay)
ESS TIE	Bus Interconnection
ENG INST	Engine Instruments

MAIN BUS

MAIN TIE	Bus Interconnection
XFR PUMP	Fuel Transfer Pump
MFD	Multi Function Display
INST. LT	Instrument Lights
AV/CDU FAN	Avionic-, CDU-Cooling Fans
PWR	Power
STROBE	Strobe Lights (= Anti Collision Lights)
POSITION	Position Lights
TAXI/MAP	Taxi Light / Map Lights
START	Starter
AV. BUS	Avionic Bus

EECU BUS

EECU A	ECU A
EECU B	ECU B
FUEL PUMP A	ECU A Fuel Pump
FUEL PUMP B	ECU B Fuel Pump

AVIONICS BUS

GPS/NAV2	Global Positioning System and NAV Receiver No. 2
COM2	COM Radio No. 2
AUDIO	Audio Panel / Marker Beacon Receiver
AUTOPILOT	Autopilot System
ADF	Automatic Direction Finder
DME	Distance Measuring Equipment
WX500	Stormscope
TAS	Traffic Advisory System

<u>(g) Equipment</u>

ELT: Emergency Locator Transmitter.

<u>(h) Design Change Advisories</u>

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]
			[qts]	US quarts	[l] / 0.9464 = [qts]
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] x 196.85 = [fpm]
Speed of rotation	[RPM] revolutions per minute				--
Mass	[kg]	kilogram	[lb]	pound	[kg] x 2.2046 = [lb]
Force, weight	[N]	newton	[lbf]	pound force	[N] x 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] x 14.504 = [psi]
Temperature	[°C]	degree Celsius	[°F]	degree Fahrenheit	[°C]x1.8 + 32 = [°F]
					([°F] - 32)/1.8 = [°C]

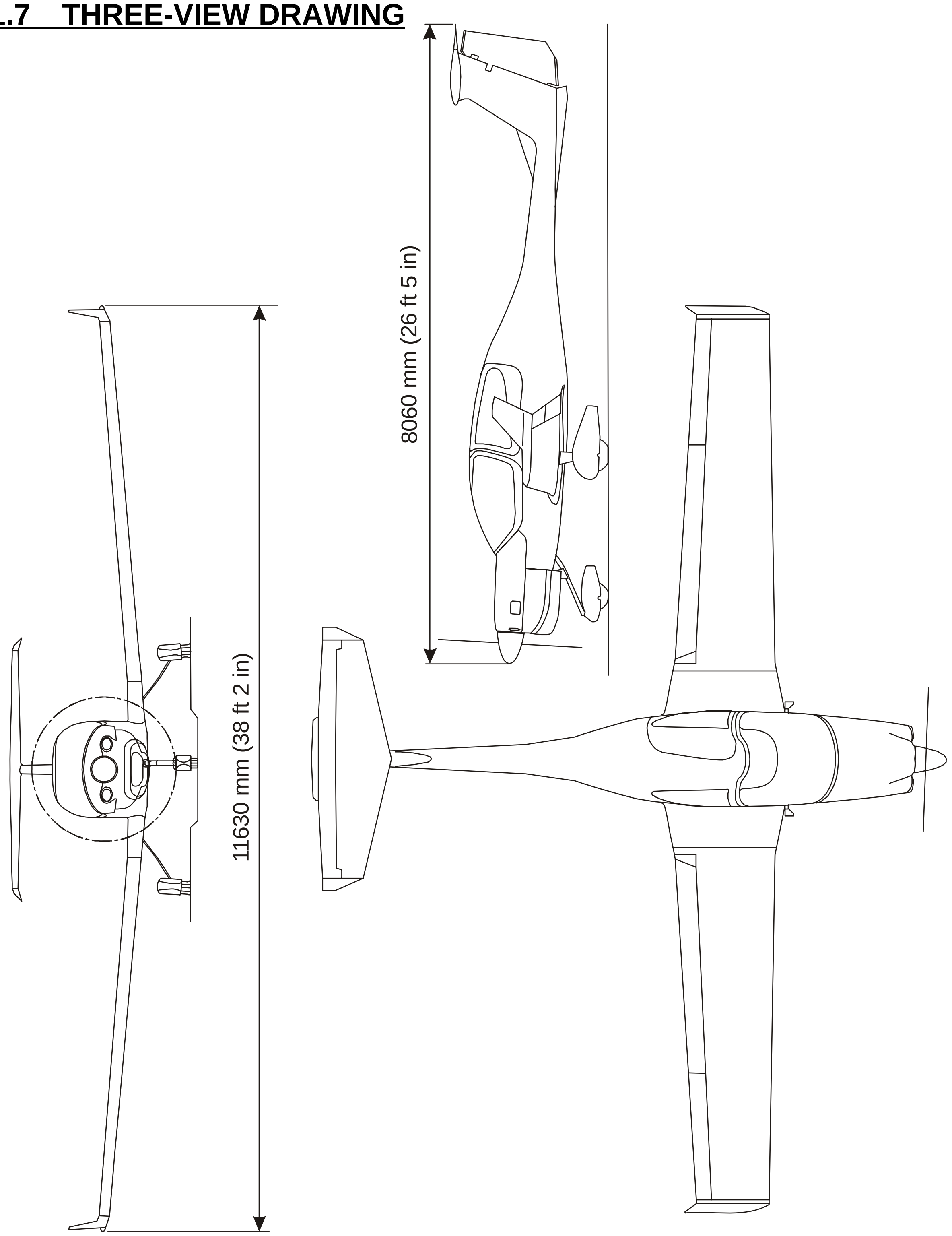
Dimension	SI-Units	US Units	Conversion
Intensity of electric current	[A] ampère		--
Electric charge (battery capacity)	[Ah] ampère-hour		--
Electric potential	[V] volt		--
Time	[sec] second		--

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 G1000 AVIONICS SYSTEM

1. The G1000 Integrated Avionics System is a fully integrated flight, engine, communication, navigation and surveillance instrumentation system. The system consists of a Primary Flight Display (PFD), Multi-Function Display (MFD), audio panel, Air Data Computer (ADC), Attitude and Heading Reference System (AHRS), engine sensors and processing unit (GEA), and integrated avionics (GIA) containing VHF communications, VHF navigation, and GPS (Global Positioning System).

2. The primary function of the PFD is to provide attitude, heading, air data, navigation, and alerting information to the pilot. The PFD may also be used for flight planning. The primary function of the MFD is to provide engine information, mapping, terrain information, autopilot operation, and for flight planning. The audio panel is used for selection of radios for transmitting and listening, intercom functions, and marker beacon functions.

3. The primary function of the VHF Communication portion of the G1000 is to enable external radio communication. The primary function of the VOR/ILS Receiver portion of the equipment is to receive and demodulate VOR, Localizer, and Glide Slope signals. The primary function of the GPS portion of the system is to acquire signals from the GPS satellites, recover orbital data, make range and Doppler measurements, and process this information in real-time to obtain the user's position, velocity, and time.

4. Provided a Garmin G1000 GPS receiver is receiving adequate usable signals, it has been demonstrated capable of and has been shown to meet the accuracy specifications for:

   (a) VFR/IFR enroute, oceanic, terminal, and non-precision instrument approach (GPS, Loran-C, VOR, VOR-DME, TACAN, NDB, NDB-DME, RNAV) operation within the U.S. National Airspace System in accordance with AC 20-138A.

(b) RNAV (GPS) Approaches - The G1000 GPS meets the requirements of AC 20-138(A) for GPS based RNAV approaches. This includes RNAV approaches labeled as RNAV (GPS), provided GPS sensor data is valid.

(c) The system meets the accuracy of RNP5 airspace (BRNAV) requirements of AC 90-96 and in accordance with AC 20-138A, EASA AMC 20-4, and FAA Order 8110.60 for oceanic and remote airspace operations, provided it is receiving usable navigation information from the GPS receiver.

Navigation is accomplished using the WGS-84 (NAD-83) coordinate reference datum. GPS navigation data is based upon use of only the GPS operated by the United States of America.

1.9 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.

1.9.1 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
Documents:	Operation Manual AE300, E4.01.01 Rev. 3 or later
	Maintenance Manual AE300, E4.08.04 Rev. 3 or later
	Installation Manual AE300, E4.02.01 Rev. 7 or later

1.9.2 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

1.9.3 AVIONICS SYSTEM

Address: Garmin International, Inc.
1200 East 151st Street
Olathe, Kansas 66062
USA

Phone: +1-(913)-3978200
Fax: +1-(913)-3978282
Website: www.garmin.com

Documents: G1000 Cockpit Reference Guide
P/N 190-00953-00, Rev. 0 or later

G1000 Pilot´s Guide
P/N 190-00952-00, Rev. 0 or later

CHAPTER 2
OPERATING LIMITATIONS

Page

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	58 KIAS - 98 KIAS	Operating range with flaps fully extended.
Green arc	62 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 up to 1500 RPM	:	1.5 bar
Minimum above 1500 RPM	:	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

Minimum	:	- 30 °C
Maximum	:	140 °C
Normal range	:	50 °C - 125 °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 G1000 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 on the G1000; a fuel pressure warning will illuminate on the PFD if the pressure is below the limit.

Maximum : 7 bar

NOTE

The fuel pressure is not indicated on the G1000; the fuel pressure caution 'ECU A/B FAIL' will illuminate on the PFD 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°± 0.2° High Pitch 35°± 1.0°
r) Governor	:	mt-Propeller P-853-16 electrical governor
s) Oil specification	:	SHELL HELIX ULTRA 5W30 SHELL HELIX ULTRA 5W40
t) Gearbox oil (propeller gearbox)	:	SHELL SPIRAX GSX 75W-80
u) Coolant	:	Distilled water / Cooler protection (BASF Glysantin Protect Plus / G48) 1/1. The freezing point of the coolant is - 38°C (-36°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:

Indi-cation	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 1.5 bar	1.5 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 125°C	125° to140°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 5°C	5° 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 alerts lights on the G1000.

Color and Significance of the Warning Lights (Red)

Warning Alerts (Red)	Meaning / Cause
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 / < 1.5 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	Engine fuel pressure is low.
ALTN AMPS	Engine alternator output is in the upper red range (too high / > 70 A).
ALTN FAIL	Engine alternator has failed.
STARTER	Engine starter is engaged.
DOOR OPEN	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.

Warning Alerts (Red)	Meaning / Cause
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
CAUTION	One of the cautions below is being indicated.
ECU A FAIL	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	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	Left fuel quantity is low.
VOLTS LOW	Engine bus voltage is too low (< 25 V).
COOL LVL	Engine coolant level is low.
PITOT FAIL	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.

Color and Significance of the Status Lights (White)

Advisory Alerts (White)	Meaning / Cause
GLOW ON	Engine glow plug active.
FUEL XFER	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)

Maximum take-off mass	:	1280 kg	(2822 lb)
Maximum landing mass	:	1216 kg	(2681 lb)
Max. load in baggage compartment	:	30 kg	(66 lb)
Max. load in baggage tube compartment	:	5 kg	(11 lb)
Max. load in baggage tray (if OÄM 40-164 is installed, extended baggage compartment)	:	45 kg	(100 lb)
Minimum flight mass	:	940 kg	(2072 lb)
Maximum zero fuel mass	:	1200 kg	(2646 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

The maximum landing mass is 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.

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)

linear variation between these values

Most rearward CG:

2.53 m (99.6 in) aft of DP from 940 kg (2072 lb) to1280 kg (2822 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.

	For daytime VFR flights	In addition for night VFR flights	In addition for IFR flights
Flight & navigation instruments	• Airspeed indicator (on G1000 PFD or backup) • Altimeter (on G1000 PFD or backup) • Magnetic compass • 1 headset, used by pilot in command	• Vertical speed indicator (VSI) • Attitude gyro (artificial horizon; on G1000 PFD or backup) • Turn & bank indicator • Directional gyro • VHF radio (COM) with speaker and microphone • VOR receiver • Transponder (XPDR), mode A and mode C • GPS receiver (part of G1000)	• Second airspeed indicator (both, on G1000 PFD and backup) • Second altimeter (both, on G1000 PFD and backup) • Second attitude gyro (both, on G1000 PFD and backup) • Second VHF radio (COM) • VOR-LOC-GP receiver • Second GPS receiver (part of G1000)

	For daytime VFR flights	In addition for night VFR flights	In addition for IFR flights
Engine instru-ments	• Fuel qty. • Oil press. • Oil temp. • Coolant temp. • Coolant level indicator • Gearbox temp. • Load • Prop. RPM • Fuel temp. left & right tank • Fuel flow • Fuel pressure warning • ECU CAUTION • ECU A/B FAIL	• Ammeter • Voltmeter	
Lighting		• Position lights • Strobe lights (anti collision lights) • Landing light • Instrument lighting • Flood light • Flashlight	

	For daytime VFR flights	In addition for night VFR flights	In addition for IFR flights
Other operational minimum equipment	• Stall warning system • Alternate means for fuel quantity indication (see Section 7.9) • Safety belts for each occupied seat • Airplane Flight Manual	• Pitot heating system • Alternate static valve	• Emergency battery (for backup attitude gyro and flood light)

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

Fuel Grade: JET A (ASTM D 1655),

JET A-1 (ASTM D 1655)

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.

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 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:

LIMITATIONS FOR GFC 700 AUTOPILOT SYSTEM:
DO NOT USE AP IF "ALTERNATE STATIC" IS OPEN.
CONDUCT AP AND TRIM CHECK PRIOR TO EACH FLIGHT (SEE AFM).
AUTOPILOT OFF DURING TAKE-OFF AND LANDING.
MAXIMUM SPEED FOR AUTOPILOT OPERATION IS 165 KIAS.
MINIMUM SPEED FOR AUTOPILOT OPERATION IS 70 KIAS.
<u>MINIMUM ALTITUDE FOR AUTOPILOT OPERATION:</u>
CRUISE, CLIMB, DESCENT AND MANEUVERING: 800 FEET AGL
APPROACH: 200 FEET AGL

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)

GPS NOT APPROVED
FOR WAAS OPERATIONS

<u>On the Instrument Panel, Next to the Fuel Quantity Indication:</u>

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

<u>Next to Each of the Two Fuel Filler Necks:</u>

WARNING

APPROVED FUEL

JET-A1

or see Airplane Flight Manual

<u>Next to the Essential Bus Switch:</u>

Ess. Bus NOT for normal operation. See AFM.

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

OIL

SHELL HELIX

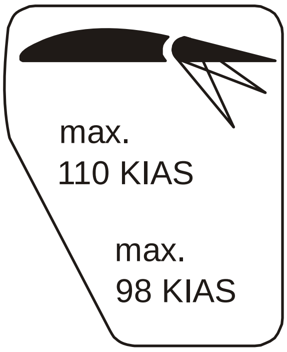
ULTRA

5W30

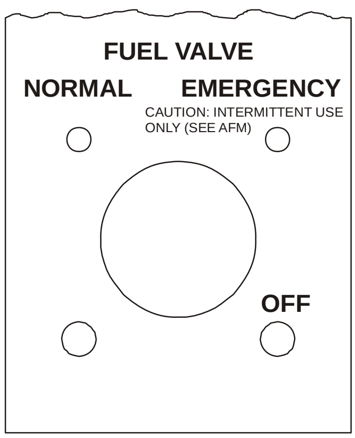
or see Airplane

Flight Manual

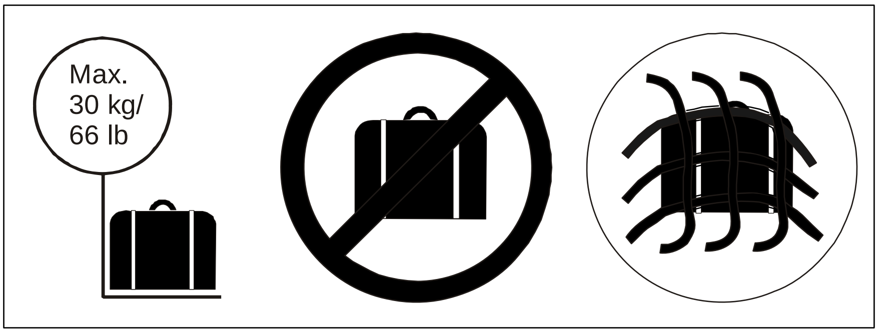
Next to the Flap Selector Switch:



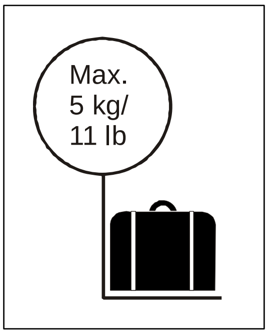
On the Fuel Valve:



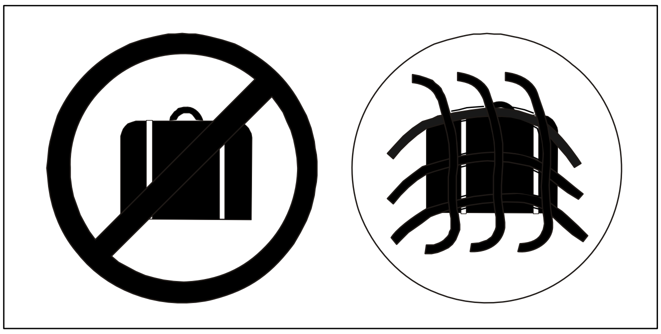
Next to the Baggage Compartment:

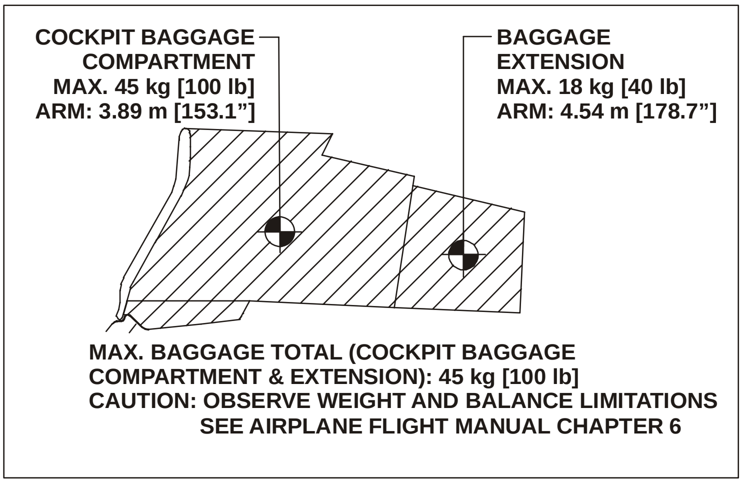


Baggage Tube Compartment:

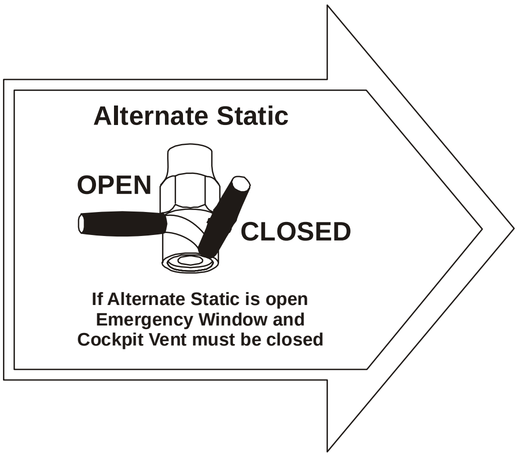


Baggage Tray (if OÄM 40-164 installed, extended baggage compartment):





On the left Sidewall, next to the Instrument Panel:



Beside the Door Locking Device:

EMERGENCY EXIT:

The keylock must be unlocked during flight

On Ventilation Inlet Baffle (if installed):

Remove at Outside Temperatures above 15 °C / 59 °F

On the Left-Hand Side of 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 -20 °C (-4 °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 ventilation inlet baffle installed when the outside air temperature at take-off does not exceed 15 °C (59 °F).

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 GARMIN G1000 AVIONICS SYSTEM

1. The Garmin G1000 Cockpit Reference Guide, 190-00953-00, appropriate revision must be immediately available to the flight crew.

2. The G1000 must utilize the software Garmin 010-00915-01 approved software in accordance with the mandatory service bulletin DAI MSB 40NG-003, latest version.

Software	Approved Version	Function
System	for approved version, see DAI MSB 40NG-003, latest version	
010-00915-( )		
Manifest		
006-B0093-( )		GPS1, GPS2
006-B0172-( )		GTX1-GIA1, GTX1-GIA2
006-B0190-( )		GIA1, GIA2
006-B0193-( )		GEA1-GIA1; GEA1-GIA2
006-B0203-( )		GMA1-GIA1, GMA1-GAI2
006-B0223-( )		GRS1-GIA1, GRS1-GIA2
006-B0224-( )		GMU1
006-B0319-( )		PFD1, MFD1
006-B0328-( )		
006-B0329-( )		
006-C0048-( )		GMU1 FPGA
006-C0049-( )		GRS1 FPGA
006-C0055-( )		GDC1 FPGA
006-D0159-( )		GRS1 MV DB

Software	Approved Version	Function
006-D0202-( )		
006-B0261-( )		GDC1-GIA1
006-B0081-( )		COM1, COM2
006-B0083-( )		GS1, GS2
006-B0082-( )		NAV1, NAV2

NOTE

The database version is displayed on the MFD power-up page immediately after system power-up and must be acknowledged. The remaining system software versions can be verified on the AUX group sub-page 5, "AUX-SYSTEM STATUS".

3. IFR enroute, oceanic and terminal navigation predicated upon the G1000 GPS Receiver is prohibited unless the pilot verifies the currency of the database or verifies each selected way point for accuracy by reference to current approved data.

4. Instrument approach navigation predicated upon the G1000 GPS Receiver must be accomplished in accordance with approved instrument approach procedures that are retrieved from the GPS equipment database. The GPS equipment database must incorporate the current update cycle.

NOTE

Not all published approaches are in the FMS database. The pilot must ensure that the planned approach is in the database.

(a) Instrument approaches utilizing the GPS receiver must be conducted in the approach mode and Receiver Autonomous Integrity Monitoring (RAIM) must be available at the Final Approach Fix.

(b) Accomplishment of ILS, LOC, LOC-BC, LDA, SDF, MLS or any other type of approach not approved for GPS overlay with the G1000 GPS receiver is not authorized.

(c) Use of the G1000 VOR/ILS receiver to fly approaches not approved for GPS require VOR/ILS navigation data to be present on the display.

(d) When an alternate airport is required by the applicable operating rules, it must be served by an approach based on other than GPS or Loran-C navigation, the airplane must have the operational equipment capable of using that navigation aid, and the required navigation aid must be operational.

(e) VNAV information may be utilized for advisory information only. Use of VNAV information for Instrument Approach Procedures does not guarantee step-down fix altitude protection, or arrival at approach minimums in normal position to land.

(f) RNAV (GPS) approaches must be conducted utilizing the GPS sensor.

(g) RNP RNAV operations are not authorized, except as noted in Chapter 1 of this AFM.

5. If not previously defined, the following default settings must be made in the "SYSTEM SETUP" menu of the G1000 prior to operation (refer to Pilot's Guide for procedure if necessary):

(a) DIS, SPD : nm, kt (sets navigation units to "nautical miles" and "knots")

(b) ALT, VS : ft, fpm (sets altitude units to "feet" and "feet per minute")

(c) POSITION : deg-min (sets navigation grid units to decimal minutes)

NOTE

Navigation Information is referenced to WGS-84 reference system, and should only be used where the Aeronautical Information Publication (including electronic data and aeronautical charts) conforms to WGS-84 or equivalent.

6. When AHRS is required to meet the items listed in the minimum operational equipment (serviceable) table in Section 2.13 of this AFM, operation is prohibited in the following areas:

   (a) North of 72° N latitude at all longitudes.

   (b) South of 70° S latitude at all longitudes.

   (c) North of 65° N latitude between longitude 75° W and 120° W (Northern Canada).

   (d) North of 70° N latitude between longitude 70° W and 128° W (Northern Canada).

   (e) North of 70° N latitude between longitude 85° E and 114° E (Northern Russia).

   (f) South of 55° S latitude between longitude 120° E and 165° E (Region south of Australia and New Zealand).

   When day VFR operations are conducted in the above areas, the MFD must be in a non-heading up orientation.

7. The fuel quantity, fuel remaining, range and endurance functions on the Fuel Page (displayed when pushing the FUEL button as shown in Section 7.9) of the FMS are supplemental information only and must be verified by the flight crew.

8. The GPS is not approved for WAAS operations:

   (a) The G1000 integrated avionics system is NOT approved for GPS WAAS operations including GPS WAAS approach procedures such as "LPV", "LNAV/VNAV", and "LNAV +V".

   (b) SBAS (WAAS & MSAS) functionality must be disabled on the G 1000 GPS Status page (refer to the G1000 Pilot´s Guide for procedure).

9. The availability of SafeTaxi®, ChartView, or FliteCharts® in electronic form on the G1000 is for information purposes only, it is still mandatory to carry another source of charts on-board the airplane.

2.16.8 AUTOPILOT LIMITATIONS

1. It is the responsibility of the pilot in command to monitor the autopilot when it is engaged. The pilot should be prepared to immediately disconnect the autopilot and to take prompt corrective action in the event of unexpected or unusual autopilot behavior.
2. The autopilot must be disconnected (using the DISC button) during take-off and landing.
3. Following an autopilot or electric trim malfunction, reengaging the autopilot or manual electric trim, or resetting the AUTOPILOT circuit breaker is prohibited until the cause of the malfunction has been determined and corrected.
4. The Garmin G1000 Cockpit Reference Guide for the Diamond DA 40 NG approved revision must be immediately available to the flight crew.
5. ILS approaches using the GFC700 / flight director are limited to Category I approaches.
6. Autopilot maximum airspeed: 165 KIAS
   Autopilot minimum airspeed: 70 KIAS
7. The autopilot must be disengaged:

   - below 200 ft AGL during approach,
   - below 800 ft AGL for all other phases of flight.
8. Overriding the autopilot to change pitch or roll attitude is prohibited. (Disengage or press CWS while maneuvering.)

9. The GFC 700 components must utilize the following or later approved software versions:

Sub-System	Software Version
GDU	v9.03
GDC 74	v3.02
GEA 7X	v2.07
GPS	v3.03
GIA 6X	v5.65
GIA Audio	v2.03
GMAX347	v4.01
GMU44	v2.01
GRS 77	v2.11
GTX 33X	v5.01
GDL 69	v3.20.00
GSA 8X	v2.20
GFC 700	v2.00

The system software versions can be verified on the AUX group sub-page 5, "AUX - SYSTEM STATUS".

10. The GFC 700 AFCS pre-flight test must be successfully completed prior to use of the autopilot, flight director, or manual electric trim. Use of the autopilot or manual electric trim system is prohibited if the preflight test is not satisfactorily completed.

11. A pilot with the seat belt fastened must occupy the left pilot's seat during all operations.

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CHAPTER 3
EMERGENCY PROCEDURES

Page

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

3.1.3 SELECTING EMERGENCY FREQUENCY

In an in-flight emergency, depressing and holding the Com transfer button ⟷ on the G1000 for 2 seconds will tune the emergency frequency of 121.500 MHz. If the display is available, it will also show it in the "Active" frequency window.

3.2 AIRPLANE RELATED G1000 WARNINGS

3.2.1 WARNINGS / GENERAL

CHARACTERISTICS	Means that the non-observation of the corresponding procedure leads to an immediate or important degradation in flight-safety. Red color coded warning text. Warning chime tone of 1.5 second duration which repeats without delay until acknowledged by the crew.

3.2.2 ENG TEMP

ENG TEMP	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 G1000 for COOL LVL caution message (low coolant level).

COOL LVL Caution Message <u>*Not*</u> *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 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 3.5.4 - ENGINE FAILURE IN FLIGHT.

COOL LVL 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 3.5.4 - ENGINE FAILURE IN FLIGHT.

END OF CHECKLIST

3.2.3 OIL TEMP

OIL TEMP	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 3.5.4 - 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 3.5.4 - ENGINE FAILURE IN FLIGHT.

END OF CHECKLIST

3.2.4 OIL PRES

OIL PRES	Engine oil pressure is in the lower red range (too low / below 1.5 bar).

Oil pressures below the limit value of 1.5 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 3.5.4 - ENGINE FAILURE IN FLIGHT.

