Diamond AIRCRAFT

AIRPLANE FLIGHT MANUAL
DA 40

Airworthiness Category	**: Normal, Utility**
Requirement	**: JAR-23**
Serial Number	: 40.698
Registration	: N216DG
Doc. No.	**: 6.01.01-E**
Date of Issue	**: 26 June 2000**

Signature	:	Winkler
Authority	:	AUSTRO CONTROL GmbH Abteilung Flugtechnik Zentrale
Stamp	:	A-1030 Wien, Schnirchgasse 11
Date of approval	:	09. DEZ. 2004

This Flight Manual has been verified for EASA by the Austrian Civil Aviation Authority Austro Control (ACG) as Primary Certification Authority (PCA) in accordance with the valid Certification Procedures and approved by EASA with approval no. 2004-12326

This Flight Manual has been approved by EASA on behalf of CAAC-AAD.

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

AmSafe, Inc.
Inflatable Restraints Division
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Document No.: E509609

FAA APPROVED
AIRPLANE FLIGHT MANUAL SUPPLEMENT
to
PILOT'S OPERATING HANDBOOK AND FAA APPROVED AIRPLANE FLIGHT MANUAL
for
Diamond Aircraft Industries, Inc.
Model DA 40

Aircraft Reg. No. N216DG **Aircraft S/N:** 40.698

This supplement must be attached to the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual for Diamond Aircraft Model DA 40 when the Airplane is modified by the installation of AmSafe Aviation Inflatable Restraint (AAIR®) System, V23 Version in accordance with STC SA01918LA.

The information contained herein supplements or supersedes the basic manual only in those areas listed herein. For limitations, procedures, and performance information not contained in this supplement, consult the basic Airplane Flight Manual.

FAA APPROVED Patrick Power

Manager, Flight Test Branch, ANM-160L
Federal Aviation Administration
Los Angeles Aircraft Certification Office
Transport Airplane Directorate

DATE September 25, 2006

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.

NOTE

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

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

Rev. No.	Reason	Chapter	Page(s)	Date of Revision	Approval	Date of Approval	Date Inserted	Signature
1	corrections	all	all	26-Sep-2000	[approved by Ing. Andreas Winkler for ACG]	09-Oct-2000		
2	OÄM 40-060 (White Wire optional) OÄM 40-068 (Essential Bus) OÄM 40-073 (LASAR optional) corrections	0	0-2, 0-4 thru 0-7	19-Dec-2000	approved by Ing. Andreas Winkler for ACG]	25-Jan-2001		
		1	1-16					
		2	2-1, 2-7 thru 2-9, 2-13 thru 2-19					
		3	3-7, 3-8, 3-19, 3-20, 3-25, 3-26					
		4A	4A-3 thru 4A-8, 4A-14, 4A-15					
		4B	4B-4 thru 4B-6					
		6	6-1, 6-2, 6-12 thru 6-14					
		7	7-1, 7-8, 7-14, 7-28 thru 7-38					
3	OÄM 40-064 (Night VFR) OÄM 40-069 (control surf. gust lock) OÄM 40-070 (tow bar) corrections	0	0-2 thru 0-7	05-Feb-2001	[approved by Ing. Andreas Winkler for ACG]	02 Jul 2001		
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		8	8-1 thru 8-9					

Rev. No.	Reason	Chapter	Page(s)	Date of Revision	Approval	Date of Approval	Date Inserted	Signature
4	OÄM 40-067 (IFR) corrections	all	all	09 Apr 2001	[approved by Ing. Andreas Winkler for ACG]	02 Jul 2001		
5	OÄM 40-061 (KAP 140 autopilot) OÄM 40-073 (SlickSTART) OÄM 40-081 (door lock) OÄM 40-085 (KX 155A as COM 1) OÄM's 40-092 thru 40-094 (Mikrotechna ASI, altimeter, VSI) MÄM 40-039/a (VM 1000) MÄM 40-048 (RH emerg. window) corrections	0	0-1 thru 0-8	09 Sep 2001	[approved by Ing. Andreas Winkler for ACG]	09 Sep 2001		
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Rev. No.	Reason	Chapter	Page(s)	Date of Revision	EASA Approval No.	ACG Compliance	Date Inserted	Signature
6	type certification in China	0	0-0, 0-5, 0-6	15 Sep 2004	2004-12326	[Ing. Andreas Winkler for ACG]		
7	**MÄM-40-** -047, -069, -075, -078, -096, -099, -123e, -133, -141, -174, -175; **OÄM-40-** -063/b, -071/c, -077, -078, -080, -083/a, -090, -091, -097, -098, -103, -104, -105, -106, -111, -112, -114, -115, -117, -117/a, -119, -120, -121, -122, -124, -127, -128, -138, -140, -154, -165, -167, -168, -179, -181, -183, -185, -186, -190, -198, -200, -206, -237, 250/a; **RÄM-40-** -014; corrections; double-sided layout	all	all except cover page	15 Jul 2006	Revision No. 7 of the AFM Doc. No. 6.01.01-E is approved under the authority of DOA No. EASA.21J.052	[11 Aug 2006 Dipl.-Ing. (FH) Manfred Reichel for DAI]		

Rev. No.	Reason	Chapter	Page(s)	Date of Revision	EASA Approv-al No.	ACG Compliance	Date Inserted	Signature
8	**MÄM-40-** -176, -227/a, -313, -344, -360/a, -378, -401, -415, -428, -446; **OÄM-40-** -217, -251, -253/b, 258, -267, -277/a, -279, 283/a, -284, -289, -326, -327; corrections	all	all except cover page	01 Dec 2010	Revision No. 8 of the AFM Doc. No. 6.01.01-E is approved under the authority of DOA No. EASA.21J.052			

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0.4 TABLE OF CONTENTS

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	
RH Emergency Window	MÄM 40-048	☐ yes	☑ no
Modified MLG Strut	MÄM 40-123/e	☐ yes	☐ no
1200 kg Maximum Take-Off Mass	MÄM 40-227	☐ yes	☐ no
Autopilot	OÄM 40-061	☐ yes	☐ no
Tow-Plane Operation	OÄM 40-063/b	☐ yes	☐ no
Emergency Switch	OÄM 40-067	☐ yes	☐ no
Essential Bus	OÄM 40-068	☐ yes	☐ no
Long Range Tank	OÄM 40-071/b	☐ yes	☐ no
Alternate Static Valve	OÄM 40-072	☐ yes	☐ no
SlickSTART Ignition System	OÄM 40-073	☐ yes	☐ no
MT P-420-10 Governor	OÄM 40-077	☐ yes	☐ no
Operation with Winter Kit	OÄM 40-078	☐ yes	☐ no

Modification	Source	Installed	
Door Locking System	OÄM 40-081	☐ yes	☐ no
NLG Speedkit	OÄM 40-105	☐ yes	☐ no
MLG Speedkit	OÄM 40-106	☐ yes	☐ no
Essential Tie Relay Bypass	OÄM 40-126	☐ yes	☐ no
Baggage Extension Baggage Tray*	OÄM 40-163 OÄM 40-164	☐ yes ☐ yes	☐ no ☐ no
Winter Baffle Fresh Air Inlet	OÄM 40-183	☐ yes	☐ no
Nose Landing Gear Tie-Down	OÄM 40-200	☐ yes	☐ no
Electrical Rudder Pedal Adjustment	OÄM 40-251	☐ yes	☐ no
CO Monitor	OÄM 40-253	☐ yes	☐ no
Autopilot Static Source	OÄM 40-267	☐ yes	☐ no
Tall Main Landing Gear	OÄM 40-283	☐ yes	☐ no
ELT Artex ME 406 'ACE'	OÄM 40-284	☐ yes	☐ no
MT P-860-23 Governor	OÄM 40-289	☐ yes	☐ no
Emergency Axe	OÄM 40-326	☐ yes	☐ no

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

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

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

CAUTION

The DA 40 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 JAA JC/VP procedure. The certification basis is JAR-23, published on 11-Mar-1994.

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

Overall Dimensions

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

Wing

Airfoil	:	Wortmann FX 63-137/20 - W4	
Wing Area	:	appr. 13.54 m²	appr. 145.7 sq.ft.
Mean aerodynamic chord (MAC)	:	appr. 1.121 m	appr. 3 ft 8.1 in
Aspect ratio	:	appr. 10.53	
Dihedral	:	appr. 5°	
Leading edge sweep	:	appr. 1°	

Aileron

Area (total, left + right)	:	appr. 0.654 m²	appr. 7.0 sq.ft.

Wing Flaps

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

Horizontal Tail

Area	:	appr. 2.34 m²	appr. 25.2 sq.ft.
Elevator area	:	appr. 0.665 m²	appr. 7.2 sq.ft.
Angle of incidence	:	appr. -3.0° relative to longitudinal axis of airplane	

Vertical Tail

Area	:	appr. 1.60 m²	appr. 17.2 sq.ft.
Rudder area	:	appr. 0.47 m²	appr. 5.1 sq.ft.

Landing Gear

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

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

Main wheel :
(a) 6.00-6; 6 PR, 120 mph in combination with any MLG strut
(b) 15 x 6.0-6; 6 PR, 160 mph only in combination with the "thin" (MÄM 40-123/e) or the "tall" (OÄM 40-283) MLG strut

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 at MSL.

IAS: Indicated Airspeed as shown on an airspeed indicator.

KCAS: CAS in knots.

KIAS: IAS in knots.

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

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

v_{FE}: Max. Flaps Extended Speed. This speed must not be exceeded with the given flap setting.

v_{NE}: Never Exceed Speed in smooth air. This speed must not be exceeded in any operation.

v_{NO} Maximum Structural Cruising Speed. This speed may be exceeded only in smooth air, and then only with caution.

v_S: Stalling Speed, or the minimum continuous speed at which the airplane is still controllable in the given configuration.

v_{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 1013.25 hPa (29.92 inHg); the temperature gradient up to the altitude at which the temperature reaches -56.5 °C (-69.7 °F) is -0.0065 °C/m (-0.00357 °F/ft), and above this 0 °C/m (0 °F/ft).
MSL:	Mean Sea Level.
OAT:	Outside Air Temperature.
QNH:	Theoretical atmospheric pressure at MSL, calculated from the elevation of the measuring point above MSL and the actual atmospheric pressure at the measuring point.
Indicated Pressure Altitude:	Altitude reading with altimeter set to 1013.25 hPa (29.92 inHg).
Pressure Altitude:	Altitude above MSL, indicated by a barometric altimeter which is set to 1013.25 hPa (29.92 inHg). The Pressure Altitude is the Indicated Pressure Altitude corrected for installation and instrument errors. In this Airplane Flight Manual altimeter instrument errors are regarded as zero.
Density Altitude:	Altitude in ISA conditions at which the air density is equal to the current air density.
Wind:	The wind speeds which are shown as variables in the diagrams in this manual should be regarded as headwind or downwind components of the measured wind.

(c) Flight Performance and Flight Planning

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

MET: Weather, weather advice.

NAV: Navigation, route planning.

(d) Mass and Balance (M&B, W&B)

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

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

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

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

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

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

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

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

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

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

Maximum Take-off Mass:
The maximum permissible mass for take-off.

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

(e) Engine

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

Maximum Continuous Power:
Maximum permissible engine output power used continuously during flight.

CHT: Cylinder Head Temperature.

EGT: Exhaust Gas Temperature.

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

Asymmetric Instrument Panel (Circuit Breakers Right Hand)

AVIONICS:

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

ENGINE:

IGNITION	Ignition
INST. 1	Engine Instrument VM 1000
START	Starter

LIGHTING:

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

SYSTEMS:

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

ELECTRICAL:

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

Symmetric Instrument Panel (Circuit Breakers Bottom Side)

MAIN BUS:

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

MAIN AV. BUS (Main Avionic Bus):

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

ESS. AV. BUS (Essential Avionic-Bus):

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

ESSENTIAL BUS:

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

(g) Equipment

ELT:	Emergency Locator Transmitter.

(h) Design Change Advisories

MÄM:	Mandatory Design Change Advisory.
OÄM:	Optional Design Change Advisory.

(i) Miscellaneous

ACG:	Austro Control GmbH (formerly BAZ, Federal Office of Civil Aviation).
ATC:	Air Traffic Control.
CFRP:	Carbon Fiber Reinforced Plastic.
GFRP:	Glass Fiber Reinforced Plastic.
JAR:	Joint Aviation Requirements.
JC/VP:	Joint Certification/Validation Procedure.
PCA:	Primary Certification Authority.

1.6 UNITS OF MEASUREMENT

1.6.1 CONVERSION FACTORS

Dimension	SI-Units		US Units		Conversion
Length	[mm]	millimeters	[in]	inches	[mm] / 25.4 = [in]
	[m]	meters	[ft]	feet	[m] / 0.3048 = [ft]
	[km]	kilometers	[NM]	nautical miles	[km] / 1.852 = [NM]
Volume	[l]	liters	[US gal]	US gallons	[l] / 3.7854 = [US gal]
			[qts]	US quarts	[l] / 0.9464 = [qts]
Speed	[km/h]	kilometers per hour	[kts]	knots	[km/h] / 1.852 = [kts]
	[m/s]	meters per second	[mph]	miles per hour	[km/h] / 1.609 = [mph]
			[fpm]	feet per minute	[m/s] x 196.85 = [fpm]
Speed of rotation	[RPM] revolutions per minute				--
Mass	[kg]	kilograms	[lb]	pounds	[kg] x 2.2046 = [lb]
Force, weight	[N]	newtons	[lbf]	pounds force	[N] x 0.2248 = [lbf]
Pressure	[hPa]	hecto-pascals	[inHg]	inches of mercury	[hPa] = [mbar]
	[mbar]	millibars	[psi]	pounds per square inch	[hPa] / 33.86 = [inHg]
	[bar]	bars			[bar] x 14.504 = [psi]
Temperature	[°C]	degrees Celsius	[°F]	degrees Fahrenheit	[°C]x1.8 + 32 = [°F] ([°F] - 32)/1.8 = [°C]

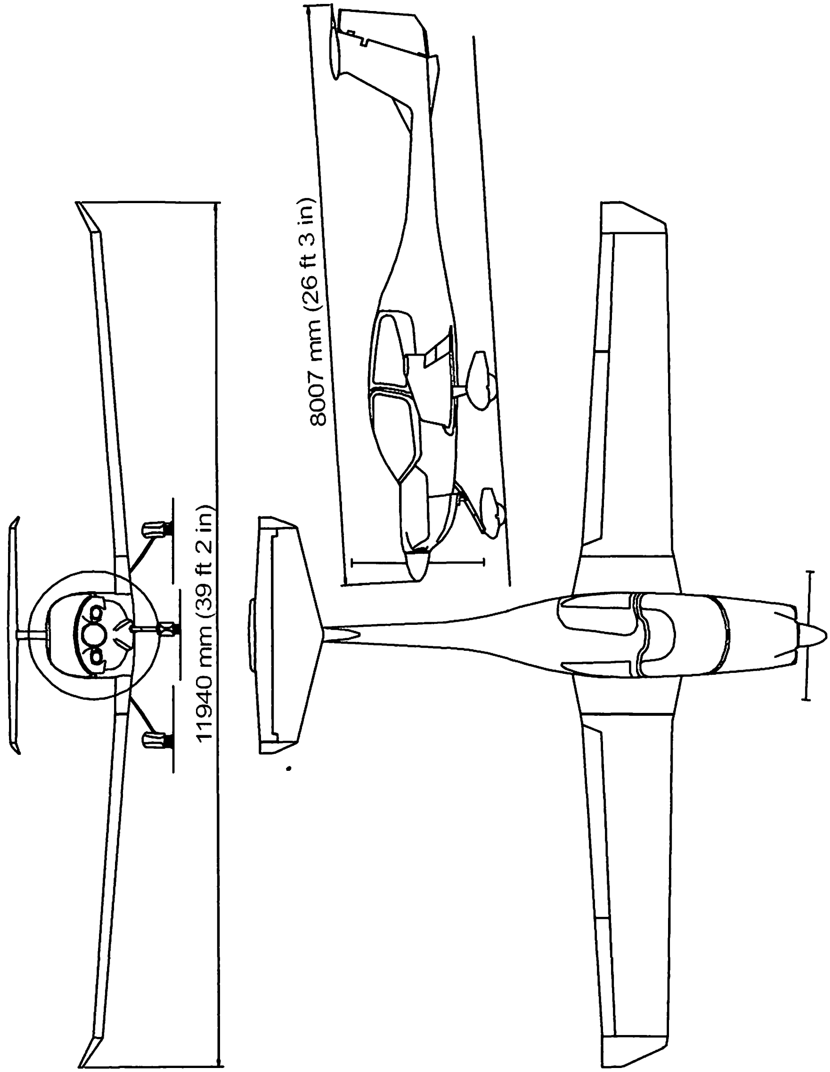
Dimension	SI-Units	US Units	Conversion
Intensity of electric current	[A] ampères		--
Electric charge (battery capacity)	[Ah] ampère-hours		--
Electric potential	[V] volts		--
Time	[sec] seconds		--

1.6.2 CONVERSION CHART LITERS / US GALLONS

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

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

1.7 THREE-VIEW DRAWING



1.8 SOURCE DOCUMENTATION

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

1.8.1 ENGINE

Address:	Textron Lycoming 652 Oliver Street WILLIAMSPORT, PA 17701 USA
Phone:	+1-570-323-6181
Webpage:	www.lycoming.textron.com
Documents:	a) Textron Lycoming Operator's Manual, Aircraft Engines 60297-12 (Part No.) b) Service Bulletins (SB) Service Instructions (SI); (e.g. SI 1014, SI 1070) Service Letters (SL); (e.g. SL114 (subscriptions))

1.8.2 PROPELLER

Address:	mt-Propeller Airport Straubing Wallmühle D-94348 ATTING GERMANY
Phone:	+49-9429-9409-0
E-mail:	sales@mt-propeller.com
Webpage:	www.mt-propeller.de
Documents:	E-124, Operation and Installation Manual Hydraulically controlled variable pitch propeller MTV -5, -6, -9, -11, -12, -14, -15, -16, -21, -22, -25

1.8.3 ENGINE INSTRUMENTS

Address:	VISION MICROSYSTEMS, INC. ADVANCED ELECTRONIC INSTRUMENTATION 4071 Hannegan Road, Suite T BELLINGHAM, WA 98226 USA
Phone:	+1-360-714-8203
Documents:	5010002 REV F, VM 1000 Owner's Manual

1.8.4 IGNITION CONTROL UNIT

The electronic ignition control unit LASAR is optional equipment.

Address:	UNISON Industries 7575 Baymeadows Way JACKSONVILLE, FL 32256 USA
Phone:	+1-904-739-4066
Webpage:	www.unisonindustries.com
Documents:	L-1502 LASAR Installation, Operation, and Troubleshooting Manual

CHAPTER 2
OPERATING LIMITATIONS

Page

2.1 INTRODUCTION

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

The limitations included in this Chapter are approved.

WARNING

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

2.2 AIRSPEED

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

2.3 AIRSPEED INDICATOR MARKINGS

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

2.4 POWER-PLANT LIMITATIONS

a) Engine manufacturer : Textron Lycoming

b) Engine designation : IO-360 M1-A

c) RPM limitations
- Max. take-off RPM : 2700 RPM
- Max. continuous RPM : 2400 RPM

d) Manifold pressure limitations
- Maximum : FULL throttle

e) Oil pressure
- Minimum (IDLE) : 25 PSI / 1.72 bar
- Maximum : 98 PSI / 6.76 bar
- Normal operating range : 55 to 95 PSI / 3.8 to 6.55 bar

f) Oil quantity
- Minimum : 4 qts
- Maximum : 8 qts

g) Oil temperature
- Maximum : 245 °F (118 °C)

h) Fuel pressure
- Minimum : 14 PSI / 0.97 bar
- Maximum : 35 PSI / 2.4 bar

i) Cylinder head temperature
- Maximum : 500 °F (260 °C)

j) Propeller manufacturer : mt-Propeller

k) Propeller designation : MTV-12-B/180-17 or
MTV-12-B/180-17f

l) Propeller diameter : 1.80 m (+ 0 mm, - 50 mm)
5 ft 10.9 in (+ 0.0 in, - 2.0 in)

m) Propeller pitch angle (0.75 R) : 10.5° to 30°

n) Oil specification:

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

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

2.5 ENGINE INSTRUMENT MARKINGS

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

NOTE

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

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
Manifold pressure	--	--	13 - 30 inHg	--	--
RPM	--	--	500 - 2400 RPM	2400 - 2700 RPM	above 2700 RPM
Oil temp.	--	--	149 - 230 °F	231 - 245 °F	above 245 °F
Cylinder head temp.	--	--	150 - 475 °F	476 - 500 °F	above 500 °F
Oil pressure	below 25 PSI	25 - 55 PSI	56 - 95 PSI	96 - 97 PSI	above 97 PSI
Fuel pressure	below 14 PSI	--	14 - 35 PSI	--	above 35 PSI
Fuel flow	--	--	1 - 20 US gal/hr	--	above 20 US gal/hr
Voltage	below 24.1 V	24.1 - 25 V	25.1 - 30 V	30.1 - 32 V	above 32 V
Ammeter	--	--	2 - 75 A	--	--

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
Fuel quantity, Standard Tank	0 US gal	--	0 - 15 US gal[1] 0 - 17 US gal[2]	--	--
Fuel quantity, Long Range Tank	0 US gal	--	0 - 16 US gal + 0 - 9 US gal[3]	--	--

[1] up to and including serial number 40.054

[2] serial number 40.055 and subsequent

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

2.6 WARNING, CAUTION AND STATUS LIGHTS

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

NOTE

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

Color and Significance of the Warning Lights (Red)

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

Color and Significance of the Caution Lights (Amber)

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

Color and Significance of the Status Light (White)

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

2.7 MASS (WEIGHT)

Maximum take-off mass (Normal Category)	: 1150 kg	2535 lb
if MÄM 40-227 is carried out	: 1200 kg	2646 lb
Maximum take-off mass (Utility Category)	: 980 kg	2161 lb
Maximum landing mass		
Original MLG strut	: 1092 kg	2407 lb
Modified MLG strut (MÄM 40-123/e or OÄM 40-283)	: 1150 kg	2535 lb
Maximum zero fuel mass	: 1150 kg	2535 lb
Max. load in standard baggage compartment	: 30 kg	66 lb
Max. load in baggage tube	: 5 kg	11 lb
Max. load in extended baggage compartment (OÄM 40-163)		
Max. load in forward part	: 45 kg	100 lb
Max. load in aft part	: 18 kg	40 lb
Max. total load forward + aft	: 45 kg	100 lb
Max. surface load for baggage compartments	: 75 kg/m²	15.3 lb/ft²

WARNING

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

NOTE

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

NOTE

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

2.8 CENTER OF GRAVITY

Datum Plane

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

Center of Gravity Limitations

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

Most forward CG:

2.40 m (94.5 in) aft of DP from 780 kg to 980 kg (1720 lb to 2161 lb)
2.46 m (96.9 in) aft of DP at 1150 kg (2535 lb)
linear variation between these values

If MÄM 40-227 is carried out:

2.40 m (94.5 in) aft of DP from 780 kg to 980 kg (1720 lb to 2161 lb)
2.48 m (97.6 in) aft of DP at 1200 kg (2646 lb)
linear variation between these values

Most rearward CG:

a) Standard Tank	: 2.59 m (102.0 in) aft of DP
b) Long Range Tank	: 2.55 m (100.4 in) aft of DP

WARNING

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

2.9 APPROVED MANEUVERS

The airplane is certified in the Normal Category and in the Utility Category in accordance with JAR-23.

Approved Maneuvers

a) Normal Category:

1) All normal flight maneuvers;

2) Stalling (with the exception of dynamic stalling); and

3) Lazy Eights, Chandelles, as well as steep turns and similar maneuvers, in which an angle of bank of not more than 60° is attained.

CAUTION

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

b) Utility Category:

1) All normal flight maneuvers;

2) Stalling (with the exception of dynamic stalling); and

3) Lazy Eights, Chandelles, as well as steep turns and similar maneuvers, in which an angle of bank of not more than 90° is attained.

CAUTION

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

CAUTION

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

2.10 MANEUVERING LOAD FACTORS

Table of maximum structural load factors:

Normal Category

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

Utility Category

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

WARNING

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

2.11 OPERATING ALTITUDE

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

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

2.12 FLIGHT CREW

Minimum crew number : 1 (one person)

Maximum number of occupants:

Normal Category	:	4 (four persons)
Utility Category	:	2 (two persons), both of whom must sit in front

2.13 KINDS OF OPERATION

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

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

Flights into known or forecast icing conditions are prohibited.

Flights into known thunderstorms are prohibited.

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.

Minimum Operational Equipment (Serviceable)			
	For Daytime VFR Flights	In Addition for Night VFR Flights	In addition for IFR Flights
Flight and Navigation Instruments	* Airspeed indicator * Altimeter * Magnetic compass	* Vertical speed indicator (VSI) * Attitude gyro (artificial horizon) * Turn & bank indicator * Directional gyro * OAT indicator * Chronometer with indication of hours, minutes, and seconds * VHF radio (COM) with speaker and microphone * VOR receiver * Transponder (XPDR), Mode A and Mode C * 1 headset	* Second VHF radio (COM) * VOR-LOC-GP receiver * Marker beacon receiver
Engine Instruments	* Fuel indicators * Integrated engine instrument * Annunciator panel (all lights, see 2.6)	* Ammeter (included in VM 1000) * Voltmeter (included in VM 1000)	

Minimum Operational Equipment (Serviceable)			
	For Daytime VFR Flights	In Addition for Night VFR Flights	In addition for IFR Flights
Lighting		* Position lights * Strobe lights (anti collision lights) * Landing light * Instrument lighting * Flood light * Flashlight	
Other Operational Minimum Equipment	* Stall warning system * Fuel quantity measuring device (see 7.10) * Safety belts for each occupied seat * Airplane flight manual	* Pitot heating system * Alternate static valve * Essential bus	* Emergency battery

NOTE

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

NOTE

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

2.14 FUEL

Fuel Grade AVGAS 100LL

Fuel Quantity

a) Standard Tank:

Total fuel quantity	: 2 x 20.6 US gal (app. 2 x 78 liter)
Unusable fuel	: 2 x 0.5 US gal (app. 2 x 2 liter)
Max. indicated fuel quantity:	
up to and incl. serial no. 40.054	: 15 US gal (app. 57 liter) per tank
serial no. 40.055 & subsequent	: 17 US gal (app. 64 liter) per tank
Max. permissible difference between right and left tank	: 10 US gal (app. 38 liter)

b) Long Range Tank (if installed):

Total fuel quantity	: 2 x 25.5 US gal (app. 2 x 96.5 liter)
Unusable fuel	: 2 x 0.5 US gal (app. 2 x 2 liter)
Max. indicated fuel quantity	: 16 US gal (app. 61 liter) per tank
Indicated quantity auxiliary fuel tank	: 0 to 9 US gal (app. 0 to 34 liter) per tank
Max. permissible difference between right and left tank	: 8 US gal (app. 30 liter)

CAUTION

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

2.15 LIMITATION PLACARDS

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

On the Instrument Panel:

If MÄM 40-227 is not carried out:

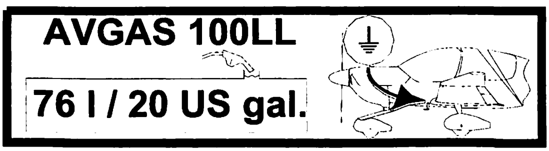
Maneuvering speed: **v_A = 108 KIAS (above 980 up to 1150 kg / above 2161 up to 2535 lb)** **v_A = 94 KIAS (780 to 980 kg / 1720 to 2161 lb)** **This airplane may only be operated in accordance with the Airplane Flight Manual. It can be operated in the "Normal" and "Utility" categories in non-icing conditions. Provided that national operational requirements are met and the appropriate equipment is installed, this airplane is approved for the following kinds of operation: day VFR, night VFR and IFR. All aerobatic maneuvers including spinning are prohibited.** **For further operational limitations refer to the Airplane Flight Manual.**
No smoking.

If MÄM 40-227 is carried out:

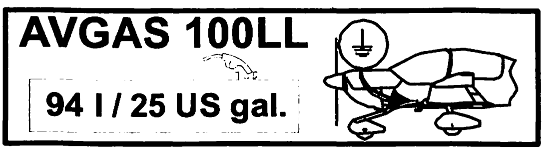
Maneuvering Speed: **v_A = 111 KIAS (above 1036 up to 1200 kg, above 2284 up to 2646 lb)** **v_A = 94 KIAS (780 to 1036 kg, 1720 to 2284 lb)** **The airplane may only be operated in accordance with the Airplane Flight Manual. It can be operated in the „Normal“ and the „Utility“ categories in non-icing conditions. Provided that national operational requirements are met and the appropriate equipment is installed, this airplane is approved for the following kinds of operation: day VFR, night VFR and IFR. All aerobatic maneuvers including spinning are prohibited.** **For further operational limitations refer to the Airplane Flight Manual.**
No smoking.

Next to Each of the Two Fuel Filler Necks:

a) Standard Tank:



b) Long Range Tank (if installed):



Next to the Fuel Quantity Indication:

a) Standard Tank:

Up to serial number 40.054:

max. indicated fuel quantity: 15 US gal
left and right tank max. 10 US gal difference
For use of max. tank capacity see AFM

Serial number 40.055 and subsequent:

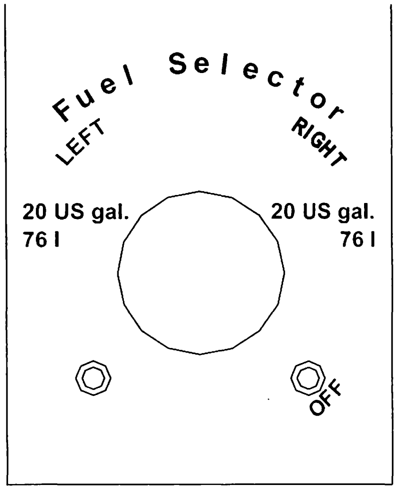
max. indicated fuel quantity: 17 US gal
left and right tank max. 10 US gal difference
For use of max. tank capacity see AFM

b) Long Range Tank (if installed):

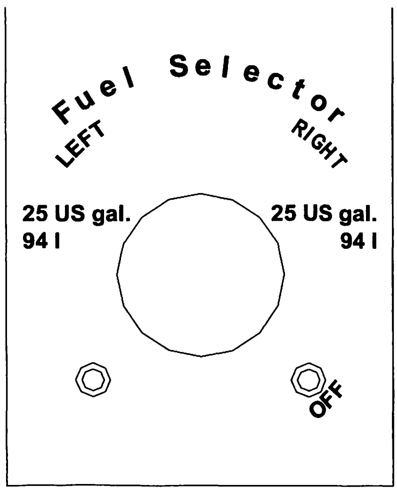
Fuel qty. indication: 16 + 9 US gal
max. difference LH/RH tank: 8 US gal
AUX FUEL QTY switch for LH/RH auxiliary fuel quantity
NOTE: See AFM for more information on AUX FUEL

On the Fuel Tank Selector:

a) Standard Tank:



b) Long Range Tank (if installed):



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

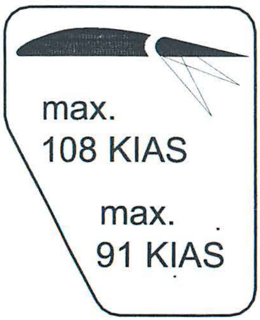
OIL	**1 qt = 0.95 liters**

SAE 15W50

ashless dispersant aviation
grade oil (SAE Standard J-1899)
or see AFM Chapter 2

VFR Min./Max.: 4/8 qts
IFR Min./Max.: 6/8 qts

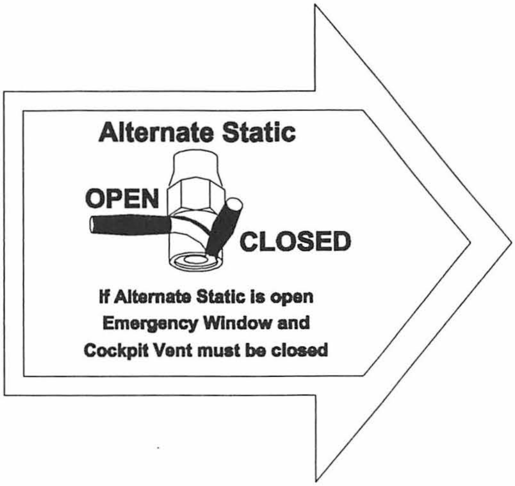
Next to the Flap Selector Switch:



Next to the Essential Bus Switch (if installed):

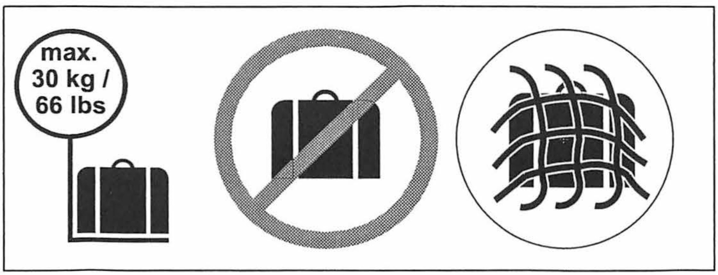
Ess. Bus NOT for normal operation. See AFM.

In the Cockpit, on the Left Fuselage Sidewall:
(if alternate static valve is installed):

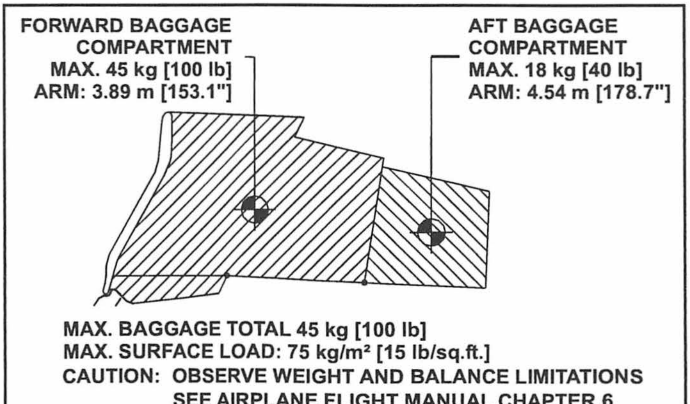


Next to the Baggage Compartment:

a) Standard Baggage Compartment:



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



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

EMERGENCY EXIT:
The keylock must be
unlocked during flight!

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

NAV No. 2 not approved
for precision approaches

2.16 OTHER LIMITATIONS

2.16.1 TEMPERATURE

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

CAUTION

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

2.16.2 BATTERY CHARGE

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

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

2.16.3 EMERGENCY SWITCH

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

2.16.4 OPERATION TIME OF ELECTRICAL EQUIPMENT

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

2.16.5 DOOR LOCKING DEVICE

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

2.16.6 ELECTRONIC EQUIPMENT

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

Examples of undesirable items of equipment are:

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

This list is not exhaustive.

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

2.16.7 USE OF THE SUN VISORS

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

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

3.2 ENGINE PROBLEMS

3.2.1 ENGINE PROBLEMS ON THE GROUND

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

CAUTION

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

WARNING

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

END OF CHECKLIST

3.2.2 ENGINE PROBLEMS DURING TAKE-OFF

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

Land Straight Ahead:

1. Throttle . . . . IDLE

On the Ground:

2. Brakes . . . . as required

CAUTION

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

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

CONTINUED

(b) Take-Off Can No Longer Be Aborted

1. Airspeed .... 74 KIAS (1200 kg, 2646 lb)
   72 KIAS (1150 kg, 2535 lb)
   66 KIAS (1000 kg, 2205 lb)
   59 KIAS (850 kg, 1874 lb)

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. Turning back can be fatal.

If Time Allows:

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

8. Alternate Air .... OPEN

WARNING

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

END OF CHECKLIST

3.2.3 ENGINE PROBLEMS IN FLIGHT

(a) Engine Running Roughly

WARNING

An engine which is running very roughly can lead to the loss of the propeller. If the engine is running roughly operation should only be continued if there is no other alternative.

1. Airspeed . . . . 76 KIAS (1200 kg, 2646 lb)
   73 KIAS (1150 kg, 2535 lb)
   68 KIAS (1000 kg, 2205 lb)
   60 KIAS (850 kg, 1874 lb)
2. Electrical fuel pump . . . . check ON
3. Fuel tank selector . . . . check selected tank
4. Engine instruments . . . . check
5. Throttle . . . . check
6. RPM lever . . . . check
7. Mixture control lever . . . . set for smooth running
8. Alternate Air . . . . OPEN
9. Ignition status light . . . . check (only if the electronic ignition control unit is installed)
10. Ignition switch . . . . check BOTH

CONTINUED

11. Ignition circuit breaker (IGN) .... pull (only if the electronic ignition control unit is installed); if rough running is cleared by doing this, the circuit breaker should remain open

12. Throttle/RPM/Mixture .... try various settings

WARNING

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

END OF CHECKLIST

(b) Loss of Oil Pressure

1. Check oil pressure warning light and oil pressure indicator.
2. Check oil temperature.

2a. If the oil pressure indication drops below the green sector and the oil temperature is normal (oil pressure warning light does not illuminate or flash):

* Monitor the oil pressure warning light: it is probable that the oil pressure indication is defective.
* Monitor the oil and cylinder head temperatures.

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

If the oil pressure warning light illuminates or flashes, or

If both of these occur together:

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

2c. Oil pressure tending to zero combined with:

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

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

END OF CHECKLIST

(c) High Oil Pressure

Check oil temperature.

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

END OF CHECKLIST

(d) High Oil Temperature

Check cylinder head and exhaust gas temperature.

* If neither of these is high, it is probable that the fault lies in the oil temperature indication. The airplane should be serviced. A stable oil temperature indication of 26 °F (-3 °C) or 317 °F (158 °C) suggests a failure of the oil temperature sensor.

* If the cylinder head temperature or exhaust gas temperature is also high:

  - Check oil pressure. If the oil pressure is low, proceed as in 3.2.3 (b) - LOSS OF OIL PRESSURE.

  - If the oil pressure is in the green sector:

    - Check mixture setting, enrich mixture if necessary.

    - Reduce power; if this produces no improvement, land at the nearest appropriate airfield.

END OF CHECKLIST

(e) High Cylinder Head Temperature

Cylinder head temperature in yellow sector or above:

1. Check mixture setting, enrich mixture if necessary.
2. Check oil temperature.

   * If the oil temperature is also high:

     - Check oil pressure. If the oil pressure is low, proceed as in 3.2.3 (b) - LOSS OF OIL PRESSURE.

     - If the oil pressure is in the green sector:

       - Reduce power; if this produces no improvement, land at the nearest appropriate airfield.

       - Be prepared for possible emergency landing.

END OF CHECKLIST

(f) High RPM

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

1. Check friction adjuster for throttle quadrant.
2. Check oil pressure: Following a loss of oil or oil pressure, the propeller governor sets a high RPM. In this case the RPM should be regulated using the throttle. Proceed as in 3.2.3 (b) - LOSS OF OIL PRESSURE.
3. If oil pressure is normal:

   * Pull RPM lever back and listen for an associated drop in RPM:

     - If the indication does not change in spite of an audible drop in RPM, it is probable that the RPM indication is defective, which should thus be ignored (the airplane should be serviced).

     - If there is no audible drop in RPM, it is probable that the governor system is defective. In this case the RPM should be regulated using the throttle.

END OF CHECKLIST

(g) Loss of RPM

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

* Listen for rise in RPM.

  - If there is no audible rise in RPM, it is probable that the governor system is defective. In this case the RPM can be regulated within certain limits using the throttle.

    - Land at the nearest appropriate airfield.
    - Be prepared for possible emergency landing.

  - If the indication does not change in spite of an audible rise in RPM, it is probable that the RPM indication is defective, which should thus be ignored (the airplane should be serviced).

END OF CHECKLIST

(h) High Fuel Flow

Fuel flow in the red sector:

1. Electrical fuel pump .... ON
2. Fuel pressure .... check after 10 - 15 sec:

   * If the fuel pressure is low, refer to 3.2.3 (i) - LOW FUEL PRESSURE WITH THE ELECTRICAL FUEL PUMP SET TO ON.

   * If the fuel pressure is in the green sector, or the fuel pressure warning light is not illuminated, the likely cause is a defective fuel flow indication, which should thus be ignored (the airplane should be serviced). Fuel flow data should be taken from the engine performance table in Chapter 5.

3. Check fuel quantity. A rapid reduction in fuel quantity confirms a high fuel flow.

END OF CHECKLIST

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

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

1. Fuel flow .... check:

* If the fuel flow is high, there is possibly a leak (between the injection system and the injectors). Land on the nearest suitable airfield.

* If the fuel flow is in the green sector and the engine is running smoothly, the likely cause is a defective fuel pressure indication, which should thus be ignored (the airplane should be serviced).

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

END OF CHECKLIST

3.2.4 RESTARTING THE ENGINE WITH WINDMILLING PROPELLER

NOTE

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

NOTE

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

1. Airspeed .... 80 KIAS
2. Fuel tank selector .... fullest tank
3. Ignition switch .... check BOTH
4. Mixture control lever .... check appropriate position
5. Electrical fuel pump .... check ON
6. Alternate air .... OPEN

If Engine Does Not Start:

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

NOTE

If it is not possible to start the engine:
- Adopt glide configuration as in 3.4 - GLIDING.
- Carry out emergency landing as in 3.5.1 - EMERGENCY LANDING WITH ENGINE OFF.

END OF CHECKLIST

3.2.5 DEFECTIVE ENGINE CONTROLS

Defective Mixture Control Cable

(a) Flight and Landing:

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

WARNING

Go-around may become impossible with the remaining power.

(b) Engine Shut-Down:

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

END OF CHECKLIST

Defective Throttle Control Cable

(a) Sufficient Engine Power Available to Continue Flight:

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

(b) No Sufficient Engine Power Available to Continue Flight:

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

END OF CHECKLIST

Defective RPM Lever Control Cable

(a) Sufficient Engine Power Available to Continue Flight:

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

WARNING

Go-around may become impossible with the remaining power.

