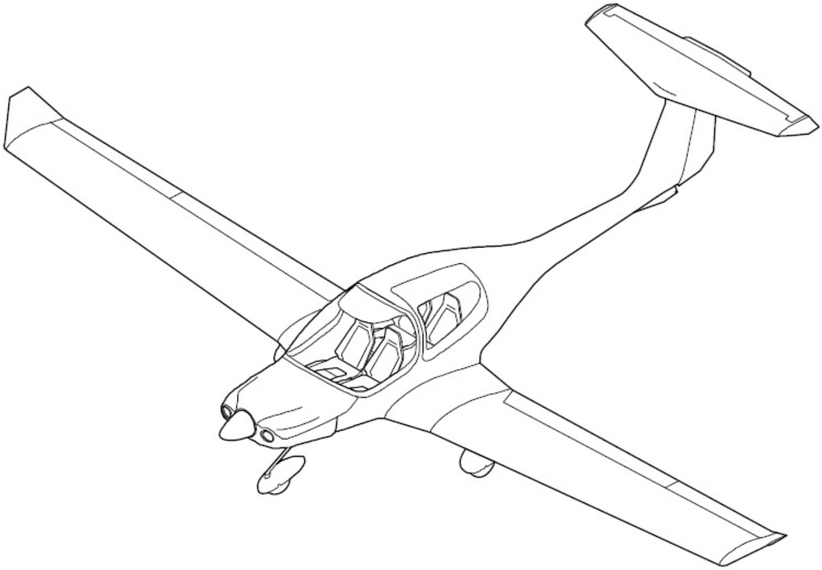
AIRPLANE FLIGHT MANUAL



DA 40-180

Doc. # 6.01.01-E

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

REV 10 **Current issue: 18-Sep-2023**

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

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M. Woloshyn
A/ Chief, Flight Test
for Director, Aircraft Certification Branch
TCCA February 04, 2025

TEMPORARY REVISION

TR-MÄM-40-1203

Door Latching and Locking

This Temporary Revision TR-MÄM-40-1203 is approved in conjunction with the Mandatory Design Change Advisory MÄM 40-1203 and is valid in conjunction with the latest revision of the DA 40 Airplane Flight Manual (AFM), until this temporary revision has been incorporated into the AFM.

The limitations and information contained herein either supplement or, in the case of conflict, override those in the AFM or its previous temporary revisions.

The technical information contained in this document has been approved by Transport Canada.

Doc. No.	Chapter	Affected Page
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	3	3-2a, 3-30a, 3-30b
	4A	4A-5a, 4A-5b, 4A-11a, 4A-21a
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	7	7-15a, 7-16a

Instruction:

– Print this document on yellow paper (single-sided).

– Insert this cover page as the first page of the AFM.

– Insert the other pages of this TR in front of the corresponding AFM pages.

AIRPLANE FLIGHT MANUAL
DA 40

Category of Airworthiness	**: Normal, Utility**
Requirement	**: AWM Chapter 523**
Serial Number	: **40.079**
Registration	: **OE-DGE**
Doc. No.	**: 6.01.01-E**
Date of Issue	**: 18-Sep-2023**
Signature	: DocuSigned by: 2BE2FBE348AE416... Andreas Hartono
Authority	: A/ Chief Flight Test for Director, National Aircraft Certification TRANSPORT CANADA
Date of Approval	: September 19, 2023

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

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

FOREWORD

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

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

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

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

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

0.1 APPROVAL

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

0.2 RECORD OF REVISIONS

All revisions of this manual, with the exception of -

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

must be recorded in the following table.

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

NOTE

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

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

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<tr><td>1</td><td>Corrections</td><td>All</td><td>All</td><td>26-Sep-2000</td><td>Approved by Ing. Andreas</td><td>09-Oct-2000</td><td></td><td></td></tr>
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OÄM 40-058 (Essential Bus)

OÄM 40-073 (LASAR optional)

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<tr><td rowspan="9">3</td><td rowspan="9">OÄM 40-064 (Night VFR)

OÄM 40-069 (control surf. gust lock)

OÄM 40-070 (tow bar)

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4	OÄM 40-067 (IFR) Corrections	All	All	04-Apr-2001	Approved by Ing. Andreas Winkler for ACG	02-Jul-2001		
5	OÄM 40-061 (KAP 140 autopilot) OÄM 40-073 (SlickSTART) OÄM 40-081 (door lock) OÄM 40-085 (KX 155A as COM 1) OÄMs 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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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	Chap-ter	Page(s)	Date of Revision	EASA Approval No.	ACG Compli-ance	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			
9	**MÄM-40-** -580, -617; **OÄM-40-** -252, -362, -369, -371	0 1 2 3 4A 6 7	0-5, 0-6, 0-7, 0-8, 0-9, 0-11, 0-12, 0-13, 1-3, 1-7, 2-22, 2-25, 3-29, 4A-11, 4A-12, 4A-22 thru 4A-24, 4A-34, 4A-35, 6-17 thru 6-34 , 7-1, 7-2, 7-25 thru 7-58	31-Jan-2014	Revision No. 9 of the AFM Doc. No. 6.01.01-E is approved under the authority of DOA No. EASA.21J.052			

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10	**MÄM DAIC-0042** **MÄM 40-** -766, -816, 1008, -1020, -1087; **OÄM 40-** -375, -401, -1030, -1034; TR-17-01, change in type design responsibility from ACG to TCCA; Corrections	All	All	18-Sep-2023				

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Chapter

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 AWM 523 requirement. Beyond this, it contains further data and operating instructions which, in the manufacturer's opinion, could be of value to the pilot.

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

Modification	Source	Installed	
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
Garmin G1000 NXi	MÄM 40-1008	□ yes	□ no
USB Ports	MÄM 40-1051	□ 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

Modification	Source	Installed	
Operation with Winter Kit	OÄM 40-078	☐ yes	☐ no
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
Front Seats with Adjustable Backrest	OÄM 40-252	☐ 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
Front seats with adjustable backrest - Hydrolok	OÄM 40-375	☐ yes	☐ no
Emergency Egress Hammer	OÄM 40-401	☐ yes	☐ no
GTX 345R	OÄM 40-1003	☐ yes	☐ no
MD302 Standby Attitude Module	OÄM 40-1025	☐ 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 U.S. 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 procedures established by TCCA. The certification basis is the Canadian Airworthiness Manual (AWM) Chapter 523, Type Certificate No. A-224.

Category of Airworthiness: NORMAL, UTILITY

1.3 WARNINGS, CAUTIONS AND NOTES

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

WARNING

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

CAUTION

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

NOTE

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

1.4 DIMENSIONS

1.4.1 OVERALL DIMENSIONS

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

1.4.2 WING

Airfoil	:	Wortmann FX 63-137/20 - W4	
Wing Area	:	appr. 13.54 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°	

1.4.3 AILERON

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

1.4.4 WING FLAPS

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

1.4.5 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	

1.4.6 VERTICAL TAIL

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

1.4.7 LANDING GEAR

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

1.5 DEFINITIONS AND ABBREVIATIONS

1.5.1 AIRSPEEDS

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

IAS: Indicated Airspeed as shown on an airspeed indicator.

KCAS: CAS in knots.

KIAS: IAS in knots.

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

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

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

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

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

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

v_{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.

1.5.2 METEOROLOGICAL TERMS

ISA: International Standard Atmosphere. Conditions at which air is identified as an ideal dry gas. The temperature at mean sea level is 15 °C (59 °F), air pressure at MSL is 1013.25 hPa (29.92 inHg); the temperature gradient up to the altitude at which the temperature reaches -56.5 °C (-69.7 °F) is -0.0065 °C/m (-0.00357 °F/ft), and above this 0 °C/m (0 °F/ft).

MSL: Mean Sea Level.

OAT: Outside Air Temperature.

QNH: Theoretical atmospheric pressure at MSL, calculated from the elevation of the measuring point above MSL and the actual atmospheric pressure at the measuring point.

Indicated Pressure Altitude:

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

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

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

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

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

1.5.3 FLIGHT PERFORMANCE AND FLIGHT PLANNING

Demonstrated Crosswind Component:

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

MET: Weather, weather advice.

NAV: Navigation, route planning.

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

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

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

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

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

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

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

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

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

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

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

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

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

1.5.5 ENGINE

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

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

CHT: Cylinder Head Temperature.

EGT: Exhaust Gas Temperature.

1.5.6 DESIGNATION OF THE CIRCUIT BREAKERS ON THE INSTRUMENT PANEL

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

Avionics:

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

Engine:

IGNITION	Ignition
INST. 1	Engine Instrument VM 1000
START	Starter

Lighting:

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

Systems:

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

Electrical:

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

(b) Symmetric Instrument Panel (Circuit Breakers Bottom Side)

Main bus:

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

Main AV. bus (main avionics bus):

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

TAS	Traffic Advisory System

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

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

Essential bus:

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

1.5.7 EQUIPMENT

ELT: Emergency Locator Transmitter.

1.5.8 DESIGN CHANGE ADVISORIES

MÄM: Mandatory Design Change Advisory.

OÄM: Optional Design Change Advisory.

1.5.9 MISCELLANEOUS

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

1.6 UNITS OF MEASUREMENT

1.6.1 CONVERSION FACTORS

Dimension	SI-Units		US Units		Conversion
Length	[mm] [m] [km]	millimeters meters kilometers	[in] [ft] [NM]	inches feet nautical miles	[mm] / 25.4 = [in] [m] / 0.3048 = [ft] [km] / 1.852 = [NM]
Volume	[l]	liters	[US gal] [qts]	US gallons US quarts	[l] / 3.7854 = [US gal] [l] / 0.9464 = [qts]
Speed	[km/h] [m/s]	kilometers per hour meters per second	[kts] [mph] [fpm]	knots miles per hour feet per minute	[km/h] / 1.852 = [kts] [km/h] / 1.609 = [mph] [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] [mbar] [bar]	hectopascals millibars bars	[inHg] [psi]	inches of mercury pounds per square inch	[hPa] = [mbar] [hPa] / 33.86 = [inHg] [bar] x 14.504 = [psi]
Temperature	[°C]	degrees Celsius	[°F]	degrees Fahrenheit	[°C]x1.8 + 32 = [°F] ([°F] - 32)/1.8 = [°C]

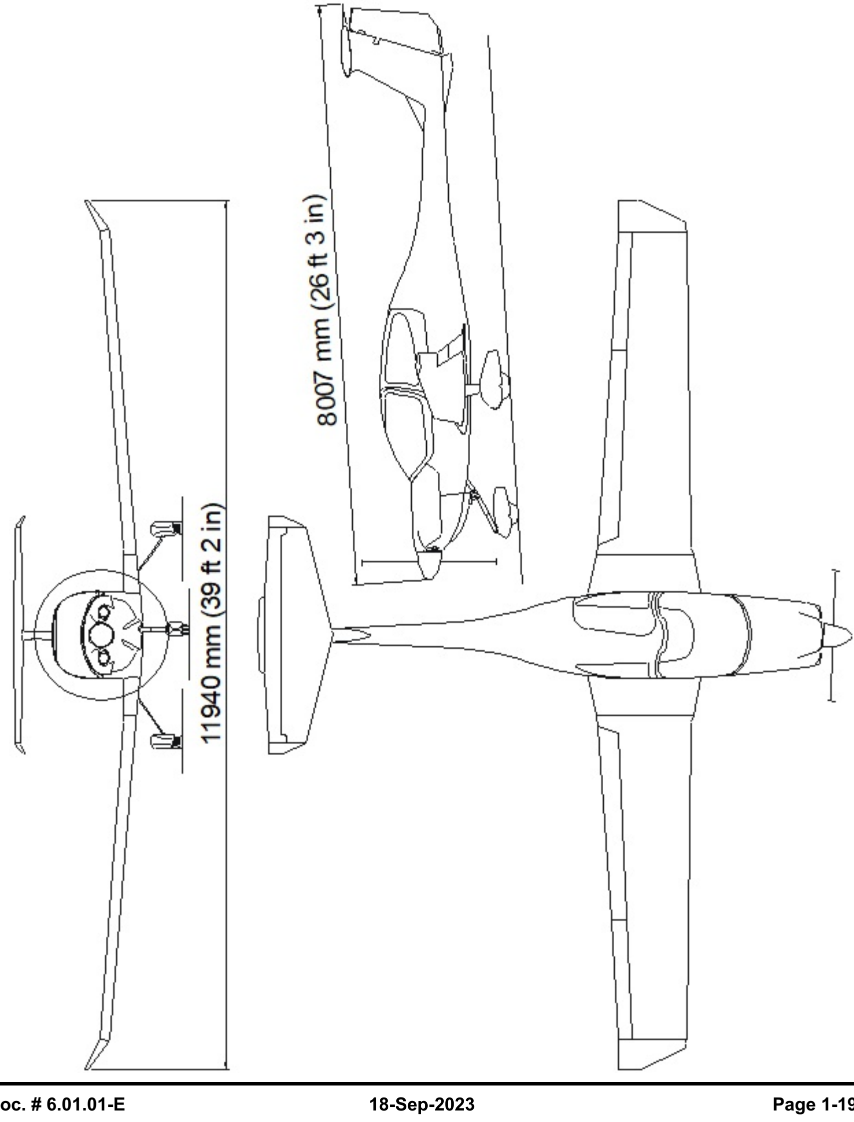
Dimension	SI-Units	US Units	Conversion
Intensity of electric current	[A] ampères		--
Electric charge (battery capacity)	[Ah] ampère-hours		--
Electric potential	[V] volts		--
Time	[sec] seconds		--

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-M1A

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

d) Manifold pressure limitations
Maximum : FULL throttle

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

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

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

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

n) Oil specification:

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

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.

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

Indication	Red arc/bar = lower prohibited range	Yellow arc/bar = caution range	Green arc/bar = normal operating range	Yellow arc/bar = caution range	Red arc/bar = upper prohibited range
Fuel quantity, Standard Tank	0 US gal	--	0 - 15 US gal[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.

2.6.1 COLOR AND SIGNIFICANCE OF THE WARNING LIGHTS (RED)

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

2. OPERATING LIMITATIONS

2.6 WARNING, CAUTION AND STATUS LIGHTS

2.6.1 COLOR AND SIGNIFICANCE OF THE WARNING LIGHTS (RED)

The following item is amended to read:

Warning Lights (Red)			Cause
Variant "DAI"	Variant "White Wire"	Meaning	
DOOR	DOORS	Doors	Canopy and/or passenger door not completely closed and latched

The following item is added to read:

If G1000 is installed:

G1000 Warning Lights (Red)	Meaning / Cause
DOOR OPEN	Canopy and/or passenger door not completely closed and latched.

2.6.2 COLOR AND SIGNIFICANCE OF THE CAUTION LIGHTS (AMBER)

Caution Lights (Amber)			Cause
Variant "DAI"	**Variant "White Wire"**	**Meaning**	
L FUEL		Fuel quantity left tank	Fuel quantity in the left tank less than 3 US gal (±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

2.6.3 COLOR AND SIGNIFICANCE OF THE STATUS LIGHTS (WHITE)

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

2.7 MASS (WEIGHT)

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

2.8.1 DATUM PLANE

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

2.8.2 CENTER OF GRAVITY LIMITATIONS

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

(a) Most forward CG:

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

If MÄM 40-227 is carried out:

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

(b) Most rearward CG:

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

WARNING

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

2.9 APPROVED MANEUVERS

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

Approved Maneuvers

a) *Normal Category:*

1) All normal flight maneuvers;

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

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

CAUTION

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

b) *Utility Category:*

1) All normal flight maneuvers;

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

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

CAUTION

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

CAUTION

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

2.10 MANEUVERING LOAD FACTORS

Table of maximum structural load factors:

2.10.1 NORMAL CATEGORY

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

2.10.2 UTILITY CATEGORY

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

WARNING

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

2.11 OPERATING ALTITUDE

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

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

2.12 FLIGHT CREW

Minimum crew number : 1 (one person)

Maximum number of occupants:

Normal Category : 4 (four persons)

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

2.13 KINDS OF OPERATION

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

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

Flights into known or forecast icing conditions are prohibited.

Flights into known thunderstorms are prohibited.

2.13.1 MINIMUM OPERATIONAL EQUIPMENT (SERVICEABLE)

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

Minimum Operational Equipment (Serviceable)			
	For Daytime VFR Flights	**In Addition for Night VFR Flights**	**In Addition for IFR Flights**
Flight and Navigation Instruments	* 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

2.14.1 FUEL GRADE

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

2.14.2 FUEL QUANTITY

(a) Standard Tank:

Total fuel quantity	: 2 x 20.6 US gal (app. 2 x 78 liter)
Unusable fuel	: 2 x 0.5 US gal (app. 2 x 2 liter)
Max. indicated fuel quantity	: 15 US gal (app. 57 liter) per tank (up to and including S/N 40.054)
	: 17 US gal (app. 64 liter) per tank (S/N 40.055 & subsequent)
Max. permissible difference 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:

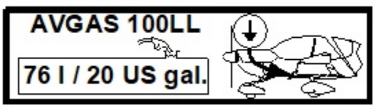
Maneuvering speed: **v_A = 108 KIAS (above 980 up to 1150 kg / above 2161 up to 2535 lb)** **v_A = 94 KIAS (780 to 980 kg / 1720 to 2161 lb)** **This airplane may only be operated in accordance with the Airplane Flight Manual. It can be operated in the “Normal” and “Utility” categories in non-icing conditions. 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:

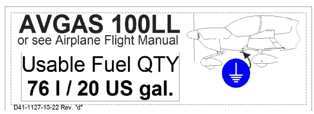
Maneuvering Speed: **v_A = 111 KIAS (above 1036 up to 1200 kg, above 2284 up to 2646 lb)** **v_A = 94 KIAS (780 to 1036 kg, 1720 to 2284 lb)** **The airplane may only be operated in accordance with the Airplane Flight Manual. It can be operated in the "Normal" and the "Utility" categories in non-icing 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:

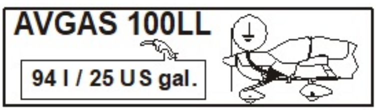
a) *Standard Tank:*



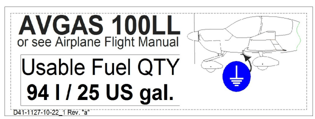
If MÄM 40-617 is installed:



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



If MÄM 40-617 is installed:



Next to the Fuel Quantity Indication:

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

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

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

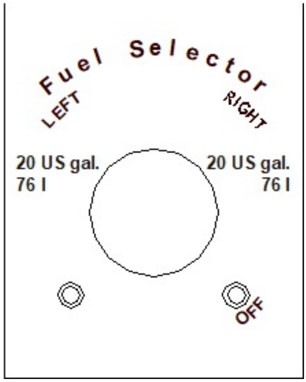
max. indicated fuel quantity: 17 US gal
left and right tank max. 10 US gal difference
For use of max. tank capacity see AFM

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

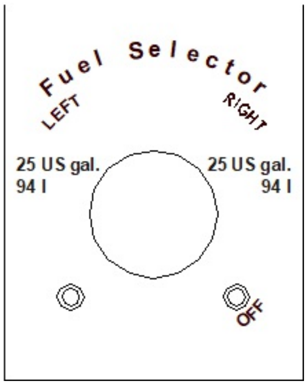
Fuel qty. indication: 16 + 9 US gal
max. difference LH/RH tank: 8 US gal
AUX FUEL QTY switch for LH/RH auxiliary fuel quantity
NOTE: See AFM for more information on AUX FUEL

On the Fuel Tank Selector:

a) Standard Tank:



b) Long Range Tank (if installed):



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

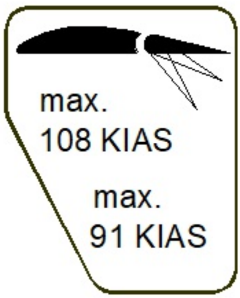
OIL **1 qt = 0.95 liters**

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:

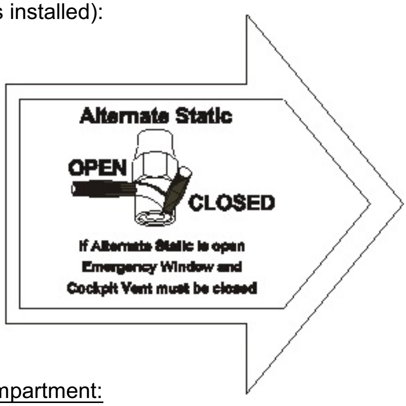


Next to the Essential Bus Switch (if installed):

Ess. Bus NOT for normal operation. See AFM.

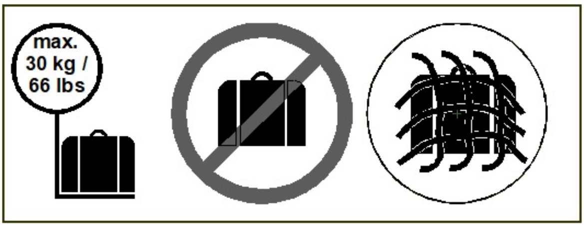
In the Cockpit, on the Left Fuselage Sidewall:

(if alternate static valve is installed):

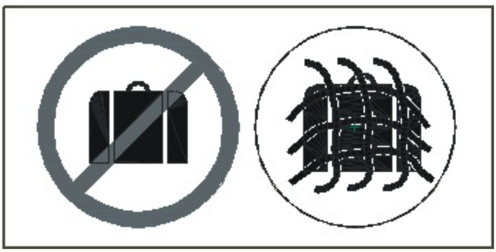


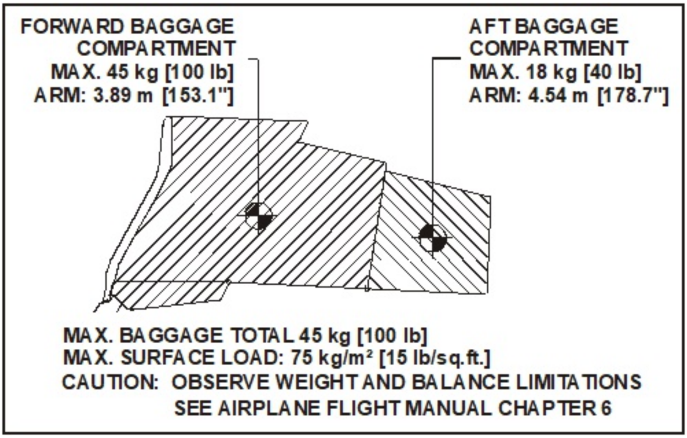
Next to the Baggage Compartment:

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**

2.15 LIMITATION PLACARDS

The following placard is added:

On the Passenger Door Frame:

2.16 OTHER LIMITATIONS

2.16.1 TEMPERATURE

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

CAUTION

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

2.16.2 BATTERY CHARGE

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

NOTE

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

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

2.16.3 EMERGENCY SWITCH

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

2.16.4 OPERATION TIME OF ELECTRICAL EQUIPMENT

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

2.16.5 DOOR LOCKING DEVICE

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

2.16.5 DOOR LOCKING DEVICE

The following sentence is amended to read:

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

2.16.6 ELECTRONIC EQUIPMENT

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

Examples of undesirable items of equipment are:

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

This list is not exhaustive.

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

2.16.7 USE OF THE SUN VISORS

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

CHAPTER 3
EMERGENCY PROCEDURES

Page

NOTE

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

3. EMERGENCY PROCEDURES

The following headline is amended to read:

3.1 INTRODUCTION

3.1.1 GENERAL

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

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

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

WARNING

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

3.1.2 CERTAIN AIRSPEEDS IN EMERGENCIES

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

(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.

CONTINUED

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

CONTINUED

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

WARNING

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

END OF CHECKLIST

(b) Loss of Oil Pressure

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

2. Check oil temperature.

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

   * Monitor the oil pressure warning light: it is probable that the oil pressure indication is defective.

   * Monitor the oil and cylinder head temperatures.

CONTINUED

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

If the oil pressure warning light illuminates or flashes, or

If both of these occur together:

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

2c. Oil pressure tending to zero combined with:

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

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

END OF CHECKLIST

(c) High Oil Pressure

Check oil temperature.

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

END OF CHECKLIST

(d) High Oil Temperature

Check cylinder head and exhaust gas temperature.

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

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

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

  - If the oil pressure is in the green sector:

  - Check mixture setting, enrich mixture if necessary.

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

END OF CHECKLIST

(e) High Cylinder Head Temperature

Cylinder head temperature in yellow sector or above:

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

* If the oil temperature is also high:

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

  - If the oil pressure is in the green sector:

CONTINUED

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

- Be prepared for possible emergency landing.

END OF CHECKLIST

(f) High RPM

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

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

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

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

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

END OF CHECKLIST

(g) Loss of RPM

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

CONTINUED

* Listen for rise in RPM.

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

  - Land at the nearest appropriate airfield.

  - Be prepared for possible emergency landing.

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

END OF CHECKLIST

(h) High Fuel Flow

Fuel flow in the red sector:

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

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

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

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

END OF CHECKLIST

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

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

1. Fuel flow. . . . . check:

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

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

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

END OF CHECKLIST

3.2.4 RESTARTING THE ENGINE WITH WINDMILLING PROPELLER

NOTE

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

NOTE

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

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

CONTINUED

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

If Engine Does Not Start:

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

NOTE

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

END OF CHECKLIST

3.2.5 DEFECTIVE ENGINE CONTROLS

(a) Defective Mixture Control Cable

Flight and Landing:

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

WARNING

Go-around may become impossible with the remaining power.

CONTINUED

Engine Shut-Down:

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

END OF CHECKLIST

(b) Defective Throttle Control Cable

Sufficient Engine Power Available to Continue Flight:

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

No Sufficient Engine Power Available to Continue Flight:

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

END OF CHECKLIST

(c) Defective RPM Lever Control Cable

Sufficient Engine Power Available to Continue Flight:

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

CONTINUED

WARNING

Go-around may become impossible with the remaining power.

No Sufficient Engine Power Available to Continue Flight:

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

END OF CHECKLIST

3.2.6 RESTARTING THE ENGINE WITH STATIONARY PROPELLER

NOTE

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

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

CONTINUED

NOTE

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

If it is not possible to start the engine:

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

CAUTION

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

END OF CHECKLIST

3.3 SMOKE AND FIRE

3.3.1 SMOKE AND FIRE ON THE GROUND

(a) Engine Fire When Starting on the Ground

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

After Standstill:

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

CONTINUED

When the Engine Has Stopped:

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

END OF CHECKLIST

(b) Electrical Fire with Smoke on the Ground

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

If the Engine is Running:

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

When the Engine Has Stopped:

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

END OF CHECKLIST

3.3.2 SMOKE AND FIRE DURING TAKE-OFF

(a) If Take-Off Can Still Be Aborted

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

END OF CHECKLIST

(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)

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 the backup attitude instruments.

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

CAUTION

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

END OF CHECKLIST

3.4 GLIDING

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

CONTINUED

NOTE

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

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

END OF CHECKLIST

3.5 EMERGENCY LANDINGS

3.5.1 EMERGENCY LANDING WITH ENGINE OFF

CAUTION

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

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

CONTINUED

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. If time allows . . . . advise ATC
7. Fuel tank selector . . . . OFF

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

8. Flaps . . . . LDG
9. Safety harnesses . . . . tighten

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

10. 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.

CONTINUED

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

END OF CHECKLIST

3.5.3 LANDING WITH DEFECTIVE BRAKES

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

CAUTION

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

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

END OF CHECKLIST

3.6 RECOVERY FROM AN UNINTENTIONAL SPIN

CAUTION

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

CONTINUED

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

When Rotation Has Stopped:

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

END OF CHECKLIST

3.7 OTHER EMERGENCIES

3.7.1 ICING

(a) Unintentional Flight Into Icing Conditions

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

CONTINUED

CAUTION

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

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

CAUTION

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

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

END OF CHECKLIST

3.7.2 FAILURES IN THE ELECTRICAL SYSTEM

(a) Complete Failure of the Electrical System

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

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

END OF CHECKLIST

(b) Alternator Failure

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

Alternator Failure During Flight

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

CAUTION

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

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

CONTINUED

CAUTION

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

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

END OF CHECKLIST

Alternator Failure on the Ground

NOTE

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

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

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

- Terminate flight preparation.

END OF CHECKLIST

(c) Starter Malfunction

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

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

Terminate flight preparation!

END OF CHECKLIST

(d) Overvoltage

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

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

WARNING

Leave Master switch (BAT) ON!

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

END OF CHECKLIST

3.7.3 SUSPICION OF CARBON MONOXIDE CONTAMINATION IN THE CABIN

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

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

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

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

CAUTION

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

NOTE

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

END OF CHECKLIST

3.7.4 "DOOR"-WARNING LIGHT ON

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

(a) Canopy Unlocked

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

(b) Rear Door Unlocked

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

WARNING

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

NOTE

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

END OF CHECKLIST

3.7.5 EMERGENCY EXIT

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

END OF CHECKLIST

3.7 OTHER EMERGENCIES

The following procedure is amended to read:

3.7.4 UNLATCHED DOORS

WARNING

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

NOTE

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

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

Canopy or Passenger Door Unlatched

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

END OF CHECKLIST

~~(b) Rear Door Unlocked~~

~~4. Airspeed~~ . . . . ~~below 140 KIAS~~
~~5. Land at 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

The second sentence is amended to read:

In case of a roll over of the airplane on ground, the passenger door can be used as exit. For this purpose the front hinge of the passenger door can be disconnected. The function is displayed on a placard next to the hinge.

CHAPTER 4A
NORMAL OPERATING PROCEDURES

Page

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4A.1 INTRODUCTION

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

4A.2 AIRSPEEDS FOR NORMAL OPERATING PROCEDURES

Event \ Flight Mass	850 kg 1874 lb	1000 kg 2205 lb	1150 kg 2535 lb	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

(a) Cabin Check

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

CONTINUED

f) Circuit breakers . . . . set in (if one has been pulled, check reason)

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

h) Throttle. . . . . IDLE

i) Mixture control lever. LEAN

j) RPM lever . . . . HIGH RPM

k) Master switch (BAT). ON

l) Annunciator panel (if equipped) . . . . check function (see 7.11)

m) PFD annunciations (if G1000 is installed) . . . check

n) Fuel quantity. . . . . check

NOTE

Standard Tank (conventional instrument panel):

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

Standard Tank (G1000 instrument panel):

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

CONTINUED

NOTE

Long Range Tank (conventional instrument panel):

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

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

Long Range Tank (G1000 instrument panel):

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

CAUTION

Long Range Tank (conventional instrument panel):

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

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

CONTINUED

4A.3 CHECKLISTS FOR NORMAL OPERATING PROCEDURES

4A.3.1 PRE-FLIGHT INSPECTION

(a) Cabin check

Steps p) thru u) are amended to read, steps v) thru ac) are added:

p) Check for loose items . . . . complete

q) Flight controls and trim . . . . check free and correct movement up to full deflection

r) Baggage . . . . stowed and secure

s) Emergency axe (if OÄM 40-326 installed). . . stowed and secure

t) Emergency egress hammer (if OÄM 40-401 installed) . . . . stowed and secure

u) Fire extinguisher. . . .. charged and secure

DOOR OPEN (if G1000 is installed) or DOOR(S) warning check:

v) All doors (passenger door, canopy) . . . . close and latch

w) DOOR OPEN or DOOR(S) warning . . . . check extinguished

x) Passenger door . . . . unlatch

y) DOOR OPEN or DOOR(S) warning . . . . check active

z) Pull on outer passenger door handle . . . . the safety hook must hold the passenger door in the closed position

CONTINUED

aa) Passenger door . . . . check front and rear locking bolt (firmly mounted and undamaged)

ab) Passenger door . . . . check push-button
Push-button returns freely to the fully extended position after pressing and releasing

ac) Master switch (BAT) . . . . OFF

END OF CHECKLIST

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

v) Fire extinguisher. . . . . charged and secure

END OF CHECKLIST

(b) Walk-Around Check, Visual Inspection

CAUTION

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

CAUTION

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

CAUTION

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

Left Main Landing Gear:

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

CONTINUED

i) Chocks. . . . . remove

Left Wing:

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

Fuselage, Left Side:

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

CONTINUED

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

Empennage:

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

Fuselage, Right Side:

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

Right Wing:

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

CONTINUED

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

Right Main Landing Gear:

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

Front Fuselage:

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

CONTINUED

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

WARNING

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

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

WARNING

The exhaust can cause burns when it is hot.

Underside:

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

CONTINUED

u) Venting pipes . . . . check for blockage

v) Fuselage underside . . . . check for excessive contamination particularly by oil, fuel, and other fluids

END OF CHECKLIST

4A.3.2 BEFORE STARTING ENGINE

CAUTION

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

NOTE

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

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

CONTINUED

4A.3.2 BEFORE STARTING ENGINE

The note for step 3 and Caution for step 7 were added. Step 7 is amended to read:

3. Passengers . . . . instructed

NOTE

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

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

7. Passenger door. . . . . closed and latched

CAUTION

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

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

CAUTION

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

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

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

CAUTION

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

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

CONTINUED

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

WARNING

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

Never try to start the engine by hand.

END OF CHECKLIST

4A.3.3 STARTING ENGINE

(a) Cold Engine

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

WARNING

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

CAUTION

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

CONTINUED

CAUTION

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

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

CAUTION

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

6. Ignition switch. . . . . START

When Engine Fires:

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

WARNING

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

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

CONTINUED

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

END OF CHECKLIST

(b) Warm Engine

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

WARNING

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

CAUTION

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

CAUTION

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

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

5. Ignition switch . . . . START

CONTINUED

When Engine Fires:

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

WARNING

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

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

END OF CHECKLIST

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

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

WARNING

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

CAUTION

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

CONTINUED

CAUTION

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

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

5. Ignition switch . . . . START

When Engine Fires:

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

WARNING

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

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

END OF CHECKLIST

4A.3.4 BEFORE TAXIING

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

CONTINUED

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

CAUTION

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

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

If G1000 is equipped:

NOTE

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

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

CONTINUED

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

END OF CHECKLIST

4A.3.5 TAXIING

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

CAUTION

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

CONTINUED

CAUTION

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

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

Remedy:

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

NOTE

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

END OF CHECKLIST

4A.3.6 BEFORE TAKE-OFF

CAUTION

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

CONTINUED

CAUTION

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

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

CAUTION

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

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

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

CONTINUED

4A.3.6 BEFORE TAKE-OFF

Step 5, step 6, the following caution and step 7 are amended to read:

5. Passenger door. . . . . check closed and latched
6. Canopy . . . . closed and latched

CAUTION

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

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

7. DOOR OPEN (if G1000 is installed) or
   DOOR(S) warning. . . . . check no indication

NOTE

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

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

CAUTION

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

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

CONTINUED

If G1000 is installed:

a) Flight plan . . . . entered
b) Altimeter setting (G1000 NXi and standby) . . checked and set
c) Altitude preselector . . . . set
d) Radios . . . . set and checked
e) Transponder . . . . code set

23. Parking brake . . . . release
24. Alternate air . . . . check CLOSED
25. Landing light . . . . ON as required
26. Pitot heating. . . . . ON as required

END OF CHECKLIST

4A.3.7 TAKE-OFF

(a) Normal Take-Off Procedure

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

WARNING

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

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

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

CONTINUED

NOTE

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

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

Above a Safe Height:

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

END OF CHECKLIST

4A.3.8 CLIMB

(a) Procedure for Best Rate of Climb

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

CONTINUED

CAUTION

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

END OF CHECKLIST

(b) Cruise Climb

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

CAUTION

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

END OF CHECKLIST

4A.3.9 CRUISE

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

NOTE

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

NOTE

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

NOTE

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

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

CONTINUED

CAUTION

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

NOTE

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

END OF CHECKLIST

4A.3.10 MIXTURE ADJUSTMENT

CAUTION

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

(a) Best Economy Mixture

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

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

CONTINUED

(b) Best Power Mixture

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

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

END OF CHECKLIST

4A.3.11 DESCENT

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

CAUTION

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

CAUTION

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

END OF CHECKLIST

4A.3.12 LANDING APPROACH

CAUTION

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

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

(a) Before Landing

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

CAUTION

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

CONTINUED

NOTE

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

END OF CHECKLIST

4A.3.13 GO-AROUND

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

(a) Above a Safe Height

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

END OF CHECKLIST

4A.3.14 AFTER LANDING

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

CONTINUED

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

END OF CHECKLIST

4A.3.15 ENGINE SHUT-DOWN

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

CAUTION

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

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

END OF CHECKLIST

4A.3.16 POST-FLIGHT INSPECTION

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

CONTINUED

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

NOTE

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

END OF CHECKLIST

4A.3.17 FLIGHT IN RAIN

NOTE

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

4A.3.18 REFUELING

CAUTION

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

4A.3.19 FLIGHT AT HIGH ALTITUDE

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

Also see Section 2.11 - OPERATING ALTITUDE.