END OF CHECKLIST

3.2.5 GBOX TEMP

GBOX TEMP	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 3.5.4 - ENGINE FAILURE IN FLIGHT.

END OF CHECKLIST

3.2.6 L/R FUEL TEMP

L/R FUEL TEMP	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

3.2.7 FUEL PRESS

FUEL PRESS	Engine fuel pressure is low.

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

If FUEL PRESS Warning Remains:

4. Fuel Valve . . . . EMERGENCY
5. Fuel pumps . . . . OFF

If FUEL PRESS Warning Still Remains:

WARNING

Imminent engine failure must be expected. Prepare for an engine failure in accordance with 3.5.4 - ENGINE FAILURE IN FLIGHT.

END OF CHECKLIST

3.2.8 ALTN AMPS

ALTN 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.

1. ESSENTIAL BUS . . . . ON
2. ENGINE SYSTEM DISPLAY . . . . select by pressing ENGINE and SYSTEM Softkey on MFD
3. Circuit breakers . . . . check IN
4. Land on the nearest suitable airfield.

END OF CHECKLIST

3.2.9 ALTN FAIL

ALTN FAIL	Engine alternator has failed.

An alternator failure is indicated by a warning light (ALTN FAIL) on the G1000 system. The batteries are the last remaining source of electrical power for about 30 minutes.

1. Circuit breakers . . . . check; if all are IN, proceed with step 2
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

3.2.10 STARTER

STARTER	Engine starter is engaged.

Proceed according to:

3.6.3 - STARTER MALFUNCTION

3.2.11 DOOR OPEN

DOOR OPEN	Canopy and/or Rear Door are/is not closed and locked.

Proceed according to:

3.11.3 - UNLOCKED DOORS

3.3 G1000 SYSTEM WARNINGS

3.3.1 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.

3.3.2 ATTITUDE FAIL

ATTITUDE FAIL	The 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.

Revert to the standby attitude indicator.

3.3.3 AIRSPEED FAIL

AIRSPEED FAIL	The display system is not receiving airspeed input from the air data computer; accompanied by a red X through the airspeed display.

Revert to the standby airspeed indicator.

3.3.4 ALTITUDE FAIL

ALTITUDE FAIL	The display system is not receiving altitude input from the air data computer; accompanied by a red X through the altimeter display.

Revert to the standby altimeter.

3.3.5 VERT SPEED FAIL

VERT SPEED FAIL	The display system is not receiving vertical speed input from the air data computer; accompanied by a red X through the vertical speed display.

Determine vertical speed based on the change of altitude information.

3.3.6 HDG

HDG	The display system is not receiving valid heading input from the AHRS; accompanied by a red X through the digital heading display.

Revert to the emergency compass.

3.4 G1000 FAILURES

3.4.1 NAVIGATION INFORMATION FAILURE

If Garmin G1000 GPS navigation information is not available or invalid, utilize remaining operational navigation equipment as required.

3.4.2 PFD OR MFD DISPLAY FAILURE

1. DISPLAY BACKUP button on audio panel . . push

Automatic Entry of Display Revisionary Mode

If the PFD and MFD have automatically entered reversionary mode, use the following procedure.

(a) DISPLAY BACKUP button on audio panel ...... PUSH (button will be OUT)

NOTE

After automatic entry of reversionary mode, the pilot must press the DISPLAY BACKUP button on the audio panel. After the DISPLAY BACKUP button has been pushed, the system will remain in reversionary mode even if the problem causing the automatic entry of reversionary mode is resolved. A maximum of one attempt to return to normal mode is approved using the following procedure.

CONTINUED

(b) DISPLAY BACKUP button on audio panel ...... PUSH (button will be IN)

- If the system returns to normal mode, leave the DISPLAY BACKUP button IN and continue.
- If the system remains in reversionary mode, or abnormal display behavior such as display flashing occurs, then return the DISPLAY BACKUP button to the OUT position.

END OF CHECKLIST

3.4.3 AHRS FAILURE

NOTE

A failure of the Attitude and Heading Reference System (AHRS) is indicated by a removal of the sky/ground presentation and a red X and a yellow "AHRS FAILURE" shown on the PFD. The digital heading presentation will be replaced with a yellow "HDG" and the compass rose digits will be removed. The course pointer will indicate straight up and course may be set using the digital window.

1. Use standby attitude indicator, emergency compass and Navigation Map
2. Course . . . . set using digital window

END OF CHECKLIST

3.4.4 AIR DATA COMPUTER (ADC) FAILURE

NOTE

Complete loss of the air data computer is indicated by a red X and yellow text over the airspeed, altimeter, vertical speed, TAS and OAT displays. Some FMS functions, such as true airspeed and wind calculations, will also be lost.

1. Use standby airspeed indicator and altimeter.

END OF CHECKLIST

3.4.5 ERRONEOUS OR LOSS OF ENGINE AND FUEL DISPLAYS

NOTE

Loss of an engine parameter is indicated by a red X through the data field. Erroneous information may be identified by indications which do not agree with other system information. Erroneous indications may be determined by comparing a display with other displays and other system information.

1. Set power based on throttle lever position, engine noise and speed.
2. Monitor other indications to determine the health of the engine.
3. Use known power settings and performance data, refer to 5.3.2 - FUEL FLOW DIAGRAM for approximate fuel flow values.
4. Use other system information, such as annunciator messages, GPS, fuel quantity and flow, to safely complete the flight.

END OF CHECKLIST

3.4.6 ERRONEOUS OR LOSS OF WARNING/CAUTION ANNUNCIATORS

NOTE

Loss of an annunciator may be indicated when engine or fuel displays show an abnormal or emergency situation and the annunciator is not present. An erroneous annunciator may be identified when an annunciator appears which does not agree with other displays or system information.

1. If an annunciator appears, treat it as if the condition exists. Refer to Chapter 3 - EMERGENCY PROCEDURES or Chapter 4B - ABNORMAL OPERATING PROCEDURES.
2. If a display indicates an abnormal condition but no annunciator is present, use other system information, such as engine displays, GPS fuel quantity and flow, to determine if the condition exists. If it cannot be determined that the condition does not exist, treat the situation as if the condition exists. Refer to Chapter 3 - EMERGENCY PROCEDURES or Chapter 4B - ABNORMAL OPERATING PROCEDURES.

END OF CHECKLIST

3.5 ENGINE PROBLEMS

3.5.1 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

3.5.2 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 3.9.1 - EMERGENCY LANDING WITH ENGINE OFF.

END OF CHECKLIST

3.5.3 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.

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

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 3.5.4 - ENGINE FAILURE IN FLIGHT and land as soon as possible.

END OF CHECKLIST

3.5.4 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 3.5.5 - RESTARTING THE ENGINE IN FLIGHT.

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

Carry out an emergency landing in accordance with 3.9.1 - EMERGENCY LANDING WITH ENGINE OFF.

END OF CHECKLIST

3.5.5 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 3.9.1 - 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

3.5.6 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

(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 AUTOMATIC. 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

3.5.7 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

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

3.6 FAILURES IN THE ELECTRICAL SYSTEM

3.6.1 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 . . . . 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.

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

3.6.2 HIGH CURRENT

If HIGH CURRENT Is Indicated on the G1000:

1. ESSENTIAL BUS . . . . ON
1. Circuit breakers . . . . check
3. Land on the nearest suitable airfield.

END OF CHECKLIST

3.6.3 STARTER MALFUNCTION

If the starter does not disengage from the engine after starting (starter engaged warning (STARTER) on the G1000 annunciator field 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

3.7 SMOKE AND FIRE

3.7.1 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

3.7.2 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 3.5.2 - 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 emergency landing with engine off. Allow for increased landing distance due to the flap position. Refer to 3.9.1 - EMERGENCY LANDING WITH ENGINE OFF.

CONTINUED

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

3.7.3 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 3.9.1 - 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

(b) Electrical Fire with Smoke in Flight

1. EMERGENCY switch . . . . ON
2. AVIONIC MASTER . . . . OFF
3. ELECTRIC MASTER . . . . OFF
4. Cabin heat . . . . OFF
5. Emergency windows . . . . open if required
6. Land immediately. Refer to 3.9.1 - 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, the emergency battery 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

3.8 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.

END OF CHECKLIST

3.9 EMERGENCY LANDINGS

NOTE

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

3.9.1 EMERGENCY LANDING WITH ENGINE OFF

1. ENGINE MASTER . . . . check OFF
2. Fuel transfer pump . . . . OFF
3. Fuel pumps . . . . OFF
4. Fuel valve . . . . OFF
5. AVIONIC MASTER . . . . OFF
6. Safety harnesses . . . . check fastened and tightened

When Sure of Making Landing Area:

7. 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

8. Approach speed . . . . see table below:

NOTE

If the landing mass exceeds 1216 kg (2681 lb), the landing constitutes an abnormal operating procedure. Refer to Section 4B.8.

Flaps	940 kg (2072 lb)	1000 kg (2205 lb)	1080 kg (2381 lb)	1160 kg (2557 lb)	1216 kg (2681 lb)	up to 1280 kg (2822 lb)
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

9. ELECTRIC MASTER . . . . OFF
10. Touch down . . . . lowest practical speed

END OF CHECKLIST

3.9.2 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

3.9.3 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

3.10 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

3.11 OTHER EMERGENCIES

3.11.1 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

3.11.2 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

3.11.3 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

3.11.4 AUTOPILOT OR ELECTRIC TRIM MALFUNCTION / FAILURE

NOTE

An autopilot or electric trim malfunction may be recognized by an unexpected deviation from the desired flight path, abnormal flight control or trim wheel movement, or flight director commands which cause unexpected or contradictory information on the other cockpit displays. It may be accompanied by the aural autopilot disconnect tone, a red AFCS, red PTCH, red ROLL, red AP or yellow AP indication on the PFD, or a yellow CHECK ATTITUDE on the PFD. The autopilot and AHRS monitors normally detect failures and automatically disconnect the autopilot.

Failure of the electric pitch trim, indicated by a red boxed PTRM flashing on the PFD, may not cause the autopilot to disconnect. Be alert to possible autopilot out of trim conditions (see AUTOPILOT OUT OF TRIM procedure below), and expect residual control forces upon disconnect. The autopilot will not re-engage after disconnect with failed pitch trim. If AUTOPILOT OUT OF TRIM ELE indication is present, expect substantial elevator forces on autopilot disconnect.

CONTINUED

NOTE

Accomplish items 1 and 2 simultaneously!

1. Airplane control stick . . . . grasp firmly and regain airplane control
2. AP DISC switch . . . . DEPRESS AND HOLD
3. Trim . . . . retrim airplane manually as required
4. AUTOPILOT circuit breaker . . . . pull
5. AP DISC Switch . . . . RELEASE

NOTE

When the AUTOPILOT circuit breaker is pulled, the manual electric trim and autopilot autotrim systems will be disabled.

WARNING

Do not attempt to re-engage the autopilot following an autopilot, autotrim, or manual electric trim malfunction until the cause for the malfunction has been corrected.

END OF CHECKLIST

CHAPTER 4A
NORMAL OPERATING PROCEDURES

Page

4A.1 INTRODUCTION

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

NOTE

Readability of the G1000 PFD and MFD displays may be degraded when wearing polarizing sunglasses.

NOTE

Normal operating procedures for GFC 700 are described in the Garmin G1000 Cockpit Reference Guide, P/N 190-00953-00, Rev. 0 or later and the Garmin G1000 Pilot's Guide for the Diamond DA 40 NG, P/N 190-00952-00, Rev. 0 or later.

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)**	**1080 kg (2381 lb)**	**1280 kg (2822 lb)**
Airspeed for rotation (Take-off run, v_R) (Flaps T/O)	56 KIAS	60 KIAS	67 KIAS
Airspeed for take-off climb (best rate-of-climb speed v_Y) (Flaps T/O)	72 KIAS	72 KIAS	72 KIAS
Airspeed for cruise climb (Flaps UP)	88 KIAS	88 KIAS	88 KIAS

Flight Mass	**940 kg (2072 lb)**	**1080 kg (2381 lb)**	**1216 kg (2681 lb)**
Approach speed for normal landing (Flaps LDG)	66 KIAS	72 KIAS	76 KIAS
Minimum speed during go-around (Flaps T/O)	72 KIAS	72 KIAS	72 KIAS

4A.3 ADVISORY ALERTS ON THE G1000

The G1000 provides the following advisory-alerts on the PFD in the alert area:

4A.3.1 ADVISORY / GENERAL

CHARACTERISTICS	White color coded text.

4A.3.2 GLOW ON

GLOW ON	Engine glow plug active.

4A.3.3 FUEL XFER

FUEL XFER	Fuel transfer from auxiliary to main tank is in progress.

4A.3.4 PFD/MFD/GIA FAN FAIL

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 GIA is inoperative.

The flight may be continued, but maintenance action is required after landing.

4A.4 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.5 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)
- Visual inspection of the spinner and its attachment (including screws).

4A.6 CHECKLISTS FOR NORMAL OPERATING PROCEDURES

4A.6.1 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 . . . . set in (if one has been pulled, check reason)
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.

CONTINUED

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) 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 . . . . 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

2. Left Wing:

a)	Entire wing surface	visual inspection
b)	Step	visual inspection
c)	Air intake on lower surface	visual inspection
d)	Openings on lower surface	check for foreign objects and for traces of fuel (if tank is full, fuel may spill over through the tank vent)
e)	Tank drain	drain to check for water and sediment (drain until free of contamination)
f)	Stall warning	check function (suction)
g)	Tank filler	check closed (for fuel qty. check use alternate means)
h)	Tank air outlet in lower surface	visual inspection
i)	Pitot probe	clean, orifices clear
j)	Landing/taxi light	visual inspection
k)	Wing let	visual inspection
l)	Position light, strobe light (ACL)	visual inspection
m)	Tie-down	check, clear
n)	Aileron and linkage	visual inspection
o)	Aileron hinges and safety pin	visual inspection
p)	Foreign objects in aileron paddle	visual inspection
q)	Trim tab	visual inspection
r)	Flap and linkage	visual inspection
s)	Flap hinges and safety pin	visual inspection
t)	Static discharger	visual inspection

CONTINUED

u)	Ventilation inlet baffle (if installed)	verify that the outside air temperature permits the use
v)	Ventilation 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

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

CONTINUED

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	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.

f)	Spinner including attachment screws	visual inspection
g)	Nose landing gear strut	visual inspection

CONTINUED

h) Winter baffle (if installed) . . . . visual inspection
i) Tie-down (if installed) . . . . check, clear
j) Tire and wheel . . . . visual inspection, check slip marks
k) Wear, tread depth of tire . . . . check
l) Wheel fairing . . . . visual inspection
m) Tow bar . . . . removed
n) Chocks . . . . remove
o) Exhaust . . . . visual inspection

WARNING

The exhaust can cause burns when it is hot.

Underside:

p) Antennas . . . . visual inspection
q) Gascolator . . . . pull down on drain to check for water and sediment (drain until free of contamination)
r) Venting pipes . . . . check for blockage
s) Fuselage underside . . . . check for excessive contamination particularly by oil, fuel or other fluids

END OF CHECKLIST

4A.6.2 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
13. Friction device on power lever . . . . adjusted
14. Alternate air . . . . check CLOSED
15. Alternate static valve . . . . check CLOSED

CONTINUED

16. VOTER switch . . . . check AUTO
17. Fuel pumps . . . . check OFF
18. AVIONIC MASTER . . . . check OFF
19. ELECTRIC MASTER . . . . ON
20. G1000 . . . . wait until power-up completed. Press ENT on MFD to acknowledge

NOTE

The engine instruments are only available on the MFD after item 20 has been completed.

21. COOL LVL caution . . . . check OFF
22. Fuel temperature . . . . check

WARNING

Never rotate the propeller by hand.

END OF CHECKLIST

4A.6.3 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 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 ambient temperatures below -22°C 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
3. Annunciations . . . . check "ENGINE GLOW" ON

NOTE

"ENGINE GLOW" is indicated only when the engine is cold.

4. Annunciations / Engine / System Page . . . . . check

CONTINUED

WARNING

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

After the ENGINE GLOW indication is extinguished:

5.	START KEY	START as required / release when engine has started.
6.	Annunciations / Engine / System Page	check OK/normal range
7.	Annunciations / Starter	check OFF
8.	Annunciations / Oil pressure	check OK
9.	Circuit breakers	check all in / as required
10.	Idle RPM	check, 710 ±30 RPM (above 7,000 ft pressure altitude idle RPM might be higher)
11.	Warm up	IDLE for 2 minutes, then at 50% load until: oil temperature reaches 50°C (122°F) and the coolant temperature reaches 60 °C (140°F)

END OF CHECKLIST

4A.6.4 BEFORE TAXIING

1. AVIONIC MASTER . . . . ON
2. Electrical equipment . . . . ON as required
3. Flight instruments and avionics . . . . set as required
4. Flood light . . . . ON, test function, as required
5. Pitot heating . . . . ON, check annunciation and observe an increase in alternator load

6. Pitot heating . . . . OFF
7. Strobe lights (ACL's) . . . . check ON
8. 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.

9. Primary flight display (PFD) . . . . NO AUTOPILOT ANNUNCIATIONS
10. Autopilot disconnect tone . . . . NOTE

CONTINUED

NOTE

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.

11. MANUAL ELECTRIC TRIM - TEST as follows:
    Press the AP DISC button down and hold while commanding trim.
    Manual electric trim should not operate either nose up or nose down.

12. AUTOPILOT . . . . engage by pressing AP button
13. AP DISC switch . . . . press. verify that the autopilot disconnects, check tone
14. TRIM . . . . set to take-off position manually

END OF CHECKLIST

4A.6.5 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.

END OF CHECKLIST

4A.6.6 BEFORE TAKE-OFF

1. Position airplane into wind if possible.
2. Parking brake . . . . set
3. Safety harnesses . . . . fastened
4. 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.

5. Front canopy . . . . closed and locked
6. Door warning (DOOR OPEN) . . . . check no indication
7. Annunciations / Engine / System Page . . . . . check OK / normal range (except oil pressure may be in the yellow range with a warm engine and power lever set to IDLE)
8. Circuit breakers . . . . check pressed in
9. Longitudinal trim . . . . set T/O
10. Fuel valve . . . . check NORMAL
11. FLAPS . . . . check function & indicator / set T/O
12. Flight controls . . . . unrestricted free movement, correct sense
13. Pitot heating . . . . ON, if required
14. Landing light . . . . ON, if required

CONTINUED

ECU / Fuel Pump Test Sequence:

CAUTION

If the ECU A/B FAIL 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 extinguished after test completion). In case the test procedure aborts with an error indication (one or both ECU A/B FAIL 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.

NOTE

The engine oil temperature has to be in the green range before starting the test sequence.

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.

CONTINUED

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.

8. ECU A/B FAIL lights . . . . verify both OFF

Test sequence completed.

9. ECU TEST button . . . . release

CONTINUED

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. Annunciations . . . . check OK / normal range
3. Instruments . . . . check within normal range
4. RPM . . . . stabilizes at 2200 to 2300 RPM
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.

	OAT								
Altitude [ft]	**-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							95%	92%	90%
2000							95%	92%	
4000				96%			95%	92%	
6000							95%	92%	
8000						95%	94%	91%	
10000				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 break . . . . release

END OF CHECKLIST

4A.6.7 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:

940 kg (2072 lb)	1000 kg (2205 lb)	1100 kg (2425 lb)	1200 kg (2646 lb)	1280 kg (2822 lb)
56 KIAS	58 KIAS	61 KIAS	64 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:

940 kg (2072 lb)	1000 kg (2205 lb)	1100 kg (2425 lb)	1200 kg (2646 lb)	1280 kg (2822 lb)
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.6.8 GFC 700 OPERATION

WARNING

It is the responsibility of the pilot in command to monitor the autopilot when it is engaged. The pilot should be prepared to immediately disconnect the autopilot and to take prompt corrective action in the event of unexpected or unusual autopilot behavior. Do not attempt to manually fly the airplane with the autopilot engaged. The autopilot servos will oppose pilot input and will trim opposite the direction of pilot input (pitch axis only). This could lead to a significant out-of-trim condition. Disconnect the autopilot if manual control is desired. The pilot in command must use proper autopilot modes and proper engine power settings to ensure that airplane speed is maintained between 70 KIAS and 165 KIAS. It will be necessary to change engine power to maintain the desired rate of descent when operating at 165 KIAS. Observe the minimum autopilot operating speed of 70 KIAS Operation in pitch (PIT) or vertical speed (VS) modes below this speed can result in an airplane stall. If indications of an airplane stall are present, including stall warning horn, loss of control effectiveness or airframe buffet, disconnect the autopilot and manually return the airplane to stabilized flight prior to re-engaging the autopilot.

4A.6.9 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/System Page . . . . . . 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/System Page . . . . . . monitor
5. Rudder . . . . as required

END OF CHECKLIST

GFC 700 Operation During Climb

NOTE

The NOSE UP and NOSE DN buttons on the mode controller on the MFD are referenced to airplane movement. The NOSE UP button will increase the reference pitch attitude, increase the reference vertical speed and decrease the reference airspeed. Likewise, the NOSE DN button will decrease the reference pitch attitude, decrease the reference vertical speed, and increase the reference airspeed.

a) Vertical Speed (VS)

1. Altitude preselect . . . . set to desired altitude
2. Mode controller . . . . select VS on mode controller
3. Vertical speed reference . . . . adjust using NOSE UP and NOSE DN buttons
4. White ALT (altitude preselect armed) . . . . . . note on PFD
5. Green ALT . . . . verify upon altitude capture

NOTE

If the altitude preselect is not changed before selecting VS, the autopilot may re-capture the current altitude immediately after entering VS mode. Always ensure that the altitude preselect is adjusted prior to selecting VS.

The vertical speed mode is limited to 1500 ft/min climb and 3000 ft/min descent. Use engine power to maintain appropriate airplane speed. If the CWS switch is used while in VS mode, the VS reference will change to the vertical speed when the CWS switch is released.

END OF CHECKLIST

b) Flight Level Change (FLC)

1. Altitude preselect . . . . set to desired altitude
2. Mode controller . . . . select FLC on mode controller
3. Airspeed speed reference . . . . adjust using NOSE UP and NOSE DN buttons
4. White ALT (altitude preselect armed) . . . . . . note on PFD
5. Green ALT . . . . verify upon altitude capture

NOTE

If the altitude preselect is not changed before selecting FLC, the autopilot may re-capture the current altitude immediately after entering FLC mode. Always ensure that the altitude preselect is adjusted prior to selecting FLC.

If the airspeed reference cannot be maintained without deviating away from the selected altitude, the system will maintain level flight until the power or reference is changed to allow climbing or descending towards the selected altitude.

The FLC mode is limited to airspeeds between 70 KIAS and 165 KIAS. Use engine power to maintain appropriate vertical speed. If the CWS switch is used while in FLC mode, the airspeed reference will change to the airspeed when the CWS switch is released.

END OF CHECKLIST

c) To Capture a Selected Altitude:

1. Altimeter setting . . . . adjust to appropriate value
2. Altitude preselect . . . . set to desired altitude
3. Vertical mode and reference . . . . select on mode controller
4. White ALT(altitude preselect armed) . . . . . . note on PFD
5. Green ALT . . . . verify upon altitude capture

NOTE

In ALT mode, the autopilot will maintain the reference altitude shown in the autopilot window of the PFD regardless of the altitude in the altitude preselect window or the altimeter's barometric pressure setting. If the altimeter setting is changed, the autopilot will climb or descend to maintain the reference altitude.

END OF CHECKLIST

d) Altitude Hold

To maintain a selected altitude:

1. Altimeter setting . . . . adjust to appropriate value
2. Reaching desired altitude . . . . select ALT on mode controller
3. Green ALT . . . . verify on PFD

END OF CHECKLIST

e) Navigation Capture and Track:

1. Navigation source . . . . select VOR or GPS using CDI button on PFD
2. Course bearing pointer . . . . set using course knob (VOR only)
3. Intercept heading . . . . establish in HDG or ROL mode (if required)
4. Mode controller . . . . select NAV on mode controller
5. Green or white VOR or GPS annunciation . . . note on PFD
6. Vertical mode and reference . . . . select on mode controller

NOTE

If the Course Deviation Indicator (CDI) is greater than one dot from center, the autopilot will arm the NAV mode and indicate VOR or GPS in white on the PFD. The pilot must ensure that the current heading will result in a capture of the selected course. If the CDI is one dot or less from center, the autopilot will enter the capture mode when the NAV button is pressed and annunciate VOR or GPS in green on the PFD.

END OF CHECKLIST

4A.6.10 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.6.11 - 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

GFC 700 Operation During Cruise

NOTE

The NOSE UP and NOSE DN buttons on the mode controller on the MFD are referenced to airplane movement. The NOSE UP button will increase the reference pitch attitude, increase the reference vertical speed and decrease the reference airspeed. Likewise, the NOSE DN button will decrease the reference pitch attitude, decrease the reference vertical speed, and increase the reference airspeed.

a) Vertical Speed (VS):

1. Altitude preselect . . . . set to desired altitude
2. Mode controller . . . . select VS on mode controller
3. Vertical speed reference . . . . adjust using NOSE UP and NOSE DN buttons
4. White ALT (altitude preselect armed) . . . . . . note on PFD
5. Green ALT . . . . verify upon altitude capture

NOTE

If the altitude preselect is not changed before selecting VS, the autopilot may re-capture the current altitude immediately after entering VS mode. Always ensure that the altitude preselect is adjusted prior to selecting VS.

The vertical speed mode is limited to 1500 ft/min climb and 3000 ft/min descent. Use engine power to maintain appropriate airplane speed. If the CWS switch is used while in VS mode, the VS reference will change to the vertical speed when the CWS switch is released.

END OF CHECKLIST

b) Flight Level Change (FLC):

1. Altitude preselect . . . . set to desired altitude
2. Mode controller . . . . select FLC on mode controller
3. Airspeed speed reference . . . . adjust using NOSE UP and NOSE DN buttons
4. White ALT (altitude preselect armed) . . . . . . note on PFD
5. Green ALT . . . . verify upon altitude capture

NOTE

If the altitude preselect is not changed before selecting FLC, the autopilot may re-capture the current altitude immediately after entering FLC mode. Always ensure that the altitude preselect is adjusted prior to selecting FLC.

If the airspeed reference cannot be maintained without deviating away from the selected altitude, the system will maintain level flight until the power or reference is changed to allow climbing or descending towards the selected altitude.

The FLC mode is limited to airspeeds between 70 KIAS and 165 KIAS. Use engine power to maintain appropriate vertical speed. If the CWS switch is used while in FLC mode, the airspeed reference will change to the airspeed when the CWS switch is released.

END OF CHECKLIST

c) To Capture a Selected Altitude:

1. Altimeter setting . . . . adjust to appropriate value
2. Altitude preselect . . . . set to desired altitude
3. Vertical mode and reference . . . . select on mode controller
4. White ALT(altitude preselect armed) . . . . . . note on PFD
5. Green ALT . . . . verify upon altitude capture

NOTE

In ALT mode, the autopilot will maintain the reference altitude shown in the autopilot window of the PFD regardless of the altitude in the altitude preselect window or the altimeter's barometric pressure setting. If the altimeter setting is changed, the autopilot will climb or descend to maintain the reference altitude.

END OF CHECKLIST

d) Altitude Hold:

To maintain a selected altitude:

1. Altimeter setting . . . . adjust to appropriate value
2. Reaching desired altitude . . . . select ALT on mode controller
3. Green ALT . . . . verify on PFD

END OF CHECKLIST

e) Navigation Capture and Track:

1.	Navigation source	select VOR or GPS using CDI button on PFD
2.	Course bearing pointer	set using course knob (VOR only)
3.	Intercept heading	establish in HDG or ROL mode (if required)
4.	Mode controller	select NAV on mode controller
5.	Green or white VOR or GPS annunciation	note on PFD
6.	Vertical mode and reference	select on mode controller

NOTE

If the Course Deviation Indicator (CDI) is greater than one dot from center, the autopilot will arm the NAV mode and indicate VOR or GPS in white on the PFD. The pilot must ensure that the current heading will result in a capture of the selected course. If the CDI is one dot or less from center, the autopilot will enter the capture mode when the NAV button is pressed and annunciate VOR or GPS in green on the PFD.