(b) No Sufficient Engine Power Available to Continue Flight:

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

END OF CHECKLIST

3.2.6 RESTARTING THE ENGINE WITH STATIONARY PROPELLER

NOTE

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

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

NOTE

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

if it is not possible to start the engine:

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

CONTINUED

CAUTION

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

END OF CHECKLIST

3.3 SMOKE AND FIRE

3.3.1 SMOKE AND FIRE ON THE GROUND

(a) Engine Fire When Starting on the Ground

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

After Standstill:

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

When the Engine Has Stopped:

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

END OF CHECKLIST

(b) Electrical Fire with Smoke on the Ground

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

If the Engine is Running:

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

When the Engine Has Stopped:

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

END OF CHECKLIST

3.3.2 SMOKE AND FIRE DURING TAKE-OFF

(a) If Take-Off Can Still Be Aborted

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

END OF CHECKLIST

(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. Turning back can be fatal.

3. Airspeed . . . . 74 KIAS (1200 kg, 2646 lb)
   72 KIAS (1150 kg, 2235 lb)
   66 KIAS (1000 kg, 2205 lb)
   59 KIAS (850 kg, 1874 lb)

CONTINUED

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

4. Fuel tank selector .... OFF
5. Electrical fuel pump .... OFF
6. Cabin heat .... OFF
7. Master switch (ALT/BAT) .... OFF
8. Emergency window(s) .... open if required
9. Carry out emergency landing with engine off. Allow for increased landing distance due to the flap position.

CAUTION

In case of extreme smoke development, the 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

3.3.3 SMOKE AND FIRE IN FLIGHT

CAUTION

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

(a) Engine Fire in Flight

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

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

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

CAUTION

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

END OF CHECKLIST

(b) Electrical Fire with Smoke in Flight

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

CAUTION

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

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

CAUTION

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

END OF CHECKLIST

3.4 GLIDING

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

NOTE

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

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

END OF CHECKLIST

3.5 EMERGENCY LANDINGS

3.5.1 EMERGENCY LANDING WITH ENGINE OFF

1. Select suitable landing area. If no level landing area is available, a landing on an upward slope should be sought.
2. Consider wind.
3. Approach: If possible, fly along a short-cut rectangular circuit. On the downwind leg of the circuit the landing area should be inspected for obstacles from a suitable height. The degree of offset at each part of the circuit will allow the wind speed and direction to be assessed.
4. Airspeed .... 76 KIAS (1200 kg, 2646 lb)
   73 KIAS (1150 kg, 2535 lb)
   68 KIAS (1000 kg, 2205 lb)
   60 KIAS (850 kg, 1874 lb)
5. If time allows .... advise ATC
6. Fuel tank selector .... OFF

When It Is Certain That the Landing Field Will Be Reached:

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

CONTINUED

CAUTION

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

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

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

END OF CHECKLIST

3.5.2 LANDING WITH A DEFECTIVE TIRE ON THE MAIN LANDING GEAR

CAUTION

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

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

END OF CHECKLIST

3.5.3 LANDING WITH DEFECTIVE BRAKES

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

CAUTION

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

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

END OF CHECKLIST

3.6 RECOVERY FROM AN UNINTENTIONAL SPIN

CAUTION

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

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

When Rotation Has Stopped:

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

END OF CHECKLIST

3.7 OTHER EMERGENCIES

3.7.1 ICING

Unintentional Flight Into Icing Conditions

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

CAUTION

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

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

CAUTION

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

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

END OF CHECKLIST

3.7.2 FAILURES IN THE ELECTRICAL SYSTEM

(a) Complete Failure of the Electrical System

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

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

END OF CHECKLIST

(b) Alternator Failure

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

(i) Alternator Failure During Flight

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

CAUTION

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

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

CONTINUED

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

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

(ii) Alternator Failure on the Ground

NOTE

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

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

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

- Terminate flight preparation.

END OF CHECKLIST

(c) Starter Malfunction

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

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

Terminate flight preparation!

END OF CHECKLIST

(d) Overvoltage

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

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

WARNING

Leave Master switch (BAT) ON!

3. Equipment that is not needed, in particular Pitot heating .... OFF
4. Land on the nearest appropriate airfield.

END OF CHECKLIST

3.7.3 SUSPICION OF CARBON MONOXIDE CONTAMINATION IN THE CABIN

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

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

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

CAUTION

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

NOTE

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

END OF CHECKLIST

3.7.4 'DOOR'-WARNING LIGHT ON

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

Canopy Unlocked

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

Rear Door Unlocked

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

WARNING

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

NOTE

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

END OF CHECKLIST

3.7.5 EMERGENCY EXIT

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

END OF CHECKLIST

Intentionally left blank.

CHAPTER 4A
NORMAL OPERATING PROCEDURES

Page

4A.1 INTRODUCTION

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

4A.2 AIRSPEEDS FOR NORMAL OPERATING PROCEDURES

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

4A.3 CHECKLISTS FOR NORMAL OPERATING PROCEDURES

4A.3.1 PRE-FLIGHT INSPECTION

I. Cabin Check

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

e) All electrical equipment . . . . OFF
f) Circuit breakers . . . . set in (if one has been pulled, check reason)

g) Engine control levers . . . . check condition, freedom of movement and full travel of throttle, RPM and mixture levers

h) Throttle . . . . IDLE
i) Mixture control lever . . . . LEAN
j) RPM lever . . . . HIGH RPM
k) Master switch (BAT) . . . . ON
l) Annunciator panel . . . . check function (see 7.11)
m) Fuel quantity . . . . check

CONTINUED

NOTE

Standard Tank:

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

Long Range Tank:

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

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

CAUTION

Long Range Tank:

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

CONTINUED

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

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

CAUTION

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

CONTINUED

1. Left Main Landing Gear:

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

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 traces of fuel (if tank is full, fuel may spill over through the tank vent)
e) Tank drain	drain off a small quantity, check for water and sediment
f) Stall warning	check (suck on opening)
g) Tank filler	visual inspection, fuel quantity must agree with indicator
h) Tank air outlet in lower surface	visual inspection

CONTINUED

i) 2 stall strips on wing .... visual inspection
j) Pitot probe .... clean, orifices open
k) Landing/taxi light .... visual inspection
l) Wing tip .... visual inspection
m) Position light, strobe light (ACL) .... visual inspection
n) Mooring .... check, clear
o) Aileron and linkage .... visual inspection
p) Aileron hinges and safety pin .... visual inspection
q) Foreign objects in aileron paddle .... visual inspection
r) Flap and linkage .... visual inspection
s) Flap hinges and safety pin .... visual inspection

3. Fuselage, Left Side:

a) Canopy, left side .... visual inspection
b) Rear cabin door & window .... visual inspection
c) Fuselage skin .... visual inspection
d) Antennas .... visual inspection
e) Autopilot static source (if OÄM 40-267 installed) .... check for blockage

4. Empennage:

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

CONTINUED

5. Fuselage, Right Side:

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

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

CONTINUED

7. Right Main Landing Gear:

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

8. Front Fuselage:

a) Oil level	check dipstick, min. 4 qts for VFR operation min. 6 qts for IFR operation
b) Cowling	visual inspection
c) 3 air intakes	clear
d) Propeller	visual inspection; blade shake: max. 3 mm (1/8 in); angular play of blade: max. 2°

WARNING

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

e) Spinner including attachment screws	visual inspection

CONTINUED

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

WARNING

The exhaust can cause burns when it is hot.

Underside:

s) Antennas (if fitted) . . . . visual inspection
t) Gascolator . . . . drain off a small quantity of fuel, check for water and sediment
u) Venting pipes . . . . check for blockage
v) Fuselage underside . . . . check for excessive contamination particularly by oil, fuel, and other fluids

END OF CHECKLIST

4A.3.2 BEFORE STARTING ENGINE

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

CAUTION

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

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

8. Front canopy .... Position 1 or 2 ("Cooling Gap")
9. Canopy lock (if installed) .... unblocked, key removed
10. Parking brake .... set
11. Flight controls .... free movement
12. Trim wheel .... T/O
13. Throttle .... IDLE
14. RPM lever .... HIGH RPM
15. Mixture control lever .... LEAN
16. Friction device, throttle quadrant .... adjusted

CONTINUED

17. Alternate air .... CLOSED
18. Alternate static valve .... CLOSED, if installed
19. Avionics Master switch .... OFF
20. Essential Bus switch .... OFF, if installed

CAUTION

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

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

WARNING

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

Never try to start the engine by hand.

END OF CHECKLIST

4A.3.3 STARTING ENGINE

(a) Cold Engine

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

WARNING

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

CAUTION

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

CONTINUED

CAUTION

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

6. Ignition switch .... START

When Engine Fires:

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

WARNING

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

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

END OF CHECKLIST

(b) Warm Engine

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

WARNING

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

CAUTION

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

5. Ignition switch .... START

CONTINUED

When Engine Fires:

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

WARNING

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

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

END OF CHECKLIST

(c) Engine Will Not Start After Injection ("Flooded Engine")

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

WARNING

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

CAUTION

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

5. Ignition switch .... START
6. Throttle .... pull back towards IDLE when engine fires

CONTINUED

When Engine Fires:

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

WARNING

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

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

END OF CHECKLIST

4A.3.4 BEFORE TAXIING

1.	Avionics Master switch	ON
2.	Electrical equipment	ON as required
3.	Flaps	UP - T/O - LDG - T/O (indicator and visual check)
4.	Flight instruments and avionics	set, test function, as required
5.	Flood light	ON, test function, as required
6.	Ammeter	check, if required increase RPM
7.	Fuel tank selector	change tanks, confirm that engine also runs on other tank (at least 1 minute at 1500 RPM)
8.	Pitot heating	ON, test function; ammeter must show rise
9.	Pitot heating	OFF
10.	Strobe lights (ACLs)	check ON, as required
11.	Position lights, landing and taxi lights	ON, as required

CAUTION

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

12.	Idle RPM	check, 600 to 800 RPM

END OF CHECKLIST

4A.3.5 TAXIING

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

CAUTION

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

CAUTION

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

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

CONTINUED

Remedy:

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

NOTE

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

END OF CHECKLIST

4A.3.6 BEFORE TAKE-OFF

CAUTION

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

1. Position airplane into wind if possible
2. Parking brake . . . . set
3. Safety harnesses . . . . on and fastened
4. Rear door . . . . check closed and locked
5. Front canopy . . . . closed and locked

CAUTION

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

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

6. Door warning light (DOOR or DOORS) . . . . check OFF
7. Fuel tank selector . . . . fullest tank
8. Engine instruments . . . . in green sector
9. Circuit breakers . . . . pressed in

CONTINUED

10. Fuel pressure indicator .... check (approx. 14 - 35 PSI)
11. Electrical fuel pump .... ON
12. Mixture control lever .... RICH (below 5000 ft)

NOTE

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

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

CONTINUED

CAUTION

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

19. Circuit breaker .... check in
20. Voltmeter .... check in green range
21. Throttle .... IDLE
22. Parking brake .... release
23. Alternate air .... check CLOSED
24. Landing light .... ON as required
25. Pitot heating .... ON as required

END OF CHECKLIST

4A.3.7 TAKE-OFF

Normal Take-Off Procedure

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

WARNING

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

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

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

NOTE

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

6. Nose wheel lift-off .... at v_R = 59 KIAS

CONTINUED

7. Airspeed . . . . 67 KIAS (1200 kg, 2646 lb)
66 KIAS (1150 kg, 2535 lb)
60 KIAS (below 1000 kg, 2205 lb)

Above a Safe Height:

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

END OF CHECKLIST

4A.3.8 CLIMB

Procedure for Best Rate of Climb

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

CAUTION

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

END OF CHECKLIST

Cruise Climb

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

CAUTION

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

END OF CHECKLIST

4A.3.9 CRUISE

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

NOTE

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

NOTE

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

NOTE

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

4. Mixture . . . . set in accordance with 4A.3.10 - MIXTURE ADJUSTMENT

CONTINUED

5. Trim . . . . as required
6. Fuel tank selector . . . . as required (max. difference 10 US gal with Standard Tank, 8 US gal with Long Range Tank)
7. Electrical fuel pump . . . . ON at high altitudes

CAUTION

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

NOTE

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

END OF CHECKLIST

4A.3.10 MIXTURE ADJUSTMENT

CAUTION

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

Best Economy Mixture

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

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

CONTINUED

Best Power Mixture

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

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

END OF CHECKLIST

4A.3.11 DESCENT

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

CAUTION

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

CAUTION

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

END OF CHECKLIST

4A.3.12 LANDING APPROACH

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

Before Landing:

8. Mixture control lever . . . . RICH
9. RPM lever . . . . HIGH RPM
10. Throttle . . . . as required
11. Airspeed . . . . reduce to operate flaps (91 KIAS)
12. Flaps . . . . LDG

13. Approach speed . . . . 73 KIAS (1200 kg, 2646 lb)
    71 KIAS (1150 kg, 2535 lb)
    67 KIAS (1092 kg, 2407 lb)
    63 KIAS (1000 kg, 2205 lb)
    58 KIAS (850 kg, 1874 lb)

CAUTION

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

CONTINUED

NOTE

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

END OF CHECKLIST

4A.3.13 GO-AROUND

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

Above a Safe Height:

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

END OF CHECKLIST

4A.3.14 AFTER LANDING

1. Throttle .... IDLE
2. Brakes .... as required
3. Electrical fuel pump .... OFF
4. Transponder .... OFF / STBY
5. Pitot heating .... OFF
6. Avionics .... as required
7. Lights .... as required
8. Flaps .... UP

END OF CHECKLIST

4A.3.15 ENGINE SHUT-DOWN

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

END OF CHECKLIST

4A.3.16 POST-FLIGHT INSPECTION

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

NOTE

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

END OF CHECKLIST

4A.3.17 FLIGHT IN RAIN

NOTE

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

4A.3.18 REFUELING

CAUTION

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

4A.3.19 FLIGHT AT HIGH ALTITUDE

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

Also see Section 2.11 - OPERATING ALTITUDE.

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 fuel shortage, weather conditions, or at nightfall the possibility of endangering the airplane and its occupants by continuing the flight cannot be excluded. The pilot is required to decide whether or not a controlled landing in a field represents a lower risk than the attempt to reach the target airfield under all circumstances.

NOTE

If no level landing area is available, a landing on an upward slope should be 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. Airspeed .... 76 KIAS (1200 kg, 2646 lb)
   73 KIAS (1150 kg, 2535 lb)
   68 KIAS (1000 kg, 2205 lb)
   60 KIAS (850 kg, 1874 lb)

5. ATC .... advise

CONTINUED

On Final Approach:

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

CAUTION

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

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

END OF CHECKLIST

4B.2 INSTRUMENT INDICATIONS OUTSIDE OF GREEN RANGE

(a) High Oil Pressure When Starting in Low Ambient Temperatures

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

(b) High Manifold Pressure

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

(c) Oil Temperature

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

(d) Cylinder Head Temperature and Exhaust Gas Temperature

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

END OF CHECKLIST

4B.3 FAILURES IN THE ELECTRICAL SYSTEM

(a) 'Low Voltage' Caution (VOLT or LOW VOLTS)

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

Possible reasons are:

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

(i) 'Low Voltage' Caution on the Ground:

1. Engine speed .... 1200 RPM
2. Electrical equipment .... OFF
3. Ammeter .... check
   If the caution light does not go out, and the ammeter flashes and reads zero:
   - Terminate flight preparation.

(ii) 'Low Voltage' Caution During Flight:

1. Electrical equipment .... OFF if not needed
2. Ammeter .... check
   If the caution light does not go out, and the ammeter flashes and reads zero:
   - Follow procedure in 3.7.2 (b) - ALTERNATOR FAILURE.

(iii) 'Low Voltage' Caution During Landing:

- Follow (i) after landing.

END OF CHECKLIST

(b) Electronic Ignition Control Unit

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

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

END OF CHECKLIST

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

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

NOTE

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

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

8. Airspeed .... 67 KIAS (1200 kg, 2646 lb)
   66 KIAS (1150 kg, 2535 lb)
   60 KIAS (1000 kg, 2205 lb)
   54 KIAS (850 kg, 1874 lb)

9. RPM lever .... 2400 RPM, above safe altitude

CONTINUED

10. Flaps .... UP, above safe altitude
11. Electrical fuel pump .... OFF, above safe altitude
12. Landing light .... as required

END OF CHECKLIST

4B.5 FAILURES IN FLAP OPERATING SYSTEM

Failure in Position Indication or Function

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

Modified Approach Procedure Depending on the Available Flap Setting

(a) Only UP or T/O Available:

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

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

(b) Only LDG Available:

Perform normal landing.

END OF CHECKLIST

4B.6 FAILURES IN ELECTRICAL RUDDER PEDAL ADJUSTMENT

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

NOTE

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

1. Circuit breaker . . . . pull

END OF CHECKLIST

4B.7 LANDING WITH HIGH LANDING MASS

NOTE

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

NOTE

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

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

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

WARNING

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

END OF CHECKLIST

4B.8 STARTING THE ENGINE WITH EXTERNAL POWER

WARNING

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

WARNING

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

NOTE

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

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

CONTINUED

CAUTION

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

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

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

CAUTION

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

CONTINUED

21. External power .... connect
22. Master switch (BAT) .... ON
23. Annunciator panel .... test (see Section 7.11)
24. Fuel tank selector .... on full tank

WARNING

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

Never try to start the engine by hand.

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

END OF CHECKLIST

CHAPTER 5
PERFORMANCE

5.1 INTRODUCTION

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

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

5.2 USE OF THE PERFORMANCE TABLES AND DIAGRAMS

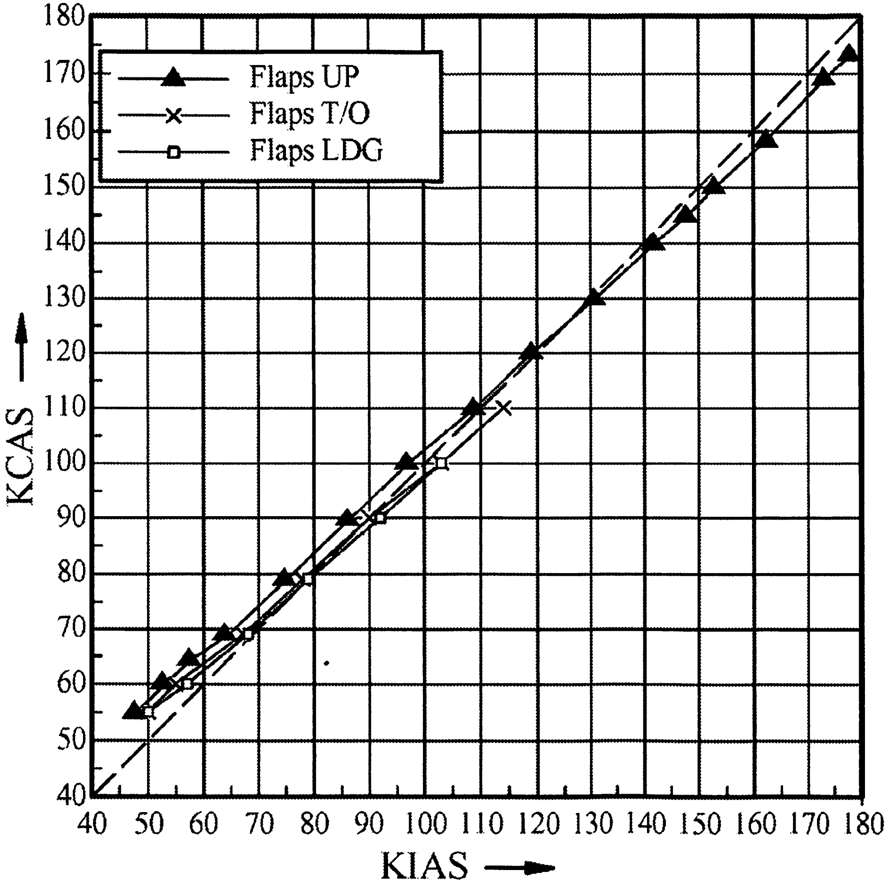
In order to illustrate the influence of a number of different variables, the performance data is reproduced in the form of tables or diagrams. These contain sufficiently detailed information so that conservative values can be selected and used for the determination of adequate performance data for the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

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

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

5.3 PERFORMANCE TABLES AND DIAGRAMS

5.3.1 AIRSPEED CALIBRATION



5.3.2 TABLE FOR SETTING ENGINE PERFORMANCE

NOTE

If the Long Range Tank is installed:

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

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

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

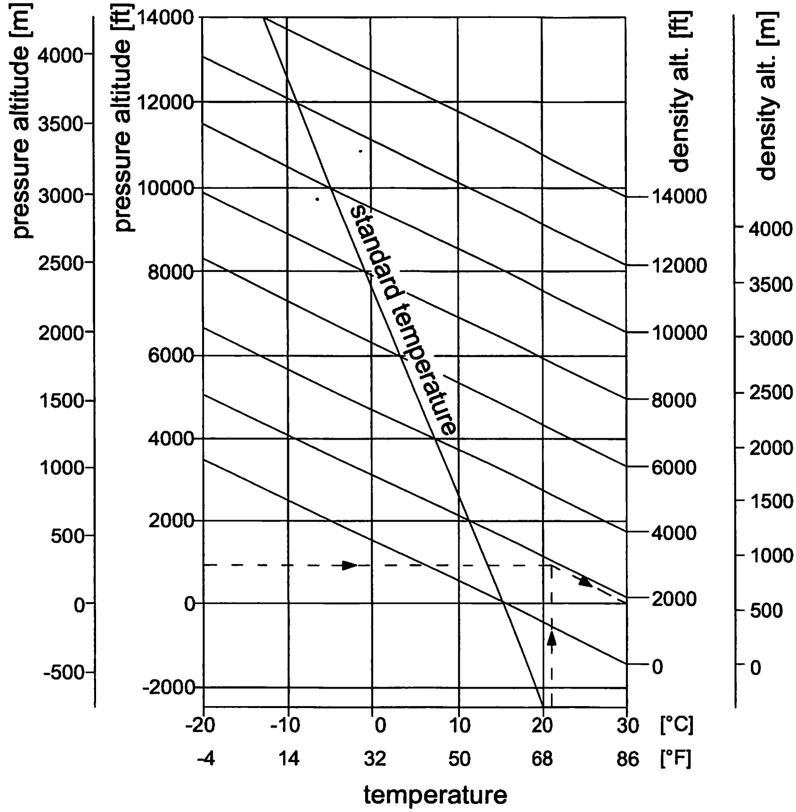
The areas shaded grey under each RPM heading are the recommended bands.

Correcting the Table for Variation from Standard Temperature

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

5.3.3 PRESSURE ALTITUDE - DENSITY ALTITUDE

Conversion from pressure altitude to density altitude.



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

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

5.3.4 STALLING SPEEDS

Airspeeds in KIAS

Mass: 980 kg (2161 lb)

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

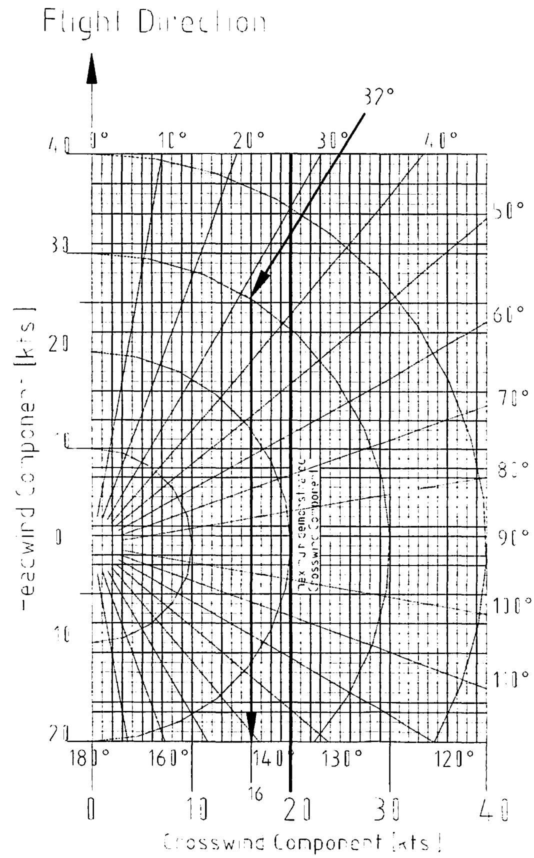
Mass: 1150 kg (2535 lb)

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

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

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

5.3.5 WIND COMPONENTS



Example:	Flight direction	:	360°
	Wind	:	32°/30 kts
Result:	Crosswind component	:	16 kts

Max. demonstrated crosswind component : 20 kts

5.3.6 TAKE-OFF DISTANCE

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

WARNING

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

CAUTION

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

CAUTION

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

NOTE

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

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

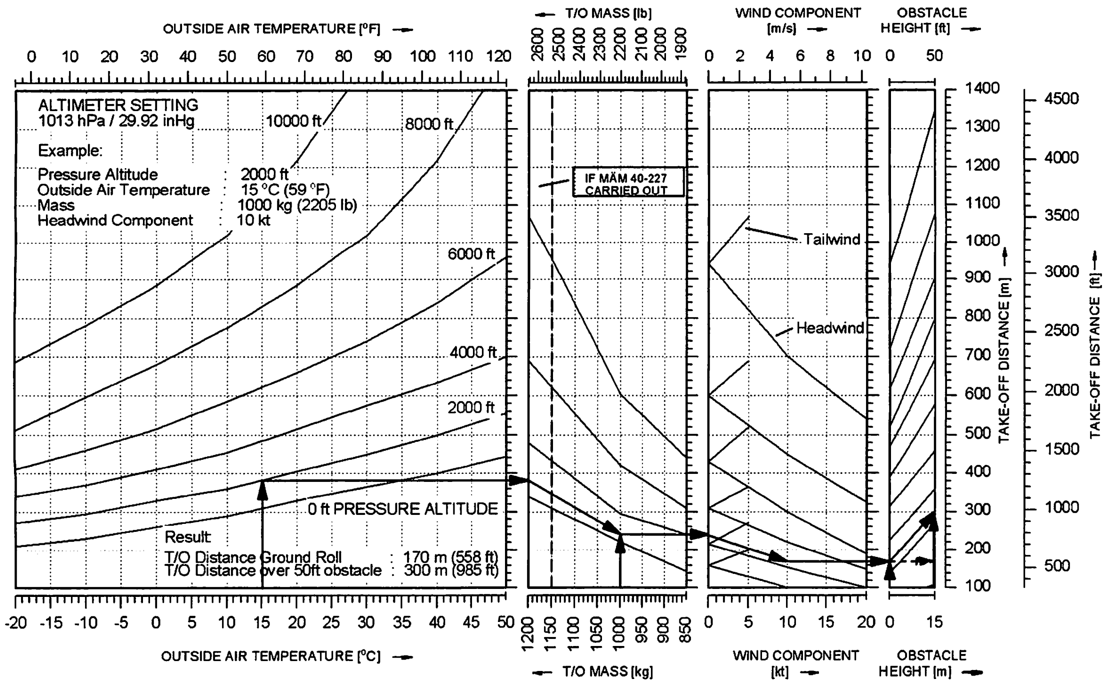
NOTE

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

NOTE

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

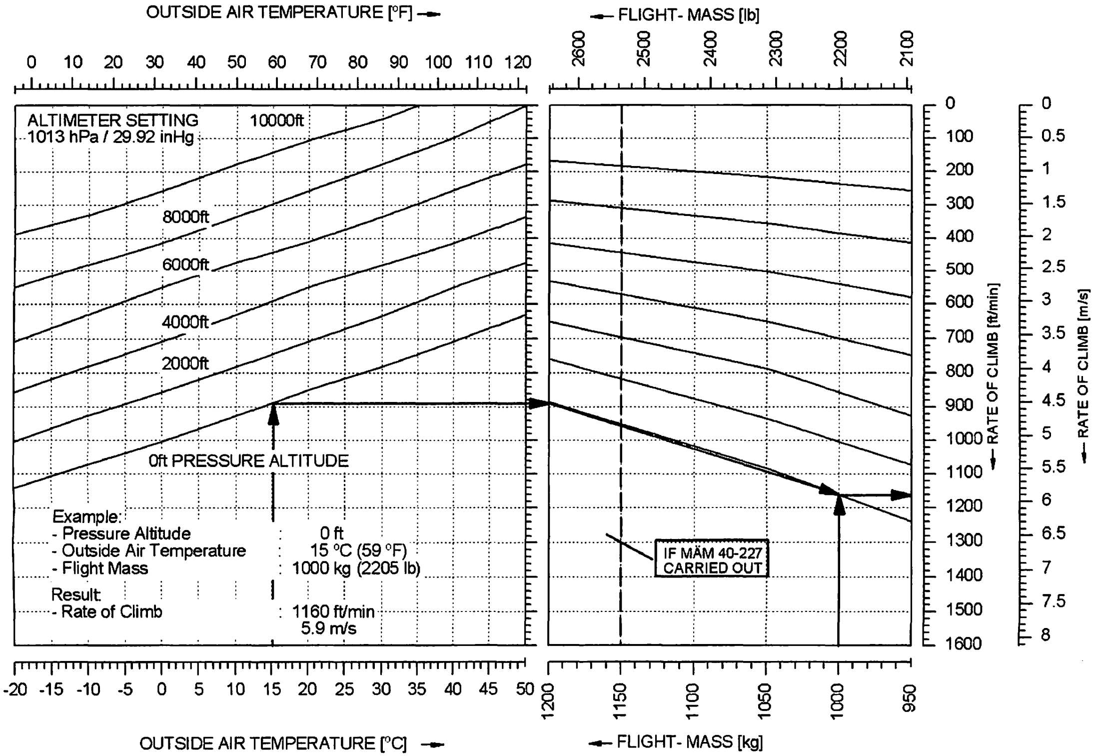
DA 40 - TAKE-OFF DISTANCES



5.3.7 CLIMB PERFORMANCE - TAKE-OFF CLIMB

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

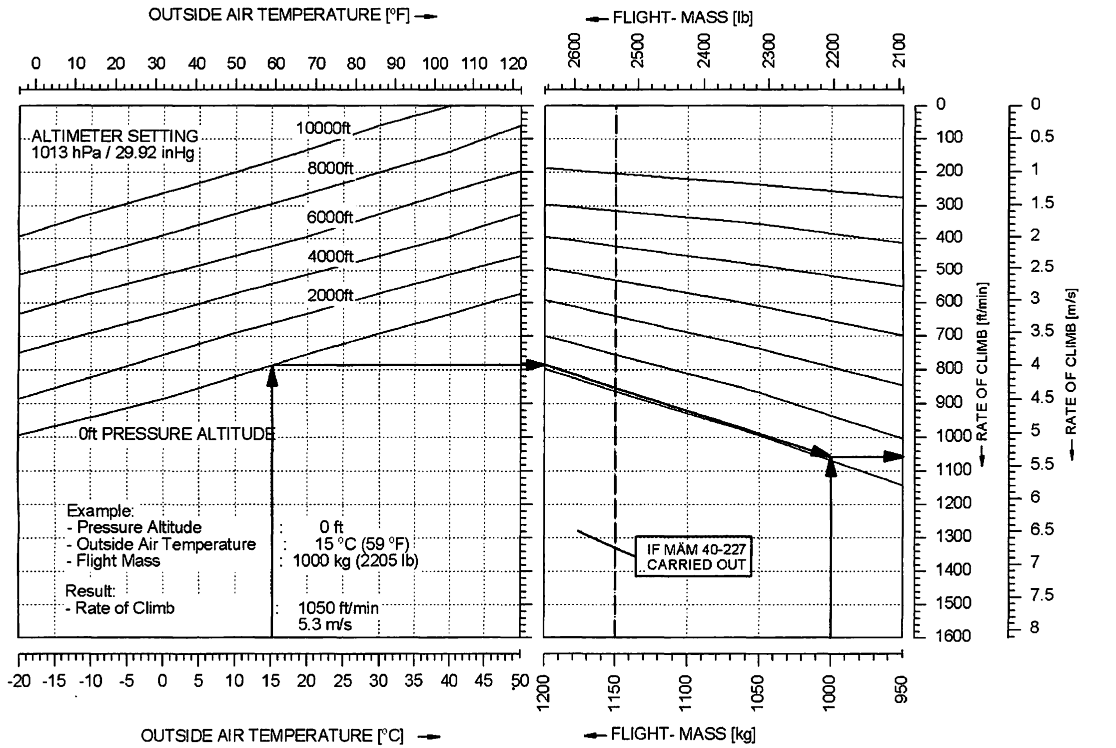
DA 40 - CLIMB PERFORMANCE - TAKE OFF CLIMB



5.3.8 CLIMB PERFORMANCE - CRUISE CLIMB

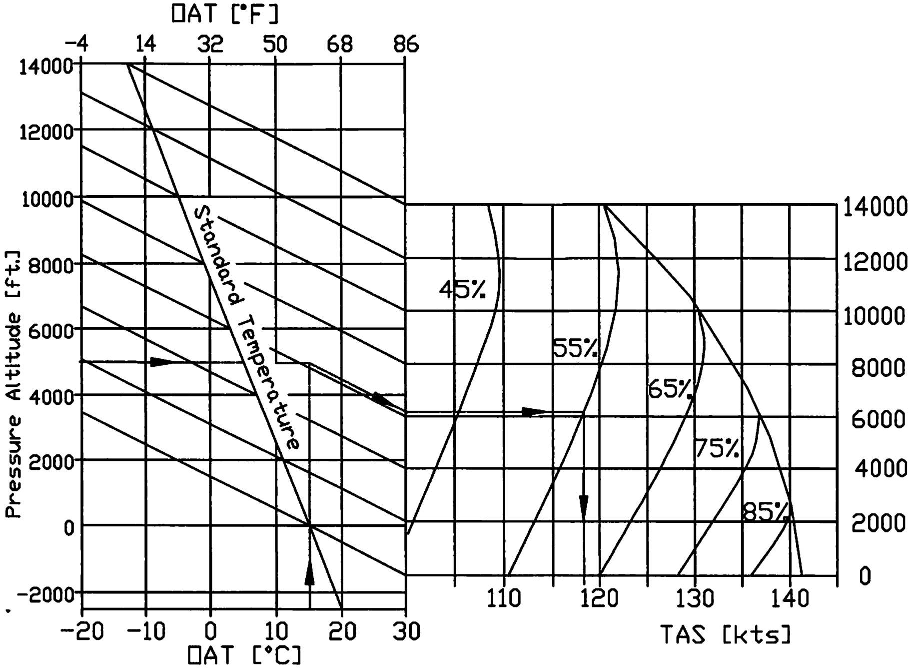
Conditions:	- Throttle	MAX PWR
	- RPM lever	2400 RPM
	- Flaps	UP
	- Airspeed	76 KIAS (1200 kg, 2646 lb)
		73 KIAS (1150 kg, 2535 lb)
		68 KIAS (1000 kg, 2205 lb)
		60 KIAS (850 kg, 1874 lb)

DA 40 - CLIMB PERFORMANCE - CRUISE CLIMB



5.3.9 CRUISING (TRUE AIRSPEED TAS)

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



Example:	Pressure altitude	5000 ft
	Temperature	15 °C (59 °F)
	Power setting	55 %
Result:	True Airspeed (TAS)	118 kts

CAUTION

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

5.3.10 LANDING DISTANCE - FLAPS LDG

Conditions:
- Throttle .... IDLE
- RPM lever .... HIGH RPM
- Flaps .... LDG
- Approach speed .... 73 KIAS (1200 kg, 2646 lb)
  71 KIAS (1150 kg, 2535 lb)
  63 KIAS (1000 kg, 2205 lb)
  58 KIAS (850 kg, 1874 lb)
- Runway .... level, asphalt surface

NOTE

A landing mass above 1150 kg (2535 lb) up to 1200 kg (2646 lb) will increase the landing distance over a 50 ft (15 m) obstacle and the landing ground roll distance up to 6%.

Values for ISA and MSL, at 1150 kg (2535 lb)	
Landing distance over a 50 ft (15 m) obstacle	approx. 638 m (2093 ft)
Ground roll	approx. 352 m (1155 ft)

WARNING

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

CAUTION

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

CAUTION

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

NOTE

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

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

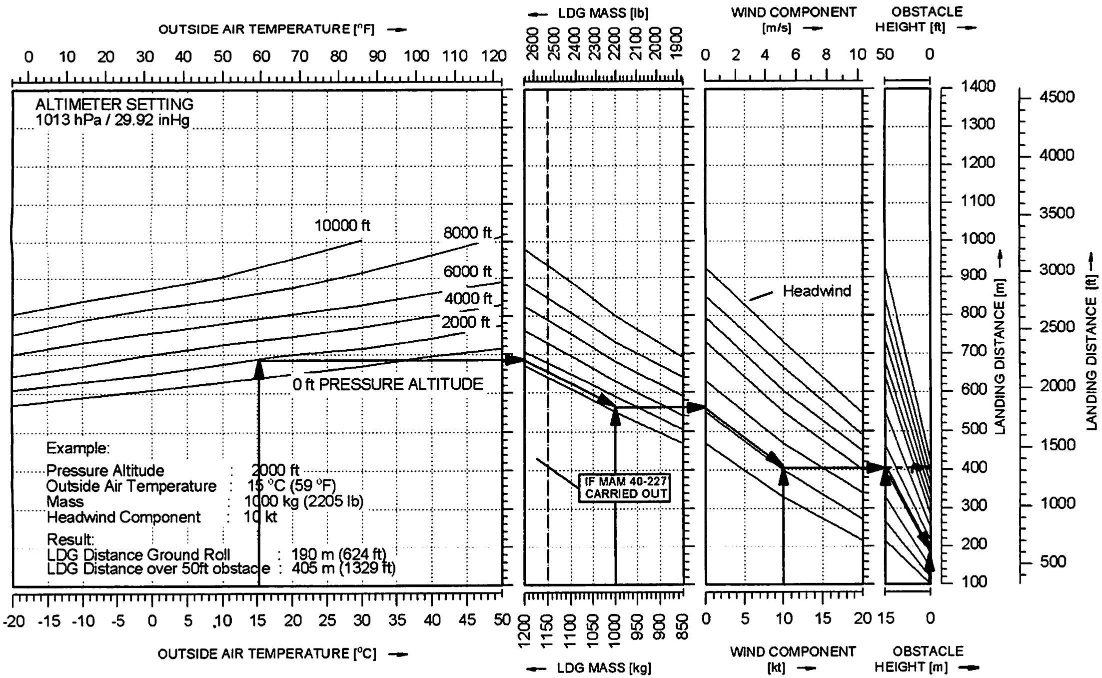
NOTE

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

NOTE

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

DA 40 - LANDING DISTANCES - FLAPS LDG



5.3.11 LANDING DISTANCE - FLAPS UP

Conditions:	- Throttle	IDLE
	- RPM lever	HIGH RPM
	- Flaps	UP
	- Approach speed	73 KIAS (1200 kg, 2646 lb) 71 KIAS (1150 kg, 2535 lb) 63 KIAS (1000 kg, 2205 lb) 58 KIAS (850 kg, 1874 lb)
	- Runway	level, asphalt surface

NOTE

A landing mass above 1150 kg (2535 lb) up to 1200 kg (2646 lb) will increase the landing distance over a 50 ft (15 m) obstacle and the landing ground roll distance up to 6%.

Values for ISA and MSL, at 1150 kg (2535 lb)	
Landing distance over a 50 ft (15 m) obstacle	approx. 775 m (2543 ft)
Ground roll	approx. 471 m (1545 ft)

WARNING

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

CAUTION

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

CAUTION

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

NOTE

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

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

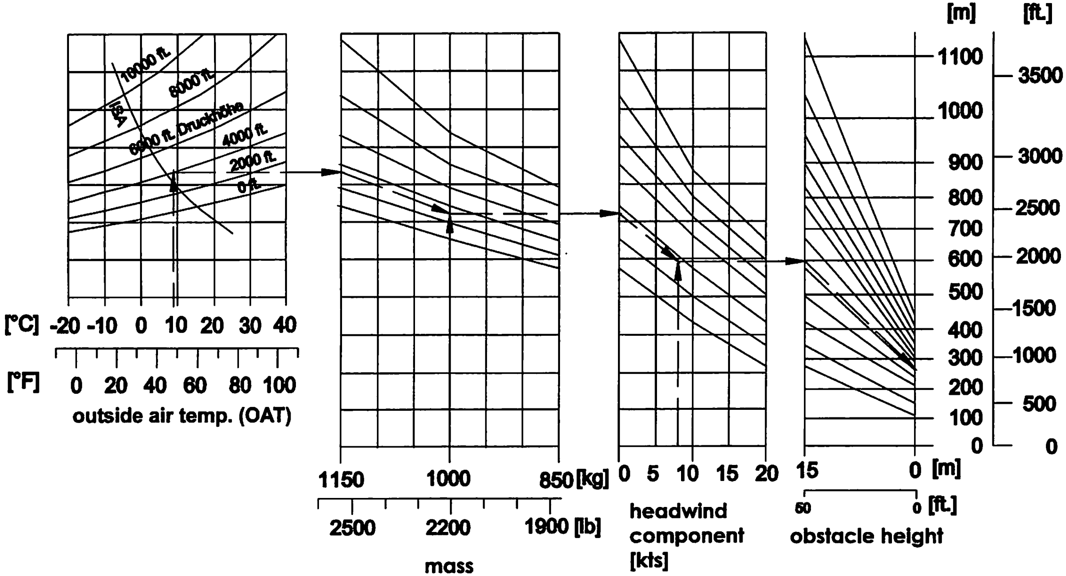
NOTE

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

NOTE

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

Landing Distance - Flaps UP



Example:

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

Result:

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

5.3.12 GRADIENT OF CLIMB ON GO-AROUND

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

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

If MÄM 40-227 is carried out:

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

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

5.3.13 APPROVED NOISE DATA

ICAO Annex 16 Chapter X : 69.28 dB(A)
JAR-36 Subpart C : 69.28 dB(A)

If MÄM 40-227 is carried out:

ICAO Annex 16 Chapter X : 78.4 dB(A)
JAR-36 Subpart C : 78.4 dB(A)

CHAPTER 6
MASS AND BALANCE

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 at any point in time is described in this Chapter. Over and above this there is a comprehensive list of the equipment approved for this airplane (Equipment List), 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 (7.6 liter = 8 qts), plus unusable fuel (4 liter = approx. 1 US gal).