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CHAPTER 4B
ABNORMAL OPERATING PROCEDURES

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4B.1 PRECAUTIONARY LANDING

NOTE

A landing of this type is only necessary when there is a reasonable suspicion that due to 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

On Final Approach:

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

CONTINUED

CAUTION

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

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

END OF CHECKLIST

4B.2 INSTRUMENT INDICATIONS OUTSIDE OF GREEN RANGE

4B.2.1 HIGH OIL PRESSURE WHEN STARTING IN LOW AMBIENT TEMPERATURES

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

4B.2.2 HIGH MANIFOLD PRESSURE

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

4B.2.3 OIL TEMPERATURE

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

4B.2.4 CYLINDER HEAD TEMPERATURE AND EXHAUST GAS TEMPERATURE

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

END OF CHECKLIST

4B.3 FAILURES IN THE ELECTRICAL SYSTEM

4B.3.1 LOW VOLTAGE CAUTION

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

Possible reasons are:

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

(a) "Low Voltage" Caution on the Ground

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

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

   - Terminate flight preparation.

(b) "Low Voltage" Caution During Flight

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

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

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

(c) "Low Voltage" Caution During Landing

- Follow (a) after landing.

END OF CHECKLIST

4B.3.2 ELECTRONIC IGNITION CONTROL UNIT

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

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

END OF CHECKLIST

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

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

NOTE

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

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

CONTINUED

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

END OF CHECKLIST

4B.5 FAILURES IN FLAP OPERATING SYSTEM

4B.5.1 FAILURE IN POSITION INDICATION OR FUNCTION

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

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

(a) Only UP or T/O Available

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

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

(b) Only LDG Available

Perform normal landing.

END OF CHECKLIST

4B.6 FAILURES IN ELECTRICAL RUDDER PEDAL ADJUSTMENT

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

NOTE

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

1. Circuit breaker . . . . pull

END OF CHECKLIST

4B.7 LANDING WITH HIGH LANDING MASS

NOTE

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

NOTE

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

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

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

CONTINUED

WARNING

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

END OF CHECKLIST

4B.8 STARTING THE ENGINE WITH EXTERNAL POWER

WARNING

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

WARNING

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

NOTE

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

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

CONTINUED

4B.8 STARTING ENGINE WITH EXTERNAL POWER

4B.8.1 BEFORE STARTING ENGINE

Step 6 is amended to read:

6. Passenger door . . . . closed and latched

CAUTION

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

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

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

CAUTION

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

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

CONTINUED

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

WARNING

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

Never try to start the engine by hand.

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

END OF CHECKLIST

4B.9 ERRONEOUS INDICATIONS OF AIRSPEED OR ALTITUDE

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

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

END OF CHECKLIST

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CHAPTER 5
PERFORMANCE

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5.1 INTRODUCTION

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

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

5.2 USE OF THE PERFORMANCE TABLES AND DIAGRAMS

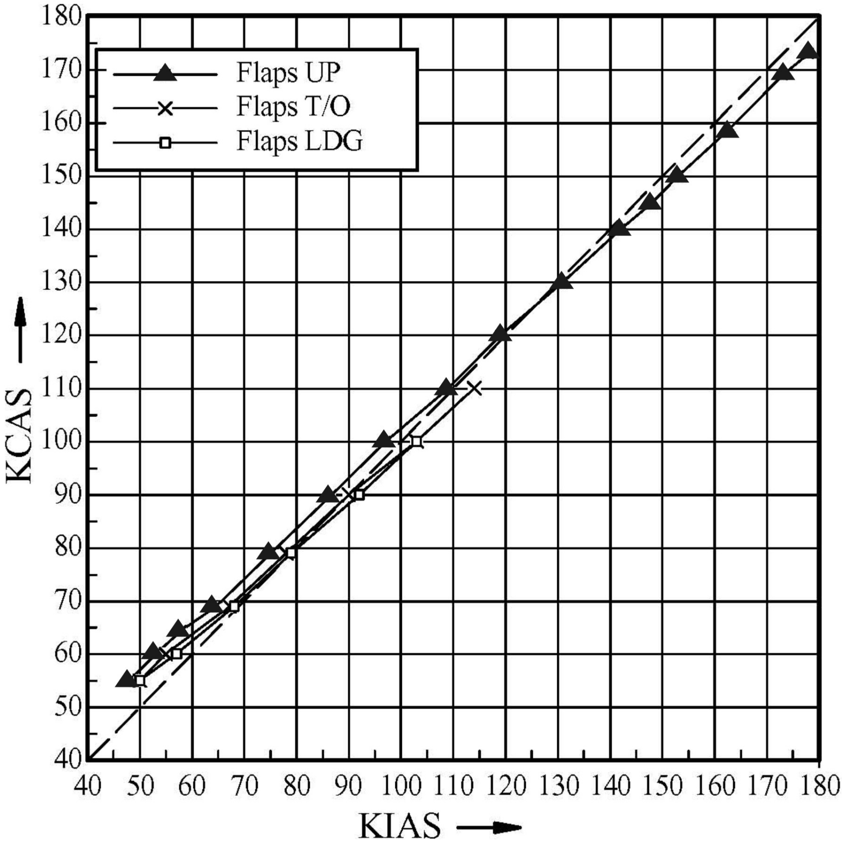
In order to illustrate the influence of a number of different variables, the performance data is reproduced in the form of tables or diagrams. These contain sufficiently detailed information so that conservative values can be selected and used for the determination of adequate performance data for the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

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

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

5.3 PERFORMANCE TABLES AND DIAGRAMS

5.3.1 AIRSPEED CALIBRATION



5.3.2 TABLE FOR SETTING ENGINE PERFORMANCE

NOTE

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

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

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

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

			Engine Power as % of Max. Take-Off Power						
			45 %				55 %		
	RPM		1800	2000	2200	2400	2000	2200	2400
Fuel Flow [US gal/h]	Best Economy		5.8	6	6.3	6.6	7	7.2	7.5
	Best Power		-	-	7.3	7.7	-	8.5	8.7
ISA	[°C]	[°F]	Manifold Pressure (MP) [inHg]						
MSL	15	59	**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			-		

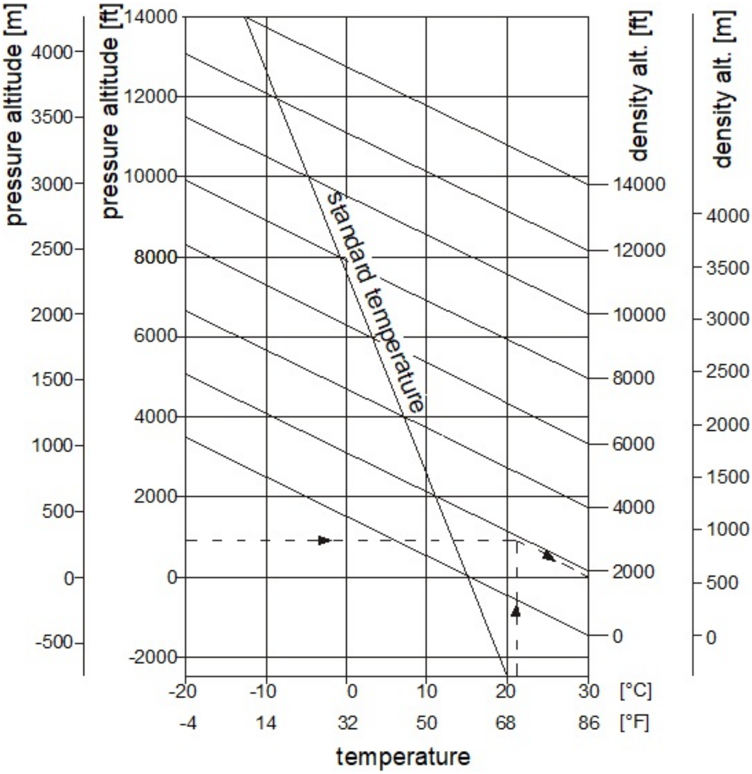
The areas shaded grey under each RPM heading are the recommended bands.

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

(a) Mass: 980 kg (2161 lb)

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

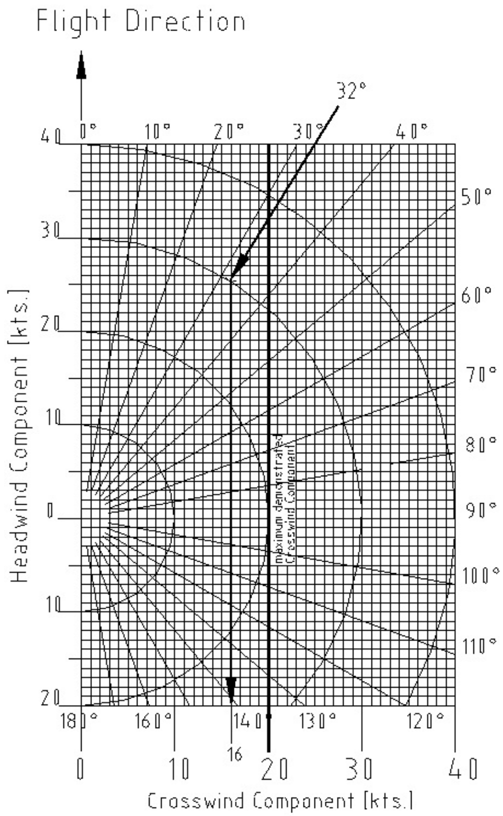
(b) Mass: 1150 kg (2535 lb)

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

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

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

5.3.5 WIND COMPONENTS



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

Max. demonstrated crosswind component : 20 kts

5.3.6 TAKE-OFF DISTANCE

Conditions:

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

WARNING

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

CAUTION

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

CAUTION

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

NOTE

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

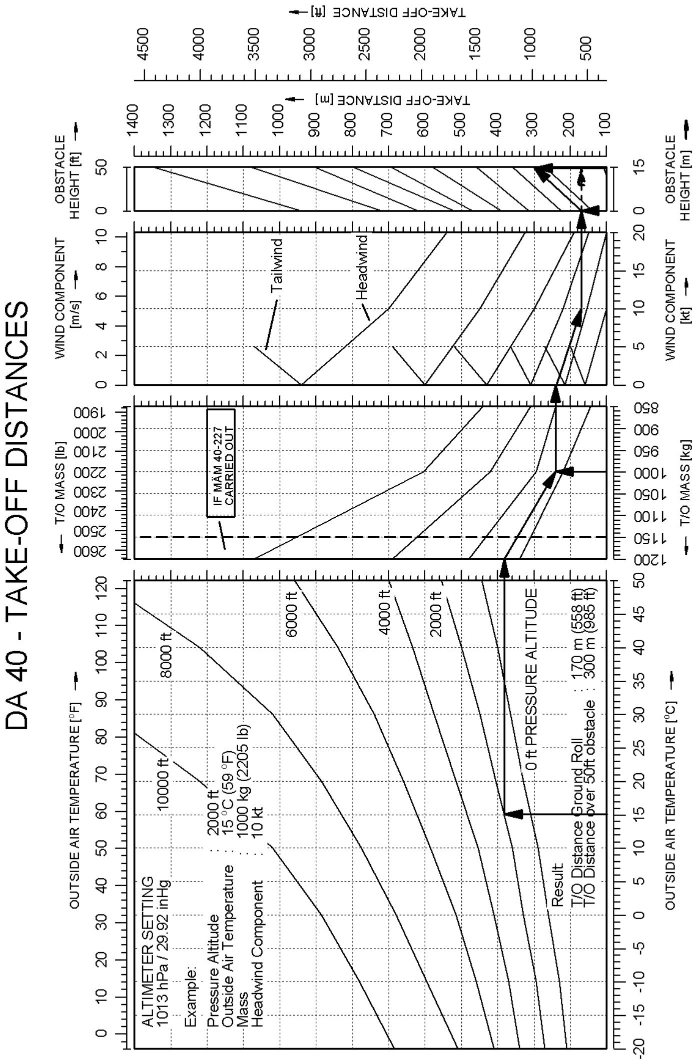
- Grass up to 5 cm (2 in) long: 10 % increase in take-off roll.
- Grass 5 to 10 cm (2 to 4 in) long: 15 % increase in take-off roll.
- Grass longer than 10 cm (4 in): at least 25 % increase in take-off roll.
- Grass longer than 25 cm (10 in): take-off should not be attempted.

NOTE

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

NOTE

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

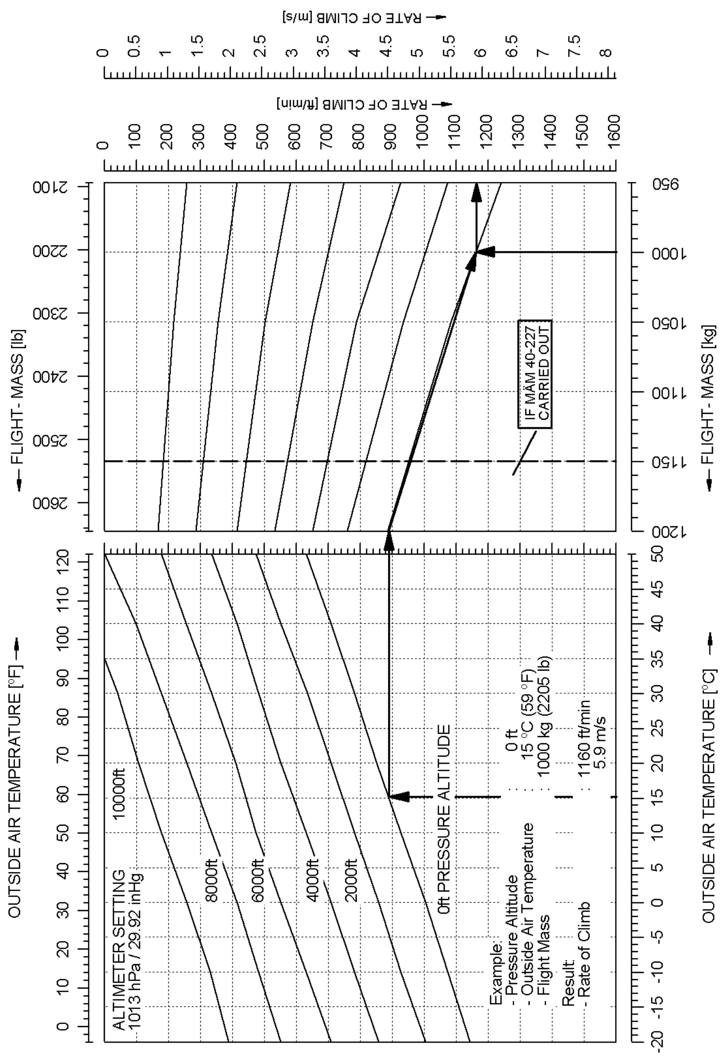

DA 40 - TAKE-OFF DISTANCES
OUTSIDE AIR TEMPERATURE [°F]
OUTSIDE AIR TEMPERATURE [°C]
T/O MASS [lb]
T/O MASS [kg]
WIND COMPONENT [m/s]
WIND COMPONENT [kt]
OBSTACLE HEIGHT [ft]
OBSTACLE HEIGHT [m]
TAKE-OFF DISTANCE [m]
TAKE-OFF DISTANCE [ft]
ALTIMETER SETTING
1013 hPa / 29.92 inHg
Example:
Pressure Altitude : 2000 ft
Outside Air Temperature : 15 °C (59 °F)
Mass : 1000 kg (2205 lb)
Headwind Component : 10 kt
10000 ft
8000 ft
6000 ft
4000 ft
2000 ft
0 ft PRESSURE ALTITUDE
Result:
T/O Distance Ground Roll : 170 m (558 ft)
T/O Distance over 50ft obstacle : 300 m (985 ft)
IF MÄM 40-227 CARRIED OUT
Tailwind
Headwind

5.3.7 CLIMB PERFORMANCE - TAKE-OFF CLIMB

Conditions:

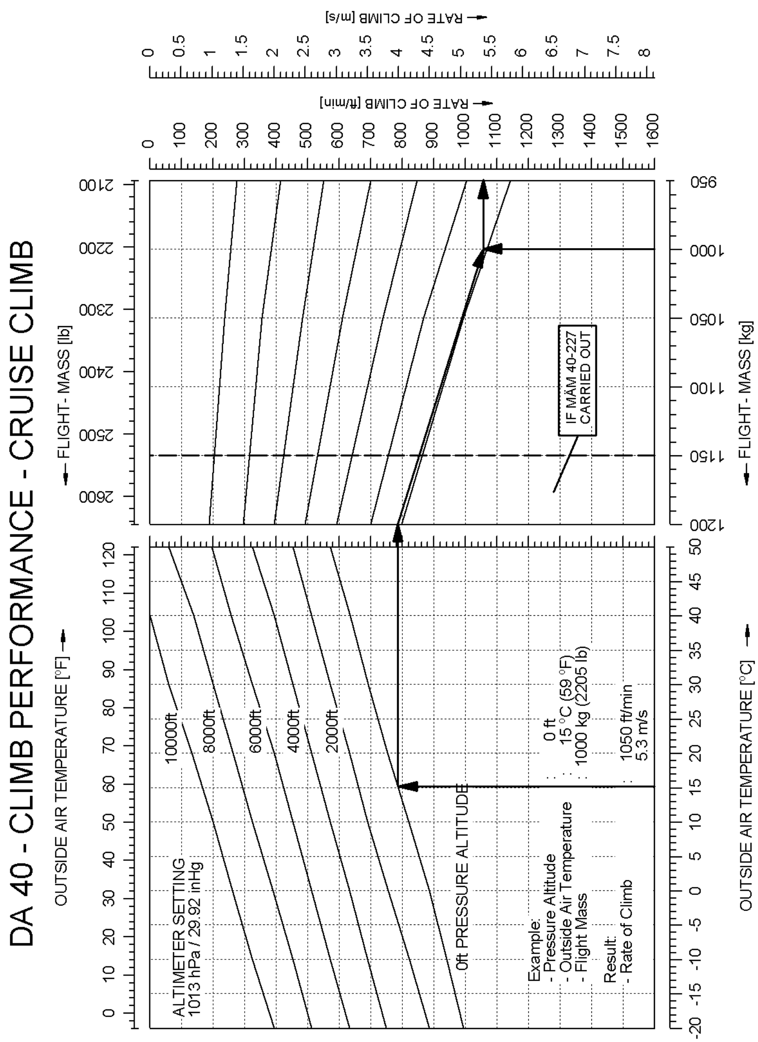
- Throttle . . . . MAX PWR
- RPM lever . . . . 2400 RPM
- Flaps . . . . T/O
- Airspeed . . . . 67 KIAS (1200 kg, 2646 lb)
  66 KIAS (1150 kg, 2535 lb)
  60 KIAS (1000 kg, 2205 lb)
  54 KIAS (850 kg, 1874 lb)

DA 40 - CLIMB PERFORMANCE - TAKE OFF CLIMB



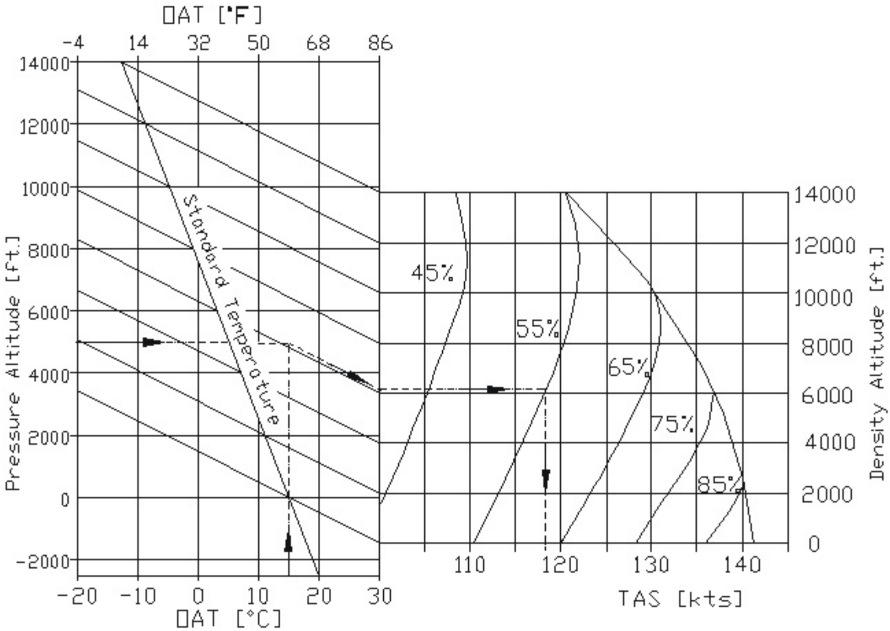
5.3.8 CLIMB PERFORMANCE - CRUISE CLIMB

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
OUTSIDE AIR TEMPERATURE [°F]
FLIGHT- MASS [lb]
RATE OF CLIMB [ft/min]
RATE OF CLIMB [m/s]
OUTSIDE AIR TEMPERATURE [°C]
FLIGHT- MASS [kg]
ALTIMETER SETTING
1013 hPa / 29.92 inHg
10000ft
8000ft
6000ft
4000ft
2000ft
0ft PRESSURE ALTITUDE
IF MÄM 40-227
CARRIED OUT
Example:
- Pressure Altitude : 0 ft
- Outside Air Temperature : 15 °C (59 °F)
- Flight Mass : 1000 kg (2205 lb)
Result:
- Rate of Climb : 1050 ft/min
5.3 m/s

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):

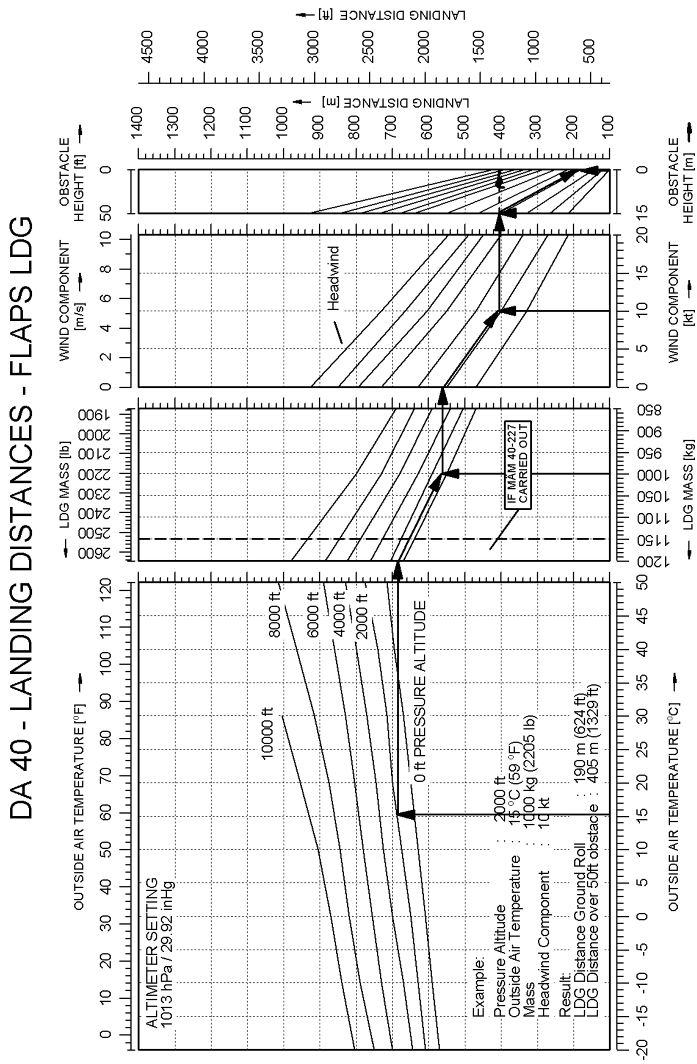
- Grass up to 5 cm (2 in) long: 5 % increase in landing roll.
- Grass 5 to 10 cm (2 to 4 in) long: 15 % increase in landing roll.
- Grass longer than 10 cm (4 in): at least 25 % increase in landing roll.

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
OUTSIDE AIR TEMPERATURE [°F]
OUTSIDE AIR TEMPERATURE [°C]
LDG MASS [lb]
LDG MASS [kg]
WIND COMPONENT [m/s]
WIND COMPONENT [kt]
OBSTACLE HEIGHT [ft]
OBSTACLE HEIGHT [m]
LANDING DISTANCE [m]
LANDING DISTANCE [ft]
Headwind
IF MÄM 40-227 CARRIED OUT
10000 ft
8000 ft
6000 ft
4000 ft
2000 ft
0 ft PRESSURE ALTITUDE
ALTIMETER SETTING
1013 hPa / 29.92 inHg
Example:
Pressure Altitude : 2000 ft
Outside Air Temperature : 15 °C (59 °F)
Mass : 1000 kg (2205 lb)
Headwind Component : 10 kt
Result:
LDG Distance Ground Roll : 190 m (624 ft)
LDG Distance over 50ft obstacle : 405 m (1329 ft)

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.

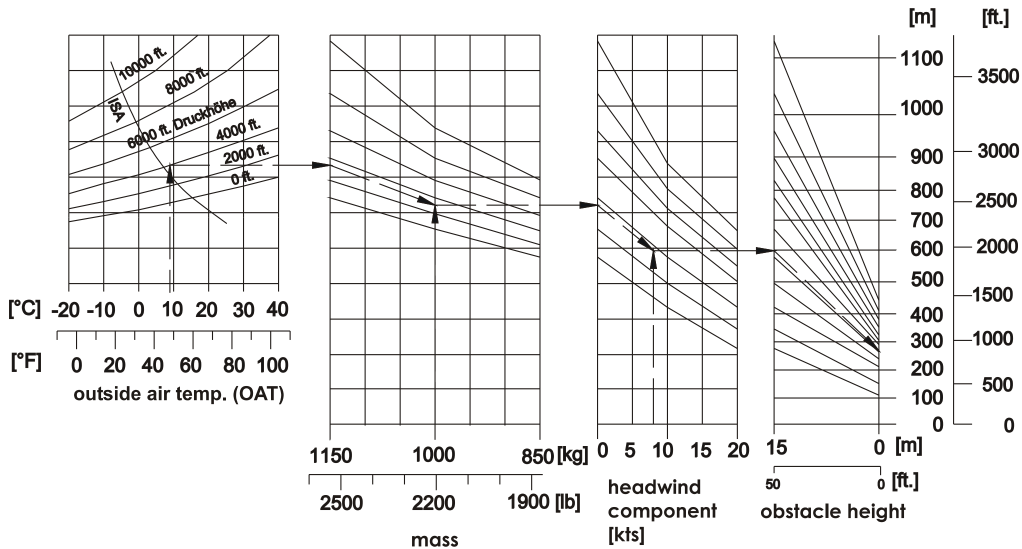
NOTE

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:		*Result:*	
Pressure altitude	: 4000 ft	Landing distance over 50 ft obstacle	: approx. 580 m (1903 ft)
OAT	: 8 °C (46 °F)	Ground roll	: approx. 270 m (886 ft)
Mass	: 1000 kg (2205 lb)		
Headwind comp.	: 8 kts		

5.3.12 GRADIENT OF CLIMB ON GO-AROUND

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

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

If MÄM 40-227 is carried out:

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

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

5.3.13 APPROVED NOISE DATA

ICAO Annex 16 Chapter X : 69.28 dB(A)

If MÄM 40-227 is carried out:

ICAO Annex 16 Chapter X : 78.4 dB(A)

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CHAPTER 6
MASS AND BALANCE

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6.1 INTRODUCTION

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

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

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

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

NOTE

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

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

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

NOTE

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

6.2 DATUM PLANE

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

6.3 MASS AND BALANCE REPORT

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

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

Condition of the airplane for establishing the empty mass:

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

MASS AND BALANCE REPORT

(Continuous report on structural or equipment changes)

DA 40				Serial No.:			Registration:			Page:		
				Changes in Mass						Current Empty Mass		
				Addition (+)			Subtraction (-)					
	Entry No.			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									

WEIGHING REPORT

Model: DA 40 Serial Number: 40.079 Registration: OE-DGE

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

Reference Plane: Vertical plane 2194 mm (86.38 in) in front of the leading edge of wing at the root rib.

Horizontal reference line: Wedge 600:31 (2.96°), 2910 mm (114.57 in) aft of the step in the cockpit rim.

Equipment Inventory - dated:__________ Cause for Weighing: Replacement of LH-WING

Weight and Balance Calculations (Weighing at the wheels)

Weight Condition: Including brake fluid, engine oil (MAX level), coolant (TAE version only), and unusable fuel (Lycoming: 2 x 0.5 US gal / 2 x 1.9 liters; TAE: 2 x 1 US gal / 2 x 3.8 liters).

Support	Gross	Tare	Net
MAIN G_{1LH}			326,5
MAIN G_{1RH}			328,0
NOSE G_2			133,0
		Empty Weight	787,5

Lever Arm
X_{1LH} = 2739
X_{1RH} = 2739
X_2 = 955

Calculate the Empty Weight, G = MAIN G_{1LH} + MAIN G_{1RH} + NOSE G_2.	G = 787,5 kg
Calculate the Empty Weight Moment, M = (G_{1LH} * X_{1LH})+(G_{1RH} * X_{1RH}) + (G_2 * X_2).	M = 1919,7 kg m
Calculate the Empty Weight Center-of-Gravity position, X_{CG} = M/G.	X_{CG} = 2,43770 m
Maximum permitted all-up-weight: Max AUW (see AFM).	1150 kg
Maximum useful load = Max AUW - G.	362,5 kg

Record the Empty Weight (G) and the Empty-Weight Moment (M) in the Airplane Flight Manual.

Place/Date	Authorizing Stamp	Authorizing Signature
LOAN, 04.12.25	Diamond Aircraft Lic. No. AT.66.977 AT.145.073	Diamond Aircraft Lic. No. AT.66.977 AT.145.073

Figure 6: Weighing Report for Mechanical Scales Under the Wheels

6.4 FLIGHT MASS AND CENTER OF GRAVITY

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

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

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

6.4.1 EMPTY MASS

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

6.4.2 OIL

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

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

6.4.3 BAGGAGE

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

(a) Standard baggage compartment.

(b) Standard baggage compartment with “baggage tube.”

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

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

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

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

6.4.4 FUEL

(a) Standard Tank

The fuel quantity can be read on the fuel indicators.

NOTE

(Conventional and G1000 instrument panels):

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

(b) Long Range Tank

Read the fuel quantity indicated on the fuel quantity indicators.

NOTE

Conventional instrument panel:

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

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

G1000 instrument panel:

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

CAUTION

Conventional instrument panel:

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

6.4.5 MOMENTS

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

6.4.6 TOTAL MASS AND CG

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

CAUTION

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

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

6.4.7 GRAPHICAL METHOD

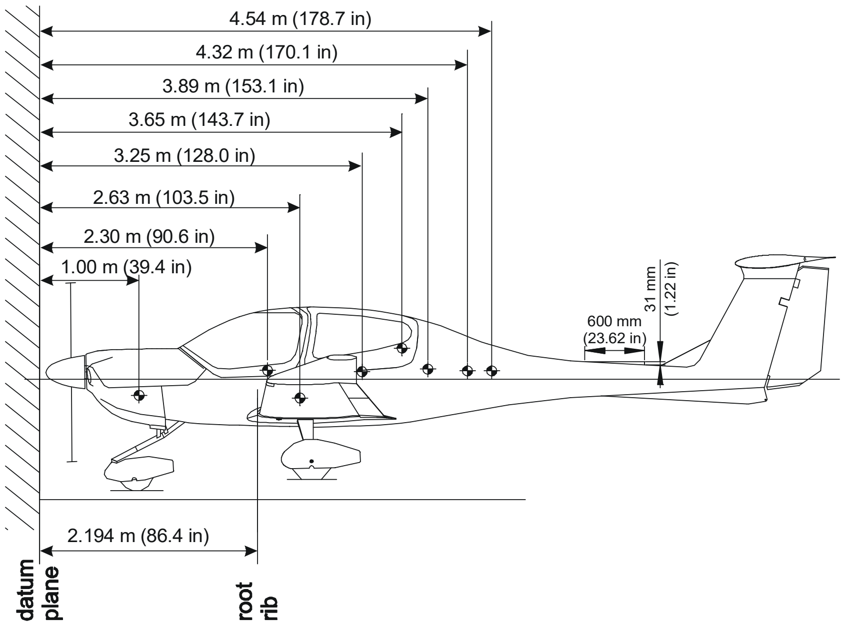
The diagram under 6.4.9 - LOADING DIAGRAM is used to determine the moments. The masses and moments for the individual items of loading are added. Then, the diagram under 6.4.12 - PERMISSIBLE MOMENT RANGE is used to check whether the total moment associated with the total mass is in the admissible range.

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

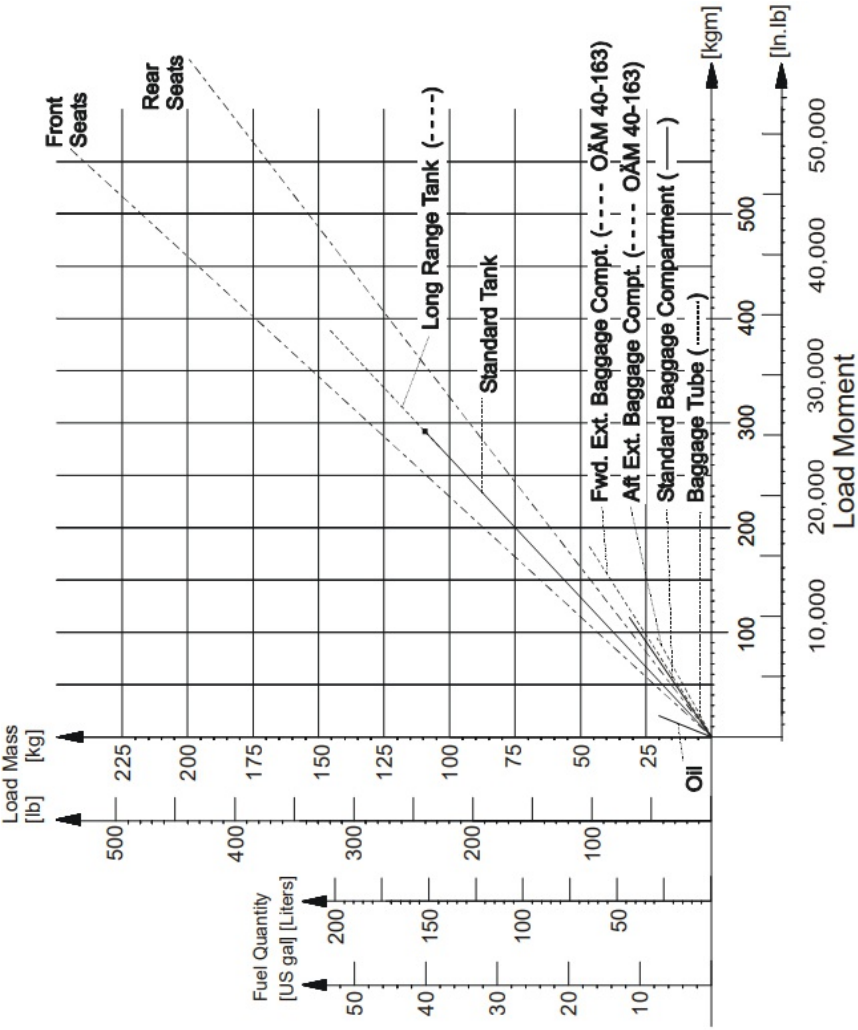
6.4.8 MOMENT ARMS

The most important lever arms aft of the Datum Plane:

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



6.4.9 LOADING DIAGRAM



6.4.10 CALCULATION OF LOADING CONDITION

CAUTION

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

NOTE

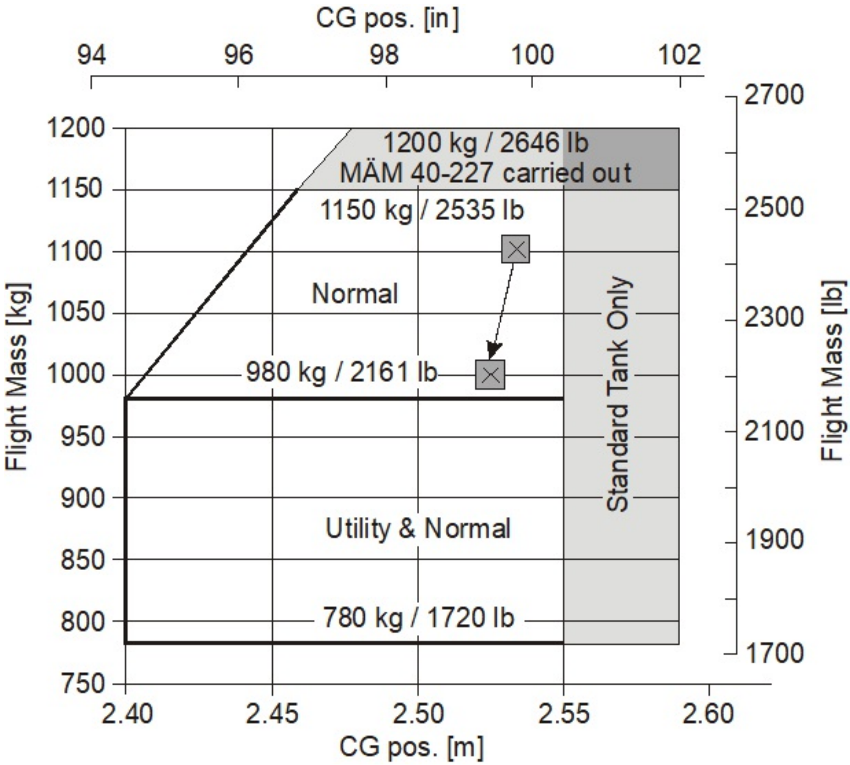
For the mass (weight) of the fuel, a density of 0.72 kg/liter (6.01 lb/US gal) is assumed. For the mass (weight) of the engine oil, a density of 0.89 kg/liter (1.86 lb/US qt, 0.84 kg/US qt) is assumed.