END OF CHECKLIST

4A.6.11 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.6.12 DESCENT

1. Power lever . . . . as required
2. Airspeed . . . . as required
3. Trim . . . . as required
4. Annunciations / Engine / System Page . . . . monitor

END OF CHECKLIST

GFC700 Operation During Descent

NOTE

The NOSE UP and NOSE DN buttons on the mode controller on the MFD are referenced to airplane movement. The NOSE UP button will increase the reference pitch attitude, increase the reference vertical speed and decrease the reference airspeed. Likewise, the NOSE DN button will decrease the reference pitch attitude, decrease the reference vertical speed, and increase the reference airspeed.

a) Vertical Speed (VS):

1. Altitude preselect . . . . set to desired altitude
2. Mode controller . . . . select VS on mode controller
3. Vertical speed reference . . . . adjust using NOSE UP and NOSE DN buttons
4. White ALT (altitude preselect armed) . . . . . . note on PFD
5. Green ALT . . . . verify upon altitude capture

NOTE

If the altitude preselect is not changed before selecting VS, the autopilot may re-capture the current altitude immediately after entering VS mode. Always ensure that the altitude preselect is adjusted prior to selecting VS.

The vertical speed mode is limited to 1500 ft/min climb and 3000 ft/min descent. Use engine power to maintain appropriate airplane speed. If the CWS switch is used while in VS mode, the VS reference will change to the vertical speed when the CWS switch is released.

END OF CHECKLIST

b) Flight Level Change (FLC):

1. Altitude preselect . . . . set to desired altitude
2. Mode controller . . . . select FLC on mode controller
3. Airspeed speed reference . . . . adjust using NOSE UP and NOSE DN buttons
4. White ALT (altitude preselect armed) . . . . . . note on PFD
5. Green ALT . . . . verify upon altitude capture

NOTE

If the altitude preselect is not changed before selecting FLC, the autopilot may re-capture the current altitude immediately after entering FLC mode. Always ensure that the altitude preselect is adjusted prior to selecting FLC.

If the airspeed reference cannot be maintained without deviating away from the selected altitude, the system will maintain level flight until the power or reference is changed to allow climbing or descending towards the selected altitude.

The FLC mode is limited to airspeeds between 70 KIAS and 165 KIAS. Use engine power to maintain appropriate vertical speed. If the CWS switch is used while in FLC mode, the airspeed reference will change to the airspeed when the CWS switch is released.

END OF CHECKLIST

c) To Capture a Selected Altitude:

1. Altimeter setting . . . . adjust to appropriate value
2. Altitude preselect . . . . set to desired altitude
3. Vertical mode and reference . . . . select on mode controller
4. White ALT(altitude preselect armed) . . . . . . note on PFD
5. Green ALT . . . . verify upon altitude capture

NOTE

In ALT mode, the autopilot will maintain the reference altitude shown in the autopilot window of the PFD regardless of the altitude in the altitude preselect window or the altimeter's barometric pressure setting. If the altimeter setting is changed, the autopilot will climb or descend to maintain the reference altitude.

END OF CHECKLIST

d) Altitude Hold:

To maintain a selected altitude:

1. Altimeter setting . . . . adjust to appropriate value
2. Reaching desired altitude . . . . select ALT on mode controller
3. Green ALT . . . . verify on PFD

END OF CHECKLIST

e) Navigation Capture and Track:

1. Navigation source . . . . select VOR or GPS using CDI button on PFD
2. Course bearing pointer . . . . set using course knob (VOR only)
3. Intercept heading . . . . establish in HDG or ROL mode (if required)
4. Mode controller . . . . select NAV on mode controller
5. Green or white VOR or GPS annunciation . . . note on PFD
6. Vertical mode and reference . . . . select on mode controller

NOTE

If the Course Deviation Indicator (CDI) is greater than one dot from center, the autopilot will arm the NAV mode and indicate VOR or GPS in white on the PFD. The pilot must ensure that the current heading will result in a capture of the selected course. If the CDI is one dot or less from center, the autopilot will enter the capture mode when the NAV button is pressed and annunciate VOR or GPS in green on the PFD.

END OF CHECKLIST

4A.6.13 APPROACH & LANDING

Approach:

NOTE

If the landing mass exceeds 1216 kg (2681 lb), the landing constitutes an abnormal operating procedure. Refer to Section 4B.8.

1. Safety harnesses . . . . check fastened and tightened
2. Controls . . . . no interference by foreign objects
3. Landing light . . . . as required
4. Fuel pumps . . . . ON
5. Parking brake . . . . check released
6. Trim . . . . as required

Before Landing:

7. Airspeed . . . . see table below:

Flaps	940 kg (2072 lb)	1000 kg (2205 lb)	1080 kg (2381 lb)	1160 kg (2557 lb)	1216 kg (2681 lb)
T/O	68 KIAS	70 KIAS	73 KIAS	76 KIAS	77 KIAS
LDG	66 KIAS	69 KIAS	72 KIAS	74 KIAS	76 KIAS

8. FLAPS . . . . as required
9. POWER lever . . . . as required
10. Trim . . . . as required

CONTINUED

11. Final approach speed . . . . see table below:

Flaps	940 kg (2072 lb)	1000 kg (2205 lb)	1080 kg (2381 lb)	1160 kg (2557 lb)	1216 kg (2681 lb)
LDG	66 KIAS	69 KIAS	72 KIAS	74 KIAS	76 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

GFC700 Operation During Approach

a) VOR:

1. Navigation source . . . . select VOR using CDI button on PFD
2. Course bearing pointer . . . . set using course knob
3. Intercept heading . . . . establish in HDG or ROL mode (if required)
4. Mode controller . . . . select APR on mode controller
5. Green or white VAPP annunciation . . . . note on PFD
6. Vertical mode and reference . . . . select on mode controller

NOTE

If the Course Deviation Indicator (CDI) is greater than one dot from center, the autopilot will arm the VAPP mode and indicate VAPP in white on the PFD. The pilot must ensure that the current heading will result in a capture of the selected course. If the CDI is one dot or less from center, the autopilot will enter the capture mode when the VAPP button is pressed and annunciate VAPP in green on the PFD.

END OF CHECKLIST

b) ILS:

1. Navigation source . . . . select LOC using CDI button on PFD
2. Course bearing pointer . . . . set using course knob
3. Intercept heading . . . . establish in HDG or ROL mode (if required)
4. Mode controller . . . . select APR on mode controller
5. Green or white LOC and GS annunciation . . note on PFD
6. Vertical mode and reference . . . . select on mode controller

NOTE

When the selected navigation source is a valid ILS, glideslope coupling is automatically armed when tracking the localizer. The glideslope cannot be captured until the localizer is captured. The autopilot can capture the glideslope from above or below the glideslope.

END OF CHECKLIST

c) GPS:

1.	Navigation source	select GPS using CDI button on PFD
2.	Approach	load in FMS and ACTIVATE
3.	Intercept heading	establish in HDG or ROL mode (if required)
4.	Mode controller	select APR on mode controller
5.	Green or white GPS annunciation	note on PFD
6.	Vertical mode and reference	select on mode controller

END OF CHECKLIST

d) Back Course (BC):

1. Navigation source . . . . select LOC using CDI button on PFD
2. Course bearing pointer . . . . set to ILS front course using course knob
3. Intercept heading . . . . establish in HDG or ROL mode (if required)
4. Mode controller . . . . select NAV on mode controller
5. Green or white BC annunciation . . . . note on PFD

NOTE

The course pointer must be at least 115° from the current magnetic heading before BC will be annunciated in the lateral mode field. Until that point, LOC will be annunciated.

Selecting NAV mode for back course approaches inhibits the glideslope from coupling.

6. Vertical mode and reference . . . . select on mode controller

END OF CHECKLIST

4A.6.14 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

GFC700 Operation During Go-Around

1. Control stick . . . . GRASP FIRMLY
2. GA button . . . . PUSH - Verify GA/GA on PFD in lateral and vertical mode fields

NOTE

After the GA button is pressed, the autopilot disconnects and the flight director indicates a 7° pitch up attitude.

3. Balked landing . . . . execute
4. Missed approach procedure . . . . execute (as applicable)
5. Altitude preselect . . . . set to appropriate altitude

At an Appropriate Safe Altitude:

6. Autopilot mode controller . . . . select appropriate lateral and vertical mode on controller
7. Autopilot . . . . RE-ENGAGE if desired

NOTE

If the missed approach procedure requires tracking the localizer outbound from the airport, use NAV mode to prevent inadvertent coupling to glideslope.

END OF CHECKLIST

4A.6.15 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.6.16 ENGINE SHUT-DOWN

1. Parking brake . . . . set
2. POWER lever . . . . up to 10 % load for 1 minute
3. Engine/System Page . . . . 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 G1000 engine indications are red X'd 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.6.17 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.6.18 PARKING

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

END OF CHECKLIST

4A.6.19 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.6.20 REFUELING

CAUTION

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

4A.6.21 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

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.6.13 - APPROACH & LANDING.

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

CONTINUED

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 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.3 ENGINE INSTRUMENT INDICATIONS OUTSIDE OF GREEN RANGE ON THE G1000

4B.3.1 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 3.5.6 - DEFECTIVE RPM REGULATING SYSTEM.

3. Land at the nearest suitable airfield.

END OF CHECKLIST

4B.3.2 COOLANT TEMPERATURE

(a) High Coolant Temperature

Proceed according to:

3.2.2 - ENG TEMP

(b) Low Coolant Temperature

- Check G1000 for COOL LVL 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 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 3.5.3 - ENGINE TROUBLESHOOTING IN FLIGHT.

END OF CHECKLIST

4B.3.3 OIL TEMPERATURE

a) High Oil Temperature

Proceed according to:

3.2.3 - OIL TEMP

(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.3.4 OIL PRESSURE

(a) High Oil Pressure

- Check oil temperature.
- Check coolant temperature.

If the Temperatures are Within the Green Range:

- Expect false oil pressure indication. Keep monitoring temperatures.

If the Temperatures are Outside of the Green Range:

- Reduce power.

WARNING

Land at the nearest suitable airfield. Prepare for an engine failure in accordance with 3.5.4 - ENGINE FAILURE IN FLIGHT.

(b) Low Oil Pressure

Proceed according to:

3.2.4 - OIL PRES

END OF CHECKLIST

4B.3.5 GEARBOX TEMPERATURE

High Gearbox Temperature

Proceed according to:

3.2.5 - GBOX TEMP

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 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.3.6 FUEL TEMPERATURE

(a) High Fuel Temperature

Proceed according to:

3.2.6 - FUEL TEMP

(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 3.5.4 - ENGINE FAILURE IN FLIGHT.

END OF CHECKLIST

4B.3.7 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 CAUTION (4B.4.5 - LOW VOLTS) Is Still Indicated on the G1000:

- Follow procedure in 3.2.9 - ALTN FAIL.

END OF CHECKLIST

4B.4 CAUTION-ALERTS ON THE G1000

The G1000 provides the following CAUTION-alerts on the PFD in the ALERT area.

4B.4.1 CAUTIONS / GENERAL

CHARACTERISTICS	* Yellow color coded text. * Single warning chime tone of 1.5 seconds duration.

4B.4.2 ECU A FAIL

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

(a) ECU A Caution on the Ground

- 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. VOTER switch . . . . check AUTO
2. If the ECU caution remains . . . . land at the next suitable airfield

NOTE

If additional engine problems are observed refer to 3.5.3 - ENGINE TROUBLESHOOTING IN FLIGHT.

END OF CHECKLIST

4B.4.3 ECU B FAIL

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

(a) ECU B Caution on the Ground

- 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'.

1. VOTER switch . . . . check AUTO
2. If the ECU caution remains . . . . land at the next suitable airfield

NOTE

If additional engine problems are observed refer to 3.5.3 - ENGINE TROUBLESHOOTING IN FLIGHT.

END OF CHECKLIST

4B.4.4 FUEL LOW

FUEL 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 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 3.9.1 - 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.4.5 LOW VOLTAGE CAUTION (LOW VOLTS)

VOLTS LOW	Bus voltage is too low (less than 25 volts).

Possible reasons are:

- A fault in the power supply.

Continue with 4B.3.7 - VOLTAGE.

END OF CHECKLIST

4B.4.6 COOL LVL

COOL LVL	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 4B.3.2 - 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.4.7 PITOT FAIL / HT OFF

PITOT FAIL	Pitot heating system has failed.
PITOT HT OFF	Pitot heating system is OFF.

1. PITOT HEAT . . . . check ON / as required

NOTE

The Pitot heating caution message is displayed when the Pitot heating is switched OFF, or when there is a failure of the Pitot heating system. Prolonged operation of the Pitot heating on the ground can also cause the Pitot heating caution message to be displayed. In this case it indicates the activation of the thermal switch, which prevents overheating of the Pitot heating system on the ground. This is a normal function of the system. After a cooling period, the heating system will be switched on again automatically.

If in Icing Conditions:

2. Expect loss of airspeed indication.
3. Leave icing zone / refer to 3.11.1 - ICING.

END OF CHECKLIST

4B.4.8 LOI

LOI	GPS integrity is insufficient for the current phase of flight.

(a) Enroute, Oceanic, Terminal, or Initial Approach Phase of Flight

If the LOI annunciation is displayed in the enroute, oceanic, terminal, or initial approach phase of flight, continue to navigate using the GPS equipment or revert to an alternate means of navigation other than the G1000 GPS receiver appropriate to the route and phase of flight. When continuing to use GPS navigation, position must be verified every 15 minutes using the G1000 VOR/ILS receiver or another IFR-approved navigation system.

(b) Final Approach

If the LOI annunciation is displayed while on the final approach segment, GPS based navigation will be aborted.

END OF CHECKLIST

4B.4.9 AHRS ALIGNING - KEEP WINGS LEVEL

AHRS ALIGN: Keep Wings Level	The AHRS (Attitude and Heading Reference System) is aligning.

Keep wings level using standby attitude indicator.

END OF CHECKLIST

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:

940 kg (2072 lb)	**1000 kg (2205 lb)**	**1080 kg (2381 lb)**	**1160 kg (2557 lb)**	**1216 kg (2681 lb)**	**up to 1280 kg (2822 lb)**
71 KIAS	73 KIAS	78 KIAS	81 KIAS	82 KIAS	83 KIAS

NOTE

If the landing mass exceeds 1216 kg (2681 lb), the landing constitutes an abnormal operating procedure. Refer to Section 4B.8 - LANDING WITH HIGH LANDING MASS.

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:

940 kg (2072 lb)	1000 kg (2205 lb)	1080 kg (2381 lb)	1160 kg (2557 lb)	1216 kg (2681 lb)	up to 1280 kg (2822 lb)
68 KIAS	70 KIAS	73 KIAS	76 KIAS	77 KIAS	78 KIAS

NOTE

If the landing mass exceeds 1216 kg (2681 lb), the landing constitutes an abnormal operating procedure. Refer to Section 4B.8 - LANDING WITH HIGH LANDING MASS.

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 FAILURES IN THE AUTOPILOT SYSTEM

4B.6.1 AUTOPILOT DISCONNECT (yellow AP flashing on PFD)

1. AP DISC switch . . . . DEPRESS AND RELEASE (to cancel disconnect tone)

2. Pitch trim . . . . retrim if necessary, using the trim wheel

NOTE

The autopilot disconnect may be accompanied by a red boxed PTCH (pitch) or ROLL on the PFD, indicating the axis which has failed. The autopilot cannot be re-engaged with either of these annunciations present.

END OF CHECKLIST

4B.6.2 AUTOPILOT OVERSPEED RECOVERY (yellow MAXSPD on PFD)

1. Power lever . . . . reduce power

When Overspeed Condition is Corrected:

2. Autopilot . . . . reselect VERTICAL MODE (if necessary)

NOTE

Overspeed recovery mode provides a pitch up command to decelerate the airplane at or below the maximum autopilot operating speed (165 KIAS). Overspeed recovery is not active in altitude hold (ALT) or glideslope (GS) modes.

END OF CHECKLIST

4B.6.3 LOSS OF NAVIGATION INFORMATION (Yellow VOR, VAPP, GPS or LOC flashing on PFD)

NOTE

If a navigation signal is lost while the autopilot is tracking it, the autopilot will roll the airplane wings level and default to roll mode (ROL).

1. Autopilot . . . . select HDG on mode controller
2. Nav source . . . . select a valid NAV source
3. Autopilot . . . . select NAV on mode controller

If on an Instrument Approach at the Time the Navigation Signal Is Lost:

4. Missed approach procedure . . . . EXECUTE (as applicable)

END OF CHECKLIST

4B.6.4 AUTOPILOT OUT OF TRIM (Yellow ←AIL, →AIL, ↑ELE, ↓ELE on PFD)

For ↑ELE, or ↓ELE Indication:

WARNING

Do not attempt to overpower the autopilot in the event of a pitch mistrim. The autopilot servos will oppose pilot input and will cause pitch trim to run opposite the direction of pilot input. This will lead to a significant out-of-trim condition resulting in large control stick force when disengaging the autopilot.

CAUTION

Be prepared for significant sustained control forces in the direction of the annunciation arrow. For example, an arrow pointing down indicates nose down control stick force will be required upon autopilot disconnect.

NOTE

Momentary illumination (5 sec or less) of the ↑ELE, or ↓ELE indication during configuration or large airspeed changes is normal.

If the Annunciation Remains:

1. AP DISC switch .... DEPRESS AND HOLD
   while grasping control stick firmly
2. Airplane attitude .... maintain/regain airplane control
   use standby attitude indicator
   if necessary

CONTINUED

3. Pitch trim . . . . retrim if necessary, using the trim wheel
4. AUTOPILOT circuit breaker . . . . PULL
5. AP DISC switch . . . . RELEASE

WARNING

Following an autopilot, autotrim or manual electric trim system malfunction, do not engage the autopilot or operate the manual electric trim until the cause of the malfunction has been corrected.

END OF CHECKLIST

For ←AIL, AIL→ Indication:

1. Rudder trim . . . . Center slip/skid indicator

NOTE

Observe the maximum fuel imbalance limitation.

If Annunciation Remains:

2. Control stick . . . . GRASP FIRMLY with both hands

CAUTION

Be prepared for sustained control forces in the direction of the annunciation arrow. For example, an ←AIL indicates that sustained right wing down control stick force will be required upon autopilot disconnect.

3. AP DISC switch . . . . DEPRESS
4. Autopilot . . . . RE-ENGAGE if lateral trim is re-established

END OF CHECKLIST

4B.6.5 FLASHING YELLOW MODE ANNUNCIATION

NOTE

Abnormal mode transitions (those not initiated by the pilot or by normal sequencing of the autopilot) will be annunciated by flashing the disengaged mode in yellow on the PFD. Upon loss of a selected mode, the system will revert to the default mode for the affected axis, either ROL or PIT. After 10 seconds, the new mode (PIT or ROL) will be annunciated in green.

Loss of Selected Vertical Mode (FLC, VS, ALT, GS)

1. Autopilot mode controls .... select another vertical mode

If on an Instrument Approach:

2. Autopilot .... DISCONNECT and continue manually or execute missed approach

END OF CHECKLIST

Loss of Selected Lateral Mode (HDG, NAV, GPS, LOC, VAPP, BC):

1. Autopilot mode controls .... select another lateral mode

If on an Instrument Approach:

2. Autopilot .... DISCONNECT and continue manually or execute missed approach

END OF CHECKLIST

4B.6.6 EFFECTS OF G1000 LOSSES UPON AUTOPILOT OPERATION

G 1000 System Loss	Effect upon Autopilot Operation
AHRS	The autopilot disconnects and autopilot flight director is inoperative. Manual electric trim is available.
HDG function of AHRS	The autopilot will remain engaged with the loss of the HDG mode.
MFD	The autopilot will remain engaged with limited functionality.
PFD	The autopilot disconnects and autopilot and flight director are inoperative. Manual electric trim is available.
GIA No. 1	The autopilot disconnects and autopilot, flight director and manual electric trim are inoperative.
GIA No. 2	The autopilot disconnects and autopilot and manual electric trim are inoperative. Flight director is available.
GPS No. 1 and 2	The autopilot and flight director operates in NAV modes only (LOC, BC, VOR, VAPP) with reduced accuracy.
ADC	The autopilot disconnects and autopilot is inoperative. The flight director is available except for air data modes (ALT, VS, FLC). Manual electric trim is available.

4B.7 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 . . . . disengage (check)
4. PFD / 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.8 LANDING WITH HIGH LANDING MASS

NOTE

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

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

Approach speed . . . . 77 KIAS up to 1280 kg (2822 lb), Flaps LDG

WARNING

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

END OF CHECKLIST

Intentionally left blank.

CHAPTER 5
PERFORMANCE

Page

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 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.

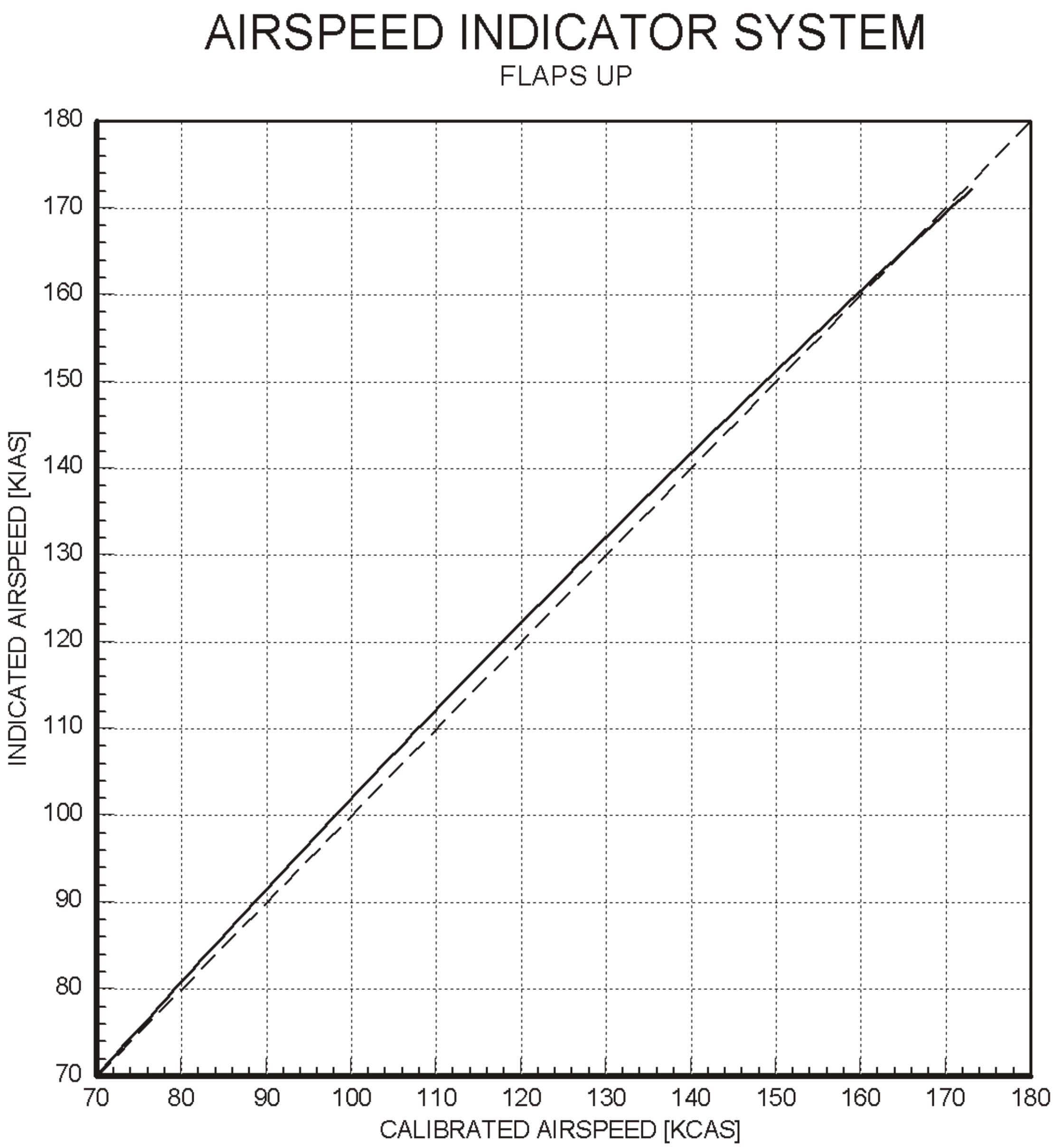
Where appropriate, any flight performance degradation resulting from the absence of wheel fairings is given as a percentage.