MASS AND BALANCE REPORT

(Continuous report on structural or equipment changes)

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

6.4 FLIGHT MASS AND CENTER OF GRAVITY

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

6.4.1 - 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, taking the fuel tank size into account:

Empty Mass

Take the empty mass and the empty mass moment of your airplane from the Mass and Balance Report, and enter the figures in the appropriate boxes under the column marked 'Your DA 40' in Table 6.4.3 - CALCULATION OF LOADING CONDITION.

Oil

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

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

Baggage

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

(a) Standard baggage compartment.

(b) Standard baggage compartment with 'baggage tube'.

(c) Extended baggage compartment (OÄM 40-163). It consists of a forward and an aft part.

Depending on the baggage compartment variant installed in your DA 40 the following calculations must be done in Table 6.4.3 - CALCULATION OF LOADING CONDITION:

For variants (a) and (b) .... use row 5 of the table; row 6 is filled with '0'

For variant (c) .... use row 6 of the table; row 5 is filled with '0'

Fuel

a) Standard Tank:

The fuel quantity can be read on the fuel indicators.

NOTE

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

b) Long Range Tank:

Read the fuel quantity indicated on the fuel quantity indicators.

NOTE

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

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

CAUTION

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

Moments

Multiply the individual masses by the moment arms quoted to obtain the moment for every item of loading, and enter these moments in the appropriate boxes in Table 6.4.3 - CALCULATION OF LOADING CONDITION.

Total Mass and CG

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

CAUTION

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

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

Graphical Method

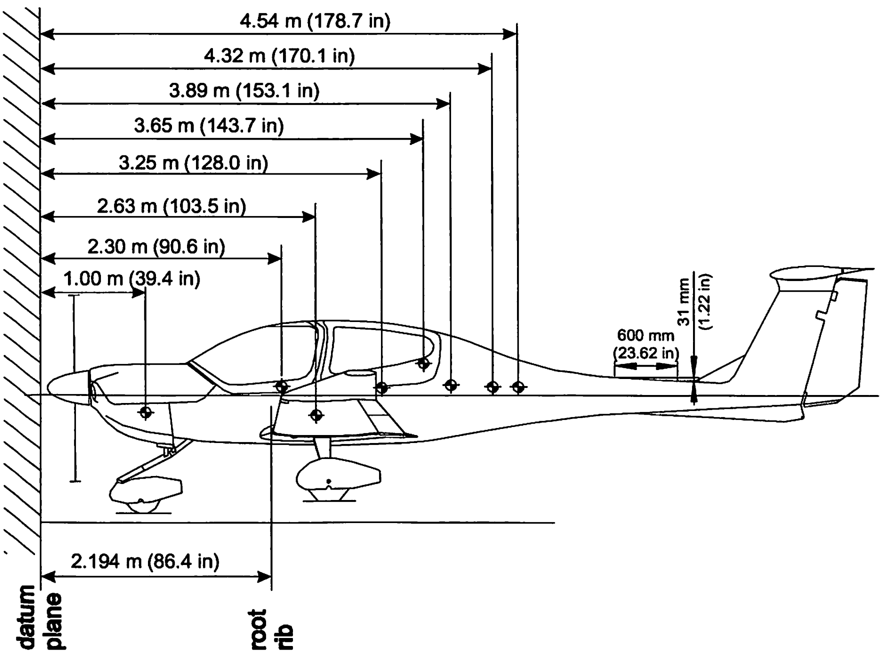
Diagram 6.4.2 - LOADING DIAGRAM is used to determine the moments. The masses and moments for the individual items of loading are added. Then Diagram 6.4.5 - PERMISSIBLE MOMENT RANGE is used to check whether the total moment associated with the total mass is in the admissible range.

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

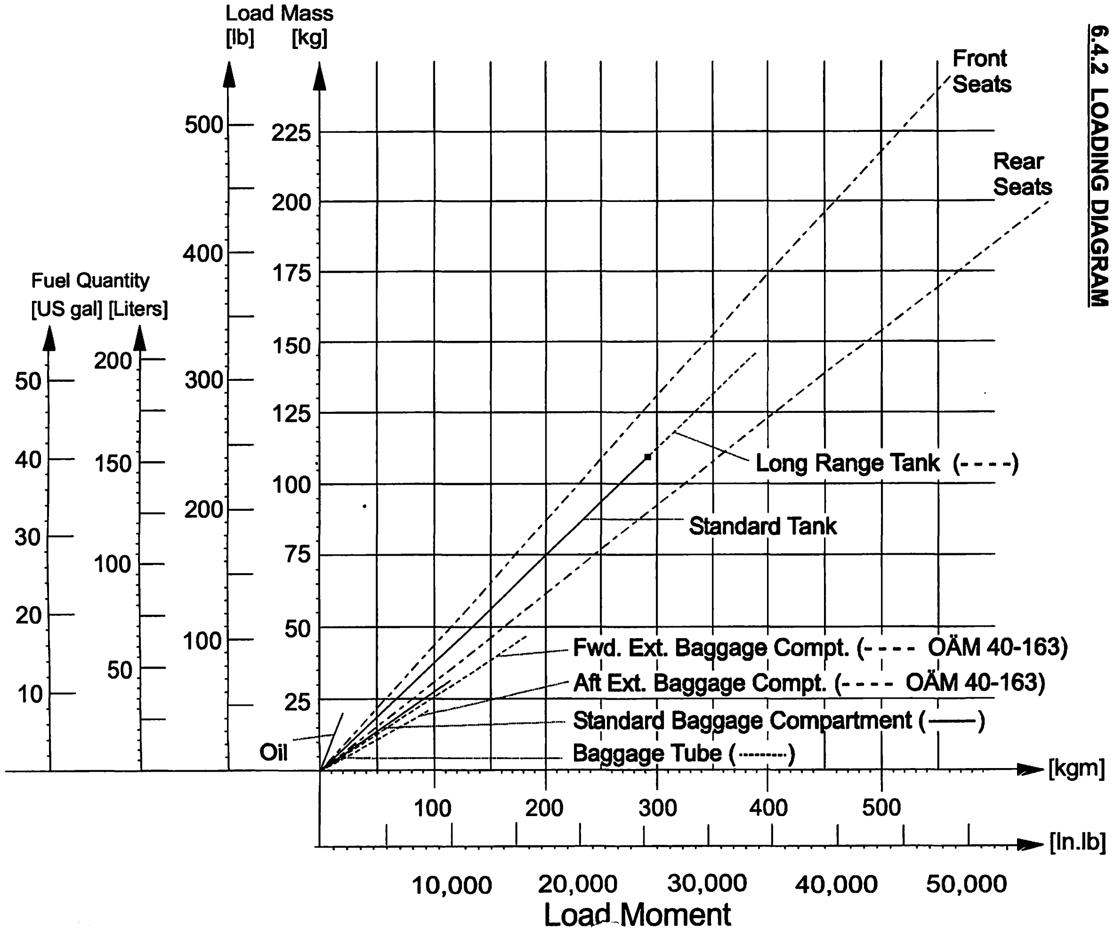
6.4.1 MOMENT ARMS

The most important lever arms aft of the Datum Plane:

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



6.4.2 LOADING DIAGRAM



6.4.3 CALCULATION OF LOADING CONDITION

CAUTION

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

NOTE

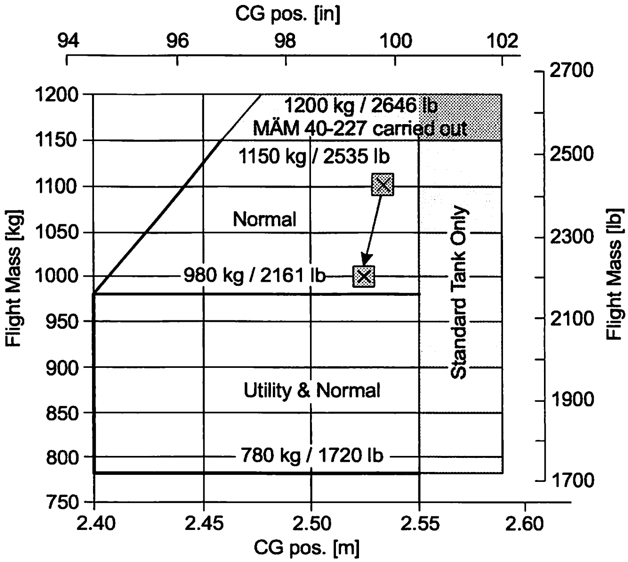
For the mass (weight) of the fuel, a density of 0.72 kg/liter (6.01 lb/US gal) is assumed. For the mass (weight) of the engine oil, a density of 0.89 kg/liter (1.86 lb/US qt, 0.84 kg/US qt) is assumed.

NOTE

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

		DA 40 (Example)		Your DA 40	
		Mass [kg] *[lb]*	Moment [kg m] *[in lb]*	Mass [kg] *[lb]*	Moment [kg m] *[in lb]*
1	Empty mass (from Mass and Balance Report)	735 *1620*	1760 *152,762*		
2	Oil not added Lever arm: 1.00 m *(39.4 in)*	-1.7 *-4*	-1.7 *-158*		
3	Front seats Lever arm: 2.30 m *(90.6 in)*	150 *331*	345 *29,989*		
4	Rear seats Lever arm: 3.25 m *(128.0 in)*	75 *165*	243.8 *21,120*		
5	Standard baggage compt. Lever arm: 3.65 m *(143.7 in)*	0 *0*	0 *0*		
	Baggage tube Lever arm: 4.32 m *(170.1 in)*	0 *0*	0 *0*		
6	Fwd. extended baggage compartment Lever arm: 3.89 m *(153.1 in)*	27 *60*	105 *9,186*		
	Aft extended baggage compartment Lever arm: 4.54 m *(178.7 in)*	18 *40*	81.7 *7,148*		
7	Total mass & total moment with empty fuel tanks (Total of 1.-6.)	1003.3 *2212*	2533.8 *220,047*		
8	Usable fuel Lever arm: 2.63 m *(103.5 in)*	99.4 *219*	261.4 *22,667*		
9	Total mass & total moment including fuel (7. plus 8.)	1102.7 *2431*	2795.2 *242,714*		
10	The total moments from rows 7 and 9 (2533.8 and 2795.2 kgm) *(220,047 and 242,714 in.lb)* must be divided by the related total mass (1003.3 and 1102.7 kg respectively) *(2212 and 2431 lb)* and then located in Diagram 6.4.4 - PERMISSIBLE CENTER OF GRAVITY RANGE. As in our example CG positions (2.525 m and 2.535 m respectively) *(99.48 and 99.84 in)* and masses fall into the permitted area, this loading condition is allowable.				

6.4.4 PERMISSIBLE CENTER OF GRAVITY RANGE



The CG's shown in the diagram are those that from the example in Table 6.4.3 - CALCULATION OF LOADING CONDITION.

Forward Flight CG Limit:

2.40 m (94.5 in) aft of Datum Plane at 780 to 980 kg (1720 to 2161 lb)
2.46 m (96.9 in) aft of Datum Plane at 1150 kg (2535 lb)
linear variation between these values

If MÄM 40-227 is carried out:

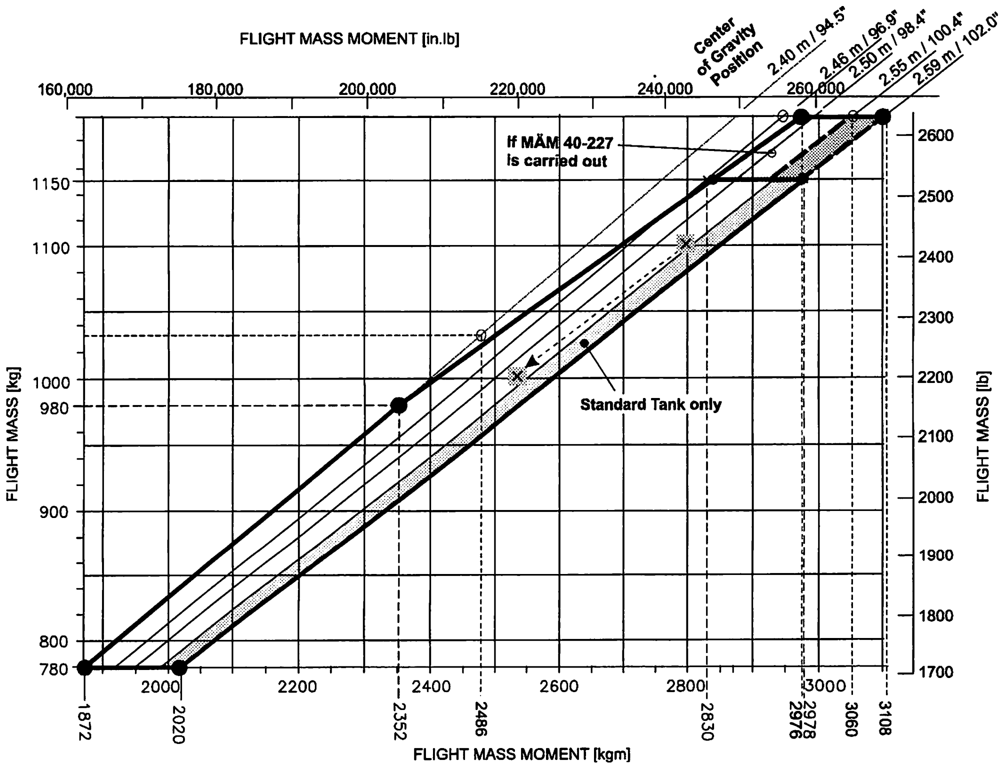
2.40 m (94.5 in) aft of Datum Plane at 780 kg to 980 kg (1720 lb to 2161 lb)
2.48 m (97.6 in) aft of Datum Plane at 1200 kg (2646 lb)
linear variation between these values

Rearward Flight CG Limit:

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

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

6.4.5 PERMISSIBLE MOMENT RANGE



6.5 EQUIPMENT LIST AND EQUIPMENT INVENTORY

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

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

NOTE

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

Airplane Serial No.:		Registration:		Date:		Mass		Lever Arm	
Description	**Type**	**Part No.**	**Manufacturer**	**S/N**	**installed**	**lb**	**kg**	**in**	**m**
AVIONICS COOLING									
Cooling fan	Cyclone 21-3 Port	CRB122253	Lone Star Aviation						
Cooling fan	ACF 328	ACF 328	Sandia Aerospace						
COMMUNICATION									
COMM #1 antenna	DMC63-1/A		DM						
COMM #2 antenna	DMC63-2		DM						
COMM #1	KX 125	069-01028-1101	Bendix/King			11.46	5.2	70.08	1.78
COMM #1	KX 155A	069-01032-0201	Bendix/King			3.7	1.68	70.08	1.78
COMM #1	KX 165	069-01025-0025	Bendix/King			5.65	2.56	70.08	1.78
COMM #1	KX 165A	069-01033-0101	Bendix/King			4.0	1.81	70.08	1.78
COMM #1	KX 165A/ 8.33 kHz	069-01033-0201	Bendix/King			4.0	1.81	70.08	1.78
COMM #1	GNS 430	011-00280-00	Garmin			5.1	2.31	70.08	1.78
COMM #1	GNS 430	011-00280-10	Garmin			5.1	2.31	70.08	1.78
COMM #1	GNS 530	011-00550-00	Garmin			6.8	3.08	70.08	1.78
COMM #1	GNS 530	011-00550-10	Garmin			6.8	3.08	70.08	1.78
COMM #2	KX 155A	069-01032-0201	Bendix/King			3.7	1,68	70.08	1.78
COMM #2	GNS 430	011-00280-00	Garmin			5.1	2.31	70.08	1.78
COMM #2	GNS 430	011-00280-10	Garmin			5.1	2.31	70.08	1.78
Audio Panel / Marker / ICS	KMA 28	066-01176-0101	Bendix/King			1.5	0.68	70.08	1.78

Airplane Serial No.:		Registration:		Date:		Mass		Lever Arm	
Description	Type	Part No.	Manufacturer	S/N	installed	lb	kg	in	m
Audio Panel / Marker / ICS	GMA 340	011-00401-10	Garmin			1.2	0.54	70.08	1.78
ICS	PM1000 II	11922	PS Engineering			0.75	0.34	70.08	1.78
Headset, pilot	Echelon 100		Telex						
Headset, co-pilot	Echelon 100		Telex						
Headset, LH pax	Echelon 100		Telex						
Headset, RH pax	Echelon 100		Telex						
Speaker	FRS8 / 4 Ohms		Visaton						
Handmic	100TRA	62800-001	Telex						
AUTOPILOT SYSTEM									
Autopilot system	KAP 140		Bendix/King						
Flight computer (w/o alt. preselect)	KC 140	065-00176-5402 (without MÄM 40-099 or MSB 40-018)	Bendix/King			2.02	0.918	70.08	1.78
Flight computer (with alt. preselect)	KC 140	065-00176-7702 (without MÄM 40-099 or MSB 40-018)	Bendix/King			2.02	0.918	70.08	1.78
Flight computer (w/o alt. preselect)	KC 140	065-00176-5403 (with MÄM 40-099 or MSB 40-018)	Bendix/King			2.02	0.918	70.08	1.78
Flight computer (with alt. preselect)	KC 140	065-00176-7703 (with MÄM 40-099 or MSB 40-018)	Bendix/King			2.02	0.918	70.08	1.78

Airplane Serial No.:		Registration:		Date:		Mass		Lever Arm	
Description	Type	Part No.	Manufacturer	S/N	installed	lb	kg	in	m
Flight computer	KC 140	065-00176-7904	Bendix/King			2.02	0.918	70.08	1.78
Pitch servo	KS 270 C	065-00178-2500	Bendix/King			2.7	1.224	154.0	3.93
Pitch servo mount	KM 275	065-00030-0000	Bendix/King			1.08	0.488	154.0	3.93
Roll servo	KS 271 C	065-00179-0300	Bendix/King			2.3	1.044	120.0	3.06
Roll servo mount	KM 275	065-00030-0000	Bendix/King			2.7	1.224	120.0	3.06
Trim servo	KS 272 C	065-00180-3500	Bendix/King			2.22	1.005	87.2	2.21
Trim servo mount	KM 277	065-00041-0000	Bendix/King			1.09	0.494	87.2	2.21
Configuration module	KCM 100	071-00073-5000	Bendix/King			0.06	0.026	70.08	1.78
Sonalert	SC	SC 628	Mallory						
Control stick		DA4-2213-12-90	Diamond						
CWS stick		031-00514-0000	Bendix/King						
AP-disc switch		031-00428-0000	Bendix/King						
Trim switch assy		200-09187-0000	Bendix/King						
ELECTRICAL POWER									
Battery	CB24-11M (G243)		Concorde (Gill)			28.0	12.7	47.0	1.19
Battery	RG24-11M		Concorde			26.4	11.97	47.0	1.19
Battery	RG24-15M		Concorde			29.5	13.38	47.0	1.19
Emergency battery (28 pcs.)	MN 1500 AA		Duracell			1.52	0.69	70.08	1.78
Emergency battery (Lithium)		D41-2560-93-00	Excell			0.564	0.256	66.5	1.69

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

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

Airplane Serial No.:		Registration:		Date:		Mass		Lever Arm	
Description	Type	Part No.	Manufacturer	S/N	installed	lb	kg	in	m
Stall warning horn assy	"C"	DA4-2739-10-00X02	Diamond						
Stall warning horn assy	"D"	DA4-2739-10-00X03	Diamond						
Stall warning horn assy	"E"	DA4-2739-10-00X04	Diamond						
Stall warning horn assy	"F"	DA4-2739-10-00X05	Diamond						
SAFETY EQUIPMENT									
Fire extinguisher, portable		HAL 1	AIR Total			4.85	2.2	110.0	2.794
Fire extinguisher, portable [1]		A 620 T	Amerex			2.43	1.1	110.0	2.794
First aid kit									
Emergency axe		G45912	Fiskars			1.23	0.558	78.74	2.00
FUEL									
Fuel qty indicator	VM1000	4010028	Vision Microsyst.						
Fuel qty sensor LH	VM1000	30100-11	Vision Microsyst.						
Fuel qty sensor RH	VM1000	30100-11	Vision Microsyst.						
Fuel qty sensor LH (auxiliary fuel)	VM1000	30100-50	Vision Microsyst.						
Fuel qty sensor RH (auxiliary fuel)	VM1000	30100-50	Vision Microsyst.						

Airplane Serial No.:		Registration:		Date:		Mass		Lever Arm	
Description	**Type**	**Part No.**	**Manufacturer**	**S/N**	**installed**	**lb**	**kg**	**in**	**m**
HYDRAULIC									
Master cylinder		10-54	Cleveland						
Parking valve		60-5B	Cleveland						
Brake assembly		30-239	Cleveland						
INDICATING / REC. SYSTEM									
Digital chronometer	LC-2	AT420100	Astro Tech						
Digital chronometer	Model 803		Davtron						
Flight timer		85000-12	Hobbs						
Flight timer		85094-12	Hobbs						
Annunciator panel (system)			Diamond						
Annunciator panel	WW-IDC 001		White Wire						
CO detector	Model 452-201		CO Guardian LLC						
LANDING GEAR									
MLG wheel fairing inst.		DA4-3215-00-00	Diamond						
MLG speed kit LH		DA4-3219-01-00	Diamond						
MLG speed kit RH		DA4-3219-02-00	Diamond						
NLG wheel fairing inst.		DA4-3225-00-00	Diamond						

Airplane Serial No.:		Registration:		Date:		Mass		Lever Arm	
Description	Type	Part No.	Manufacturer	S/N	installed	lb	kg	in	m
NLG speed kit		DA4-3229-00-00	Diamond						
NLG strut fairing inst.		DA4-3227-00-00	Diamond						
NLG tie-down		DA4-1001-00-00	Diamond						
LIGHTS									
Map / Reading light assy crew		W1461.0.010	Rivoret						
Cabin Light		W1461.0.010	Rivoret						
Instr./radio lights dimmer assy		WW-LCM-002	White Wire						
Glareshield lamp assy		DA4-3311-10-01	Diamond Aircraft						
Glareshield light inverter		APVL328-8-3-L-18QF	Quantaflex						
Strobe / Pos. light assy LH	A600-PR-D-28	01-0790006-05	Whelen						
Strobe / Pos. light assy RH	A600-PG-D-28	01-0790006-07	Whelen						
Strobe light power supply LH/RH	A490ATS-CF-14/28	01-0770062-05	Whelen			1.592	0.722	101.0	2.566
Taxi light	70346	01-0770346-05	Whelen						
Landing light	70346	01-0770346-03	Whelen						
Electro luminescent lamps	Quantaflex 1600		Quantaflex						
Ballast	GENS D1,24V	37776	Newark						
Ballast	GENS D1,24V	37776	Newark						
Taxi light	HID LAMP D15	39663	Newark						
Landing light	HID LAMP D15	39663	Newark						

Airplane Serial No.:		Registration:		Date:		Mass		Lever Arm	
Description	Type	Part No.	Manufacturer	S/N	installed	lb	kg	in	m
NAVIGATION									
Pitot/static probe, heated		DAI-9034-57-00	Diamond						
P/S probe HTR fail sensor		DA4-3031-01-00	Diamond						
Altimeter inHg/mbar, primary		5934PD-3	United Instruments			1.9	0.86	70.08	1.78
Altimeter inHg/mbar, primary	LUN 1128	1128-14B6	Mikrotechna			1.39	0.63	70.08	1.78
Altimeter inHg/mbar, secondary		5934PD-3	United Instruments			1.9	0.86	70.08	1.78
Altimeter inHg/mbar, secondary	LUN 1128	1128-14B6	Mikrotechna			1.39	0.63	70.08	1.78
Vertical speed indicator		7000	United Instruments			1.2	0.54	70.08	1.78
Vertical speed indicator	LUN 1144	1144-A4B4	Mikrotechna			0.9	0.4	70.08	1.78
Airspeed indicator		8025	United Instruments			0.7	0.32	70.08	1.78
Airspeed indicator	LUN 1116	1116-B4B3	Mikrotechna			0.77	0.35	70.08	1.78
Outside air temp. indication		301F(C)	Davtron			0.27	0.124	70.08	1.78
Magnetic compass		C2400L4P	Airpath			0.65	0.293	70.08	1.78
Compass system C/O	KCS 55A		Bendix/King						
Slaved gyro	KG 102 A	060-00015-0000	Bendix/King			4.3	1.95	70.08	1.78
HSI	KI 525A	066-03046-0007	Bendix/King			3.38	1.53	70.08	1.78
Slaving unit (vertical)	KA 51B	071-01242-0001	Bendix/King			0.2	0.91	70.08	1.78
Slaving unit (horizontal)	KA 51B	071-01242-06	Bendix/King			0.2	0.91	70.08	1.78
Flux valve	KMT 112	071-01052-0000	Bendix/King			0.3	0.14	101.0	2.566
Directional gyro, free	AIM2051BLD	505-0031-931	BF-Goodrich			2.6	1.18	70.08	1.78
Attitude indicator	AIM1100-28L(0F)	504-0111-936	BF-Goodrich			2.20	1.0	70.08	1.78

Airplane Serial No.:		Registration:		Date:		Mass		Lever Arm	
Description	Type	Part No.	Manufacturer	S/N	installed	lb	kg	in	m
Attitude indicator	AIM1100-28LK(0F)	504-0111-938	BF-Goodrich			2.20	1.0	70.08	1.78
Attitude indicator	AIM1100-28LK(2F)	504-0111-941	BF-Goodrich			2.20	1.0	70.08	1.78
Turn coordinator w/o AP pickup	1394T100-(3Z)		Mid Continent Instr.			0.822	0.373	70.08	1.78
Turn coordinator	1394T100-(12RZ)		Mid Continent Instr.			1.41	0.64	70.08	1.78
Turn coordinator	1394T100-(12RA)		Mid Continent Instr.			1.41	0.64	70.08	1.78
Turn coordinator	1394T100-(12RB)		Mid Continent Instr.			1.41	0.64	70.08	1.78
Marker antenna	CI102		Comant						
DME	KN 62A	066-01068-0004	Bendix/King			2.6	1.18	70.08	1.78
DME antenna	KA60	071-01174-0000	Bendix/King						
DME antenna	KA60	071-01591-0001	Bendix/King						
DME antenna	KA61	071-00221-0010	Bendix/King						
Transponder	KT 76A	066-1062-10	Bendix/King			0.85	0.39	70.08	1.78
Transponder	KT 76C	066-01156-0101	Bendix/King			0.2	0.09	70.08	1.78
Transponder	GTX 327	011-00490-00	Garmin			2.4	1.09	70.08	1.78
Transponder	GTX 330	011-00455-00	Garmin			3.4	1.54	70.08	1.78
XPDR antenna	KA60	071-01174-0000	Bendix/King						
XPDR antenna	KA60	071-01591-0001	Bendix/King						
XPDR antenna	KA61	071-00221-0010	Bendix/King						
Altitude digitizer		D120-P2-T	TCI						
Altitude data system	SAE5-35	305154-00	Sandia Aerospace						
ADF	KR87	066-01072-0004	Bendix/King			2.9	1.32	70.08	1.78

Airplane Serial No.:		Registration:		Date:		Mass		Lever Arm	
Description	Type	Part No.	Manufacturer	S/N	installed	lb	kg	in	m
ADF antenna	KA44B	071-01234-0000	Bendix/King						
ADF indicator	KI227	066-03063-0001	Bendix/King			0.7	0.32	70.08	1.78
ADF indicator	KI227	066-03063-00	Bendix/King			0.7	0.32	70.08	1.78
NAV antenna coupler	CI505		Comant						
NAV/GS antenna coupler	CI507		Comant			0.20	0.089	106.1	2.685
dual NAV/dual GS antenna coupler	CI 1125		Comant						
VOR/LOC/GS antenna	CI157P		Comant						
NAV/COM #1	KX 125	069-01028-1101	Bendix/King			11.46	5.2	70.08	1.78
NAV/COM #1 volt conv.	KA39	071-01041-001	Bendix/King						
NAV/COM #1	KX155A	069-01032-0201	Bendix/King			3.7	1.68	70.08	1.78
NAV/COM #1	KX 165	069-01025-0025	Bendix/King			5.65	2.56	70.08	1.78
NAV/COM #1	KX 165A	069-01033-0101	Bendix/King			4.0	1.81	70.08	1.78
NAV/COM #1	KX 165A, 8.33 kHz	069-01033-0201	Bendix/King			4.0	1.81	70.08	1.78
NAV/COM #2	KX155A	069-01032-0201	Bendix/King			3.7	1.68	70.08	1.78
NAVCOM/GPS #1	GNS 430	011-00280-00	Garmin			6.5	2.95	70.08	1.78
NAVCOM/GPS #1	GNS 430	011-00280-10	Garmin			6.5	2.95	70.08	1.78
NAVCOM/GPS #1	GNS 530	011-00550-00	Garmin			8.5	3.86	70.08	1.78
NAVCOM/GPS #1	GNS 530	011-00550-0	Garmin			8.5	3.86	70.08	1.78
NAVCOM/GPS #2	GNS 430	011-00280-00	Garmin			6.5	2.95	70.08	1.78
NAVCOM/GPS #2	GNS 430	011-00280-10	Garmin			6.5	2.95	70.08	1.78
CDI, VOR/LOC #1	KI 208	066-03056-0000	Bendix/King			1	0.45	70.08	1.78

Airplane Serial No.:		Registration:		Date:		Mass		Lever Arm	
Description	Type	Part No.	Manufacturer	S/N	installed	lb	kg	in	m
CDI, VOR/LOC #2	KI 208	066-03056-0000	Bendix/King			1	0.45	70.08	1.78
CDI, VOR/LOC/GS #1	GI 106A	013-00049-01	Garmin			1.4	0.64	70.08	1.78
CDI, VOR/LOC/GS #2	GI 106A	013-00049-01	Garmin			1.4	0.64	70.08	1.78
GPS	KLN 89 B	066-01148-0102	Bendix/King			3	1.36	70.08	1.78
GPS	KLN 94	069-01034-0101	Bendix/King			3	1.36	70.08	1.78
GPS antenna	KA 92	071-01553-0200	Bendix/King						
GPS antenna #1	GA 56	011-00134-00	Garmin						
GPS antenna #2	GA 56	011-00134-00	Garmin						
GPS annunciation unit	MD41-1488		Mid Continent						
GPS / AP switch assy	MD41-528		Mid Continent						
Multifunction display / GPS	KMD 150	066-01174-0101	Bendix/King			3.3	1.5	70.08	1.78
Stormscope	WX-500	805-11500-001	Goodrich						
Stormscope antenna	NY-163	805-10930-001	Goodrich						
Strike finder display	SF 2000	2000-009	Insight						
Strike finder sensor	SF 2000	2000-022	Insight						
TAS processor	TAS 600	70-2420-x TAS600	Avidyne/Ryan						
TAS processor	TAS 610	70-2420-x TAS610	Avidyne/Ryan						
TAS processor	TAS 620	70-2420-x TAS620	Avidyne/Ryan						
Transponder coupler		70-2040	Avidyne/Ryan						
TAS antenna, top		S72-1750-31L	Sensor Systems						
TAS antenna, bottom		S72-1750-32L	Sensor Systems						

Airplane Serial No.:		Registration:		Date:		Mass		Lever Arm	
Description	Type	Part No.	Manufacturer	S/N	installed	lb	kg	in	m
ENGINE									
Engine	IO-360-M1A		Textron Lycoming						
ENGINE FUEL CONTROL									
Fuel flow transmitter	VM1000	3010032	Vision Microsyst.						
Fuel pressure transmitter	VM1000	3010017	Vision Microsyst.						
ENGINE IGNITION SYSTEM									
SlickSTART booster	SS1001		Unison						
Lasar ignition controller	LC-1002-03	LC-1002-03	Unison						
Lasar ignition harnedd	LH-1004-43		Unison						
Magneto RH/LH	4370/4347		Slick						
Magneto RH/LH	4770/4771		Slick						
ENGINE INDICATING									
RPM sensor	VM1000	3010005	Vision Microsyst.						
Manifold pressure sensor	VM1000	3010016	Vision Microsyst.						
Cyl. head temp. probes (4 each)	VM1000	1020061	Vision Microsyst.						
EGT probes	VM1000	1020060	Vision Microsyst.						

Airplane Serial No.:		Registration:		Date:		Mass		Lever Arm	
Description	**Type**	**Part No.**	**Manufacturer**	**S/N**	**installed**	**lb**	**kg**	**in**	**m**
Data processing unit	DPU	4010067	Vision Microsyst.						
Data processing unit	DPU	4010081	Vision Microsyst.						
Integr. engine data display	VM1000	4010050	Vision Microsyst.						
I/O board assy		3020003	Vision Microsyst.						
I/O board assy		3020018	Vision Microsyst.						
ENGINE OIL									
Oil temperature sensor	VM1000	3010021	Vision Microsyst.						
Oil pressure transducer	VM1000	3010018	Vision Microsyst.						
ENGINE STARTING									
Starter	149-24LS		Skytec						
PROPELLER SYSTEM									
Propeller	MTV-12-B/180-17		mt-Propeller			47.0	21.32	15.0	0.381
Propeller	MTV-12-B/180-17f		mt-Propeller			47.0	21.32	15.0	0.381
Propeller governor	C-210776		Woodward			3.05	1.385	29.4	0.747
Propeller governor	MT-P-420-10		mt-Propeller			2.0	0.907	29.4	0.747
Propeller governor	MT-P860-23	P-860-23	mt-Propeller			2.05	0.93	29.4	0.747

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. 6.01.01(-E)	Diamond						

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

Place: ____________________ Date: ______________________ Signature: __________________________

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This date calculated replacement Weight and Balance Revision for Diamond Aircraft mass weight ballast kit C41-7106-01-00, drawing # C41-7106-01-00 installed by Aero Restorations, Inc. on October 22, 2008 at Hobbs 85.3 under Work Order # 08-2984. I certify that this Weight & Balance was prepared in accordance with current regulations of the Federal Aviation Administration and is approved for return to service for the work performed. Pertinent details of the maintenance are on file at this repair station under W/O 26045. ____________________ for Midwest Corporate Aviation CRS#BVYR657C.

NOV 0 4 2013

WEIGHT & BALANCE REVISION (REPLACEMENT)

Diamond DA40XL			**SERIAL 40.698**				**REGISTRATION N216DG**			**Page 1 of 1**		
			Changes of Weight							**Actual**		
DATE	DESCRIPTION OF		ADDITION				SUBTRACTION			EMPTY WEIGHT		
			Weight [lbs]	Arm [in.]	Moment [in.lbs]		Weight [lbs] [kgs]	Arm [in.] [m]	Moment [in.lbs] [kgm]	Weight [lbs]	Arm [in.]	Moment [in.lbs]
										1784.00	98.26	175297.64
05-Nov-13	**Mass Ballast Installation**		**17.40**	**25.00**	**435.00**					17.40		435.00
							New Empty Weight			**1801.4**	**97.55**	**175732.64**

Airframe Log

Midwest Corporate Aviation. S/N: **40.698** Date: **11/4/13** Hobbs: **590.40**

This date calculated replacement Weight and Balance Revision for Diamond Aircraft mass weight ballast kit C41-7106-01-00, drawing # C41-7106-01-00 installed by Aero Restorations, Inc. on October 22, 2008 at Hobbs 85.3 under Work Order # 08-2984. I certify that this Weight & Balance was prepared in accordance with current regulations of the Federal Aviation Administration and is approved for return to service for the work performed. Pertinent details of the maintenance are on file at this repair station under W/O 26045. ______________ for Midwest Corporate Aviation CRS#BVYR657C.

[illegible]

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

[illegible]

[illegible]

Model: DA 40

Diamond

Aircraft Specific Weighting Report

Serial Number:	40.698
Registration:	N216DG
Issue Date:	18.09.06

Data with reference to the Type Certificate Data Sheet and the Flight Manual

Reference Plane: Vertical plane 2194 mm(86.38 in) in front of wing leading edge at root rib.
Horizontal reference line: Wedge 600:31 (2.96°), 2910mm (114.57 in) aft of step in the cockpit rim.
Equipment List dated: 18.09.06
Cause for Weighing:

ORIGINAL

Weight and Balance Calculations

Weight Condition:

Include brake fluid, engine oil and unusable fuel (2 liters/0.5 US gal on each side).

Empty Weight:

Support	Gross		Tare		Net Weight	
	kg	lbs	kg	lbs	kg	lbs
Front, G_2	105.2	232.0	0	0	105.2	232.0
Main, G_{1LH}	348.4	768.0	0	0	348.4	768.0
Main, G_{1RH}	355.6	784.0	0	0	355.6	784.0
EMPTY WEIGHT, G					809.2	1784.0

Finding Arm: (Measured)

	Lever Arm	
	mm	in.
X_2	940	37.01
X_{1LH}	2738	107.80
X_{1RH}	2719	107.05

Empty Weight Centre of Gravity, X_{CG}:

Empty Weight CG Formula

$$X_{CG} = \frac{(G_{1LH}*X_{1LH}+G_{1RH}*X_{1RH}) + (G_2*X_2)}{G_2 + G_{1LH} + G_{1RH}} = \begin{matrix} 2.496 \text{ m} \\ 98.261 \text{ in.} \end{matrix}$$

Empty Weight Moment, M:

Empty Weight Moment Formula

$$M = G \times X_{CG} = \begin{matrix} 2019.65 \text{ kg·m} \\ 175297.64 \text{ in·lbs} \end{matrix}$$

Maximum Permitted Useful Load:

Maximum Ramp Weight	1150.0 kg	2535 lbs
Empty Weight	809.2 kg	1784.0 lbs
Maximum Useful Load	340.8 kg	751.0 lbs

Data to be entered into the Flight Manual:

Empty Weight, G:	Empty Weight Moment, M:
809.2 kg 1784.0 lbs	2019.65 kg·m 175297.64 in·lbs

Place: D.A.I.C. - CYXU Date: 18.09.06	Authorizing Stamp DA Q 42	Authorizing Signature

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

Ailerons

Construction: GFRP/CFRP composite sandwich

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

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

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

Flaps

Construction: GFRP/CFRP composite sandwich

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

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

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

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

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

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

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

Flap Position Indicator:

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

When the upper light (green) is illuminated, the flaps are in the Cruise position (UP);
When the center light (white) is illuminated, the flaps are in Take-off position (T/O);
When the lower light (white) is illuminated, the flaps are in Landing position (LDG).

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

Elevator

Construction: GFRP sandwich

Hinges: 5 hinges

Operation Steel push-rods;

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

Rudder

Construction: GFRP sandwich

Hinges: Upper hinge: One bolt.

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

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

Elevator Trim

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

Turn wheel to the front = nose down

Turn wheel to the rear = nose up

Pedal Adjustment

NOTE

The pedals may only be adjusted on the ground!

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

NOTE

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

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.

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

NOTE

The pedals may only be adjusted on the ground!

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

Forward Adjustment

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

Rearward Adjustment

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

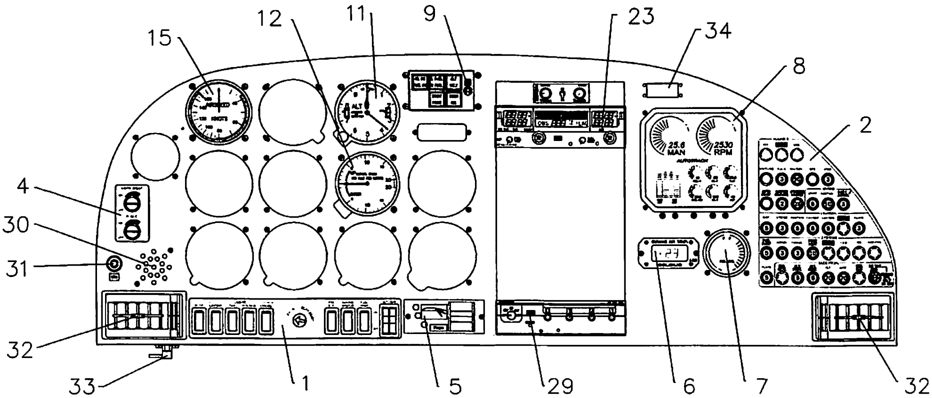
Locking

Upon release the switch moves automatically to the 'power off' position, so locking the pedals in the present position.

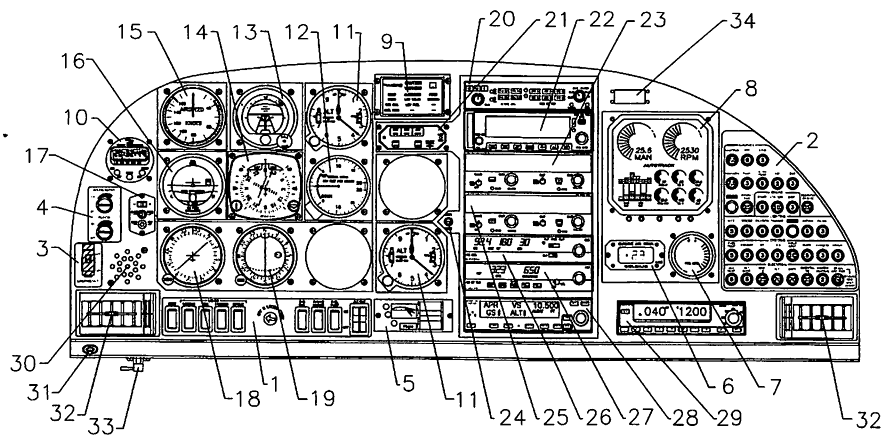
7.4 INSTRUMENT PANEL

Instrument Panel Variants

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



VFR instrument panel (example)



IFR instrument panel (example)

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

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

Cockpit Ventilation

Ventilation in the front is provided by the movable ventilation nozzles (17) in the instrument panel. Furthermore there are spherical nozzles in the roll bar on the left and right side next to the front seats as well as on the central console above the passengers' heads. The spherical nozzles are opened and closed by twisting.