NOTE

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

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

6.4.11 PERMISSIBLE CENTER OF GRAVITY RANGE



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

Forward Flight CG Limit:

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

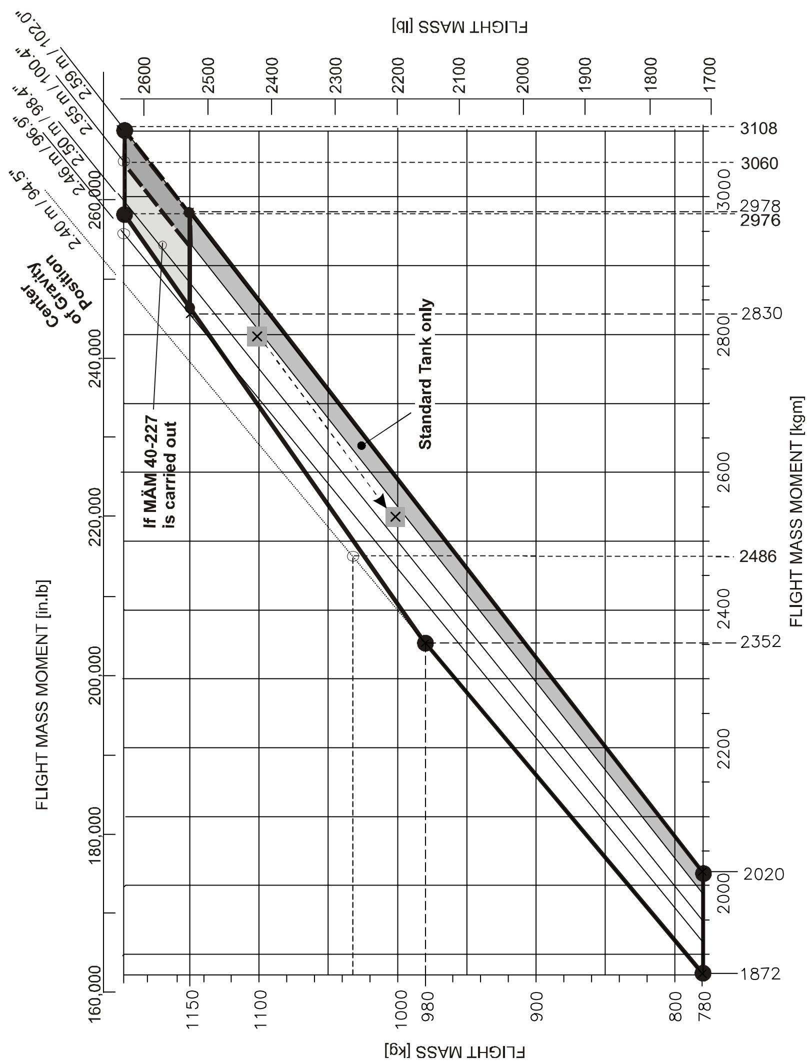
If MÄM 40-227 is carried out:

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

Rearward Flight CG Limit:

2.59 m (102.0 in) aft of Datum Plane (Standard Tank)
2.55 m (100.4 in) aft of Datum Plane (with Long Range Tank installed)

6.4.12 PERMISSIBLE MOMENT RANGE



6.5 EQUIPMENT LIST AND EQUIPMENT INVENTORY

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

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

Airplane Serial No.:	40079	**Registration:**		**Date:** 06.03.02	
Description	**Type**	**Part No.**	**Manufacturer**	**S/N**	**install-ed**
AVIONICS COOLING					
Cooling fan	Cyclone 21	CRB122253	Lone Star Aviation	N. A.	☑
COMMUNICATION					
COMM 1 antenna	DMC63-1/A		DM	N. A.	☑
COMM 2 antenna	DMC63-2		DM	N. A.	☑
COMM #1[1]	KX125 530	069-01028-1101	Bendix/King		☐
COMM #1[1]	KX 165A	069-01033-0101	Bendix/King	1774	☑
COMM #2	~~KX 155A~~ 430	069-01032-0201	Bendix/King	20374	☑
Audio Panel / Marker / ICS[2]	KMA 28	066-01176-0101	Bendix/King	A02403	☑
ICS[2]	PM1000 II	11922	PS Engineering	N. A.	☐
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	N. A.	☑
Handmic	100TRA	62800-001	Telex	N. A.	☑
AUTOPILOT SYSTEM:	KAP 140		Bendix/King		
Flight computer	KC 140	065-00176-5402	Bendix/King	5528	☑
Pitch servo	KS 270 C	065-00178-2500	Bendix/King	4784	☑
Pitch servo mount	KM 275	065-00030-0000	Bendix/King	53218	☑
Roll servo	KS 271 C	065-00179-0300	Bendix/King	6821	☑
Roll servo mount	KM 275	065-00030-0000	Bendix/King	53232	☑
Trim servo	KS 272 C	065-00180-3500	Bendix/King	4525	☑
Trim servo mount	KM 277	065-00041-0000	Bendix/King	4194	☑
Configuration module	KCM 100	071-00073-5000	Bendix/King	8769	☑
Sonalert	SC	SC 628	Mallory	N. A.	☑
Control stick		DA4-2213-12-90	DAI	N. A.	☑
CWS switch		031-00514-0000	Bendix/King	N. A.	☑
AP-Disc switch		031-00428-0000	Bendix/King	N. A.	☑
Trim switch assy.		200-09187-0000	Bendix/King	N. A.	☑

Airplane Serial No.: 40079		Registration:		Date: 06.03.02	
Description	**Type**	**Part No.**	**Manufacturer**	**S/N**	**installed**
ELECTRICAL POWER					
Battery	CB24-11M		Concorde (Gill)	N. A.	☑
Emergency Battery (28 pcs.)	MN 1500 AA		Duracell	N. A.	☑
Ammeter	VM1000	4010050	Vision Microsyst.	77948	☑
Ammeter current sensor	VM1000	3010022	Vision Microsyst.	N.A.	☑
Voltmeter	VM1000	4010050	Vision Microsyst.	N. A.	☑
Voltage regulator		VR2000-28-1 (D)	Electrosyst., Inc.	B101234	☑
External power connector			DAI	N.A.	☑
Alternator	ALU-8521LS	ALU-8521LS	Electrosyst., Inc.	B090512	☑
EQUIPMENT					
Safety belts, pilot	5-01-1C0701-LH	000918	Schroth	35/01	☑
Safety belts, co-pilot	5-01-1C5701-RH	000918	Schroth	35/01	☑
Safety belts, RH pax	5-01-1B0701-RH	000918	Schroth	35/01	☑
Safety belts, LH pax	5-01-1B5701-LH	000918	Schroth	35/01	☑
ELT unit		E-01	ACK	40244	☑
ELT remote switch		E0105	ACK	N. A.	☑
ELT antenna		E0109	ACK	N. A.	☑
FLIGHT CONTROLS					
Stall horn		DAI-9031-00-00	DAI	N. A.	☑
Flaps control unit (inst. panel)	430550		DAI	N. A.	☑
Flaps actuator assy	430555		DAI	N. A.	☑
SAFETY EQUIPMENT					
Fire extinguisher, portable		HAL1	AIR Total	N. A.	☑
First aid kit				N. A.	☑
FUEL					
Fuel qty indicator	VM1000	4010028	Vision Microsyst.	77975	☑
Fuel qty sensor LH	VM1000	30100-11	Vision Microsyst.	N. A.	☑
Fuel qty sensor RH	VM1000	30100-11	Vision Microsyst.	N. A.	☑
HYDRAULIC					
Master cylinder		10-54A	Cleveland	N. A.	☑
Parking valve		60-5B	Cleveland	N. A.	☑
Brake assembly		30-239A	Cleveland	N. A.	☑
INDICATING / REC. SYSTEM					
Digital chronometer	LC-2	AT420100	Astro Tech	N. A.	☑
Flight timer[1]		85000-12	Hobbs	N. A.	☐
Flight timer[3]		85094-12	Hobbs	N. A.	☑
Annunciator panel (system)[2]			DAI		☐
Annunciator panel[4]	WW-IDC 001		White Wire	073	☑

Airplane Serial No.: 40079		Registration:		Date: 06.03.02	
Description	**Type**	**Part No.**	**Manufacturer**	**S/N**	**installed**
LIGHTS					
Map/Reading light assy crew		W1461.0.010	Rivoret	N. A.	☑
Cabin light		W1461.0.010	Rivoret	N. A.	☑
Instr./Radio lights dimmer assy		WW-LCM-002	White Wire	N. A.	☑
Glareshield lamp assy		DA4-3311-10-01	DAI	N. A.	☑
Glareshield light inverter		APVL328-8-3-L-	Quantaflex	N. A.	☑
Strobe/Pos. light assy LH	A600-PR-D-28	01-0790006-05	Wheelen	N. A.	☑
Strobe/Pos. light assy RH	A600-PG-D-28	01-0790006-07	Wheelen	N. A.	☑
Strobe light power supply LH/RH	A490ATS-CF-	01-0770062-05	Wheelen	N. A.	☑
Taxi light	70346	01-0770346-05	Wheelen	N. A.	☑
Landing light	70346	01-0770346-03	Wheelen	N. A.	☑
Electroluminescent lamps	Quantaflex 1600		Quantaflex	N. A.	☑
NAVIGATION					
Pitot/Static probe, heated		DAI-9034-57-00	DAI	N. A.	☑
P/S probe HTR fail sensor		DA4-3031-01-00	DAI	N. A.	☑
Altimeter inHg/mbar, primary[5]		5934PD-3	United In.	423019	☑
Altimeter inHg/mbar, primary[5]	LUN 1128	1128-14B6	Mikrotechna		☐
Altimeter inHg/mbar, second.[5]		5934PD-3	United In.	423167	☑
Altimeter inHg/mbar, second.[5]	LUN 1128	1128-14B6	Mikrotechna		☐
Vertical speed indicator[6]		7000	United In.	295060	☑
Vertical speed indicator[5]	LUN 1144	1144-A4B4	Mikrotechna		☐
Airspeed indicator[1]		8025	United In.	179116	☑
Airspeed indicator[1]	LUN 1116	1116-B4B3	Mikrotechna		☐
Outside air temp. indic.		301F (C)	Davtron	A5123	☑
Magnetic compass		C2400L4P	Airpath	N.A.	☑
Compass system C/O[1]	KCS 55A		Bendix/King		
Slave gyro	KG 102 A	060-00015-0000	Bendix/King	47897	☑
HSI	KI 525A	066-03046-0007	Bendix/King	92035	☑
Slaving unit	KA 51B	071-01242-0001	Bendix/King	32574	☑
Flux valve	KMT 112	071-01052-0000	Bendix/King	63726	☑
Dir. gyro, free[5]	AIM2051BLD	5050031-931	BF-Goodrich		☐
Attitude indicator	AIM1100-28L	5040111-936	BF-Goodrich		☐
Attitude indicator	AIM1100-28LK	5040111-938	BF-Goodrich	25052	☑
Turn coordinator w/o AP pickup	1394T100-(3Z)		Mid Continent In.		☐
Turn coordinator	1394T100-(12RZ)		Mid Continent In.	2104-464	☑
Marker antenna	CI102		Comant	1074351	☑
DME	KN 62A	066-01068-0004	Bendix/King	41131	☑
DME antenna	KA60	071-01174-0000	Bendix/King	N.A.	☑
Transponder[2]	KT 76A	066-01062-0010	Bendix/King		☐
Transponder[6]	KT 76C	066-01156-0101	Bendix/King	13981	☑
XPDR antenna	KA60	071-01591-0001	Bendix/King	N.A.	☑
Altitude digitizer		D120-P2-T	TCI	77850	☑
ADF	KR87	066-01072-0004	Bendix/King	75975	☑
ADF antenna	KA44B	071-01234-0000	Bendix/King	77008	☑
ADF indicator	KI227	066-03063-0001	Bendix/King	60094	☑

12c

Airplane Serial No.:	40079	Registration:		Date: 06.03.02	
Description	Type	Part No.	Manufacturer	S/N	installed
NAV antenna coupler	CI505		Comant	N.A	☑
VOR/LOC/GS antenna		CI157P	Comant	N.A	☑
NAV/COM #1[1]	KX125	069-01028-1101	Bendix/King		☐
NAV/COM #1 volt conv.[1]	KA39	071-01041-0001	Bendix/King		☐
NAV #1[1]	KX155A	069-01032-0201	Bendix/King		☐
NAV #1[1]	KX165A	069-01033-0101	Bendix/King	1774	☑
NAV #2	KX155A	069-01032-0201	Bendix/King	20374	☑
CDI, VOR/LOC #1[5]	KI 208	066-03056-0000	Bendix/King		☐
CDI, VOR/LOC #2	KI 208	066-03056-0000	Bendix/King	71962	☑
GPS[10]	KLN 89B	066-01148-0102	Bendix/King		☐
GPS[10]	KLN 94	069-01034-0101	Bendix/King	3531	☑
GPS antenna	KA 92	050-03318-0000	Bendix/King	36076	☑
GPS/AP switch assy	MD41-528		Mid Continent	16979	☑
ENGINE	IO-360 M1A		TextronLycoming	L-30232-51A	☑
ENGINE FUEL CONTROL					
Fuel flow transmitter	VM1000	3010032	Vision Microsyst.	N.A.	☑
Fuel pressure transmitter	VM1000	3010017	Vision Microsyst.	N.A.	☑
ENGINE IGNITION SYSTEM[11]					
SlickSTART booster	SS1001		Unison	N.A.	☑
Lasar ignition controller	LC-1002-03	LC-1002-03	Unison		☐
Lasar ignition harness	LH-1004-43		Unison	N.A.	☐
Magneto RH/LH	4370/4347		Slick	N.A.	☑
Magneto RH/LH	4770/4771		Slick		☐
ENGINE INDICATING					
RPM sensor	VM1000	3010005	Vision Microsyst.	N.A.	☑
Manifold pressure sensor	VM1000	3010016	Vision Microsyst.	N.A.	☑
Cyl. head temp. probes (4 each)	VM1000	1020061	Vision Microsyst.	N.A.	☑
EGT probes	VM1000	1020060	Vision Microsyst.	N.A.	☑
Data processing unit[12]	DPU	4010067	Vision Microsyst.		☑
Data processing unit[12]	DPU	4010081	Vision Microsyst.	78632	☑
Intergr. engine data display	VM1000	4010050	Vision Microsyst.	77948	☑
IO board assy[13]		3020003	Vision Microsyst.	N.A.	☐
IO board assy[13]		3020018	Vision Microsyst.	N.A.	☑
ENGINE OIL					
Oil temperature sensor	VM1000	3010021	Vision Microsyst.	N.A.	☑
Oil pressure transducer	VM1000	3010018	Vision Microsyst.	N.A.	☑
ENGINE STARTING					
Starter	149-24LS		SKYTEC	F4L-250112	☑

12d

Airplane Serial No.:	40079	Registration:		Date: 060302	
Description	Type	Part No.	Manufacturer	S/N	installed
PROPELLER	MTV-12-B/180-17		mt-Propeller	01473	☑
GOVERNOR	C-210776		Woodward		☑
AIRPLANE FLIGHT MANUAL		Doc. No 6.01.01	DAI	N.A.	☑

Place: LOAN Date: 060302 Signature: Hr. Kienbink

1. One of the following COM #1 units may be installed:
   KX 125 (including KA 39) or KX 155A (OÄM 40-085) or KX 165A (OÄM 40-083).
2. One of the following intercoms may be installed:
   KMA 28 (OÄM 40-067) or PM 1000 II.
3. One of the following flight timers may be installed:
   Part No. 85094-12 (MÄM 40-029) or Part No. 85000-12.
4. One of the following Annunciator Panels may be installed:
   DAI Annunciator Panel or White Wire WW-IDC-001(OÄM 40-060).
5. One of the following altimeters may be installed as primary altimeter:
   United Instruments 5934PD-3 or Mikrotechna 1128-14B6.
   One of the following altimeters may be installed as secondary altimeter:
   United Instruments 5934PD-3 or Mikrotechna 1128-14B6.
6. One of the following vertical speed indicators may be installed:
   United Instruments 7000 or Mikrotechna 1144-A4B4.
7. One of the following airspeed indicators may be installed:
   United Instruments 8025 or Mikrotechna 1116-B4B3.

8. One of the following systems may be installed:
   Compass System KCS 55A (OÄM 40-067) or
   Directional Gyro AIM 205-1BLD (including CDI #1 KI 208; OÄM 40-055).
9. One of the following transponders may be installed:
   KT 76A or KT 76C (OÄM 40-067).
10. One of the following GPS units may be installed:
    KLN 89 or KLN 94 (VFR: OÄM 40-065; IFR: OÄM 40-067).
11. One of the following ignition systems may be installed:
    SlickSTART booster with Slick 4370/4347 magnetos (OÄM 40-073) or
    LASAR ignition controller & harness with Slick 4770/4771 magnetos.
12. On of the following combinations of DPU and I/O board assy. may be installed:
    DPU 4010067 with I/O board assy. 3020003 or
    DPU 4010081 with I/O board assy. 3020018 (MÄM 40-039/a)

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	CI 291		Comant			0.5	0.227	177.16	4.500
COMM #2 antenna	CI 292-2		Comant			0.5	0.227	161.42	4.100
COMM #1 antenna	DMC63-1/A		DM						
COMM #2 antenna	DMC63-2		DM						
COMM #1	KX 125	069-01028-1101	Bendix/King			11.46	5.2	70.08	1.78
COMM #1	KX 155A	069-01032-0201	Bendix/King			3.7	1.68	70.08	1.78
COMM #1	KX 165	069-01025-0025	Bendix/King			5.65	2.56	70.08	1.78
COMM #1	KX 165A	069-01033-0101	Bendix/King			4.0	1.81	70.08	1.78
COMM #1	KX 165A/ 8.33 kHz	069-01033-0201	Bendix/King			4.0	1.81	70.08	1.78
COMM #1	GNS 430	011-00280-00	Garmin			5.1	2.31	70.08	1.78
COMM #1	GNS 430	011-00280-10	Garmin			5.1	2.31	70.08	1.78
COMM #1	GNS 530	011-00550-00	Garmin			6.8	3.08	70.08	1.78
COMM #1	GNS 530	011-00550-10	Garmin			6.8	3.08	70.08	1.78
COMM #2	KX 155A	069-01032-0201	Bendix/King			3.7	1.68	70.08	1.78
COMM #2	GNS 430	011-00280-00	Garmin			5.1	2.31	70.08	1.78
COMM #2	GNS 430	011-00280-10	Garmin			5.1	2.31	70.08	1.78

Airplane Serial No.:		Registration:		Date:		Mass		Lever Arm	
Description	Type	Part No.	Manufacturer	S/N	Installed	lb	kg	in	m
Audio Panel / Marker / ICS	KMA 28	066-01176-0101	Bendix/King			1.5	0.68	70.08	1.78
Audio Panel / Marker / ICS	GMA 340	011-00401-10	Garmin			1.2	0.54	70.08	1.78
Audio Panel / Marker / ICS	GMA 1360	011-03568-00	Garmin			1.86	0.84	70.08	1.78
ICS	PM1000 II	11922	PS Engineering			0.75	0.34	70.08	1.78
Headset, pilot	Echelon 100		Telex						
Headset, co-pilot	Echelon 100		Telex						
Headset, LH pax	Echelon 100		Telex						
Headset, RH pax	Echelon 100		Telex						
Speaker	FRS8 / 4 Ohms		Visaton						
Handmic	100TRA	62800-001	Telex						
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

Airplane Serial No.:		Registration:		Date:		Mass		Lever Arm	
Description	Type	Part No.	Manufacturer	S/N	Installed	lb	kg	in	m
Flight computer (with alt. preselect)	KC 140	065-00176-7703 (with MÄM 40-099 or MSB 40-018)	Bendix/King			2.02	0.918	70.08	1.78
Flight computer	KC 140	065-00176-7904	Bendix/King			2.02	0.918	70.08	1.78
Pitch servo	KS 270 C	065-00178-2500	Bendix/King			2.7	1.224	154.0	3.93
Pitch servo mount	KM 275	065-00030-0000	Bendix/King			1.08	0.488	154.0	3.93
Roll servo	KS 271 C	065-00179-0300	Bendix/King			2.3	1.044	120.0	3.06
Roll servo mount	KM 275	065-00030-0000	Bendix/King			2.7	1.224	120.0	3.06
Trim servo	KS 272 C	065-00180-3500	Bendix/King			2.22	1.005	87.2	2.21
Trim servo mount	KM 277	065-00041-0000	Bendix/King			1.09	0.494	87.2	2.21
Configuration module	KCM 100	071-00073-5000	Bendix/King			0.06	0.026	70.08	1.78
Sonalert	SC	SC 628	Mallory						
Control stick		DA4-2213-12-90	Diamond						
CWS switch		031-00514-0000	Bendix/King						
AP-disc switch		031-00428-0000	Bendix/King						
Trim switch assy		200-09187-0000	Bendix/King						
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

Airplane Serial No.:		Registration:		Date:		Mass		Lever Arm	
Description	**Type**	**Part No.**	**Manufacturer**	**S/N**	**Installed**	**lb**	**kg**	**in**	**m**
Emergency battery (Lithium)		D41-2560-93-00	Excell			0.564	0.256	66.5	1.69
Ammeter	VM1000	4010050	Vision Microsyst.						
Ammeter current sensor	VM1000	3010022	Vision Microsyst.						
Voltmeter	VM1000	4010050	Vision Microsyst.						
Voltage regulator		VR2000-28-1 (D)	Electrosyst., Inc.						
External power connector			Diamond						
Alternator	ALU-8521LS	ALU-8521LS	Electrosyst., Inc.						
DC-AC Inverter	MD 26	MD 26-28	Mid Continent						
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)									
USB Ports						0.050	0.023	70.08	1.780
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						
Stall warning horn assy	“C”	DA4-2739-10-00X02	Diamond						

Airplane Serial No.:		Registration:		Date:		Mass		Lever Arm	
Description	**Type**	**Part No.**	**Manufacturer**	**S/N**	**Installed**	**lb**	**kg**	**in**	**m**
Stall warning horn assy	"D"	DA4-2739-10-00X03	Diamond						
Stall warning horn assy	"E"	DA4-2739-10-00X04	Diamond						
Stall warning horn assy	"F"	DA4-2739-10-00X05	Diamond						
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
Fire extinguisher, portable		337TS	Amerex			3.17	1.44	110.0	2.794
First aid kit									
Emergency axe		G45912	Fiskars			1.23	0.558	78.74	2.00
Emergency egress hammer		D64-2560-70-50	Diamond						
Emergency egress hammer		D67-2560-80-50	Diamond						
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.						
Alternate means for fuel qty. II		D4D-2807-90-00_01	Diamond Aircraft						

Airplane Serial No.:		Registration:		Date:		Mass		Lever Arm	
Description	Type	Part No.	Manufacturer	S/N	Installed	lb	kg	in	m
HYDRAULIC									
Master cylinder		10-54 A	Cleveland						
Parking valve		60-5D	Cleveland						
Brake assembly		30-239 B	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						
Primary flight display (PFD)	GDU 1050	011-03470-00	Garmin						
Multi function display (MFD)	GDU 1050	011-03470-00	Garmin						
Multi function display (MFD)	GDU 1054	011-03470-60	Garmin						
LANDING GEAR									
LANDING GEAR STANDARD FAIRINGS									
MLG wheel fairing LH		D41-3213-91-00	Diamond Aircraft						

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

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

Airplane Serial No.:		Registration:		Date:		Mass		Lever Arm	
Description	Type	Part No.	Manufacturer	S/N	Installed	lb	kg	in	m
Instr./radio lights dimmer assy		WW-LCM-002	White Wire						
Glareshield lamp assy		DA4-3311-10-01	Diamond Aircraft						
Glareshield light inverter		APVL328-8-3-L-18QF	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 / Pos. light assy LH	0R6002R	01-0771733-12	Whelen						
Strobe / Pos. light assy RH	0R6002G	01-0771733-11	Whelen						
Strobe light power supply LH/RH	A490ATS-CF–14/28	01-0770062-05	Whelen			1.592	0.722	101.0	2.566
Halogen Taxi light	70346-01	01-0770346-05	Whelen			0.28	0.13	79.920	2.030
Halogen Landing light	70346-01	01-0770346-03	Whelen			0.28	0.13	79.920	2.030
Electro luminescent lamps	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						
LED Taxi light	71125	01-0771125-23	Whelen			0.3	0.14	79.920	2.030
LED Landing light	71125	01-0771125-20	Whelen			0.3	0.14	79.920	2.030
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

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

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

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

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

Airplane Serial No.:		Registration:		Date:		Mass		Lever Arm	
Description	**Type**	**Part No.**	**Manufacturer**	**S/N**	**Installed**	**lb**	**kg**	**in**	**m**
ENGINE IGNITION SYSTEM									
SlickSTART booster	SS1001		Unison						
Lasar ignition controller	LC-1002-03	LC-1002-03	Unison						
Lasar ignition harness	LH-1004-43		Unison						
Magneto RH/LH	4370/4347		Slick						
Magneto RH/LH	4770/4771		Slick						
RPM sensor	VM1000	3010005	Vision Microsyst.						
Manifold pressure sensor	VM1000	3010016	Vision Microsyst.						
Cyl. head temp. probes (4 each)	VM1000	1020061	Vision Microsyst.						
EGT probes	VM1000	1020060	Vision Microsyst.						
Data processing unit	DPU	4010067	Vision Microsyst.						
Data processing unit	DPU	4010081	Vision Microsyst.						
Integr. engine data display	VM1000	4010050	Vision Microsyst.						
I/O board assy		3020003	Vision Microsyst.						
I/O board assy		3020018	Vision Microsyst.						
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

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

7.2.1 FUSELAGE

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

7.2.2 WINGS

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

7.2.3 EMPENNAGE

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

7.3 FLIGHT CONTROLS

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

7.3.1 AILERONS

Construction: GFRP/CFRP composite sandwich

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

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

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

7.3.2 FLAPS

Construction: GFRP/CFRP composite sandwich

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

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

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

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

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

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

Flap Position Indicator:

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

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

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

7.3.3 ELEVATOR

Construction:	GFRP sandwich
Hinges:	5 hinges
Operation:	Steel push-rods
	Two of the bellcrank bearings are accessible to visual inspection next to the lower hinge of the rudder. The elevator horn and its bearing, as well as the connection to the push-rod, can be visually inspected at the upper end of the rudder.

7.3.4 RUDDER

Construction:	GFRP sandwich
Hinges:	Upper hinge: One bolt
	Lower hinge: Bearing bracket including rudder stops, held by 4 screws to the rear web of the vertical stabilizer. The mating part on the rudder is a bracket which is attached to the rudder by 2 bolts. The bolts and nuts are accessible to visual inspection.
Operation:	Steel cables, the eyes of which are connected to the bolts on the bracket.

7.3.5 ELEVATOR TRIM

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

Turn wheel to the front = nose down

Turn wheel to the rear = nose up

7.3.6 PEDAL ADJUSTMENT

NOTE

The pedals may only be adjusted on the ground!

The pedals are unlocked by pulling the black 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.

(a) Forward Adjustment

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

(b) Rearward Adjustment

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

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

NOTE

The pedals may only be adjusted on the ground!

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

Forward Adjustment

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

Rearward Adjustment

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

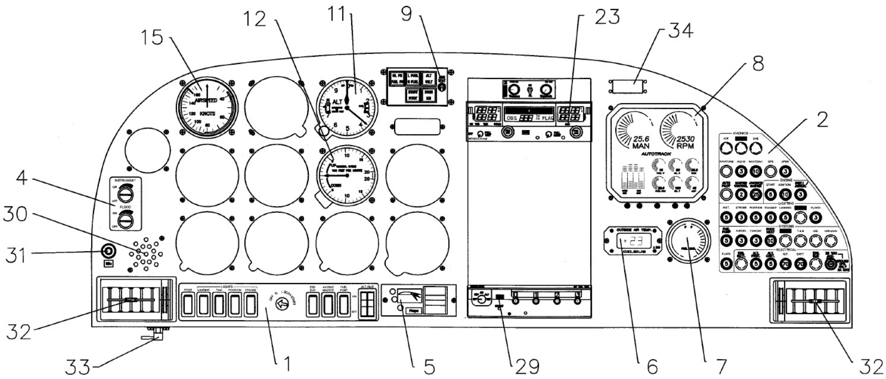
Locking

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

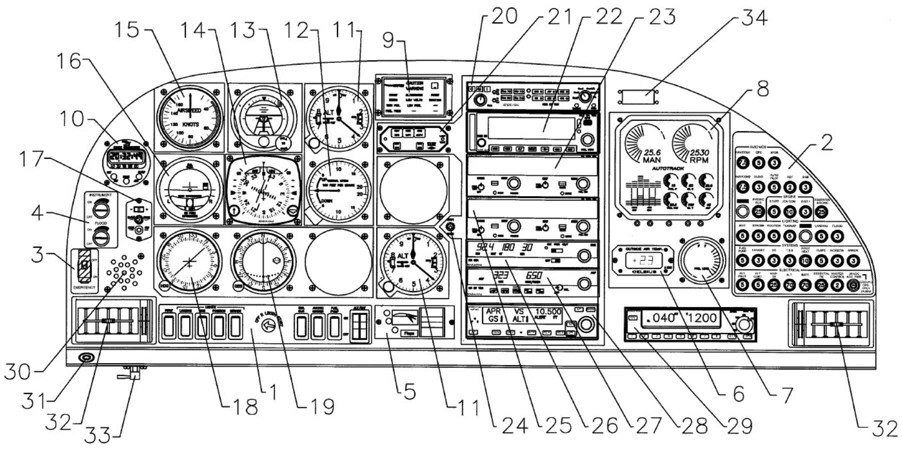
7.4 INSTRUMENT PANEL

7.4.1 INSTRUMENT PANEL VARIANTS

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



VFR instrument panel (example)



IFR instrument panel (example)

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

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

7.4.2 COCKPIT VENTILATION

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

7.5 LANDING GEAR

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

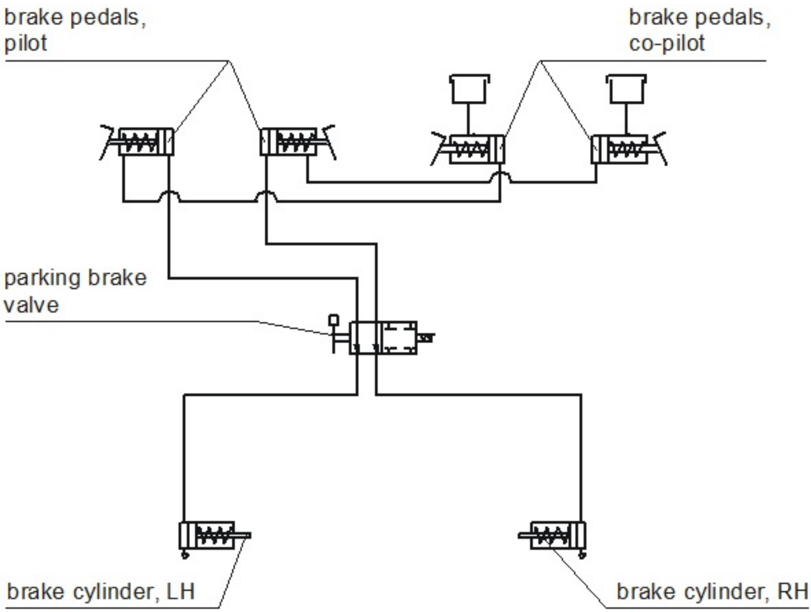
The wheel fairings are removable. When flying without wheel fairings, it should be noted that there is a reduction in some areas of performance (see Chapter 5).

7.5.1 WHEEL BRAKES

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

7.5.2 PARKING BRAKE

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



Hydraulic system schematic

7.6 SEATS AND SAFETY 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.

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

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

CAUTION

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

CAUTION

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

CAUTION

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

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

If OÄM 40-252 is installed, and in case of a defective adjustment mechanism, the outboard friction adjustment screw can be tightened with a 10 mm hexagon nut in clockwise direction in order to fix the backrest in the upright position.

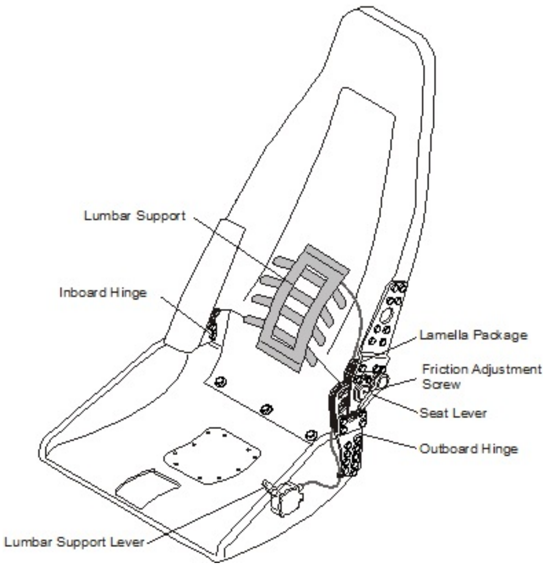
If possible, set the backrest lever to the “locked” position. The mechanism must be repaired at the next scheduled inspection.

If OÄM 40-375 is installed, and in case of a malfunction of the release button, the backrest can be moved into the upright position by pulling (480 N) the backrest forward.

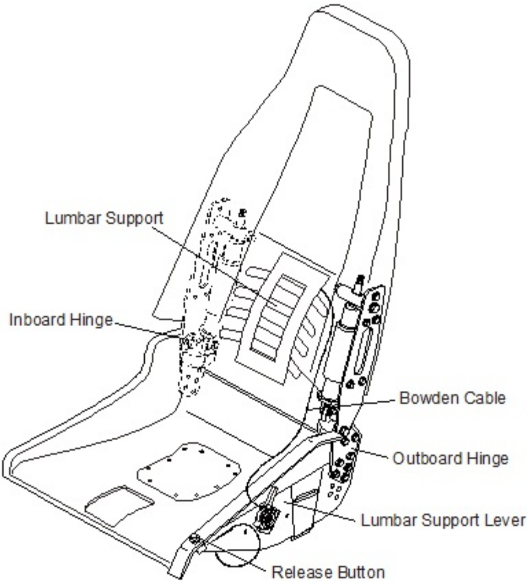
The seats have removable furnishings and are equipped with energy-absorbing foam elements. The seats are fitted with three-point safety harnesses. The harnesses are fastened by inserting the end of the belts in the belt lock, and are opened by pressing the release on the belt lock.

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

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



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



7.7 BAGGAGE COMPARTMENT

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

(a) Standard baggage compartment.

(b) Standard baggage compartment with “baggage tube.”

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

Without a baggage net, no baggage may be loaded.

7.7.1 STANDARD BAGGAGE COMPARTMENT

The baggage compartment is located behind the rear seats.