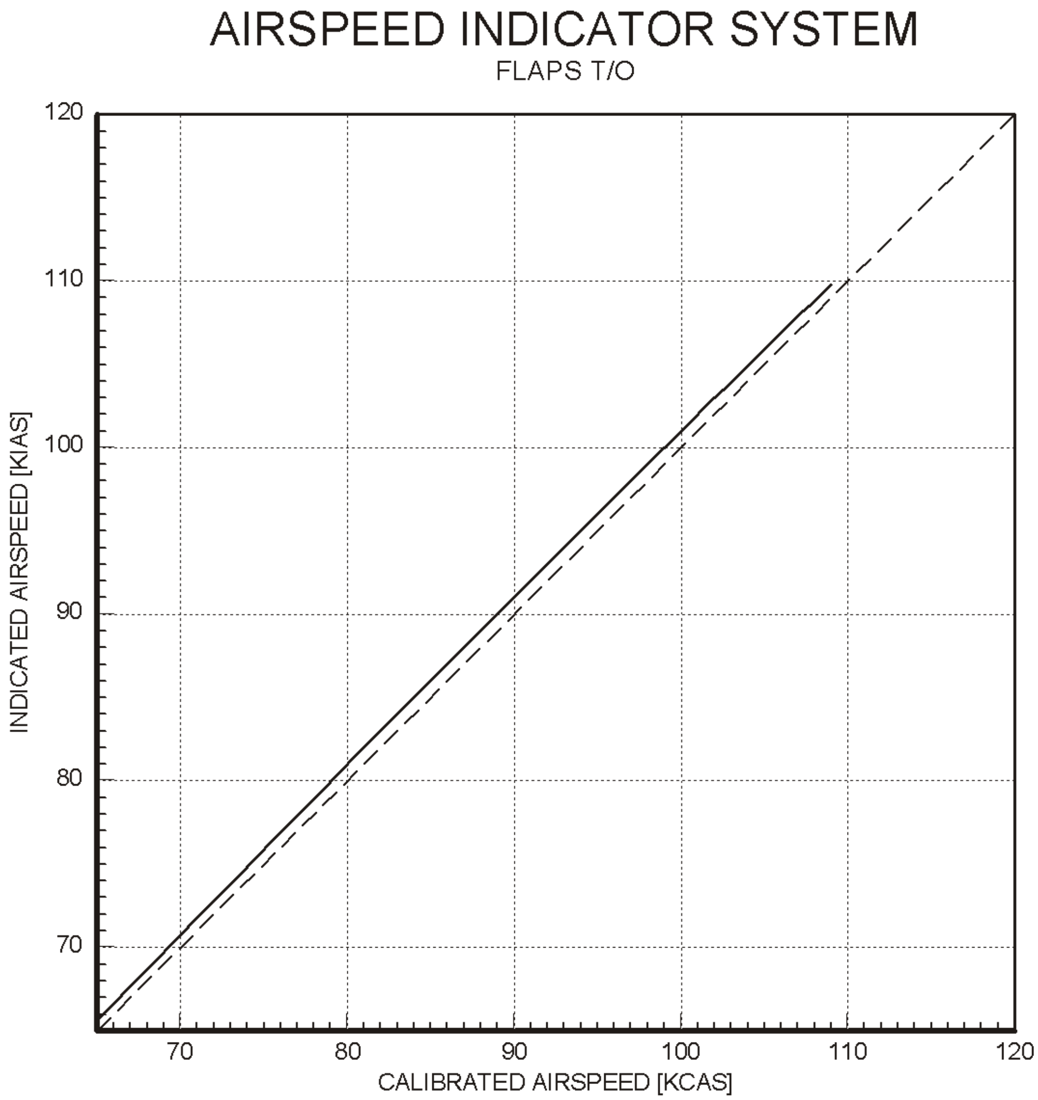
5.2 USE OF THE PERFORMANCE TABLES AND DIAGRAMS

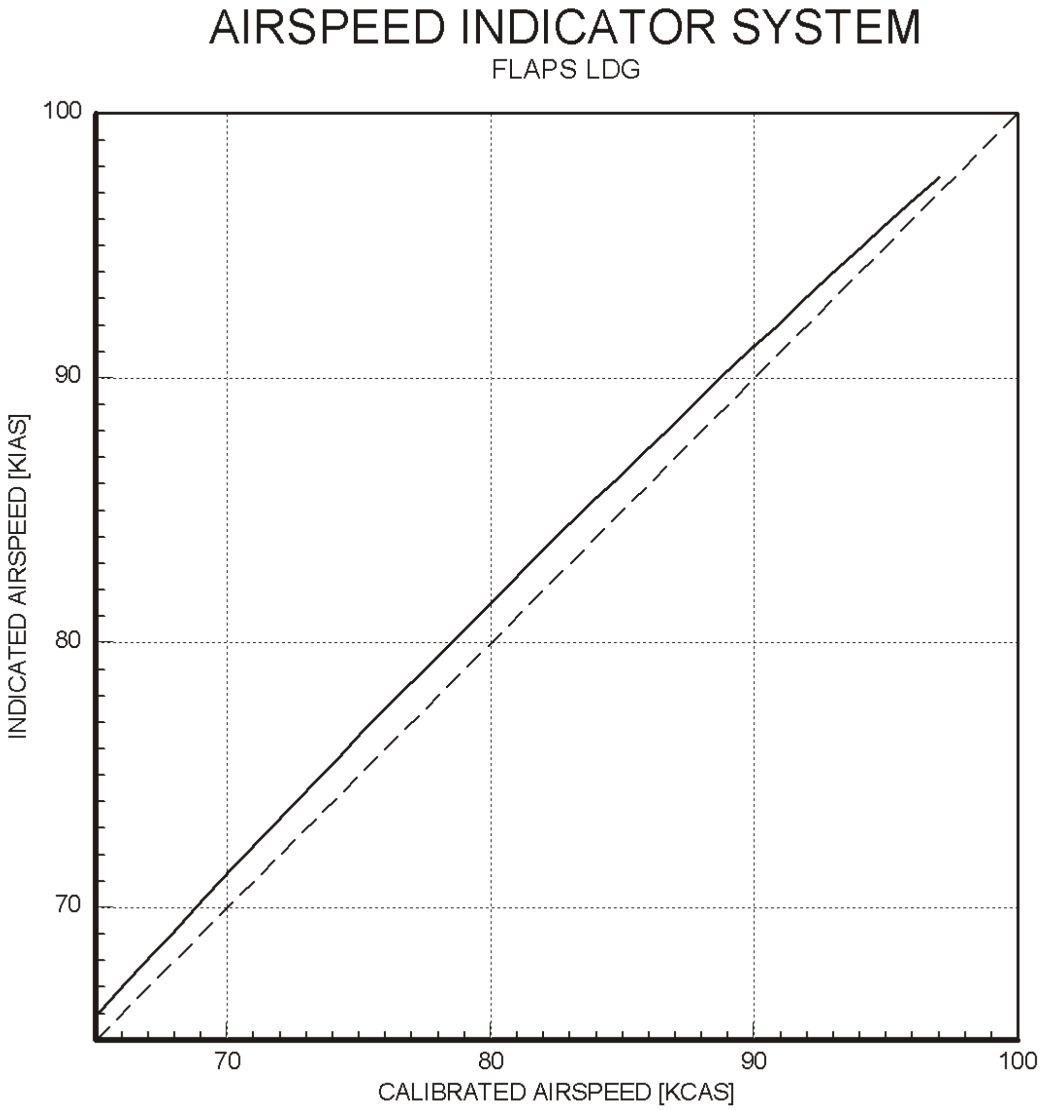
In order to illustrate the influence of a number of different variables, the performance data is reproduced in the form of tables or diagrams. These contain sufficiently detailed information so that conservative values can be selected and used for the determination of adequate performance data for the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

5.3 PERFORMANCE TABLES AND DIAGRAMS

5.3.1 AIRSPEED CALIBRATION



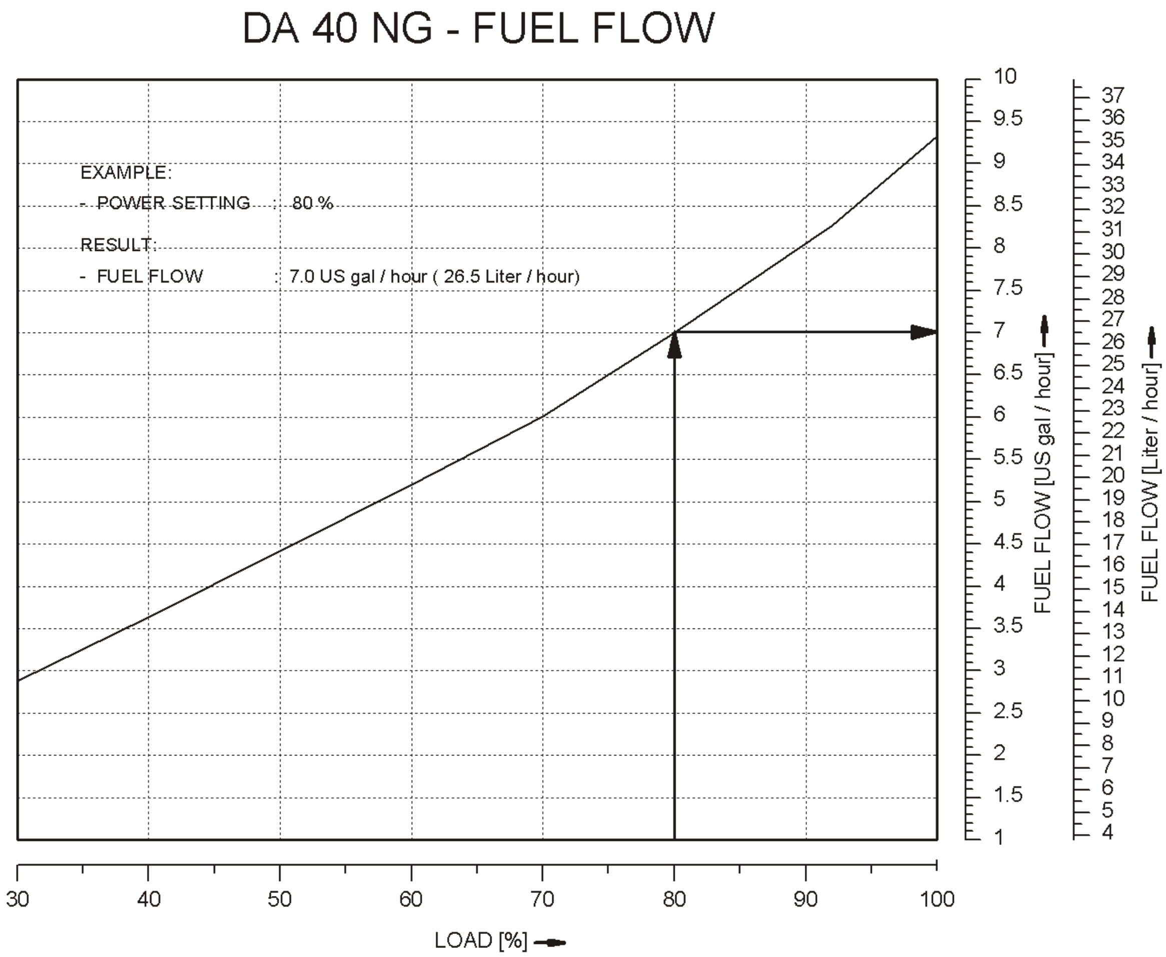

AIRSPEED INDICATOR SYSTEM
FLAPS T/O
INDICATED AIRSPEED [KIAS]
CALIBRATED AIRSPEED [KCAS]
70
80
90
100
110
120


AIRSPEED INDICATOR SYSTEM
FLAPS LDG
100
90
80
70
INDICATED AIRSPEED [KIAS]
70
80
90
100
CALIBRATED AIRSPEED [KCAS]

5.3.2 FUEL FLOW DIAGRAM

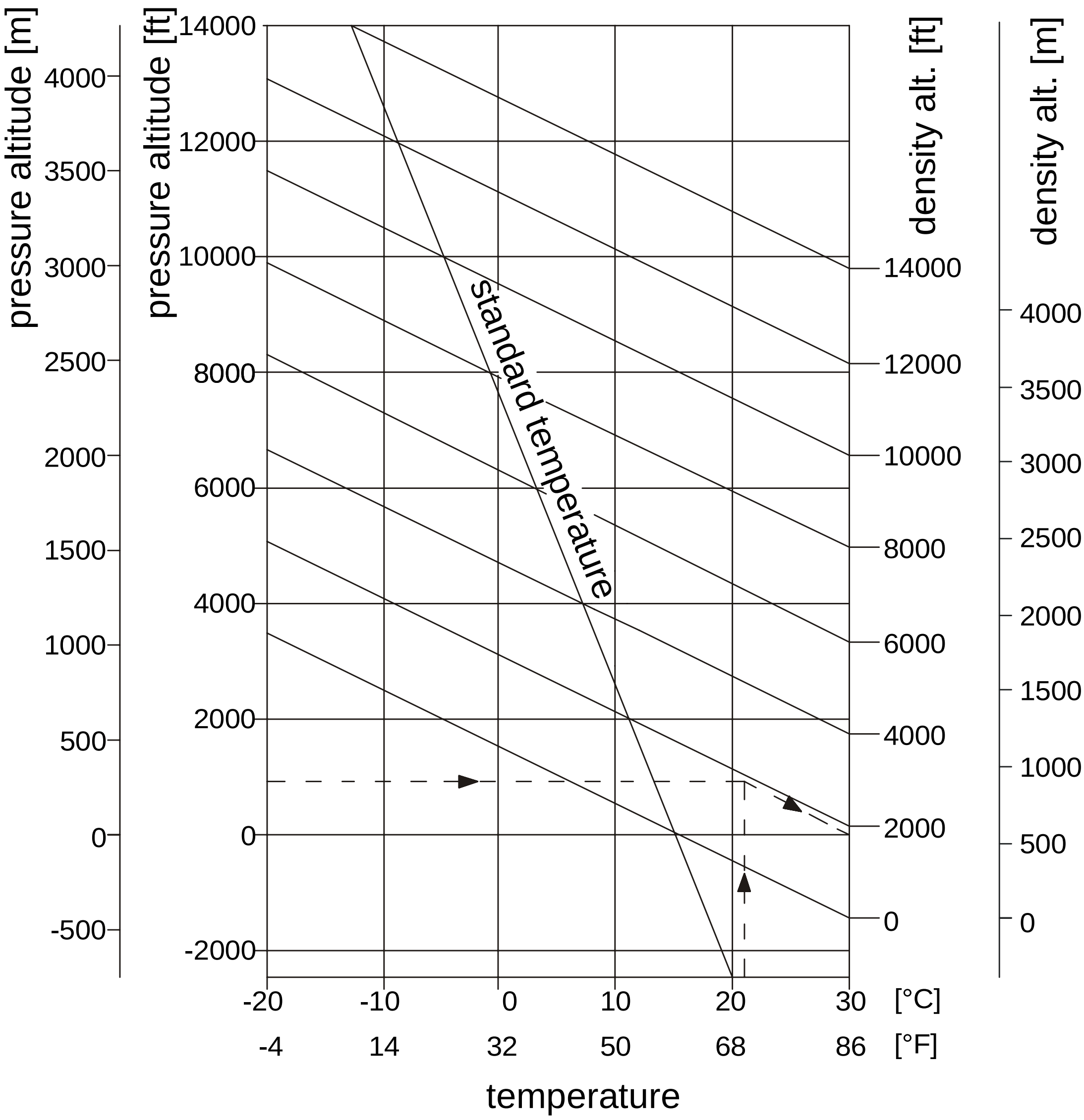
NOTE

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.



5.3.3 PRESSURE ALTITUDE - DENSITY ALTITUDE

Conversion from pressure altitude to density altitude.



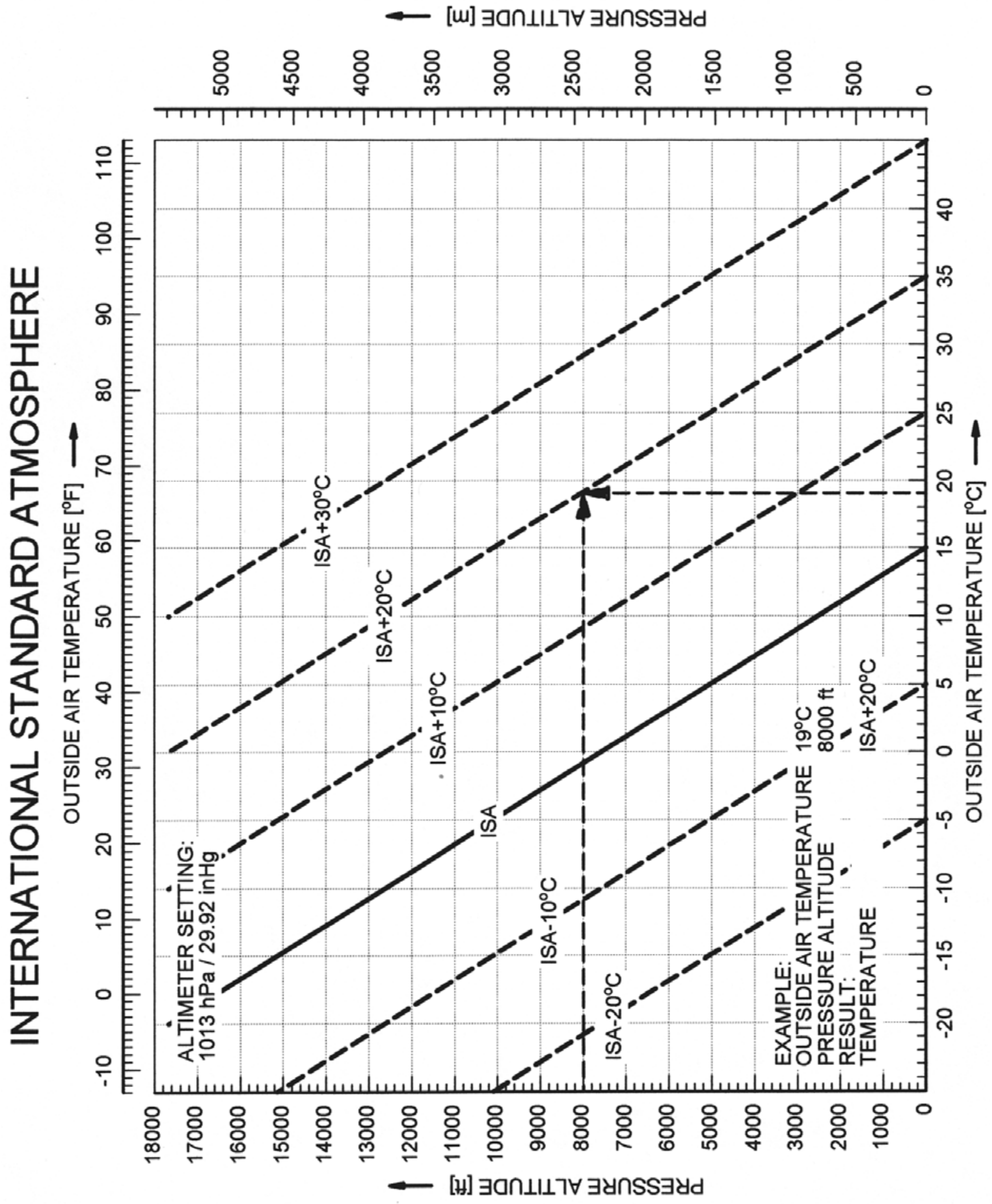
Example: 1. Set 1,013.25 hPa on altimeter and read pressure altitude (900 ft).

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

NOTE

Close to a stall, the disturbed air flow has an influence on the airspeed calibration and therefore on the indicated airspeed. Magnitude and direction of the airspeed error is dependent on the flap setting.

Mass 1280 kg (2822 lb)		Bank Angle 0°	30°	45°	60°
Flaps	UP	66 KIAS	68 KIAS	74 KIAS	88 KIAS
	T/O	62 KIAS	65 KIAS	71 KIAS	84 KIAS
	LDG	60 KIAS	63 KIAS	69 KIAS	82 KIAS

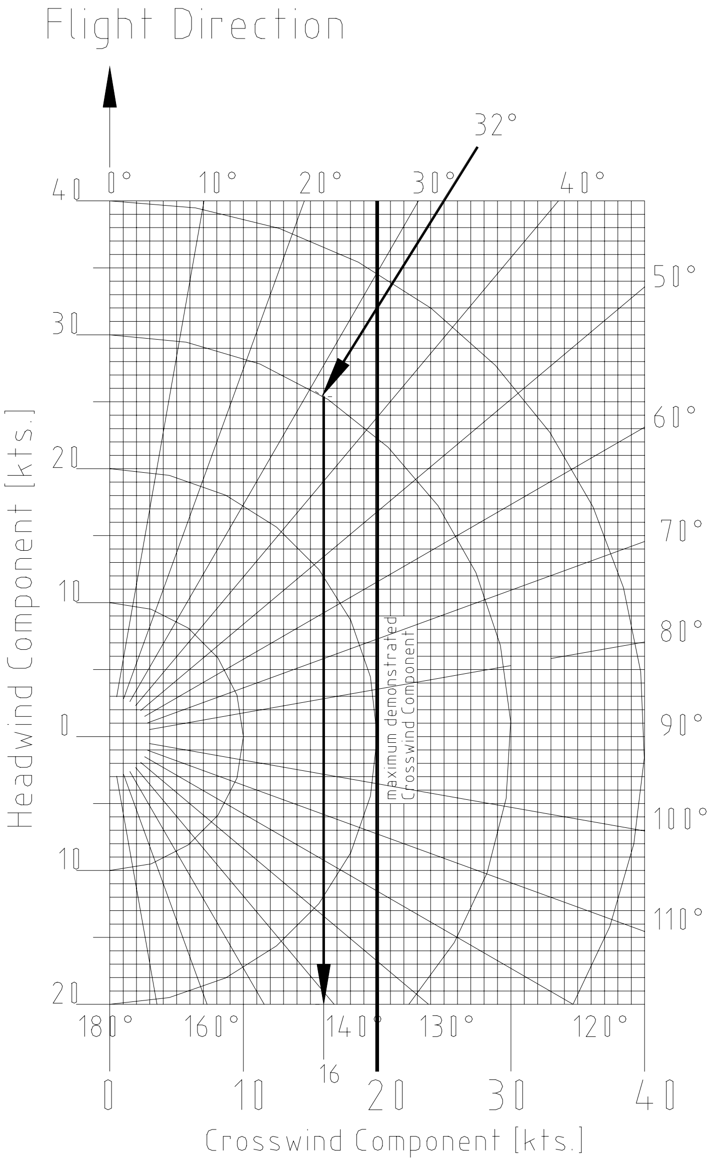
Mass 1216 kg (2681 lb)		Bank Angle 0°	30°	45°	60°
Flaps	UP	64 KIAS	67 KIAS	73 KIAS	87 KIAS
	T/O	60 KIAS	64 KIAS	69 KIAS	82 KIAS
	LDG	59 KIAS	62 KIAS	68 KIAS	81 KIAS

Mass 1080 kg (2381 lb)		Bank Angle 0°	30°	45°	60°
Flaps	UP	60 KIAS	63 KIAS	69 KIAS	82 KIAS
	T/O	56 KIAS	60 KIAS	66 KIAS	78 KIAS
	LDG	57 KIAS	59 KIAS	64 KIAS	76 KIAS

Mass 980 kg (2161 lb)		Bank Angle			
		0°	30°	45°	60°
Flaps	UP	57 KIAS	58 KIAS	63 KIAS	75 KIAS
	T/O	54 KIAS	57 KIAS	62 KIAS	74 KIAS
	LDG	55 KIAS	55 KIAS	60 KIAS	71 KIAS

Mass 940 kg (2072 lb)		Bank Angle			
		0°	30°	45°	60°
Flaps	UP	55 KIAS	57 KIAS	62 KIAS	74 KIAS
	T/O	53 KIAS	56 KIAS	61 KIAS	72 KIAS
	LDG	54 KIAS	54 KIAS	58 KIAS	69 KIAS

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
- Nose wheel lift-off . . . . airspeed see table below:

940 kg (2072 lb)	1000 kg (2205 lb)	1100 kg (2425 lb)	1200 kg (2646 lb)	1280 kg (2822 lb)
56 KIAS	58 KIAS	61 KIAS	64 KIAS	67 KIAS

- Airspeed for initial climb . . . . . . airspeed see table below:

940 kg (2072 lb)	1000 kg (2205 lb)	1100 kg (2425 lb)	1200 kg (2646 lb)	1280 kg (2822 lb)
62 KIAS	65 KIAS	67 KIAS	70 KIAS	72 KIAS

- Runway . . . . level, asphalt surface

Values for ISA and MSL, at 1280 kg (2822 lb)	
Take-off distance over a 50 ft (15 m) obstacle	584 m (1916 ft)
Take-off ground roll	389 m (1276 ft)

NOTE

The rate of climb with a power setting of 100 % is 712 ft/min (3.61 m/s) at MSL and ISA standard conditions.

WARNING

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

CAUTION

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.

CAUTION

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

NOTE

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

- grass up to 5 cm (2 in) long: 10 % increase in take-off roll.
- grass 5 to 10 cm (2 to 4 in) long: 30 % increase in take-off roll.
- grass longer than 10 cm (4 in): at least 45 % increase in take-off roll.

NOTE

For wet grass, an additional 20 % increase in take-off ground roll must be expected.

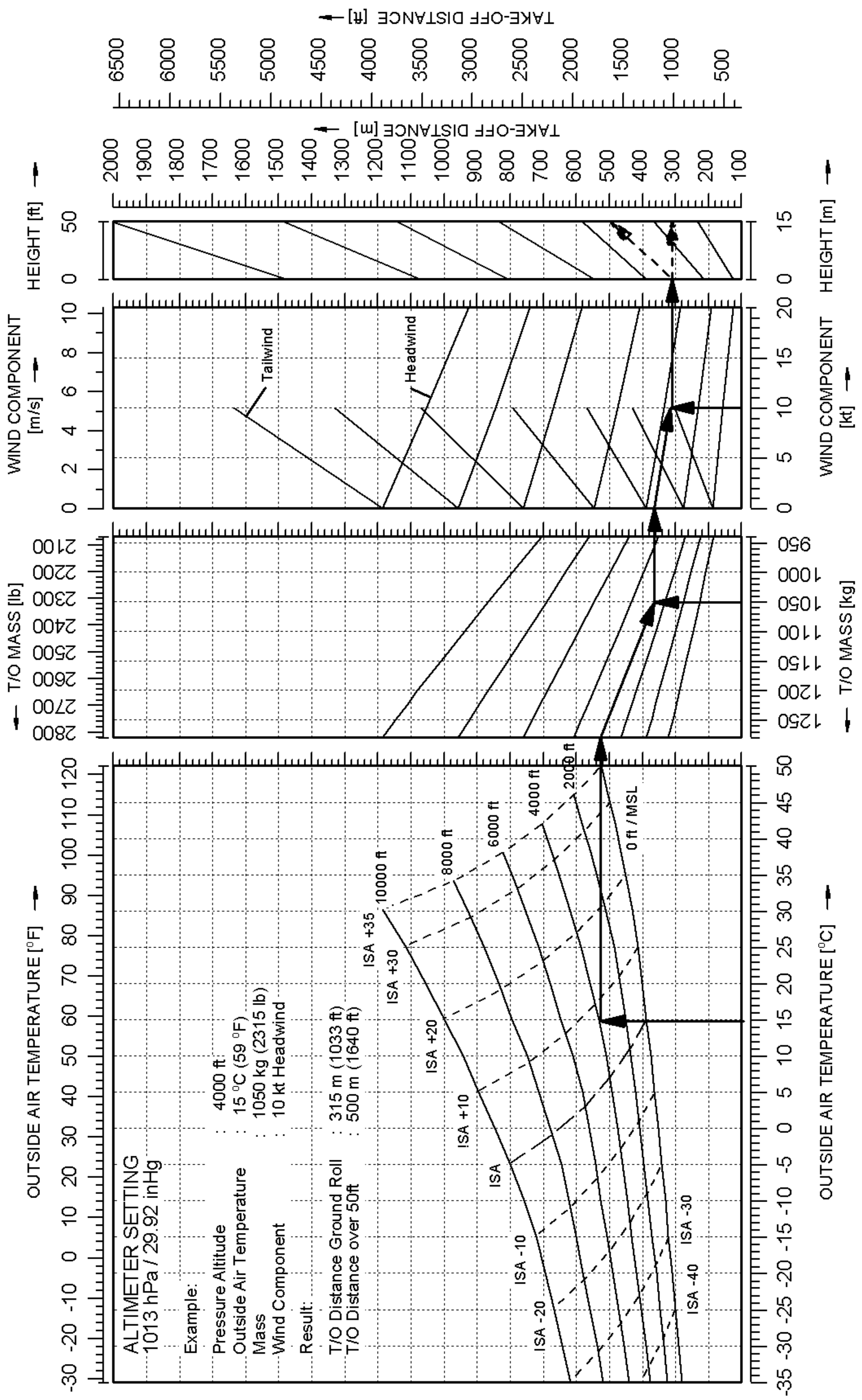
NOTE

For soft ground, an additional increase in take-off ground roll of at least 50 % must be expected.

NOTE

An uphill slope of 2 % (2 m per 100 m or 2 ft per 100 ft) results in an increase in the take-off distance of approximately 17 %. The effect on the take-off roll can be greater.