7.5 LANDING GEAR

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

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

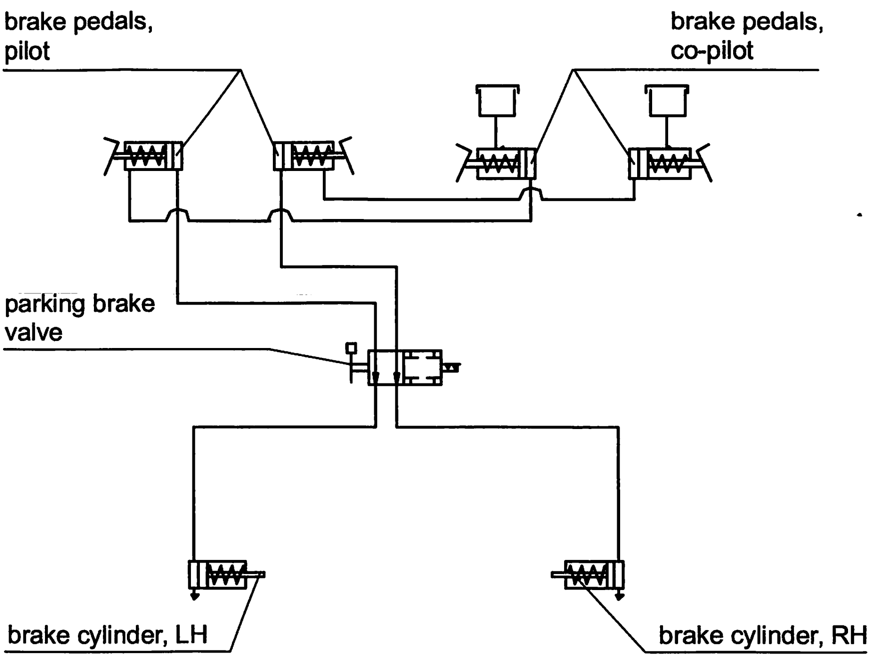
Wheel Brakes

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 facilitate the maintenance and inspection of the underlying controls. Covers on the control sticks prevent loose objects from falling into the area of the controls.

The seats have removable furnishings and are equipped with energy-absorbing foam elements.

The seats are fitted with three-point safety harnesses. The harnesses are fastened by inserting the end of the belts in the belt lock, and are opened by pressing the release on the belt lock.

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

7.7 BAGGAGE COMPARTMENT

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

(a) Standard baggage compartment.

(b) Standard baggage compartment with 'baggage tube'.

(c) Extended baggage compartment (OÄM 40-163). It consists of a forward and an aft part.

Without a baggage net, no baggage may be loaded.

Standard Baggage Compartment

The baggage compartment is located behind the rear seats.

Baggage Tube (if installed)

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

Extended Baggage Compartment (OÄM 40-163 and OÄM 40-164, if installed)

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

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

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

7.8 CANOPY, REAR DOOR, AND CABIN INTERIOR

Front Canopy

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

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

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

WARNING

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

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

Rear Door

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

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

WARNING

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

Heating and Ventilation

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

Left lever: up = heating ON

down = heating OFF

Central lever (Air distribution lever):

up = airflow to canopy (▲)

down = airflow to floor (▼)

Emergency Axe

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

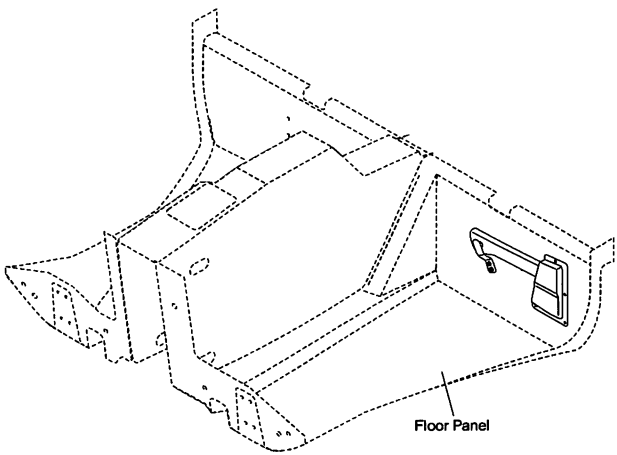
If the canopy can not be opened in case of an emergency use the emergency axe to break through the canopy.

WARNING

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

WARNING

Beware of sharp edges and fragments of the broken canopy.



7.9 POWER PLANT

7.9.1 ENGINE, GENERAL

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

Displacement:	5916 cm^3 (361 in^3).
Max. power:	180 HP (134.2 kW) at 2700 RPM at sea level and ISA.
Max. continuous power:	160 HP (119.3 kW) at 2400 RPM at sea level and ISA.

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

Further information should be obtained from the engine operating manual.

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

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

7.9.2 OPERATING CONTROLS

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

Throttle

- Left hand lever with large, black knob.

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

Lever forward (MAX PWR)	= Full throttle, higher MP
Lever to rear (IDLE)	= Idle, low MP

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

RPM Lever

- Central lever with blue handle.

Lever forward (HIGH RPM)	= High RPM, fine pitch
Lever to rear (LOW RPM)	= Low RPM, coarse pitch

By means of this lever the propeller governor controls the propeller pitch and thus engine RPM (= propeller RPM). A selected RPM is held constant by the governor independent of the airspeed and the throttle setting ('Constant Speed').

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

CAUTION

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

CAUTION

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

<u>Mixture Control Lever</u>

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

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

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

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

If the lever is at the forward stop, extra fuel is being supplied to the engine which at higher performance settings contributes to engine cooling.

In cruise, the mixture should be made leaner in order to reach the appropriate fuel-air mixture. The leaning procedure is given in Chapter 4.

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

Alternate Air

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

Placard on the lever, forward position:

ALTERNATE AIR

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

ALTERNATE AIR
ON

7.9.3 PROPELLER

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

CAUTION

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

WARNING

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

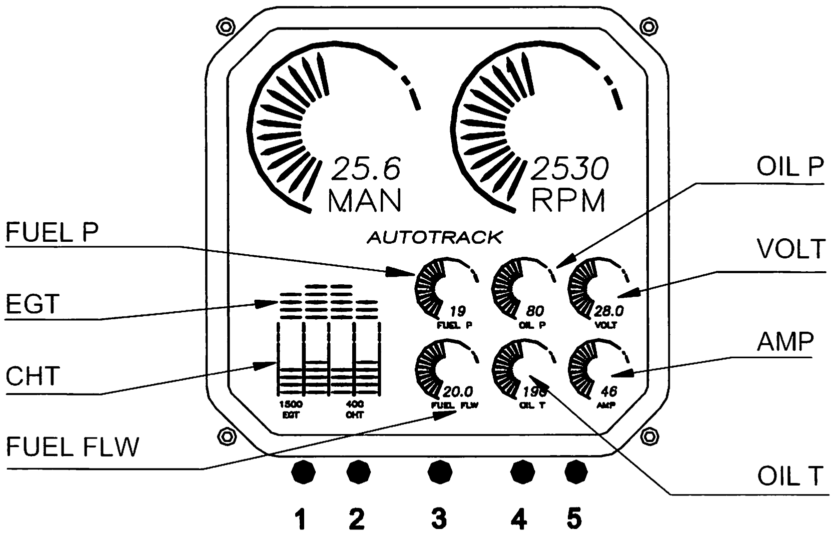
Never try to start the engine by hand.

Governor

One of the following governors may be installed:

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

7.9.4 ENGINE INSTRUMENTS



Button 1: Lean mode

Button 2: Digital exhaust gas / cylinder head temperature mode

Button 3: Switch in autotrack

Button 4: Fuel computer mode

Button 5: Engine data recorder

Button 3 has an additional function on switch-on: Display mode

Sweep Mode or Pointer Mode

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

Indications on the Vision Microsystems VM 1000 Engine Instrument

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

Button 1 - Lean Mode

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

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

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

A flashing bar column indicates that the relevant cylinder has reached the hottest exhaust gas temperature. This point will be marked with a single bar, which can be used as a reference for enriching the mixture. As an option, the numerical indication can be used additionally for this purpose.

Button 2: Digital Exhaust Gas / Cylinder Head Temperature Mode

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

Button 3: Switch in Autotrack

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

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

Button 4 - Fuel Computer Mode

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

REM: The remaining fuel is shown is US gal. The steps in this are 0.1 US gal. This mode is only available if the ADD mode - add up fuel - has previously been activated.

HRS: This mode shows the remaining flight time (in hours) on the basis of the current fuel flow. The steps in this indication are tenths of hours. This mode is also only available if the ADD mode - add up fuel - has previously been activated.

BRN: This mode shows the amount of fuel used (in US gal) since the equipment was switched on. The steps in this are 0.1 US gal.

ADD: This mode can be used after refueling to bring the fuel quantity, which the equipment uses for its calculations, up to date. In order to utilize the REM and HRS modes, the computer needs to be told how much fuel has been taken on. 10 US gal are added by pressing button 3, while pressing button 5 adds one US gal to the total. The quantity is confirmed by pressing button 4. In doing this, the quantity which has been entered in ADD is added to the previous total under REM. To check the fuel quantity button 4 should be pressed until REM is shown.

If too much has been added, button 4 should not be pressed for confirmation. After approx. 20 seconds the computer automatically leaves the ADD mode.

CAUTION

Incorrect use of the computer in the fuel-computer mode will result in false statements in the "REM - remaining fuel" and the "HRS - remaining flight time" modes. Before using the fuel computer mode in flight the pilot must be certain that he has understood the operation and use of the equipment. Beyond this, use of the fuel computer must not be regarded as a substitute for fuel planning for a flight.

Button 5 - Engine Data Recorder

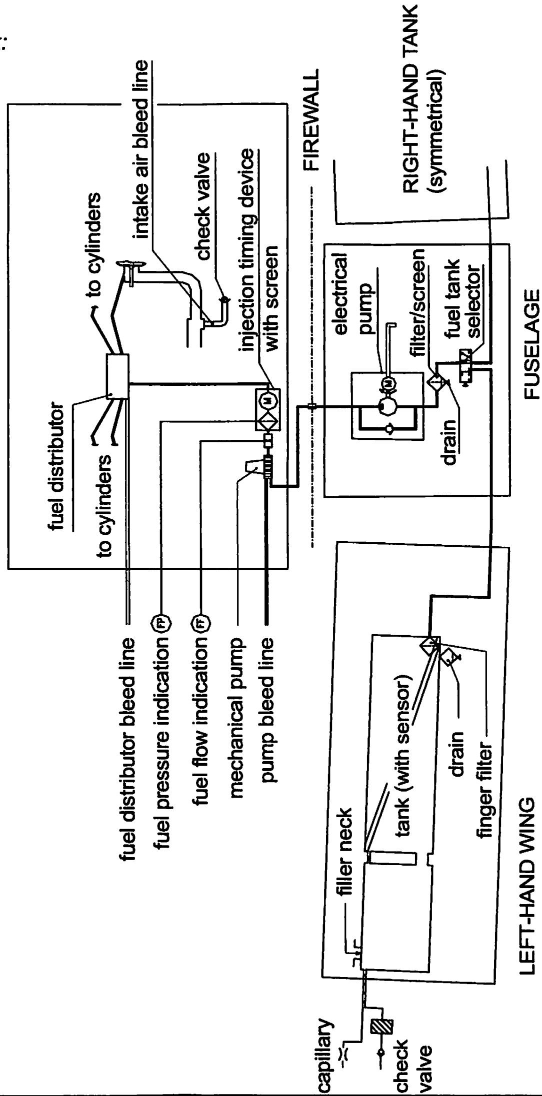
Operating button 5 will activate the engine data recorder. The digital values shown are the minimum values recorded by the engine instrument unit during operation, such as lowest voltage, lowest fuel pressure, etc. The numerical RPM indicator will indicate the total operating hours.

Pressing button 5 again will show the maximum values encountered. Pressing button 5 still another time will turn off the engine data recorder and the display will return to the original mode. If button 5 is not pressed for approximately 20 seconds, the display will automatically return to the original mode.

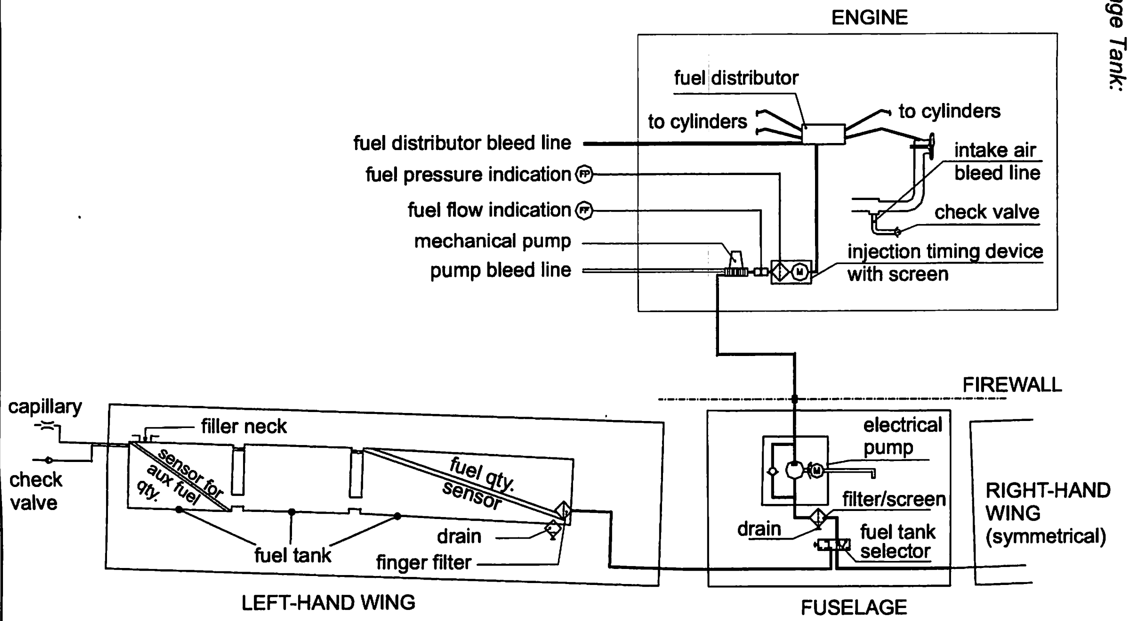
Data of the engine data recorder can be called during or immediately after flight only. With each new flight the old data will be overwritten.

7.10 FUEL SYSTEM

a) Standard Tank:



b) Long Range Tank:



Fuel Pumps

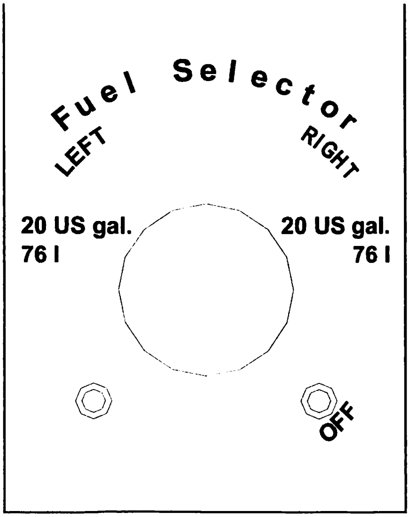
The fuel system is equipped with a mechanical and an electrical fuel pump. The mechanical pump provides for the normal fuel supply.

The electrical fuel pump is provided as an auxiliary and emergency pump, which does not operate under normal circumstances. It is operated with the FUEL PUMP switch on the row of switches on the instrument panel. It is checked during engine start, and is used as a safety back-up during take-off and landing, as well as when switching fuel tanks. It is also switched on for safety in the event of a decrease in fuel pressure.

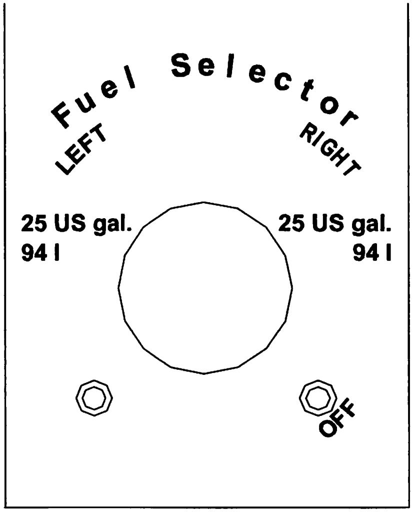
Fuel Tank Selector

The fuel tank selector is situated on the center console. Its positions are LEFT (tank), RIGHT (tank) and OFF. The OFF position is reached by turning the selector to the right while pulling up the safety catch of the fuel tank selector. This is to ensure that an OFF selection is not made unintentionally.

a) Standard Tank



b) Long Range Tank



<u>Fuel Tanks</u>

Each of the two wing tanks consists of two (standard tank) or three (long range tank) aluminum chambers which are joined by a piece of flexible hose and two independent vent hoses. There are two separate vents per tank. The hose terminations are situated on the underside of the wing, approx. 2 meter (7 ft) from the wing tip. One vent acts as a capillary, both to equalize the air pressure, and to provide a safety factor in the event of a failure of the other vent. The second vent is a check valve, to allow air to enter the tank, but prevent flow to the outside.

A coarse filter (finger filter) is fitted before the outlet. To allow draining of the tank, there is an outlet valve at its lowest point. A gascolator sits at the lowest point in the fuel system. A drain valve is fitted to the gascolator, which can be used to remove water and sediment which has collected in the fuel system. This valve is fitted centrally on the underside of the fuselage, approximately 30 cm (1 ft) forward of the wing leading edge.

Fuel Quantity Indication

a) Standard Tank

A capacity probe ascertains fuel quantity in the tank. When the fuel quantity indicator reads zero, only the unusable fuel remains in the tank. The total capacity of each tank is 20 US gal (approximately 76 liter). The maximum quantity that can be indicated is either 15 US gal (up to serial number 40.054) or 17 US gal (serial number 40.055 and subsequent). The indication up to this quantity is correct. At an actual quantity above 15 US gal / 17 US gal the indication remains at 15 US gal / 17 US gal.

NOTE

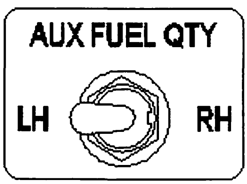
When the fuel quantity indicator reads 15 US gal / 17 US gal, the correct fuel quantity must be determined with the fuel quantity measuring device. If this measurement is not carried out, the fuel quantity available for flight planning is 15 US gal / 17 US gal.

b) Long Range Tank

For ascertaining fuel quantity in the enlarged tanks an additional capacitive probe is used on each side (LH/RH). When the fuel quantity indicator reads zero, only the unusable fuel remains in the tank. The usable capacity of each tank is 25 US gal (approximately 94 liter).

Up to an actual fuel quantity of 16 US gal the fuel quantity is measured by the standard probes and is brought to indication on the left and right side of the instrument in increments of 1 US gal.

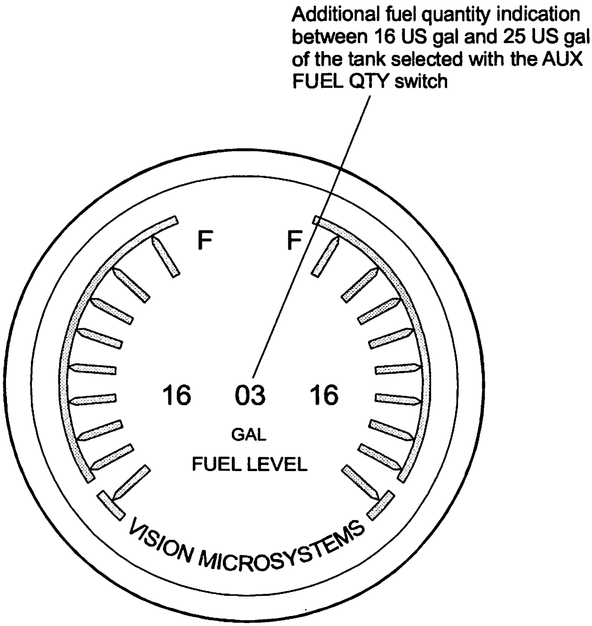
A fuel quantity between 16 US gal and 25 US gal is ascertained by the additional probes and is brought to indication in the central area of the fuel quantity indicator. The indication is numerical in 3 US gal steps (in the range from 0 to 3 US gal) and 1 US gal steps (in the range above 3 US gal up to max. 9 US gal). The side to be indicated can be selected by the AUX FUEL QTY switch (see figure below) which is located next to the indicator. The indication on the left and right side of the instrument (0 US gal to max. 16 US gal) is not affected by the switch.



The actual fuel quantity in the respective tank (LH/RH) is the sum of the central indication and the corresponding indication on the left or right side.

CAUTION

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



Fuel Quantity Measuring Device

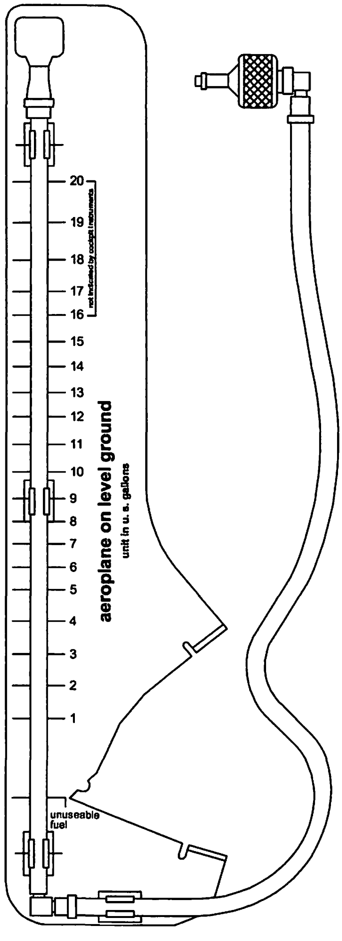
The fuel quantity measuring device allows the fuel quantity in the tank to be determined during the pre-flight inspection. It functions according to the principle of communicating containers. The fuel quantity measuring device has a recess which fits the airfoil of the wing. With this recess the device is held against the stall strip at the leading edge of the wing. The exact position is marked by a bore in the stall strip. Then the metal connector is pressed against the drain of the tank. The amount of fuel in the tank can now be read off from the vertical ascending pipe.

For a correct indication the airplane must be placed on a horizontal ground and the fuel filler must have been opened before.

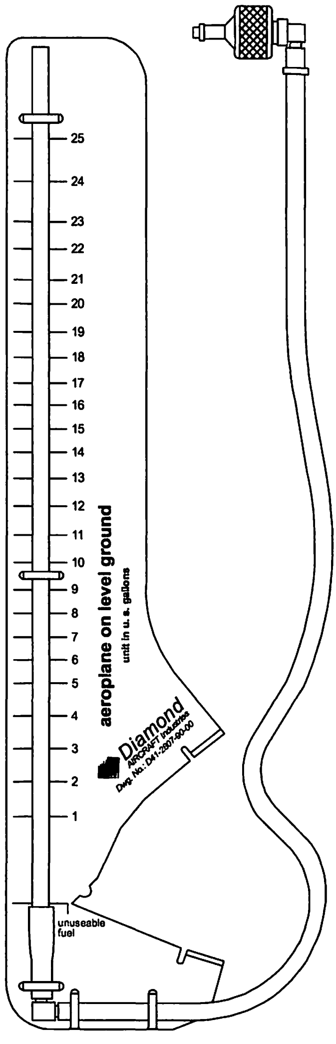
The designated place for the fuel quantity measuring device is the bag on the rear side of the pilot's seat.

CAUTION

Different fuel measuring devices are used for the standard tank and the long range tank. The use of the wrong device results in a wrong indication.

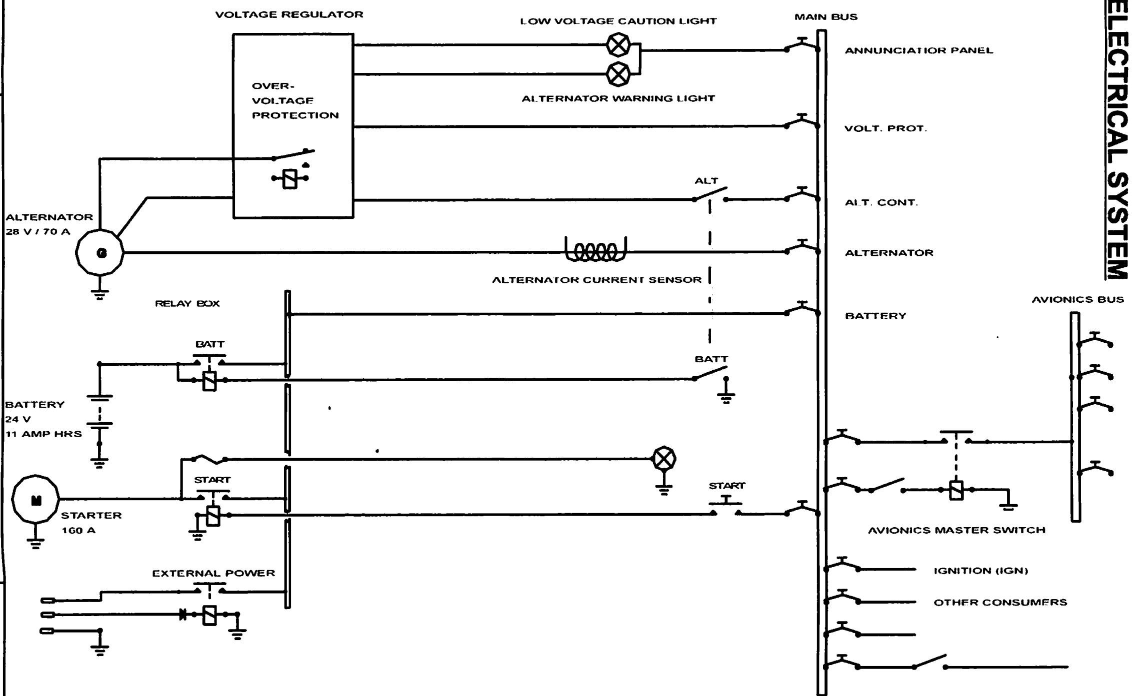


a) Standard Tank

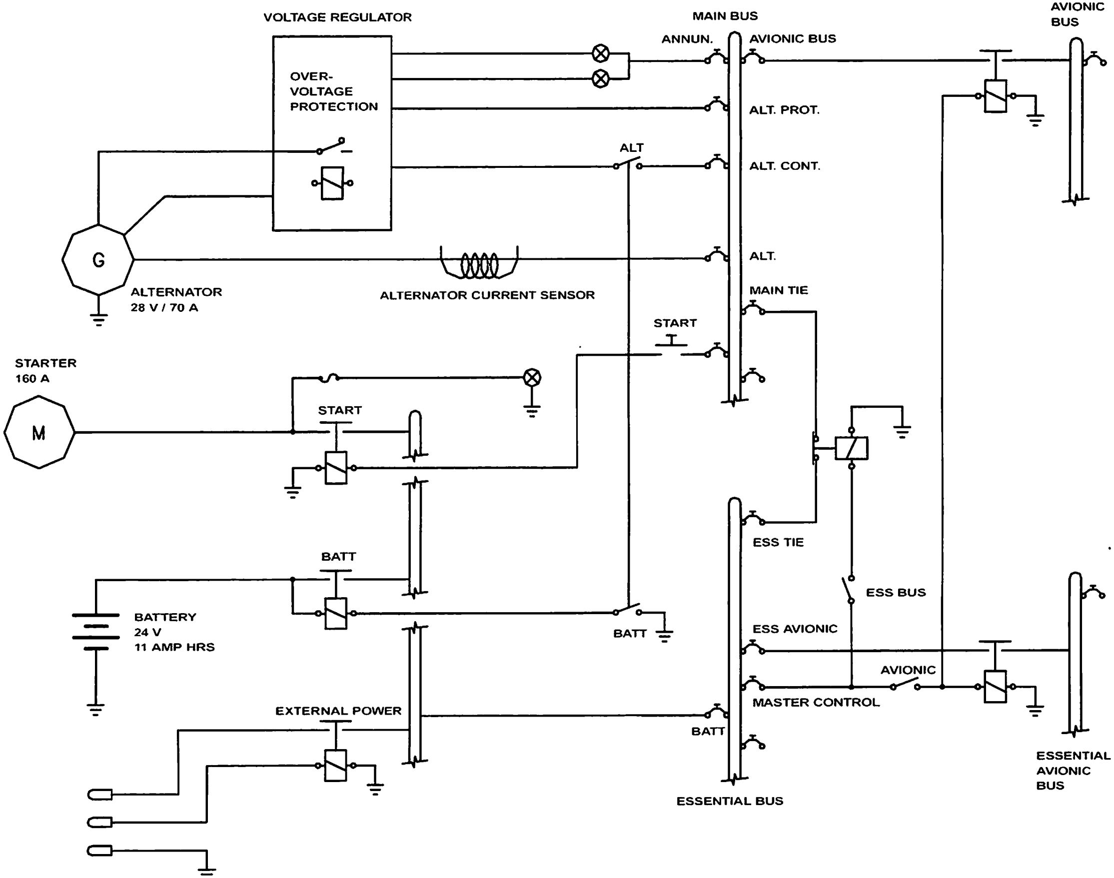


b) Long Range Tank

7.11 ELECTRICAL SYSTEM



Simplified wiring diagram for serial numbers without Essential Bus



Simplified wiring diagram for serial numbers with Essential Bus

7.11.1 GENERAL

The DA 40 has 28 Volt DC system, which can be sub-divided into:

- Power generation
- Storage
- Distribution
- Consumers

Power Generation

The 70 Ampère alternator (generator) is mounted on the front of the engine. It is driven by a V-belt, and charges the battery. In the event of alternator failure, the battery provides the system with electrical energy. Given the provision of these two independent sources of electrical power, the complete failure of the electrical system is extremely unlikely.

Storage

Power is stored in a lead-acid battery which is mounted in the right-hand side of the engine compartment. It has a capacity of 10 Ampère-hour or more, depending on the battery type. The battery is connected to the airplane electrical system via the main (70 Ampère) circuit breaker.

In addition, a non-rechargeable dry battery or a lithium battery pack is installed in the IFR model as a further source of power for the attitude gyro (artificial horizon) and the flood light. When the emergency switch is set to ON, these two systems are supplied with power for 1 hour and 30 minutes, independent of all other electrical consumers.

Distribution

Electrical power is distributed via the main bus and, if installed, the essential bus.

Master Switch (ALT/BAT)

The Master switch is divided into a Master switch (ALT) on the left and a Master switch (BAT) on the right. Both switches together are known as the Master switch (ALT/BAT).

Consumers

The individual consumers (e.g. radio, electrical fuel pump, position lights, etc.) are connected to the main bus via automatic circuit breakers.

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

Ignition

The basic version of the DA 40 is equipped with the electric start boost system SlickSTART. This system improves the start characteristics by delivering more spark energy during the engine start sequence. After engine starting the ignition is controlled by the conventional retard breaker magneto system.

As an option, the LASAR electronic ignition control unit can be installed instead of the SlickSTART system. This unit measures manifold pressure and RPM and uses these parameters to optimize the ignition timing. This provides for smooth engine running and improved starting behavior. If the electronic ignition control is not in operation, the status light for the ignition illuminates and the conventional magneto ignition takes over the ignition control. Also, during operation of the engine on only one magneto, for example during the magneto check, the ignition is not controlled electronically and the status light for the ignition should illuminate. For engine restart in flight without the electronic ignition control being operative an engine speed of more than 500 RPM is necessary. The magneto ignition is independent of the electrical network, therefore providing safe engine operation even in the event of a power failure.

Voltmeter

The voltmeter displays the potential on the main bus. If the alternator is operating, the alternator voltage is shown, otherwise it is that provided by the battery.

Ammeter

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

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, and the Pitot heating caution will be displayed. In this case the system should be serviced.

NOTE

The Pitot heating caution will also be displayed whenever the Pitot heating system is switched OFF.

7.11.2 DAI ANNUNCIATOR PANEL (WARNING, CAUTION AND STATUS LIGHTS)

There are two variants of the annunciator panel ('DAI' and 'White Wire'). The 'DAI' variant, which is described below, can be identified by the lights in the shape of a square.

Testing the Annunciator Panel

In the process of the pre-flight check the lights of the annunciator panel must be checked by operating the test switch. This is to check that the lights have not failed. All lights must be serviceable.

Alternator Warning Light (ALT)

The alternator warning light illuminates on alternator failure. The only remaining source of electrical power is the battery. The color is red.

The procedure to be followed upon alternator warning is given in 3.7.2 - FAILURES IN THE ELECTRICAL SYSTEM.

Low Voltage Caution Light (VOLT)

This caution light illuminates when the on-board voltage drops below 24 Volts. It goes out again when the voltage exceeds 25 Volts. The color is amber.

The procedure to be followed upon low voltage caution is given in 4B.3 - FAILURES IN THE ELECTRICAL SYSTEM.

Fuel Pressure Warning Light (FUEL PR)

The fuel pressure warning light illuminates when the fuel pressure drops below 14 PSI. The color is red.

Low Fuel Caution Lights (L FUEL and R FUEL)

Each tank has its own caution light. It starts to flash when the fuel quantity becomes low, and illuminates permanently when the quantity of usable fuel in the respective tank drops below 3 US gal (±1 US gal). The indication is calibrated for straight and level flight. The light may illuminate during turns which are flown with slip, or while taxiing in curves. The color is amber.

Oil Pressure Warning Light (OIL PR)

The oil pressure warning light illuminates when the oil pressure drops below 25 PSI. The color is red.

The procedure to be followed upon oil pressure warning is given in 3.2.3 - ENGINE PROBLEMS IN FLIGHT.

Door Warning Light (DOOR)

The door warning light illuminates when the front canopy and/or the rear door is not closed and locked. The color is red.

The procedure to be followed upon door warning is given in 3.7.4 - DOOR-WARNING LIGHT ON.

Status Light for the Ignition (IGN)

This light is only used when the electronic ignition control unit is installed.

The status light for the ignition illuminates when the electronic ignition control is not operating. In this case the conventional magneto ignition will be in use. The color is white.

The procedure to be followed upon illumination of the ignition status light is given in 4B.3 - FAILURES IN THE ELECTRICAL SYSTEM.

Starter Warning Light (START)

The starter warning light illuminates when the starter is being operated or when the connection between the starter motor and the engine has not been broken. This occurs when the pinion of the starter motor remains engaged with the propeller flywheel. The color is red.

The procedure to be followed upon starter warning is given in 3.7.2 - FAILURES IN THE ELECTRICAL SYSTEM.

Pitot Heating Caution Light (PITOT)

The Pitot heating caution light is illuminated when the Pitot heating is not switched on, or when there is a failure of the Pitot heating system. The color is amber.

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

7.11.3 WHITE WIRE ANNUNCIATOR PANEL (WARNING, CAUTION AND STATUS LIGHTS)

There are two variants of the annunciator panel ('DAI' and 'White Wire'). The 'White Wire' variant, which is described below, can be identified by the flat front panel and the 'White Wire' logo on the display in the upper left corner.

Testing the Annunciator Panel

In the process of the pre-flight check, proper functioning of the annunciator panel must be verified. This functional check is automatically started after switching the battery master switch ON. All lights are flashed, and the aural alert is muted. By pressing the 'acknowledge' button, the lights are extinguished, and a momentary aural alert is sounded. This test verifies functionality of the microprocessor, the lights, and the aural signal.

The pilot may initiate additional system tests by holding the 'acknowledge' button for 2 seconds. All lights will begin flashing, and the aural alert will sound continuously.

Warning Messages

A warning is indicated by a continuous aural alert (sounded in the airplane's intercom system), flashing of the red WARNING light, and flashing of the red warning light associated with the affected system.

By pressing the 'acknowledge' button, which is now illuminated green, the aural alert will be terminated, and the WARNING light will be extinguished. The warning light associated with the affected system will change from flashing to solid illumination.

Caution Messages

A caution is indicated by a momentary aural alert (sounded in the airplane's intercom system), flashing of the amber CAUTION light, and flashing of the amber caution light associated with the affected system.

By pressing the 'acknowledge' button, which is now illuminated green, the CAUTION light will be extinguished. The caution light associated with the affected system will change from flashing to solid illumination.

The LOW FUEL caution message is displayed in a slightly different manner (extended functionality), which is described below.

Alternator Warning Message (ALTERNATOR)

The alternator warning message is displayed on alternator failure. The only remaining source of electrical power is the battery.

The procedure to be followed upon alternator warning is given in 3.7.2 - FAILURES IN THE ELECTRICAL SYSTEM.

Low Voltage Caution Message (LOW VOLTS)

The low voltage caution message is displayed when the on-board voltage drops below 24 Volts. It is terminated when the voltage exceeds 25 Volts again.

The procedure to be followed upon low voltage caution is given in 4B.3 - FAILURES IN THE ELECTRICAL SYSTEM.

Fuel Pressure Warning Message (FUEL PRESS)

The fuel pressure warning message is displayed when the fuel pressure drops below 14 PSI.

Low Fuel Caution Message (LOW FUEL)

As soon as the amount of usable fuel *in one tank* is less than 3 US gal (±1 US gal), a caution message is displayed in the usual manner (momentary aural alert, flashing CAUTION light, flashing LOW FUEL caution light). Termination of the message is also done as usual ('acknowledge', CAUTION light is extinguished, LOW FUEL caution light changes to solid illumination).

As soon as the amount of usable fuel *in the second tank* is also less than 3 US gal (±1 US gal), a caution message is displayed in a different manner. A *continuous* aural alert is sounded in the airplane's intercom system, the amber CAUTION light is flashed, and the amber LOW FUEL caution light is flashed.

By pressing the 'acknowledge' button, which is now illuminated green, the aural alert will be terminated, and the CAUTION light will be extinguished. The LOW FUEL caution light will continue to be flashed.

The indication is calibrated for straight and level flight. The caution message may be triggered during turns which are flown with slip, or while taxiing in curves.

Oil Pressure Warning Message (OIL PRESS)

The oil pressure warning message is displayed when the oil pressure drops below 25 PSI.

The procedure to be followed upon oil pressure warning is given in 3.2.3 - ENGINE PROBLEMS IN FLIGHT.

Door Warning Message (DOORS)

The door warning message is displayed when the front canopy and/or the rear door is not closed and locked.

The procedure to be followed upon door warning is given in 3.7.4 - DOOR-WARNING LIGHT ON.

Status Light for the Ignition (IGN)

This light is only used when the electronic ignition control unit is installed.

The status light for the ignition is illuminated when the electronic ignition control is not operating. In this case the conventional magneto ignition will be in use. The color is white.

The WARNING light, the CAUTION light, and the aural alert will *not* be activated.

The procedure to be followed upon illumination of the ignition status light is given in 4B.3 - FAILURES IN THE ELECTRICAL SYSTEM.

Starter Warning Message (START)

The starter warning message is displayed when the connection between the starter motor and the engine has not been broken. This occurs when the pinion of the starter motor remains engaged with the propeller flywheel.

Furthermore, the START warning light is illuminated continuously as long as the starter is being operated. In this case the WARNING light and the aural alert will not be activated.

The procedure to be followed upon starter warning is given in 3.7.2 - FAILURES IN THE ELECTRICAL SYSTEM.

Pitot Heating Caution Message (PITOT)

The Pitot heating caution message is displayed when the Pitot heating is not switched on, or when there is a failure of the Pitot heating system.

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

Trim Failure Warning Message (TRIM FAIL)

The White Wire annunciator panel is prepared for the installation of an autopilot in the DA 40. When the autopilot is installed and ready for operation, this warning message indicates a failure of the automatic trim system of the autopilot. For further details, refer to the Supplement to the AFM for the autopilot (if installed).

Unused Lights

The White Wire annunciator panel has two lights for possible future use. These lights are currently unused.

7.12 PITOT-STATIC SYSTEM

Total pressure is measured at the leading edge of a Pitot probe under the left wing. Static pressure is measured at two orifices at lower and rear edges of the same probe. To protect against dirt and condensation there are filters in the system, which are accessible from the wing root. The Pitot probe is electrically heated.

In addition, some serial numbers have an alternate static valve installed on the underside of the instrument panel. With this valve, the static pressure in the cabin can be used as static pressure source in the event of a failure of the Pitot-static system.

If an autopilot system is installed, additional static sources may be installed (OÄM 40-267).

7.13 STALL WARNING

If airspeed drops below approximately 10 to minimum 5 knots above the stalling speed, the stall warning horn, located in the instrument panel, will sound. The horn becomes progressively louder the closer one gets to stalling speed. Suction at an orifice on the left wing leading edge activates the horn via a hose. The orifice for the stall warning in the left wing is marked by a red ring.

7.14 AVIONICS

The radio and navigation equipment is located in the central part of the instrument panel. A transmit switch for the radio is mounted on the end of each control stick. There are connection facilities for up to 4 headsets between the front seats.

7.15 CO-MONITOR (IF INSTALLED)

The airplane may be equipped with a CO detector (OÄM 40-253).

7.15.1 SELF TEST SEQUENCE

When power is applied to the CO detector, a self-test routine begins. The test checks for functionality of the critical components such as the CO sensor, temperature sensor, and the integrity of the total CO detector system.

The remote alert light will flash twice. Then the remote light will remain OFF until there is another CO alert or until a failure of the unit occurs.

7.15.2 IN-FLIGHT CO ALARM

If the CO detector visual alert annunciator illuminates in flight, press the TEST/RESET button.

If the alert continues with the remote light staying ON, proceed with the emergency procedure 3.7.3 - SUSPICION OF CARBON MONOXIDE CONTAMINATION IN THE CABIN.

NOTE

The remote light will stay on until the CO level goes below 50 PPM.

7.15.3 UNIT FAILURE INDICATION

A failure of the CO sensor, temperature sensor, or the micro-controller will result in the following failure indications:

The remote light will flash at an approximately rate of one flash each four seconds until the failure is cleared or power is removed from the unit.