7.7.2 BAGGAGE TUBE (IF INSTALLED)

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

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

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

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

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

7.8 CANOPY, REAR DOOR, AND CABIN INTERIOR

7.8.1 FRONT CANOPY

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

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

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

7. DESCRIPTION OF THE AIRPLANE AND ITS SYSTEMS

The following paragraph is amended to read:

7.8 CANOPY, PASSENGER DOOR AND CABIN INTERIOR

7.8.1 CANOPY

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

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

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

WARNING

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

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

7.8.2 REAR DOOR

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

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

WARNING

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

7.8.3 HEATING AND VENTILATION

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

Left lever:

up = heating ON
down = heating OFF

The following warnings and paragraphs are amended to read:

WARNING

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

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

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

7.8.2 PASSENGER DOOR

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

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

WARNING

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

Central lever (air distribution lever):

up = airflow to canopy (▲)

down = airflow to floor (▼)

7.8.4 EMERGENCY AXE

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

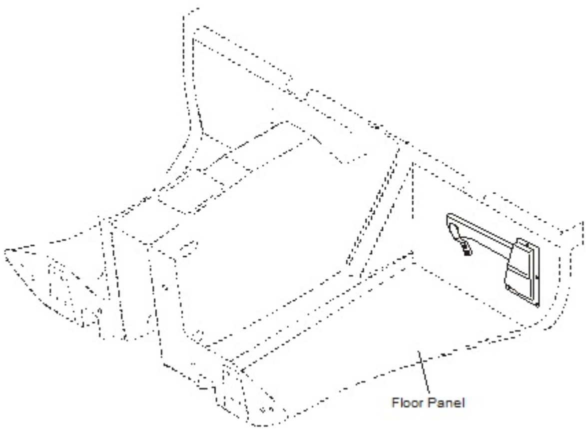
If the canopy can not be opened in case of an emergency use the emergency axe to break through the canopy.

WARNING

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

WARNING

Beware of sharp edges and fragments of the broken canopy.



7.8.5 EMERGENCY EGRESS HAMMER

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

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

WARNING

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

WARNING

Beware of sharp edges and fragments of the broken canopy.

7.9 POWER PLANT

7.9.1 ENGINE, GENERAL

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

Displacement:	5916 cm^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.

(a) Throttle

- Left hand lever with large, black knob.

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

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

Lever to rear (IDLE) = Idle, low MP

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

(b) RPM Lever

- Central lever with blue handle.

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

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

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

The propeller governor is flanged onto the front of the engine. It regulates the supply of engine oil to the propeller. The propeller governor oil circulation is an integral part of the engine oil circulation system. Following a defect in governor or oil system, the blades go 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.

(c) Mixture Control Lever

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

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

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

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

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

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

(d) Alternate Air

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

Placard on the lever, forward position:

ALTERNATE AIR

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

ALTERNATE AIR ON

7.9.3 PROPELLER

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

CAUTION

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

WARNING

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

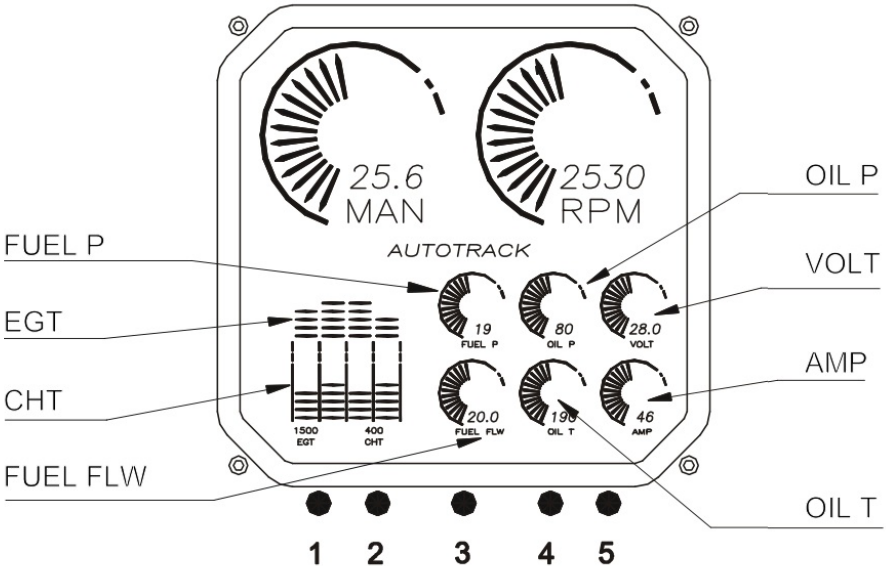
Never try to start the engine by hand.

(a) Governor

One of the following governors may be installed:

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

7.9.4 ENGINE INSTRUMENTS



Button 1: Lean mode

Button 2: Digital exhaust gas / cylinder head temperature mode

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

Button 4: Fuel computer mode

Button 5: Engine data recorder

(a) Sweep Mode or Pointer Mode

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

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

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

(c) Button 1 - Lean Mode

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

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

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

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

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

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

(e) Button 3 - Switch in Autotrack

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

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

(f) Button 4 - Fuel Computer Mode

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

REM: The remaining fuel is shown 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.

(g) Button 5 - Engine Data Recorder

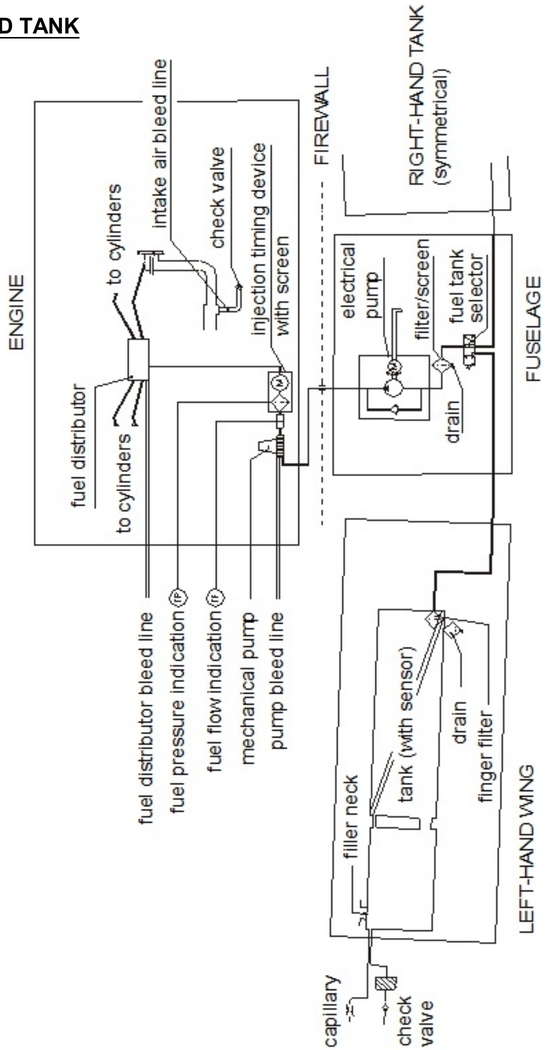
Operating button 5 will activate the engine data recorder. The digital values shown are the minimum values recorded by the engine instrument unit during operation, such as lowest voltage, lowest fuel pressure, etc. The numerical RPM indicator will indicate the total operating hours.

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

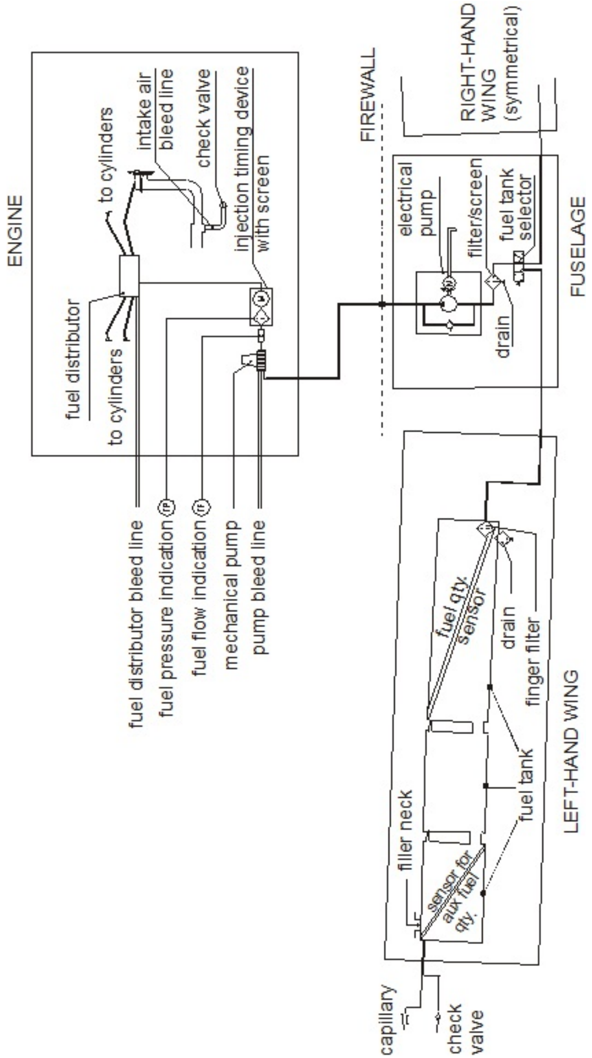
Data of the engine data recorder can be called during or immediately after flight only. With each new flight the old data will be overwritten.

7.10 FUEL SYSTEM

7.10.1 STANDARD TANK



7.10.2 LONG RANGE TANK



7.10.3 FUEL PUMPS

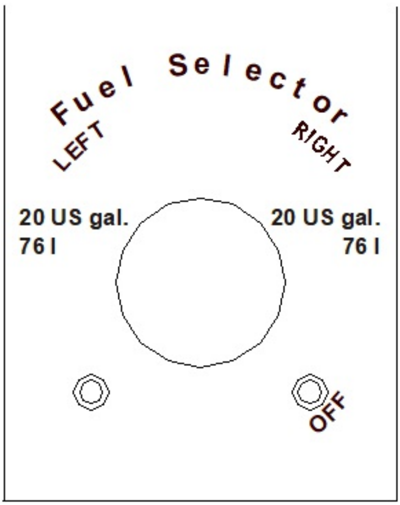
The fuel system is equipped with a mechanical and an electrical fuel pump. The mechanical pump provides for the normal fuel supply.

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

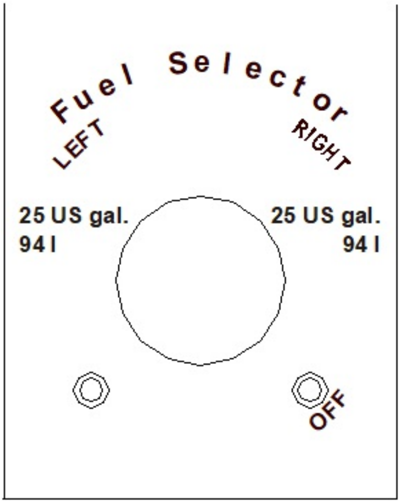
7.10.4 FUEL TANK SELECTOR

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

(a) Standard Tank



(b) Long Range Tank



7.10.5 FUEL TANKS

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

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

(a) Fuel Quantity Indication

Standard tank

A capacity probe ascertains fuel quantity in the tank. When the fuel quantity indicator reads zero, only the unusable fuel remains in the tank. The total capacity of each tank is 20 US gal (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.

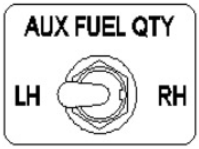
Long range tank

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

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

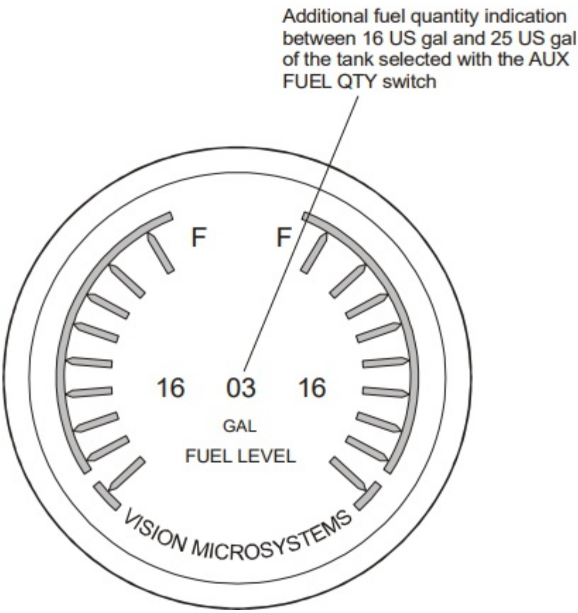
A fuel quantity between 16 US gal and 25 US gal is ascertained by the additional probes and is brought to indication in the central area of the fuel quantity indicator. The indication is numerical in 3 US gal steps (in the range from 0 to 3 US gal) and 1 US gal steps (in the range above 3 US gal up to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

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



CAUTION

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



7.10.6 FUEL QUANTITY MEASURING DEVICE

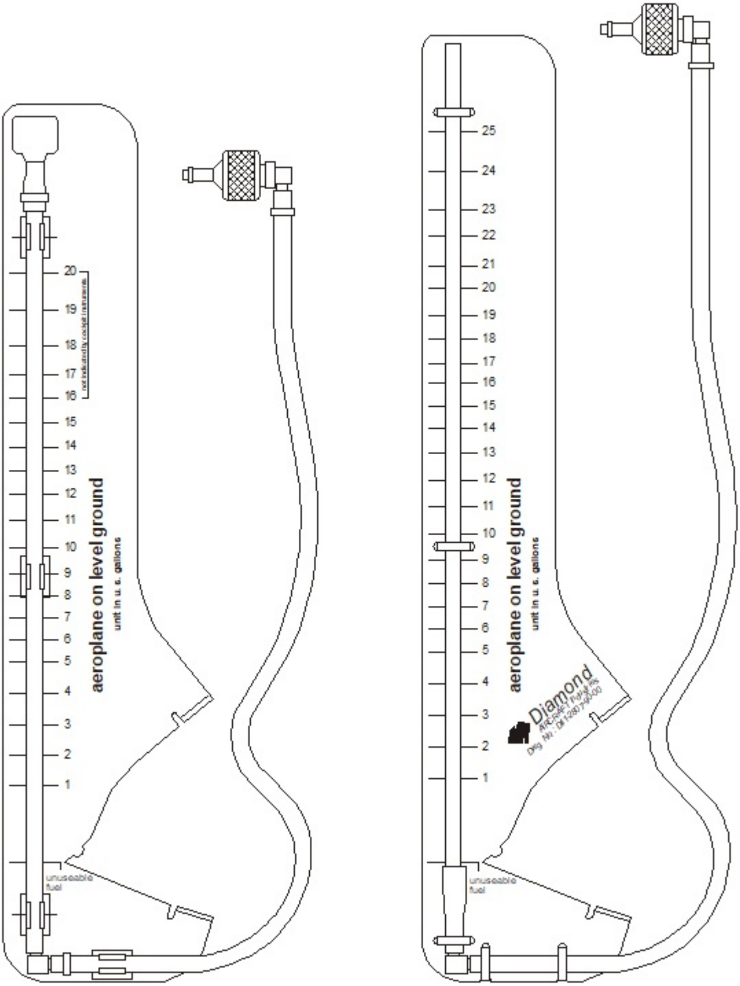
The fuel quantity measuring device allows the fuel quantity in the tank to be determined during the pre-flight inspection. It functions according to the principle of communicating containers. The fuel quantity measuring device has a recess which fits the airfoil of the wing. With this recess the device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

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

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

CAUTION

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

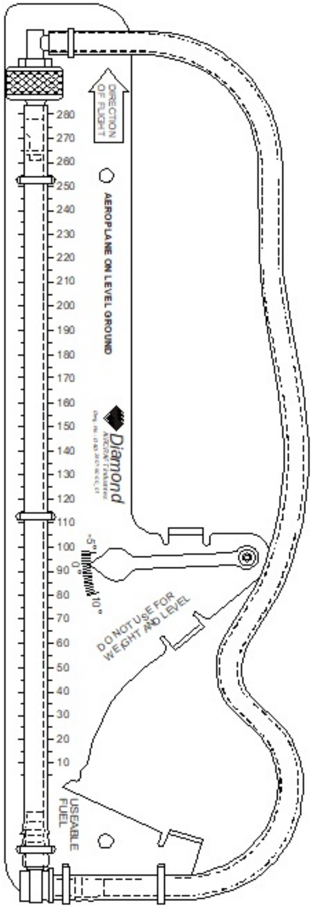


Fuel quantity measuring device for standard tank (left) and long range tank (right)

(a) Alternate Means for Fuel Quantity Indication with Fuel Indicator II (for Standard Tank Configuration Only)

For an exact indication, the airplane must stand on horizontal ground with the wings level.

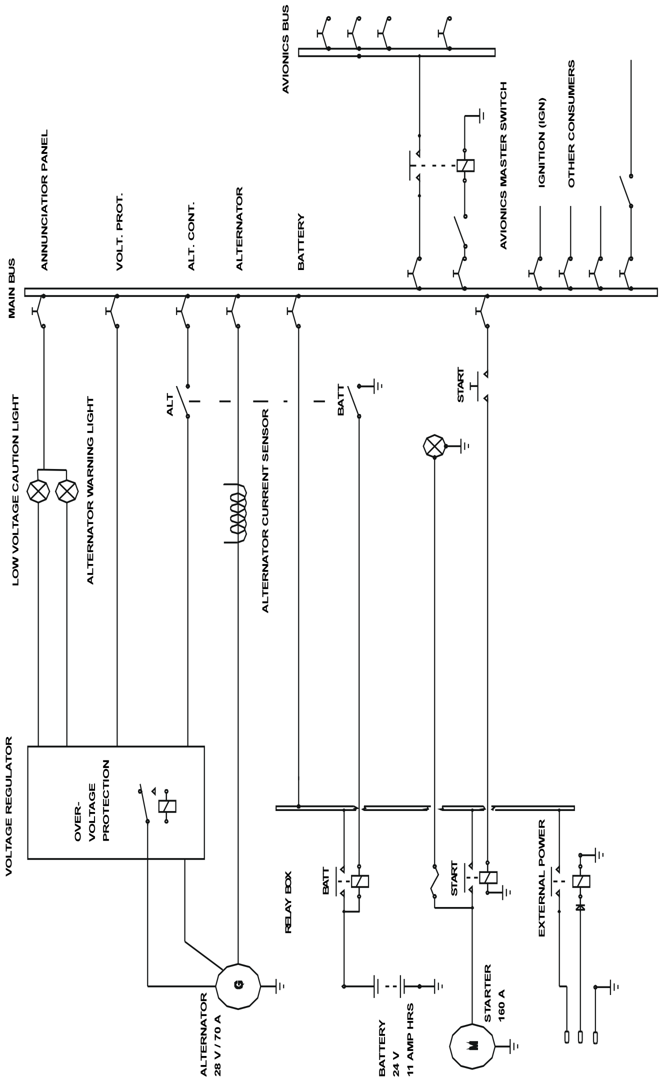
The fuel indicator II includes a protractor for an additional pitch angle measurement. The fuel indicator II is placed on top of the fuselage tube just in front of the vertical tail. The lower edge of the fuel indicator II must be supported by the fuselage for its entire length. Read the pitch angle on the fuel indicator II, and read the exact fuel quantity on the tables provided.



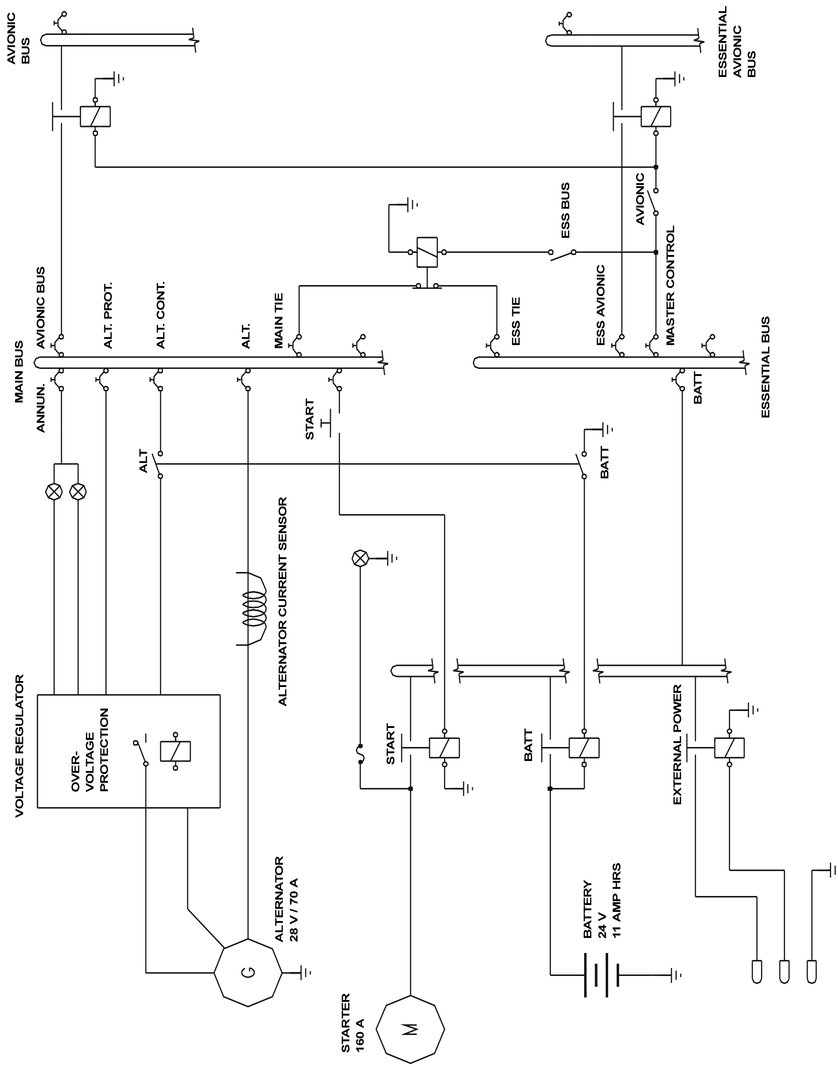
Fuel Quantity Indicator II - standard tank configuration only

Fuel Quantity Indicator II Pitch Angle Reading					Usable Fuel Quantity	
1°	2°	3°	4°	5°	US gal	Liter
up to 5	up to 5	up to 5	up to 5	up to 0	0	0
35	25	16	8	1	1	3.8
45	36	30	20	15	2	7.6
65	48	40	35	28	3	11.3
75	68	55	47	39	4	15.1
92	80	72	66	55	5	18.9
110	90	78	70	65	6	22.7
118	108	95	87	77	7	26.5
130	123	110	100	90	8	30.3
140	132	115	102	95	9	34.1
148	136	129	122	113	10	37.8
162	149	138	130	118	11	41.6
174	158	150	138	131	12	45.4
180	171	162	156	146	13	49.2
185	180	175	166	156	14	53.0
200	195	184	176	168	15	56.8
217	205	196	189	181	16	60.6
232	220	215	204	196	17	64.4
248	238	230	221	214	18	68.1

7.11 ELECTRICAL SYSTEM



Simplified wiring diagram for serial numbers without Essential Bus



Simplified wiring diagram for serial numbers with Essential Bus

7.11.1 GENERAL

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

- Power generation
- Storage
- Distribution
- Consumers

(a) Power Generation

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

(b) Storage

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

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

(c) Distribution

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

(d) Master Switch (ALT/BAT)

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

(e) Consumers

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

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

(f) Ignition

The 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.

(g) Voltmeter

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

(h) Ammeter

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

(i) Landing and Taxi Lights

Landing and taxi lights are built into the left wing, and are each operated by means of a switch (LANDING, TAXI) on the row of switches on the instrument panel.

(j) Position and Strobe Lights

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

(k) Flood Light

A two-dimensional light emitter is mounted above the instrument panel. It illuminates the instrument panel as well as all levers, switches, etc. With a rotary button (FLOOD) in the left-hand section of the instrument panel the flood light is switched on and its brightness is adjusted.

(l) Instrument Lighting

With a rotary button (INSTRUMENT) in the left-hand section of the instrument panel the internal lighting of the instruments is switched on and its brightness is adjusted.

(m) Pitot Heating

The Pitot probe, which provides measurement for the Pitot-static system, is electrically heated. The heating is activated with a switch (PITOT) on the row of switches on the instrument panel. The temperature is automatically kept constant by means of a thermal switch on the Pitot probe, and as an additional safety measure a thermal fuse is built in. If this thermal fuse is activated, the Pitot heating can no longer be switched on, and the Pitot heating caution will be displayed. In this case the system should be serviced.

NOTE

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

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

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

(a) Testing the Annunciator Panel

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

(b) Alternator Warning Light (ALT)

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

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

(c) Low Voltage Caution Light (VOLT)

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

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

(d) Fuel Pressure Warning Light (FUEL PR)

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

(e) Low Fuel Caution Lights (L FUEL and R FUEL)

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

(f) Oil Pressure Warning Light (OIL PR)

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

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

(g) Door Warning Light (DOOR)

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

The procedure to be followed upon door warning is given in 3.7.4 - DOOR OPEN.

(h) Status Light for the Ignition (IGN)

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

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

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

(i) Starter Warning Light (START)

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

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

(j) Pitot Heating Caution Light (PITOT)

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

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

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

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

(a) Testing the Annunciator Panel

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

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

(b) Warning Messages

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

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

(c) Caution Messages

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

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

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

(d) Alternator Warning Message (ALTERNATOR)

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

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

(e) Low Voltage Caution Message (LOW VOLTS)

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

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

(f) Fuel Pressure Warning Message (FUEL PRESS)

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

(g) Low Fuel Caution Message (LOW FUEL)

As soon as the amount of usable fuel *in one tank* is less than 3 US gal (±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.

(h) Oil Pressure Warning Message (OIL PRESS)

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

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

(i) Door Warning Message (DOORS)

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

The procedure to be followed upon door warning is given in 3.7.4 - DOOR OPEN.

(j) Status Light for the Ignition (IGN)

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

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

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

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

(k) Starter Warning Message (START)

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

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

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

(l) Pitot Heating Caution Message (PITOT)

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

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

(m) Trim Failure Warning Message (TRIM FAIL)

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

(n) Unused Lights

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

7.12 PITOT-STATIC SYSTEM

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

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

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

7.13 STALL WARNING

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

7.14 AVIONICS

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

7.15 CO-MONITOR (IF INSTALLED)

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

7.15.1 SELF TEST SEQUENCE

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

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

7.15.2 IN-FLIGHT CO ALARM

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

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

NOTE

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

7.15.3 UNIT FAILURE INDICATION

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

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

CHAPTER 8
AIRPLANE HANDLING, CARE AND MAINTENANCE

Page

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8.1 INTRODUCTION

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

8.2 AIRPLANE INSPECTION INTERVALS

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

CAUTION

Unscheduled maintenance checks are required after:

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

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

8.3 AIRPLANE ALTERATIONS OR REPAIRS

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

8.4 GROUND HANDLING / ROAD TRANSPORT

8.4.1 GROUND HANDLING WITHOUT TOW BAR

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

8.4.2 GROUND HANDLING WITH TOW BAR

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

WARNING

The tow bar must be removed before starting the engine.

CAUTION

The tow bar may only be used for moving the airplane on the ground by hand. After moving the airplane, the tow bar must be removed.

NOTE

When moving the airplane rearward, the tow bar must be held firmly to prevent abrupt sideward deflection of the nose wheel.

8.4.3 PARKING

For short term parking, the airplane must be positioned into the wind, the parking brake must be engaged and the wing flaps must be in the retracted position. For extended and unattended parking, as well as in unpredictable wind conditions, the airplane must be anchored to the ground or placed in a hangar. Parking in a hangar is recommended.

(a) Control Surfaces Gust Lock

The manufacturer offers a control surfaces gust lock which can be used to block the primary controls. It is recommended that the control surfaces gust lock be used when parking outdoors, because the control surfaces can hit the stops in strong tail winds. This can lead to excessive wear or damage.

WARNING

The control surfaces gust lock must be removed before flight.

The control surfaces gust lock is installed as follows:

1. Move the rudder pedals fully rearward.
2. Engage the control surfaces gust lock with the pedals.
3. Engage the stick, wrap straps around stick once.
4. Attach the locks and tighten the straps.

For removal, reverse the sequence.

NOTE

The figures below show the gust lock installed in a DA 42. Nevertheless, the figures are an accurate depiction of the gust lock installed correctly in the DA 40.

8.4.4 MOORING

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

8.4.5 JACKING

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

8.4.6 ALIGNMENT

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

8.4.7 ROAD TRANSPORT

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

(a) Fuselage

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

(b) Wings

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

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

(c) Horizontal Stabilizer

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

8.5 CLEANING AND CARE

CAUTION

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

CAUTION

Excessive dirt deteriorates the flight performance.

8.5.1 PAINTED SURFACES

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

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

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

8.5.2 CANOPY AND REAR DOOR

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

8.5.3 PROPELLER

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

(a) Surface

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

8.5.4 ENGINE

Engine cleaning is part of the scheduled inspections.

CAUTION

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

8.5.5 INTERIOR SURFACES

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

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

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

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

8.6 DE-ICING ON THE GROUND

(a) Approved De-Icing Fluids

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

(b) De-Icing Procedure

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

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CHAPTER 9
SUPPLEMENTS

Page

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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: 40.079		**Registration:** OE-DGE		**Date:** 5.12.2024	
Sup. No.	**Title**	**Rev. No.**	**Date**	**Applicable**	
				YES	**NO**
A1	COMM/NAV, KX 125 Bendix/King	1	20-Apr-2001	□	X
A2	Intercom System, Model PM 1000 II PS Engineering, Inc.	2	15-Mar-2005	□	X
A3	Transponder, KT 76A Bendix/King	1	20-Apr-2001	□	X
A4	GPS, KLN 89B Bendix/King	1	20-Apr-2001	□	X
A5	Course Deviation Indicator, KI 208 Bendix/King	1	20-Apr-2001	□	X
A6	GPS, KLN 94 (VFR Operation) Bendix/King	2	09-Sep-2001	□	X
A7	Audio Amplifier / Intercom / Marker Beacon Receiver, KMA 28 Bendix/King	1	20-Apr-2001	□	X
A8	VHF Communication/Navigation Transceivers, KX 155A and KX 165A Bendix/King	2	03-Oct-2001	□	X

Airplane S/N: 40.079		Registration: OE-DGE		Date: 5.12.2024	
Sup. No.	Title	Rev. No.	Date	Applicable	
				YES	NO
A9	Automatic Direction Finder, KR 87 Bendix/King	2	17-Feb-2003	X	☐
A10	Distance Measuring Equipment, KN 62A Bendix/King	2	17-Feb-2003	X	☐
A11	Compass System, KCS 55A Bendix/King	4	15-Mar-2005	X	☐
A12	Transponder, KT 76C Bendix/King	2	15-Mar-2005	☐	X
A13	Autopilot System, KAP 140 Bendix/King	2	15-Mar-2005	X	☐
A14	GPS, KLN 94 (IFR Operation) Bendix/King	3	15-Mar-2005	☐	X
A15	GPS Annunciation Control Unit, MD 41 Mid-Continent	2	15-Mar-2005	☐	X
A16	Multifunction Display / GPS KMD 150, Bendix/King	0	20-Sep-2001	☐	X
A17	COM / NAV / GPS GNS 430, Garmin	3	22-Jun-2005	X	☐
A18	Audio Panel, GMA 340, Garmin	2	22-Jun-2005	☐	X
A19	Transponder, GTX 327, Garmin	1	15-Mar-2005	X	☐
A20	Course Deviation Indicator, GI 106A, Garmin	1	15-Mar-2005	X	☐
A21	COM / NAV / GPS, GNS 530, Garmin	1	15-Mar-2002	☐	X
A22	Strike Finder, SF 2000, Insight	0	10-Oct-2001	☐	X
A23	GPS Annunciation Unit, MD 41-1488/1484, MID Continent	1	20-Dec-2002	☐	X
A24	Stormscope, WX-500, Goodrich	2	28-Feb-2003	☐	X

Airplane S/N: 40.079	Registration: OE-DGE		Date: 5.12.2024		
Sup. No.	**Title**	**Rev. No.**	**Date**	**Applicable**	
				YES	**NO**
A25	Audio Panel, GMA 340, Garmin, VFR	2	15-Mar-2005	☐	X
A26	COM / NAV / GPS, GNS 430, Garmin, VFR	0	02-Aug-2002	☐	X
A27	Ground Com #2 Switch	0	05-Apr-2002	☐	X
A29	Transponder, GTX 330, Garmin	0	25-Jun-2003	☐	X
A30	Garmin G1000 NXi Avionics System	0	10-Feb-2020	☐	X
E1	Digital Chronometer, LC-2 AstroTech	1	20-Apr-2001	X	☐
E2	Attitude Indicator, AIM 1100-28L(0F) BF Goodrich	2	15-Mar-2005	☐	X
E3	Attitude Indicator, AIM 1100-28LK(0F) DIA BF Goodrich	2	15-Mar-2005	☐	X
E4	Digital Chronometer, Model 803, Davtron	1	15-Mar-2005	☐	X
E7	Ventilation Inlet Baffle	1	27-Apr-2005	☐	X
N023	Operation in Brazil	-	04-Jul-2008	☐	X
O1	Use of the DA 40 as Tow-Plane	1	28-Nov-2001	☐	X
O2	Operation of the DA 40 with Winter Kit	0	26-Nov-2001	☐	X
S1	Emergency Locator Transmitter, Model E-01, ACK	2	15-Mar-2005	☐	X
S2	Emergency Locator Transmitter, JE2-NG, Jolliet	0	01-Jun-2001	☐	X
S4	ELT Artex ME 406 ‘ACE’	1	10-Apr-2007	☐	X

ARTEX ELT 345	**1**	**X**
VT2000 Mode S Transponder	**1**	**X**
GTN750/GMA35 GPS Nav/Com/Audio	**1**	**X**
Charterware OBU	**1**	**X**
Garmin G5 Attitude Indicator	**1**	**X**

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SUPPLEMENT A9
TO THE AIRPLANE FLIGHT MANUAL DA 40 (D)

AUTOMATIC DIRECTION FINDER
KR 87
BENDIX/KING

Doc. No.	:	**6.01.01-E (DA 40)**
		6.01.05-E (DA 40 D)
Date of Issue of the Supplement	:	**01 Mar 2001**
Design Change Advisory	:	**OÄM 40-067 (DA 40)**
		OÄM 40-136 (DA 40 D)

Signature	:	
Authority	:	AUSTRO CONTROL GmbH Abteilung Flugtechnik Zentrale A-1030 Wien, Schnirchgasse 11
Stamp	:	
Date of approval	:	18. JUNI 2003

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).

DIAMOND AIRCRAFT INDUSTRIES GMBH
N.A. OTTO-STR. 5
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0.1 RECORD OF REVISIONS

Rev. No.	Chapter	Pages	Date of Revision	Date Inserted	Signature
1	all	all	20 Apr 2001		
2	all	all	17 Feb 2003		

0.2 LIST OF EFFECTIVE PAGES

Chapter	Page	Date
0	9-A9-1	17 Feb 2003
	9-A9-2	17 Feb 2003
	9-A9-3	17 Feb 2003
1, 2, 3, 4A, 4B, 5	9-A9-4	17 Feb 2003
6	9-A9-5	17 Feb 2003
7	9-A9-5	17 Feb 2003
	9-A9-6	17 Feb 2003
	9-A9-7	17 Feb 2003
	9-A9-8	17 Feb 2003
	9-A9-9	17 Feb 2003
	9-A9-10	17 Feb 2003
	9-A9-11	17 Feb 2003
	9-A9-12	17 Feb 2003
	9-A9-13	17 Feb 2003
8	9-A9-13	17 Feb 2003

0.3 TABLE OF CONTENTS

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1. GENERAL

This Supplement supplies the information necessary for the efficient operation of the airplane when the ADF KR 87 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 ADF KR 87 is installed.

2. LIMITATIONS

No change.

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

Upon removal or installation of the ADF System KR 87 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

7.14 AVIONICS

The Bendix/King Digital ADF is a panel-mounted, digitally tuned automatic direction finder. It is designed to provide continuous 1 kHz digital tuning in the frequency range of 200 kHz to 1799 kHz and eliminates the need for mechanical band switching. The system is comprised of a receiver, a built-in electronics timer, a bearing indicator, and a KA 44B combined loop and sense antenna. Operating controls and displays for the Bendix/King Digital ADF are shown and described are shown in the Figure below.