DA 40 NG - TAKE-OFF DISTANCES



5.3.8 CLIMB PERFORMANCE - TAKE-OFF CLIMB

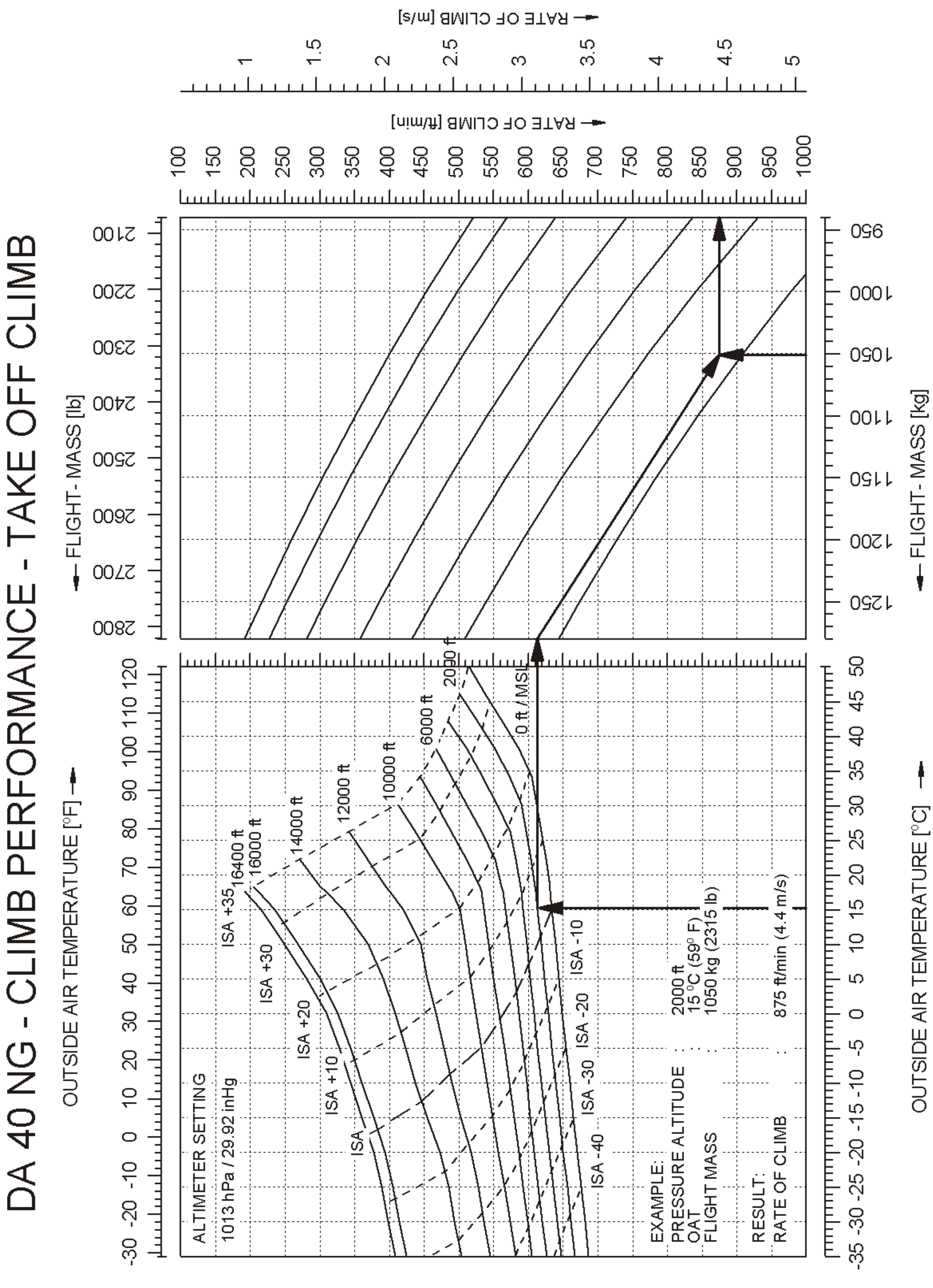
Conditions:
- Power lever . . . . 92% or max. 2100 RPM
- Flaps . . . . T/O
- Airspeed . . . . 72 KIAS

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:

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

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


DA 40 NG - CLIMB PERFORMANCE - TAKE OFF CLIMB
OUTSIDE AIR TEMPERATURE [°F]
FLIGHT - MASS [lb]
RATE OF CLIMB [ft/min]
RATE OF CLIMB [m/s]
FLIGHT - MASS [kg]
OUTSIDE AIR TEMPERATURE [°C]
ALTIMETER SETTING
1013 hPa / 29.92 inHg
16400 ft
16000 ft
14000 ft
12000 ft
10000 ft
6000 ft
2000 ft
0 ft / MSL
ISA +35
ISA +30
ISA +20
ISA +10
ISA
ISA -10
ISA -20
ISA -30
ISA -40
EXAMPLE:
PRESSURE ALTITUDE : 2000 ft
OAT : 15 °C (59° F)
FLIGHT MASS : 1050 kg (2315 lb)
RESULT:
RATE OF CLIMB : 875 ft/min (4.4 m/s)

5.3.9 CLIMB PERFORMANCE - CRUISE CLIMB

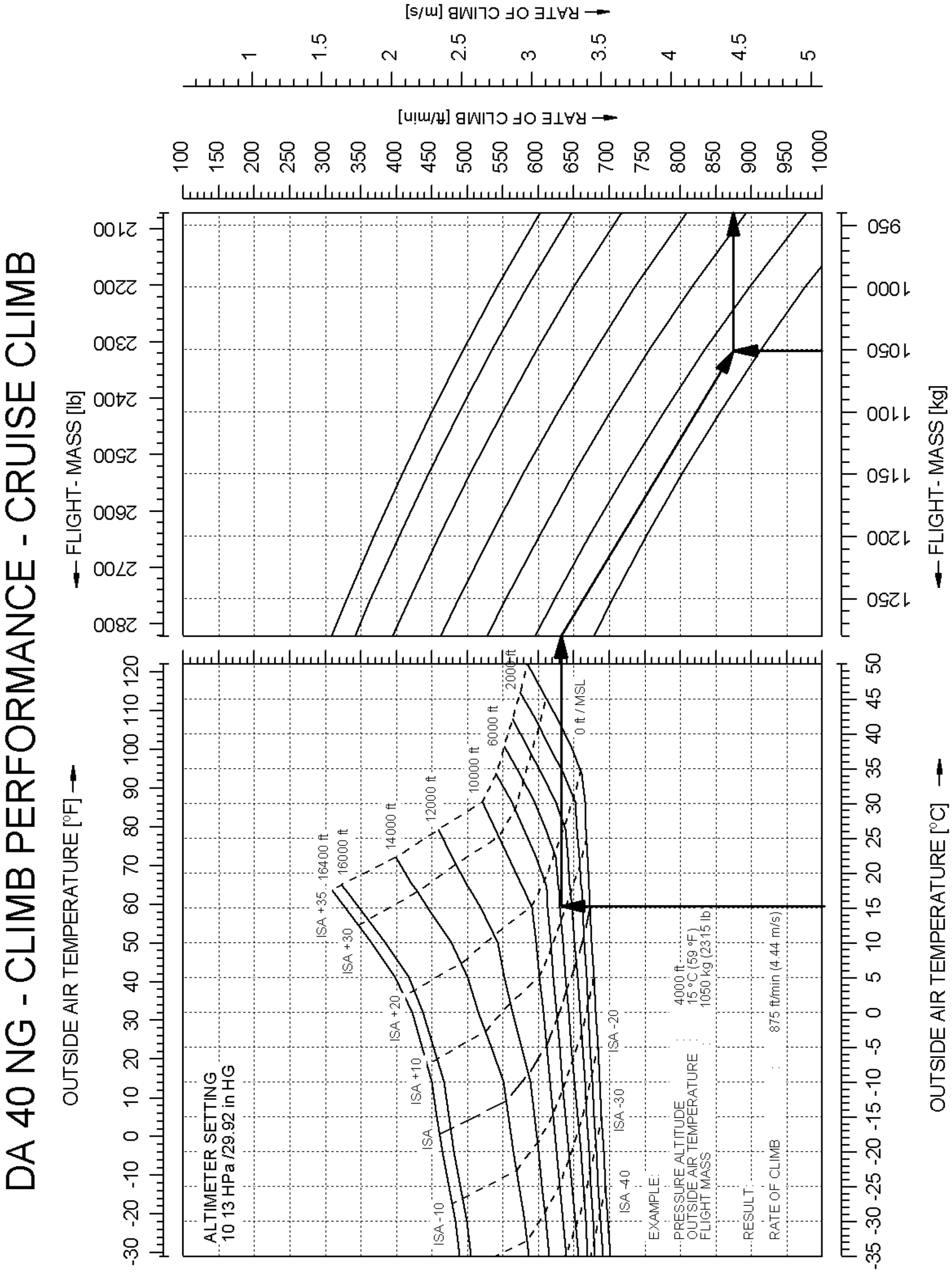
Conditions:
- Power lever . . . . 92% or max. 2100 RPM
- Flaps . . . . UP
- Airspeed . . . . 88 KIAS

NOTE

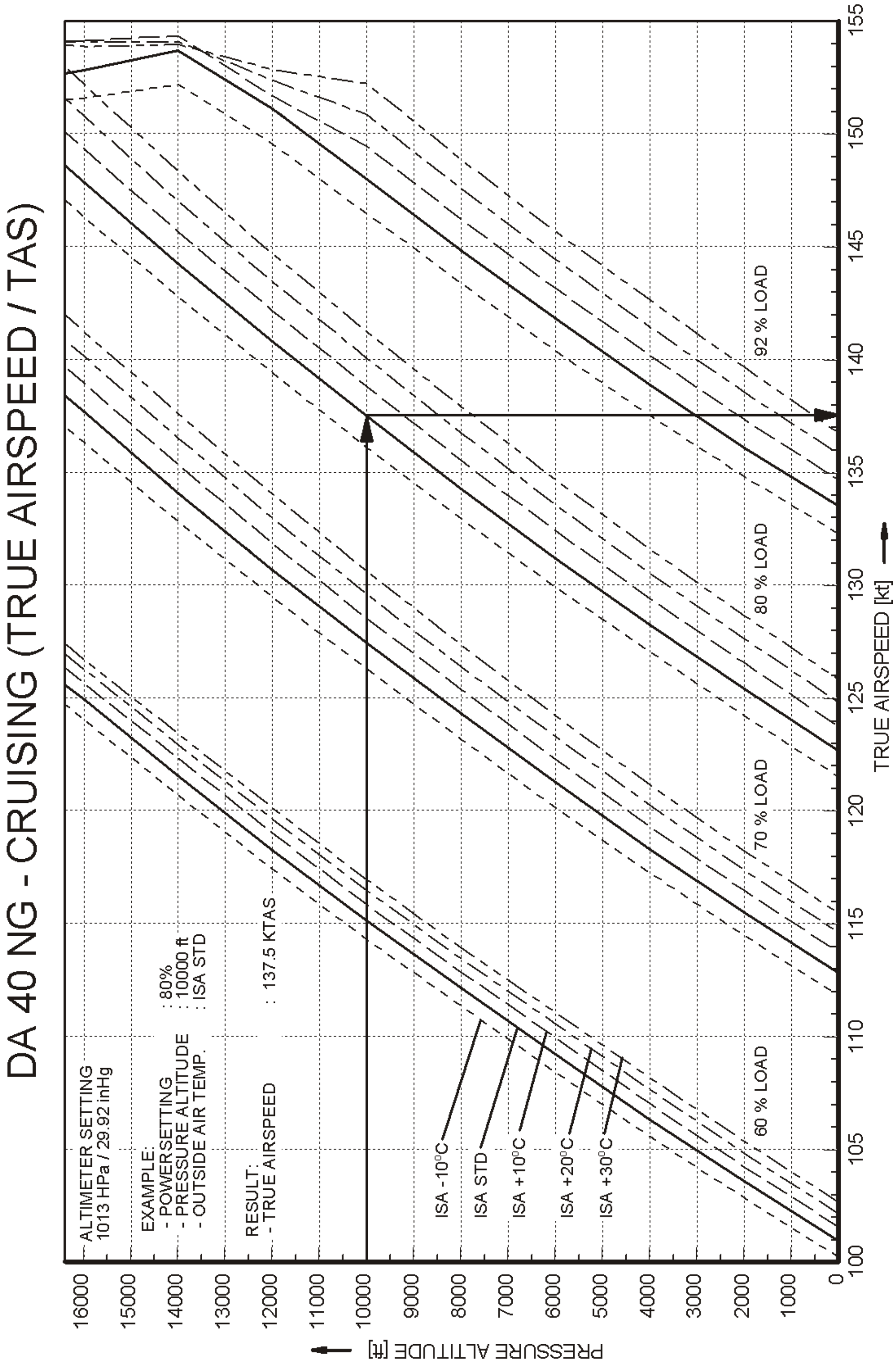
The graph on the following page shows the *rate* of climb. The *gradient* of climb cannot easily be determined with a graph, but it can be calculated using the following formulae:

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

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


DA 40 NG - CLIMB PERFORMANCE - CRUISE CLIMB
RATE OF CLIMB [m/s]
1 1.5 2 2.5 3 3.5 4 4.5 5
RATE OF CLIMB [ft/min]
100 150 200 250 300 350 400 450 500 550 600 650 700 750 800 850 900 950 1000
FLIGHT - MASS [lb]
2100 2200 2300 2400 2500 2600 2700 2800
FLIGHT - MASS [kg]
950 1000 1050 1100 1150 1200 1250
OUTSIDE AIR TEMPERATURE [°F]
-30 -20 -10 0 10 20 30 40 50 60 70 80 90 100 110 120
OUTSIDE AIR TEMPERATURE [°C]
-35 -30 -25 -20 -15 -10 -5 0 5 10 15 20 25 30 35 40 45 50
ALTIMETER SETTING
10 13 HPa /29.92 in HG
16400 ft
16000 ft
14000 ft
12000 ft
10000 ft
6000 ft
2000 ft
0 ft / MSL
ISA +35
ISA +30
ISA +20
ISA +10
ISA
ISA -10
ISA -20
ISA -30
ISA -40
EXAMPLE:
PRESSURE ALTITUDE : 4000 ft
OUTSIDE AIR TEMPERATURE : 15 °C (59 °F)
FLIGHT MASS : 1050 kg (2315 lb)
RESULT:
RATE OF CLIMB : 875 ft/min (4.44 m/s)

5.3.10 CRUISING (TRUE AIRSPEED TAS)



5.3.11 LANDING DISTANCE - FLAPS LDG

Conditions: - Power lever . . . . IDLE
- Flaps . . . . LDG
- Approach speed . . . . see table below:

Flaps	940 kg (2072 lb)	1000 kg (2205 lb)	1080 kg (2381 lb)	1160 kg (2557 lb)	1216 kg (2681 lb)	1280 kg (2822 lb)
LDG	66 KIAS	69 KIAS	72 KIAS	74 KIAS	76 KIAS	77 KIAS

- Runway . . . . level, asphalt surface

Values for ISA and MSL, at 1280 kg (2822 lb)	
Landing distance over a 50 ft (15 m) obstacle	632 m (2074 ft)
Landing ground roll	303 m (994 ft)

Values for ISA and MSL, at 1216 kg (2681 lb)	
Landing distance over a 50 ft (15 m) obstacle	635 m (2083 ft)
Landing ground roll	286 m (938 ft)

WARNING

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

CAUTION

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

CAUTION

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

NOTE

For landings on dry, short-cut grass covered runways, the following corrections must be taken into account, compared to paved runways:

- grass up to 5 cm (2 in) long: 30 % increase in landing roll.
- grass longer than 5 cm (2 in): at least 45 % increase in landing roll.

NOTE

For wet grass or soft ground, an additional 15 % increase in landing ground roll must be expected.

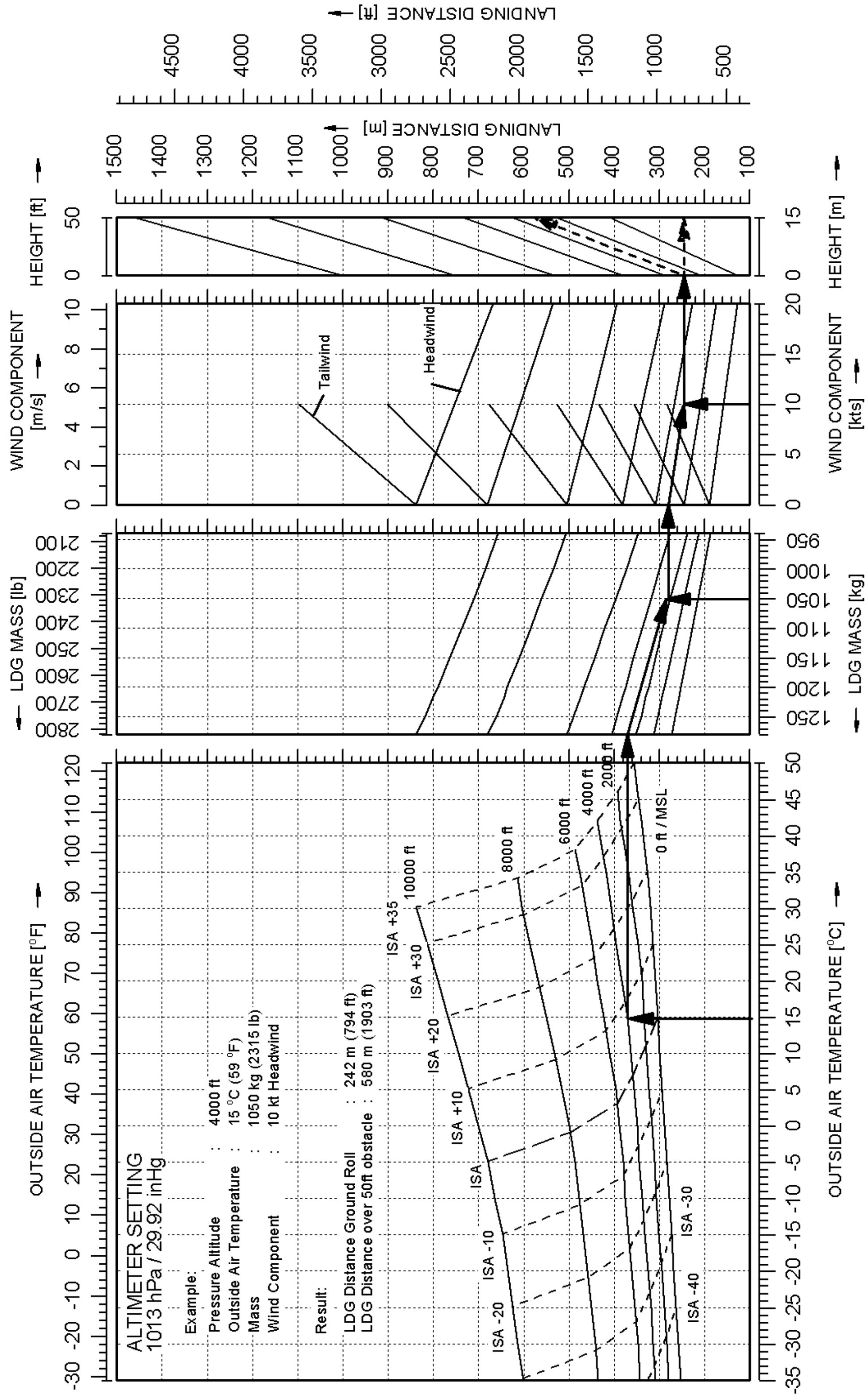
NOTE

A downhill slope of 2 % (2 m per 100 m or 2 ft per 100 ft) results in an increase in the landing distance of approximately 12 %. The effect on the landing roll can be greater.

NOTE

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

DA 40 NG - LANDING DISTANCES - FLAPS LDG



5.3.12 LANDING DISTANCE - ABNORMAL FLAP POSITION

Conditions:
- Power lever . . . . IDLE
- Flaps . . . . UP
- Approach speed . . . . see table below:

Flaps	940 kg (2072 lb)	1000 kg (2205 lb)	1080 kg (2381 lb)	1160 kg (2557 lb)	1216 kg (2681 lb)	1280 kg (2822 lb)
UP	71 KIAS	73 KIAS	78 KIAS	81 KIAS	82 KIAS	83 KIAS

- Runway . . . . level, asphalt surface

Values for ISA and MSL, at 1280 kg (2822 lb)	
Landing distance over a 50 ft (15 m) obstacle	771 m (2530 ft)
Landing ground roll	355 m (1165 ft)

Values for ISA and MSL, at 1216 kg (2681 lb)	
Landing distance over a 50 ft (15 m) obstacle	776 m (2546 ft)
Landing ground roll	331 m (1086 ft)

WARNING

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

CAUTION

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

CAUTION

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

NOTE

For landings on dry, short-cut grass covered runways, the following corrections must be taken into account, compared to paved runways:

- grass up to 5 cm (2 in) long: 40 % increase in landing roll.
- grass longer than 5 cm (2 in): at least 60 % increase in landing roll.

NOTE

For wet grass or soft ground, an additional 20 % increase in landing ground roll must be expected.

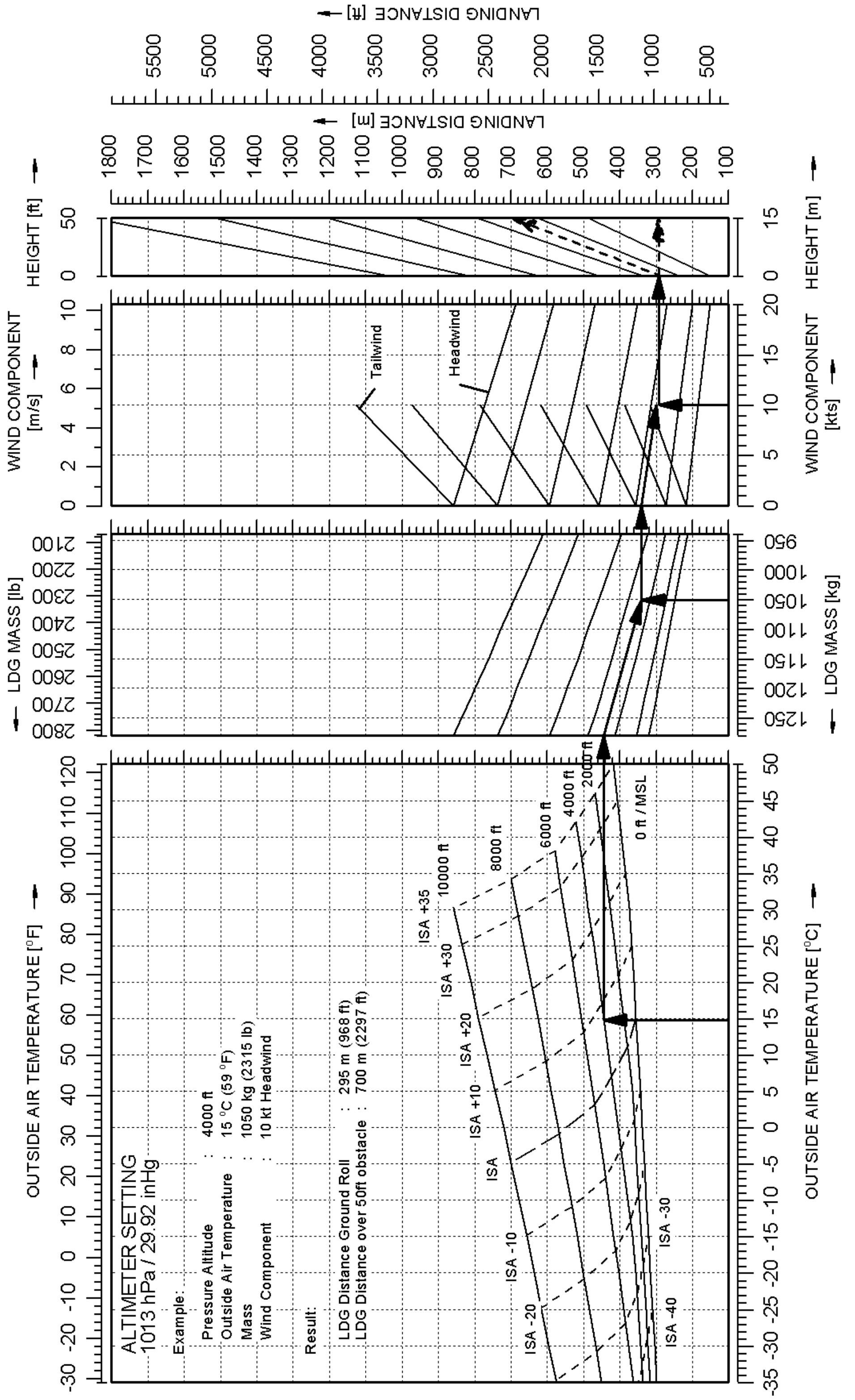
NOTE

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

NOTE

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

DA 40 NG - LANDING DISTANCES - ABNORMAL FLAP POSITION



5.3.13 GRADIENT OF CLIMB ON GO-AROUND

Landing Mass 1216 kg (2681 lb)

Conditions:

- Power lever . . . . MAX
- Flaps . . . . LDG
- Airspeed: . . . . 76 KIAS

Value for ISA and MSL, at 1216 kg (2681 lb)	
Constant gradient of climb	6.6 % (equals 3.8° climb angle) or 492 ft/min

Landing Mass above 1216 kg (2681 lb) up to 1280 kg (2822 lb)

NOTE

A landing with a mass between 1216 kg (2681 lb) and 1280 kg (2822 lb) is admissible. It constitutes an abnormal operating procedure. Refer to Section 4B.8.

Conditions:

- Power lever . . . . MAX
- Flaps . . . . LDG
- Airspeed: . . . . 77 KIAS

Value for ISA and MSL, at 1280 kg (2822 lb)	
Constant gradient of climb	5.5 % (equals 3.1° climb angle) or 420 ft/min

5.3.14 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.

	Glide ratio	**Maximum horizontal distance per 1000 ft (305 m) altitude loss**
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.

5.3.15 APPROVED NOISE DATA

ICAO Annex 16 Chapter X . . . . 74.5 dB(A)
CS-36 Subpart C . . . . 74.5 dB(A)

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CHAPTER 6
MASS AND BALANCE / EQUIPMENT LIST

Page

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 (7.5 liter / 7.93 qts), gearbox oil (2.1liter / 2.22 qts), engine oil (7.0 liter / 7.4 qts), plus unusable fuel (2.0 US gal / approx. 7.6 liter).

MASS AND BALANCE REPORT

(Continuous report on structural or equipment changes)

DA 40 NG				Serial No.:			Registration:			Page No.:		
				Changes in Mass						Current Empty Mass		
				Addition (+)			Subtraction (-)					
	Entry No.		Description of Part or Modification	Mass	Moment Arm	Moment	Mass	Moment Arm	Moment	Mass	Moment Arm	Moment
Date	IN	OUT		[kg]	[m]	[kgm]	[kg]	[m]	[kgm]	[kg]	[m]	[kgm]
			upon delivery									

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 6 for the condition with empty fuel tanks, and row 8 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.