CHAPTER 8
AIRPLANE HANDLING, CARE AND MAINTENANCE

Page

8.1 INTRODUCTION

Chapter 8 contains the manufacturer's recommended procedures for proper ground handling and servicing of the airplane. The Airplane Maintenance Manual (Doc. No. 6.02.01) lists certain inspection and maintenance requirements which must be followed if the airplane is to retain a new plane performance and reliability.

8.2 AIRPLANE INSPECTION INTERVALS

For maintenance work on engine and propeller, the currently effective Operator's Manuals, Service Instructions, Service Letters and Service Bulletins of Lycoming and mt-Propeller must be followed. For airframe inspections, the currently effective checklists/manuals of the manufacturer must be followed.

CAUTION

Unscheduled maintenance checks are required after:

- Hard landings.
- Propeller strike.
- Engine fire.
- Lighting strike.
- Occurrence of other malfunctions and damage.

Unscheduled maintenance checks are described in the Airplane Maintenance Manual (Doc. No. 6.02.01; Section 05-50).

8.3 AIRPLANE ALTERATIONS OR REPAIRS

Alterations or repairs of the airplane may be carried out only according to the Airplane Maintenance Manual, Doc. No. 6.02.01, and only by authorized personnel.

8.4 GROUND HANDLING / ROAD TRANSPORT

8.4.1 GROUND HANDLING WITHOUT TOW BAR

During forward traversing the nose wheel will follow the movement of the airplane. Change in direction is achieved by pulling on the propeller near the spinner. To traverse in the rear direction, the tail section of the airplane should be pushed down until the nose wheel is clear of the ground. This method can also be used to turn the airplane around its main landing gear.

8.4.2 GROUND HANDLING WITH TOW BAR

For pushing or pulling the airplane on the ground, it is recommended to use the tow bar which is available from the manufacturer. The tow bar is bent apart and engaged in the appropriate holes in the nose wheel fairing as shown 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.

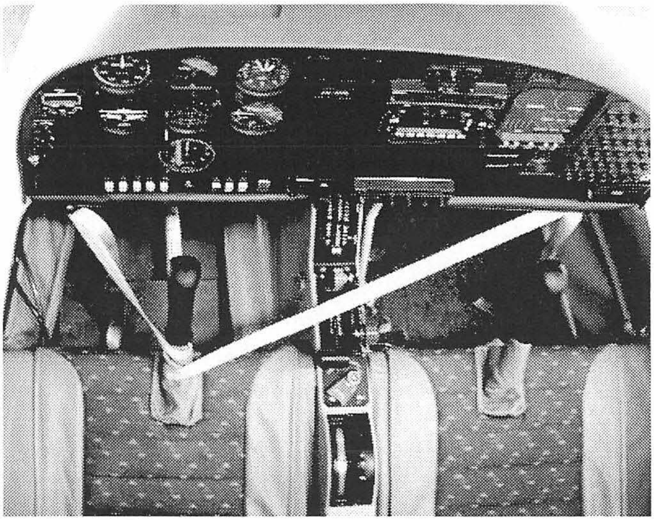
WARNING

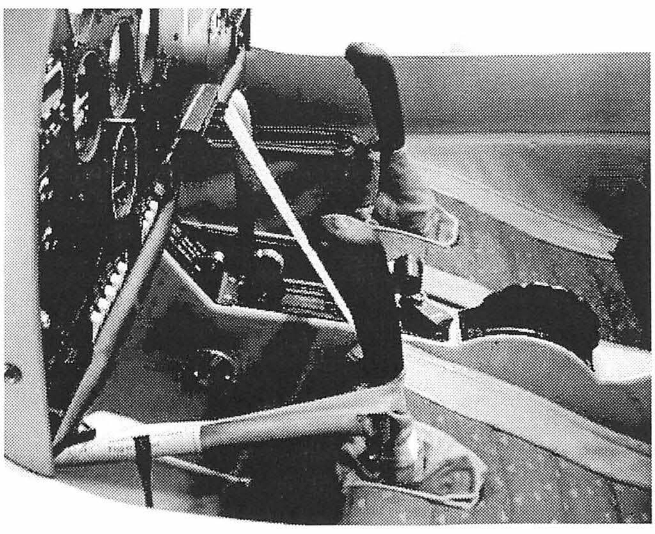
The control surfaces gust lock must be removed before flight.

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.





8.4.4 MOORING

The tail fin of the airplane has a hole which can be used to tie-down the airplane to the ground. Also on each wing near the wing tip, an eyelet with a metric M8 thread can be installed and used as tie-down points.

8.4.5 JACKING

The DA 40 can be jacked at the two jackpoints located on the lower side of the fuselage's LH and RH root ribs as well as at the tail fin.

8.4.6 ALIGNMENT

For alignment push down on the tail section at the fuselage/vertical tail junction until the nose wheel is clear of the ground. With the nose wheel free, the DA 40 can be turned around the main landing gear. After turning the airplane into the correct position, release the tail section until the nose wheel is back on the ground.

8.4.7 ROAD TRANSPORT

For transporting the airplane on the road it is recommended that an open trailer be used. All airplane components must be stored on a cushioned surface and secured to avoid any movement during transportation.

1. *Fuselage:*

The fuselage should stand on the main and nose landing gear. It must be ensured that the fuselage will not move in a forward, backward or upward direction. Furthermore, it must be ensured that the propeller has sufficient clearance so that it cannot be damaged due to fuselage movement during transportation.

2. *Wings:*

For transportation, both wings must be removed from the fuselage. To avoid any damage, the wings are stored in an upright position on the leading edge with the root rib area positioned on an upholstered profiled surface with a width of at least 400 mm (1.3 ft). The outside wing area (approximately 3 m (10 ft) from the root rib area) is placed on an upholstered profiled surface with a minimum width of 300 mm (1 ft).

The wings must be secured to avoid any sliding movement to the rear.

3. *Horizontal Stabilizer:*

The horizontal stabilizer is stored flat on the trailer and secured with straps, or in an upright position sitting on the leading edge on a profiled surface. All storing surfaces must be upholstered with felt or cellular rubber.

8.5 CLEANING AND CARE

CAUTION

The airplane must be kept clean. The bright surface prevents the structure from overheating.

CAUTION

Excessive dirt deteriorates the flight performance.

8.5.1 PAINTED SURFACES

The entire surface of the airplane is painted with a white weatherproof two component paint. Nevertheless, it is advantageous to protect the airplane against moisture and dampness. It is recommended to park the airplane in a hangar for prolonged storage. Moisture that has penetrated must be removed by storing the affected parts in a dry place and turning them over several times.

Dirt, insects, etc. can be removed with water alone and if necessary with a mild detergent. An automotive paint cleaner can be used for stubborn spots. For best results, clean the airplane after the day's flying is ended, so that the dirt will not become ingrained.

Oil stains, exhaust stains, etc. on the lower fuselage skin can be removed with a cold detergent. Before starting, ensure that the detergent does not affect the surface finish. Use commercial automotive preservatives without silicone additives to conserve the paint finish.

8.5.2 CANOPY AND REAR DOOR

The canopy and rear door should be cleaned with 'Plexiklar' or any other acrylic glass detergent if available; otherwise use lukewarm water. Final cleaning should be done with a clean piece of chamois-leather or soft cloth. Never rub or polish dry acrylic glass.

8.5.3 PROPELLER

Damage and malfunctions during operation must be inspected by authorized personnel.

Surface

The manufacturer uses PU paint or acrylic paint which is resistant to almost any solvent. The blades may be treated with commercial automotive cleaning agents or preservatives. The penetration of moisture into the wooden core must be avoided by all means. Should doubts arise, an appropriately rated inspector must be consulted.

8.5.4 ENGINE

Engine cleaning is part of the scheduled inspections.

CAUTION

Do not use acidic detergents (e.g. automotive wheel cleaners) for cleaning the exhaust system.

8.5.5 INTERIOR SURFACES

The interior should be cleaned using a vacuum cleaner. All loose items (pens, bags etc.) should be removed or properly stored and secured.

All instruments can be cleaned using a soft dry cloth, plastic surfaces should be wiped clean using a damp cloth without any cleaning agents.

The leather interior should be treated with leather sealer within 3 months since new, and then at intervals of 3 to 6 months. Clean the leather interior with an appropriate mild leather cleaning agent and a soft cleaning brush for leather.

Note that the acrylic glass windows transmit the ultraviolet radiation from the sun.

8.6 DE-ICING ON THE GROUND

Approved De-Icing Fluids

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

De-Icing Procedure

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

Diamond®
AIRCRAFT

S/N 40.698
REG#: N216DG

CHAPTER 9
SUPPLEMENTS

9.1 INTRODUCTION

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

Unless otherwise stated, the procedures given in the Supplements must be applied in addition to the procedures given in the main part of the Airplane Flight Manual.

All approved supplements are listed in the List of Supplements in this Chapter.

The Airplane Flight Manual contains exactly those Supplements which correspond to the installed equipment according to the Equipment Inventory of Section 6.5.

9.2 LIST OF SUPPLEMENTS

Airplane S/N: 40.698 Registration: N216DG Date: SEPT 18 2006

Sup. No.	Title	Rev. No.	Date	applicable YES	applicable NO
A1	COMM/NAV, KX 125 Bendix/King	1	20-Apr-2001	☐	☑
A2	Intercomm System, Model PM 1000 II PS Engineering, Inc.	1	20-Apr-2001	☐	☑
A3	Transponder, KT 76A Bendix/King	1	20-Apr-2001	☐	☑
A4	GPS, KLN 89B Bendix/King	1	20-Apr-2001	☐	☑
A5	Course Deviation Indicator, KI 208 Bendix/King	1	20-Apr-2001	☐	☑
A6	GPS, KLN 94 (VFR Operation) Bendix/King	2	09-Sep-2001	☐	☑
A7	Audio Amplifier / Intercom / Marker Beacon Receiver, KMA 28 Bendix/King	1	20-Apr-2001	☐	☑
A8	VHF Communication/Navigation Transceivers, KX 155A and KX 165A Bendix/King	1	20-Apr-2001	☐	☑

Airplane S/N:		Registration:		Date:		
Sup. No.	**Title**	**Rev. No.**	**Date**	**applicable**		
				YES	**NO**	
A9	Automatic Direction Finder, KR 87 Bendix/King	1	20-Apr-2001	☐	☑	
A10	Distance Measuring Equipment, KN 62A Bendix/King	1	20-Apr-2001	☐	☑	
A11	Compass System, KCS 55A Bendix/King	1	20-Apr-2001	☐	☑	
A12	Transponder, KT 76C Bendix/King	1	20-Apr-2001	☐	☑	
A13	Autopilot, KAP 140 Bendix/King	0	01-Mar-2001	☐	☑	
A14	GPS, KLN 94 (IFR Operation) Bendix/King	2	09-Sep-2001	☐	☑	
A15	GPS Annunciation Control Unit, MD 41 Mid-Continent	1	20-Apr-2001	☐	☑	

Airplane S/N: 40.698 Registration: N216DG Date: SEPT 18 2006

Sup. No.	Title	Rev. No.	Date	applicable YES	applicable NO
E1	Digital Chronometer, LC-2 AstroTech	1	20-Apr-2001	☐	☑
E2	Attitude Indicator, AIM 1100-28L(0F) BF Goodrich	1	20-Apr-2001	☐	☑
E3	Attitude Indicator, AIM 1100-28LK(0F) DIA BF Goodrich	1	20-Apr-2001	☐	☑
S1	Emergency Locator Transmitter, Model E-01 ACK	1	20-Apr-2001	☑	☐

9.3 AMENDMENTS

There are no Amendments at this time.

Garmin Ltd. Or its subsidiaries

c/o Garmin International
1200 E. 151st Street
Olathe, KS 66062 USA

Document No. 190-00492-15

AIRPLANE FLIGHT MANUAL SUPPLEMENT

GARMIN G1000 SYNTHETIC VISION AND PATHWAYS OPTION

Reg. No. N216DG S/N 40.698

This Supplement must be attached to the FAA Approved Airplane Flight Manual when the Garmin G1000 Synthetic Vision and Pathways Option is installed in accordance with STC SA01480WI-D.

The information contained herein supplements the information of the basic Airplane Flight Manual and the airplane specific G1000 Airplane Flight Manual Supplement. For Limitations, Procedures and Performance information not contained in this Supplement consult the basic Airplane Flight Manual and Supplements.

Only Section II, of this supplement "Limitations" is FAA APPROVED.

Robert Murray

Lead DAS Administrator

Garmin International

DAS-240087-CE

Date: 9-4-2008

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		LOG OF REVISIONS		
Revision Number	**Page Number(s)**	**Description**	**FAA Approved**	**Date of Approval**
1	All	Initial Release	See Page 1	See Page 1

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AIRPLANE FLIGHT MANUAL SUPPLEMENT

GARMIN G1000 SYNTHETIC VISION AND PATHWAYS OPTION

Table of Contents

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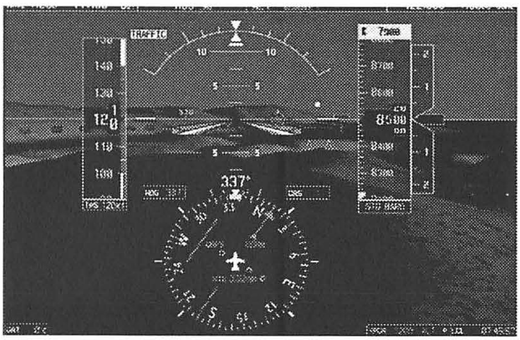
SECTION I
GENERAL

This document describes the Synthetic Vision sub system (SVS) that is an optional part of the Garmin G1000 Integrated Avionics System. This information supplements the information presented in the Aircraft Flight Manual and the aircraft specific Garmin G1000 Aircraft Flight Manual Supplement.

The purpose of the SVS system is to assist the pilot in maintaining situational awareness with regard to the terrain and traffic surrounding the aircraft and the navigational situation relative to the programmed flight plan. A typical SVS display is shown below.



SVS provides additional features on the G1000 primary flight display (PFD) which display the following information:

- **Synthetic Terrain**; an artificial, database derived, three dimensional view of the terrain ahead of the aircraft within a field of view of approximately 30 degrees left and 35 degrees right of the aircraft heading.
- **Obstacles**; obstacles such as towers, including buildings over 200 AGL that are within the depicted synthetic terrain field of view.
- **Flight Path Marker (FPM)**; an indication of the current lateral and vertical path of the aircraft. The FPM is always displayed when synthetic terrain is selected for display.
- **Pathway**; a pilot selectable three dimensional representation of the programmed flight plan path that can be selected for display alone or with the flight director anytime synthetic terrain is selected for display.
- **Traffic**; a display on the PFD indicating the position of other aircraft detected by the Traffic Information System (TIS) component of the G1000 system.
- **Horizon Line**; a white line indicating the true horizon is always displayed on the SVS display.
- **Horizon Heading**; a pilot selectable display of heading marks displayed just above the horizon line on the PFD.
- **Airport Signs**; pilot selectable "signposts" displayed on the synthetic terrain display indicating the position of nearby airports that are in the G1000 database.

- **Runway Highlight**; a highlighted presentation of the location and orientation of the runway(s) at the destination airport.

The synthetic terrain depiction displays an area approximating the view from the pilot's eye position when looking directly ahead out the windshield in front of the pilot. Terrain features outside this field of view are not shown on the display.

The synthetic terrain display is intended to aid the pilot awareness of the terrain and obstacles in front of the airplane. It may not provide either the accuracy or fidelity, or both, on which to solely base decisions and plan maneuvers to avoid terrain or obstacles. The synthetic vision elements are not intended to be used for primary aircraft control in place of the primary flight instruments.

The Pathway presentation is intended only to aid the pilot's awareness of the programmed flight path location relative to the airplane's current position. No vertical Pathway information is presented for climbs.

SECTION II
LIMITATIONS

1. Use of the Synthetic Vision system display elements alone for aircraft control without reference to the G1000 primary flight instruments or the aircraft standby instruments is prohibited.
2. Use of the Synthetic Vision system alone for navigation, or obstacle or terrain avoidance is prohibited.
3. Use of the SVS traffic display alone to avoid other aircraft is prohibited.

SECTION III
EMERGENCY PROCEDURES

No change. Refer to the basic aircraft flight manual or aircraft specific flight manual supplements.

SECTION IVA
NORMAL PROCEDURES

Turn Synthetic Vision on/off

The SVS system may be turned on or off as desired. To turn the synthetic vision system on or off;

On the PFD;

PFD key .... press

SYN VIS key .... press

SYN TERR key .... press as desired

The synthetic vision system will cycle on or off with each press of the SYN TERR key. The Flight Path Marker is displayed anytime SYN TERR is selected for display.

Turn Pathways on/off

On the PFD;

PFD key .... press

SYN VIS key .... press

PATHWAY key .... press as desired

The Pathway display will cycle on or off with each press of the PATHWAY key. The Pathway can be displayed separately or in conjunction with the flight director.

NOTE:

If displayed, the Pathway may be quickly turned off by pressing the PFD softkey at the bottom of the PFD followed by two presses of the far left PFD soft key.

Turn Horizon Heading on/off

On the PFD;

PFD key .... press

SYN VIS key .... press

HRZN HDG key .... press as desired

The horizon heading display will cycle on or off with each press of the HRZN HDG key.

Turn Airport Signs on/off

On the PFD;

PFD key .... press

SYN VIS key .... press

APTSIGNS key .... press as desired

The horizon heading display will cycle on or off with each press of the APTSIGNS key.

Use of Pathway

If Synthetic Terrain is displayed on the PFD, the Pathway may be used to assist the pilot's awareness of the programmed lateral and vertical navigation path. The following sections describe the basic use of the Pathway in various flight segments. For more detailed information, consult the G1000 Pilot's Guide.

Departure

Prior to departure, load and activate the desired flight plan into the G1000 FMS, set the initial altitude on the G1000 altitude selector and select GPS on the HSI display just as you would without the SVS system.

The programmed flight path will be displayed as a series of magenta boxes along the path at the flight plan altitude subject to the following conditions;

- If the first segment of the flight plan is a heading to altitude leg, the Pathway will not be displayed for that segment. The first Pathway segment displayed will be the first GPS course leg.
- The Pathway must be within the SVS field of view of 30 degrees left and 35 degrees right. If the programmed path is outside that field of view, the Pathway will not be visible on the display until the aircraft has turned toward the course.
- The Pathway will be displayed at either the altitude selected on the G1000 selector OR the altitude published for the procedure (e.g. SID) WHICHEVER IS HIGHER.

After departure, the primary aircraft control must be by reference to the primary aircraft instruments. The SVS and Pathway displays should be used to aid in awareness of the terrain and programmed flight path.

Prior to intercepting the programmed course, the Pathway will be displayed as a series of magenta "boxes" with pointers at each corner that point in the direction of the programmed course. The Pathway boxes will not be displayed on portions of the course line that would lead the pilot to intercept the course in the wrong direction.

As the aircraft approaches the center of the programmed course and altitude, the number of Pathway boxes will decrease to a minimum of four.

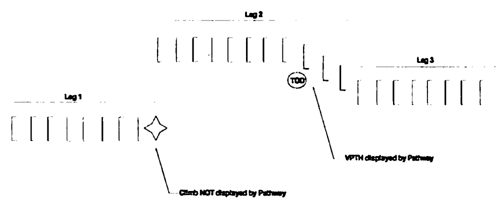
Enroute

When enroute, the Pathway will be displayed along the lateral path defined by the flight plan, at the altitude selected on the G1000 altitude selector.

Flight plan changes in altitude that require a climb will be indicated by the Pathway being displayed as a level path at the altitude entered for the current flight plan leg. Because the G1000 system does not have information available to it about aircraft performance, climb profiles are not displayed by the Pathway.

If the programmed flight plan includes one or more defined VNAV descent segments, the descent path(s) will be displayed by the Pathway as prompted by the G1000 FMS.

If the flight plan includes a significant change in course at a waypoint, the Pathway boxes toward the currently active waypoint will be magenta in color. The boxes defining the next flight plan segment may be visible, but will be displayed in a white color.



Enroute Pathway Altitude Display

Approach

During approach, the SVS and Pathway displays should only be used to maintain awareness with regard to the surrounding terrain and the programmed flight path. Primary aircraft control must be accomplished by reference to the primary flight instruments and, if desired, the flight director.

GPS approach

During a GPS approach, the lateral path and altitude will be displayed by the Pathway in magenta along each segment including the path required to track course reversals that are part of the approach procedure (such as a holding pattern). Approach descent segments will be displayed by the Pathway as published in the approach procedure.

If Vectors-To-Final is selected as the approach transition, the Pathway will display the final approach course inbound to the Missed Approach Point (MAP). The Pathway will be shown level at the altitude set in the

G1000 altitude selector, or the Final Approach Fix (FAF) crossing altitude (whichever is higher), up to the point along the final approach course where that altitude intercepts the extended VPTH or GP. If the altitude selector indicates an altitude below the airplane's current altitude, the Pathway will appear below the airplane altitude and the pilot must use normal descent techniques to intercept the VPTH or GP. If the altitude selector is left at an altitude above the current airplane altitude, the airplane will intercept the final approach course below the extended VPTH or GP, such that the Pathway will be displayed above the airplane until the aircraft intercepts the VPTH or GP. From the VPTH or GP intercept point, the pathway will be shown inbound to the MAP along the published lateral and vertical descent path.

ILS approach

When an ILS approach is programmed into the G1000 FMS, the initial approach segments will be displayed by the Pathway in magenta at the procedure segment altitudes if they are being flown by reference to a GPS path. When the G1000 system switches to the localizer inbound to the final approach fix, the Pathway will be displayed along the localizer inbound path and glideslope in green.

If Vectors-To-Final is selected as the approach transition, the Pathway will display the final approach course inbound to the Missed Approach Point (MAP). The Pathway will be shown level at the altitude set in the G1000 altitude selector, or the Final Approach Fix (FAF) crossing altitude (whichever is higher), up to the point along the final approach course where that altitude intercepts the extended GS. If the altitude selector indicates an altitude below the airplane's current altitude, the Pathway will appear below the airplane altitude and the pilot must use normal descent techniques to intercept the GS. If the altitude selector is left at an altitude above the current airplane altitude, the airplane will intercept the final approach course below the extended GS, such that the Pathway will be displayed above the airplane until the aircraft intercepts the GS. From the GS intercept point, the pathway will be shown inbound to the MAP along the published localizer and glideslope.

VOR, LOC BC, or other approach

Approach segments for a VOR, LOC BC, ADF or other approach that are approved to be flown by reference to GPS will be displayed by the Pathway in a magenta color. Approach segments that are defined by other than a GPS or ILS, such as heading legs or VOR defined final approach course, will not be displayed by the Pathway.

Missed approach

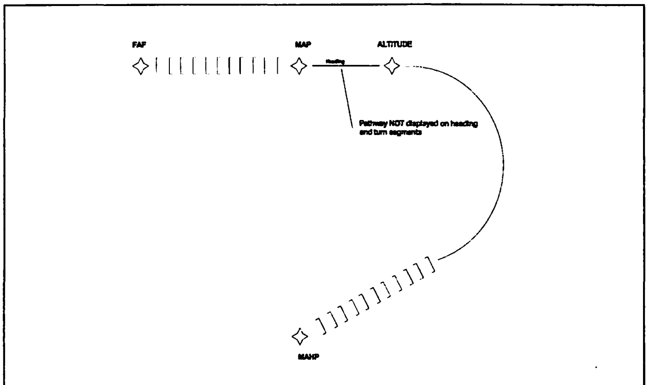
When the missed approach is selected on the G1000 FMS, the Pathway to the Missed Approach Holding Point will be displayed just as described for the departure segment.

The pilot must assure that the aircraft path will, at all times, comply with the requirements of the published missed approach procedure.

If the initial missed approach leg is heading-to-altitude or a leg defined by other than a GPS course, the Pathway will not be displayed for that segment.

If the course to the Missed Approach Holding Point is out of the SVS field of view during the initial missed approach climb, the Pathway will not be visible on the PFD until the aircraft is turned toward the course.

The Pathway will be displayed at the published missed approach altitude OR the altitude set on the G1000 altitude selector WHICHEVER IS HIGHER. If the G1000 altitude selector is set to MDA on the final approach segment and not reset during the initial missed approach, the Pathway will still be displayed at the published missed approach altitude.



Missed Approach Pathway Display

SECTION IVB
ABNORMAL PROCEDURES

SVS Displays information inconsistent with G1000 primary flight instrumentation.

On the PFD:

PFD key .... press

SYN VIS key .... press

SYN TERR key .... press

SVS is removed from the PFD .... Verify

Use G1000 primary displays for navigation and aircraft control.

G1000 operation in display backup mode is required

Select display backup mode on the G1000 system.

NOTE:

When display backup mode is selected, the MFD will initially present a non-SVS (blue sky over solid brown ground) display. SVS will be presented on the backup display within 20 seconds if it was enabled on the PFD when display backup was selected.

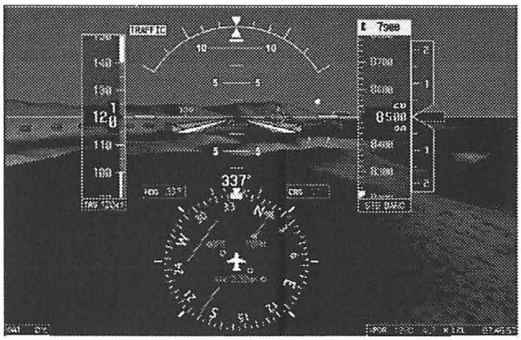
SECTION V
PERFORMANCE

No change. Refer to the basic aircraft flight manual or aircraft specific flight manual supplements.

SECTION VI
WEIGHT AND BALANCE

No change. Refer to current weight and balance data for your aircraft.

SECTION VII
SYSTEM DESCRIPTIONS



General

The SVS sub system is dependent upon terrain data provided by the underlying G1000 system. If, for some reason, the terrain data is not available from the G1000, all of the components of the SVS system will be unavailable. The flight path marker, horizon heading, and airport signs are all sub-components of the Synthetic Terrain display and are only available when Synthetic Terrain is enabled. Those features are selected or de-selected using the PFD softkeys on the SVS menu.

Synthetic Terrain

The synthetic (3D) terrain display on the PFD provides a perspective view of the terrain ahead of the aircraft showing ground features up to 30 degrees left and 35 degrees right of the airplane heading. The terrain display is derived from the same terrain data contained in the G1000 system that is optionally used to display terrain on the MFD map display. The terrain data has a resolution of 9 arc-seconds, this means that the terrain elevation contours in the database are stored broken down into squares 9 arc-seconds on each side. That data is processed and smoothed by the G1000 system to provide the synthetic terrain display. In some instances, terrain features such as lakes in mountainous areas may be presented by the SVS system as if the lake water extends somewhat up the mountainside. This is due to the limitations of the terrain database resolution but is not significant for the approved uses of the SVS system.

The SVS terrain display will show land contours; large water features; and, towers and other obstacles over 200 ft AGL (including buildings), that are included in the G1000 obstacle database. In order to provide a clean, uncluttered PFD display, cultural features on the ground such as; roads and highways, railroad tracks, cities, and political boundaries (state / county lines) are not displayed on the PFD even if those features are selected for display on the MFD. The colors used to display the terrain elevation contours are similar to those used on the MFD map. The terrain display also includes a north-south, east-west grid to assist in orientation relative to the terrain.

The terrain display is intended to serve as an awareness tool only. It may not provide either the accuracy or fidelity, or both, on which to solely base decisions and plan maneuvers to avoid terrain or obstacles. Navigation must not be predicated solely upon the use of the TAWS, Terrain or Obstacle data displayed by the G1000 SVS system.

The Terrain/Obstacle/Airport databases have an area of coverage as detailed below:

- The Terrain Database has an area of coverage from North 75° Latitude to South 60° Latitude in all longitudes.
- The Airport Terrain Database has an area of coverage that includes the United States, Canada, Mexico, Latin America, and South America.
- The Obstacle Database has an area of coverage that includes the United States.

NOTE

The area of coverage may be modified, as additional terrain data sources become available.

Obstacle and Terrain Alerts and Warnings

Obstacles and terrain displayed on the SVS system may be highlighted if an alert or warning is generated by the G1000 Terrain or TAWS system. If an obstacle alert is presented for an obstacle that is in the SVS field of view, the obstacle symbol on the PFD will turn yellow in color. If an obstacle warning is generated by the G1000 system, the obstacle symbol on the PFD will turn red.

If the G1000 Terrain or TAWS system generates a terrain alert or warning, the terrain feature displayed on the PFD will be colored yellow for an alert or red for a warning for as long as the alert remains valid.

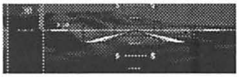
Because the area monitored by the Terrain or TAWS system can be wider than the field of view that can be displayed by the SVS system, it is possible to receive an obstacle or terrain audible alert for an obstacle or terrain that is not shown on the SVS display. In those cases, the object generating the alert will be left or right of the aircraft. Refer to the other displays in the aircraft to determine the cause of the message.

Flight Path Marker 

The SVS display includes a green circular barbed symbol called the Flight Path Marker (FPM) that represents the current path of the airplane relative to the terrain display. The FPM is always displayed when synthetic terrain is displayed and the aircraft ground speed exceeds 30 kt. The FPM indicates the current lateral and vertical path of the airplane as determined by the GPS sensor. If the FPM is above the horizon line, the airplane is climbing, and similarly if the FPM is below the horizon line, the airplane is descending. If the airplane is flying in a crosswind, the FPM will be offset from the center of the display. In that case, the center of the PFD airplane reference symbol indicates the airplane heading and the FPM indicates the direction that the airplane is actually moving, taking into account the crosswind.

The FPM indicates the current path of the airplane but does not predict the future path. If aircraft attitude, power setting, airspeed, crosswind, etc. are changed, the FPM will move to indicate the new path resulting from those changes.

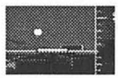
If the FPM is below the terrain or obstacle displayed behind it on the PFD, the current aircraft path will not clear that terrain or obstacle. If the FPM is above that terrain or obstacle, the aircraft will clear the terrain or obstacle IF, AND ONLY IF, THE CURRENT AIRCRAFT CONFIGURATION IS MAINTAINED, AND THE AIRCRAFT PERFORMANCE WILL PERMIT YOU TO MAINTAIN THE CURRENT VERTICAL (CLIMB) GRADIENT UNTIL PAST THE TERRAIN OR OBSTACLE.

Pathway 

If PATHWAY is enabled on the SVS menu of the PFD and a defined navigation path has been entered on the G1000, the SVS system will display a pathway, sometimes called a "highway in the sky" or HITS. The pathway is a perspective representation of the programmed flight path. When the aircraft is well off course, the pathway will be displayed as a number boxes floating in the sky along the programmed lateral and vertical path. As the aircraft intercepts the programmed flight path, the number of boxes displayed will be reduced to a maximum of four to avoid cluttering the PFD display. The pathway is only displayed for navigation paths that are fully defined by the sensor in use, including GPS and ILS paths. Because a fully defined lateral and vertical path through space is not defined by them, a Pathway is not displayed for heading legs, VOR, LOC, BC or ADF segments. When the Pathway is displayed, the color of the boxes indicates the sensor generating the path. If the GPS sensor is in use, the boxes will be magenta colored. If the ILS sensor is defining the path in use, the boxes will be green.

The Pathway boxes are +- 100 ft in vertical dimension and approximately +-380 ft horizontally from the center of the box. The Pathway presentation is intended only to aid the pilot in awareness of the programmed flight path location relative to the airplane's current position. The pathway is not intended for use as a primary reference in tracking the navigation path.

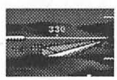
If a GPS based descent profile has been programmed either on the G1000 flight plan page or as part of an approach or STAR, the descent will be displayed by the Pathway. Climb paths are never displayed by the Pathway. If a profile requires a climb, the Pathway will be displayed as a level segment at the higher of the altitude defined by the programmed path or the G1000 altitude selector.

Traffic  

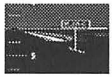
If traffic that is within the SVS field of view is detected by the G1000 TIS system, a symbol will be displayed on the PFD indicating the direction and relative altitude of the traffic. The traffic will be displayed as a white diamond unless it generates a traffic alert. Traffic that causes an alert will be displayed as a solid yellow circle accompanied by a yellow TRAFFIC annunciator to the right of top of the airspeed display tape.

Horizon line 

The SVS display includes an always visible white horizon line that represents the true horizon. Terrain will be presented behind the horizon line, and terrain shown above the horizon line is above the current aircraft altitude. Terrain that is shown below the horizon line is below the aircraft altitude.

Horizon Heading 

A heading scale may be displayed on the PFD horizon line, if selected by the pilot. The heading marks are spaced in even 30 degree increments and are presented just above the horizon line with tic marks that intersect the horizon line. The horizon heading will correspond to that presented by the HSI. Because the horizon heading is only displayed in 30 degree increments, it should only be used for general heading awareness and not be used to establish the aircraft heading.



Airport Signs and runway highlight

If APTSIGNS is selected, a "sign post" along with a representation of the runways will be plotted on the SVS display for nearby airports that are contained in the G1000 airport database. The signpost will become visible when you are within approximately 15nm of the airport. The text identifier for the airport will be displayed inside the airport sign when the aircraft reaches approximately 8 nm from the airport. Once the aircraft reaches approximately 4.5 nm from the airport, the airport sign will be removed but the runways presentation will remain. If an approach to a specific runway has been loaded and activated, that runway will be highlighted on the SVS display.

When on an approach, the highlight for the approach runway will be considerably larger than "normal" to assist in visually acquiring the runway. The oversized highlight will automatically shrink around the runway depiction so that the runway is proportionally displayed when the aircraft is within approximately ½ nm of the threshold. Runway highlighting is displayed even if APTSIGNS are turned off.

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Olathe, KS 66062 USA

Document No. 190-00492-10

FAA APPROVED

FAA APPROVED AIRPLANE FLIGHT MANUAL SUPPLEMENT GARMIN G1000 INTEGRATED AVIONICS SYSTEM WITH GFC 700 AUTOMATIC FLIGHT CONTROL SYSTEM

DIAMOND MODEL DA 40
DIAMOND MODEL DA 40 F

Reg No. ____________________ S/N ____________________

This Supplement must be attached to the FAA Approved Airplane Flight Manual when the Garmin G1000 Integrated Avionics System and GFC 700 automatic flight control system are installed in accordance with STC **SA01444WI-D**. The information contained herein supplements the information of the basic Airplane Flight Manual. For Limitations, Procedures and Performance information not contained in this Supplement consult the basic Airplane Flight Manual.

Note: This Airplane Flight Manual Supplement follows the format and content of the Airplane Flight Manual for the Diamond DA 40 for consistency and ease of use.

Only the Limitations Section is FAA APPROVED.

Robert Murray
Lead DAS Administrator
Garmin International
DAS-240087-CE

Date: 7/6/07

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FAA APPROVED AIRPLANE FLIGHT MANUAL SUPPLEMENT
GARMIN G1000 INTEGRATED AVIONICS SYSTEM WITH
GFC 700 AUTOMATIC FLIGHT CONTROL SYSTEM

DIAMOND MODEL DA 40
DIAMOND MODEL DA 40 F

LOG OF REVISIONS				
Revision Number	**Page Number(s)**	**Description**	**FAA Approved**	**Date of Approval**
1	All	Initial Release	Robert Murray	7/26/2007
2	All	Add Software Levels	See Cover	See Cover

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FAA APPROVED AIRPLANE FLIGHT MANUAL SUPPLEMENT
GARMIN G1000 INTEGRATED AVIONICS SYSTEM WITH
GFC 700 AUTOMATIC FLIGHT CONTROL SYSTEM

DIAMOND MODEL DA 40
DIAMOND MODEL DA 40 F

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SECTION I
GENERAL

G1000

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. GIA 63 units are standard and provide non-WAAS GPS position information. Optional GIA 63W units provide WAAS augmented GPS position.
3. 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, and for flight planning. The audio panel is used for selection of radios for transmitting and listening, intercom functions, and marker beacon functions.
4. 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 system satellites (and WAAS satellites if so equipped), recover orbital data, make range and Doppler measurements, and process this information in real-time to obtain the user's position, velocity, and time.
5. If the optional GIA 63W WAAS GPS receivers are installed: Provided a GIA 63W WAAS GPS receiver is receiving adequate usable signals, the G1000 has been demonstrated capable of and has been shown to meet the accuracy specifications for:
    - VFR/IFR enroute, oceanic, terminal, non-precision instrument approach (GPS, Loran-C, VOR, VOR-DME, TACAN, NDB, NDB-DME, RNAV), and approach procedures with vertical guidance (LNAV/VNAV, LPV) operation within the U.S. National Airspace System in accordance with AC 20-138A.
    - Oceanic/Remote per FAA AC 20-138A Appendix 1 – Two FMSs are required to be installed, operating and receiving usable signals from independent GPS sensors (one GPS sensor for those routes requiring only one Long Range Navigation (LRN) sensor). This does not constitute operational approval.
    - North Atlantic (NAT) Minimum Navigation Performance Specifications (MNPS) Airspace as defined in AC 91-49 and AC 91-70 – Provided two FMSs are installed, operating and are receiving usable signals from any two GPS navigation sensors (one GPS sensor for those routes requiring only one Long Range Navigation (LRN) sensor). The GPS sensor meets the requirements of FAA AC 20-138A

Appendix 1 for primary navigation sensors. This does not constitute operational approval.

- 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.
- The systems meets RNP5 airspace (BRNAV) requirements of AC 90-96 and in accordance with AC 20-138A, JAA GAI-20 ACJ 20X4, and FAA AC 20-138A Appendix 1 for oceanic and remote airspace operations, provided it is receiving usable navigation information from the GPS receiver.

6. If the standard GIA 63 NON-WAAS GPS receivers are installed: Provided a GIA 63 NON-WAAS GPS receiver is receiving adequate usable signals, it has been demonstrated capable of and has been shown to meet the accuracy specifications for:

   - 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.
   - Oceanic/Remote per FAA Notice 8110.60 – Two FMSs are required to be installed, operating and receiving usable signals from independent GPS sensors (one GPS sensor for those routes requiring only one Long Range Navigation (LRN) sensor. This does not constitute operational approval.
   - North Atlantic (NAT) Minimum Navigation Performance Specifications (MNPS) Airspace as defined in AC 91-49 and AC 91-70 – Provided two FMSs are installed, operating and are receiving usable signals from any two GPS navigation sensors (one GPS sensor for those routes requiring only one Long Range Navigation (LRN) sensor). The GPS sensor meets the requirements of FAA Notice 8110.60 for primary navigation sensors. This does not constitute operational approval.
   - 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.
   - The system meets RNP5 airspace (BRNAV) requirements of AC 90-96 and in accordance with AC 20-138A, JAA GAI-20 ACJ 20X4, 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.

7. If the optional TAWS function is installed in the G1000, the pilot will receive appropriate aural warnings and cautions for terrain and obstacles. The pilot should refer to the DA 40/DA 40F Pilot's Guide for the terrain warning and caution messages and system information.

GFC 700

1. The GFC 700 Automatic Flight Control System (AFCS) is a 2 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); Vertical Navigation (VPTH) (optional feature); Navigation tracking for VOR (NAV) and GPS (GPS); Heading Hold (HDG); Approach mode coupling to VOR (VAPP) or localizer (LOC) and glideslope (GS); Glidepath coupling (GP) (GIA 63W equipped aircraft only); Back Course (BC) tracking; 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 GIAs, 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 throttle-mounted GA (Go-Around) switch, and PFD/MFD-mounted altitude preselect, heading, and course knobs.
2. 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 system is operated by a split switch on the pilot's control stick.
3. 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).
4. 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
5. The GFC 700 may be manually disconnected by any of the following means:
   - Depressing the red AP DISC button on the pilot'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 throttle
- Pulling the AFCS circuit breaker
- Turning off the AVIONIC MASTER switch
- Turning off the airplane Master (ALT/BAT) 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.

6. Power to the GFC 700 autopilot and electric trim system is supplied through the AVIONIC MASTER switch and the AFCS circuit breaker. The AVIONIC MASTER switch can be used as an additional means to disable the autopilot and electric trim system.
7. 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.
8. 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 AFCS CIRCUIT BREAKER, UNTIL THE CAUSE OF THE MALFUNCTION HAS BEEN DETERMINED AND CORRECTED.

SECTION II
LIMITATIONS

2.1 INTRODUCTION

General Limitations:

1. The Garmin G1000 Cockpit Reference Guide (CRG) must be immediately available to the flight crew. The required CRG is referenced to the System Software Version number. The System Software Version number is displayed at the top right side of the MFD Power-up page.

System Software Version	Garmin G1000 Cockpit Reference Guide (CRG) revision
0369.13	P/N 190-00324-07, Revision A, or later appropriate revision.

2. The G1000 installation in the DA 40 requires the following or later FAA approved LRU software versions. Approved LRU software versions are referenced to the System Software Version number.

LRU	LRU Software Version			
	0369.13 WAAS	0369.13 Non-WAAS		
COM 1 & 2	7.00	7.00		
GDC 1	2.05	2.05		
GEA 1	2.07	2.07		
GIA 1 & 2	5.31	5.31		
GMA 1	3.03	3.03		
GMU 1	2.01	2.01		
GPS 1 & 2	2.40	3.03		
GRS 1	2.10	2.10		
GS 1 & 2	3.00	3.00		
GTX 1	4.06	4.06		
MFD1	8.02	8.02		
NAV 1 & 2	4.00	4.00		
PFD 1	8.02	8.02		
GDL	3.10	3.10		
GSA	2.06	2.06		

The system's databases and System Software Version number are displayed on the MFD Power-up page immediately after system power-up and must be acknowledged. The LRU software versions can be verified on the AUX group sub-page 5, "AUX - SYSTEM STATUS" along with the system's databases.

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 waypoint for accuracy by reference to current approved data.