The Bendix/King Digital ADF can be used for position plotting and homing procedures, and for aural reception of amplitude-modulated (AM) signals.

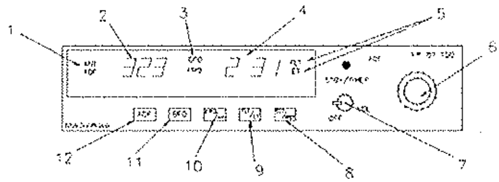
The 'flip-flop' frequency display allows switching between preselected 'STANDBY' and 'ACTIVE' frequencies by pressing the frequency transfer button. Both pre-selected frequencies are stored in a non-volatile memory circuit (no battery power required) and displayed in large, easy-to-read, self-dimming gas discharge numerics. The active frequency is continuously displayed in the left window, while the right window will display either the standby frequency or the selected readout from the built-in electronic timer.

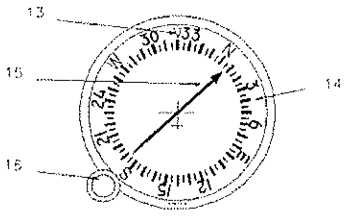
The built-in electronic timer has two separate and independent timing functions.

- An automatic flight timer that starts whenever the unit is turned on. This timer functions up to 59 hours and 59 minutes.

- An elapsed timer which will count up or down for up to 59 minutes and 59 seconds.

When a preset time interval has been programmed and the countdown reaches :00, the display will flash for 15 seconds. Since both the flight timer and elapsed timer operate independently, it is possible to monitor either one without disrupting the other. The pushbutton controls and the bearing indicators are internally lighted. Intensity is controlled by the instrument lights potentiometer.





1. ANT/ADF MODE ANNUNCIATOR - Antenna (ANT) is selected by the 'out' position of the ADF button. This mode improves the audio reception and is usually used for station identification.

The bearing pointer is deactivated and will park in the 90° relative position. Automatic Direction Finder (ADF) mode is selected by the depressed position of the ADF button. This mode activates the bearing pointer. The bearing pointer will point in the direction of the station relative to the airplane heading.

2. IN-USE FREQUENCY DISPLAY - The frequency to which the ADF is tuned is displayed here. The active ADF frequency can be changed directly when either of the timer functions is selected.

3. BFO (Beat Frequency Oscillator) ANNUNCIATOR - The BFO mode, activated and annunciated when the 'BFO' button is depressed, permits the carrier wave and associated morse code identifier broadcast on the carrier wave to be heard.

NOTE

CW signals (Morse Code) are unmodulated and no audio will be heard without use of BFO. This type of signal is not used in the United States air navigation. It is used in some other countries and marine beacon.

4. STANDBY FREQUENCY/FLIGHT TIME OR ELAPSED TIME ANNUNCIATION - When FRQ is displayed the STANDBY frequency is displayed in the right hand display. The STANDBY frequency is selected using the frequency select knobs. The selected STANDBY frequency is put into the ACTIVE frequency windows by pressing the frequency transfer button. Either the standby frequency, the flight timer, or the elapsed timer is displayed in this position. The flight timer and elapsed timer are displayed replacing the standby frequency which goes into 'blind' memory to be called back at any time by depressing the FRQ button. Flight time or elapsed time are displayed and annunciated alternatively by depressing the FLT/ET button.

5. FLIGHT TIMER AND ELAPSED TIMER MODE ANNUNCIATION - Either the elapsed time (ET) or flight time (FLT) mode is annunciated here.

6. FREQUENCY SELECT KNOBS - Selects the standby frequency when FRQ is displayed and directly selects the active frequency whenever either of the time function is selected. The frequency selector knobs may be rotated either clockwise or counterclockwise. The small knob is pulled out to tune the 1´s. The small knob is pushed in to tune the 10´s. The outer knob tunes the 100´s with rollover into the 1000´s up to 1799. These knobs are also used to set the desired time when the elapsed timer is used in the countdown mode.

7. ON/OFF/VOLUME CONTROL SWITCH (ON/OFF/VOL) - Controls primary power and audio output level. Clockwise rotation from OFF position applies primary power to the receiver; further clockwise rotation increases audio level. Audio muting causes the audio output to be muted unless the receiver is locked on a valid station.

8. SET/RESET ELAPSED TIMER BUTTON (SET/RST) - The set/reset button when pressed resets the elapsed timer whether it is being displayed or not.

9. FLIGHT TIMER/ELAPSED TIMER MODE SELECTOR BUTTON (FLT/ET) - The Flight Timer/Elapsed Time mode selector button when pressed alternatively selects either Flight Timer mode or Elapsed Timer mode.

10. FREQUENCY TRANSFER BUTTON (FRQ) - The FRQ transfer button when pressed exchanges the active and standby frequencies. The new frequency becomes active and the former active frequency goes into standby.

11. BFO (Beat Frequency Oscillator) BUTTON - The BFO button selects the BFO mode when in the depressed position. (See note under item 3).

12. ADF BUTTON - The ADF button selects either the ANT mode or the ADF mode. The ANT mode is selected with the ADF button in the out position. The ADF mode is selected with the ADF button in the depressed position.

13. LUBBER LINE - Indicates magnetic heading of the airplane.

14. COMPASS CARD - Slaved Compass Card, derives its heading input from the Slaved Compass System KCS 55A.

15. BEARING POINTER - Indicates magnetic bearing to the station.

16. SYNC KNOB - The compass card is synchronized to the HSI compass card by rotating the SYNC knob until the heading matches that of the HSI.

OPERATING THE KR 87

TURN-ON

Rotate the ON/OFF/VOL knob clockwise from the detented 'OFF' position. The unit will be activated and will be ready to operate. Rotation of this control also adjusts audio volume. The KR 87 has 'audio muting' which causes the audio output to be muted unless the receiver is locked on a valid station.

FREQUENCY SELECTION

The active frequency (to which the ADF is tuned) is displayed in the left side of the window at all times. A standby frequency is displayed in the right side when 'FRQ' is annunciated. The standby frequency is placed in 'blind' memory when either FLT (Flight Time) or ET (Elapsed Time) mode is selected.

With 'FRQ' annunciated, the standby frequency is selected using the frequency select knobs which may be rotated either clockwise or counterclockwise. Pull the small inner knob out to tune 1´s. Push the smaller inner knob to tune 10´s. The outer knob tunes the 100´s and the 1000´s up to 1799.

The standby frequency selected may then be put into the active window by pressing the 'FRQ' button. The standby and active frequencies will be exchanged (flip-flopped), the new frequency will become active, and the former active frequency will go into standby.

OPERATING MODES

Antenna (ANT) mode is selected and annunciated when the 'ADF' button is in the 'out' position. ANT provides improved audio reception from the station tuned and is usually used for identification. The bearing pointer in the KI 227 indicator will be deactivated and immediately turn to the 90° relative position and remain there during ANT reception.

The ADF mode is selected and annunciated when the 'ADF' button is in the depressed position. ADF activates the bearing pointer in the KI 227 indicator, causing it to move without hesitation to the point in the direction of the station relative to the airplane heading. The compass card on the KI 227 may be rotated as desired by using the heading knob.

NOTE

The KI 227 indicator has a slaved compass card. The magnetic heading of the airplane will be under the lubber line. The indication of this compass card should be compared with that of the KI 525A master indicator from time to time. Check especially after steep bank turns and taxi turns. If a discrepancy between the two readings exists, the KI 227 compass card should be synchronized to the KI 525A compass card by rotating the 'SYNC' knob on the indicator.

Some stations are unmodulated and use an interrupted carrier for identification purposes. The BFO mode, activated and annunciated when the 'BFO' button is depressed, permits the carrier wave and the associated Morse code identifier broadcast on the carrier wave to be heard.

ADF TEST (PRE-FLIGHT OR IN-FLIGHT)

Select ANT mode. This will cause the bearing pointer to move directly to the parked 90° position. Make sure the unit is tuned to a useable frequency.

Now select ADF mode and the needle should move without hesitation to the station bearing. Excessive sluggishness, wavering or reversals indicate a signal that is too weak or a system malfunction.

OPERATING THE TIMERS

The flight timer will always be automatically reset to :00 whenever power is interrupted either by the avionics master switch or the unit's ON/OFF switch.

Flight time or elapsed time are displayed and annunciated alternatively by depressing the FLT/ET button. The flight timer continues to count up until the unit is turned off. The elapsed timer may be reset back to :00 by pressing the SET/RST button. It will then start counting up again.

NOTE

Pressing the SET/RST button will reset the elapsed timer whether it is being displayed or not.

The elapsed timer also has a 'count-down' mode. To enter the countdown mode, the SET/RST button is depressed for about two seconds, or until the 'ET' annunciation begins to flash. It is now in the ET set mode, and a time up to 59 minutes, 59 seconds may be preset into the elapsed timer with the concentric knobs.

The preset time will be displayed and remain unchanged until SET/RST is pressed again, which will start the elapsed timer counting down from the preset time. When the timer reaches :00 it will start to count up as the display flashes for 15 seconds and an aural alarm is activated for about 1 second.

NOTE

> The standby frequency which is in memory while flight time or elapsed time modes are being displayed maybe called back by pressing the FRQ button, then transferred to active use by pressing the FRQ button again.

While FLT or ET is displayed the 'in use' frequency on the left side of the window may be changed, by using the frequency select knobs, without any effect on the stored standby frequency or the other modes. This feature is especially useful when searching for stations with unknown frequencies.

ERRONEOUS ADF BEARINGS DUE TO RADIO FREQUENCY PHENOMENA

STATION OVERLAP

In the U.S., the FCC, which assigns AM radio frequencies, occasionally will assign the same frequency to more than one station in an area. Certain conditions, such as Night Effect, may cause signals from such stations to overlap. This should be taken into consideration when using AM broadcast stations for naviation.

Sunspots and atmospheric phenomena may occasionally distort reception so that signals from two stations on the same frequency will overlap. For this reason it is always wise to make positive identification of the station being tuned, by switching the function selector to ANT and listening for station call letters.

ELECTRICAL STORMS

In the vicinity of electrical storms, an ADF Indicator pointer tends to swing from the station tuned toward the electrical discharges. Location of the storm can be useful information, but the erratic behavior of the pointer should be taken into account.

NIGHT EFFECT

This is a disturbance particularly strong just after sunset and just after dawn. An ADF indicator pointer may swing erratically at these times. If possible, tune to the most powerful station at the lowest frequency. If this is not possible, take the average of pointer oscillations to determine relative station bearing.

MOUNTAIN EFFECT

Radio waves reflecting from the surface of mountains may cause the pointer to fluctuate or show an erroneous bearing. This should be taken into account when taking bearings over mountainous terrain.

COASTAL REFRACTION

Radio waves may be refracted when passing from land to sea or when moving parallel to the coastline. This should be taken into account when operating near coastal areas.

8. AIRPLANE HANDLING, CARE AND MAINTENANCE

No change.

SUPPLEMENT A10
TO THE AIRPLANE FLIGHT MANUAL DA 40 (D)

DISTANCE MEASURING EQUIPMENT
KN 62A
BENDIX/KING

Doc. No.	**: 6.01.01-E (DA 40)**
	6.01.05-E (DA 40 D)
Date of Issue of the Supplement	**: 01 Mar 2001**
Design Change Advisory	**: OÄM 40-067 (DA 40)**
	OÄM 40-136 (DA 40 D)

Signature :	
Authority :	
Stamp :	...TRO CONTROL GmbH Abteilung Flugtechnik Zentrale A-1030 Wien, Schnirchgasse 11
Date of approval :	18. JUNI 2003

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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1	all	all	20 Apr 2001		
2	all	all	17 Feb 2003		

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1. GENERAL

This Supplement supplies the information necessary for the efficient operation of the airplane when the DME KN 62A 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 DME KN 62A is installed.

2. LIMITATIONS

No change.

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

Upon removal or installation of the DME KN 62A 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

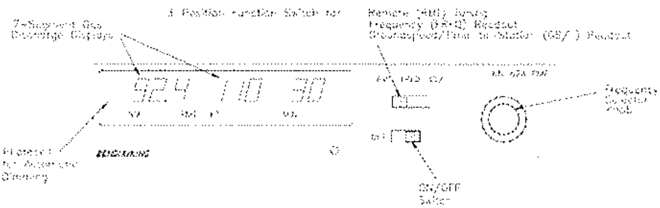
7.14 AVIONICS

The KN 62A front panel controls consists of an ON/OFF switch, a function switch, and frequency selector knobs. The function switch determines both the information displayed and the channeling source for the KN 62A. In Remote (RMT) mode, the KN 62A is channeled from an external control head, and the display shows range, speed, and time-to-station. In Frequency (FREQ) mode, the KN 62A is channeled from its own frequency selection knobs, and the display shows range and frequency. In Ground Speed/Time-to-Station (GS/T) mode, the KN 62A holds the last internally selected frequency and displays range, speed, and time-to-station.

The frequency hold feature in GS/T mode is necessary to prevent accidental rechanneling of the DME when frequency is not being displayed. To prevent the unit from displaying false information, the KN 62A will display dashes and stay in 'search' whenever power is turned on or momentarily interrupted in GS/T mode. Normal operation is re-established by switching to FREQ or RMT mode.

When the KN 62A is locked to a ground station, range is displayed to the nearest 0.1 nautical mile from 0 to 99.9 nautical miles and to the nearest 1 nautical mile from 100 to 389 nautical miles. Ground speed is displayed to the nearest knot from 0 to 999 knots. Time-to-station is displayed to the nearest minute from 0 to 99 minutes.

The display also indicates 99 minutes for any computes time-to-station greater than 99 minutes. When the KN 62A is in search mode, dashes are displayed instead of range, speed and time-to-station. An automatic dimming circuit adjusts the brightness of the display to compensate for changes in ambient light level. The dimming is controlled by a photocell mounted behind the front panel to the left of the display. Backlighting is connected and controlled directly by the airplane´s instrument light dimmer.



OPERATION

The 3-position function switch determines both the information displayed and the channeling source.

Place the function switch on Frequency (FREQ). The unit is channeled internally with its own two concentric frequency selection knobs. The smaller of the two knobs has an 'in' and an 'out' position. When in the 'in' position, this smaller knob changes the 0.1 MHz digit (0.0, 0.1, 0.2, etc.). When pulled 'out', it adds 0.05 MHz to the frequency and tunes in 0.1 MHz steps (0.05, 0.15, 0.25, etc.). Pushing the smaller knob 'in' subtracts 0.05 MHz from the displayed frequency. The outer, larger knob changes the larger digits (1 MHz, 10 MHz). In FREQ mode, the unit will display distance and the selected frequency.

Now move the function switch to the Groundspeed/Time-to-Station (GS/T) position. The unit will hold the internally selected frequency and will display distance, ground speed and time-to-station.

Rotating the frequency selector will have no effect on the display, because the DME is in 'Frequency Hold'. This frequency hold feature in the GS/T mode prevents accidental rechanneling of the DME when the frequency is not displayed.

Place the function switch in the Remote (RMT) position, and your DME will be channeled when you select your NAV frequency on the NAV #1 receiver or NAV #2 receiver depending on the position of the 'Remote DME Switch'. Search time is usually about one second. When the unit locks on a ground station, it will display distance, ground speed and time-to-station.

Prior to lock on, 'dashes' will be displayed.

Note that you may have two frequencies available at all times (one remotely selected on the NAV receiver and one internally selected with the unit's controls).

OPERATIONAL NOTES

The KN 62A has an audio output for use in identifiying the DME ground station being received. The audio level is preset at the factory, but may be easily adjusted through the top cover.

The unit electronically converts to distance the elapsed time required for signals to travel to and from the ground station. This distance is then indicated in nautical miles on the Distance/Time-to-Station display. This distance, commonly referred to as slant range distance, should not be confused with actual along-the-ground distance. The difference between actual ground distance and slant range is least at low altitude and/or long range. If the range is three times the altitude or greater, error is negligible.

The effective range of DME depends on many factors, most important being the altitude of the airplane. Other contributing factors are the location and elevation of the station, DME transmitter power output, and receiver sensitivity.

The ground speed feature incorporated in the unit measures the rate of change in DME slant range distance with time. This speed is then read from 0 to 999 knots in 1 knot increments. To obtain accurate ground speed, the airplane must be tracking directly to or from the station. To obtain accurate time to station, the airplane must be tracking directly to the station.

8. HANDLING, SERVICING AND MAINTENANCE

No change.

SUPPLEMENT A11
TO THE AIRPLANE FLIGHT MANUAL
DA 40, DA 40 D, DA 40 F
COMPASS SYSTEM KCS 55A
BENDIX/KING

Doc. No.	**: 6.01.01-E (DA 40)**
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Signature :

Authority : AUSTRO CONTROL GmbH
Abteilung Flugtechnik
Zentrale

Stamp : A-1030 Wien, Schnirchgasse 11

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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 - 3345

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4	DA 40 AFM Rev. 0 EASA Statement	all	all	15 Mar 2005	2005-334	18.		

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6	9-A11-5	15 Mar 2005
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8	9-A11-14	15 Mar 2005

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1. GENERAL

This Supplement supplies the information necessary for the efficient operation of the airplane when the Compass System KCS 55A 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 Compass System KCS 55A is installed.

2. LIMITATIONS

No change.

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

Upon removal or installation of the KCS 55A Compass System the change of the 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

7.14 AVIONICS

GENERAL

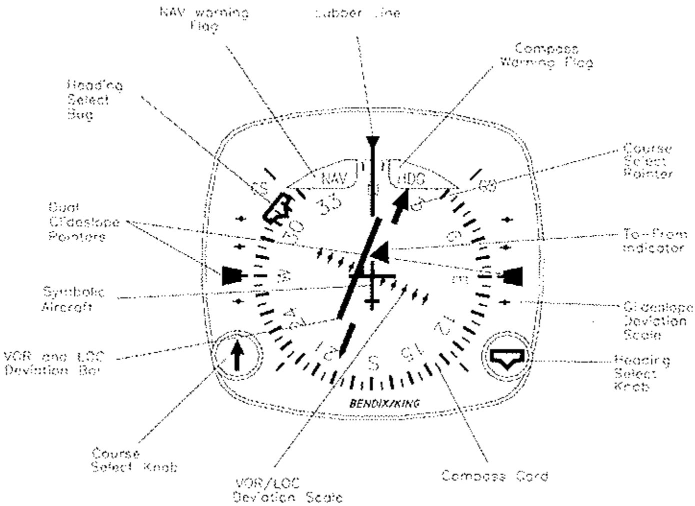
The KCS 55A Compass System includes the KA 51B Slaving Control and Compensator Unit, the KMT 112 Magnetic Slaving Transmitter and the KG 102 Directional Gyro as well as the KI 525A Pictorial Navigation Indicator.

The panel-mounted KI 525A HSI combines the display functions of both the standard Directional Gyro and the Course Deviation Indicator´s VOR/LOC/Glideslope information to provide the pilot with a single presentation of the complete horizontal navigation situation. This greatly simplifies course orientation, interception and tracking, while eliminating the need for scan coordination between two seperate indicators.

The KCS 55A Compass System has the feature to indicate alternatively information of the NAV #1 or information of the GPS. This is arranged with the GPS annunciation control unit MD 41 (see DA 40 Supplement A15). This switching unit allows to switch either NAV #1 information or GPS information to the KCS 55 A. For immediate crosscheck of the navigation information displayed on the KCS55A the navigation data must also be displayed directly on the NAV #1 or GPS receiver.

If the GNS 430 or 530 is installed, the indication of this information is controlled directly by the GNS 430 or 530 and displayed on the GPS annunciation unit MD 41-1488/1484 (see Supplement A23).

KI 525A INDICATOR



The KI 525A Pictorial Navigation Indicator is the panel display for the KCS 55A Compass System. It replaces the standard Directional Gyro and Course Deviation Indicator (CDI) in the airplane's panel, combining slaved heading and VOR/LOC/Glideslope information into one compact display. By providing a simple, comprehensive visual presentation of the airplanes heading and position in relation to a desired course, the pilot's navigation workload is considerably reduced.

DESCRIPTION OF INDICATOR AND DISPLAY FUNCTIONS

Compass Card

Responding to the input from the slaved directional gyro, this card rotates within the display so that the airplane heading is always at the top, under lubber line.

Lubber Line

The lubber line is a fixed white marker at the top of the display that indicates the airplane magnetic heading on the compass card.

Symbolic Airplane

The symbolic airplane is a fixed representation of the actual airplane. This miniature airplane always points toward the top of the display and the lubber line.

Selected Course Pointer

On this two-part arrow, the 'head' indicates the desired VOR or Localizer course and the 'tail' indicates the reciprocal. This pointer is set by rotating the course select knob.

Course Select Knob

The course select knob is used to rotate the course pointer to the desired course on the compass card. This knob corresponds to the Omni Bearing Selector (OBS) on standard NAV indicators.

VOR/RNAV and LOC Deviation

be positioned This bar corresponds to the 'left/right' needle on standard course deviation indicators. When the airplane is precisely on the VOR radial or Localizer course, it forms the center section of the selected course pointer and will under the symbolic airplane. When off course or approaching a new course, it will move to one side or the other. Since the entire VOR and Localizer display rotates with the compass card, the angular relationship between the deviation bar and the symbolic airplane provides a pictorial symbolic display of the airplane's position with respect to the selected course.

Deviation Scale

When tuned to a VOR frequency, each white dot represents two degrees of deviation left or right of course. When tuned to a Localizer, the deviation is 1/2 degree per dot. (When GPS data is selected for presentation, refer to the Pilot's Guide for the GPS receiver.)

Heading Select Bug

A moveable orange marker on the outer perimeter of the display, used primarily to select the desired heading you wish to fly. This desired heading is coupled to the KAP 140 Autopilot to provide the 'Heading Select' function.

Heading Select Knob

Used to rotate the heading select bug to a desired point on the compass card.

To-From Indicator

A white triangle near the center of the display that indicates, with reference to the OBS setting, whether the course selected is 'to' or 'from' the selected VOR station and/or RNAV waypoint.

Dual Glideslope Pointers

Chartreuse triangular pointers on either side of the display drop into view when a useable glideslope signal is received and retract out of view when the glideslope signal becomes marginal. During an ILS approach, these pointers indicate the relative position of the glideslope path with respect to the airplane. (In other words, if the pointers are above the center marker, the airplane is below the glideslope.) When on glideslope, the pointer will align with the center markers on the glideslope scale.

Glideslope Deviation Scale

White dots on each side of the display which, in conjunction with the glideslope pointers, indicate either 'above', 'below' or 'on glideslope' during an ILS approach.

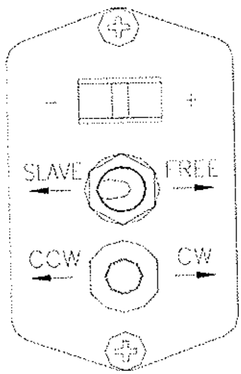
Compass Warning Flag

A red flag labeled 'HDG' becomes visible in the upper right quadrant of the display whenever the electrical power is inadequate or the directional gyro is not up to speed. Compass failures can occur which will not be annunciated by the 'HDG' flag. Therefore, periodic comparison with the standby compass is advised.

NAV Warning Flag

A red flag labeled 'NAV' becomes visible in the upper left quadrant of the display whenever a useable signal is not being received.

SLAVING METER (KA 51B)



This meter indicates any difference between the displayed heading and the magnetic heading. Right or up deflection indicates a clockwise error of the compass card. Left or down deflection indicates a counterclockwise error of the compass card. Whenever the airplane is in a turn and the card rotates, it is normal for this meter to show a full deflection to one side or another.

NOTE

During level flight it is normal for the meter needle to continuously move from side to side and to be fully deflected during a turn. If the needle stays fully deflected, left or right, during level flight, the free gyro mode can be used to center it as follows:

- *Slave and Free Gyro Switch* - When the switch is in the SLAVE position, the system is in the slaved gyro mode. When the switch is in the FREE position, the system is in the free gyro mode.
- *Clockwise Adjustment* - When the system is in the free gyro mode, holding the manual heading switch to the CW position will rotate the compass card to the right to eliminate left compass card error.
- *Counterclcockwise Adjustment* - When the system is in the free gyro mode, holding the manual heading switch to the CCW position will rotate the compass card to the left to eliminate right compass card error.

KMT 112 MAGNETIC SLAVING TRANSMITTER

The unit senses the direction of the earth's magnetic field and continuously transmits this information through the slaving circuitry to the directional gyro which is automatically corrected for precession or 'drift'. This sensor is mounted in the right wing to eliminate the possibility of magnetic interference.

KG 102A DIRECTIONAL GYRO

The directional gyro provides gyro stabilization for the system and contains the slaving circuitry necessary for operation of the system. This sensor is also remote mounted.

OPERATING INSTRUCTIONS

Until power is applied to the KCS 55A System, and the directional gyro is up to speed, a red flag labeled 'HDG' will be visible in the upper right quadrant of the KI 525A Indicator. In operation, this warning flag will be visible whenever the power being supplied is inadequate or the gyro is not up to speed.

With the application of the power to the KCS 55A System, and gyro up to operating speed, the red 'HDG' flag should disappear from view.

If the KCS 55A System is in the slaved gyro mode, the compass card will automatically fast slave at the rate of 180 degrees per minute toward the airplane's magnetic heading. (Immediately after applying power, this compass card movement should be quite visible.) It will continue to fast slave until the proper magnetic heading is indicated, after which it will slave at a constant rate of three degrees per minute to keep the system aligned with the earth's magnetic field. Under some conditions it is possible for the system to stop slaving exactly 180 degrees from the correct heading. If this should occur, move the 'Slave' switch on the KA 51B to the unslaved (free) position. Rotate the compass card ±10 degrees from the incorrect heading by using the manual rotation switch and then return the system to slaved operation. The system will then slave to the correct heading.

For the free gyro operation, check the magnetic compass to determine the correct magnetic heading. Then use the manual slave switch to align the system with the earth´s magnetic field. Periodic checks with the standby compass are recommended to check and correct for gyro precession.

Until a useable navigation signal is being received by the NAV system, a red flag labeled 'NAV' will be visible in the upper left quadrant of the KI 525A Indicator. In operation, this warning flag should be visible whenever an inadequate navigation signal is being received.

For normal navigation to or from a VOR or VORTAC, set the NAV receiver to the desired VOR or VORTAC frequency and the red navigation flag (NAV) should disappear from view if a usable signal is being received.

Rotate the course select knob to position the course pointer to the desired VOR course.

The VOR deviation bar represents the selected course, and the relationship of this bar to the symbolic airplane in the center of the instrument visually presents the actual relationship of the selected course to your airplane heading. (In other words, if the symbolic airplane on the display indicates approaching the deviation bar at 45 degrees, that is the angle at which your airplane is actually approaching the selected course.)

To prepare for an ILS approach, tune the NAV receiver to the desired Localizer frequency. If a usable Localizer signal is being received, the NAV warning flag will disappear.

For a front or back course approach, rotate the course select knob to set the course pointer on the inbound Localizer course. As with normal navigation (#6 above), the

LOC deviation bar represents the desired course. The relationship between this bar and the symbolic airplane gives a true picture of your airplane's position with respect to the Localizer course. Always setting the course pointer to the inbound Localizer course provides the correct deviation bar sensing whether flying a front or back course approach.

The glideslope deviation pointers should become visible on both sides of the display when a useable glideslope signal is received. If they do not come into view, a useable glideslope signal is not being received.

The glideslope pointers indicate the relative position of the glideslope path with respect to the airplane. (In other words, if the pointers are above the center marker, the airplane is below the glideslope.)

ABNORMAL CIRCUMSTANCES

If the Warning Flag (HDG) appears during operation, the compass card indications will be in error. Power may be removed from the KG 102A Directional Gyro by pulling the circuit breaker labeled DG. The Selected Course, VOR/LOC Deviation Bar, the NAV flag, and the To/From Indicator will remain in operation.

If the Navigation Warning Flag (NAV) appears during operation, there are several possibilities:

(1) the NAV receiver is not turned on,

(2) the NAV receiver is improperly turned,

(3) the ground VOR or LOC station is malfunctioning,

(4) the airplane is out of range of the selected ground station, or

(5) the airplane NAV receiver has malfunctioned. (The compass card will continue to display the airplane heading even if a useable NAV signal is not being received.)

If the glideslope pointers remain out of view during a front course ILS approach, either the airplane glideslope receiver or the ground station glideslope transmitter is malfunctioning. Glideslope is usually not available during a back course approach. (The VOR and LOC course display will continue to function normally even if a useable glideslope signal is not being received.)

A continuous large deflection of the slaving meter or large discrepancies between the magnetic compass and the KI 525A compass card may indicate a failure in the slaving system.

If a slaving failure should occur, the Slave/Free Switch should be moved to select the free gyro mode. Then, by using manual clockwise or counterclockwise corrections, the compass can be rotated to the corrected heading as indicated on the standby compass. The KCS 55A system should continue to function normally except the heading information will be solely derived from the KG 102 A Directional Gyro. There will be no automatic heading correction and periodic adjustments must be made manually to correct for precession by reference to the standby magnetic compass, as with any directional gyro.

8. AIRPLANE HANDLING, CARE AND MAINTENANCE

No change.

SUPPLEMENT A13
TO THE AIRPLANE FLIGHT MANUAL
DA 40, DA 40 F
AUTOPILOT SYSTEM
KAP 140
BENDIX/KING

Doc. No.	**: 6.01.01-E, 6.01.02-E**
Date of Issue	**: 01 Mar 2001**

Signature	:	
Authority	:	AUSTRO CONTROL GmbH Abteilung Flugtechnik Zentrale A-1030 Wien, Schnirchgasse 11
Stamp	:	
Date of approval	:	18. APR. 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.:________________

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2	DA 40 F AFM Rev. 0 EASA Statement	all	all	15 Mar 2005	EASA 2005-3345	18. APR. 2005		

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1. GENERAL

This Supplement supplies the information necessary for the efficient operation of the airplane when the Autopilot System KAP 140 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 Autopilot System KAP 140 is installed.

2. LIMITATIONS

A. The entire preflight test procedure outlined under Section 4 of this Supplement, must be successfully completed prior to each flight. Use of the autopilot or manual electrical trim system is prohibited prior to completion of these tests.

B. During autopilot operation, a pilot with the seat belt fastened must be seated at the left pilot position.

C. The autopilot must be DISENGAGED during take-off and landing.

D. The system is approved for Category I operation only (Approach mode selected).

E. Maximum flap extension during approach operation: T/O position

F. Autopilot maximum airspeed limitation: 165 KIAS

Autopilot minimum airspeed limitation: 70 KIAS

G. Altitude Select captures below 800 feet AGL are prohibited (if altitude preselect option installed).

H. The autopilot must be disengaged below 200 feet AGL during approach operations and below 800 feet AGL for all other phases of flight.

I. Overriding the autopilot to change pitch or roll attitude is prohibited. (Disengage or press CWS while maneuvering.)

J. The AUTOPILOT circuit breaker must be pulled following any inflight illumination of the red TRIM FAIL warning light, but only after first completing the Emergency Procedures (Section 3). The manual electric trim and autopilot autotrim systems will be disabled with the AUTOPILOT circuit breaker pulled.

NOTE

The red TRIM FAIL warning will illuminate normally during the preflight self test. If the TRIM FAIL light remains illuminated after the preflight self test, the AUTOPILOT circuit breaker must be pulled. The TRIM FAIL light will extinguish when the circuit breaker is pulled.

K. The autopilot must be disengaged if the Alternate Static Valve is open.

L. The following limitation placard is in the forward view of the pilot:

Limitations for KAP 140 Autopilot System:
Do not use AP if "Alternate Static" is open.
Conduct AP and trim check prior to each flight (see AFM).
Autopilot OFF during take-off and landing.
Maximum speed for autopilot operation is 165 KIAS.
Minimum speed for autopilot operation is 70 KIAS.
Minimum altitude for autopilot operation:
Cruise, Climb, Descent and Maneuvering: 800 feet AGL
Approach: 200 feet AGL
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3. EMERGENCY PROCEDURES

The four step procedure listed below should be among the basic airplane emergency procedures that are committed to memory. It is important that the pilot be proficient in accomplishing all four steps without reference to this manual.

In case of Autopilot, Autopilot Trim, or Manual Electric Trim malfunction (accomplish Items A and B simultaneously):

A. Airplane Control Stick - GRASP FIRMLY and regain airplane control.

B. AP DISC Switch - PRESS and HOLD throughout recovery.

C. AIRPLANE - RETRIM manually as needed.

D. AUTOPILOT Circuit Breaker - PULL.

NOTE

The AVIONIC MASTER switch may be used as an alternate means of removing all power from the autopilot and electric trim system. If necessary perform steps A through C above, then turn the AVIONIC MASTER switch off before locating and pulling the AUTOPILOT circuit breaker. Turn the AVIONIC MASTER switch ON as soon as possible to restore power to all other avionics equipment. Primary attitude, airspeed and altitude instruments will remain operational at all times.

WARNING

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

Maximum Altitude losses and maximum absolute Attitude changes due to an autopilot malfunction:

Configuration	Alt Loss	Pitch	Roll
Cruise, Climb, Descent	400 ft	25°	50°
Maneuvering	400 ft	25°	35°
Approach	100 ft	15°	20°

NOTES

The following paragraphs are presented to supply additional information for the purpose of providing the pilot with a more complete understanding of the recommended course of action for an emergency situation.

1. An autopilot trim malfunction may be recognized as an uncommanded deviation in the airplane flight path or when there is abnormal control stick or trim wheel motion. In some cases, especially for autopilot trim, there may be little or no airplane motion, yet the red TRIM FAIL annunciator may illuminate and an alert tone will sound. The primary concern in reacting to an autopilot or autopilot trim malfunction, or to an automatic disconnect of the autopilot, is in maintaining control of the airplane. Immediately grasp the control stick and press and hold down the AP DISC switch throughout the recovery. Manipulate the controls as required to safely maintain operation of the airplane within all of its operating limitations.

Elevator trim should be used manually as needed to relieve control forces. Finally, locate and pull the AUTOPILOT circuit breaker, to completely disable these systems.

2. A manual electric trim malfunction may be recognized by the illumination of the red TRIM FAIL warning light accompanied by an alert tone, or by unusual trim wheel motions with the autopilot mode DISENGAGED without pilot actuation of the manual electric trim switch. As with an autopilot malfunction, the first concern following a manual electric trim malfunction is regaining control of the airplane. Grasp the control stick firmly and press and hold down the AP DISC switch. Locate and pull the AUTOPILOT circuit breaker.

3. Note that the emergency procedure for any malfunction is essentially the same: immediately grasp the control stick and regain airplane control while pressing and holding the AP DISC switch down, and manually retrim the airplane as needed. After these steps have been accomplished secure the autopilot or electric trim system using the proper circuit breaker. As with any other airplane emergency procedure, it is important that the 4 steps of the Autopilot/Electric Trim Emergency Procedures located on page 8 of this Supplement are committed to memory.

4. The AVIONICS MASTER switch may be used as required to remove all power from the Autopilot and Electric Trim systems while the circuit breaker is located and pulled. Return the AVIONICS MASTER switch to the ON position as soon as possible. With the AVIONICS MASTER switch off, all flight instruments will remain operational; however, communications, navigation, and identification equipment will be inoperable.

5. The KAP 140 autopilot incorporates a pitch monitor that detects abnormal airplane acceleration in the vertical axis; therefore, if the airplane, for any reason, is moved rapidly in pitch, the autopilot may disconnect automatically.

6. It is important that all portions of the autopilot and electric trim system are

preflight tested prior to each flight in accordance with the procedures published herein in order to assure their integrity and continued safe operation during flight.

WARNING

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

4A. NORMAL OPERATING PROCEDURES

4A.3.4.A BEFORE TAXIING

1. POWER APPLICATION AND SELF TEST - A self test is performed upon power application to the computer. This test is a sequence of internal checks that validate proper system operation prior to allowing normal operation. The sequence is indicated by „PFT" with an increasing number for the sequence steps. Successful completion of self test is identified by all display segments being illuminated (Display Test) and the disconnect tone sounding.

NOTE

Following the preflight self test, the red P warning on the face of the autopilot may illuminate indicating that the pitch axis cannot be engaged. This condition should be temporary, lasting approximately 30 seconds. The P will extinguish and normal operation will be available.

If power to the autopilot is cycled in flight (i.e., through the autopilot circuit breaker for instance) it is possible that a 5 minute delay may be necessary prior to autopilot engagement to allow the pitch axis accelerometer circuit to stabilize. Engagement prior to stabilization may result in mildly erratic pitch axis behavior.