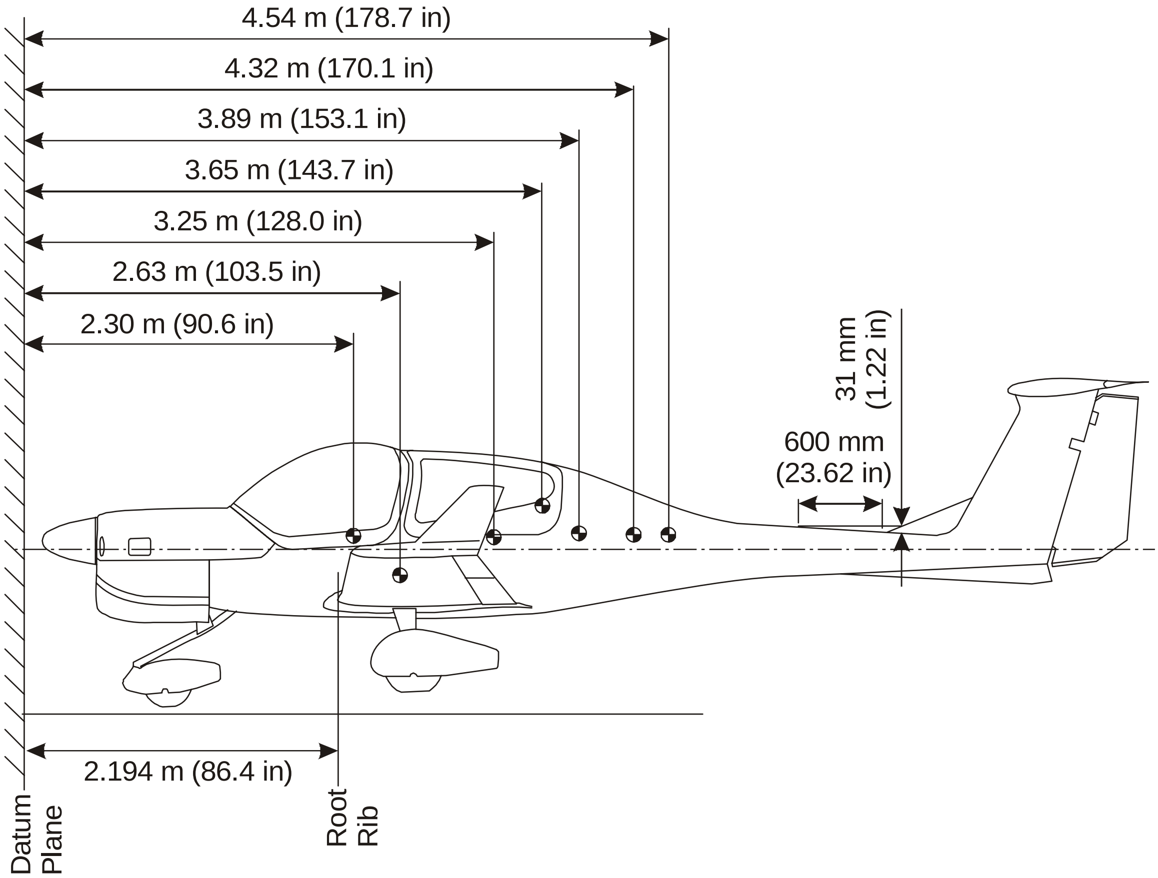
6.4.1 MOMENT ARMS

The most important lever arms aft of the Datum Plane:

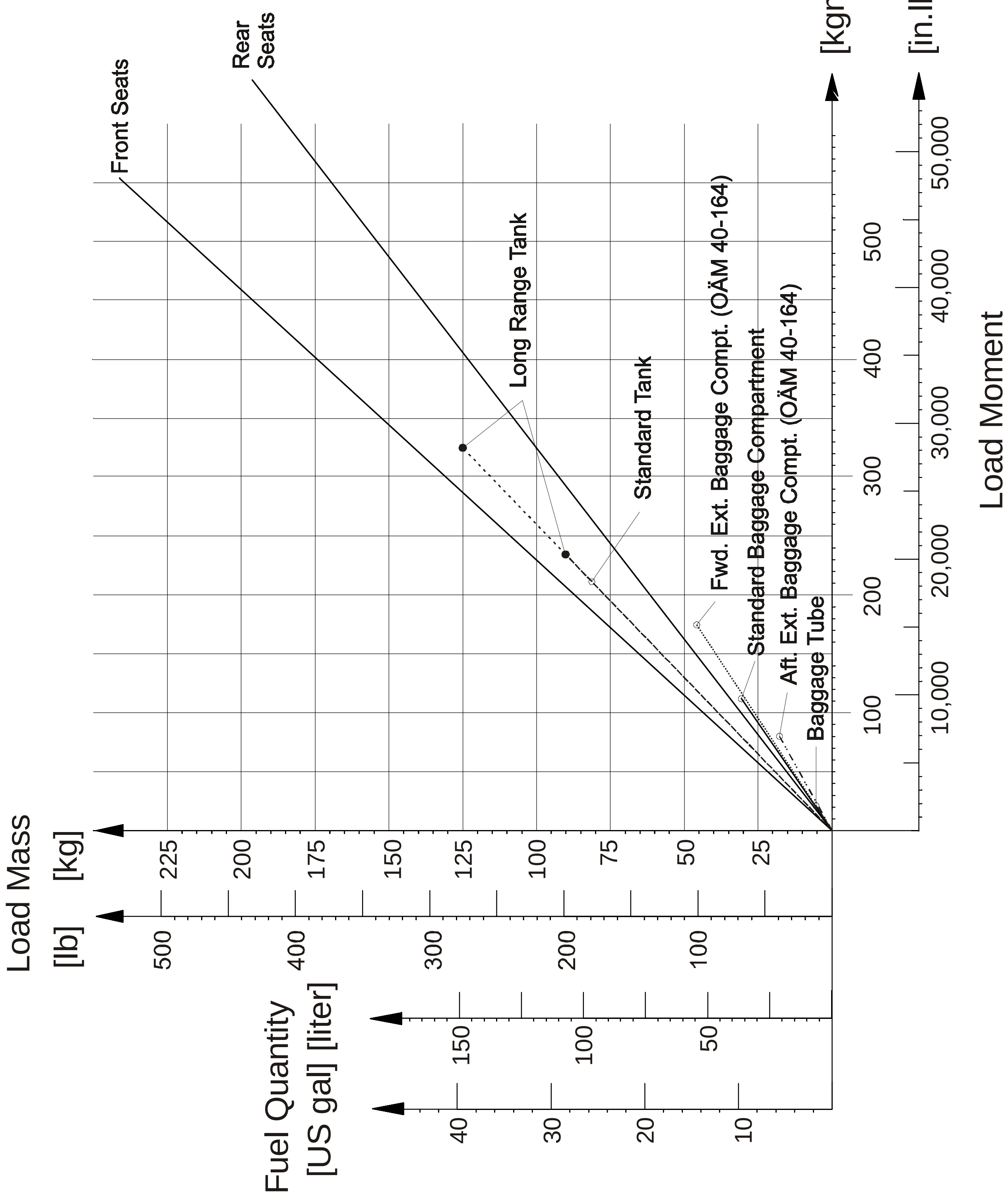
- Front seats :	2.30 m	90.6 in
- Rear seats :	3.25 m	128.0 in
- Wing tank (Standard & Long Range) :	2.63 m	103.5 in
- Baggage in standard compartment :	3.65 m	143.7 in
- Baggage in baggage tube :	4.32 m	170.1 in

- Baggage in baggage tray (if OÄM-164 is installed, extended baggage compartment):

- 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*		
Baggage tube Lever arm: 4.32 m *(170.1 in)*	0 *0*	0 *0*		
5. Forward extended baggage compartment Lever arm: 3.89 m *(153.1 in)*	0 *0*	0 *0*		
Aft extended baggage compartment Lever arm: 4.54 m *(178.7 in)*	0 *0*	0 *0*		
6. Total mass and total moment with empty fuel tanks (Total of 1.-5.)	1,070 *2,359*	2,598.8 *225,565*		
7. 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*		

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]*
8. Total mass and total moment with full fuel tanks (Total 6. plus 7.)	1,159 *2,555*	2,832.9 *245,851*		

9. The total moments from rows 6 and 8 (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.

   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.

b) Long Range Tank Configuration

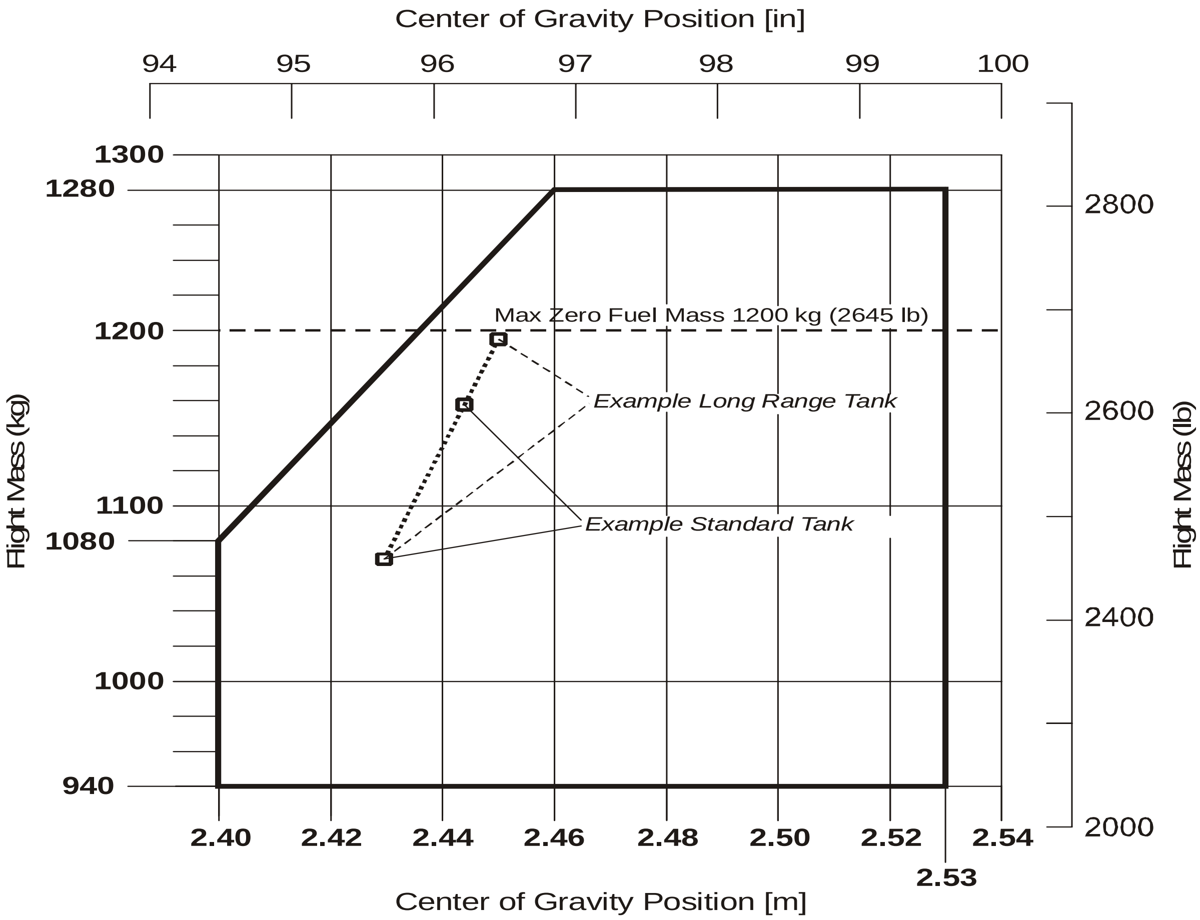
CALCULATION OF LOADING CONDITION	DA 40 NG (Example)		Your DA 40 NG	
	Mass [kg] *[lb]*	Moment [kgm] *[in.lb]*	Mass [kg] *[lb]*	Moment [kgm] *[in.lb]*
1. Empty mass (from Mass and Balance Report)	900 *1,984*	2,180.8 *189,253*		
2. Front seats Lever arm: 2.30 m *(90.6 in)*	150 *331*	345.0 *29,989*		
3. 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*		
Baggage tube Lever arm: 4.32 m *(170.1 in)*	0 *0*	0 *0*		
5. Forward extended baggage compartment Lever arm: 3.89 m *(153.1 in)*	0 *0*	0 *0*		
Aft extended baggage compartment Lever arm: 4.54 m *(178.7 in)*	0 *0*	0 *0*		
6. Total mass and total moment with empty fuel tanks (Total of 1.-5.)	1,070 *2,359*	2,598.8 *225,565*		
7. 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*		
8. Total mass and total moment with full fuel tanks (Total 6. plus 7.)	1,194 *2,632*	2,924.9 *253,821*		

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. The total moments from rows 6 and 8 (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.

   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.

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 6 and 8.

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)

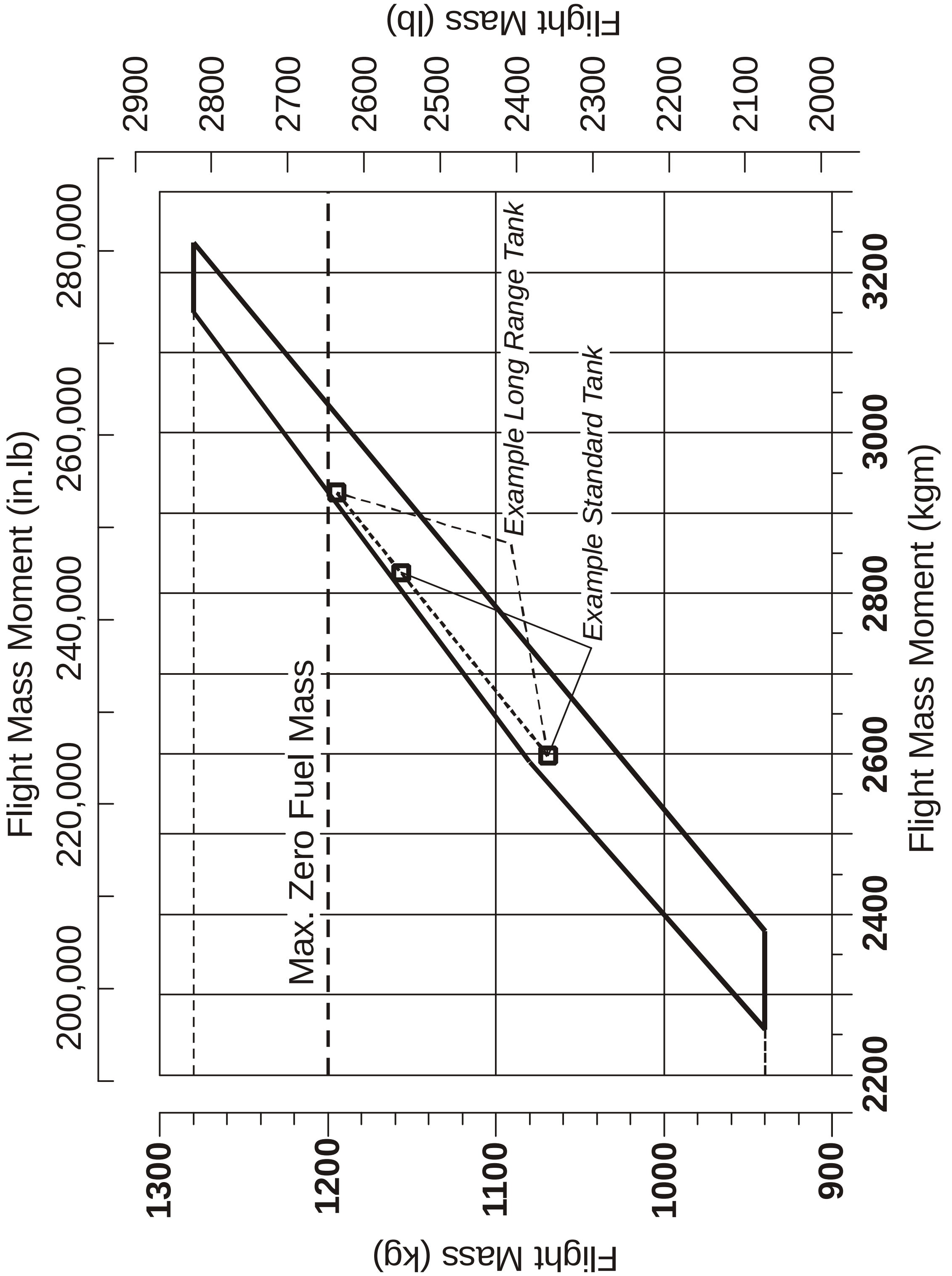
2.46 m (96.9 in) aft of DP at 1280 kg (2822 lb)

linear variation between these values

Most rearward CG:

2.53 m (99.6 in) aft of DP from 940 kg (2072 lb) to 1280 kg (2822 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
AVIONICS COOLING									
Avionics cooling fan	SAFE 328	305 467-00	Sandia Aerospace						
PFD cooling fan	SAFE 128	305 468-00	Sandia Aerospace						
MFD cooling fan	SAFE 128	305 468-00	Sandia Aerospace						
AUTOPILOT SYSTEM									
Pitch servo	GSA 81	011-00878-00	Garmin						
Pitch servo mount	GSM 85	011-00894-07	Garmin						
Roll servo	GSA 81	011-00878-00	Garmin						
Roll servo mount	GSM 85	011-00894-07	Garmin						
Pitch trim servo	GSA 81	011-00878-00	Garmin						
Pitch trim servo mount	GSM 85	011-00894-04	Garmin						
Control stick		DA4-2213-12-90	Diamond Aircraft						
CWS switch		031-00514-0000	Bendix/King						
AP-Disc switch		031-00428-0000	Bendix/King						
Trim switch assy		200-09187-0000	Bendix/King						
ELECTRICAL POWER									
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						

Airplane Serial No.:		Registration:		Date:		Mass		Lever Arm	
Description	Type	Part No.	Manufacturer	S/N	installed	lb	kg	in	m
EQUIPMENT									
Safety belt, pilot	5-01-() Series	5-01-1C0710	Schroth			2.110	0.960	92.520	2.350
Safety belt, co-pilot	5-01-() Series	5-01-1C5710	Schroth			2.110	0.960	92.520	2.350
Safety belt, LH pax	5-01-() Series	5-01-1B5710	Schroth			2.250	1.020	126.800	3.220
Safety belt, RH pax	5-01-() Series	5-01-1B0710	Schroth			2.250	1.020	126.800	3.220
Safety belt, pilot	5-01-() Series	5-01-2G0710	Schroth			2.110	0.960	92.520	2.350
Safety belt, co-pilot	5-01-() Series	5-01-2G5710	Schroth			2.110	0.960	92.520	2.350
Safety belt, LH pax	5-01-() Series	5-01-2H5710	Schroth			2.250	1.020	126.800	3.220
Safety belt, RH pax	5-01-() Series	5-01-2H0710	Schroth			2.250	1.020	126.800	3.220
Safety belt, pilot	5-01-() Series	5-01-2G0701	Schroth			2.110	0.960	92.520	2.350
Safety belt, co-pilot	5-01-() Series	5-01-2G5701	Schroth			2.110	0.960	92.520	2.350
Safety belt, LH pax	5-01-() Series	5-01-2H5701	Schroth			2.250	1.020	126.800	3.220
Safety belt, RH pax	5-01-() Series	5-01-2H0701	Schroth			2.250	1.020	126.800	3.220
Safety belt, pilot	5-01-() Series	5-01-1C0701	Schroth			2.110	0.960	92.520	2.350
Safety belt, co-pilot	5-01-() Series	5-01-1C5701	Schroth			2.110	0.960	92.520	2.350
Safety belt, LH pax	5-01-() Series	5-01-1B5701	Schroth			2.250	1.020	126.800	3.220
Safety belt, RH pax	5-01-() 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
SAFETY EQUIPMENT									
Fire extinguisher		HAL 1	AIR Total						
First aid kit									
FLIGHT CONTROLS									
Flaps actuator assy		43055	Krutz						
Stall horn		DAI-9031-00-00	Diamond						
FUEL									
Fuel transfer pump		5100-00-9	Dukes Inc.						
INDICATING / REC. SYSTEM									
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
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
Flight timer		85094-12	Hobbs						
HYDRAULIC									
Master cylinder		10-54A	Cleveland						
Parking valve		60-5B	Cleveland						
Brake assembly		30-239A	Cleveland						

Airplane Serial No.:		Registration:		Date:		Mass		Lever Arm	
Description	Type	Part No.	Manufacturer	S/N	installed	lb	kg	in	m
LIGHTS									
Map / Reading light assy crew		W1461.0.010	Rivoret						
Cabin Light		W1461.0.010	Rivoret						
Strobe / Pos. light assy LH	A600-PR-D-28	01-0790006-05	Whelen			0.800	0.363	103.800	2.638
Strobe / Pos. light assy RH	A600-PG-D-28	01-0790006-07	Whelen			0.800	0.363	103.800	2.638
Strobe light power supply LH/RH	A490ATS-CF–14/28	01-0770062-05	Whelen						
Taxi light	7034601	01-0770346-01	Whelen			0.990	0.449	79.920	2.030
Landing light	7034601	01-0770346-01	Whelen			0.990	0.449	79.920	2.030
Glareshield lamp assy		DA4-3311-10-02	Diamond Aircraft						
Glareshield light inverter		APVL328-4-1-L-5QF	Quantaflex						
Placards inverter		APVL328-4-1-L-15QF	Quantaflex						
COMMUNICATION / NAVIGATION									
COMM #1 antenna	DMC63-1/A		DM			0.400	0.180	177.100	4.500
COMM #2 antenna	DMC63-2		DM			0.400	0.180	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						

Airplane Serial No.:		Registration:		Date:		Mass		Lever Arm	
Description	Type	Part No.	Manufacturer	S/N	installed	lb	kg	in	m
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-B890	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						
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 63W	011-01105-01	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
Transponder	GTX 33	011-00779-10	Garmin			3.100	1.410	153.100	3.890
Attitude / Heading reference system	GRS 77	011-00868-10	Garmin			2.800	1.270	154.900	3.935
Magnetometer	GMU 44	011-00870-00	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 61	071-00221-0010	Bendix/King						
Marker antenna	CI 102		Comant						
GPS #1 antenna	GA 36	013-00244-00	Garmin			0.470	0.210	104.100	2.645
GPS #2 antenna	GA 36	013-00244-00	Garmin			0.470	0.210	104.100	2645
DME	KN 63	066-1070-01	Bendix/King			2.800	1.270	141.100	3.580
DME antenna	KA 61	071-00221-0010	Bendix/King						

Airplane Serial No.:		Registration:		Date:		Mass		Lever Arm	
Description	Type	Part No.	Manufacturer	S/N	installed	lb	kg	in	m
ENGINE									
Engine	E4-A	E4A-00-000-000	Austro Engine						
Engine control unit	EECU-E4-01	E4A-92-100-000 Iss: 02()	Austro Engine						
ECU software		Refer to DAI Service Bulletin MSP-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 regulator		E4A-91-100-000	Austro Engine						
ENGINE FUEL PUMPS									
Fuel pumps (2x)		0-580-054-001	Bosch						
ENGINE INDICATING									
Engine / Airframe unit	GEA 71	011-00831-00	Garmin						
ENGINE EXHAUST									
Exhaust pipe		D44-7806-10-01	Diamond Aircraft						

Airplane Serial No.:		Registration:		Date:		Mass		Lever Arm	
Description	Type	Part No.	Manufacturer	S/N	installed	lb	kg	in	m
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 Serial No.:		Registration:		Date:		Mass		Lever Arm	
Description	Type	Part No.	Manufacturer	S/N	installed	lb	kg	in	m
AIRPLANE FLIGHT MANUAL		Doc. No. 6.01.15-E	Diamond Aircraft						

Place: ______________________ Date: _________________________ Signature: ____________________________

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CHAPTER 7
DESCRIPTION OF THE AIRPLANE AND ITS SYSTEMS

Page

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.

<u>Elevator</u>

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.

<u>Rudder</u>

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.

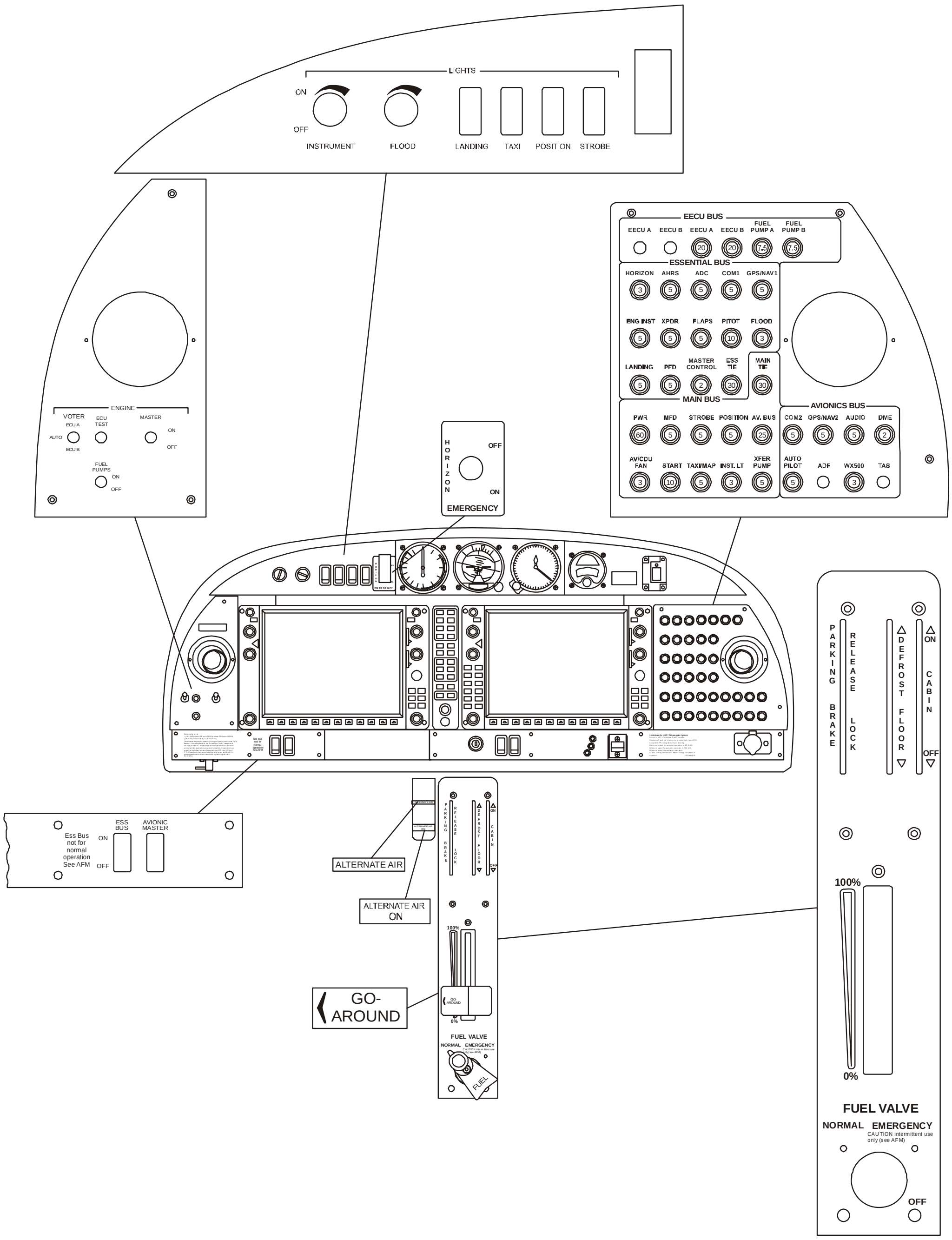
Forward Adjustment:

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

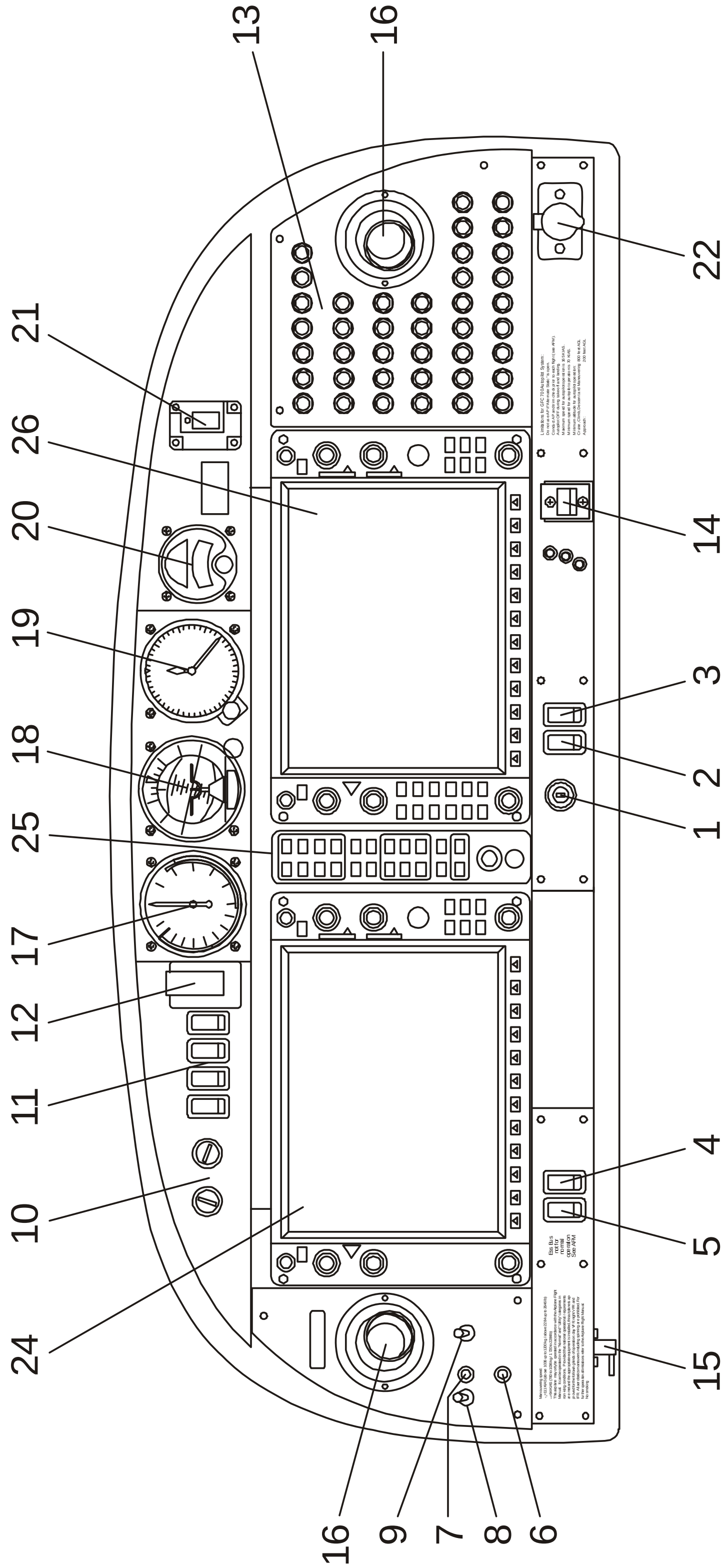
Rearward Adjustment:

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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6

Major instruments and controls			
1	Electric Master key switch	14	Flap selector switch
2	Fuel Transfer switch	15	Alternate static valve
3	Pitot Heat switch	16	Ventilation nozzles
4	Avionics Master switch	17	Backup airspeed indicator
5	Essential Bus switch	18	Backup artificial horizon
6	Fuel pumps switch	19	Backup altimeter
7	ECU Test button	20	Emergency compass
8	ECU Voter switch	21	ELT control unit
9	Engine Master switch	22	Accessory power socket
10	Rotary buttons for instrument lighting and flood light		
11	Light switches	24	Primary Flight Display (PFD)
12	Emergency switch	25	Audio amplifier / Intercom / Marker beacon receiver
13	Circuit breakers*	26	Multi Function Display (MFD)

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

NOTE

The figure on previous page shows the typical DA 40 NG installation position for the equipment. The actual installation may vary due to the approved equipment version.