4. GIA 63W IFR operational limitation. The following limitation applies ONLY to the optional GIA 63W WAAS GPS receivers.

   This system does not comply with US 14 CFR Part 91, SFAR 97 requirements for TSO-C145a/TSO-C146a equipment. Until complete compliance is demonstrated and approved by the FAA, authorization to conduct any GPS or WAAS operation under Instrument Flight Rules (IFR) requires that:

   A. Aircraft using the GPS or WAAS capability of the GIA 63W navigation equipment under IFR must be equipped with an approved and operational alternate means of navigation appropriate to the flight with the exception of oceanic and remote operations.

   B. For flight planning purposes, if an alternate airport is required, it must have an approved instrument approach procedure other than GPS or RNAV that is anticipated to be operational and available at the estimated time of arrival. All equipment required for this procedure must be installed and operational.

   C. For flight planning purposes, Garmin Prediction Program 006-A0154-01 with the 013-00235-00 antenna selection should be used to confirm the availability of RAIM for the intended flight in accordance with the local aviation authority guidelines for TSO-C129a equipment. WAAS NOTAMs (or their absence) and generic prediction tools do not provide an acceptable indication of the availability for the GIA 63W equipment.

   D. When flight planning an LNAV/VNAV or LPV approach, operators should use the Garmin Prediction Program 006-A0154-01 with the 013-00235-00 antenna selection in addition to any NOTAMs issued for the approach.

5. 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 (LNAV, LNAV+V, L/VNAV, or LPV), and GPS/WAAS integrity monitoring must be available at the Final Approach Fix. If there is not sufficient GPS/WAAS integrity at any time after crossing the Final Approach

Fix, a Loss Of Integrity (LOI) will be annunciated on the HSI and the approach mode will be aborted.

(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 requires VOR/ILS navigation data to be present on the display.

(d) IFR non-precision approach approval is limited to published approaches within the U.S. National Airspace System. Approaches to airports in other airspace are not approved unless authorized by the appropriate governing authority.

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

(f) When conducting missed approach procedures, autopilot coupled operation is prohibited until the pilot has established a rate of climb that ensures all altitude requirements of the procedure will be met.

(g) RNP RNAV operations are not authorized, except as noted in items 5 and 6 of Section I of this AFMS.

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) **MAP DATUM** ..WGS 84 (sets map datum to WGS-84, see note below)

(d) **POSITION**.........deg-min (sets navigation grid units to degree-minutes)

NOTE

In some areas outside the United States, datums other than WGS-84 or NAD-83 may be used. If the G1000 is authorized for use by the appropriate Airworthiness authority, the required geodetic datum must be set in the G1000 prior to its use for navigation.

6. Operation is prohibited north of 70°N and south of 70°S latitudes. In addition, operation is prohibited in the following two regions: 1) north of 65°N between 75°W and 120°W longitude and 2) south of 55°S between 120°E and 165°E longitude.

7. The fuel quantity, fuel required, and fuel remaining functions of the FMS are supplemental information only and must be verified by the flight crew.

8. Navigation must not be predicated upon the use of the TAWS, Terrain or Obstacle data displayed by the G1000.

9. TAWS must be inhibited prior to the Final Approach Fix (FAF) when conducting an instrument approach that terminates in a circling to land or side step maneuver.

NOTE: The terrain display is intended to serve as a situational awareness tool only. It may not provide either the accuracy or fidelity, or both, on which to solely base decisions and plan maneuvers to avoid terrain or obstacles.

10. Pilots are authorized to deviate from their ATC clearance to the extent necessary to comply with terrain / obstacle warnings from TAWS.

11. The Terrain/Obstacle/Airport databases have an area of coverage as detailed below:

    (a) The Terrain Database has an area of coverage from North 75° Latitude to South 60° Latitude in all longitudes.
    (b) The Airport Terrain Database has an area of coverage that includes the United States, Canada, Mexico, Latin America, and South America.
    (c) The Obstacle Database has an area of coverage that includes the United States.

    NOTE: The area of coverage may be modified, as additional terrain data sources become available.

12. To avoid giving unwanted alerts, TAWS must be inhibited when landing at an airport that is not included in the airport database.

13. The ADF aural identifier must be monitored any time the ADF is used as the primary source of navigation.

14. If the optional ChartView or FliteChart function is installed, the data is limited to supplemental use only. Current paper copies of navigation charts and data appropriate to the intended operation must be available to the pilot.

15. If the optional ChartView function is installed:

    At airport locations outside the United States, within ±1.5° either side of zero degrees latitude or longitude, the aircraft symbol will be either missing or incorrectly positioned on terminal charts to include airport diagrams and approach procedures. Disregard the presentation of position information on all terminal charts for airports within ±1.5° either side of zero degrees latitude or longitude.

    The list of affected airports below is subject to change by Jeppesen. This list is accurate as of 30 MARCH 2007. All airports within ±1.5° either side of zero degrees latitude or longitude will be affected.

    Equatorial Region (zero degrees latitude):

    ANYN, FOGR, FOOG, FZEA, FZGN, HKKI, HUEN, SBMD, SBMQ, SBUA, SECO, SEGS, SEII, SELT, SEMT, SENL, SEQU, SEST, SESV, SETR, SKAC, VRMG, WIPT, WIOO

    Prime Meridian Region (zero degrees longitude):

    DAOO, DAOV, DAUA, DAUT, DGAA, DGLE, EGCN, EGDM, EGGW, EGHI, EGKA, EGKB, EGKK, EGLC, EGLF, EGLK, EGLL, EGNJ, EGNV, EGNX, EGPB, EGPM, EGSC, EGSS, EGTC, EGTF, EGTK, EGUB, EGUL, EGVN, EGVO, EGWU, EGXC, EGXE, EGXU, EGXW, EGYD, GAGO, LEAL, LELC, LEVC, LEZG, LFBC, LFBD, LFBG, LFBH, LFBM, LFBN, LFBP, LFBT, LFBZ, LFCY, LFDN, LFJR, LFOD, LFOH, LFOT, LFOU, LFOV, LFRG, LFRI, LFRK, LFRM, LFRN

GFC 700 LIMITATIONS

1. The GFC 700 AFCS preflight 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.

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

3. The autopilot must be off during takeoff and landing.

4. Autopilot maximum engagement speed – 165 KIAS
   Autopilot minimum engagement speed – 70 KIAS
   Electric Trim maximum operating speed – 178 KIAS

5. Maximum fuel imbalance with autopilot engaged – 8 US gallons (Long range tank configuration)
   – 10 US gallons (Standard tank configuration)

6. The autopilot must be disengaged below 200 feet AGL during approach operations and below 800 feet AGL during all other operations.

7. ILS approaches using the GFC 700 autopilot/flight director are limited to Category I approaches only.

2.3 AIRSPEED MARKINGS

Marking	IAS	Significance
Red band	20 KIAS – 53 KIAS	Low speed awareness – stall is imminent
Yellow band	53 KIAS – 58 KIAS	Low speed awareness – reduced airspeed margin to stall
White band	58 KIAS – 91 KIAS	Operating range with flaps fully extended
Green band	58 KIAS – 129 KIAS	Normal operating range
Yellow band	129 KIAS – 178 KIAS	Caution range – smooth air only
Red band	178 KIAS and greater	Lower limit of 178 KIAS is the maximum speed for all operations

The airspeed indicator is marked in IAS values.

2.5 ENGINE INSTRUMENT MARKINGS

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

NOTE

When an indication lies in the upper or lower prohibited range, the legend for that display will change to the color of the prohibited range and will begin flashing as well.

Indication	Red arc or bar = Lower prohibited range	Yellow arc or bar = Caution range	Green arc or bar = Normal operating range	Yellow arc or bar = Caution range	Red arc or bar = Upper prohibited range
Manifold Pressure In. – Hg ***Note 2***	--	--	13 – 30	--	--
RPM	--	--	500 – 2700	--	>2700 ***Note 3***
Oil Temp °F	--	--	149 – 230	231 - 245	>245
Cylinder Head Temp °F	--	--	150 – 475	476 – 500	>500
Fuel Press PSI (DA 40) ***Note 4***	0 – 14	--	14 – 35	--	>35
Oil Press PSI	0 – 25	25 - 55	56 – 95	96 - 97	>97
Fuel flow Gal/hr	--	--	1 – 20	--	>20
Voltage Volts	0 – 24.1	24.1 – 25	25.1 – 30	30.1 – 32	>32
Amperage Amps	--	--	2 – 75	--	--
Fuel quantity US gal Standard Tanks	0	--	<0 – 17	--	--
Fuel quantity US gal Long Range Tanks	0	--	<0 – 16 19 – 24	--	--

Note 2: Not applicable to DA 40 F. Manifold Pressure gauge is not installed in the DA 40 F.

Note 3: To prevent nuisance alerts during normal takeoffs, the legend "RPM" and digits will not turn red or flash until the RPM exceeds 2780.

Note 4: Fuel Pressure Gauge is optional for DA 40 aircraft.

2.6 WARNING, CAUTION AND STATUS MESSAGES

The following tables show the color and significance of the warning, caution, and advisory messages which may appear on the G1000 displays.

NOTE

The G1000 Cockpit Reference Guide and the G1000 Pilot's Guide contain detailed descriptions of the annunciator system and all warnings, cautions and advisories.

Warning annunciations – Red	
Annunciation	**Cause**
OIL PRES LO	Oil pressure is less than 25 psi
FUEL PRES LO (DA40 Only)	Fuel pressure is less than 14 psi
FUEL PRES HI (DA40 Only)	Fuel pressure is greater than 35 psi
ALTERNATOR	Alternator failure
STARTER ENGD	Operation of the starter without the key in the start position, or failure of the starter motor to disengage from the engine after starting
DOOR OPEN	Front canopy and/or rear door not completely closed and locked
Caution annunciations – Yellow	
Annunciation	**Cause**
PITOT OFF	Pitot heat is not switched on
PITOT FAIL	Fault in the pitot heating system
L FUEL LOW	Fuel quantity in the left tank is less than 3 US gal (±1 US gal)
R FUEL LOW	Fuel quantity in the right tank is less than 3 US gal (±1 US gal)
LOW VOLTS	On-board voltage below 24 volts

Advisory annunciations – White	
Annunciation	**Cause**
PFD FAN FAIL	The cooling fan for the PFD is inoperative.
MFD FAN FAIL	The cooling fan for the MFD is inoperative.
GIA FAN FAIL	The cooling fan for the GIA is inoperative.

2.13 KINDS OF OPERATION

Minimum operational equipment (serviceable)

Equipment	Number installed	VFR Day	VFR Night	IFR
Primary Flight Display	1	1	1	1
Multi-Function Display	1	1	1	1
Audio panel	1	1	1	1
Air data computer	1	1	1	1
Attitude and Heading Reference System	1	-	1	1
Static dischargers	7	-	-	7
GPS	2	-	1	2

2.14 FUEL

Fuel Quantity: Total fuel quantity:

Standard Tanks:	2 x 20.6 US gal (approx. 156 liters)
Long Range Tanks:	2 x 25.5 US gal (approx. 193 liters)

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

Max. Indicated Fuel Quantity:

Standard Tanks:	17 US gal per tank
Long Range Tanks:	24.0 US gal per tank

Max. permissible difference between right and left tank:

Standard Tanks:	10 US gal (approx. 38 liters)
Long Range Tanks:	8 US gal (approx. 30.3 liters)

2.15 Limitation Placard

Below the MFD, next to the fuel quantity indication:

Standard Tanks

Fuel qty. Indication: max 17 US gal
Max. difference LH/RH tank: 10 US gal
For use of max. tank capacity see AFM

Long Range Tanks

Fuel qty. Indication: max 24 US gal
Refer to AFM to use entire tank capacity
Max. difference LH/RH tank: 8 US gal

SECTION III
EMERGENCY PROCEDURES

GENERAL

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

2. If the G1000 system reverts to Dead Reckoning mode (indicated by DR displayed on the HSI), the moving map will continue to be displayed. Aircraft position will be based upon the last valid GPS position and estimated by Dead Reckoning methods. Changes in winds aloft can affect the estimated position substantially. Dead Reckoning is only available in Oceanic and Enroute modes; Terminal and Approach modes do not support DR.

3. If Garmin G1000 GPS navigation information is not available or invalid and the TAWS option is installed, TAWS will not be available. A white 'TAWS N/A' or red 'TAWS FAIL' annunciator will be displayed on the PFD (left of selected altitude) or on the MFD TAWS page (lower right hand corner).

4. If the "GPS NAV LOST" annunciation is displayed the system will flag and no longer provide GPS based navigational guidance. The crew should revert to the G1000 VOR/ILS receivers or an alternate means of navigation other than the G1000 GPS receivers.

5. If the "LOI" (Loss of Integrity) annunciation is displayed in the enroute, oceanic, or terminal 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.

6. If the "ABORT APR" or "GPS NAV LOST" annunciation is displayed while on an approach segment, the pilot shall initiate the missed approach.

7. Aircraft equipped with GIA 63W WAAS GPS receivers only: If the "APR DWNGRADE" annunciation is displayed, the pilot shall use LNAV minima.

8. Aircraft equipped with GIA 63 non-WAAS GPS receivers only: If the "RAIM UNAVAIL" annunciation is displayed while on an approach segment, the approach will become inactive and the pilot shall initiate the missed approach. Missed approach course guidance may still be available with 1 nautical mile CDI sensitivity.

9. In an in-flight emergency, depressing and holding the Com transfer button 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.

10. If the white 'TAWS N/A' status annunciator is displayed on the PFD or MFD TAWS page, the system will no longer provide TAWS alerting or display relative terrain elevations. The crew must maintain compliance with procedures that ensure minimum terrain separation.

11. If the red 'TAWS FAIL' status annunciator is displayed on the PFD or MFD TAWS page, the system will no longer provide TAWS alerting or display relative terrain elevations. The crew must maintain compliance with procedures that ensure minimum terrain separation.

12. The following warnings and cautions appear in various locations on the PFD or MFD.

Annunciation	**Cause**
AHRS Aligning – Keep Wings Level	Attitude and Heading Reference System is aligning. Keep wings level using standby attitude indicator.
ATTITUDE FAIL	Display system is not receiving attitude reference information from the AHRS; accompanied by the removal of sky/ground presentation and a red X over the attitude area.
AIRSPEED FAIL	Display system is not receiving airspeed input from the air data computer; accompanied by a red X through the airspeed display.
ALTITUDE FAIL	Display system is not receiving altitude input from the air data computer; accompanied by a red X through the altimeter display.
VERT SPEED FAIL	Display system is not receiving vertical speed input from the air data computer; accompanied by a red X through the vertical speed display.
HDG	Display system is not receiving valid heading input from the AHRS; accompanied by a red X through the digital heading display.
Red X	A red X through any display field, such as com frequencies, nav frequencies, or engine data, indicates that display field is not receiving valid data.
LOI	GPS integrity is insufficient for the current phase of flight.

GFC 700 EMERGENCY PROCEDURES

Some emergency situations require immediate memorized corrective action. These numbered steps are printed in boxes within the emergency procedures and should be accomplished without the aid of the checklist.

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 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 indication 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.

1. AP DISC Switch ....DEPRESS AND HOLD
while grasping control stick firmly
2. Aircraft Attitude.........................MAINTAIN/REGAIN AIRCRAFT CONTROL,
use standby attitude indicator if necessary

3. Pitch Trim ....RETRIM if necessary, using the trim wheel
4. AP 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.

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.

AUTOPILOT OVERSPEED RECOVERY (Yellow MAXSPD on PFD)

1. Throttle..REDUCE

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.

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 aircraft 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)

AUTOPILOT OUT OF TRIM (Yellow ←AIL, AIL→, ↑ELE, or ↓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. Aircraft Attitude........................MAINTAIN/REGAIN AIRCRAFT CONTROL,
   use standby attitude indicator if necessary

3. Pitch Trim ....RETRIM if necessary, using the trim wheel
4. AFCS 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.

For ←AIL, AIL→ Indication:

1. Rudder Trim..VERIFY slip/skid indicator is centered

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 arrow pointing to the right 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 re-established

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, VPTH, GP)
1. Autopilot mode controls .... SELECT ANOTHER VERTICAL MODE

If on an instrument approach:
2. Autopilot...DISCONNECT and continue manually, or execute missed approach

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

FAILURE OF THE PREFLIGHT TEST (Red boxed PFT on PFD)

1. AFCS Circuit Breaker..PULL

WARNING

DO NOT ATTEMPT TO ENGAGE THE AUTOPILOT OR OPERATE THE MANUAL ELECTRIC TRIM UNTIL THE CAUSE OF THE MALFUNCTION HAS BEEN CORRECTED.

NOTE

When the AFCS circuit breaker is pulled, the PFT FAIL annunciation will be removed and the autopilot and manual electric trim will be unavailable. Do not reset the circuit breaker unless the airplane is on the ground.

MAXIMUM ALTITUDE LOSS DUE TO AUTOPILOT, FLIGHT DIRECTOR OR AHRS MALFUNCTIONS:

MANEUVER	ALTITUDE LOSS
Climb, Cruise, Descent	200 feet
Maneuvering	115 feet
Approach	130 feet

3.2.3 ENGINE PROBLEMS IN FLIGHT

(h) High Fuel Flow – (DA 40 only)

Fuel flow in red sector

1. Fuel pressure ....check for red FUEL PRESS LO message
   - If fuel pressure is low (FUEL PRESS LO message), there is possibly a leak (between the injection system and the injectors). Land at the nearest available airport.
   - If there is no FUEL PRESS LO message, there is no leak; the likely cause is a defective fuel flow indication, which should thus be ignored (the airplane should be serviced). Fuel flow data should be taken from the engine performance table in Chapter 5 of the AFM.

(g) High Fuel Flow – (DA 40 F only)

1. Fuel Quantity .... Check and Monitor
2. Power Setting .... Check

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

NOTE

Have the airplane inspected before next flight.

3.3.3 SMOKE AND FIRE IN FLIGHT

(b) Electrical fire with smoke in flight

1. Emergency switch .... ON if installed

CAUTION

Switching OFF the master switch (ALT/BAT) will lead to total loss of all electronic and electric equipment, including the AHRS and attitude display.

However, by switching the HORIZON EMERGENCY switch ON, the emergency battery will supply power to the standby 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.

2. Master switch (ALT/BAT) .... OFF
3. Cabin heat .... OFF
4. Emergency window(s) .... OPEN
5. Use standby instruments for airspeed, altitude and attitude reference, if necessary
6. Land at the nearest suitable airport as soon as possible

   If electronic or avionics equipment is required for continued flight, the following procedure may be used to isolate the source of the smoke or fumes:

7. BATtery switch .... ON
8. ESS BUS switch .... ON

NOTE

This removes power from the main and avionics busses, but does not allow alternator operation. See the table at the end of this section for the equipment which is still available.

If smoke or fumes decrease:

9. Land at the nearest suitable airport as soon as possible

If smoke or fumes persist:

10. ALTernator switch .... ON
11. ESS BUS switch ....OFF
12. BATT and ESS TIE circuit breakers .... PULL

    This removes power from the essential bus and restores power to the main and avionics busses. See the table at the end of this section for the equipment which will still be available.

13. Use standby instruments for attitude, airspeed and altitude
14. Refer to Section 3.7.2 (b) of this Supplement, Alternator Failure
15. Land at the nearest suitable airport as soon as possible

The equipment available on **Essential Bus** only (operating on battery only and the Essential Bus switch selected) is:

Air Data Computer (airspeed, altitude, vertical speed, OAT, TAS)
Attitude and Heading Reference System (attitude, heading)
PFD (in composite mode)
Pitot Heat
Flaps
COM 1
GPS/NAV 1
Transponder
Landing light
Instrument flood lights
Engine instruments
Starter

Refer to the "Essential Bus" area of the circuit breaker panel for a quick reference to equipment on the Essential Bus.

Equipment available on the **Main and Avionics Busses** only:

COM 2
GPS/NAV 2
MFD
Electric fuel pump
Instrument lights
Strobe lights
Position lights
Taxi light

Refer to the "Main Bus" and "Avionics Bus" areas of the circuit breaker panel for a quick reference to equipment on those busses.

3.7.1 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. Air distribution lever .... ▲(UP)
5. RPM .... increase, in order to prevent ice build-up on the propeller blades
6. Alternate Air **(DA 40 only)** .... OPEN

6a Carburetor Heat **(DA 40 F only)** .... HOT

7. Emergency window(s) .... open if required

CAUTION

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

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

CAUTION

When the pitot heating fails (yellow PITOT FAIL annunciation), and the alternate static valve is installed:

9. Alternate static valve .... OPEN
10. Emergency window(s) .... close

3.7.2 FAILURES IN THE ELECTRICAL SYSTEM

(b) Alternator failure

An alternator failure is indicated by a red ALTERNATOR message and an ammeter indication of 0 Amps.

1. Circuit breakers.. Check in
2. ALTernator switch.. OFF, then ON

If alternator does not come back on line (message extinguishes and ammeter indication greater than zero):

3. ESS BUS switch .... ON
4. Switch off any non-essential electrical loads.
5. Land within 30 minutes

If PFD attitude information is lost prior to landing:

6. HORIZON EMERGENCY Switch.. ON

CAUTION

The following items are available on the Essential Bus:

- PFD in composite (backup) format
- NAV/COM 1
- GPS 1
- Attitude and Heading Reference System (AHRS)
- Air Data Computer
- Pitot heat
- Engine instruments
- Transponder
- Flood light
- Landing light

Refer to the ESSENTIAL BUS area of the circuit breaker panel for a quick reference to equipment on those busses. These items of equipment can be supplied with power by the battery for at least 30 minutes. During this 30-minute period, the airplane must be landed at a suitable airport. Economical use of electrical equipment, in particular of pitot heat, and switching off equipment that is not needed extends the time during which the other equipment remains available.

For cases in which the battery capacity is not sufficient to reach a suitable airport, an emergency battery is installed to power the standby attitude gyro and floodlight. This battery is switched on with the HORIZON EMERGENCY Switch. It provides power for 1 hour and 30 minutes when the floodlight is switched on.

3.8 AVIONICS EMERGENCIES

3.8.1 PFD OR MFD DISPLAY FAILURE

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

3.8.1.1 AUTOMATIC ENTRY OF DISPLAY REVERSIONARY MODE

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

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

NOTE

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

b) DISPLAY BACKUP button on audio panel......PUSH (button shall 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 the OUT position.

3.8.2 AHRS FAILURE

NOTE

A failure of the Attitude and Heading Reference System (AHRS) is indicated by 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, magnetic compass and Navigation Map
2. Course .... Set using digital window

3.8.3 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
2. Land as soon as practical at a suitable airport

3.8.4 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 that 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 from Table 5.3.2 (DA 40) or Charts 5.3.8 (DA 40 F) of AFM for approximate fuel flow values.

4. Use other system information, such as annunciator messages, ENGINE SYSTEM page, and AUX – TRIP PLANNING page to safely complete the flight.

3.8.5 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 the AFM Emergency or Abnormal procedures or the procedures contained in this AFMS.

2. If a display indicates an abnormal condition but no annunciator is present, use other system information, such as engine displays, ENGINE SYSTEM page, GAL REM and FFLOW GPH displays, 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 the AFM Emergency or Abnormal procedures or the procedures contained in this AFMS.

SECTION IVA
NORMAL PROCEDURES

NOTE

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

1. DETAILED OPERATING PROCEDURES

Normal operating procedures for the G1000 and GFC 700 are described in the Garmin G1000 Cockpit Reference Guide and the Garmin G1000 Pilot's Guide.

PRE-FLIGHT INSPECTION

I. Cabin check

a) MET, NAV, Mass & CG .... flight planning complete
b) Airplane documents .... complete and up-to-date
c) Ignition key .... pulled out
d) Front canopy & rear door .... clean, undamaged
e) All electrical equipment .... OFF
f) Circuit breakers .... set in (if one has been pulled, check reason)
g) Engine control levers .... check condition, freedom of movement
Full travel of throttle,
Full Travel of RPM (DA 40 only)
Full Travel of mixture lever
h) Throttle .... IDLE
i) Mixture control lever .... LEAN
j) RPM lever (DA 40 only) .... HIGH RPM
k) Carburetor Heat (DA 40 F only) .... COLD
l) Master switch (BAT) .... ON
m) Fuel Quantity .... check fuel qty. on EIS
check with fuel qty. measuring device

NOTE

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

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

n) Position lights, strobe light (ACL's) .... check
o) Master switch (BAT) .... OFF
p) Check for loose items .... complete
q) Flight controls and trim .... free to move and correct
r) Baggage .... stowed and secure

NOTE

Refer to DA 40 and DA 40 F AFMs to complete the Walk-around check, visual inspection

BEFORE STARTING ENGINE

1. Preflight inspection .... Complete
2. Rudder pedals .... Adjusted and locked
3. Passengers .... Instructed
4. Safety Harnesses .... All on and fastened
5. Rear door .... Closed and locked
6. Door lock (if installed) .... Unblocked, key removed
7. Front canopy .... Position 1 or 2 ("cooling gap")
8. Canopy lock (if installed) .... Unblocked, key removed
9. Parking brake .... Set
10. Flight controls .... Freedom of movement and proper direction
11. Trim wheel .... T/O
12. Friction device, throttle quadrant .... Adjusted
13. Throttle .... IDLE
14. Mixture control lever .... LEAN
15. RPM lever (DA 40 only) .... HIGH RPM
16. Carburetor heat (DA 40 F only) .... COLD
17. Alternate air (DA 40 only) .... CLOSED
18. Alternate Static Valve .... CLOSED, if installed

19. Avionics master switch .... OFF
20. Essential Bus switch .... OFF

CAUTION

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

21. BATtery switch .... ON
22. Fuel tank selector .... on fullest tank

WARNING

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

Never try to start the engine by hand.

STARTING ENGINE (DA 40 only)

(a) Cold engine

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

WARNING

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

CAUTION

Do not overheat the starter motor. Do not operate the starter motor for more than 10 seconds. After operating the starter motor, let it cool off for 20 seconds. After 6 attempts to start the engine, let the starter cool for 30 minutes before further start attempts.

CAUTION

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

When engine starts:

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

WARNING

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

9. ALTernator switch .... ON
10. Ammeter .... Check
11. Fuel pressure .... Check no messages illuminated
12. Annunciator section of PFD .... Check

(b) Warm engine

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

WARNING

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

CAUTION

Do not overheat the starter motor. Do not operate the starter motor for more than 10 seconds. After operating the starter motor, let it cool off for 20 seconds. After 6 attempts to start the engine, let the starter cool for 30 minutes before further start attempts.

5. Ignition switch .... START

When engine starts:

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

WARNING

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

8. Electrical fuel pump .... OFF
9. ALTernator switch .... ON
10. Ammeter .... Check
11. Fuel pressure .... Check no messages illuminated
12. Annunciator section of PFD .... Check

(c) Engine will not start after injection ("flooded engine") Warm engine

1. Strobe light (ACL) .... ON
2. Electrical fuel pump .... ON, note pump noise (=Functional check of pump)
3. Mixture control lever .... LEAN, fully aft
4. Throttle .... at mid position

WARNING

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

CAUTION

Do not overheat the starter motor. Do not operate the starter motor for more than 10 seconds. After operating the starter motor, let it cool off for 20 seconds. After 6 attempts to start the engine, let the starter cool for 30 minutes before further start attempts.

5. Ignition switch .... START
6. Throttle .... pull back towards IDLE when engine starts

When engine starts:

7. Mixture control lever .... rapidly move to RICH
8. Oil pressure .... green arc within 15 sec

WARNING

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

9. ALTernator switch .... ON
10. Ammeter .... Check
11. Fuel pressure .... Check no messages illuminated
12. Annunciator section of PFD .... Check

STARTING ENGINE (DA 40 F only)

(a) Cold engine

1. Strobe light (ACL) .... ON
2. Mixture .... fully RICH
3. Electrical fuel pump .... ON, note pump noise (=functional check of pump)
4. Throttle .... ¼ travel forward from IDLE
5. Prime .... 1 – 4 seconds (electric pump)

WARNING

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

CAUTION

The priming system is not intended for operation in flight.

WARNING

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

CAUTION

Do not overheat the starter motor. Do not operate the starter motor for more than 10 seconds. After operating the starter motor, let it cool off for 20 seconds. After 6 attempts to start the engine, let the starter cool for 30 minutes before further start attempts.

CAUTION

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

6. Starter .... engage

When engine starts:

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

WARNING

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

10. ALTernator switch....................ON
11. Ammeter....................Check
12. Annunciator section of PFD....................Check

(b) Warm engine

1. Strobe light (ACL)....................ON
2. Mixture....................fully RICH
3. Electrical fuel pump....................ON, note pump noise (=functional check of pump)
4. Throttle....................¼ travel forward from IDLE

WARNING

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

CAUTION

Do not overheat the starter motor. Do not operate the starter motor for more than 10 seconds. After operating the starter motor, let it cool off for 20 seconds. After 6 attempts to start the engine, let the starter cool for 30 minutes before further start attempts.

5. Starter....................engage

When engine starts:

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

WARNING

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

9. ALTernator switch....................ON
10. Ammeter....................Check
11. Annunciator section of PFD....................Check

(c) Engine will not start after priming ("flooded engine")

1. Strobe light (ACL) .... ON
2. Electrical fuel pump .... OFF
3. Mixture .... LEAN, fully aft
4. Throttle .... MAX PWR

WARNING

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

CAUTION

Do not overheat the starter motor. Do not operate the starter motor for more than 10 seconds. After operating the starter motor, let it cool off for 20 seconds. After 6 attempts to start the engine, let the starter cool for 30 minutes before further start attempts.

5. Starter .... engage

When engine starts:

6. Throttle .... pull back towards IDLE when engine fires
7. Oil pressure .... green arc within 15 sec

WARNING

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

8. Throttle .... set 1000 RPM
9. ALTernator switch .... ON
10. Ammeter .... Check
11. Annunciator section of PFD .... Check

BEFORE TAXIING

1. Avionics master switch .... ON
2. Electrical equipment .... On as required
3. Flaps .... UP – T/O – LDG – T/O (indicator and visual check)
4. Flight instruments and avionics .... set, test function, as required
5. (set both altimeters)
6. Flood light .... ON, test function, as required
7. Ammeter .... check, if required increase RPM
8. Fuel tank selector .... change tanks, confirm that engine also runs on other tank (at least 1 minute at 1500 RPM)
9. Pitot heating .... ON, test function – no yellow PITOT FAIL annunciation
10. Pitot heating .... OFF if not required (yellow PITOT OFF annunciation)
11. Strobe lights (ACLs) .... check ON, test function, as required
12. Position lights, landing and taxi lights .... ON, test function, as required

CAUTION

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

13. Throttle .... check, 600 to 800 RPM

NOTE

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

14. Primary Flight Display (PFD) .... NO AUTOPILOT ANNUNCIATIONS
15. Autopilot Disconnect Tone .... NOTE

BEFORE TAKE-OFF

1. Position airplane into wind if possible
2. Parking brake .... set
3. Safety harnesses .... on and fastened
4. Rear door .... check closed and locked
5. Front canopy .... closed and locked

CAUTION

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

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

6. Door warning light (DOOR OPEN) .... Check no messages illuminated
7. Fuel tank selector .... fullest tank
8. Engine instruments .... in green sector
9. Circuit breakers .... pressed in
10. Fuel pressure .... Check no messages illuminated
11. Electric fuel pump .... ON
12. Mixture control lever .... RICH (below 5000 ft)

NOTE

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

13. Flaps .... check T/O
14. Trim .... check T/O
15. Flight controls .... free movement, correct sense
16. Throttle .... 2000 RPM (DA 40)
    1800 RPM (DA 40 F)
17. Magneto check .... L-BOTH-R-BOTH
    Max. RPM drop .... 175 RPM
    Max. difference .... 50 RPM

CAUTION

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

18. RPM lever (DA 40 only) .... pull back until a drop of max. 500 RPM is reached – HIGH RPM; Cycle 3 times

18a Carburetor Heat (DA 40 F only)... check function
18b Throttle (DA 40 F only)................................ MAX PWR, minimum 2200 RPM

NOTE (DA 40 F only)

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

19. Throttle.. set 1000 RPM
20. Carburetor Heat (DA 40 F only)... check COLD
21. Alternate Air (DA 40 only).. check CLOSED
22. Parking brake .... release
23. Landing light...ON as required

AFTER TAKEOFF – GFC 700 NORMAL PROCEDURES

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 AIRCRAFT 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), VERTICAL SPEED (VS), OR ALTITUDE HOLD (ALT) 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.

NOTE

The NOSE UP and NOSE DN buttons on the mode controller on the MFD are referenced to aircraft 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.

CLIMB, CRUISE and DESCENT:

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

The vertical speed mode is limited to 1,500 ft/min climb and 3,000 ft/minute descent. Use engine power to maintain appropriate aircraft 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.

Flight Level Change (FLC):
1. Altitude Preselect .... SET to desired altitude
2. Mode Controller .... SELECT FLC on mode controller
3. Airspeed 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 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.

Altitude Hold (ALT):
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.

Altitude Hold (ALT):
To maintain a desired altitude:
1. Altimeter Setting.................................ADJUST TO APPROPRIATE VALUE
2. Reaching desired altitude.............................SELECT ALT on mode controller
3. Green ALT...VERIFY on PFD

Vertical Path (VPTH): (If equipped with optional GDU 1044)
1. Navigation Source............................ SELECT GPS using CDI button on PFD
2. MFD flight plan page...Enter Desired Vertical Profile
3. Altitude Preselect.. SET TO DESIRED ALTITUDE
4. Mode Controller..SELECT VNV on mode controller
5. White VPTH (Vertical Path armed).. NOTE on PFD
6. Green VPTH.........................VERIFY UPON VERTICAL PATH CAPTURE

NOTE

If VNV is pressed and VPTH is armed prior to 5 minutes time to top of descent, VPTH will flash in white at 1 minute prior to top of descent. The pilot must acknowledge the flashing by pressing VPTH again.

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.

APPROACH:

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
7. Airspeed.................... MAINTAIN 80 KIAS OR GREATER (Recommended)

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.

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 annunciations............................. NOTE on PFD
6. Airspeed.................... MAINTAIN 80 KIAS OR GREATER (Recommended)

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.

GPS: LNAV

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

7. Airspeed .... MAINTAIN 80 KIAS OR GREATER (Recommended)

GPS: LPV, LNAV/VNAV, LNAV+V (If equipped with optional GIA 63W GIA units)

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. Green or White GP annunciation .... NOTE on PFD
7. Airspeed .... MAINTAIN 80 KIAS OR GREATER (Recommended)

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 105° 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
7. Airspeed .... MAINTAIN 80 KIAS OR GREATER (Recommended)

GO AROUND

1. Control Stick .... GRASP FIRMLY
2. GA button .... PUSH – Verify GA/GA on PFD in lateral and vertical mode fields
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 modes on mode 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.

AFTER TAKEOFF – TAWS NORMAL PROCEDURES
(If Optional TAWS system is installed)

TAWS CAUTION

When a TAWS CAUTION occurs, take positive corrective action until the alert ceases. Stop descending or initiate either a climb or a turn, or both, as necessary, based on analysis of all available instruments and information.

TAWS WARNING

If a TAWS WARNING occurs, immediately initiate and continue a climb that will provide maximum terrain clearance, or any similar approved vertical terrain escape maneuver, until all alerts cease. Only vertical maneuvers are recommended, unless either operating in visual meteorological conditions (VMC), or the pilot determines, based on all available information, that turning in addition to the escape maneuver is the safest course of action, or both.

TAWS INHIBIT

The TAWS Forward Looking Terrain Avoidance (FLTA) and Premature Descent Alerts (PDA) functions may be inhibited to stop alerting for acceptable flight conditions (such as below glideslope maneuvers). For detailed operating instructions regarding the G1000 TAWS Option, refer to the Garmin DA 40/DA 40F Pilot's Guide.

SECTION IVB
ABNORMAL PROCEDURES

4B.3 FAILURES IN THE ELECTRICAL SYSTEM

(a) Low voltage caution (LOW VOLTS)

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

Possible reasons are:

-A fault in the power supply

-RPM is too low

(i) Low voltage on the ground:

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

If the caution message does not extinguish, and the ammeter legend flashes and reads zero, discontinue the flight.

(ii) Low voltage caution during flight:

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

If the caution message does not go out, and the ammeter legend flashes and reads zero, follow procedure 3.7.2(b) – Alternator Failure, in this Supplement.

(iii) Low voltage caution during landing:

-Follow (i) after landing

SECTION V
PERFORMANCE
No change.

SECTION VI
WEIGHT AND BALANCE
See current weight and balance data.

SECTION VII
SYSTEM DESCRIPTIONS

G1000 SYSTEM

The Garmin G1000 Integrated Avionics System consists of a Primary Flight Display (PFD), a Multi-Function Display (MFD), an Audio Panel, and Attitude and Heading Reference System (AHRS), an Air Data Computer (ADC), and the sensors and computers to process flight and engine information for display to the pilot. The system contains dual GPS receivers, dual VOR/ILS receivers, dual VHF communications transceivers, a transponder, an Automatic Direction Finder (ADF) receiver, Distance Measuring Equipment (DME), and an integrated annunciation system to alert the pilot of certain abnormal conditions.

The GPS receivers will either be non – WAAS capable (if GIA 63 units are installed) or WAAS capable (if GIA 63W units are installed).

The Primary Flight Display (PFD) 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 acknowledgement
- 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 the Emergency or Abnormal Procedures Sections of the AFM or this Supplement for the appropriate procedure to follow for each message.

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 (if applicable).

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.

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 GFC 700 autopilot mode controls are located on the MFD. These controls are described later in this section.

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.

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 aircraft is in motion, but will align more quickly if the wings are kept level during the alignment process.

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.

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.

GFC 700 SYSTEM

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

- One GDU, installed as the MFD, 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). The optional GDU 1044 contains the VNV button (Vertical Navigation mode On/Off).
- 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 throttle 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 the 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 Pilot's Guide for the Diamond DA 40, for a complete description of the GFC 700 system and operating procedures.

Refer to the Garmin G1000 Cockpit Reference Guide for descriptions of the G1000 and GFC 700 system and operating procedures. Refer to the following table to determine the appropriate guide. The System Software Version number is displayed at the top, right side of the MFD Power-up page.

System Software Version	Pilot's Guides
0369.13	**Garmin G1000 Cockpit Reference Guide (CRG)** P/N 190-00324-07, Revision A or later appropriate revision.

7.10 FUEL SYSTEM

Fuel Quantity Indication

Each fuel tank has a capacity probe that ascertains fuel quantity in that tank. Standard Tank configurations have two fuel probes, one in each wing. Long Range Tank configurations have four fuel probes, two in each wing, an outboard tank and an inboard tank. When the fuel quantity indicator reads zero, only unusable fuel remains in the tank. Usable capacity of each tank for the Standard Tank configuration is 20 US gal (76 liters). Usable capacity of an outboard and inboard tank for the Long Range Tank configuration is 24 US gal (91 liters).

Fuel quantity:

Fuel quantity indicating for the Standard Tank configuration functions as described in the DA 40 AFM. Also, refer to the 'G1000 Pilot's Guide for the Diamond DA 40' for additional information about the functionality of the G1000's fuel quantity gauge.

For the Long Range Tank configuration, dual pointers on a linear scale, a top pointer for the left fuel quantity and a bottom pointer for the right fuel quantity indicate fuel quantity. The fuel quantity gauge is marked in five gallon increments starting at zero to 25 US gal. The break in the green band between 16 and 19 US gal shows the ungauged portion of the fuel tanks usable fuel.

When a fuel tank is completely full, the quantity pointer will indicate 24 US gallons. As fuel is consumed from the tank, the pointer will move to the left. Once there is no more measurable fuel in the outboard tank, the pointer migrates over a 30 second period to the 16 US gal position. The pointer will remain at 16 US gallons while the ungauged fuel quantity is consumed. Once the quantity of fuel remaining in the inboard tank is less than 16 gallons, the pointer will begin moving left towards zero. When either pointer enters the amber portion of the scale, the pointer and the gauge title, 'FUEL QTY GAL', will turn amber. When either pointer enters the red portion of the gauge, the pointer will turn red, and the gauge title, 'FUEL QTY GAL', will turn red and flash continuously in inverse video.

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Document No. 190-00303-02

FAA APPROVED

FAA APPROVED AIRPLANE FLIGHT MANUAL SUPPLEMENT
GARMIN G1000 INTEGRATED AVIONICS SYSTEM

DIAMOND MODEL DA 40
DIAMOND MODEL DA 40 F

Reg. No. N216DG S/N 40.698

This Supplement must be attached to the FAA Approved Airplane Flight Manual when the Garmin G1000 Integrated Avionics System is installed in accordance with STC SA01254WI. The information contained herein supplements the information of the basic Airplane Flight Manual. For Limitations, Procedures and Performance information not contained in this Supplement consult the basic Airplane Flight Manual.

Note: This Airplane Flight Manual Supplement follows the format and content of the Airplane Flight Manual for the Diamond DA 40 for consistency and ease of use.