WARNING

If the TRIM FAIL warning light stays on, the autotrim did not pass the preflight test. The autopilot circuit breaker must be pulled. Manual electric trim cannot be used.

2. MANUAL ELECTRIC TRIM - TEST as follows:

   Press the AP DISC switch down and hold while commanding trim. Manual Electric Trim should not operate either nose up or nose down.

3. AUTOPILOT - ENGAGE by pressing AP button.
4. FLIGHT CONTROLS - MOVE fore, aft, left and right to verify that the autopilot clutches can be overpowered.
5. AP DISC Switch - PRESS. Verify that the autopilot disconnects.
6. TRIM - SET to take-off position manually.
7. AP DISC Switch - PRESS.

8. Autopilot Altitude Alert/Preselector Operation (if Altitude Preselect Option is installed).

   a. BARO setting - CHECK.

CAUTION

If the installation does not incorporate automatic baro setting, the baro display will flash until set manually by the pilot. Continue to set manually throughout the flight. Each time the altimeter baro setting requires adjustment. No further reminders (flashing) will be given.

   b. ALTITUDE SELECT knob (if Altitude Preselect Option is installed) - ROTATE until the desired altitude is displayed.

NOTE

An altitude alert is annuciated 1000 ft prior to arrival at the selected altitude. After arriving at the selected altitude, a further alert is annunciated if the airplane deviates from the selected altitude by ± 200 ft. The alert is a series of 5 short tones.

4A.3.8 CLIMB / 4A.3.11 DESCENT

1. Elevator Trim - VERIFY or SET to place the airplane in a trimmed condition prior to Autopilot engagement.

NOTE

Engaging the autopilot into a mistrim condition may cause unwanted attitude changes and a TRIM FAIL annunication.

2. AP Button - PRESS. Note ROL and VS annunciators on. If no other modes are selected, the autopilot will operate in the ROL and vertical speed hold modes.

WARNING

The pilot in command must continuously monitor the autopilot when it is engaged, and be prepared to disconnect the autopilot and take immediate corrective action - including manual control of the airplane and/or performance of emergency procedures - if autopilot operation is not as expected or if airplane control is not maintained.

During all autopilot coupled operations the pilot in command must use proper autopilot commands and use the appropriate combination of engine power and wing flaps to ensure that the airspeed is maintained between 70 and 165 KIAS, and the airplane does not exceed other basic airplane operating limitations.

WARNING

When operating at or near the best rate of climb airspeed and using vertical speed hold, it is easy to decelerate to an airspeed on the back side of the power curve where a decrease in airspeed results in a reduced rate of climb. Continued operation on the back side of the power curve in vertical speed hold mode will result in a stall.

When operating at or near the maximum autopilot speed, it may be necessary to reduce power in order to maintain the desired rate of descent and not exceed the maximum autopilot speed.

CAUTION

Avoid abrupt power changes at low indicated airspeeds with the autopilot engaged.

WARNING

Do not help the autopilot or hand-fly the airplane with the autopilot engaged as the autopilot will run the pitch trim to oppose control wheel movement. A mistrim of the airplane, with accompanying large elevator control forces, may result if the pilot manipulates the control wheel manually while the autopilot is engaged.

3. BARO setting - CHECK if not automatic.

4. Using CWS

   a. CWS Button - PRESS and MOVE airplane nose to the desired vertical speed.

   b. CWS Button - RELEASE. Autopilot will command airplane vertical speed up to the limits of ± 2000 ft/min.

5. Using Vertical Trim

   a. VERTICAL TRIM Control - PRESS either the UP or DN button to modify airplane vertical speed within the limits of ± 2000 ft/min.

   b. VERTICAL TRIM Control - RELEASE when desired vertical speed is displayed. The autopilot will command the desired vertical speed.

4A.3.9. CRUISE

NOTE

The airplane´s altitude may vary by as much as 120 feet with an airspeed change from 70 KIAS to 140 KIAS in altitude hold in heavy turbulence.

1. ALT Mode Selector Button - PRESS. Note ALT mode annunciator ON. The autopilot will maintain the selected baro corrected altitude.

2. Capture preselected altitudes (if Altitude Preselect Option is installed)

   a. ALTITUDE SELECT knob - ROTATE until the desired altitude is displayed. Note ARM annunciation occurs automatically upon altitude selection when the autopilot is engaged.

b. ALTITUDE SELECT MODE (ARM) button - PUSH to alternately disarm or arm altitude capture.

c. Airplane - ESTABLISH vertical speed necessary to intercept the selected altitude.

NOTE

Autopilot tracking performance will be degraded in turbulence. Use of basic 'ROL' mode is recommended during operation in heavy turbulence. It is recommended that the autopilot be disconnected and that the airplane be flown by hand in severe turbulence.

3. Change altitudes

   a. Using CWS (recommended for altitude changes greater than 100 ft.)

      1) CWS Button - PRESS and fly airplane to desired altitude.

      2) CWS Button - RELEASE when desired altitude is reached. The autopilot will maintain the desired altitude.

   b. Using Vertical Trim (recommended for altitude changes less than 100 ft.)

      1) VERTICAL TRIM Control - PRESS and HOLD either the UP or DN button. Vertical Trim will seek an altitude rate of change of about 500 fpm.

      2) VERTICAL TRIM Control - Release when the desired altitude is reached. The autopilot will maintain the desired altitude.

NOTE

As an alternative, press either the UP or DN button with a succession of quick momentary presses programming either an increase or decrease in the altitude reference at the rate of 20 feet per button press.

4. Heading Changes

   a. Manual Heading Changes in ROL mode.

      1) CWS Button - PRESS and MANEUVER airplane to the desired heading.

      2) CWS Button - RELEASE. Autopilot will attempt to maintain the airplane at a zero turn rate in the ROL mode.

NOTE

Airplane heading may change in ROL mode due to turbulence.

   b. Heading Hold

      1) Heading Selector Knob - SET BUG to desired heading.

      2) HDG Mode Selector Button - PRESS. Note HDG mode annunciator ON. Autopilot will automatically turn the airplane to the selected heading.

   c. Command Turns (Heading Hold mode ON)

      1) Heading Selector Knob - MOVE BUG to the desired heading. Autopilot will automatically turn the airplane to the new selected heading.

5. NAV Coupling

   a. Course Bearing Pointer - SET to desired course.

   b. Heading Selector Knob - SET BUG to provide desired intercept angle and engage HDG mode.

   c. NAV Mode Selector Button - PRESS.

      1) If the Course Deviation Bar is greater than 2 to 3 dots: the airplane will continue in HDG mode (or ROL if HDG not selected) with NAV ARM annunciated; when the computed capture point is reached HDG will disengage, the ARM annunciator will go out and the selected course will be automatically captured and tracked.

      2) If the D-Bar is less than 2 to 3 dots: the HDG mode will disengage upon selecting NAV mode; the NAV annunciator will illuminate and the capture/track sequence will automatically begin.

4A.3.12 LANDING APPROACH

1. Approach (APR) Coupling (to enable glideslope coupling on an ILS, and more precise course tracking on instrument approaches).

   a. BARO setting - CHECK if not automatic.

      1) Course Bearing Pointer - SET to desired course.

      2) Heading Selector Knob - SET BUG to provide desired intercept angle.

      3) APR Mode Selector Button - PRESS.

a) If the Course Deviation Bar is greater than 2 to 3 dots: the airplane will continue in HDG mode (or ROL if HDG not selected) with the APR ARM annunciated; when the computed capture point is reached HDG mode will disengage, the ARM annunciator will go out and the selected course will be automatically captured and tracked.

b) If the D-Bar is less than 2 to 3 dots: the HDG mode will disengage upon selecting APR mode; the APR annunciator will illuminate and the capture/track sequence will automatically begin.

4) Airspeed - Maintain 90 to 100 KIAS minimum during coupled autopilot approaches (recommended).

2. BC Approach Coupling (i.e., reverse localizer) (REV)

a. BARO setting - CHECK if not automatic.

1) Course Bearing Pointer - SET to the ILS front course inbound heading.

2) Heading Selector Knob - SET BUG to provide desired intercept angle and engage HDG mode.

3) REV Mode Selector Button - PRESS.

a) If the Course Deviation Bar is greater than 2 to 3 dots: the airplane will continue in HDG mode (or ROL if HDG not selected) with REV ARM annunciated; when the computed capture point is reached HDG mode will disengage, the ARM annunciator will go out and the selected course will be automatically captured and tracked.

b) If the D-Bar is less than 2 to 3 dots: the HDG mode will disengage upon selecting REV mode; the REV annunciator will illuminate and the capture/track sequence will automatically begin.

3. Glideslope Coupling

NOTE

Glideslope coupling is inhibited when operating in NAV or REV modes. Glideslope arm and coupling occurs automatically in the APR mode when tracking a localizer.

a. APR Mode - ENGAGED. Note GS ARM annunciated.

b. At Glideslope centering - note ARM annunciator goes out.

NOTE

Autopilot can capture glideslope from above or below the beam.

NOTE

Altitude preselect captures are not recommended on non precision approaches to capture the MDA. Glideslope coupling will preclude a preselect altitude capture on an ILS.

4. Missed Approach

   a. AP DISC Switch - PRESS to disengage AP.

   b. MISSED APPROACH - EXECUTE.

   c. AP Button - After airplane is in trim, PRESS for autopilot operation if desired.

NOTE

If tracking the ILS course outbound as part of the missed approach procedure is desired, use the NAV mode to prevent inadvertent GS coupling.

5. Before Landing

   a. AP DISC Switch - PRESS to disengage AP.

4B. ABNORMAL OPERATING PROCEDURES

4B.7 FAILURE IN THE AUTOPILOT SYSTEM

A. A flashing PT annunciator with an up or down arrow head in the display of the autopilot computer.

A flashing PT auto trim annunciation on the face of the autopilot suggests a failure of the auto trim function to relieve pitch servo loading in a timely manner. This condition should be temporary.

1. FLASHING PT ANNUNCIATION - OBSERVE airplane pitch behavior. If pitch behavior is satisfactory, wait 5-10 seconds for the annunciation to stop.

2. If annunciation continues, Airplane Control Sticks - GRASP FIRMLY, press CWS and check for an out of pitch trim condition. Manually retrim as required.

3. CWS Button - Release.

4. AUTOPILOT OPERATION - CONTINUE if satisfied that the out of trim indication was temporary. DISCONTINUE if evidence indicates a failure of the auto trim function.

B. A red P or R on the face of the autopilot computer.

1. A red P is an indication that the pitch axis of the autopilot has been disabled and cannot be engaged. DO NOT ENGAGE INTO A ROLL AXIS ONLY SYSTEM.

NOTE

If the red P lamp was the result of some abnormal accelerations on the airplane, the annunciation should extinguish within approximately one minute and normal use of the autopilot will be re-established.

2. A red R is an indication that the roll axis of the autopilot has been disabled. The autopilot cannot be engaged.

C. Flashing Baro Setting in the display of the autopilot computer. (If Systems with automatic baro setting installed.)

A flashing baro setting annunciation on the face of the autopilot computer, in an installation when the baro setting is automatically updated with each change to the KEA 130 altimeter baro setting, indicates a failure of the communication link between the altimeter and the autopilot. The flashing will be initiated at the time the communication link failure is detected, and each time thereafter that a change to the preselected altitude is made.

1. Flashing Baro Setting - SET proper baro setting manually (or press BARO to accept the present value).

2. Altitude Alert/Preselector Setting - SET as desired.

D. Flashing Mode Annunciation in the display of the Autopilot computer.

A flashing mode annunciation on the face of the autopilot is normally an indication of mode loss.

1. Flashing HDG - Indication of a failed heading valid input. PRESS HDG button to terminate flashing. ROL will be displayed.

2. Flashing NAV, APR, or REV - Usually an indication of a flagged navigation source. PRESS the NAV, APR or REV button to terminate flashing. ROL will be displayed. (Select a valid navigation source.)

NOTE

A flashing NAV, APR or REV annunciation can also be caused by a failed heading valid input.

3. Flashing GS - Indication of a flagged glideslope. (GS will rearm automatically if a valid GS signal is received.)

NOTE

To continue tracking the localizer, observe the appropriate minimums for a non precision approach. (Press ALT twice in rapid succession to terminate the flashing. Control the pitch axis in the default VS mode.)

NOTE

At the onset of mode annunciator flashing, the autopilot has already reverted to a default mode of operation, i.e., ROL and or VS mode. An immediate attempt to re-engage the lost mode may be made if the offending navigation, glideslope or compass flag has cleared.

E. Effects of instrument losses upon autopilot operation:

1. Loss of the attitude gyro - no effect on the autopilot.
2. Loss of the turn coordinator - autopilot inoperative.
3. Loss of the HSI - HDG, NAV and approach modes inoperative.
4. Loss of altitude encoding - automatic baro set operation, preselect altitude captures and altitude alerting inoperative.

5. PERFORMANCE

No change.

6. MASS AND BALANCE

Upon removal or installation of the KAP 140 Autopilot system 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. SYSTEM DESCRIPTION

7.14 AVIONICS

This Supplement to the AFM is provided to acquaint the pilot with the limitations as well as normal and emergency operating procedures of the Bendix/King KAP 140 Autopilot. The limitations presented are pertinent to the operation of the KAP 140 System as installed in the DA 40 airplane; the Autopilot must be operated within the limitations specified herein.

The KAP 140 Autopilot has an electric pitch trim system which provides autotrim during autopilot operation and manual electric trim for the pilot when the autopilot is not engaged. The trim system is designed to be fail safe for any single inflight trim malfunction. Trim faults are monitored and annunciated both visually and aurally.

A lockout device prevents autopilot engagement until the system has successfully passed preflight self test. Automatic preflight self test begins with initial power application to the autopilot.

The following conditions will cause the Autopilot to automatically disengage:

A. Power failure.

B. Internal Flight Control System failure.

C. Pitch accelerations in excess of +1.4 g or less than 0.6 g will cause the autopilot clutches to disengage.

D. Turn Coordinator failure.

E. Autopilot computer monitor that detects either the R (Roll) or P (Pitch) axis annunciator.

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

The airplane BAT switch function is unchanged and can be used in conjunction with the ALT switch in an emergency to shut off electrical power to all flight control systems while the problem is being isolated.

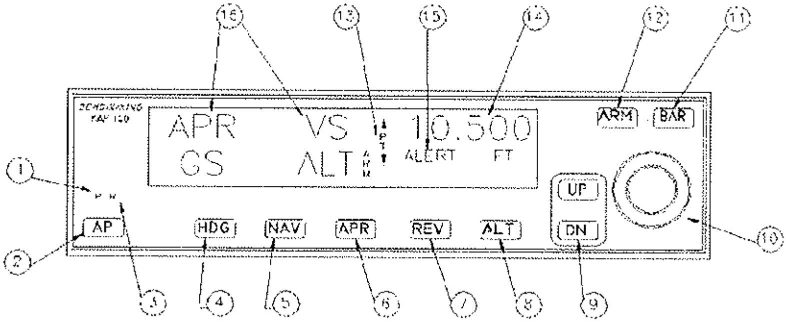
Activation of AP DISC stick switch will also disconnect the autopilot.

The following circuit breakers are used to protect the following elements of the KAP 140 Autopilot:

LABEL	FUNCTION
AUTOPILOT	Supplies power to the KC 140 Computer, and the autopilot pitch, roll and pitch trim servos.
ANNUN	Supplies separate power for autopilot alerting.
DG	Supplies power to the KCS 55A Compass System.

LABEL	FUNCTION
T&B	Supplies power to the panel mounted turn and bank indicator/gyro.
XPDR	Supplies power to the King KEA 130A Altimeter, when installed.
XPDR	Supplies power to the blind altitude encoder, when installed.

SYSTEM CONTROLS AND DISPLAYS



1. PITCH AXIS, (P) ANNUNCIATOR - When illuminated, it indicates failure of the pitch axis and will either disengage the autopilot or does not allow engagement of the pitch axis. The P light may illuminate with the autopilot disengaged. This condition can occur during maneuvering flight when g thresholds are exceeded. The autopilot monitor will not allow engagement during illumination.

2. AUTOPILOT ENGAGE/DISENGAGE (AP) BUTTON - When pushed, it engages the autopilot if all logic conditions are met. The autopilot will engage in the basic roll (ROL) mode which functions as a wing leveler and in the vertical speed (VS) hold mode. The commanded vertical speed may be displayed manually in the upper right corner of autopilot display area if either UP or DN button is pressed. The captured VS will be the vertical speed present at the moment of AP button press. When pressed again, it will disengage the autopilot. If MÄM 40-099 or MSB 40-018 has been implemented, this button is the only button to engage the autopilot.

3. ROLL AXIS (R) ANNUNCIATOR - When illuminated, it indicates failure of the roll axis and will disengage the autopilot or does not allow engagement.

4. HEADING (HDG) MODE SELECTOR BUTTON - When pushed, it will select the Heading mode, which commands the airplane to turn to and maintain the heading selected by the heading bug on the HSI. A new heading may be selected at any time and will result in the airplane turning to the new heading. The button can also be used to toggle between HDG and ROL modes. If MÄM 40-099 or MSB 40-018 has not yet implemented, this button may also be used to engage the autopilot.

5. NAVIGATION (NAV) MODE SELECTOR BUTTON - When pushed, will select the navigation mode. The mode provides automatic beam capture and tracking of VOR, LOC or GPS as selected for presentation on the HSI or CDI. NAV mode is recommended for enroute navigation tracking.

6. APPROACH (APR) MODE SELECTOR BUTTON - When pushed, it will select the navigation mode. The mode provides automatic beam capture and tracking of VOR, GPS, LOC, and Glideslope (GS) on an ILS, as selected for presentation on the HSI or CDI. APR mode tracking sensitivity is recommended for instrument approaches.

7. BACK COURSE APPROACH (REV) MODE SELECTOR BUTTON - When pushed, it will select the Back Course approach mode. This mode functions identically to the approach mode except that the autopilot response to LOC signals is reversed.

8. ALTITUDE HOLD (ALT) MODE SELECT BUTTON - When pushed, it will select the Altitude Hold mode. This mode provides capture and tracking of the selected altitude. The selected altitude is the altitude at the moment the ALT button is pressed. If the ALT button is pressed with an established VS rate present, there will be approximately a 10 % (of VS rate) overshoot, with the airplane returned positively to the selected altitude. If MÄM 40-099 or MSB 40-018 has not yet implemented, this button may also be used to engage the autopilot.

9. VERTICAL TRIM (UP/DN) BUTTONS - The action of these buttons is dependent upon the vertical mode present when pressed. If VS mode is active, the initial button stroke will bring up the commanded vertical speed in the display. Subsequent immediate button strokes will increment the vertical commanded either up or down at the rate of 100 ft/min per button press, or at the rate of approximately 300 ft/min per second if continuously. If ALT mode is active, incremental button strokes will move the altitude hold reference altitude either up or down by 20 feet per press, or if held continuously will command the airplane up or down at the rate of 500 ft/min, synchronizing the altitude hold reference to the actual airplane altitude upon button release. (Note that the altitude hold reference is not displayed. The display will continue to show the altitude alerter reference.)

10. ROTARY KNOBS (only if Altitude Preselect Option is installed) - Used to set the altitude alerter reference altitude; or may be used immediately after pressing the BARO button, to adjust the autopilot baro setting to match that of the airplane's altimeter when manual adjustment is

required.

11. BARO SET (BARO) BUTTON (only if Altitude Preselect Option is installed) - When pushed and released, it will change the display from the altitude alerter selected altitude to the baro setting display (either IN HG or HPA) for 3 seconds. If pushed and held for 2 seconds, it will change the baro setting display from IN HG to HPA or vice versa. Once the baro setting display is visible, the rotary knobs may be used to manually adjust the baro setting if the system configuration does not employ automatic correction.

12. ALTITUDE ARM (ARM) BUTTON (only if Altitude Preselect Option is installed) - When pushed it will toggle altitude arming on or off. When ALT ARM is annunciated, the autopilot will capture the altitude alerter displayed altitude (provided the airplane is climbing or descending in VS to the displayed altitude). ALT hold arming when the autopilot is engaged is automatic upon altitude alerter altitude selection via the rotary knobs. Note that the alerter functions are independent of the arming process, thus providing full time alerting, even when the autopilot is disengaged.

13. PITCH TRIM (PT) ANNUNCIATION - Indicates the direction of required pitch trim. With electric trim installed, the annunciation simply provides status to the autopilot request for auto trim. A solid indication represents the lowest demand level for trim, whereas a flashing annunciation implies a greater demand. A solid PT without an arrow head is an indication of a pitch trim fault. Refer to the EMERGENCY PROCEDURES for proper response to a pitch trim fault. During MET operation, this annunciation can be caused by a stuck MET switch. If the stuck switch fault clears, trim operation will resume.

14. ALTITUDE ALERTER/VERTICAL SPEED/BARO SETTING DISPLAY (only

if Altitude Preselect Option is installed) - Normally displays the altitude alerter selected altitude.

If the UP or DN button is pushed while in VS hold, the display changes to the command reference for the VS mode in FPM for 3 seconds. If the BARO button is pushed, the display changes to the autopilot baro setting in either IN HG or HPA for 3 seconds.

NOTE

This display may be dashed for up to 3 minutes on start up if a blind encoder is installed which requires a warm up period.

15. ALTITUDE ALERT (ALERT) ANNUNCIATION (only if Altitude Preselect Option is installed) - Illuminates continuously in the region of from 200 to 1000 feet from the selected altitude if the airplane was previously outside of this region.

    Flashes

    (1) for two seconds the first time the airplane crossed the selected altitude, and

    (2) continuously in the 200 to 1000 feet region if the airplane was previously inside of this region (i.e., at the selected altitude). Associated with the visual alerting is an aural alert (5 short tones) which occurs 1000 feet from the selected altitude upon approaching the altitude and 200 feet from the selected altitude on leaving the altitude.

16. PITCH AND ROLL MODE DISPLAYS - Displays the active pitch modes (VS,

ALT, ARM, ALT, GS ARM, GS) and roll modes (ROL, HDG, NAV ARM, NAV, APR ARM, APR, REV ARM, REV). Also displayed will be flashing AP annunication (5 seconds) at each autopilot disconnect accompanied by an aural tone (for 2 seconds).

17. AUTOPILOT DISCONNECT (AP DISC) SWITCH (not shown) - When pressed, it will disengage the autopilot, and interrupt electric trim power. (Located on pilot´s and copilot´s stick.)

18. MANUAL ELECTRIC TRIM SWITCHES (not shown) - When both switches are pressed in the same direction, they will activate pitch trim in the selected direction. If only one switch is moved, the trim system will not operate. If one switch fail or is moved and held for 3 seconds, the trim monitoring system will detect a switch failure resulting in a PT annunciation on the autopilot display and the disabling of the electric trim system. Autopilot power will have to be cycled to clear the fault. Use of manual electric trim during autopilot operation will disengage the autopilot. (Located on the pilot´s stick.)

19. CONTROL WHEEL STEERING (CWS) MODE BUTTON (not shown) - When pressed and held, it disengages the pitch, roll, and pitch trim clutches allowing the pilot to maneuver the airplane by hand. Pressing the CWS button will also sync the autopilot ALT or VS commands to the actual altitude or vertical speed present at the time the button is released. (Located at the pilot´s stick.)

20. OMNI BEARING SELECT KNOB - Selects the desired course to be tracked by the autopilot (Located on the HSI.)

21. HEADING SELECT KNOB - Positions the heading bug on the compass card (located on the HSI.)

22. TRIM FAIL ANNUNCIATOR - Illuminates whenever the automated preflight self test detects a pitch trim fault or a continuous monitoring system detects a pitch trim fault in flight. (Located on the White Wire annunciator panel.) Refer to the EMERGENCY PROCEDURES for proper response to a pitch trim fault.

VOICE MESSAGING

The voice messaging feature provides the pilot with an additional annunciation of normal and abnormal operation of the autopilot system. The voice messages can be heard by the pilot, the copilot and the two passengers over the headsets and also over the cabin speaker. The following voice messages may be heard during operation of the autopilot system, where some messages are only available for altitude preselect flight computers:

- The message 'ALTITUDE' occurs 1000 ft before approaching the selected altitude.
- The message 'LEAVING ALTITUDE' occurs upon a deviation of 200 ft from the selected altitude.
- The message 'AUTOPILOT' occurs when the autopilot has disengaged, either through the pilot, or automatically.
- The message 'CHECK PITCH TRIM' occurs 10 seconds after a continuous flashing of a nose up or nose down trim arrow on the autopilot display panel.
- The message 'AUTOPILOT BARO SET FAIL - SET MANUALLY' is a one time message delivered upon detection of an automatic baro set failure.
- The message 'TRIM IN MOTION, TRIM IN MOTION' occurs when the autotrim has been running for more than 5 seconds, and it repeats until the autotrim stops running.
- The message 'CHECK PITCH TRIM' occurs when the KAP 140 System has detected an out-of-trim condition for more than 15 seconds.

8. AIRPLANE HANDLING, CARE AND MAINTENANCE

No change in Chapter 8.

SUPPLEMENT A17
TO THE AIRPLANE FLIGHT MANUAL
DA 40, DA 40 D, DA 40 F

COM / NAV / GPS
GNS 430
GARMIN

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0.1 RECORD OF REVISIONS

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		7	9-A17-31, 9-A17-32					
2	OÄM 40-136	all	all	17-Feb-2003				
3	OÄM 40-221 EASA Statement	all	all	22-Jun-2005				

0.2 LIST OF EFFECTIVE PAGES

Chapter	Page	Date
0	9-A17-0	22 Jun 2005
	9-A17-1	22 Jun 2005
	9-A17-2	22 Jun 2005
	9-A17-3	22 Jun 2005
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1	9-A17-5	22 Jun 2005
2	9-A17-5	22 Jun 2005
	9-A17-6	22 Jun 2005
	9-A17-7	22 Jun 2005
3	9-A17-8	22 Jun 2005
4A	9-A17-9	22 Jun 2005
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4B	9-A17-10	22 Jun 2005
5, 6	9-A17-10	22 Jun 2005

7		9-A17-11	22 Jun 2005
		9-A17-12	22 Jun 2005
		9-A17-13	22 Jun 2005
		9-A17-14	22 Jun 2005
		9-A17-15	22 Jun 2005
		9-A17-16	22 Jun 2005
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0.3 TABLE OF CONTENTS

Page

1. GENERAL

This Supplement supplies the information necessary for the efficient operation of the airplane when the COM/NAV/GPS GNS 430 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 GNS 430 is installed.
Refer to Section 7.14 for approved modes of operation (i.e. BRNAV, MNPS) of the GNS 430's GPS receiver.

2. LIMITATIONS

A. The GNS 430 Pilot's Guide, dated October, 1998, or later appropriate revision, must be immediately available to the flight crew whenever navigation is predicated on the use of the system.

B. The GNS 430 must utilize the following or later approved software versions:

Sub-System	Software Version
Main	200
GPS	200
COMM	122
VOR/LOC	125
G/S	200

The Main software version is displayed on the GNS 430 self test page immediately after turn-on for 5 seconds. The remaining system software versions can be verified on the AUX group sub-page 2, 'SOFTWARE/DATABASE VER'.

C. IFR en route and terminal navigation predicated upon the GNS 430's GPS Receiver is prohibited unless the pilot verifies the currency of the data base or verifies each selected waypoint for accuracy by reference to current approved data.

D. Instrument approach navigation predicated upon the GNS 430's GPS Receiver must be accomplished in accordance with approved instrument approach procedures that are retrieved from the GPS equipment data base. The GPS equipment database must incorporate the current update cycle.

(1) 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.

(2) Accomplishment of ILS, LOC, LOC-BC, LDA, SDF, MLS or any other type of approach not approved for GPS overlay with the GNS 430's GPS receiver is not authorized.

(3) Use of the GNS 430 VOR/ILS receiver to fly approaches not approved for GPS require VOR/ILS navigation data to be present on the external indicator.

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

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

E. If not previously defined, the following default settings must be made in the 'SETUP 1' menu of the GNS 430 prior to operation (refer to Pilot's Guide for procedure if necessary):

(1) **dis, spd:** nm, kt (sets navigation units to 'nautical miles' and 'knots')

(2) **alt, vs:** ft, fpm (sets altitude units to 'feet' and 'feet per minute')

(3) **map datum:** WGS 84 (sets map datum to WGS-84, see note below)

(4) **posn:** hddd°mm.mmm' (sets navigation grid units to decimal minutes)

(5) **fuel:** gl (sets fuel units to gallons)

NOTE

In some areas datums other than WGS-84 may be used. If the GNS 430 is authorized for use by the appropriate Airworthiness authority, the required geodetic datum must be set in the GNS 430 prior to its use for navigation.

F. The accuracy of the data base information is only assured if it is used before the end of the effectivity period. Use of out of date data base information is done entirely at the user´s own risk.

3. EMERGENCY PROCEDURES

A. If GNS 430 navigation information is not available or invalid, utilize remaining operational navigation equipment as required.

B. If 'RAIM POSITION WARNING' message is displayed the system will flag and no longer provide GPS based navigational guidance. The crew should revert to the GNS 430 VOR/ILS receiver or an alternate means of navigation other than the GNS 430's GPS Receiver.

C. If 'RAIM IS NOT AVAILABLE' message is displayed in the en route, 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 GNS 430's 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 GNS 430's VOR/ILS receiver or another IFR-approved navigation system.

D. If 'RAIM IS NOT AVAILABLE' message 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 miles). 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 by executing the missed approach.

E. In an in-flight emergency, depressing and holding the Comm transfer button for 2 seconds will select the emergency frequency of 121.500 MHz into the 'Active' frequency window.

4A. NORMAL PROCEDURES

DETAILED OPERATING PROCEDURES

Detailed operating procedures are described in the GARMIN GNS 430 Pilot's Guide, dated October 1998, or later appropriate revision.

PILOT'S DISPLAY

The GNS 430 System data will appear on the Pilot's HSI or CDI. The source of data is either GPS or VLOC as annunciated on the display above the CDI key.

AUTOPILOT COUPLED OPERATION

Coupling of the GNS 430 System steering information to the autopilot can be accomplished by engaging the autopilot in the NAV or APR mode. When the autopilot system is using course information supplied by the GNS 430 System, the course pointer on the HSI must be manually set to the desired track (DTK) indicated by the GNS 430. For detailed autopilot operational instructions, refer to the JAA Approved Flight Manual Supplement for the autopilot.

CROSSFILL OPERATIONS

For dual GNC 400 Product Series installations, crossfill capabilities exist between the number one and number two GNC 400 Systems. Refer to the GNS 430 Pilot's Guide for detailed crossfill operating instructions.

AUTOMATIC LOCALIZER COURSE CAPTURE

By default, the GNS 430 automatic localizer course capture feature is enabled. This feature provides a method for system navigation data present on the external indicators to be switched automatically from GPS guidance to localizer / glide slope guidance as the airplane approaches the localizer course inbound to the final approach fix. If an offset from the final approach course is being flown, it is possible that the automatic switch from GPS course guidance to localizer / glide slope course guidance will not occur. It is the pilot's responsibility to ensure correct system navigation data is present on the external indicator before continuing a localizer based approach beyond the final approach fix. Refer to the GNS 430 Pilot's Guide for detailed operating instructions.

4B. ABNORMAL PROCEDURES

No change.

5. PERFORMANCE

No change.

6. MASS AND BALANCE

Upon removal or installation of the GNS 430 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

7.14 AVIONICS

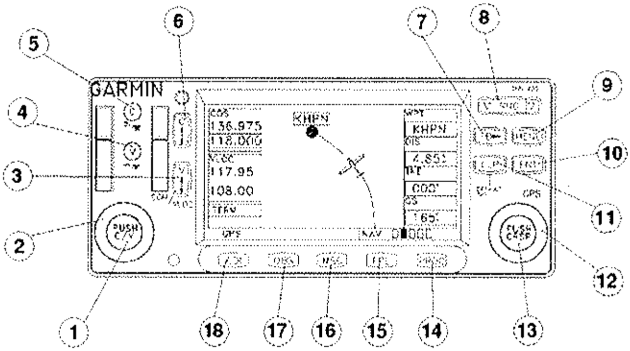
GENERAL

The GNS 430 System is a fully integrated, panel mounted instrument, which contains a VHF Communications Transceiver, a VOR/ILS receiver, and a Global Positioning System (GPS) Navigation computer. The system consists of a GPS antenna, GPS Receiver, VHF VOR/LOC/GS antenna, VOR/ILS receiver, VHF COMM antenna and a VHF Communications Transceiver. The primary function of the VHF Communication portion of the equipment is to facilitate communication with Air Traffic Control. 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.

Provided the GNS 430's 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, terminal, and non-precision instrument approach (GPS, Loran-C, VOR, VOR-DME, TACAN, NDB, NDB-DME, RNAV) operation in accordance with AC 20-138.
- One of the approved sensors, for a single or dual GNS 430 installation, for North Atlantic Minimum Navigation Performance Specification (MNPS) Airspace in accordance with AC 91-49 and AC 120-33.
- The systems meets RNP5 airspace (BRNAV) requirements of AC 90-96 and in accordance with AC 20-138, and JAA AMJ 20X2 Leaflet 2 Revision 1, provided it is receiving usable navigation information from the GPS receiver.

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



KEY AND KNOB FUNCTIONS

The key and knob descriptions on the next pages provide a general overview of the primary function(s) for each knob.

LEFT-HAND KEYS AND KNOBS

1. The small left knob (COM/VLOC) is used to tune the kilohertz (kHz) value of the standby frequency for the communications transceiver (COM) or the VLOC receiver, whichever is currently selected by the tuning cursor. Press this knob momentarily to toggle the tuning cursor between the COM and VLOC frequency fields.

2. The large left knob (COM/VLOC) is used to tune the megahertz (MHz) value of the standby frequency for the communications transceiver (COM) or the VLOC receiver, whichever is currently selected by the tuning cursor.
3. The VLOC flip-flop key is used to swap the active and standby VLOC frequencies (i.e., make the selected standby frequency active).
4. The VLOC volume knob controls audio volume for the selected VOR/Localizer frequency. Press momentarily to enable/disable the ident tone.
5. The COM power/volume knob controls unit power and communications radio volume. Press momentarily to disable automatic squelch control.
6. The COM flip-flop key is used to swap the active and standby COM frequencies. Press and hold to select emergency channel (121.500 MHz).

RIGHT-HAND KEYS AND KNOBS

7. The direct-to key provides access to the direct-to function, which allows you to enter a destination waypoint and establishes a direct course to the selected destination.
8. The range key allows you to select the desired map scale. Use the up arrow side of the key to zoom out to a larger area, or the down arrow side to zoom in to a smaller area.
9. The menu key displays a context-sensitivity list of options. This options list allows you to access additional features or make settings changes which relate to the currently displayed page.
10. The enter key is used to approve an operation or complete data entry. It is also used to confirm information, such as the Database Page during power on.
11. The clear key is used to erase information or cancel an entry. Press and hold this key to immediately display the Default Navigation Page, regardless of which page is currently being displayed.
12. The large right knob (CRSR) is used to select between the various page groups: NAV, WPT, AUX, or NRST. With the on-screen cursor enabled, the large right knob allows you to move the cursor about the page.
13. The small right knob (CRSR) is used to select between the various pages within one of the groups listed above. Press this knob momentarily to display the on-screen cursor. The cursor allows you to enter data and/or make a selection from a list of options.

BOTTOM ROW KEYS

14. The procedures key allows you to select and remove approaches, departures and arrivals from your flight plan. When using a flight plan, available procedures for your departure and/or arrival airport are offered automatically. Otherwise, you may select the desired airport, then the desired procedure.
15. The flight plan key allows you to create, edit, activate and invert flight plans, as well as access approaches, departures and arrivals. A closest point to flight plan feature is also available from the flight plan key.
16. The message key is used to view system messages and to alert you to important warnings and requirements.
17. The OBS key is used to select manual or automatic sequencing of waypoints. Pressing the OBS key selects OBS mode, which will retain the current 'active to' waypoint as your navigation reference even after passing the waypoint (i.e., prevents sequencing to the next waypoint). Pressing the OBS key again will return to normal operation, with automatic sequencing of waypoints. Whenever OBS mode is selected, you may set the desired course to/from a waypoint using the OBS Page, or an external OBS selector on your HSI.
18. The CDI key is used to toggle which navigation source (GPS or VLOC) provides output to the HSI or CDI.

OPERATION

POWERING UP THE GNS 430

The GNS 430's power and COM volume are controlled using the COM power/volume knob (5) at the top left corner of the unit. Rotating it clockwise will turn unit power on and increase the COM radio volume. After turning the unit on, a 'welcome page' will be displayed while the unit performs a self test.