Cockpit Ventilation

Ventilation in the front is provided by the movable ventilation over nozzles (16) in the instrument panel. Furthermore there are spherical nozzles in the roll bar on the left and right side next to the front seats as well as on the central console above the passengers' heads. The spherical nozzles are opened and closed by twisting.

Unconditioned ambient air is supplied to the interior through an inlet on the bottom surface of the left wing. To increase cabin temperatures when operating at low outside air temperatures, a ventilation inlet baffle may be installed at the inlet. With the baffle installed, the rear cabin ventilation nozzles on the left and right hand side and in the central console above the passengers' heads will be inoperative.

The ventilation inlet baffle consists of a metal plate with rubber edging and is attached to the bottom LH wing by a camloc.

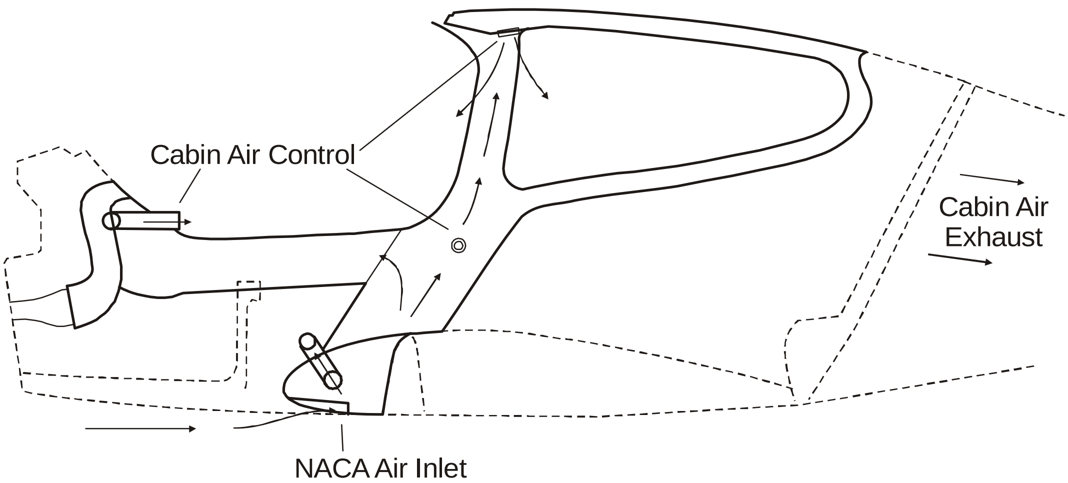
Heating

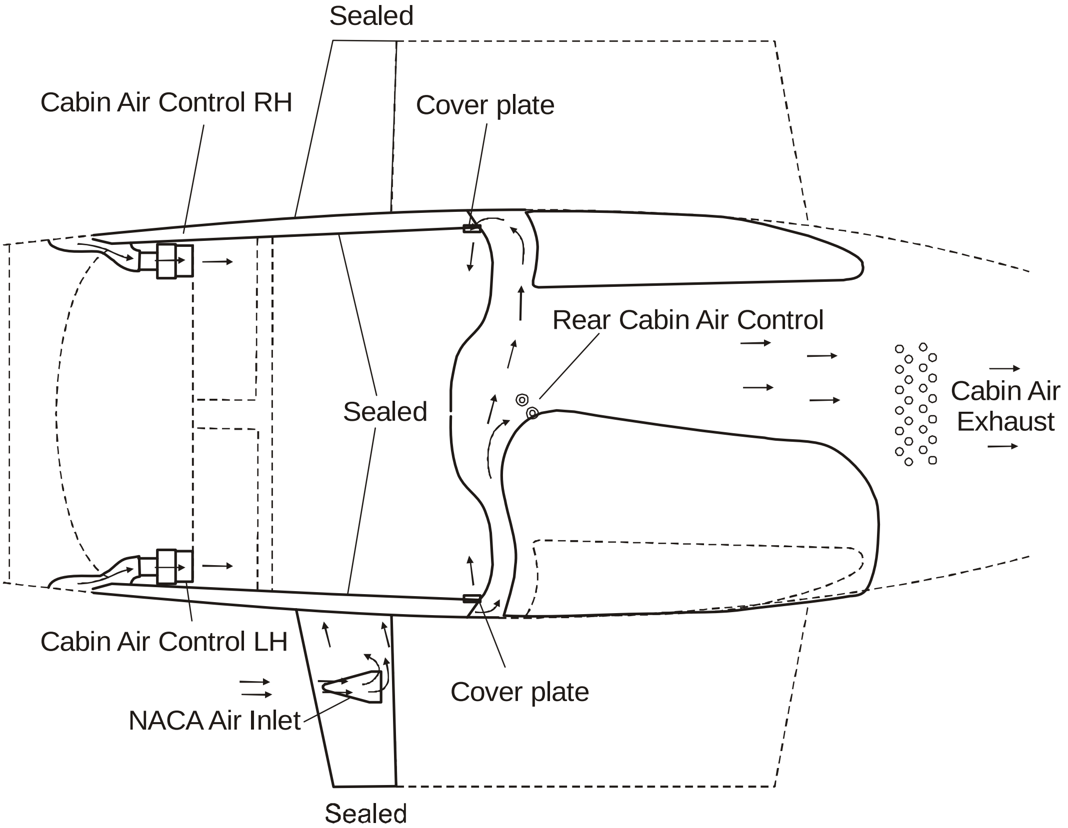
Heating is operated using two levers located on the small center console under the instrument panel.

Right lever:	up	=	heating ON
	down	=	heating OFF

Central lever (air distribution lever):

	up	=	airflow to canopy (DEFROST)
	down	=	airflow to floor (FLOOR)


Cabin Air Control
Cabin Air Exhaust
NACA Air Inlet


Sealed
Cabin Air Control RH
Cover plate
Rear Cabin Air Control
Sealed
Cabin Air Exhaust
Cabin Air Control LH
NACA Air Inlet
Cover plate
Sealed

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).

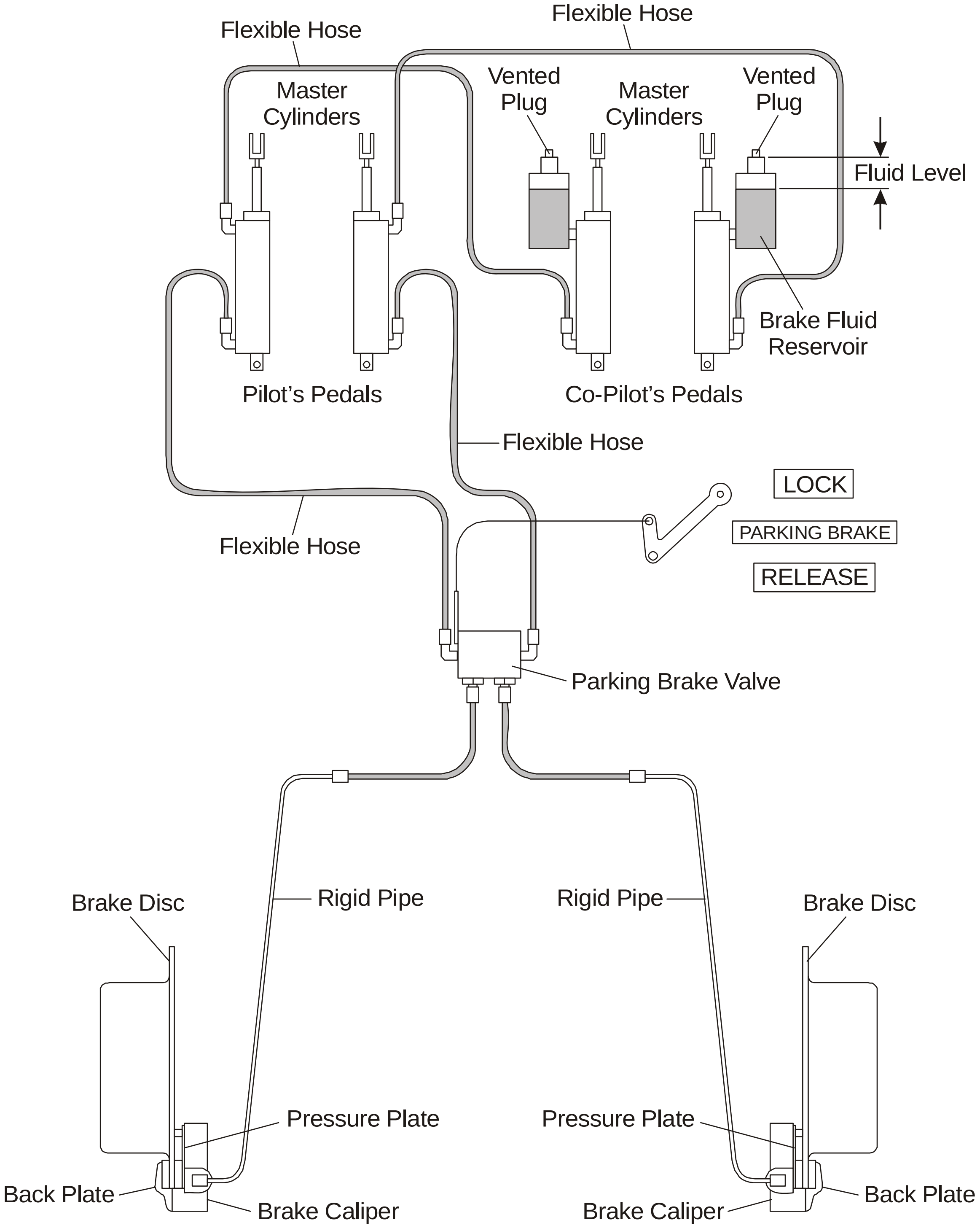
Wheel Brakes

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 HARNESSES

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-part safety harnesses. The harnesses are fastened by inserting the end of the belts in 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.

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 164) may be installed.

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 windows.

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.

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. 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 3.5.7 - 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

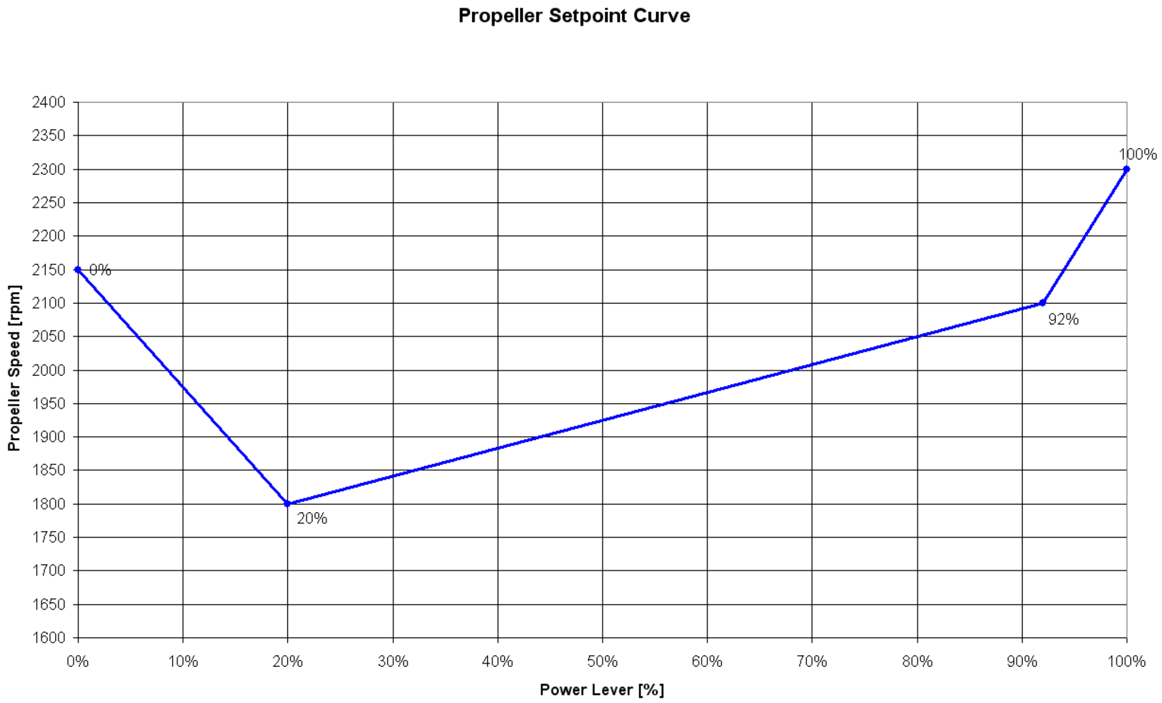
7.9.3 PROPELLER

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.



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

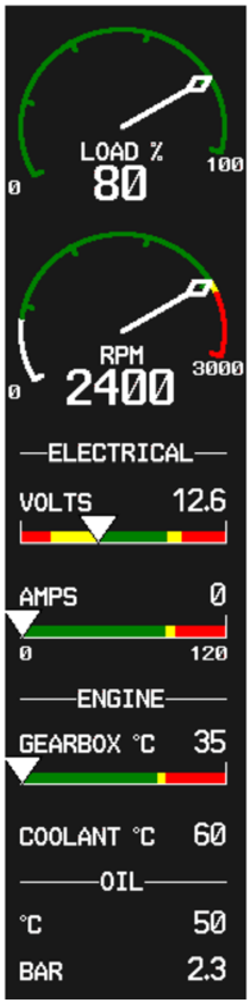
Never rotate the propeller by hand.

7.9.4 ENGINE INSTRUMENTS

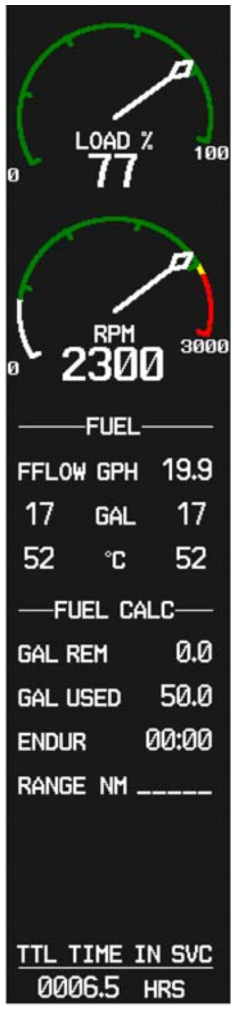
The engine instruments are displayed on the Garmin G1000 MFD. Also refer to Section 7.13.3 - MULTI-FUNCTION DISPLAY (MFD).

Default page Engine

Display when pushing the SYSTEM button



Display when pushing the FUEL button



NOTE

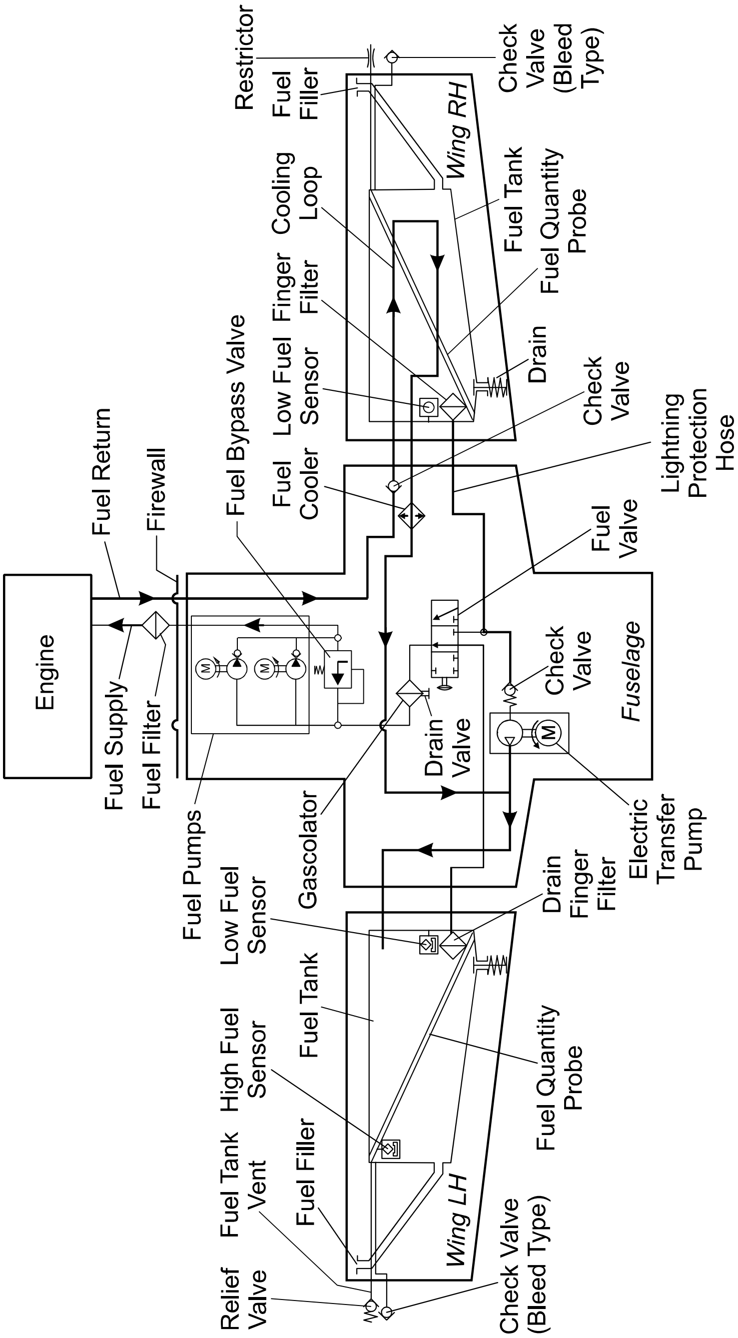
The figure on previous page is a general demonstration of a typical G1000 MFD to show the different display modes. The pictured engine instrument markings may not stringently agree with the current engine limitations of the DA 40 NG.

NOTE

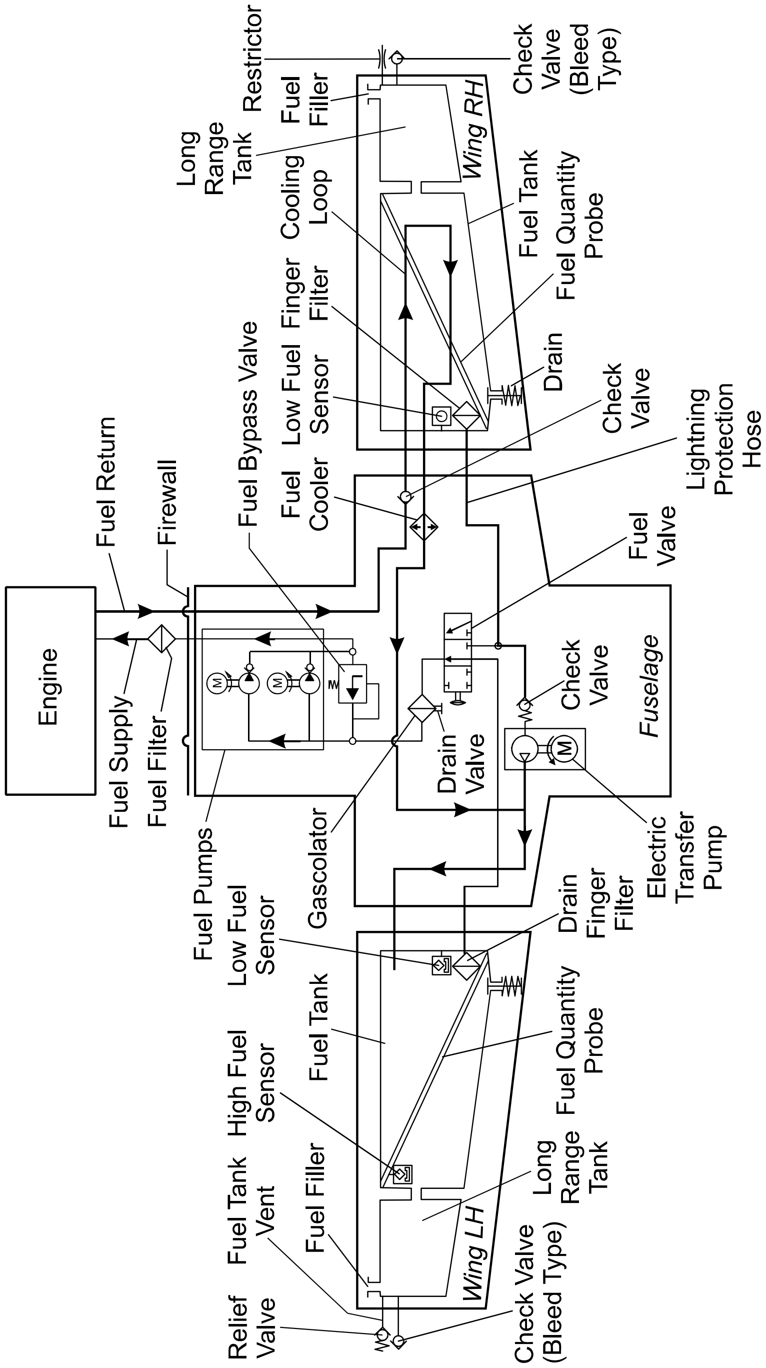
The fuel calculations on the FUEL CALC portion do not use the airplane's fuel quantity indicators. The values shown are numbers which are calculated from the last fuel quantity update done by the pilot and actual fuel flow data. Therefore, the endurance and range data is for information only, and must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

Designation	Indication	Unit
LOAD	Available power	%
RPM	Propeller RPM	1/min
VOLT	Volts	V
AMPS	Ampère	A
COOLANT TEMP	Coolant temperature	°C
GEARBOX	Gearbox temperature	°C
OIL TEMP	Engine oil temperature	°C
OIL PRES	Oil pressure	bar
FUEL QTY	Fuel quantity	US gal
FFLOW	Fuel flow	US gal/hr
FUEL TEMP.	Fuel temperature	°C

7.9.5 FUEL SYSTEM

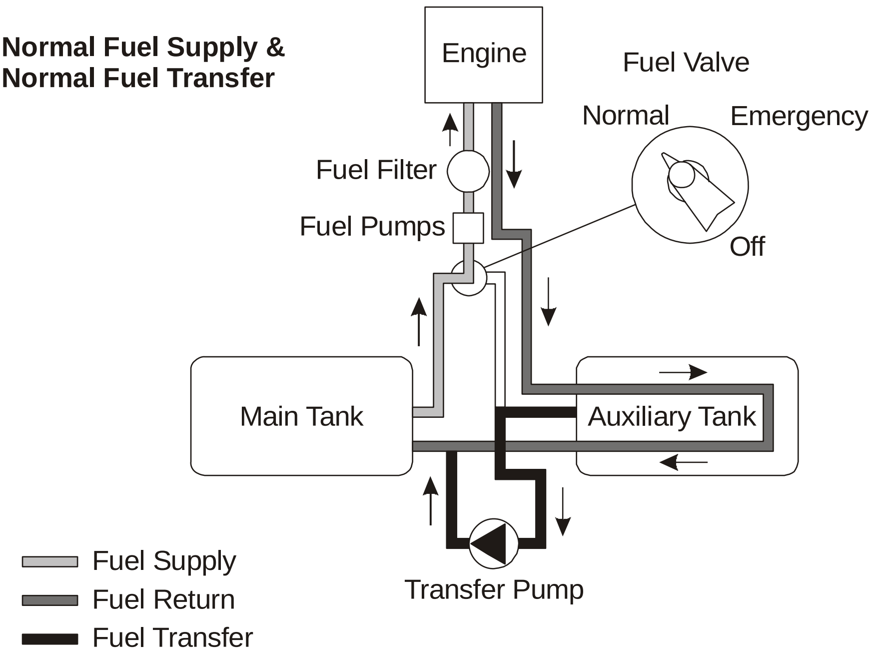


Standard Tank Schematic

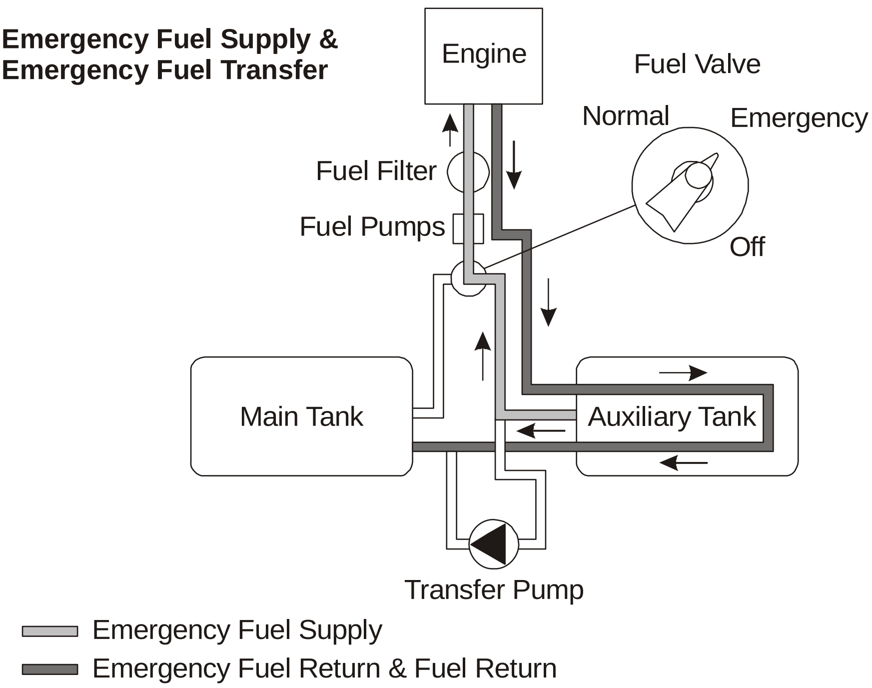


Long Range Tank Schematic

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 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

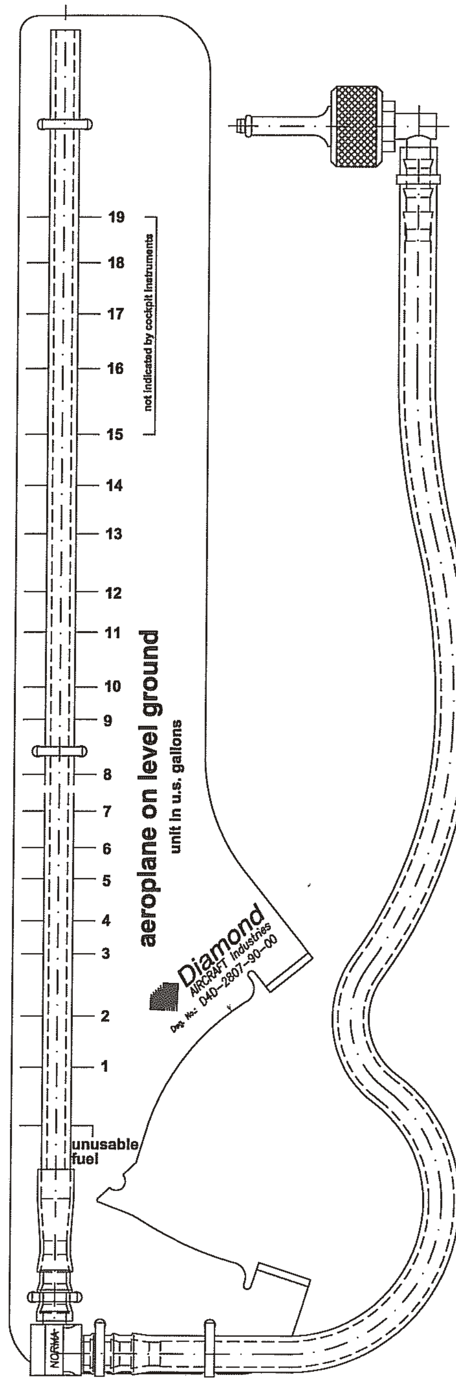
When the fuel quantity indicator reads 14 US gal, the correct fuel quantity must be determined with the alternate mean for fuel quantity indication. If this measurement is not carried out, the fuel quantity available for flight planning is 14 US gal.