Only the Limitations Section is FAA APPROVED.

for Margaret Kline
Manager, Aircraft Certification Office
Federal Aviation Administration
Wichita, Kansas 67209
DATE: 9/16/05

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GARMIN G1000 INTEGRATED AVIONICS SYSTEM

DIAMOND MODEL DA 40
DIAMOND MODEL DA 40 F

LOG OF REVISIONS				
Revision Number	**Page Number(s)**	**Description**	**FAA Approved**	**Date of Approval**
1	All	Initial Release	---	---
2	All	Updated doc. To reflect current processes. Updated header/footer to current format.	--	--
3	All	Revised to reflect FAA Approval of Limitations Section only.	--	---
4	All	Initial FAA Approval	GMB [1]	6/25/2004
5	All	Make KAP 140 autopilot an optional equipment installation	GMB [1]	9/20/2004
6	All	Amendment 1 revision and administrative corrections.	GMB[1]	3/30/05
7	All	DA 40 F revision and administrative corrections	GMB[1]	6/27/05
8	All	Amendment 2 revision and administrative corrections.	GMB[1]	9/16/05
9	All	Amendment 3 revision	JmKaber	11/3/05

[1] For Margaret Kline, Manager
Wichita Aircraft Certification Office

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FAA APPROVED AIRPLANE FLIGHT MANUAL SUPPLEMENT
GARMIN G1000 INTEGRATED AVIONICS SYSTEM

DIAMOND MODEL DA 40
DIAMOND MODEL DA 40 F

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DIAMOND MODEL DA 40
DIAMOND MODEL DA 40 F

SECTION I
GENERAL

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, 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 system 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:

   - 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.
   - Oceanic/Remote per FAA Notice 8110.60 – Two FMSs are required to be installed, operating and receiving usable signals from independent GPS sensors (one GPS sensor for those routes requiring only one Long Range Navigation (LRN) sensor. This does not constitute operational approval.
   - North Atlantic (NAT) Minimum Navigation Performance Specifications (MNPS) Airspace as defined in AC 91-49 and AC 91-70 – Provided two FMSs are installed, operating and

are receiving usable signals from any two GPS navigation sensors (one GPS sensor for those routes requiring only one Long Range Navigation (LRN) sensor). The GPS sensor meets the requirements of FAA Notice 8110.60 for primary navigation sensors. This does not constitute operational approval.

- 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.
- The systems meets RNP5 airspace (BRNAV) requirements of AC 90-96 and in accordance with AC 20-138A, JAA GAI-20 ACJ 20X4, 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.

FAA APPROVED AIRPLANE FLIGHT MANUAL SUPPLEMENT
GARMIN G1000 INTEGRATED AVIONICS SYSTEM

DIAMOND MODEL DA 40
DIAMOND MODEL DA 40 F

SECTION II
LIMITATIONS

2.1 INTRODUCTION

General Limitations:

1. The Garmin G1000 Cockpit Reference Guide (CRG) must be immediately available to the flight crew. The required CRG is referenced to the System Software Version number. The System Software Version number is displayed at the top right side of the MFD Power-up page. DA 40 F requires System Software Version 0369.07 or later FAA approved software.

System Software Version	Garmin G1000 Cockpit Reference Guide (CRG) revision
0369.04	P/N 190-00324-00, dated November, 2003 or later appropriate revision.
0369.06	P/N 190-00324-01, dated February, 2005 or later appropriate revision.
0369.07 0369.08	P/N 190-00324-03, dated June, 2005 or later appropriate revision.
0369.09	P/N 190-00324-04, Revision A or later appropriate revision.

2. The G1000 installation in the DA 40 requires the following or later FAA approved LRU software versions. Approved LRU software versions are referenced to the System Software Version number. DA 40 F requires System Software Version 0369.07 or later FAA approved software.

LRU	LRU Software Version			
	0369.04	0369.06	0369.07	0369.08 & 0369.09
COM 1 & 2	7.00	7.00	7.00	7.00
GDC 1	2.02	2.05	2.05	2.05
GEA 1	2.02	2.04	2.04	2.04
GIA 1 & 2	2.01	2.06	2.06	3.01
GMA 1	2.03	2.07	2.07	2.08
GMU 1	2.01	2.01	2.01	2.01
GPS 1 & 2	3.01	2.01	3.01	3.01
GRS 1	2.01	2.03	2.03	2.03
GS 1 & 2	3.00	3.00	3.00	3.00
GTX 1	3.06	4.01	4.01	4.01
MFD1	2.02	4.04	4.06	5.02
NAV 1 & 2	4.00	4.00	4.00	4.00
PFD 1	2.02	4.04	4.06	5.02
GDL				2.14

The system's databases and System Software Version number are displayed on the MFD Power-up page immediately after system power-up and must be acknowledged. The LRU software versions can be verified on the AUX group sub-page 5, "AUX - SYSTEM STATUS" along with the system's databases.

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

(e) IFR non-precision approach approval is limited to published approaches within the U.S. National Airspace System. Approaches to airports in other airspace are not approved unless authorized by the appropriate governing authority.

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

(g) When conducting missed approach procedures, autopilot (if installed) coupled operation is prohibited until the pilot has established a rate of climb that ensures all altitude requirements of the procedure will be met.

(h) RNP RNAV operations are not authorized, except as noted in item 4 of Section I of this AFMS.

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** .... $^{n}_{m}$ $^{k}_{t}$ (sets navigation units to "nautical miles" and "knots")

   (b) **ALT, VS** .... $^{f}_{t}$ fpm (sets altitude units to "feet" and "feet per minute")

   (c) **MAP DATUM** ..WGS 84 (sets map datum to WGS-84, see note below)

   (d) **POSITION**.........deg-min (sets navigation grid units to degree-minutes)

NOTE

In some areas outside the United States, datums other than WGS-84 or NAD-83 may be used. If the G1000 is authorized for use by the appropriate Airworthiness authority, the required geodetic datum must be set in the G1000 prior to its use for navigation.

6. Operation is prohibited north of 70°N and south of 70°S latitudes. In addition, operation is prohibited in the following two regions: 1) north of 65°N between 75°W and 120°W longitude and 2) south of 55°S between 120°E and 165°E longitude.

7. CDI sequencing of the ILS must be set to manual for instrument approaches conducted with the autopilot coupled (if installed). If the CDI source is changed when the autopilot is engaged in NAV mode, the autopilot lateral mode will revert to ROLL ATTITUDE mode and NAV mode must be manually reselected by the pilot.

8. The fuel quantity, fuel required, and fuel remaining functions of the FMS are supplemental information only and must be verified by the flight crew.

9. The pilot's altimeter is the primary altitude reference during all operations using advisory vertical navigation information.

10. If a KAP 140 autopilot is installed, autopilot-coupled ILS, LOC, LDA, and Back Course approaches are prohibited with direct crosswinds greater than 15 knots with greater than light turbulence.

11. Navigation must not be predicated upon the use of the Terrain or Obstacle data displayed by the G1000.

NOTE: The terrain display is intended to serve as a situational awareness tool only. It may not provide either the accuracy or fidelity, or both, on which to solely base decisions and plan maneuvers to avoid terrain or obstacles.

12. The Terrain/Obstacle/Airport databases have an area of coverage as detailed below:

    (a) The Terrain Database has an area of coverage from North 75° Latitude to South 60° Latitude in all longitudes.
    (b) The Airport Terrain Database has an area of coverage that includes the United States, Canada, Mexico, Latin America, and South America.
    (c) The Obstacle Database has an area of coverage that includes the United States.

    NOTE: The area of coverage may be modified, as additional terrain data sources become available.

13. The ADF aural identifier must be monitored any time the ADF is used as the primary source of navigation.
14. Display of NEXRAD information on the NAVIGATION map of the MFD, and the inset map on the PFD, is prohibited for ranges of 30 NM or less, except in North Up display mode.

2.3 AIRSPEED MARKINGS

Marking	IAS	Significance
Red band	20 KIAS – 53 KIAS	Low speed awareness – stall is imminent
Yellow band	53 KIAS – 58 KIAS	Low speed awareness – reduced airspeed margin to stall
White band	58 KIAS – 91 KIAS	Operating range with flaps fully extended
Green band	58 KIAS – 129 KIAS	Normal operating range
Yellow band	129 KIAS – 178 KIAS	Caution range – smooth air only
Red band	178 KIAS and greater	Lower limit of 178 KIAS is the maximum speed for all operations

The airspeed indicator is marked in IAS values.

2.5 ENGINE INSTRUMENT MARKINGS

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

NOTE

When an indication lies in the upper or lower prohibited range, the legend for that display will change to the color of the prohibited range and will begin flashing as well.

Indication	Red arc or bar = Lower prohibited range	Yellow arc or bar = Caution range	Green arc or bar = Normal operating range	Yellow arc or bar = Caution range	Red arc or bar = Upper prohibited range
Manifold Pressure In. – Hg *Note 2*	--	--	13 – 30	--	--
RPM	--	--	500 – 2700	--	>2700 *Note 3*
Oil Temp °F	--	--	149 – 230	231 - 245	>245
Cylinder Head Temp °F	--	--	150 – 475	476 – 500	>500
Fuel Press PSI (DA 40) *Note 4*	0 – 14	--	14 – 35	--	>35
Oil Press PSI	0 – 25	25 - 55	56 – 95	96 - 97	>97
Fuel flow Gal/hr	--	--	1 – 20	--	>20
Voltage Volts	0 – 24.1	24.1 – 25	25.1 – 30	30.1 – 32	>32
Amperage Amps	--	--	2 – 75	--	--
Fuel quantity US gal Standard Tanks	0	--	<0 – 17	--	--
Fuel quantity US gal Long Range Tanks	0	--	<0 – 16 19 – 24	--	--

Note 2: Not applicable to DA 40 F. Manifold Pressure gauge is not installed in the DA 40 F.

Note 3: To prevent nuisance alerts during normal takeoffs, the legend "RPM" and digits will not turn red or flash until the RPM exceeds 2780.

Note 4: Fuel Pressure Gauge is optional for DA 40 aircraft.

2.6 WARNING, CAUTION AND STATUS MESSAGES

The following tables show the color and significance of the warning, caution, and advisory messages which may appear on the G1000 displays.

NOTE

The G1000 Cockpit Reference Guide and the G1000 Pilot's Guide contain detailed descriptions of the annunciator system and all warnings, cautions and advisories.

Warning annunciations – Red	
Annunciation	**Cause**
OIL PRES LO	Oil pressure is less than 25 psi
FUEL PRES LO (DA40 Only)	Fuel pressure is less than 14 psi
FUEL PRES HI (DA 40 Only)	Fuel pressure is greater than 35 psi
ALTERNATOR	Alternator failure
STARTER ENGD	Operation of the starter without the key in the start position, or failure of the starter motor to disengage from the engine after starting
DOOR OPEN	Front canopy and/or rear door not completely closed and locked
TRIM FAIL	Failure of the automatic trim system of the autopilot (if installed)
Caution annunciations – Yellow	
Annunciation	**Cause**
PITOT OFF	Pitot heat is not switched on
PITOT FAIL	Fault in the pitot heating system
L FUEL LOW	Fuel quantity in the left tank is less than 3 US gal (±1 US gal)
R FUEL LOW	Fuel quantity in the right tank is less than 3 US gal (±1 US gal)
LOW VOLTS	On-board voltage below 24 volts

Advisory annunciations – White	
Annunciation	**Cause**
PFD FAN FAIL	The cooling fan for the PFD is inoperative.
MFD FAN FAIL	The cooling fan for the MFD is inoperative.
GIA FAN FAIL	The cooling fan for the GIA is inoperative.

2.13 KINDS OF OPERATION

Minimum operational equipment (serviceable)

Equipment	Number installed	VFR Day	VFR Night	IFR
Primary Flight Display	1	1	1	1
Multi-Function Display	1	1	1	1
Audio panel	1	1	1	1
Air data computer	1	1	1	1
Attitude and Heading Reference System	1	-	1	1
Static dischargers	7	-	-	7
GPS	2	-	1	2

2.14 FUEL

Fuel Quantity: Total fuel quantity:
- Standard Tanks: 2 x 20.6 US gal (approx. 156 liters)
- Long Range Tanks: 2 x 24.0 US gal (approx. 185 liters)

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

Max. Indicated Fuel Quantity:
- Standard Tanks: 17 US gal per tank
- Long Range Tanks: 24.0 US gal per tank

Max. permissible difference between right and left tank:
- Standard Tanks: 10 US gal (approx. 38 liters)
- Long Range Tanks: 8 US gal (approx. 30.3 liters)

2.15 Limitation Placard

Below the MFD, next to the fuel quantity indication:

Standard Tanks

Fuel qty. Indication: max 17 US gal
Max. difference LH/RH tank: 10 US gal
For use of max. tank capacity see AFM

Long Range Tanks

Fuel qty. Indication: max 24 US gal
Refer to AFM to use entire tank capacity
Max. difference LH/RH tank: 8 US gal

SECTION III
EMERGENCY PROCEDURES

GENERAL

1. If Garmin G1000 GPS navigation information is not available or invalid, utilize remaining operational navigation equipment as required.
2. If the "POSN ERROR" annunciation is displayed the system will flag and no longer provide GPS based navigational guidance. The crew should revert to the G1000 VOR/ILS receivers or an alternate means of navigation other than the G1000 GPS receivers.
3. If the "RAIM UNAVAIL" 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.
4. If the "RAIM UNAVAIL" annunciation is displayed while on the final approach segment, GPS based navigation will continue for up to 5 minutes with approach CDI sensitivity (0.3 nautical mile). After 5 minutes the system will flag and no longer provide course guidance with approach sensitivity. Missed approach course guidance may still be available with 1 nautical mile CDI sensitivity and integrity by executing the missed approach.
5. In an in-flight emergency, depressing and holding the Com transfer button 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.
6. The following warnings and cautions appear in various locations on the PFD or MFD.

Annunciation	Cause
AHRS Aligning – Keep Wings Level	Attitude and Heading Reference System is aligning. Keep wings level using standby attitude indicator.
ATTITUDE FAIL	Display system is not receiving attitude reference information from the AHRS; accompanied by the removal of sky/ground presentation and a red X over the attitude area.
AIRSPEED FAIL	Display system is not receiving airspeed input from the air data computer; accompanied by a red X through the airspeed display
ALTITUDE FAIL	Display system is not receiving altitude input from the air data computer; accompanied by a red X through the altimeter display
VERT SPEED FAIL	Display system is not receiving vertical speed input from the air data computer; accompanied by a red X through the vertical speed display
HDG	Display system is not receiving valid heading input from the AHRS; accompanied by a red X through the digital heading display
Red X	A red X through any display field, such as com frequencies, nav frequencies, or engine data, indicates that display field is not receiving valid data.
INTEG	RAIM is not available.
WARN	RAIM position warning – nav deviation bar removed

3.2.3 ENGINE PROBLEMS IN FLIGHT

(h) High Fuel Flow - (DA 40 only)

Fuel flow in red sector

1. Fuel pressure .... check for red FUEL PRESS LO message

   - If fuel pressure is low (FUEL PRESS LO message), there is possibly a leak (between the injection system and the injectors). Land at the nearest available airport.

   - If there is no FUEL PRESS LO message, there is no leak; the likely cause is a defective fuel flow indication, which should thus be ignored (the airplane should be serviced). Fuel flow data should be taken from the engine performance table in Chapter 5 of the AFM.

(g) High Fuel Flow – (DA 40 F only)

1. Fuel Quantity .... Check and Monitor
2. Power Setting .... Check

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

NOTE

Have the airplane inspected before next flight.

3.3.3 SMOKE AND FIRE IN FLIGHT

(b) Electrical fire with smoke in flight

3. Emergency switch .... ON if installed

CAUTION

Switching OFF the master switch (ALT/BAT) will lead to total loss of all electronic and electric equipment, including the AHRS and attitude display.

However, by switching the HORIZON EMERGENCY switch ON, the emergency battery will supply power to the standby 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.

4. Master switch (ALT/BAT) .... OFF
5. Cabin heat .... OFF
6. Emergency window(s) .... OPEN
7. Use standby instruments for airspeed, altitude and attitude reference, if necessary
8. Land at the nearest suitable airport as soon as possible

   If electronic or avionics equipment is required for continued flight, the following procedure may be used to isolate the source of the smoke or fumes:

7. BATtery switch .... ON
8. ESS BUS switch .... ON

NOTE

This removes power from the main and avionics busses, but does not allow alternator operation. See the table at the end of this section for the equipment which is still available.

If smoke or fumes decrease:

9. Land at the nearest suitable airport as soon as possible

If smoke or fumes persist:

10. ALTernator switch .... ON
11. ESS BUS switch .... OFF
12. BATT and ESS TIE circuit breakers .... PULL

    This removes power from the essential bus and restores power to the main and avionics busses. See the table at the end of this section for the equipment which will still be available.

13. Use standby instruments for attitude, airspeed and altitude
14. Refer to Section 3.7.2 (b) of this Supplement, Alternator Failure
15. Land at the nearest suitable airport as soon as possible

The equipment available on **Essential Bus** only (operating on battery only and the Essential Bus switch selected) is:

Air Data Computer (airspeed, altitude, vertical speed, OAT, TAS)
Attitude and Heading Reference System (attitude, heading)
PFD (in composite mode)
Pitot Heat
Flaps
Com 1
GPS/Nav 1
Transponder
Landing light
Instrument flood lights
Engine instruments
Starter

Refer to the "Essential Bus" area of the circuit breaker panel for a quick reference to equipment on the Essential Bus.

Equipment available on the **Main and Avionics Busses** only:

Com 2
GPS/Nav 2
MFD
Electric fuel pump
Instrument lights
Strobe lights

Position lights
Taxi light

Refer to the "Main Bus" and "Avionics Bus" areas of the circuit breaker panel for a quick reference to equipment on those busses.

3.7.1 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. Air distribution lever .... ▲(UP)
5. RPM .... increase, in order to prevent ice build-up on the propeller blades
6. Alternate Air (**DA 40 only**) .... OPEN
6a Carburetor Heat (**DA 40 F only**) .... HOT
7. Emergency window(s) .... open if required

CAUTION

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

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

CAUTION

When the pitot heating fails (yellow PITOT FAIL annunciation), and the alternate static valve is installed:

9. Alternate static valve .... OPEN
10. Emergency window(s) .... close

3.7.2 FAILURES IN THE ELECTRICAL SYSTEM

(b) Alternator failure

An alternator failure is indicated by a red ALTERNATOR message and an ammeter indication of 0 Amps.

1. Circuit breakers.. Check in
2. ALTernator switch.. OFF, then ON

If alternator does not come back on line (message extinguishes and ammeter indication greater than zero):

3. ESS BUS switch.. ON
4. Switch off any non-essential electrical loads.
5. Land within 30 minutes

If PFD attitude information is lost prior to landing:

6. HORIZON EMERGENCY Switch.. ON

CAUTION

The following items are available on the Essential Bus:

- PFD in composite (backup) format
- NAV/COM 1
- GPS 1
- Attitude and Heading Reference System (AHRS)
- Air Data Computer
- Pitot heat
- Engine instruments
- Transponder
- Flood light
- Landing light

Refer to the ESSENTIAL BUS area of the circuit breaker panel for a quick reference to equipment on those busses. These items of equipment can be supplied with power by the battery for at least 30 minutes. During this 30-minute period, the airplane must be landed at a suitable airport. Economical use of electrical equipment, in particular of pitot heat, and switching off equipment that is not needed extends the time during which the other equipment remains available.

For cases in which the battery capacity is not sufficient to reach a suitable airport, an emergency battery is installed to power the standby attitude gyro and floodlight. This battery is switched on with the HORIZON EMERGENCY Switch. It provides power for 1 hour and 30 minutes when the floodlight is switched on.

3.8 AVIONICS EMERGENCIES

3.8.1 PFD OR MFD DISPLAY FAILURE

a) DISPLAY BACKUP button on audio panel..PUSH

3.8.2 AHRS FAILURE

NOTE

A failure of the Attitude and Heading Reference System (AHRS) is indicated by 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, magnetic compass and Navigation Map
2. Course.. Set using digital window

3.8.3 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
2. Land as soon as practical at a suitable airport

3.8.4 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 that 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 from Table 5.3.2 (DA 40) or Charts 5.3.8 (DA 40 F) of AFM for approximate fuel flow values.

4. Use other system information, such as annunciator messages, ENGINE SYSTEM page, and AUX – TRIP PLANNING page to safely complete the flight.

3.8.5 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 the AFM Emergency or Abnormal procedures or the procedures contained in this AFMS.

2. If a display indicates an abnormal condition but no annunciator is present, use other system information, such as engine displays, ENGINE SYSTEM page, GAL REM and FFLOW GPH displays, 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 the AFM Emergency or Abnormal procedures or the procedures contained in this AFMS.

SECTION IVA
NORMAL PROCEDURES

WARNING

The G1000 altitude references (digits and altimeter bug) are included to increase altitude awareness, and are not connected in any way to the KAP 140 autopilot (if installed). Altitude alerter and autopilot functions are accomplished with the altitude set function of the KAP 140 autopilot if installed.

NOTE

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

1. DETAILED OPERATING PROCEDURES

   Normal operating procedures for the G1000 are described in the Garmin G1000 Cockpit Reference Guide and the Garmin G1000 Pilot's Guide.

PRE-FLIGHT INSPECTION

I. Cabin check

a) MET, NAV, Mass & CG .... flight planning complete
b) Airplane documents .... complete and up-to-date
c) Ignition key .... pulled out
d) Front canopy & rear door .... clean, undamaged
e) All electrical equipment .... OFF
f) Circuit breakers .... set in (if one has been pulled, check reason)
g) Engine control levers .... check condition, freedom of movement
   Full travel of throttle,
   Full Travel of RPM (DA 40 only)
   Full Travel of mixture lever
h) Throttle .... IDLE
i) Mixture control lever .... LEAN
j) RPM lever (DA 40 only) .... HIGH RPM
k) Carburetor Heat (DA 40 F only) .... COLD
l) Master switch (BAT) .... ON
m) Fuel Quantity .... check fuel qty. on EIS
   check with fuel qty. measuring device

NOTE

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

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

n) Position lights, strobe light (ACL's) .... check
o) Master switch (BAT) .... OFF
p) Check for loose items .... complete
q) Flight controls and trim .... free to move and correct
r) Baggage .... stowed and secure

NOTE

Refer to DA 40 and DA 40 F AFMs to complete the Walk-around check, visual inspection

BEFORE STARTING ENGINE

1. Preflight inspection .... Complete
2. Rudder pedals .... Adjusted and locked
3. Passengers .... Instructed
4. Safety Harnesses .... All on and fastened
5. Rear door .... Closed and locked
6. Door lock (if installed) .... Unblocked, key removed
7. Front canopy .... Position 1 or 2 ("cooling gap")
8. Canopy lock (if installed) .... Unblocked, key removed
9. Parking brake .... Set
10. Flight controls .... Freedom of movement and proper direction
11. Trim wheel .... T/O
12. Friction device, throttle quadrant .... Adjusted
13. Throttle .... IDLE
14. Mixture control lever .... LEAN
15. RPM lever (DA 40 only) .... HIGH RPM
16. Carburetor heat (DA 40 F only) .... COLD
17. Alternate air (DA 40 only) .... CLOSED
18. Alternate Static Valve .... CLOSED, if installed

19. Avionics master switch .... OFF
20. Essential Bus switch .... OFF

CAUTION

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

21. BATtery switch .... ON
22. Fuel tank selector .... on fullest tank

WARNING

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

Never try to start the engine by hand.

STARTING ENGINE (DA 40 only)

(a) Cold engine

1. Strobe light (ACL)........ ON
2. Electrical fuel pump........ ON, note pump noise (=functional check of pump)
3. Throttle........ 3 cm (1.2 in) forward from IDLE (measured from rear of slot)
4. Mixture control lever........ RICH for 3 – 5 sec, then LEAN
5. Throttle1 cm (0.4 in) forward from .... IDLE (measured from rear of slot)

WARNING

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

CAUTION

Do not overheat the starter motor. Do not operate the starter motor for more than 10 seconds. After operating the starter motor, let it cool off for 20 seconds. After 6 attempts to start the engine, let the starter cool for 30 minutes before further start attempts.

CAUTION

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

When engine starts:

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

WARNING

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

9. ALTernator switch........ ON
10. Ammeter........ Check
11. Fuel pressure........ Check no messages illuminated
12. Annunciator section of PFD........ Check

(b) Warm engine

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

WARNING

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

CAUTION

Do not overheat the starter motor. Do not operate the starter motor for more than 10 seconds. After operating the starter motor, let it cool off for 20 seconds. After 6 attempts to start the engine, let the starter cool for 30 minutes before further start attempts.

5. Ignition switch .... START

When engine starts:

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

WARNING

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

8. Electrical fuel pump .... OFF
9. ALTernator switch .... ON
10. Ammeter .... Check
11. Fuel pressure .... Check no messages illuminated
12. Annunciator section of PFD .... Check

(c) Engine will not start after injection ("flooded engine") Warm engine

1. Strobe light (ACL) .... ON
2. Electrical fuel pump .... ON, note pump noise (=Functional check of pump)
3. Mixture control lever .... LEAN, fully aft
4. Throttle .... at mid position

WARNING

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

CAUTION

Do not overheat the starter motor. Do not operate the starter motor for more than 10 seconds. After operating the starter motor, let it cool off for 20 seconds. After 6 attempts to start the engine, let the starter cool for 30 minutes before further start attempts.

5. Ignition switch .... START
6. Throttle .... pull back towards IDLE when engine starts

When engine starts:

7. Mixture control lever .... rapidly move to RICH
8. Oil pressure .... green arc within 15 sec

WARNING

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

9. ALTernator switch .... ON
10. Ammeter .... Check
11. Fuel pressure .... Check no messages illuminated
12. Annunciator section of PFD .... Check

STARTING ENGINE (DA 40 F only)

(a) Cold engine

1. Strobe light (ACL) .... ON
2. Mixture .... fully RICH
3. Electrical fuel pump .... ON, note pump noise (=functional check of pump)
4. Throttle .... ¼ travel forward from IDLE
5. Prime .... 1 – 4 seconds (electric pump)

WARNING

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

CAUTION

The priming system is not intended for operation in flight.

WARNING

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

CAUTION

Do not overheat the starter motor. Do not operate the starter motor for more than 10 seconds. After operating the starter motor, let it cool off for 20 seconds. After 6 attempts to start the engine, let the starter cool for 30 minutes before further start attempts.

CAUTION

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

6. Starter .... engage

When engine starts:

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

WARNING

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

10. ALTernator switch .... ON
11. Ammeter .... Check
12. Annunciator section of PFD .... Check

(b) Warm engine

1. Strobe light (ACL) .... ON
2. Mixture .... fully RICH
3. Electrical fuel pump .... ON, note pump noise (=functional check of pump)
4. Throttle .... ¼ travel forward from IDLE

WARNING

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

CAUTION

Do not overheat the starter motor. Do not operate the starter motor for more than 10 seconds. After operating the starter motor, let it cool off for 20 seconds. After 6 attempts to start the engine, let the starter cool for 30 minutes before further start attempts.

5. Starter .... engage

When engine starts:

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

WARNING

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

9. ALTernator switch .... ON
10. Ammeter .... Check
11. Annunciator section of PFD .... Check

(c) Engine will not start after priming ("flooded engine")

1. Strobe light (ACL) .... ON
2. Electrical fuel pump .... OFF
3. Mixture .... LEAN, fully aft
4. Throttle .... MAX PWR

WARNING

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

CAUTION

Do not overheat the starter motor. Do not operate the starter motor for more than 10 seconds. After operating the starter motor, let it cool off for 20 seconds. After 6 attempts to start the engine, let the starter cool for 30 minutes before further start attempts.

5. Starter .... engage

When engine starts:

6. Throttle .... pull back towards IDLE when engine fires
7. Oil pressure .... green arc within 15 sec

WARNING

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

8. Throttle .... set 1000 RPM
9. ALTernator switch .... ON
10. Ammeter .... Check
11. Annunciator section of PFD .... Check

BEFORE TAXIING

1. Avionics master switch .... ON
2. Electrical equipment .... On as required
3. Flaps .... UP – T/O – LDG – T/O (indicator and visual check)
4. Flight instruments and avionics .... set, test function, as required
5. (set both altimeters)
6. Flood light .... ON, test function, as required
7. Ammeter .... check, if required increase RPM
8. Fuel tank selector .... change tanks, confirm that engine also runs on other tank (at least 1 minute at 1500 RPM)
9. Pitot heating .... ON, test function – no yellow PITOT FAIL annunciation
10. Pitot heating .... OFF if not required (yellow PITOT OFF annunciation)
11. Strobe lights (ACLs) .... check ON, test function, as required
12. Position lights, landing and taxi lights .... ON, test function, as required

CAUTION

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

13. Throttle .... check, 600 to 800 RPM

BEFORE TAKE-OFF

1. Position airplane into wind if possible
2. Parking brake .... set
3. Safety harnesses .... on and fastened
4. Rear door .... check closed and locked
5. Front canopy .... closed and locked

CAUTION

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

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

6. Door warning light (DOOR OPEN) .... Check no messages illuminated

7. Fuel tank selector .... fullest tank
8. Engine instruments .... in green sector
9. Circuit breakers .... pressed in
10. Fuel pressure .... Check no messages illuminated
11. Electric fuel pump .... ON
12. Mixture control lever .... RICH (below 5000 ft)

NOTE

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

13. Flaps .... check T/O
14. Trim .... check T/O
15. Flight controls .... free movement, correct sense
16. Throttle .... 2000 RPM (DA 40)
    1800 RPM (DA 40 F)
17. Magneto check .... L-BOTH-R-BOTH
    Max. RPM drop .... 175 RPM
    Max. difference .... 50 RPM

CAUTION

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

18. RPM lever (DA 40 only) .... pull back until a drop of max. 500 RPM is reached – HIGH RPM; Cycle 3 times

18a Carburetor Heat (DA 40 F only) .... check function
18b Throttle (DA 40 F only) .... MAX PWR, minimum 2200 RPM

NOTE (DA 40 F only)

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

19. Throttle .... set 1000 RPM
20. Carburetor Heat (DA 40 F only) .... check COLD
21. Alternate Air (DA 40 only) .... check CLOSED
22. Parking brake .... release
23. Landing light .... ON as required

SECTION IVB
ABNORMAL PROCEDURES

4B.3 FAILURES IN THE ELECTRICAL SYSTEM

(a) Low voltage caution (LOW VOLTS)

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

Possible reasons are:

-A fault in the power supply

-RPM is too low

(i) Low voltage on the ground:

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

If the caution message does not extinguish, and the ammeter legend flashes and reads zero, discontinue the flight.

(ii) Low voltage caution during flight:

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

If the caution message does not go out, and the ammeter legend flashes and reads zero, follow procedure 3.7.2(b) – Alternator Failure, in this Supplement.

(iii) Low voltage caution during landing:

-Follow (i) after landing

SECTION V
PERFORMANCE

No change.

SECTION VI
WEIGHT AND BALANCE

See current weight and balance data.

SECTION VII
SYSTEM DESCRIPTIONS

The Garmin G1000 Integrated Avionics System consists of a Primary Flight Display (PFD), a Multi-Function Display (MFD), an Audio Panel, and Attitude and Heading Reference System (AHRS), an Air Data Computer (ADC), and the sensors and computers to process flight and engine information for display to the pilot. The system contains dual GPS receivers, dual VOR/ILS receivers, dual VHF communications transceivers, a transponder, an Automatic Direction Finder (ADF) receiver, Distance Measuring Equipment (DME), and an integrated annunciation system to alert the pilot of certain abnormal conditions.

The Primary Flight Display (PFD) 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 acknowledgement
- 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 the Emergency or Abnormal Procedures Sections of the AFM or this Supplement for the appropriate procedure to follow for each message.

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 (if applicable).

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.

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.

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.

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 aircraft is in motion, but will align more quickly if the wings are kept level during the alignment process.

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.

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.

Refer to the Garmin G1000 Cockpit Reference Guide for descriptions of the G1000 system and operating procedures. Refer to the following table to determine the appropriate guide. The System Software Version number is displayed at the top, right side of the MFD Power-up page. DA 40 F requires System Software Version 0369.07 or later FAA approved software.

<table>
<tr><th>System Software Version</th><th>Pilot's Guides</th></tr>
<tr><td>0369.04</td><td>Garmin G1000 Cockpit Reference Guide (CRG)
P/N 190-00324-00, dated May, 2004 or later appropriate revision</td></tr>
<tr><td>0369.06</td><td>Garmin G1000 Cockpit Reference Guide (CRG)
P/N 190-00324-01, dated February, 2005 or later appropriate revision</td></tr>
<tr><td>0369.07</td><td rowspan="2">Garmin G1000 Cockpit Reference Guide (CRG)
P/N 190-00324-03, dated June, 2005 or later appropriate revision</td></tr>
<tr><td>0369.08</td></tr>
<tr><td>0369.09</td><td>Garmin G1000 Cockpit Reference Guide (CRG)
P/N 190-00324-04, Revision A or later appropriate revision.</td></tr>
</table>

7.10 FUEL SYSTEM

Fuel Quantity Indication

Each fuel tank has a capacity probe that ascertains fuel quantity in that tank. Standard Tank configurations have two fuel probes, one in each wing. Long Range Tank configurations have four fuel probes, two in each wing, an outboard tank and an inboard tank. When the fuel quantity indicator reads zero, only unusable fuel remains in the tank. Usable capacity of each tank for the Standard Tank configuration is 20 US gal (76 liters). Usable capacity of an outboard and inboard tank for the Long Range Tank configuration is 24 US gal (91 liters).

Fuel quantity:

Fuel quantity indicating for the Standard Tank configuration functions as described in the DA 40 AFM. Also, refer to the 'G1000 Pilot's Guide for the Diamond DA 40' for additional information about the functionality of the G1000's fuel quantity gauge.

For the Long Range Tank configuration, dual pointers on a linear scale, a top pointer for the left fuel quantity and a bottom pointer for the right fuel quantity indicate fuel quantity. The fuel quantity gauge is marked in five gallon increments starting at zero to 25 US gal. The break in the green band between 16 and 19 US gal shows the ungauged portion of the fuel tanks usable fuel.

When a fuel tank is completely full, the quantity pointer will indicate 24 US gallons. As fuel is consumed from the tank, the pointer will move to the left. Once there is no more measurable fuel in the outboard tank, the pointer migrates over a 30 second period to the 16 US gal position. The pointer will remain at 16 US gallons while the ungauged fuel quantity is consumed. Once the quantity of fuel remaining in the inboard tank is less than 16 gallons, the pointer will begin moving left towards zero. When either pointer enters the amber portion of the scale, the pointer and the gauge title, 'FUEL QTY GAL', will turn amber. When either pointer enters the red portion of the gauge, the pointer will turn red, and the gauge title, 'FUEL QTY GAL', will turn red and flash continuously in inverse video.

FAA APPROVED

AIRPLANE FLIGHT MANUAL SUPPLEMENT

FOR

GARMIN GFC 700 AUTOMATIC FLIGHT CONTROL SYSTEM

IN A DIAMOND DA-40 / DA40F

Reg. No. N216DG S/N 40.698

This Supplement must be attached to the FAA Approved Airplane Flight Manual when the GARMIN GFC 700 Automatic Flight Control System (AFCS) is installed in accordance with STC# SA01389WI.. The information contained herein supplements the information of the basic Airplane Flight Manual. For Limitations, Procedures and Performance information not contained in this Supplement, consult the basic Airplane Flight Manual.

FAA APPROVED

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SECTION I – GENERAL

1. The GFC 700 Automatic Flight Control System (AFCS) is a 2 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 coupling to VOR (VAPP) or localizer (LOC) and glideslope (GS); Back Course (BC) tracking; 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 GIAs, 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 throttle-mounted GA (Go-Around) switch, and PFD/MFD-mounted altitude preselect, heading, and course knobs.

2. 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 system is operated by a split switch on the pilot's control stick.

3. 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).

4. 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

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

- Depressing the red AP DISC button on the pilot'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 throttle
- Pulling the AFCS circuit breaker
- Turning off the AVIONICS MASTER switch
- Turning off the airplane Master (ALT/BAT) 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.

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6. Power to the GFC 700 autopilot and electric trim system is supplied through the AVIONIC MASTER switch and the AFCS circuit breaker. The AVIONIC MASTER switch can be used as an additional means to disable the autopilot and electric trim system.

7. 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.

8. Maximum altitude loss due to autopilot, Flight Director or AHRS malfunctions:

MANEUVER	ALTITUDE LOSS
Climb, Cruise, Descent	200 feet
Maneuvering	115 feet
Approach	130 feet

9. 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 AFCS CIRCUIT BREAKER, UNTIL THE CAUSE OF THE MALFUNCTION HAS BEEN DETERMINED AND CORRECTED.

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SECTION II – LIMITATIONS

General Limitations:

1. The Garmin G1000 Cockpit Reference Guide for Diamond DA-40, P/N 190-00324-05, Rev A or later appropriate revision must be immediately available to the flight crew.

2. The GFC 700 must utilize the following or later FAA approved software versions:

Sub-System	Software Version
PFD	6.10
MFD	6.10
GMA 1347	2.08
AHRS	2.03
GDC	2.05
GIA	4.30
GPS	3.01
GSA	2.06

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

3. The GFC 700 AFCS preflight 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.

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

5. The autopilot must be off during takeoff and landing.

6. Autopilot maximum engagement speed – 165 KIAS
   Autopilot minimum engagement speed – 70 KIAS
   Electric Trim maximum operating speed – 178 KIAS

7. Maximum fuel imbalance with autopilot engaged – 8 US gallons (Long range tank configuration)
   10 US gallons (Standard tank configuration)

8. The autopilot must be disengaged below 200 feet AGL during approach operations and below 800 feet AGL during all other operations.

9. ILS approaches using the GFC 700 autopilot/flight director are limited to Category I approaches only.

10. CDI mode sequencing (GPS-to-ILS) must be set to manual for instrument approaches conducted with the autopilot coupled.

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SECTION III – EMERGENCY PROCEDURES

Some emergency situations require immediate memorized corrective action. These numbered steps are printed in boxes within the emergency procedures and should be accomplished without the aid of the checklist.

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 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.

1. AP DISC Switch .... DEPRESS AND HOLD while grasping control stick firmly
2. Aircraft Attitude .... MAINTAIN/REGAIN AIRCRAFT CONTROL, use standby attitude indicator if necessary

3. Pitch Trim .... RETRIM if necessary, using the trim wheel
4. AP 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.

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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.

AUTOPILOT OVERSPEED RECOVERY (Yellow MAXSPD on PFD)

1. Throttle.. REDUCE

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.

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 aircraft 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)

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AUTOPILOT OUT OF TRIM (Yellow ←AIL, →AIL, ↑ELE, or ↓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. Aircraft Attitude........................MAINTAIN/REGAIN AIRCRAFT CONTROL,
use standby attitude indicator if necessary

3. Pitch Trim..RETRIM if necessary, using the trim wheel
4. AFCS 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.

For ←AIL, →AIL Indication:

1. Rudder Trim...VERIFY slip/skid indicator is centered

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 arrow pointing to the right 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 re-established

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

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

FAILURE OF THE PREFLIGHT TEST (Red boxed PFT on PFD)

1. AFCS Circuit Breaker... PULL

WARNING

DO NOT ATTEMPT TO ENGAGE THE AUTOPILOT OR OPERATE THE MANUAL ELECTRIC TRIM UNTIL THE CAUSE OF THE MALFUNCTION HAS BEEN CORRECTED.

NOTE

When the AFCS circuit breaker is pulled, the PFT FAIL annunciation will be removed and the autopilot and manual electric trim will be unavailable. Do not reset the circuit breaker unless the airplane is on the ground.

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SECTION IV – NORMAL PROCEDURES

NOTE

Normal operating procedures for the GFC 700 are described in the Garmin G1000 Cockpit Reference Guide and the Garmin G1000 Pilot's Guide.

BEFORE STARTING ENGINE

NOTE

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

1. Aircraft Master Switch (ALT/BAT) .... ON
2. AVIONIC MASTER switch .... ON
3. Primary Flight Display (PFD) .... NO AUTOPILOT ANNUNCIATIONS
4. Autopilot Disconnect Tone ....NOTE

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AFTER TAKEOFF

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 AIRCRAFT 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.

NOTE

The NOSE UP and NOSE DN buttons on the mode controller on the MFD are referenced to aircraft 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.

CLIMB, CRUISE and DESCENT:

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 1,500 ft/min climb and 3,000 ft/minute descent. Use engine power to maintain appropriate aircraft 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.

Flight Level Change (FLC):
1. Altitude Preselect .... SET to desired altitude
2. Mode Controller .... SELECT FLC on mode controller
3. Airspeed 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.

Altitude Hold (ALT):
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.

Altitude Hold (ALT):
To maintain a desired altitude:
1. Altimeter Setting .... ADJUST TO APPROPRIATE VALUE
2. Reaching desired altitude .... SELECT ALT on mode controller
3. Green ALT .... VERIFY on PFD

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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.

APPROACH:

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
7. Airspeed .... MAINTAIN 80 KIAS OR GREATER (Recommended)

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.

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 annunciations..............................NOTE on PFD
6. Airspeed .... MAINTAIN 80 KIAS OR GREATER (Recommended)

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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.

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
7. Airspeed .... MAINTAIN 80 KIAS OR GREATER (Recommended)

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
7. Airspeed .... MAINTAIN 80 KIAS OR GREATER (Recommended)

GO AROUND

1. Control Stick.. GRASP FIRMLY
2. GA button ....PUSH – Verify GA/GA on PFD in lateral and vertical mode fields
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 modes on mode 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.

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SECTION V – PERFORMANCE

No change.

SECTION VI – WEIGHT AND BALANCE

No change. See current weight and balance data for aircraft weight and balance information.

SECTION VII – SYSTEM DESCRIPTIONS

The GFC 700 Automatic Flight Control system (AFCS), as installed in the Diamond DA-40, 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). 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 throttle 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 the 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

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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 Pilot's Guide for the Diamond DA-40, Garmin P/N 190-00592-01 Rev. A, or later revision, for a complete description of the GFC 700 system and operating procedures.

SECTION VIII – HANDLING AND SERVICE

No change.

FLIGHT MANUAL SUPPLEMENT - RYAN INTERNATIONAL 9900BX TAS SYSTEM - DIAMOND DA40 AIRCRAFT

		DATE
PREPARED	G. Brander	24 NOV 05
CHECKED	T.Smith	24 Nov 05
APPROVED	R. Gow	24 Nov 05

REVISION LOG

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A	G.Brander	ALL	Normal Procedures revised	23 JAN. 2006	2005-12-22

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Chapters 1 to 8 inclusive of this document comprise the approved Flight Manual Supplement. Compliance with Chapter 2, "Operating Limitations", is mandatory.

The information and data contained in this document supersedes or supplements that contained in the basic Approved Flight Manual for the Diamond DA-40 only in the areas listed herein. For Limitations, Procedures and Performance data not contained in this supplement refer to the Approved Flight Manual or other applicable Approved Flight Manual Supplements.