During the self-test, check for the following indications on other instruments:

- Course deviation - half left / no flag
- TO/FROM flag - TO
- All external annunciators - on
- Glideslope - half up / no flag

The land data page will appear next, followed by the database confirmation page, which shows the current database information on the NavData card (with the valid operating dates, cycle number and database type indicated). The database is updated every 28 days, and must be current for approved instrument approach operations. Information on database subscriptions is available inside your GNS 430 package.

To acknowledge the database information, press the ENT-key.

ACQUIRING SATELLITES & VIEWING MESSAGES

Once the database has been acknowledged, the satellite status page will appear, and the GNS 430 will begin to collect satellite information. An 'Acquiring' status will be displayed on the satellite status page, and the signal strength of any satellites received will appear as 'bar graph' readings. This is a good indication that you are receiving signals and a position fix will be determined. Following the first-time use of your GNS 430, the time required for a position fix will vary - usually from one to two minutes.

If the unit can only obtain enough satellites for 2D navigation (no altitude), the unit will use the altitude provided by the altitude encoder.

If the GNS 430 has not been operated for a period of six months or more, it may have to 'Search the Sky' to collect new data. This means the unit is acquiring satellite data to establish almanac and satellite orbit information, which can take 5 to 10 minutes. The satellite status page will display a 'Searching Sky' status, and the message annunciator (MSG), above the MSG key, will also flash to alert you of a system message, 'Searching the Sky'.

To view a system message, press MSG.

The message page will appear and display the status or warning information applicable to the receiver's current operating condition.

To return to the previous page after viewing a message, press MSG again.

SELECTING COM AND VLOC FREQUENCIES

The GNS 430's display is divided into separate 'windows' (or screen areas), including a COM window, VLOC window and the GPS window (the right 3/4 of the display). Pushing the small left knob (1) activates the tuning cursor in the desired frequency window. To select the active frequency, you must first enter the frequency in the standby field, and use the COM flip-flop (6) (or the VLOC flip-flop (3)) key to move it to the active field.

To change the standby communication frequency:

1. Press the small left knob (1) if needed, to move the tuning cursor to the COM window
2. Rotate the large left knob (2) to select the MHz, and the small left knob (1) to select the kHz of the desired frequency

To place the standby communication frequency in the active field, press the COM flip-flop key (6).

Once you've entered the active frequency, simply repeat steps 1 and 2, above, to enter the standby frequency. After both communication frequencies have been entered, you may select to keep the COM window 'hot' by leaving the cursor on the standby frequency, or move the cursor to the VLOC window by pressing the small left knob (1).

NOTE

When selecting VLOC frequencies, the tuning cursor will automatically return to the COM window after 30 seconds of inactivity.

To change the standby VLOC frequency:

1. Press the small left knob (1), if needed, to activate the tuning cursor in the VLOC window.
2. Rotate the large left knob (2) to select the MHz, and the small left knob (1) to select the kHz of the desired frequency.

To place the standby frequency in the active field, press the VLOC flip-flop key (3).

MAP PAGE

After the GNS 430 acquires satellites and computes a position, the map page will appear automatically.
The map page displays your present position (using an airplane symbol) relative to nearby airports, VORs, NDBs, intersections, user waypoints and airspace boundaries - and your route displayed as a solid line.
Data fields for destination waypoint (WPT), distance to waypoint (DIS), desired track (DTK) and ground speed (GS) appear on the right hand side of the display. These fields are user selectable to allow you to configure the unit to your own preferences. Available settings include: altitude, bearing, enroute, safe altitude, estimated time of arrival, minimum safe altitude, and ground track.

NAV PAGES & PAGE GROUPS

The map page is one of six pages available under the NAV group:

- Default NAV page
- NAVCOM page
- Satellite status page
- Vertical navigation page
- Position page
- Map page

To select the desired NAV page, rotate the small right knob (13) until the desired page is displayed.

If you are currently viewing a page which is not part of the NAV group, you can quickly return to the NAV group using the CLR-key.

To select the NAV group and display the default NAV page, press and hold the

CLR-key (11).

In addition to the NAV group of pages, additional groups of pages are available for waypoint information (WPT), auxiliary (AUX) functions such as flight planning or unit settings, and listings for nearest (NRST) airports or other facilities.

To select the desired page group, rotate the large right knob (12) until a page from the desired group is displayed

To select the desired page within the group, rotate the small right knob (13) until the desired page is displayed.

DIRECT-TO NAVIGATION

The GNS 430 can use direct point-to-point navigation to guide you from takeoff to touchdown, even in the IFR environment. Once a destination is selected, the unit will provide speed, course and distance data based upon a direct course from your present position to your destination. A destination can be selected from any page with the direct-to-key (7).

To select a direct-to destination:

1. Press the direct-to-key. The select direct-to waypoint page will appear with the destination field highlighted.
2. Rotate the small right knob (13) to enter the first letter of the destination waypoint identifier. The destination waypoint may be an airport, VOR, NDB, intersection or user waypoint, as long as it is in the database or stored in memory as a user waypoint.
3. Rotate the large right knob (12) to the right to move the cursor to the next character position.
4. Repeat steps 2 and 3 to spell out the rest of the waypoint identifier.
5. Press ENT to confirm the identifier. The 'Activate?' function field will be highlighted.
6. Press ENT to activate a direct-to course to the selected destination.

DEFAULT NAV PAGE

During most flights, the default NAV, map and NAVCOM pages will be the primary pages used for navigation. The default NAV page displays a graphic course deviation indicator (CDI), the active leg of your flight plan (as defined by the current 'from' and 'to' waypoints), and six user-selectable data fields. The default settings for these fields are distance to waypoint (DIS), desired track (DTK), bearing to waypoint (BRG), ground speed (GS), ground track (TRK) and estimated time en route (ETE).
From the default NAV page, simply rotate the small right knob (13) to display the map page and again to display the NAVCOM page. The NAVCOM page displays the available frequencies (communications and navigation) for the departure airport, any en route airports which are included in your flight plan, and the final destination airport. When using the direct-to function, frequencies will be listed for the airport nearest to your starting position and the destination airport.

To display the frequency list for the desired flight plan or direct-to airport:

1. Push the small right knob (13) to activate the cursor on the airport identifier field (in the GPS window).
2. Rotate the small right knob (13) to display the list of airports (departure, arrival and en route) for your flight plan or direct-to. Continue to rotate the small right knob (13) until the desired airport is selected.
3. Press ENT to display the frequency list for the selected airport.

NAVCOM PAGE

A frequency listed on the NAVCOM page can be quickly transferred to the standby field of the COM or VLOC windows. This time saving process prevents having to 're-key' a frequency already displayed elsewhere on the screen.

To select a communication or navigation frequency:

1. Push the small right knob (13) to activate the cursor in the GPS window.
2. Rotate the large right knob (12) to select the desired frequency from the list.
3. Press ENT to transfer the selected frequency to the standby field in the COM or VLOC window. COM frequencies will automatically go to the standby field of the COM window and navigation frequencies will automatically go to the standby field of the VLOC window, regardless of which window is currently being highlighted by the cursor.
4. To activate the selected frequency, press the COM flip-flop-key (6) or the VLOC flip-flop-key (3).

IFR PROCEDURES

Once the direct-to or flight plan is confirmed, the whole range of instrument procedures is available to you. Departures (SIDs), arrivals (STARs), non-precision and precision approaches are stored within the NavData card and available using the PROC (procedures) key.

To display the procedures page, press PROC.

The steps required to select and activate an approach, departure or arrival are identical. In this Supplement, examples of the steps required to select an approach are shown, but keep in mind the same process also applies to departures and arrivals.

To select an approach, departure or arrival:

1. Rotate the small right knob (13) to select the desired option ('Select Approach?', 'Select Arrival?', or 'Select Departure?') from the procedures page.
2. Press ENT to display a list of available procedures for the arrival (when using approach or STARs) or departure (when using SIDs) airport.
3. Rotate the small right knob (13) to select the desired procedure and press ENT.
4. For approaches, a window appears to select the desired initial approach fix (IAF) or provide a 'vectors' option to select just the final course segment of the approach. Rotate the small right knob (13) to select the desired option and press ENT. (The 'vectors' option extends the final outbound course beyond the final approach fix, allowing you to intercept the final course segment beyond its normal limits.)

5. For departures and arrivals, a window appears to select the desired transition. Rotate the small right knob (13) to select the desired option and press ENT.

In your flight plan or direct-to, the departure or arrival airport is replaced with the sequence of waypoints contained within the selected procedure.

NEAREST AIRPORT EMERGENCY SEARCH

The NRST group provides detailed information on the nine nearest airports, VORs, NDBs, intersections and user-created waypoints within 200 nautical miles of your current position. In addition, pages are also provided to display the five nearest center (ARTCC/FIR) and Flight Service Station (FSS) points of communication, plus alert you to any special-use or controlled airspace you may be in or near.

To display the NRST pages:

1. If necessary, press the small right knob (13) to remove the cursor from the page.
2. Rotate the large right knob (12) to select the NRST page group, as indicated by 'NRST' appearing in the lower right corner of the screen.
3. Rotate the small right knob (13) to select the desired NRST page.

The nearest airport page is one of eight pages available under the NRST group:

- Nearest airport page
- Nearest intersection page
- Nearest NDB page
- Nearest VOR page
- Nearest user waypoints page
- Nearest ARTCC page
- Nearest FSS page
- Nearest airspace page

You may examine both the communication frequencies and runway information directly from the nearest airport page. As discussed earlier for the NAVCOM page, you may also place any displayed frequency into the standby COM or VLOC field by highlighting the frequency with the cursor and pressing ENT.

NEAREST AIRPORTS: ADDITIONAL INFORMATION AND DIRECT-TO

To view additional information for a nearby airport:

1. Press the small right knob (13) to activate the cursor.
2. Rotate the large right knob (12) to select the desired airport from the list.
3. Press ENT to display waypoint (WPT) information pages for the selected airport.
4. To display runway and frequency information, press the small right knob (13) to remove the cursor and rotate the small right knob (13) to display the desired information page.

The nearest airport page may be used in conjunction with the direct-to (7) key to quickly set a course to a nearby facility in an in-flight emergency. Selecting a nearby airport as a direct-to destination will override your flight plan or cancel a previously selected direct-to destination. (You'll still have the option of returning to your flight plan by canceling the direct-to.)

To select a nearby airport as a direct-to destination:

From the nearest airport page:

1. Press the small right knob (13) to activate the cursor.
2. Rotate the large right knob (12) to select the desired airport from the list.
3. Press direct-to (7), ENT and ENT (again) to navigate to the nearby airport.

From an airport information page:

1. Press direct-to (7), ENT and ENT (again) to navigate to the nearby airport.

SPECIAL USE AND CONTROLLED AIRSPACE

The last page in the NRST group, the nearest airspace page, provides information for up to nine controlled or special-use airspaces near or in your flight path. Airspace information appears on this page based upon the same criteria used for airspace alert messages.

Nearby airspace information and airspace alert messages are provided according to the following conditions:

- If your projected course will take you inside an airspace within the next ten minutes, the message 'Airspace ahead - - less than 10 minutes' will appear.
- If you are within two nautical miles of an airspace and your current course will take you inside, the message 'Airspace near and ahead' will appear.
- If you are within two nautical miles of an airspace and your current course will not take you inside, the message 'Near airspace less than 2 nm' will appear.
- If you have entered an airspace, the message 'Inside Airspace' will appear.

By default, airspace alert messages are turned off. When turned on, the message (MSG) annunciator located directly above the MSG-key will flash to alert you to the airspace message.

To view an airspace alert message:

1. Press the MSG-key. The message page appears with the alert message.
2. Press MSG again to return to the previous display.

Note that airspace alerts are based upon three-dimensional data (latitude, longitude and altitude) to avoid nuisance alerts. The alert boundaries for controlled airspace are also sectorized to provide complete information on any nearby airspace. Additional information about a nearby airspace - such as controlling agency, frequency and floor/ceiling limits - is available from the nearest airspace page.

FLIGHT PLANS

The GNS 430 lets you create up to 20 flight plans, with up to thirty-one waypoints in each flight plan. Flight plans are created, edited and activated using the FPL-key. The FPL page group includes two pages: the active flight plan page and the flight plan catalog. The active flight plan provides information and editing features for the flight plan currently in use (referred to as 'flight plan 00'). The flight plan catalog serves as the main page for creating new flight plans, as well as editing or activating previously created flight plans.

Since using flight plans is arguably one of the more complex features of the GNS 430, we'll only discuss it briefly here - focusing on creating a new flight plan and activating it to use for navigation. After reading through this brief introduction, answers to additional questions you may have about flight plans can be found in the Pilot's Guide.

To create a new flight plan:

1. Press the FPL-key and rotate the small right knob (13) to select the flight plan catalog.
2. Press the MENU-key to display the flight plan catalog options.
3. Rotate the large right knob (12) to select 'Create New Flight Plan?' and press ENT.
4. The cursor will appear on the first waypoint identifier field (located directly below 'WAYPOINT'). Use the large (12) and small (13) right knobs to enter the identifier of the first waypoint in the flight plan. (The small knob is used to select the desired letter or number and the large knob is used to move to the next character space.)
5. Press ENT once the identifier has been selected. The cursor will move to the next blank waypoint identifier field.
6. Repeat steps 4 and 5, above, until all waypoints for the flight plan have been entered.

Once the flight plan is created, it may be activated from an options window. Activating the flight plan will place it into 'flight plan 00' (a copy of it will still reside in the original catalog location) and replaces any flight plan which currently exists in 'flight plan 00'.

To activate the new flight plan:

1. Press the MENU-key to display the flight plan catalog options.
2. Rotate the small right knob (13) to select 'Activate Flight Plan?' and press ENT.

STORMSCOPE INTERFACE

The GNS 430 provides the display interface for the Goodrich Stormscope WX-500 Weather Mapping Sensor. The interface capability allows weather data to be shown on the color display which gives you the ability to look at your display and quickly identify weather hazards relative to your airplane.

NOTE

Refer to the WX-500 Supplement A24 to the AFM and to the WX-500 Pilot´s Guide for a detailed description of the WX-500 Stormscope.

NOTE

Refer to the Pilot´s Guide Addendum of the GNS 430 for detailed operating procedures of the GNS 430 when the WX-500 Stormscope is installed.

8. AIRPLANE HANDLING, CARE AND MAINTENANCE

No change.

SUPPLEMENT A20
TO THE AIRPLANE FLIGHT MANUAL
DA 40, DA 40 F
COURSE DEVIATION INDICATOR
GI 106A
GARMIN

Doc. No.	**: 6.01.01-E, 6.01.02-E**
Date of Issue of the Supplement	**: 01 Oct 2001**
Design Change Advisory	**: OÄM 40-097**

Signature	: Windler
Authority	: AUSTRO CONTROL GmbH Abteilung Flugtechnik
Stamp	: A-1030 Wien, Schnirchgasse 11
Date of approval	: 18. APR. 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 - 3345

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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	DA 40 F AFM Rev. 0 EASA Statement	all	all	15 Mar 2005	EASA 2005-3345	18 [illegible] 2005		

0.2 LIST OF EFFECTIVE PAGES

Chapter	Page	Date
0	9-A20-0	15 Mar 2005
	9-A20-1	15 Mar 2005
	9-A20-2	15 Mar 2005
	9-A20-3	15 Mar 2005
1, 2, 3, 4A, 4B, 5	9-A20-4	15 Mar 2005
6	9-A20-5	15 Mar 2005
7	9-A20-5	15 Mar 2005
	9-A20-6	15 Mar 2005
	9-A20-7	15 Mar 2005
	9-A20-8	15 Mar 2005
8	9-A20-8	15 Mar 2005

0.3 TABLE OF CONTENTS

1. GENERAL

This Supplement supplies the information necessary for the efficient operation of the airplane when the CDI GI 106A is installed. The information contained within this Supplement is to be used in conjunction with the complete Manual.

This Supplement is a permanent part of this Manual and must remain in this Manual as long as the CDI GI 106A is installed.

2. OPERATING LIMITATIONS

No change.

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

Upon removal or installation of the CDI 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

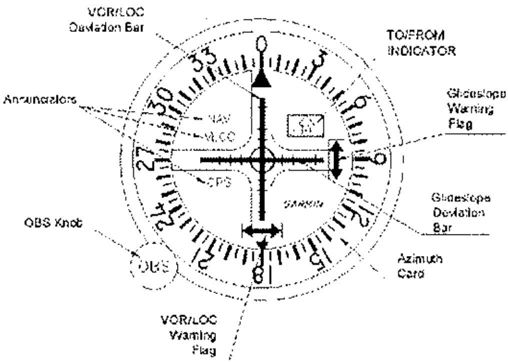
7.14 AVIONICS

GENERAL

The GI 106A Course Deviation Indicator is designed to operate with VHF and GPS navigational equipment to provide VOR, Localizer (LOC), GPS and Glideslope (GS) information.

The GI 106A is designed to accept signals from a remote mounted VOR converter or GPS receiver. Additionally it will accept signals from a glideslope receiver which will drive the Glideslope Deviation Bar along with an Glideslope warning flag. The unit incorporates NAV, GPS and VLOC (VOR/LOC as displayed on the Garmin GNS 430) annunciation with photocell dimming.

When GPS is selected for display, the GI 106A receives inputs from the GPS receiver to provide a visual presentation to the pilot. All information presented on the navigation indicator is generated from this external receiver.



VOR OPERATION

Channel the VOR/ILS receiver to the desired VOR frequency and positively identify the station by listening to received audio. Determine the left/right (VOR/LOC) warning flag is out of view.

Flying inbound to a VOR station is accomplished by first rotating the OBS knob to center the deviation indicator, and determining the TO/FROM indicator is in the TO condition. Read the 'To' bearing under the top indicator index and maneuver the airplane to approximately fly the magnetic course 'To' the station. When the airplane is on course, the vertical pointer will be centered. If the airplane moves off the course, the deviation bar will move away from the center position and flying in the direction of pointer deflection (left or right) is required to re-intercept the course.

The procedure for flying outbound from a VOR station is the same as flying inbound, except the OBS knob is first rotated to cause a 'FROM' indication to appear with the pointer centered.

To intercept a selected VOR radial (from the station) and fly outbound, turn the OBS knob to set the desired radial under the top indicator index. Maneuver the airplane to fly the selected radial magnetic heading plus or minus 45° which will provide a sufficient intercept angle. The intercept angle should be reduced as the deviation needle approaches an on course condition (center) to prevent excessive course bracketing.

LOCALIZER OPERATION

Select the desired localizer frequency and observe that the localizer flag is concealed. The TO/FROM indicator is not functional for localizer operation. When flying on the front course or outbound on the back course make corrections toward the localizer (vertical) needle deflection. The localizer path narrows as the approach end of the runway becomes closer. When flying inbound on the back course or outbound on the front course, the corrections are made away from the direction of needle deflection.

A helpful hint when flying the localizer is to set the localizer heading on the OBS dial under the lubber line for quick reference.

GLIDESLOPE OPERATION

The glideslope (horizontal) deviation bar provides the pilot with vertical steering information during ILS approaches. The glideslope circuitry is energized when the associated localizer frequency is selected on the navigation receiver. Observe that the glideslope warning flag is concealed. The glideslope deviation bar deflects towards the direction the pilot must fly to remain on the glide path.

If the glideslope deviation bar deflects upward, the airplane is below the glide path and the pilot must climb to again intercept the glide path and center the deviation bar. If the deviation bar deflects downward, the airplane is above the glide path and the pilot must descend to again intercept the glide path and center the deviation bar. When the deviation bar is centered the airplane is on the glide path.

8. AIRPLANE HANDLING, CARE AND MAINTENANCE

No change.

SUPPLEMENT E1
TO THE AIRPLANE FLIGHT MANUAL DA 40

DIGITAL CHRONOMETER
LC-2
ASTRO TECH

Doc. No.	:	**6.01.01-E**
Date of Issue of the Supplement	:	**26 Sep 2000**
Design Change Advisory	:	**OÄM 40-053**

Signature	:	Windler
Authority	:	
Stamp	:	AUSTRO CONTROL GmbH Abteilung Flugtechnik Zentrale A-1030 Wien, Schnirchgasse 11
Date of approval	:	0 2. 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

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1	alle	alle	20 Apr 2001		

0.2 LIST OF EFFECTIVE PAGES

Chapter	Page	Date
0	9-E1-1 9-E1-2 9-E1-3	20 Apr 2001 20 Apr 2001 20 Apr 2001
1, 2, 3, 4A, 4B	9-E1-4	20 Apr 2001
5, 6	9-E1-5	20 Apr 2001
7	9-E1-5 9-E1-6 9-E1-7	20 Apr 2001 20 Apr 2001 20 Apr 2001
8	9-E1-7	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 Digital Chronometer LC-2 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 Digital Chronometer LC-2 is installed.

2. LIMITATIONS

No change.

3. EMERGENCY PROCEDURES

No change.

4A. NORMAL OPERATING PROCEDURES

No change.

4B. ABNORMAL OPERATING PROCEDURES

No change.

5. PERFORMANCE

No change.

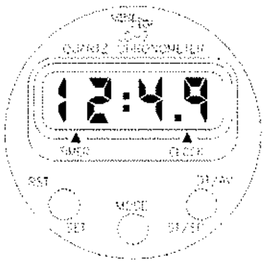
6. MASS AND BALANCE

Upon removal or installation of the Digital Chronometer LC-2 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

GENERAL

The chronometer consists of a front panel with 3 push button switches and a LC-Display with 4 numerals. The switches have legends to indicate the function of the switch. The LC-Display has backlighting.



FUNCTIONS

DATE

When the Date button is momentarily pressed, while in the 'Chronometer'-mode, the LC-2 displays the month and day for approximately 1,5 seconds and then returns to the 'Chronometer'-mode.

CHRONOMETER

The chronometer displays the time of day in hours and minutes. The hours can be displayed in 12 or 24 hour format. In the 12 hour 'Chronometer'-mode, the annunciator will appear above the word 'Clock'. In the 24 hour 'Chronometer'-mode, there is no 'Clock' annunciator.

ELAPSED TIMER

The timer can be reset to 00:00, started, stopped, restarted. The timer counts in minutes and seconds for the first hour and then in hours and minutes.

SETTING DATE AND TIME

DATE

While in 'Chronometer'-mode, press the 'Set'-button. The left two digits in the display will flash. This is the month. Press the 'Advance'-button to change the current month. When the month is set, press the 'Set'-button. The right two digits will flash. This is the day of the month. Press the 'Advance'-button to change the current day.

TIME

After the Date is set, press the 'Set'-button. The display will now show both month and day. Press the 'Set'-button again. The left two digits will flash. This is the hour. Press the 'Advance'-button to change the current hour. When the hour is set, press the 'Set'-button. The right two digits will flash. This is the minute. Press the 'Advance'-button to change to the next minute. When the minute is set, press the 'Set'-button. The display will now show the hour and minute just set. The chronometer is stopped and holding. Press the 'Start'-button. The display will flash the date and start the chronometer running.

8. AIRPLANE HANDLING, CARE AND MAINTENANCE

No change.

VT-2000

Secondary Surveillance Radar Transponder Mode-S

Bedienungsanleitung

Bitte nehmen Sie dieses Dokument in das
Flug- und Betriebshandbuch Ihres Luftfahrzeuges auf.

GARRECHT
Avionik GmbH

Verzeichnis der Änderungen

Bitte diese Seite stets als erste Seite im Handbuch belassen

Datum	Revision	Seiten	Änderungen	Bearbeitet von
13.02.07	1.0	alle	erstellt	JG
11.02.07	1.1	alle	Ergänzt: Funktionen von UI-SW Rev. 1.20	JG
11.04.12	1.2	Alle	Ergänzt: Anleitung VT-2000	JG

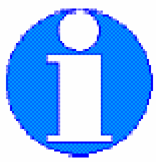
Inhaltsverzeichnis

Vorwort

Dieses Handbuch erläutert alle zum sicheren Betrieb nötigen Funktionen. Es wurde mit der gebotenen Sorgfalt erstellt. Sollten Sie weitergehende Fragen zur Bedienung des Transponders VT-2000 haben, so wenden Sie sich bitte an den Lieferanten.

In diesem Handbuch verwendetet Symbole

	***Gefahr*** ***Bezeichnet eine unmittelbar drohende Gefahr. Bei Nichtbeachten des Warnhinweises drohen Tod oder schwere Verletzungen***
	***Vorsicht*** ***Bezeichnet einen besonderen Hinweis zum Betrieb. Bei Nichtbeachten könnten das Gerät oder andere Einrichtungen Schaden nehmen.***
	***Wichtiger Hinweis*** ***Bezeichnet Anwendungshinweise und andere nützliche Informationen. Bei Nichtbeachten drohen Gerätefehlfunktionen***



Der Luftfahrzeughalter bzw. –führer ist verantwortlich für die Einhaltung der gesetzlichen Bestimmungen und Verpflichtungen, die mit dem Betrieb des eingebauten Transponders VT-2000 entstehen.

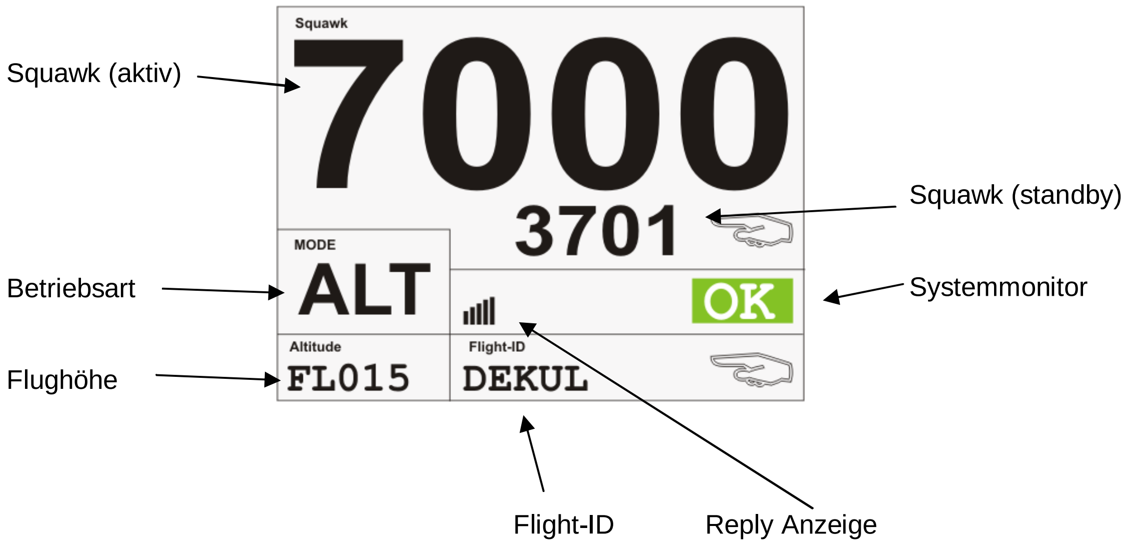
Um Beschädigungen durch Spannungsspitzen zu vermeiden, muß das System beim Starten oder Abstellen des Flugzeugtriebwerkes stets ausgeschaltet sein. Schäden durch Spannungsspitzen sind als solche nachweisbar und fallen nicht unter den Gewähr-leistungsanspruch

1. Ein- und Ausschalten

	Das Einschalten erfolgt wahlweise durch Drücken der Tasten **SBY**, **GND**, **ON**, **ALT**. Das Gerät startet im gewählten Betriebsmodus. Ausgeschaltet wird das Gerät durch Drücken und Halten der **OFF**-Taste, bis das Display erlischt.
	Displayanzeige beim Einschalten des Gerätes. Die im **Bedienteil** des Systems installierte Firmwareversion wird angezeigt. Hinweis: Informationen über weitere Firmware bzw. FPGA erhalten Sie über die Main Menu.Setting.Info des Gerätes

2. Normaler Betrieb

Im normalen Betrieb wird der nachfolgende Bildschirm dargestellt.

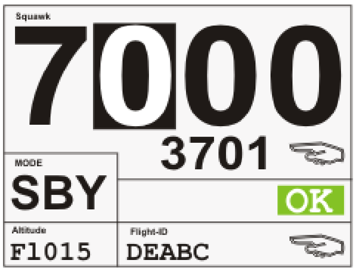


Hinweise:

- Wenn keine Mode-S Adresse eingetragen ist, blinkt anstelle der Flight-ID der Text `No Mode-S` und das Gerät arbeitet im Mode-A/C Betrieb
- Die momentane Flughöhe (bezogen auf 1013,25 hPa) wird als Flugfläche in der unteren linken Ecke des Displays angezeigt.

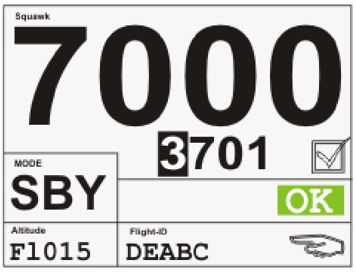
2.1. Eingabe Squawk

Die Eingabe des Squawks erfolgt mittels des mittleren Tastenblockes.



- Nach Drücken der ersten Taste wird der Wert an der ersten Position sofort gesetzt und der Cursor springt zur nächsten Position.
- Falscheingaben können durch Drücken der **CLR** - Taste korrigiert werden. Der Cursor wird hierfür eine Position nach links geschoben und der falsche Wert kann durch Eingabe des korrekten Wertes korrigiert werden.
- Mit Eingabe der vierten Ziffer ist der Squawk komplett und wird sofort aktiv.
- Durch Drücken der **VFR** - Taste wird der im Setup einstellbare Squawk direkt aufgerufen. Der bisher gültige Wert wird in den Standby Squawk Bereich verschoben.
- Durch Drücken der  Taste wird der aktive Squawk gegen den Standby-Squawk ausgetauscht.

2.2. Eingabe Standby Squawk

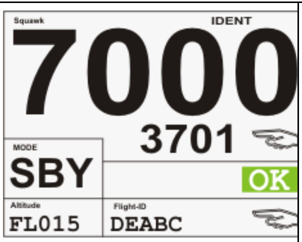


Die Eingabe des Standby Squawks erfolgt ebenfalls mittels des Zahlenblockes der Tastatur.

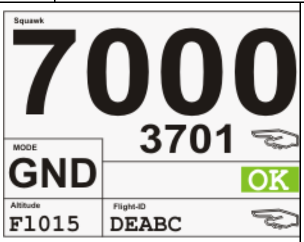
- Aktivieren Sie hierzu durch Drücken der oberen Softkey den Edit-Modus. Das Symbol ☜ neben dem Standby-Squawk ändert sich zu ☑.
- Geben Sie nun den Standby-Squawk über den Zahlenblock ein.
- Falscheingaben können durch Drücken der CLR - Taste korrigiert werden. Der Cursor wird hierfür eine Position nach links geschoben und der falsche Wert kann durch Eingabe des korrekten Wertes korrigiert werden.
- Mit Eingabe der vierten Ziffer ist die Eingabe abgeschlossen.
- Durch Drücken der  Taste wird der aktive Squawk gegen den Standby-Squawk ausgetauscht.

2.3. Auswahl der Betriebsart (Mode)

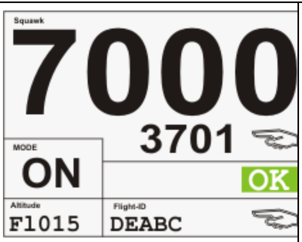
Die Auswahl der Betriebsart (Mode) erfolgt durch Drücken der Tasten **SBY**, **GND**, **ON**, **ALT**.



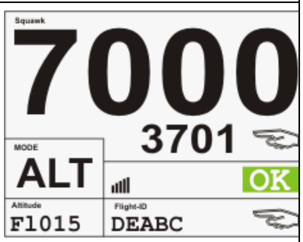
Standby Modus



On-Ground Modus



ON-Modus



ALT-Modus

Anzeige	Betriebsart (Mode)	Beschreibung/Funktion
SBY	Standby	Bedienteil läuft, Hauptgerät ist deaktiviert, Transponder beantwortet keine Anfragen.
GND	Ground	Mode-A/C/S intermode All-Calls werden nicht beantwortet
ON	Gerät aktiv, ohne Höhensignal	Abfragen werden beantwortet, Gerät squittert, Höhenwerte in der Antwort stehen auf Null. Diesen Mode nur auf Anforderung der Flugverkehrskontrollstelle schalten.
ALT	Gerät aktiv	Abfragen werden beantwortet, Gerät squittert, Höhenwerte in der Antwort enthalten auf Display dargestellten Wert. Dieser Mode ist die Standardbetriebsart in Europa.

Falls das Luftfahrzeug über einen Weight-on-Wheels Schalter verfügt und der Transponder hierfür konfiguriert ist, dann ist ein manuelles Schalten in den ON bzw. ALT-Modus nicht möglich, wenn das Luftfahrzeug am Boden steht.

2.4. IDENT Funktion

Durch Drücken der **IDT** -Taste wird die Identfunktion für 18 sek. aktiviert. Diese Funktion darf nur nach Aufforderung durch die Flugverkehrskontrolle aktiviert werden.

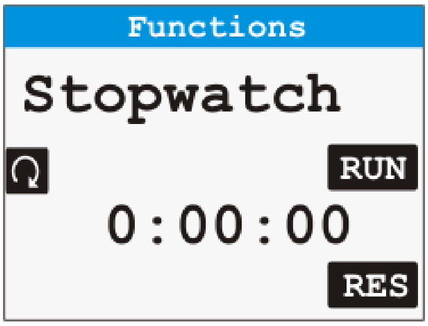
2.5. Zusätzliche Funktionen

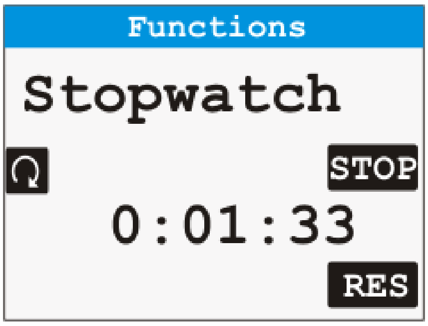
Der VT-2000 bietet weitere nützliche Funktionen, wie z.B. Stoppuhr, Countdown oder Höhenmonitor.

Durch einmaliges Drücken der **PGE** -Taste erreichen Sie aus der normalen Display-darstellung die erste Funktionsseite.

Durch Drücken der Taste wechseln Sie zwischen den einzelnen Funktions-seiten (Softkeysymbol).

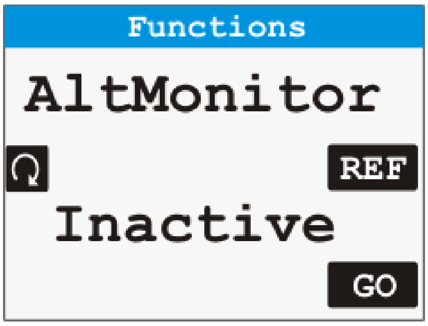
2.5.1. Stoppuhr (Timer)





RUN	startet die Stoppuhr
STOP	hält die laufende Uhr an.
RES	setzt die laufende oder stehende Uhr auf 0:00:00 zurück

2.5.2. Höhenmonitor



REF speichert den aktuellen Höhenwert als Referenz und aktiviert die Höhenmonitorfunktion.

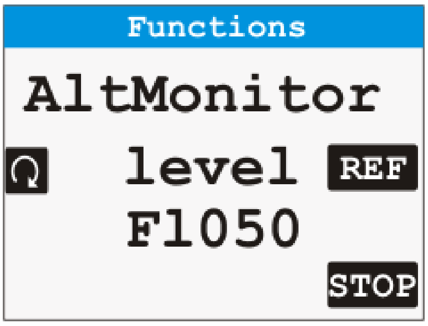
Abweichungen werden durch optische und akustische Anzeige signalisiert.

STOP beendet die Monitorfunktion.

GO startet diese erneut mit dem bisherigen Referenzwert.

reduziert die Referenzhöhe um 100ft.

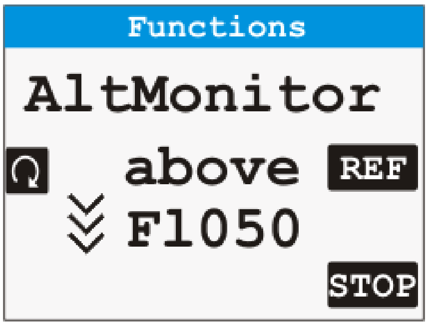
erhöht die Referenzhöhe um 100ft.