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.

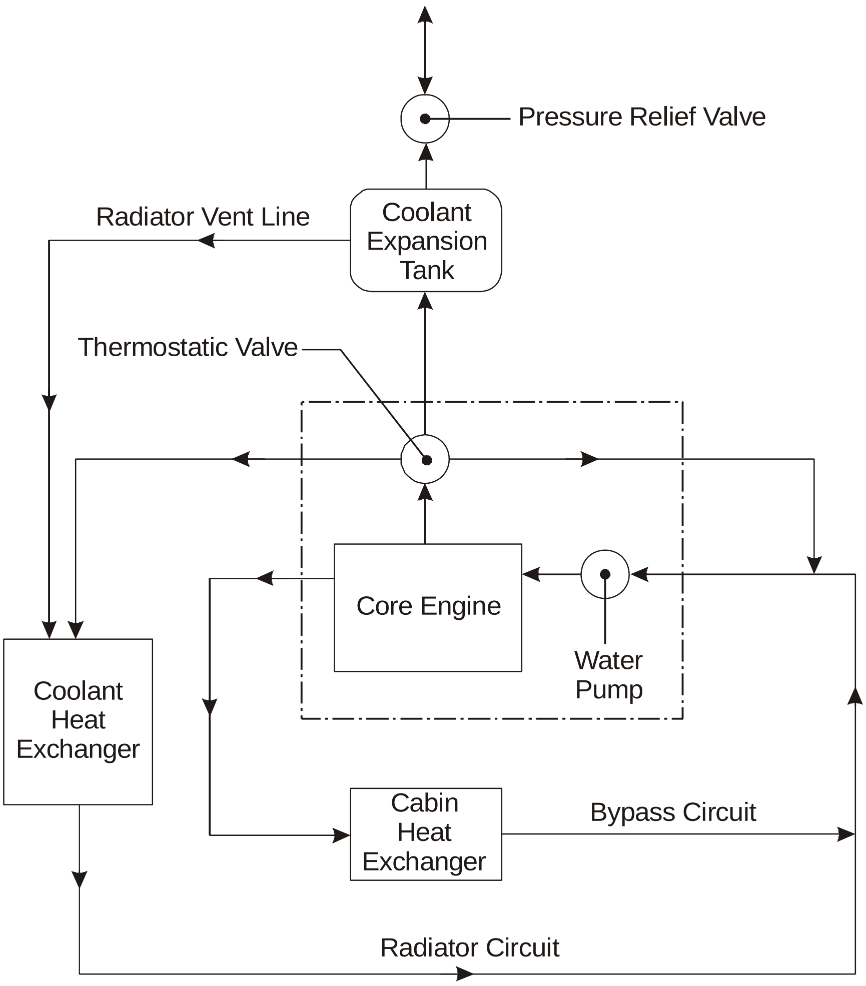


7.9.6 COOLING SYSTEM

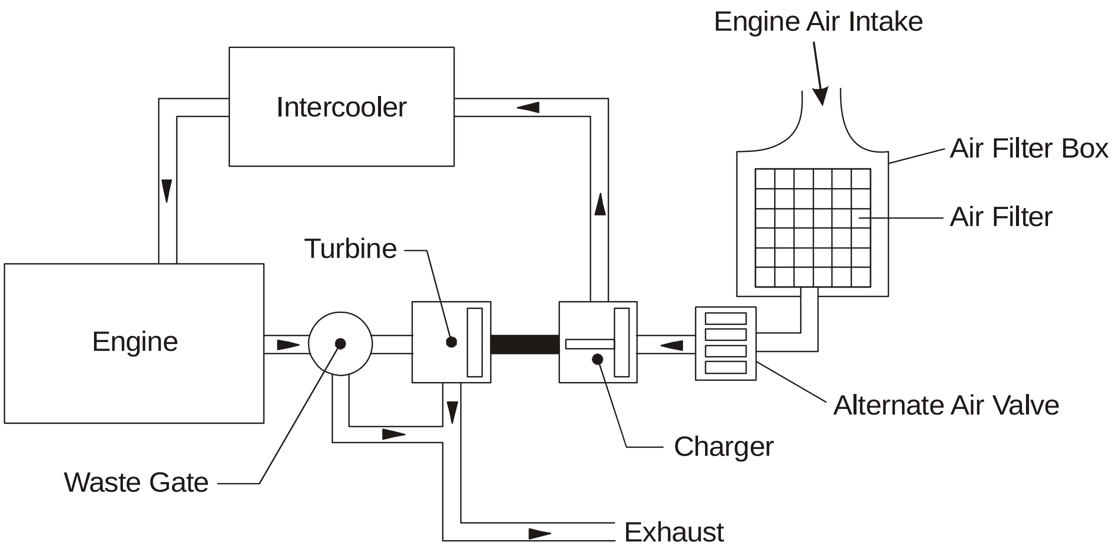
The engine is liquid cooled. The liquid cooling system consists of a radiator circuit (coolant heat exchanger) and a bypass circuit (cabin heat exchanger). The radiator circuit is only open during hot coolant temperatures. This assures that a cold engine will warm up quickly. Upon reaching approximately 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.



7.9.7 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.

7.9.8 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

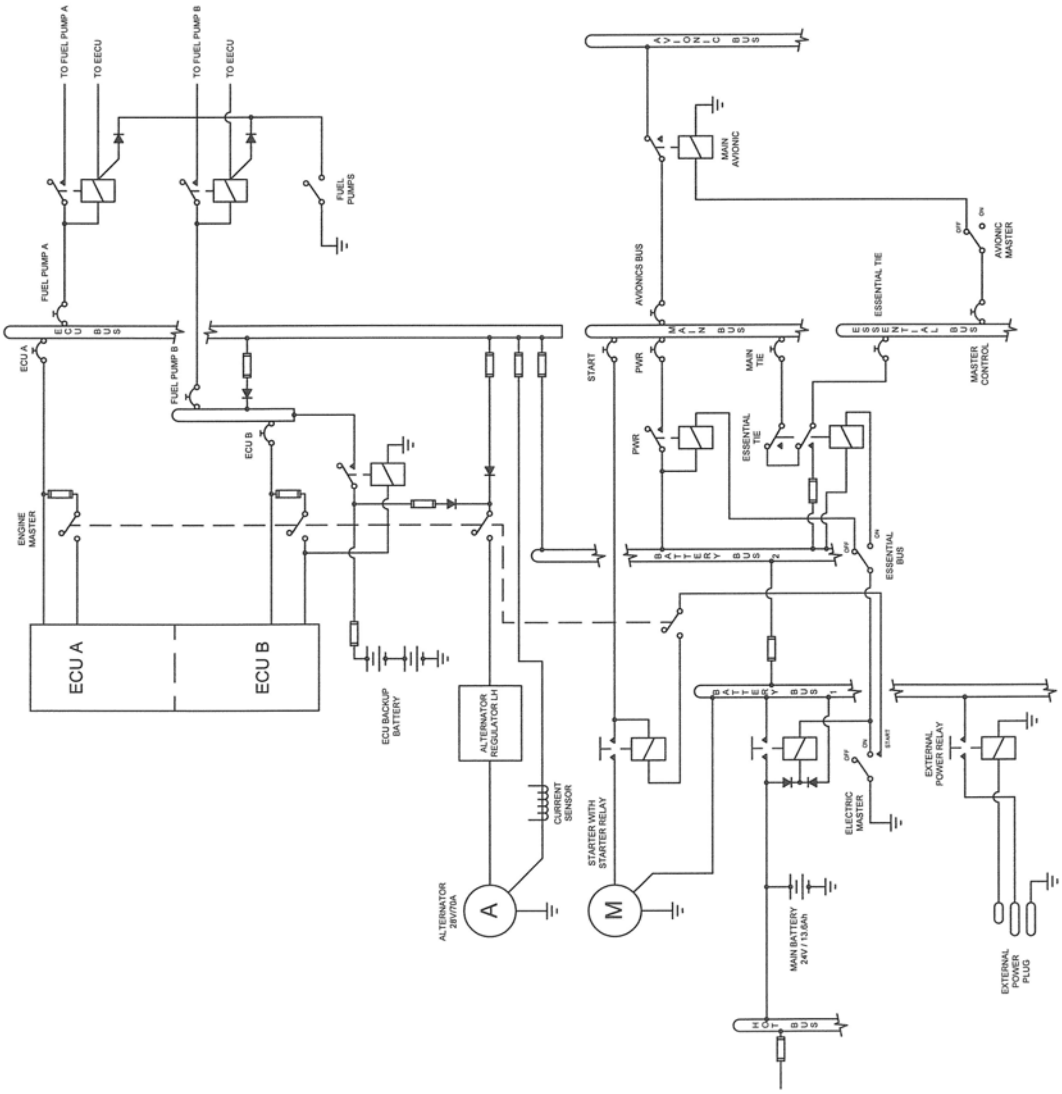
The second oil circuit lubricates the gear and serves the governor system and the regulation of the propeller.

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 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 3.6 - 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 3.6 - 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

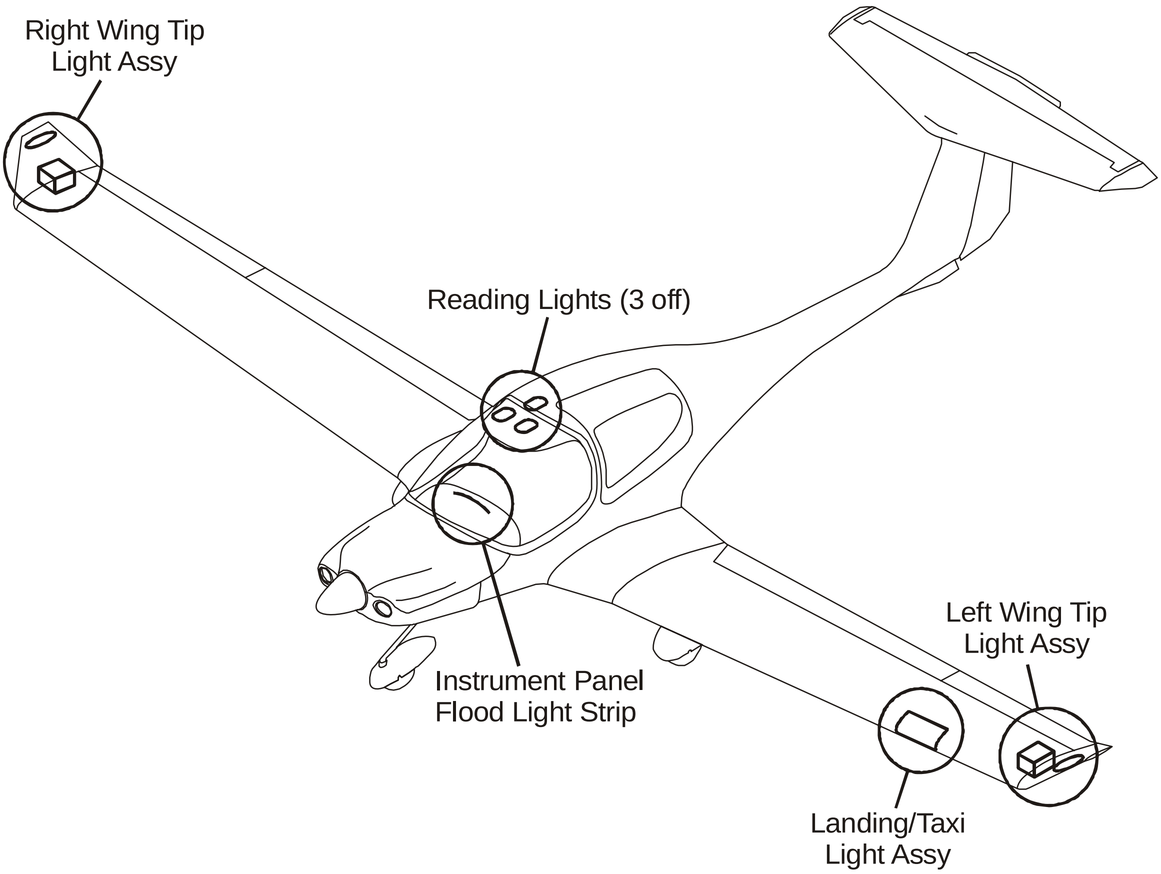
Combined position and strobe lights (anti collision lights) are installed on both wing tips. Each system is operated by a switch (POSITION, STROBE) on the row of switches on the instrument panel.

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 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 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
- Oil pressure (lubrication system engine) / OIL PRES
- Coolant temperature / COOLANT TEMP
- Gearbox temperature / GEARBOX
- 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:

- Glow sparks active
- Status ECU A
- Status ECU B
- Low fuel pressure warning

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 on the PFD (ECU A/B FAIL). After the indication of the ECU A/B FAIL caution message, the engine must be serviced.

7.10.3 WARNING, CAUTION AND ADVISORY MESSAGES

Crew Alerting System (CAS)

The G1000 crew alerting system (CAS) is designed to provide visual and aural alerts to the flight crew. Alerts are divided into three levels as follows:

WARNING

CAUTION

ADVISORY

Crew alerts will appear in the alerts window on the PFD. In this window warnings will appear at the top, followed by cautions and advisories, respectively. Within the criticality levels, messages will appear from newest (top) to oldest (bottom).

At the low right corner of the display there is a MSG (message) soft key. The MSG key provides two functions in the CAS:

1. Pressing the MSG key acknowledges a new master warning / caution / advisory indication.
2. An additional MSG key press with no master alert indication active will open a pop-up auxiliary flight display (AFD) page that contains information for all active alerts.

This structure allows the crew to scroll through all system alerts if the alerts window overflows. This approach displays the most critical alerts close to the pilot´s primary field of view at all times, with the option of allowing lower criticality alerts to overflow and be accessible from the pop-up AFD page/window.

Alert Levels

Level	Text Color	Importance	Audible Tone
Warning	Red	May require immediate corrective action	Warning chime tone which repeats without delay until acknowledged by the crew
Caution	Yellow	May require future corrective action	Single warning chime tone
Annunciation Advisory	White		None
Message Advisory	White		None
Safe Operation Annunciation	Green	Lowest	None

Warning, Caution and Advisory Alerts

A list of all alerts is given in Section 2.6 - WARNING, CAUTION AND STATUS LIGHTS.

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.

7.13 GARMIN G1000 INTEGRATED AVIONICS SYSTEM

7.13.1 GENERAL

A remote avionic box is located behind the aft baggage compartment frame. A push-to-talk (PTT) button for the COM portion of the G1000 is mounted on the end of each control stick. There are connection facilities for up to 4 headsets between the front seats.

Refer to the Garmin G1000 Cockpit Reference Guide, Garmin P/N 190-00953-00 and Pilot's Guide, P/N 190-00952-00 for complete descriptions of the G1000 system and operating procedures.

7.13.2 PRIMARY FLIGHT DISPLAY (PFD)

The primary flight display (PFD; see figure below) typically displays airspeed, attitude, altitude, and heading information in a traditional format. Slip information is shown as a trapezoid under the bank pointer. One width of the trapezoid is equal to a one ball width slip. Rate of turn information is shown on the scale above the compass rose; full scale deflection is equal to a standard rate turn. The following controls are available on the PFD (clockwise from top right):

* Communications frequency volume and squelch knob
* Communications frequency set knobs
* Communications frequency transfer button
* Altimeter setting knob (baro set)
* Course knob
* Map range knob and cursor control
* FMS control buttons and knob
* PFD softkey buttons, including master warning/caution acknowledgment

* Altitude reference set knob

* Heading bug control

* Navigation frequency transfer button

* Navigation frequency set knobs

* Navigation frequency volume and identifier knob

The PFD displays the crew alerting (annunciator) system. When a warning or caution message is received, a warning or caution annunciator will flash on the PFD, accompanied by an aural tone. A warning is accompanied by a repeating tone, and a caution is accompanied by a single tone. Acknowledging the alert will cancel the flashing and provide a text description of the message. Refer to Chapter 3. - EMERGENCY PROCEDURES, 4B. - ABNORMAL OPERATING PROCEDURES and Section 7.10.3 - WARNING, CAUTION AND ADVISORY MESSAGES.
Advisory messages related to G1000 system status are shown in white and are accompanied by a white flashing ADVISORY alert. Refer to the G1000 Pilot's Guide and Cockpit Reference Guide for descriptions of the messages and recommended actions.

Trend vectors are shown on the airspeed and altimeter displays as a magenta line predicting 6 seconds at the current rate. The turn rate indicator also functions as a trend indicator on the compass scale.

The PFD can be displayed in a composite format for emergency use by pressing the DISPLAY BACKUP button on the audio panel. In the composite mode, the full crew alerting function remains, but no map functions are available.

7.13.3 MULTI-FUNCTION DISPLAY (MFD)

The multi-function display (MFD) typically displays engine data, maps, terrain, traffic and topography displays, and flight planning and progress information. The display unit is identical to the PFD and contains the same controls as previously listed. Additionally the MFD incorporates the controls for the autopilot system.

Engine instruments are displayed on the MFD. Discrete engine sensor information is processed by the Garmin Engine Airframe (GEA) sub-system. When an engine sensor indicates a value outside the normal operating range, the legend will turn yellow for caution range, and turn red and flash for warning range.

Also refer to Section 7.9.4 - ENGINE INSTRUMENTS.

7.13.4 AUDIO PANEL

The audio panel contains traditional transmitter and receiver selectors, as well as an integral intercom and marker beacon system. The marker beacon lights appear on the PFD. In addition, a clearance recorder records the last 2 ½ minutes of received audio. Lights above the selections indicate what selections are active. Pressing the red DISPLAY BACKUP button on the audio panel causes both the PFD and MFD to display a composite mode.

7.13.5 ATTITUDE AND HEADING REFERENCE SYSTEM (AHRS)

The attitude and heading reference system (AHRS) uses GPS, rate sensors, air data, and magnetic variation to determine pitch and roll attitude, sideslip and heading. Operation is possible in a degraded mode if the system loses any of these inputs. Status messages alert the crew of the loss of any of these inputs. The AHRS will align while the airplane is in motion, but will align quicker if the wings are kept level during the alignment process.

7.13.6 AIR DATA COMPUTER (ADC)

The air data computer (ADC) provides airspeed, altitude, vertical speed, and air temperature to the display system. In addition to the primary displays, this information is used by the FMS and TIS systems.

7.14 AVIONICS

7.14.1 AUTOPILOT SYSTEM

General

The GFC 700 Automatic Flight Control System (AFCS) is a two axis autopilot and flight director system which provides the pilot with the following features: Altitude Preselect and Altitude Hold (ALT); Flight Level Change with Airspeed Hold (FLC); Vertical Speed Hold (VS); Navigation Tracking for VOR (NAV) and GPS (GPS); Heading Hold (HDG); Approach mode and Go Around (GA) pitch/roll guidance. The system consists of autopilot controls on the multi-function display (MFD), servos with autopilot processing logic, Flight Director processing logic in the GIA´s, a control stick-mounted elevator trim switch, a control stick mounted trim interrupt and autopilot disconnect switch, a control stick mounted CWS (Control Wheel Steering) switch, a power lever mounted GA (go-around) switch, and PFD/MFD-mounted altitude preselect, heading, and course knobs.

The GFC 700 autopilot contains an electric pitch trim system which is used by the autopilot for automatic pitch trim during autopilot operation and by the pilot for manual electric pitch trim when the autopilot is not engaged. The manual electric pitch trim is operated by a split switch on the pilot´s control stick.

The GFC 700 autopilot and manual electric trim (MET) will not operate until the system has satisfactorily completed a preflight test. The preflight test begins automatically with initial power application to the autopilot (AVIONIC MASTER switch is set to the ON position).

The following conditions will cause the autopilot to automatically disconnect:

- Electrical power failure
- Internal autopilot system failure
- AHRS malfunction
- Loss of air data computer information

The GFC 700 may be manually disconnected by any of the following means:

- Depressing the red AP DISC button on the pilot's or copilot's control stick
- Moving the left (outboard) side of the manual electric trim switch on the pilot's control stick
- Pushing the AP button on the autopilot mode controller when the autopilot is engaged
- Depressing the GA button on the left side of the power lever
- Pulling the AUTOPILOT circuit breaker
- Turning off the AVIONICS MASTER switch
- Turning off the ELECTRIC MASTER key switch

In addition, the CWS (control wheel steering) switch on the pilot's control stick will disconnect the autopilot servos from the airplane flight controls as long as the CWS switch is depressed.

Power to the GFC 700 autopilot and electric trim system is supplied through the AVIONIC MASTER switch and the AUTOPILOT circuit breaker. The AVIONIC MASTER switch can be used as an additional means to disable the autopilot and electric trim system. The red AP DISC switch on the pilot's control stick will interrupt power to the manual electric trim for as long as the switch is depressed.

Loss of instruments or components of the G1000 system will affect the GFC 700 AFCS as follows:

- Loss of the AHRS will cause the autopilot to disconnect. The autopilot and flight director will be inoperative. Manual electric trim will be available.
- Loss of the heading function of the AHRS will result in loss of the HDG mode. If in HDG mode at the time heading is lost, the autopilot will revert to basic roll Mode (ROL).
- Loss of the MFD will not cause the autopilot to disconnect, and will remain engaged with limited functionality, but the autopilot cannot be re-engaged after disconnect by the pilot.

- Loss of the PFD will cause the autopilot to disconnect. The autopilot and flight director will be inoperative. Manual electric trim will be available.
- Loss of air data computer information will cause the autopilot to disconnect. The autopilot will be inoperative. The flight director will be available except for air data modes (ALT, VS, FLC). Manual electric trim is available.
- Loss of GIA #1 will cause the autopilot to disconnect. The autopilot, flight director and manual electric trim will be inoperative. Loss of GIA #2 will also prevent autopilot and manual electric trim operation, but flight director will be available.
- Loss of the standby airspeed indicator, standby attitude indicator, standby altimeter, or compass will have no effect on the autopilot.
- Loss of both GPS systems will cause the autopilot and flight director to operate in NAV modes (LOC, BC, VOR, VAPP) with reduced accuracy. Course intercept and station crossing performance may be improved by executing intercepts and station crossings in HDG mode, then reselecting NAV mode.

WARNING

Following an autopilot or electric trim malfunction do not re-engage the autopilot or manual electric trim or reset the AUTOPILOT circuit breaker until the cause of the malfunction has been determined and corrected.

The GFC 700 Automatic Flight Control system (AFCS) installed in the Diamond DA 40 NG consists of the following components:

- One GDU which contains the following mode control buttons:

AP	(Autopilot engage/disengage)
FD	(Flight director On/Off)
HDG	(Heading mode On/Off)
NAV	(Nav mode On/Off)
APR	(Approach mode On/Off)
ALT	(Altitude hold mode On/Off)
VS	(Vertical speed mode On/Off)

FLC	(Flight level change mode On/Off)
NOSE UP and	
NOSE DN	(Vertical mode reference change)
VNV	(Vertical navigation mode On/Off)

This GDU is installed as the MFD.

- Servos with autopilot processing logic in the pitch, roll, and pitch trim control systems
- Servo mounts and brackets
- Flight director processing logic in the GIAs
- Control stick-mounted manual electric trim (MET) switch (split switch) for pitch trim
- Control stick-mounted trim interrupt and autopilot disconnect switch
- Control stick-mounted CWS (Control Wheel Steering) switch
- Remote-mounted go-around switch (on the left side of the power lever knob)
- PFD/MFD mounted altitude preselect knob (ALT)
- PFD/MFD mounted heading select knob (HDG)

Flight director commands and autopilot modes are displayed on the PFD. Full AFCS functionality is only available with both displays operating, and will disconnect under certain reversionary conditions.

Upon initial system power-up, the system undergoes a preflight test. At the end of the test, the autopilot disconnect tone sounds and the PFT and AFCS annunciations are removed. Successful completion of the preflight test is required for the autopilot and manual electric trim to engage.

Annunciation of the flight director and autopilot modes is shown in the lower status field of the PFD. In general, green indicates active modes and white indicates armed modes. When a mode is directly selected by the pilot, no flashing of the mode will occur. When automatic mode changes occur, they will be annunciated with a flashing annunciation of the new mode for ten seconds in green. If a mode becomes unavailable for whatever reason, the mode will flash for ten seconds in yellow and be replaced by the new mode in green.

Normal autopilot disconnects are annunciated with a yellow flashing AP on the PFD accompanied by a two second autopilot disconnect tone. Normal disconnects are those initiated by the pilot with the AP DISC switch, the MET switch, the AP button on the MFD mode controller, or the GA button. Abnormal disconnects will be accompanied by a red flashing AP on the PFD accompanied by a continuous autopilot disconnect tone. The disconnect tone and flashing alert may be cancelled by pressing the AP DISC switch or the left side of the MET switch.

Refer to the Garmin G1000 Cockpit Reference Guide, P/N 190-00953-00, Rev. 0 or later, and Garmin G1000 Pilot's Guide for the Diamond DA 40 NG, P/N 190-952-00, Rev. 0 or later, for complete descriptions of the G1000 system and operating procedures.

Power Supply

The AVIONIC MASTER switch supplies power to the avionics bus bar of the radio circuit breakers and the autopilot circuit breaker.

The following circuit breaker is used to protect the following element of the GFC 700 autopilot:

Circuit Breaker	Function
AUTOPILOT	Supplies power to the autopilot pitch, roll, and pitch trim servos.

7.14.2 AUTOMATIC FLIGHT CONTROL SYSTEM ANNUNCIATIONS AND ALERTS

Automatic Flight Control System (AFCS) Status Alerts

The following annunciations can appear on the PFD above the airspeed and attitude indicators. Only one annunciation occurs at a time, and messages are priorized by criticality

Warning Alerts on the Automatic Flight Control System (AFCS)

Warning alerts	Meaning / Cause
PFT	PREFLIGHT TEST - Preflight system test failed; aural alert sounds at failure.
AFCS	SYSTEM FAILURE - AP and MET are unavailable; FD may still be available.
PTCH	PITCH FAILURE - Pitch axis control failure; AP inoperative.
ROLL	ROLL FAILURE - Roll axis control failure; AP inoperative.
PTRM	PITCH TRIM FAILURE (or stuck AP TRIM switch) If AP engaged, take control of the airplane and disengage AP. If AP disengaged, move AP TRIM switches separately to release.

Caution Alerts on the Automatic Flight Control System (AFCS)

Caution alerts	Meaning / Cause
↑ELE	ELEVATOR MISTRIM UP - Pitch servo providing sustained force in the indicated direction.
↓ELE	ELEVATOR MISTRIM DOWN - Pitch servo providing sustained force in the indicated direction.
←AIL	AILERON MISTRIM LEFT - Roll servo providing sustained force in indicated direction.
AIL→	AILERON MISTRIM RIGHT - Roll servo providing sustained force in indicated direction.

Advisory Alerts on the Automatic Flight Control System (AFCS)

Advisory alerts	Meaning / Cause
PFT	PREFLIGHT TEST - Performing preflight system test; aural alert sounds at completion. Do not press the AP DISC switch during servo power-up and preflight system tests as this may cause the preflight system test to fail or never to start (if servos fail their power-up tests). Power must be cycled to the servos to remedy the situation.

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CHAPTER 8

AIRPLANE HANDLING, CARE AND MAINTENANCE

Page

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.

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 personel.

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:

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

1. Remove any snow from the airplane using a soft brush.
2. Spray de-icing fluid onto ice-covered surfaces using a suitable spray bottle.
3. Use a soft piece of cloth to wipe the airplane dry.

CHAPTER 9
SUPPLEMENTS

Page

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.

9.2 LIST OF SUPPLEMENTS

Airplane S/N: Registration: Date:

Sup. No.	Title	Rev. No.	Date	applicable	
				YES	NO
S04	ELT ME 406	0	01 Apr 2010	□	□
S06	G1000 Synthetic Vision Technology	0	01 Apr 2010	□	□

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