This Supplement must be attached to the Approved Flight Manual for the aircraft with the subject design change incorporated.

CHAPTER 1 - GENERAL

(NON-APPROVED CHAPTER)

1.1 INTRODUCTION

The Ryan 9900BX Traffic Advisory System (TAS) monitors the airspace surrounding your aircraft by interrogating the transponders of intruding aircraft. If the intruder is reporting Mode C altitude, the interrogation reply enables the 9900BX to compute the following information: Range between your aircraft and the intruder, relative bearing to the intruder, and relative altitude of the intruder. For non-Mode C reporting aircraft the 9900BX computes relative range and bearing only. The 9900BX does not detect aircraft without operating transponders.

The 9900BX consists of the following equipment:

- Ryan 9900BX Processor installed in the aft equipment bay,
- TAS top antenna mounted on the upper fuselage surface aft of the cabin area,
- TAS bottom antenna mounted on the lower wing surface on the aircraft centreline.
- Transponder Coupler installed in the aft equipment bay
- TRAFFIC/MUTE annunciator switch installed above the pilots instrument panel.
- Bright/Dim switch installed adjacent to the annunciator.

The 9900BX monitors altitude and range differences between your aircraft and that of intruders out to a range of 10 nautical miles and provides the flight crew with aural warnings when the calculated time to Closest Point of Approach (CPA) meets certain thresholds.

The 9900BX, when connected to the Garmin G1000 multifunction display (MFD), will display additional intruder information on the MFD.

The TRAFFIC/MUTE annunciator switch performs two functions. The TRAFFIC annunciator light displays an Amber TRAFFIC annunciation when a current traffic advisory exists. By depressing the MUTE switch once aural traffic advisory messages are muted. By double pressing the switch, the 9900BX will repeat the last advisory or annunciate **"NO ADVISORY"** if no current advisories exist.

1.5 DEFINITION AND ABBREVIATIONS

(f) <u>Designation of the circuit breakers on the instrument panel</u>

AVIONICS:

TAS	Ryan 9900BX Traffic Advisory System

23 JAN. 2006

CHAPTER 2 - OPERATING LIMITATIONS

(APPROVED CHAPTER)

2.6 WARNING CAUTION AND STATUS LIGHTS

Colour and significance of the caution lights (Amber)

Caution Light (Amber)	Meaning
TRAFFIC	The calculated time to closest approach of the intruder aircraft is < 30 seconds. Conduct a visual search for the intruder. If successful, maintain visual acquisition to ensure safe separation.

2.16 OTHER LIMITATIONS

The following pilots handbooks should be referred to for operating instructions and must be kept accessible to the flight crew at all times.

a) Ryan 9900BX Pilots Operating Handbook (part # 32-2352, rev 3 or later)

b) Garmin G1000 optional equipment addendum part# 190-00470-00 rev C or later (for aircraft fitted with the Garmin G1000 integrated avionics system), or

c) Garmin GNS-400/500 series display interfaces pilots guide addendum part# 190-00140-10 rev D or later (for aircraft fitted with Garmin GNS-430/530 panel mount avionics).

This AFM supplement is intended for use with 9900BX processor software version 1.XX. Either X may increment from 0 to 9 as released and described in Ryan software change notices. These constitute minor software changes, not operational changes.

23 JAN. 2006

CHAPTER 3 - EMERGENCY PROCEDURES

(NON-APPROVED CHAPTER)

No Change.

CHAPTER 4A - NORMAL OPERATING PROCEDURES

(NON-APPROVED CHAPTER)

4A.1 INTRODUCTION

The following pilots handbooks should be referred to for operating instructions and must be kept accessible to the flight crew at all times.

a) Ryan 9900BX Pilots Operating Handbook (part # 32-2352, rev 3 or later)
b) Garmin G1000 optional equipment addendum part# 190-00470-00 rev C or later (for aircraft fitted with the Garmin G1000 integrated avionics system), or
c) Garmin GNS-400/500 series display interfaces pilots guide addendum part# 190-00140-10 rev D or later (for aircraft fitted with Garmin GNS-430/530 panel mount avionics).

Additional information regarding the AIR/GROUND mode logic function that is not included in the 9900BX Pilot's Operating handbook is included in the following paragraph.

Double pressing the TRAFFIC/MUTE switch in flight may produce a "GROUND MODE" annunciation if the aircraft altitude is less than 1700FT AGL from the departure airfield or the flight time is less than 3 minutes after take-off. This is normal. Once the aircraft reaches approximately 1700FT AGL or flight time is approximately 3 minutes, "GROUND MODE" should not be annunciated.

4A.3.5 TAXIING

TRAFFIC/MUTE annunciator switch . . . . Double Press

Synthesized voice announcement: **"GROUND MODE" and "NO ADVISORIES".** No other announcements.

4A.3.9 CRUISE

TRAFFIC/MUTE annunciator switch . . . . Double Press

Synthesized voice announcement: **"NO ADVISORIES" (or a repeat of any current traffic advisories).** No other announcements.

23 JAN. 2006

CHAPTER 4B – ABNORMAL OPERATING PROCEDURES

(NON-APPROVED CHAPTER)

The following pilots handbooks should be referred to for operating instructions and must be kept accessible to the flight crew at all times.

a) Ryan 9900BX Pilots Operating Handbook (part # 32-2352, rev 3 or later)
b) Garmin G1000 optional equipment addendum part# 190-00470-00 rev C or later (for aircraft fitted with the Garmin G1000 integrated avionics system), or
c) Garmin GNS-400/500 series display interfaces pilots guide addendum part# 190-00140-10 rev D or later (for aircraft fitted with Garmin GNS-430/530 panel mount avionics).

1. **"GROUND MODE" annunciation in flight**

   Discontinue use of 9900BX. Identify and pull TAS circuit breaker

2. **"TCAD INTERROGATOR FAILURE" annunciation in flight**

   Traffic will be announced with bearing and relative height, but not range.

3. **"TCAD CODE" (followed by a number) annunciation in flight**

   Discontinue use of 9900BX. Identify and pull TAS circuit breaker

4. **"TCAD ALTITUDE DATA INVALID" annunciation in flight**

   Discontinue use of 9900BX. Identify and pull TAS circuit breaker

Refer to the Ryan 9900BX pilots operating handbook for further fault indications.

23 JAN. 2006

CHAPTER 5 – PERFORMANCE

(NON-APPROVED CHAPTER)

No Change.

CHAPTER 6 – MASS AND BALANCE / EQUIPMENT LIST
(NON-APPROVED CHAPTER)

6.3 MASS AND BALANCE REPORT

The following weight and moment data may be used to update the mass and balance report to include the Ryan 9900BX system.

Item	Weight (Kg)	Moment Arm (m)
Processor & Coupling	3.33	5.020
Top Antenna	0.298	4.275
Bottom Antenna	0.340	2.650
Wire Harness	1	2.5

6.13 EQUIPMENT LIST AND EQUIPMENT INVENTORY

The following equipment information may be used to update the equipment list to include the Ryan 9900BX system.

Description	Type	Part Number	Manufacturer
TRAFFIC ADVISORY			
Processor	9900BX	70-2420-4	Ryan
Transponder Coupler		70-2040	Ryan
L-Band Antenna	Top Antenna	S72-1750-31L	Sensor Systems
L-Band Antenna	Bottom Antenna	S72-1750-32L	Sensor Systems

23 JAN 2006

CHAPTER 7 – DESCRIPTION OF THE AIRPLANE AND ITS SYSTEMS

(NON-APPROVED CHAPTER)

No Change.

23 JAN. 2006

CHAPTER 8 – AIRPLANE HANDLING, CARE AND MAINTENANCE

(NON-APPROVED CHAPTER)

No Change.

AIRPLANE FLIGHT MANUAL SUPPLEMENT

For Diamond Aircraft Industries GmbH
Model DA 40

with the

Installation of a MTV-12-B/183-59b Propeller and associated Equipment

STC No. SA06-52

DOT Approved DATE: 10 AUG 2006

Kevin BRUCE
for Minister of Transport

Chapters 2, 3, 4A, 4B, 5 and, 6 comprise the Approved Flight Manual Supplement. Compliance with Chapter 2, Operating Limitations, is mandatory.

Chapters 1, 7, 8 and, 9 are Unapproved and are provided for information only.

The information and data contained in this document supersede or supplement that contained in the basic Approved Flight Manual for the Diamond Aircraft Industries GmbH Model DA 40, Doc. No. 6.01.01-E, in those areas listed herein. For limitations, procedures and performance not contained in this document refer to the Approved Flight Manual and other applicable Approved Flight Manual Supplements.

This Supplement is to be attached to Chapter 9 of the Approved Flight Manual for the aircraft with the subject Design Change incorporated.

CHAPTER 1
(Unapproved)
GENERAL

No Change.

CHAPTER 2
(Approved)
OPERATING LIMITATIONS

Change:

2.4 (c)	Max. Take-Off RPM:	2700 RPM
	Max. Continuous RPM:	2700 RPM
2.4 (k)	Propeller designation:	MTV-12-B/183-59b
2.4 (l)	Propeller diameter:	1.83 m (72.05 in)
2.4 (m)	Propeller pitch angle:	11.0° to 30.0° (at 0.75 R)

2.5 ENGINE INSTRUMENTS MARKINGS

"RPM" line in Table shall read:

Green Arc/Bar:	500 - 2700 RPM
Yellow Arc/Bar:	delete 2400 – 2700 RPM
Red Arc/Bar:	> 2700 RPM

CHAPTER 3
(Approved)
EMERGENCY PROCEDURES

No Change.

CHAPTER 4A
(Approved)
NORMAL OPERATING PROCEDURES

4A.3.8 CLIMB

Procedure for best rate of climb

change:

3. RPM lever..2700 RPM

CHAPTER 4B
(Approved)
ABNORMAL OPERATING PROCEDURES

No Change.

CHAPTER 5
(Approved)
PERFORMANCE

No Change.

CHAPTER 6
(Approved)
MASS AND BALANCE

6.5 EQUIPMENT LIST AND EQUIPMENT INVENTORY

Add:

Airplane Serial No.:		Registration:		Date:	
Description	**Type**	**Part No.**	**Manufacturer**	**S/N**	**In-stalled**
PROPELLER	MTV-12-B/183-59b		mt-Propeller		
GOVERNOR (Optional)	P-860-23		mt-Propeller		
AFMS (Airplane Flight Manual Supplement)		Doc No. 6.01.01-CS0601(E)	DAIC		

CHAPTER 7
(Unapproved)
DESCRIPTION OF THE AIRPLANE AND ITS SYSTEMS

7.4 INSTRUMENT PANEL

Note

With the subject Design Change incorporated, the GARMIN G1000 Integrated Avionics System installed in accordance with FAA STC No. SA01254WI may also be used.

7.9 POWER PLANT

7.9.3 PROPELLER

Note

Instead of the original MTV-12-B/180-17 Propeller, an MTV-12-B/183-59b Scimitar Propeller is used. All other information in this Section of the basic AFM concerning the Propeller, are still relevant.

Governor

A Woodward Governor, Model C-210776 or, an mt-Propeller Governor, Model P-860-23, may be installed.

7.9.4 ENGINE INSTRUMENTS

Note

With the subject Design Change incorporated, the Engine Instruments may be those provided by the GARMIN G1000 Integrated Avionics System installed in accordance with FAA STC No. SA01254WI or, those originally Type Certified and Re-Marked in accordance with Diamond Aircraft Industries GmbH OÄM 40-265.

CHAPTER 8
(Unapproved)
AIRPLANE HANDLING, CARE AND MAINTENANCE

No Change.

CHAPTER 9
(Unapproved)

SUPPLEMENTS

Note

Add this Airplane Flight Manual Supplement (AFMS) to Chapter 9 of the Approved Flight Manual for the aircraft with the subject Design Change incorporated.

--- END ---

SUPPLEMENT E6
TO THE AIRPLANE FLIGHT MANUAL
DA 40 & DA 40 D

OPERATION WITH BAGGAGE EXTENSION AND BAGGAGE TRAY

Doc. Nos.	**: 6.01.01-E**
	: 6.01.05-E
Date of Issue of the Supplement	**: 09 Jan 2004**
Design Change Advisories	**: OÄM 40-163, OÄM 40-164**

Signature :	
ACG Project Manager :	AUSTRO CONTROL GmbH Abteilung Flugtechnik Zentrale A-1030 Wien, Schnirchgasse 11
Stamp :	
Date :	23. FEB. 2004

This Supplement has been verified for EASA by the Austrian Civil Aviation Authority Austro Control (ACG) as Primary Certification Authority (PCA) in accordance with the valid Certification Procedures and approved by EASA with approval no. 2004.-1358

DIAMOND AIRCRAFT INDUSTRIES GMBH
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AUSTRIA

0.1 RECORD OF REVISIONS

Rev. No.	Reason	Chap- ter	Pager	Date of revision	EASA Ap- proval No.	ACG Verifica- tion	Date in- serted	Signature

0.2 LIST OF EFFECTIVE PAGES

Chapter	Page	Date
0	9-E6-0	09 Jan 2004
	9-E6-1	09 Jan 2004
	9-E6-2	09 Jan 2004
	9-E6-3	09 Jan 2004
1	9-E6-4	09 Jan 2004
2	9-E6-5	09 Jan 2004
3, 4A, 4B, 5	9-E6-6	09 Jan 2004
6	9-E6-7	09 Jan 2004
	9-E6-8	09 Jan 2004
	9-E6-9	09 Jan 2004
	9-E6-10	09 Jan 2004
	9-E6-11	09 Jan 2004
	9-E6-12	09 Jan 2004
7, 8	9-E6-13	09 Jan 2004

0.3 TABLE OF CONTENTS

Page

1. GENERAL

1.1 INTRODUCTION

This Supplement supplies the information necessary for the efficient operation of the airplane when the Baggage Extension, with or without the Baggage Tray, is installed. The baggage area including the Baggage Extension forms the Extended Baggage Compartment. The information contained within this Supplement is to be used in conjunction with the complete AFM.

This Supplement to the Airplane Flight Manual is a permanent part of the AFM and must remain in the AFM at all times when the Extended Baggage Compartment is installed.

The implementation of the design change advisory OÄM 40-163 is prerequisite for the use of the DA 40 / DA 40 D with the Extended Baggage Compartment. The implementation of the design change advisory OÄM 40-164 is prerequisite for the use of the DA 40 / DA 40 D with the Baggage Tray. The Baggage Tray may not be used without the Extended Baggage Compartment. Baggage cannot be carried unless the baggage net is used.

2. OPERATING LIMITATIONS

2.7 MASS (WEIGHT)

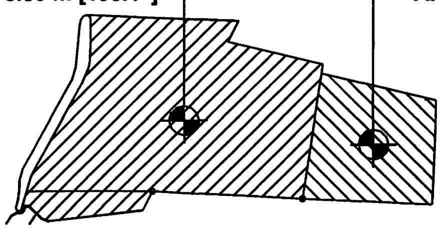
Max. load in forward baggage compartment alone	:	45 kg	100 lb
Max. load in aft baggage compartment alone	:	18 kg	40 lb
Max. load, both baggage compartments together	:	45 kg	100 lb
Max. surface load in baggage compartments	:	75 kg/m²	15 lb/sq.ft.

2.15 LIMITATION PLACARDS

On Baggage Extension:

FORWARD BAGGAGE COMPARTMENT
MAX. 45 kg [100 lb]
ARM: 3.89 m [153.1"]

AFT BAGGAGE COMPARTMENT
MAX. 18 kg [40 lb]
ARM: 4.54 m [178.7"]



MAX. BAGGAGE TOTAL 45 kg [100 lb]
MAX. SURFACE LOAD: 75 kg/m² [15 lb/sq.ft.]
CAUTION: OBSERVE WEIGHT AND BALANCE LIMITATIONS
SEE AIRPLANE FLIGHT MANUAL CHAPTER 6

3. EMERGENCY PROCEDURES

No change.

4A. NORMAL OPERATING PROCEDURES

No change.

4B. ABNORMAL OPERATING PROCEDURES

No change.

5. PERFORMANCE

No change.

6. MASS AND BALANCE

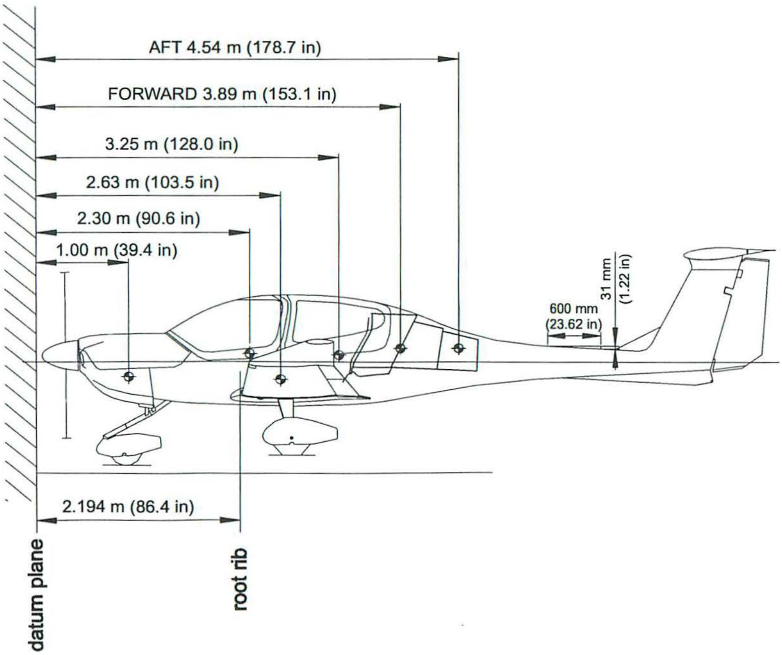
6.1 INTRODUCTION

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

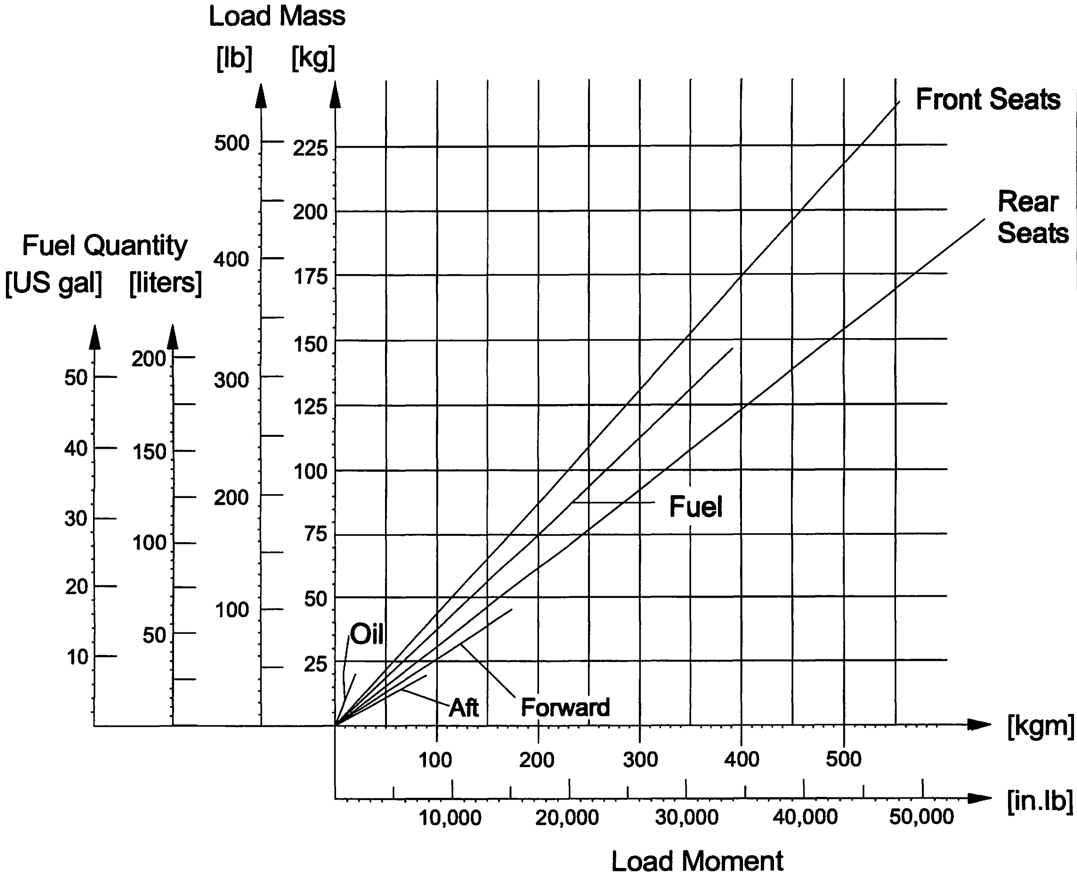
6.4 FLIGHT MASS AND CENTER OF GRAVITY

6.4.1 MOMENT ARMS

- Baggage : see diagram



6.4.2 LOADING DIAGRAM



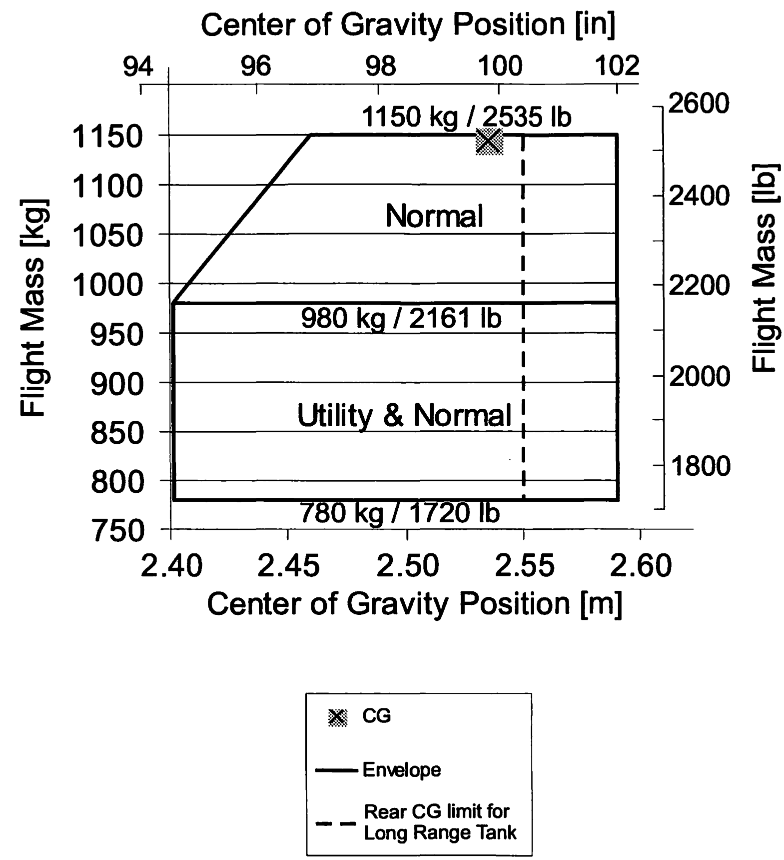
6.4.3 CALCULATION OF LOADING CONDITION

CALCULATION OF LOADING CONDITION	DA 40 (Example)		Your DA 40	
	Mass [kg] *[lb]*	Moment [kgm] *[in.lb]*	Mass [kg] *[lb]*	Moment [kgm] *[in.lb]*
1. Empty mass (from Mass and Balance Report)	781.1 *1722*	1898.1 *164,750*		
2. Oil not added Lever arm: 1.00 m *(39.4 in)*	-1.7 *-3.7*	-1.7 *-146*		
3. Front seats Lever arm: 2.30 m *(90.6 in)*	150 *331*	345 *29,989*		
4. Rear seats Lever arm: 3.25 m *(128.0 in)*	70 *154*	227.5 *19,712*		
5. Forward baggage compt. Lever arm: 3.89 m *(153.1 in)*	25 *55*	97.2 *8,421*		
6. Aft baggage compartment Lever arm: 4.54 m *(178.7 in)*	10 *22*	45.4 *3,931*		
7. Total mass & total moment with empty fuel tanks (Total of 1.-6.)	1034.4 *2280.3*	2611.5 *226,657*		
8. On-board usable fuel (0.72 kg/liter) *(6.01 lb/US gal)* Lever arm: 2.63 m *(103.5 in)*	109.4 *241*	287.7 *24,944*		
9. Total mass & total moment with full fuel tanks (Total 7. plus 8.)	1143.8 *2521.3*	2899.2 *251,600*		

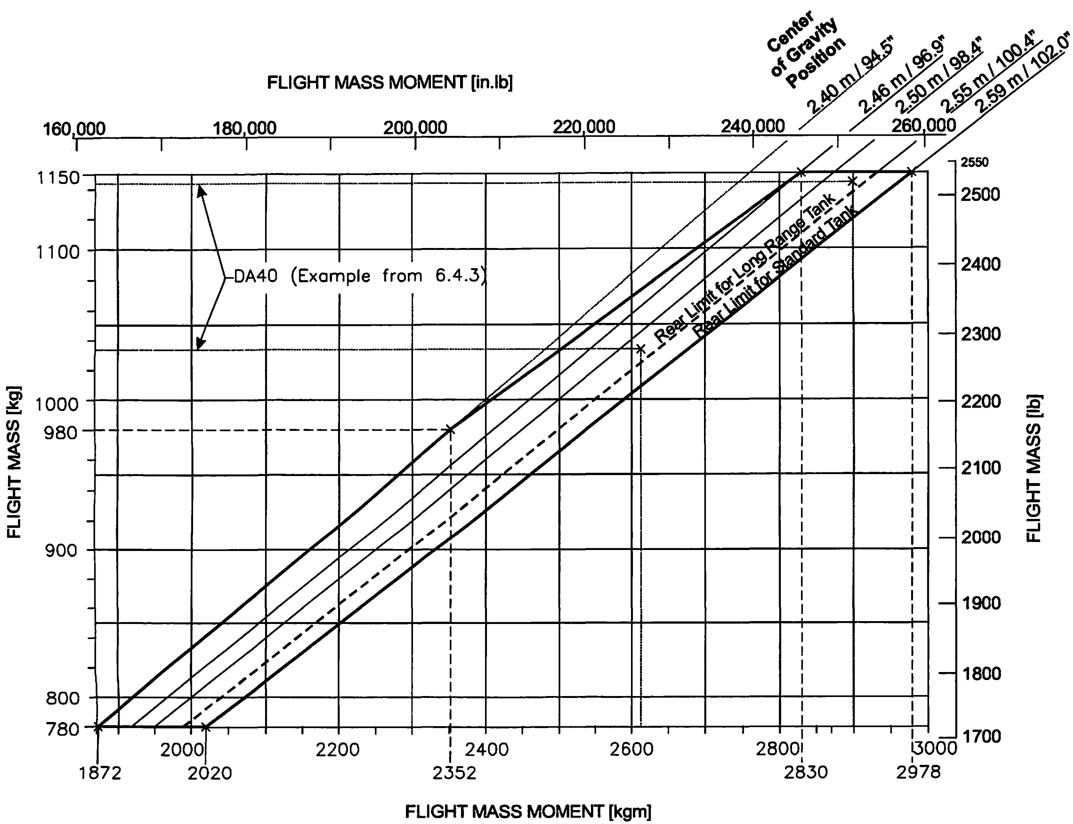
10. The total moments from rows 7 and 9 (2611.5 and 2899.2 kgm) *(226,657 and 251,600 in.lb)* must be divided by the related total mass (1034.4 and 1143.8 kg respectively) *(2280.3 and 2521.3 lb)* and then located in Diagram 6.4.4 'PERMISSIBLE CENTER OF GRAVITY RANGE'.

As in our example CG positions (2.525 m and 2.535 m respectively) *(99.4 and 99.8 in)* and masses fall into the permitted area, this loading condition is allowable.

6.4.4 PERMISSIBLE CENTER OF GRAVITY RANGE



6.4.5 PERMISSIBLE MOMENT RANGE



6.5 EQUIPMENT LIST AND EQUIPMENT INVENTORY

Additional equipment required for the operation with the extended baggage compartment:

* 1 extended baggage extension installed in accordance with OÄM 40-163
* 1 baggage net

Additional optional equipment:

* 1 baggage tray and lid installed in accordance with OÄM 40-164

7. DESCRIPTION OF THE AIRPLANE AND ITS SYSTEMS

7.7 BAGGAGE COMPARTMENT

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

The Baggage Extension has a door that may be hinged up to keep items from sliding aft or hinged down to carry long items. The Baggage Extension also has a removable panel in the bottom to allow access for inspection of the rear fuselage area.

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

Without the baggage net, no baggage may be loaded.

8. AIRPLANE HANDLING, CARE AND MAINTENANCE

No change.

SUPPLEMENT E7
TO THE AIRPLANE FLIGHT MANUAL
DA 40 & DA 40D

OPERATION WITH
VENTILATION INLET BAFFLE

Doc. Nos.	**:**	**6.01.01-E**
	:	**6.01.05-E**
Date of Issue of the Supplement	**:**	
Design Change Advisory	**:**	**OÄM 40-183**

Signature	:	
ACG Project Manager	:	AUSTRO [illegible] GmbH Ab[illegible]
Stamp	:	A-1030 Wien [illegible] 11
Date of Approval	:	1[illegible] 2005

This Supplement has been verified for EASA by the Austrian Civil Aviation Authority Austro Control (ACG) as Primary Certification Authority (PCA) in accordance with the valid Certification Procedures and approved by EASA with approval no. 2005-760.

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0.1 RECORD OF REVISIONS

Rev. No.	Reason	Chapter	Page(s)	Date of Revision	Approval Note	Approval Date	Date Inserted	Signature
1	OÄM 40-183/a	0 0 2	9 - E7 - 1 9 - E7 - 2 9 - E7 - 5	27-Apr-2005		M. Reichel 20. MAI 2005		

0.2 LIST OF EFFECTIVE PAGES

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Page

1. GENERAL

This Supplement supplies the information necessary for the efficient operation of the airplane when the Ventilation Inlet Baffle is installed in the wing. The Ventilation Inlet Baffle reduces the amount of cooling air entering the cabin. It is recommended for use when operating at low outside air temperatures. The information contained within this Supplement is to be used in conjunction with the complete AFM.

This Supplement to the "Airplane Flight Manual DA 40 & DA 40D" is a permanent part of the AFM and must remain in the AFM at all times when the Winter Baffle is installed.

The implementation of the design change advisory OÄM 40-183 is prerequisite for the use of the DA 40 or DA 40 D with the Ventilation Inlet Baffle.

2. OPERATING LIMITATIONS

2.15 LIMITATION PLACARDS

On ventilation inlet baffle:

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

2.16 OTHER LIMITATIONS

2.16.1 TEMPERATURE

The airplane may only be operated with the ventilation inlet baffle installed when the outside air temperature at take-off is does not exceed 15 C (59 F).

3. EMERGENCY PROCEDURES

No change.

4A. NORMAL OPERATING PROCEDURES

4A.3 CHECKLISTS FOR NORMAL OPERATING PROCEDURES

4A.3.1 PRE-FLIGHT INSPECTION

Walk-around visual inspection

Left Wing:

- Verify that the outside air temperature permits the use of the ventilation inlet baffle.
- Check ventilation inlet baffle for improper mounting or obvious damage.

4B. ABNORMAL OPERATING PROCEDURES

No change.

5. PERFORMANCE

No change.

6. MASS AND BALANCE

The mass of the ventilation inlet baffle is negligible. The mass and balance data of the airplane therefore remain unchanged.

7. DESCRIPTION OF THE AIRPLANE AND ITS SYSTEMS

7.4 INSTRUMENT PANEL

Cockpit Ventilation

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.

8. AIRPLANE HANDLING; CARE AND MAINTENANCE

No change.

SUPPLEMENT S1
TO THE AIRPLANE FLIGHT MANUAL DA 40

EMERGENCY LOCATOR TRANSMITTER
MODEL E-01
ACK

Doc. No. : 6.01.01-E
Date of Issue of the Supplement : 26 Sep 2000

Signature :

Authority :

AUSTRO CONTROL GmbH
Abteilung Flugtechnik
Zentrale
A-1030 Wien, Schnirchgasse 11

Stamp :

Date of approval : 02. JULI 2001

This Supplement has been approved for the Joint Aviation Authorities (JAA) by the Austrian Civil Aviation Authority Austro Control (ACG) as Primary Certification Authority (PCA) in accordance with the JAA Certification Procedures of the Joint Aviation Authorities (JAA JC/VP).

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0.1 RECORD OF REVISIONS

Rev. No.	Chapter	Pages	Date of Revision	Date Inserted	Signature
1	alle	alle	20 Apr 2001		

0.2 LIST OF EFFECTIVE PAGES

Chapter	Page	Date
0	9-S1-1	20 Apr 2001
	9-S1-2	20 Apr 2001
	9-S1-3	20 Apr 2001
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3	9-S1-4	20 Apr 2001
	9-S1-5	20 Apr 2001
4A, 4B, 5, 6	9-S1-6	20 Apr 2001
7	9-S1-7	20 Apr 2001
	9-S1-8	20 Apr 2001
	9-S1-9	20 Apr 2001
	9-S1-10	20 Apr 2001
	9-S1-11	20 Apr 2001
8	9-S1-11	20 Apr 2001

0.3 TABLE OF CONTENTS

1. GENERAL

This Supplement supplies the information necessary for the efficient operation of the airplane when the ELT (Emergency Locator Transmitter) ACK Model E-01 is installed. The information contained within this Supplement is to be used in conjunction with the complete AFM.

This Supplement is a permanent part of this AFM and must remain in this AFM at all times when the ELT ACK Model E-01 is installed.

2. LIMITATIONS

No change.

3. EMERGENCY PROCEDURES

Before performing a forced landing, especially in remote and mountainous areas, the ELT transmitter should be activated manually by pressing the ON-button on the RCPI-unit. The red LED on the RCPI-unit should flash.

Immediately after a forced landing where emergency assistance is required, the ELT should be utilized as follows:

CAUTION

The RCPI-unit could be inoperative if damaged during a forced landing. However, turning the ELT OFF and ON again requires manual switching of the main switch which is located on the ELT unit. The following points must then be executed directly on the ELT-unit.

1. ENSURE ELT ACTIVATION:

   - Press the ON-button on the RCPI-unit, even if the LED flashes.
   - If the airplane's radio is operable and can be safely used (no threat of fire or explosion), turn ON and select 121.5 MHz. If the ELT can be heard transmitting, it is working properly.

2. PRIOR TO SIGHTING RESCUE AIRCRAFT:

   - Conserve airplane battery. Do not activate radio transceiver.

3. AFTER SIGHTING RESCUE AIRCRAFT:

   - Press the RESET-button on the RCPI-unit to prevent radio interference. Attempt contact with rescue aircraft with the radio transceiver set to a frequency to 121.5 MHz. If no contact is established, press the ON-button on the RCPI-unit immediately.

4. FOLLOWING RESCUE

   - Press the RESET-button on the RCPI-unit, terminating emergency transmissions.

The ELT may be activated by hard landings or in heavy turbulence. The ELT should then be reset by pressing the RESET-button on the RCPI-unit. Ensure that the ELT does not transmit.

4A. NORMAL OPERATING PROCEDURES

No change.

4B. ABNORMAL OPERATING PROCEDURES

No change.

5. PERFORMANCE

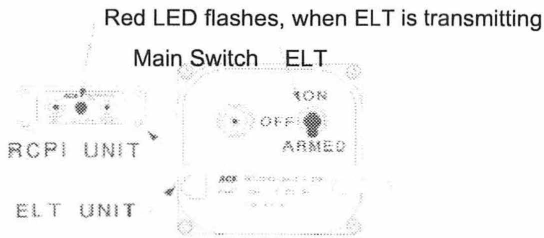
No change.

6. MASS AND BALANCE

Upon removal or installation of the ELT the change of empty mass and corresponding center of gravity of the airplane must be recorded according to Chapter 6 of the Airplane Flight Manual.

7. DESCRIPTION OF THE AIRPLANE AND ITS SYSTEMS

FRONT VIEW



DESCRIPTION

The system consists of a Remote Control (RCPI-Unit, Remote Control Panel/Indicator), installed in the instrument panel, and the Emergency Locator Transmitter-Unit (ELT-Unit), which is installed behind the baggage compartment frame.

An acceleration indicator ('g'-switch) activates the ELT upon sensing a change of velocity, along the airplane´s longitudinal axis. Therefore the Main-Switch of the ELT-Unit must be on the 'ARMED' position. The ELT will transmit a distinctive downward swept tone on the distress frequencies 121.50 MHz and 243.00 MHz. If this signal is being received, it will initiate a search and rescue operations, and is also used as a locating signal. The red LED flashes when the ELT is transmitting.

The ELT can also be manually activated, for example for testing or after an emergency landing. It can be activated either by pushing the ON button on the RCPI-Unit or by positioning the Main switch of the ELT to the ON position.

The 'g'-switch can be reset by pressing the RESET button on the RCPI-Unit or by positioning the Main switch of the ELT to the OFF position.

The ELT-Unit is connected to a antenna which is installed in the airplane. For operation of the ELT outside the airplane, the ELT has also a portable antenna, which is located on the mounting tray.

GENERAL INFORMATION

To prevent a unintended activation of the ELT, the ELT should only be removed and transported when the Main Switch of the ELT is on the 'OFF' position, except in case of emergency.

The ELT might be activated by hard landings or severe turbulence. The ELT should then be reset by pressing the 'RESET' button, and it has to be checked that the ELT is not transmitting any more (see also Function Test).

FLIGHT OPERATION

The Main Switch of the ELT must be on the ARMED position during flight. The ELT is in standby-mode, that means, the ELT can now be activated by the 'g'-Switch. The function test (only during the first five minutes of each hour) gives the pilot the possibility to verify that the ELT is in the 'ARMED'-mode. In 'ARMED'-mode, the ELT has no electric power consumption.

OPERATION ON GROUND AFTER AN ACCIDENT

The operation of the ELT outside the airplane may be necessary after an emergency landing, when the airplane must be left.

At first loosen the interior trim of the baggage compartment frame, which is fixed with velcro fasteners. The ELT is located behind the frame, slightly below, on the right side of the fuselage. Open the mounting tray of the ELT and slide it out of the bracket. Remove the cable from the ELT, and connect the portable antenna. The antenna is fixed on the mounting tray. The ELT transmits the distress signal when the Main Switch is in the 'ON' position. The portable antenna must be fully extended and pointing skyward.

At low temperatures it is recommended in order to obtain the longest operating life, to keep the ELT inside your jacket, with the antenna outside, pointing skyward.

FUNCTION TEST

The following function test must be done every 3 months to verify that the ELT is operating properly. Regulations require that transmitter tests only be done during the first 5 minutes of each hour and must not last for more than 3 audio sweeps (approx. 1.5 seconds).

Note that the batteries are replaced when the transmitter has been in use for more than 1 cumulative hour.

Performing the Test:

- Monitor 121.50 MHz using the airplane´s COM Receiver. Turn the squelch off.
- Press the 'ON'-button on the RCPI-Unit (for maximum 3 sweeps), verify that the red LED flashes. Verify that the audio sweep tone can be heard on the COM Receiver. Push the 'RESET'-button on the RCPI-Unit. The LED should stop flashing and the audio sweep tone should stop. If the LED don´t stop flashing and the audio sweep tone is still hearable, the Main Switch on the ELT-Unit should be set to the OFF position.

CIRCUIT PROTECTION

The ELT is completely independent of the airplane´s electric system. Power for the ELT-Unit is provided by eight batteries, and one battery for the RCPI-Unit. Replacement of the batteries is part of the periodic maintenance.

8. AIRPLANE HANDLING, CARE AND MAINTENANCE

No change.

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Document No.: E509609

FAA APPROVED
AIRPLANE FLIGHT MANUAL SUPPLEMENT

to

PILOT'S OPERATING HANDBOOK AND
FAA APPROVED AIRPLANE FLIGHT MANUAL

for

Diamond Aircraft Industries, Inc.
Model DA 40

Aircraft Reg. No. N216DG **Aircraft S/N:** 40.698

This supplement must be attached to the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual for Diamond Aircraft Model DA 40 when the Airplane is modified by the installation of AmSafe Aviation Inflatable Restraint (AAIR®) System, V23 Version in accordance with STC SA01918LA.

The information contained herein supplements or supersedes the basic manual only in those areas listed herein. For limitations, procedures, and performance information not contained in this supplement, consult the basic Airplane Flight Manual.

FAA APPROVED Patrick Power
Manager, Flight Test Branch, ANM-160L
Federal Aviation Administration
Los Angeles Aircraft Certification Office
Transport Airplane Directorate

DATE September 25, 2006

AmSafe, Inc.
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Document No.: E509609

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AmSafe, Inc.
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AFM Supplement for
AmSafe Aviation Inflatable Restraint System
Diamond Aircraft DA 40
STC SA01918LA

SECTION 1 GENERAL

The AAIR V23 is a self-contained, modular, three-point restraint system that improves protection from serious head-impact injury during a survivable aircraft crash by inclusion of an inflatable airbag within the lapbelt portion of the three-point restraint. An unbuckled restraint airbag will not inflate.

SECTION 2 LIMITATIONS

A child safety seat shall not be installed in any seat equipped with the AAIR V23 Inflatable Restraint System. Child safety seats may be installed in rear passenger seats equipped with AmSafe **standard** restraint P/N 3149-2-021-8157 which does not include an inflatable airbag.

SECTION 3 EMERGENCY PROCEDURES

No Change

SECTION 4 NORMAL PROCEDURES

To activate the system, join (buckle) the three-point restraint in the same manner as any other three-point seatbelt. An empty right front seat or empty rear passenger seat restraint may or may not be buckled at pilot's discretion.

SECTION 5 PERFORMANCE

No Change

SECTION 6 WEIGHT AND BALANCE/EQUIPMENT LIST

The addition of the AAIR System to each seat position has a negligible effect on the weight and balance of the Diamond DA 40 aircraft.

For complete information on the AAIR V23 System effect on weight and balance loading to the aircraft, please refer to AmSafe Aviation's, Weight and Balance Information Report, Document No. E509606.