Beispiele:

Höhenmonitor aktiv. Aktuelle Referenzhöhe: FL 050

Keine Abweichung vom Referenzwert (=level)

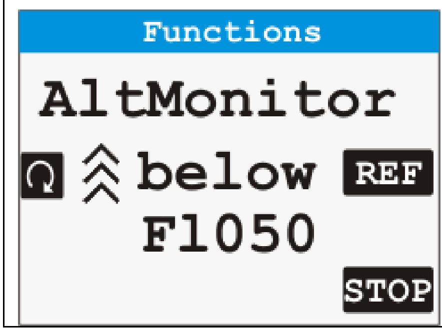


Höhenmonitor aktiv. Aktuelle Referenzhöhe: FL 050

Abweichung: 300 ft zu hoch (=above)

Ein ^ entspricht 100ft Abweichung.

Die Pfeilrichtung zeigt das Kommando: Sinken

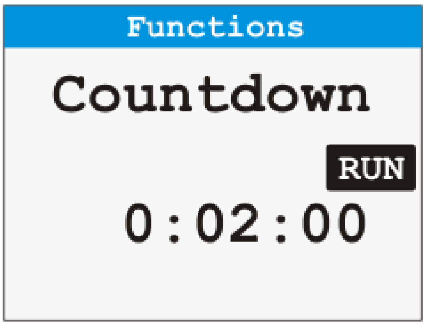


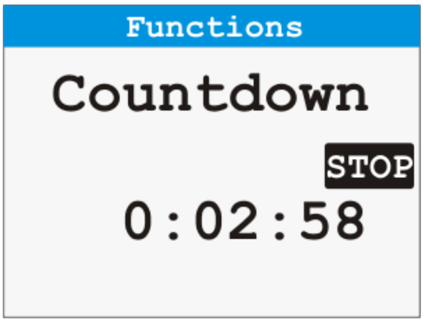
Höhenmonitor aktiv. Aktuelle Referenzhöhe: FL 050

Abweichung: 300 ft zu niedrig (=below)

Die Pfeilrichtung zeigt das Kommando: Steigen

2.5.3. Countdown





Setzen des Startwertes:

 erhöht den Wert um 30 sek. .

 reduziert den Wert um 30 sek.

Durch langes Drücken bzw. schnelles Drücken der Tasten wird die Schrittweite vergrößert.

RUN startet den Countdown

STOP hält den Countdown an.

2.6. Weitere Einstellungen

Durch zweifaches Drücken der PGE Taste gelangen Sie aus der normalen Displaydarstellung ins Hauptmenü, wo im nicht-passwortgeschützten Bereich weitere Geräteparameter eingestellt werden können.

2.6.1. Grundlagen zur Bedienung:

2.6.1.1. Navigation in Menüs:

	Die Navigation innerhalb von Menüs erfolgt grundsätzlich mit den Tasten des Zahlenblockes  bewegt den Cursor im Menü nach oben  bewegt den Cursor im Menü nach unten Softkey SEL wählt den invertierten Menüeintrag aus. Softkey EXIT verlässt das Untermenü.

2.6.1.2. Eingabe von Werten

Felder, die einstellbare Werte enthalten, sind wie folgt zu behandeln:

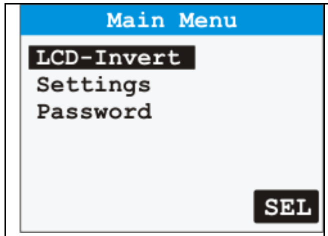
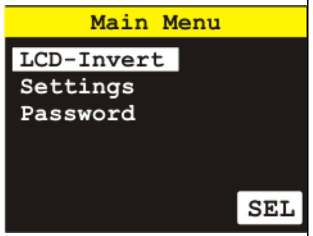
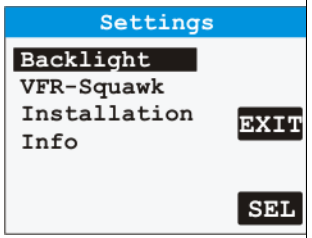
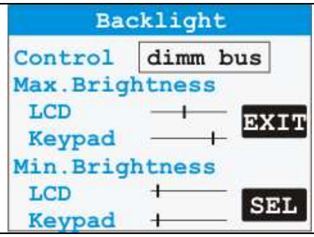
- Auswahl des zu ändernden Feldes mittels  bzw.  .
- **SEL** aktiviert den Editiermodus für das gewählte Feld. Dieses wird nun invertiert dargestellt.
- Falls die erste Stelle innerhalb einer Zeichenkette invertiert dargestellt wird, Auswahl der zu ändernden Position innerhalb der Zeichenkette mittels  bzw.  .
- Änderung des gewählten Wertes innerhalb der Zeichenkette mittels  bzw.  .
- Wird der komplette Wert invertiert dargestellt, ist die Auswahl einzelner Position innerhalb der Zeichenkette nicht möglich. Änderung des Wertes nur mittels  bzw.  .

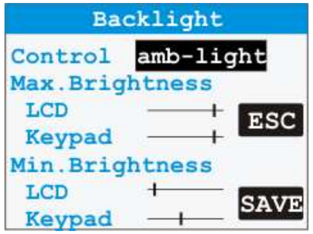
ESC verlässt das Feld ohne den neuen Wert zu speichern und beendet den Editiermodus.

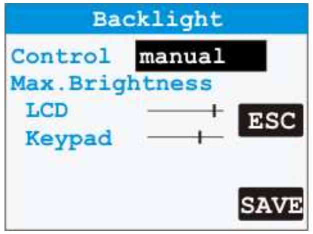
SAVE speichert den Wert des Feldes und beendet den Editiermodus.

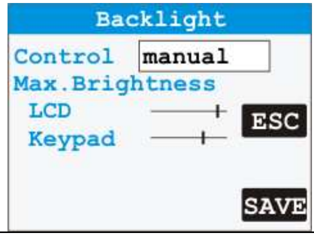
EXIT verlässt das Untermenü.

2.6.1.3. Menüstruktur VT-2000

	• LCD-Invert: Schaltet LCD-Anzeige manuell von Tag- auf Nachtdarstellung bzw. umgekehrt • Settings: Ruft Untermenü Settings auf • Password: Ruft Seite zur Passworteingabe für erweiterte Setupzwecke auf.		
	Nachtdarstellung		
		Untermenü Settings: • Backlight (Steuerung des LCD Backlights) • VFR Squawk (Voreinstellung der VFR-Taste) • Installation • Info (Zeigt Startbildschirm mit Firmware-Version)	
			Untermenü Backlight. Wählen Sie mit den Tasten  bzw.  die gewünschte Helligkeitssteuerung von LCD und Tastatur aus. Zur Auswahl stehen:

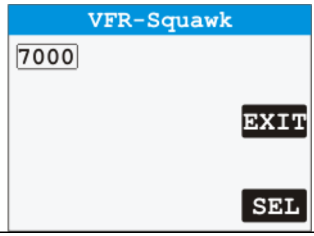
<table>
<tr>
<td></td>
<td></td>
<td>






</td>
<td>

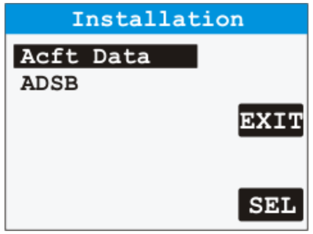
Dimm bus: Helligkeitssteuerung über Dimm-Bus des Luftfahrzeuges
Amb-light: Automatische Helligkeitssteuerung über geräteinternen Helligkeitssensor
Manual: Manuelle Einstellung

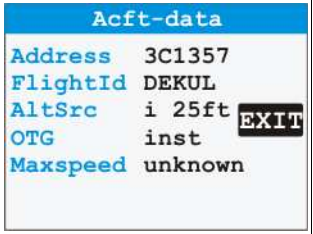
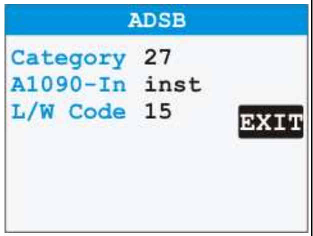
Hinweis: Der Helligkeitsabgleich für Dimm-Bus und Amb-Light ist nur über das Gerätesetup möglich. Konsultieren Sie hierzu bitten Ihren Avionik-Fachbetrieb.
</td>
</tr>
<tr>
<td></td>
<td></td>
<td>


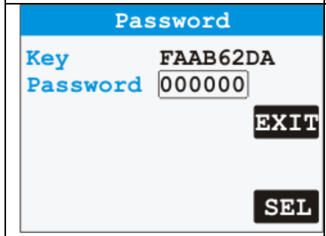
</td>
<td>
Untermenü VFR Squawk

Programmierung des Squawks, der mit der VFR -Taste aufgerufen wird.

Eingabe des gewünschten Wertes wie in 2.10.1 beschrieben
</td>
</tr>
</table>

<table>
<tr><td></td><td></td><td>
</td><td colspan="2">Untermenü Installation
• Acft Data: Anzeige flugzeugspezifischer Daten
• ADSB: Anzeige der ADS-B out Konfiguration

<u>Hinweis:</u>
Im normalen Betriebsmodus sind die Werte nicht änderbar.
Hinweise zur Änderung der Konfiguration entnehmen Sie bitte dem Installationshandbuch.</td></tr>
<tr><td></td><td></td><td></td><td>
</td><td>Adress: 24-Bit Mode-S Adresse
Flight-ID: Kennzeichen bzw. Flugnummer
AltSrc: Höhenquelle d. Alticoders
OTG: Konfiguration d. On-Ground-Interfaces
Maxspeed: max. Geschwindigkeit des Flug zeuges</td></tr>
<tr><td></td><td></td><td></td><td>
</td><td>Category: Luftfahrzeugkategorie
A1090-In: ADS-B in an Bord installiert
L/W Code: Information über Flugzeugab-messungen</td></tr>
</table>

			Untermenü Info: Anzeige der Softwareversionen des Bedienpanels (UI), des Tranponderhauptteils (XP), sowie der FPGA-Version (FPGA)
	Seite zur Eingabe des Passwortes. Nach korrekter Eingabe ist die Änderung der Gerätekonfiguration möglich. Das Passwort zur Eingabe der flugzeugspezifischen Daten finden Sie im Installationshandbuch. Der Parameter Key wird zur Erzeugung von Passwörtern zu Wartungszwecken benötigt.		

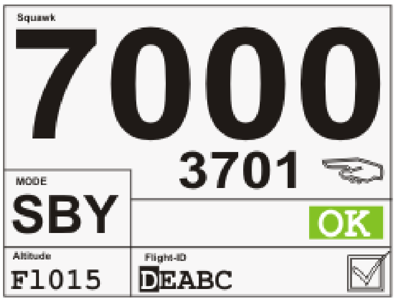
2.7. Einstellung flugspezifischer Daten

2.7.1. Flight-ID / Flugzeugkennzeichen

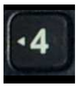
Die Flight ID (Flugnummer bei Linien- oder kommerziellen Flügen) oder das Flugzeugkennzeichen (bei kleineren Flugzeugen) wird bei Mode-S Antworten mit übertragen.

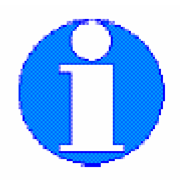
Die Flight ID sollte nur wenn nötig verändern werden. Normalerweise ist die FID das Rufzeichen Ihres Flugzeuges, außer Feld 7 des aufgegeben Flugplanes enthält andere Daten. Bitte prüfen Sie vor jedem Flug, daß die FID korrekt eingestellt ist.

Folgende Schritte sind nötig, um Flight-ID / Flugzeugkennzeichen einzustellen:



Flight-ID im Edit-Modus

- Schalten Sie den Transponder in den Standby Modus (SBY)
- Drücken Sie auf die Softkeytaste ☜
- Das Symbol ☜ neben der Flight-ID ändert sich zu ☑.
- Navigieren Sie mit den Tasten  bzw.  an die gewünschte Position und ändern Sie mit den Tasten  bzw.  den Wert
- Beenden Sie die Eingabe durch erneutes Drücken der unteren Softkeytaste. Das Symbol ☑ wechselt wieder zu ☜



Die Einstellung aller flugzeugspezifischen Daten (Mode-S Adresse etc.) ist im Installationshandbuch beschrieben.

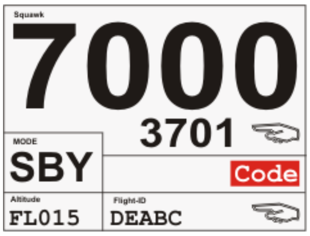
3. Fehlermeldungen / Warnungen

Fehler sind vom Selbsttest festgestellte massive Fehlfunktionen. Diese können im allgemeinen nicht selbst behoben werden. Warnungen sind Betriebszustände, die eine Fehl- oder Nichtfunktion nach sich ziehen können. Diese Zustände bzw. deren Ursache können teilweise vom Benutzer selbst behoben werden.

Beide Zustände werden sowohl optisch, als auch akustisch signalisiert.

Wenn das Gerät bei Wiederinbetriebnahme durch Wechsel in den ALT-Modus erneut einen Fehler meldet, kontaktieren Sie bitte Ihren LTB oder Lieferanten.

3.1. Systemverhalten und -anzeige bei Fehlern:



Anstelle des Wortes **Code** wird ein Fehlercode angezeigt.

Beim Erkennen eines schwerwiegenden Fehlers wird das Gerät in den Standby-Modus gesetzt, d.h. es werden weder Anfragen beantwortet noch Squitter ausgestrahlt. Gleichzeitig ertönt eine akustische Warnung, die durch Drücken der **CLR** Taste quittiert und beendet werden kann. Dadurch wird verhindert, daß Systemkomponenten beschädigt werden oder das Flugsicherungssystem gestört wird.

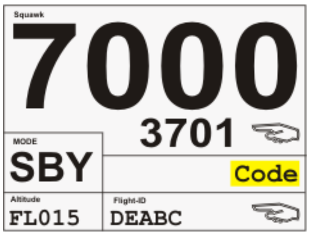
Der Systemmonitor zeigt auf dem Display den Fehlercode rot hinterlegt an.

Durch Wechsel der Betriebsart von SBY in ON oder ALT kann die Fehlermeldung zurückgesetzt werden. Tritt der Fehler danach jedoch erneut auf, schaltet das System wieder in den Fehlermodus.

Wenn ein Systemfehler festgestellt wurde, informieren Sie bitte umgehend die zuständige Flugverkehrskontrollstelle, mit der Sie in Kontakt stehen, falls Sie in einem Luftraum mit Transponderpflicht (z.B. TMZ, Luftraum C) fliegen. Versuchen Sie bitte nicht, während des Fluges die Fehlerursache selbst zu lokalisieren. Konzentrieren Sie sich nur auf die Führung Ihres Flugzeuges!!!

3.2. Systemverhalten und -anzeige bei Warnungen:

Das Gerät warnt vor Betriebsbedingungen, die eine baldige Fehlfunktion erwarten lassen. Es obliegt dem Benutzer, diese Gefahr abzuwenden. Warnungen werden für zu niedrige Betriebsspannung oder bei Alticoderproblemen ausgegeben.



Anstelle des Wortes **Code** wird ein Warn-code angezeigt.

Erkennt der systemeigene Überwachungsmonitor ein Problem, das jedoch noch nicht als Fehler klassifiziert, wird dieser Zustand als Warnung angezeigt. Das Gerät arbeitet weiter, u.U. jedoch mit Einschränkungen.

Gleichzeitig ertönt eine akustische Warnung, die durch Drücken der **CLR** Taste quittiert und beendet werden kann.

Der Systemmonitor zeigt auf dem Display den Warncode gelb hinterlegt an.

Wird der Grund der Warnung nicht mehr vom Überwachungsmonitor erkannt, wird die Warnung automatisch beendet,

Durch Wechsel der Betriebsart von SBY in ON oder ALT kann die Fehlermeldung zurückgesetzt werden. Tritt der Fehler danach jedoch erneut auf, schaltet das System wieder in den Fehlermodus.

Bei Problemen des Höhenencoders oder bei Betrieb außerhalb des zulässigen Höhenbereiches wird die Höhenübetragung deaktiviert und auch nicht mehr angezeigt (entspricht Modus **ON**).

Wenn eine Systemwarnung festgestellt wurde, informieren Sie bitte umgehend die zuständige Flugverkehrskontrollstelle, mit der Sie in Kontakt stehen, falls Sie in einem Luftraum mit Transponderpflicht (z.B. TMZ, Luftraum C) fliegen. Versuchen Sie bitte nicht, während des Fluges die Fehlerursache selbst zu lokalisieren. Konzentrieren Sie sich nur auf die Führung Ihres Flugzeuges!!!

3.3. Liste möglicher Fehler-/Warncodes

Die nachfolgende Tabelle beschreibt die Bedeutung der angezeigten Fehlercodes. Mit * gekennzeichnete Fehler können auf Installationsprobleme verursacht sein.

Alle anderen Fehlermeldungen sind auf geräteinterne Fehlfunktionen zurückzuführen. Das Gerät muß dann durch den Hersteller oder einen autorisierten Instandhaltungsbetrieb repariert werden.

Fehlercode		Beschreibung	mögliche Ursache
SQUIT		Squitterfehler	Defekt in Senderendstufe
VSUP		Betriebsspannung zu niedrig	Akku leer
ANT	*	Antennenfehler	Antennenkabel oder Antenne fehlerhaft
PRSS		Drucksensorfehler	Drucksensor defekt
COMM	*	CAN-Bus Kommunikationsfehler	Kurzschluß am CAN-Bus oder interner Gerätefehler
TXPL		Sender PLL-Fehler	Frequenzerzeugung im Senderendstufe defekt
FPGA		FPGA-Fehler	Fehler der internen Logik
V36		Fehler der internen 36V Versorgung	Fehler im internen Spannungswandler

Garmin International, Inc.
1200 E. 151st Street
Olathe, Kansas 66062 U.S.A.

FAA APPROVED

AIRPLANE FLIGHT MANUAL SUPPLEMENT

or

SUPPLEMENTAL AIRPLANE FLIGHT MANUAL

for the

Garmin GTN 625, 635, 650, 725, or 750 GPS/SBAS Navigation System

as installed in

Diamond DA40

Make and Model Airplane

Registration Number: OE-DGE Serial Number: 40.079

This document serves as an Airplane Flight Manual Supplement or as a Supplemental Airplane Flight Manual when the aircraft is equipped in accordance with Supplemental Type Certificate SA02019SE-D for the installation and operation of the Garmin GTN 625, 635, 650, 725, or 750 GPS/SBAS Navigation System. This document must be incorporated into the FAA Approved Airplane Flight Manual or provided as an FAA Approved Supplemental Airplane Flight Manual.

The information contained herein supplements the information in the FAA Approved Airplane Flight Manual. For limitations, procedures, loading and performance information not contained in this document, refer to the FAA Approved Airplane Flight Manual, markings, or placards.

FAA Approved By:

Michael Warren
ODA STC Unit Administrator
Garmin International, Inc.
ODA-240087-CE

Date: 25 - FEB - 2016

LOG OF REVISIONS				
	Page			
Revision Number	Date	Number	Description	FAA Approved
1	03/18/11	All	Complete Supplement	*Robert Grove* ODA STC Unit Administrator Garmin International, Inc. ODA-240087-CE Date: *03/18/2011*
2	12/18/12	6	Table 1 • Added new functions	*Michael Warren* ODA STC Unit Administrator Garmin International, Inc. ODA-240087-CE Date: *12/18/2012*
		8	Section 1.2 • Added capabilities checkboxes • Added GPS approaches without vertical • Added reference to EASA AMC 20-4	
		10	Section 1.3 • Removed suggestion for secondary charts • Changed to Type B Software in accordance with AC 120-76B.	
		10	Section 1.4 • Added ADS-B, AEG, FIS-B, NOTAM, TFR	
		12	Section 2.2 • Removed VFR only limitation	
		12	Section 2.3 • Clarified secondary navigation source requirement	
		18	Section 2.14 • Modified datalinked weather limitations	
		18	Section 2.16 • Modified limitation	

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	Page			
Revision Number	Date	Number	Description	FAA Approved
		19	Section 2.17 • Modified limitation	
		19	Section 2.21 • New limitation	
		24 & 25	Section 3.2.8 and 3.2.9 • Modified section title	
		25	Section 3.2.10 • New section	
		26	Section 4.1 • Added telephone audio deactivation	
		27	Section 4.3 • Modified caution statement	
		27	Section 4.4 • Added caution statement	
		29	Section 4.6 • New section	
		31	Section 7.7 • Added TCAD and GDL 88 as optional traffic systems	
		32	Section 7.8 • Modified Heading Not Available operation	
		34 - 35	Sections 7.12 – 7.16 • New sections	
3	03/26/13	20	Section 2.17 Modified limitation	*Michael Warren* ODA STC Unit Administrator Garmin International, Inc. ODA-240087-CE Date: *04/12/2013*
4	11/24/14	7	Table 1 • Added new functions	
		11	Section 1.4	

LOG OF REVISIONS				
	Page			
Revision Number	Date	Number	Description	FAA Approved
			• New section	*Michael Warren* ODA STC Unit Administrator Garmin International, Inc. ODA-240087-CE Date: *11/25/2014*
		16	Section 2.7 • Modified limitation	
		18	Section 2.12 • Added wire obstacles	
		20	Section 2.21 • Modified limitation	
		20 & 21	Section 2.22 & 2.23 • Added limitations	
		26	Section 3.2.10 • Added Flight Stream 210 to procedure	
		27	Section 4.1 • Removed telephone audio deactivation procedure	
		32	Section 7.5 • Added wire obstacles	
		34	Section 7.9 • Added Flight Stream 210	
		34	Section 7.10 • Added wire obstacles	
		37	Section 7.17 Added section	
5	02/25/16	All	All Sections • Reformatted and updated sections to better coincide with the VFR AFMS. Section 2 • Added RF leg description and limitations • Added QFE limitations • Added Autopilot limitations	See Page i

LOG OF REVISIONS				
	Page			
Revision Number	Date	Number	Description	FAA Approved
			• Added polar operation limitation • Added text regarding new data units in the GTN • Added Fuel Range Ring description and limitations • Added Flight Stream 210 limitation Section 4 • Added autopilot capability assessment regarding RF legs • Updated installer descriptions of configuration checkboxes • Added Search and Rescue autopilot note • Added RNP 1.0 installation options Section 7 • Added GMA 35c information • Removed references to GDL 88 and replaced with generic ADS-B • Added GWX 70 turbulence detection note • Added GTN crossfill information	

Table of Contents

Section 1. General

1.1 Garmin GTN Navigators

The Garmin GTN navigation system is a GPS system with a Satellite Based Augmentation System (SBAS), comprised of one or more Garmin TSO-C146c GTN 625, 635, 650, 725, or 750 navigator(s) and one or more Garmin approved GPS/SBAS antenna(s). The GTN navigation system is installed in accordance with AC 20-138A.

	GTN 625	GTN 635	GTN 650	GTN 725	GTN 750
GPS SBAS Navigation: • Oceanic, enroute, terminal, and non-precision approach guidance • Precision approach guidance (LP, LPV)	X	X	X	X	X
VHF Com Radio, 118.00 to 136.990, MHz, 8.33 or 25 kHz increments		X	X		X
VHF Nav Radio, 108.00 to 117.95 MHz, 50 kHz increments			X		X
LOC and Glideslope non-precision and precision approach guidance for Cat 1 minimums, 328.6 to 335.4 MHz tuning range			X		X
Moving map including topographic, terrain, aviation, and geopolitical data	X	X	X	X	X
Display of datalink weather products, SiriusXM, FIS-B, Connext (all optional)	X	X	X	X	X
Control and display of airborne weather radar (optional)				X	X
Display of terminal procedures data (optional)				X	X
Display of traffic data, including ADS-B (optional)	X	X	X	X	X
Display of StormScope® data (optional)	X	X	X	X	X
Display of marker beacon annunciators (optional)	X*	X*	X*	X	X
Remote audio panel control (optional)				X	X
Remote transponder control (optional)	X	X	X	X	X
Remote audio entertainment datalink control (optional)	X	X	X	X	X
TSO-C151c Class B TAWS (optional)	X	X	X	X	X
Supplemental calculators and timers	X	X	X	X	X
Control of GSR 56 Iridium Satellite Phone and SMS Text	X	X	X	X	X
Control of Flight Stream 210 (optional)	X	X	X	X	X

* Display of marker beacon annunciations on the GTN 6XX is only possible when installed with a Garmin GMA 350 audio panel.

Table 1 – GTN Functions

The GPS navigation functions and optional VHF communication and navigation radio functions are operated by dedicated hard keys, a dual concentric rotary knob, or the touchscreen.

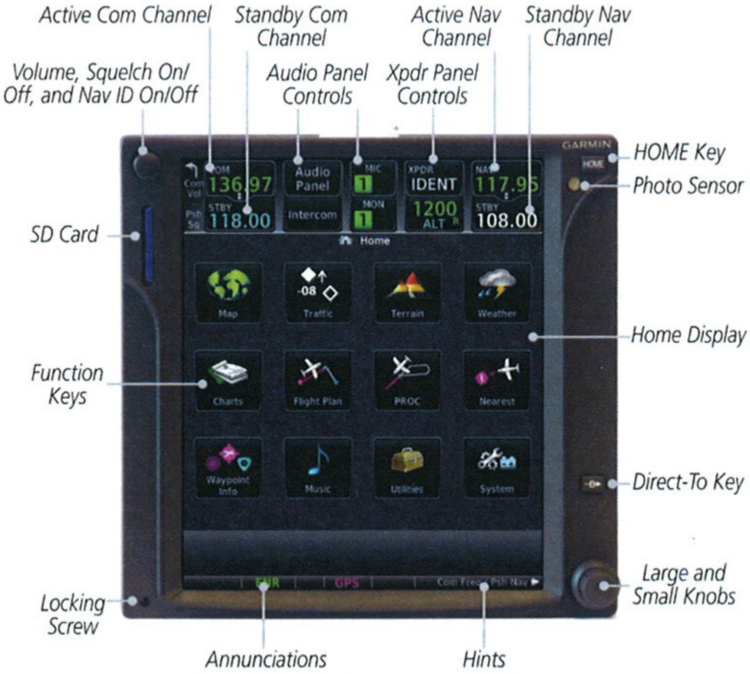

Figure 1 - GTN 750 Control and Display Layout

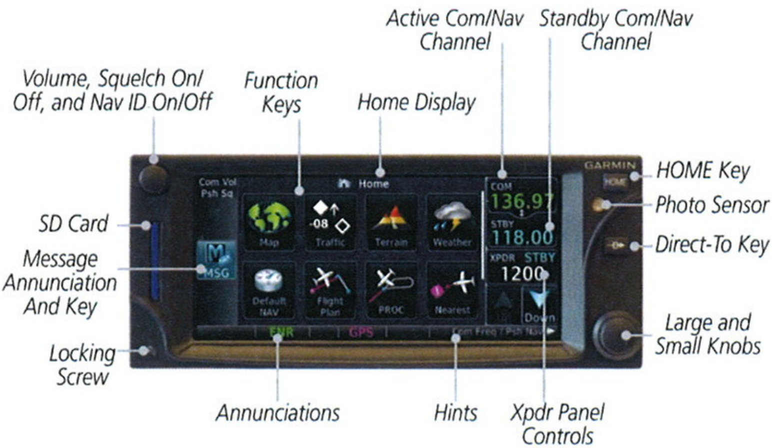

Figure 2 - GTN 635/650 Control and Display Layout

1.2 System Capabilities

This Flight Manual Supplement documents the installed capabilities of the GTN specific to the aircraft for which this manual is created.

NOTE

In sections which contain a square checkbox (□) the installer will have placed an "X" in the boxes next to the capabilities applicable to the installation.

The GTN system and associated navigation interface in this aircraft have the following capabilities, in addition to the core multifunction display capability:

☒ VHF Communication Radio
☒ Primary VHF Navigation
☒ Primary GPS Navigation (Enroute) and Approach Capability (LP/LNAV) – See below
☒ Primary GPS Approach Capability with Vertical Guidance (LNAV/VNAV, LPV) – See below
☐ TSO-C151c Terrain Awareness and Warning System – See section 2.15

GPS/SBAS TSO-C146c Class 3 Operation

The GTN complies with AC 20-138A and has airworthiness approval for navigation using GPS and SBAS (within the coverage of a Satellite Based Augmentation System complying with ICAO Annex 10) for IFR enroute, terminal area, and non-precision approach operations (including those approaches titled "GPS", "or GPS", and "RNAV (GPS)" approaches). The Garmin GNSS navigation system is composed of the GTN navigator and antenna, and is approved for approach procedures with vertical guidance including "LPV" and "LNAV/VNAV" and without vertical guidance including "LP" and "LNAV," within the U.S. National Airspace System.

The Garmin GNSS navigation system complies with the equipment requirements of AC 90-105 and meets the equipment performance and functional requirements to conduct RNP terminal departure and arrival procedures and RNP approach procedures including procedures with RF legs subject to the limitations herein. Part 91 subpart K, 121, 125, 129, and 135 operators require operational approval from the FAA.

The Garmin GNSS navigation system complies with the equipment requirements of AC 90-100A for RNAV 2 and RNAV 1 operations. In accordance with AC 90-100A, Part 91 operators (except subpart K) following the aircraft and training guidance in AC 90-100A are authorized to fly RNAV 2 and RNAV 1 procedures. Part 91 subpart K, 121, 125, 129, and 135 operators require operational approval from the FAA.

Applicable to dual installations consisting of two Garmin GNSS units: The Garmin GNSS navigation system has been found to comply with the requirements for GPS Class II oceanic and remote navigation (RNP-10) without time limitations in accordance with AC 20-138A and FAA Order 8400.12A. The Garmin GNSS navigation system can be used without reliance on other long-range navigation systems. This does not constitute an operational approval.

The Garmin GNSS navigation system has been found to comply with the navigation requirements for GPS Class II oceanic and remote navigation (RNP-4) in accordance with AC 20-138A and FAA Order 8400.33. The Garmin GNSS navigation system can be used without reliance on other long-range navigation systems. Additional equipment may be required to obtain operational approval to utilize RNP-4 performance. This does not constitute an operational approval.

The Garmin GNSS navigation system complies with the accuracy, integrity, and continuity of function, and contains the minimum system functions required for P-RNAV operations in accordance with JAA Administrative & Guidance Material Section One: General Part 3: Temporary Guidance Leaflets, Leaflet No 10 (JAA TGL-10 Rev 1). The GNSS navigation system consists of one or more TSO-C146c Class 3 approved Garmin GTN Navigation Systems. The Garmin GNSS navigation system complies with the accuracy, integrity, and continuity of function, and contains the minimum system functions required for B-RNAV operations in accordance with EASA AMC 20-4. The Garmin GNSS navigation system complies with the equipment requirements for P-RNAV and B-RNAV/RNAV-5 operations in accordance with AC 90-96A CHG 1. This does not constitute an operational approval.

Garmin International holds an FAA Type 2 Letter of Acceptance (LOA) in accordance with AC 20-153 for database integrity, quality, and database management practices for the navigation database. Flight crew and operators can view the LOA status at FlyGarmin.com then select "Type 2 LOA Status."

Navigation information is referenced to the WGS-84 reference system.

Note that for some types of aircraft operation and for operation in non-U.S. airspace, separate operational approval(s) may be required in addition to equipment installation and airworthiness approval.

Advanced RNP Capabilities

The GTN includes 3 out of 6 of the features required for operations in airspace requiring Advance RNP based on the *ICAO document 9613 Performance Based Navigation (PBN) Manual, fourth edition, 2013* and is therefore not approved for Advanced RNP operations. The following table describes the six Advanced RNP capabilities and the GTN capabilities.

Advanced RNP Feature	GTN Capability
RF legs	Available if enabled for installation. See Section 2.12 for limitations.
Parallel offsets	Available.
Scalable RNP	GTN provides CDI scalability in compliance with TSO-C146c. RNP scalability is not available.
RNAV holding	Available.
Fixed radius transitions	Not available in GTN.
Time of arrival control (TOAC)	Not available in GTN.

1.3 Electronic Flight Bag

The GTN 750/725 are operationally suitable as Class 3 Hardware, Type B Software in accordance with AC 120-76B EFB electronic aeronautical information when using current FliteChart or ChartView data.

Use of the Flight Stream 210 interface and data for the purpose of Electronic Flight Bag applications is not approved as part of this STC. Additional approval may be required to obtain operational approval for use of the Flight Stream 210 and supplied data to supplement EFB systems.

1.4 Electronic Checklists

The GTN checklist functions are designed to DO-178B software design assurance level B and support a minor failure classification. While this STC does not grant operational approval for operators requiring such approval, there are no limitations precluding operators from obtaining their own operational approval for the checklist function.

1.5 Definitions

The following terminology is used within this document:

ADF: Automatic Direction Finder

ADS-B: Automatic Dependent Surveillance Broadcast

AEG: Aircraft Evaluation Group (FAA)

APR: Approach

CDI: Course Deviation Indicator

DME: Distance Measuring Equipment

EFB: Electronic Flight Bag

EHSI: Electronic Horizontal Situation Indicator

FIS-B: Flight Information Services Broadcast

GNSS: Global Navigation Satellite System

GPS: Global Positioning System

GPSS: GPS Roll Steering

GTN: Garmin Touchscreen Navigator

HOT: Hazardous Obstacle Transmission wires

HSI: Horizontal Situation Indicator

IAP: Instrument Approach Procedure

IFR: Instrument Flight Rules

ILS: Instrument Landing System

IMC: Instrument Meteorological Conditions

LDA: Localizer Directional Aid

LNAV: Lateral Navigation

LNAV +V: Lateral Navigation with advisory Vertical Guidance

L/VNAV:	Lateral/Vertical Navigation
LOC:	Localizer
LOC-BC:	Localizer Backcourse
LP:	Localizer Performance
LPV:	Localizer Performance with Vertical Guidance
LP +V:	Localizer Performance with Advisory Vertical Guidance
MLS:	Microwave Landing System
NOTAM:	Notice to Airmen
OBS:	Omnibearing Select
PED:	Portable Electronic Device
RAIM:	Receiver Autonomous Integrity Monitoring
RF Leg:	Radius-To-Fix Leg of a Charted Instrument Procedure
RMT:	Remote
RNAV:	Area Navigation
RNP:	Required Navigational Performance
SAR:	Search and Rescue
SBAS:	Satellite Based Augmentation System
SD:	Secure Digital
SDF:	Simplified Directional Facility
SUSP:	Suspend
TACAN:	Tactical Air Navigation System
TAS:	Traffic Awareness System
TAWS:	Terrain Awareness and Warning System
TCAS:	Traffic Collision Avoidance System
TFR:	Temporary Flight Restriction
TIS:	Traffic Information Service
VHF:	Very High Frequency
VFR:	Visual Flight Rules
VLOC:	VOR/Localizer
VMC:	Visual Meteorological Conditions
VOR:	VHF Omnidirectional Range
WAAS:	Wide Area Augmentation System
WFDE:	WAAS Fault Data Exclusion
XFR:	Transfer

Section 2. LIMITATIONS

2.1 Cockpit Reference Guide

The Garmin GTN 6XX or GTN 7XX Cockpit Reference Guide, part number and revision listed below (or later revisions), *must* be immediately available to the flight crew whenever navigation is predicated on the use of the GTN.

- GTN 6XX Cockpit Reference Guide P/N 190-01004-04 Rev H
- GTN 7XX Cockpit Reference Guide P/N 190-01007-04 Rev G

2.2 Kinds of Operation

This AFM supplement does not grant approval for IFR operations to aircraft limited to VFR operations.

2.3 Minimum Equipment

The GTN must have the following system interfaces fully functional in order to be used for primary navigation during IFR operations:

Interfaced Equipment	Number installed	Number Required for IFR
External HSI/CDI/EHSI	1 or more	1
External GPS Annunciator	See Note 1	1

Table 2 – Required Equipment

Note 1: Certain installations require an external GPS annunciator panel. If installed, this annunciator must be fully functional to use the GTN GPS navigation for IFR operations.

Single engine piston aircraft under 6,000 lbs maximum takeoff weight:

Required Equipment for IFR operations utilizing GPS navigation: Single GTN Navigator

All other aircraft:

Required Equipment for IFR operations utilizing GPS navigation: Single GTN Navigator plus a second source of GPS navigation or a separate source of VHF navigation. The separate source of VHF navigation must not be the primary GTN, but it may be a secondary GTN.

Operation in remote or oceanic operation requires two sources of GPS navigation.

2.4 Flight Planning

For flight planning purposes, in areas where SBAS coverage is not available, the flight crew must check RAIM availability.

- Within the United States, RAIM availability can be determined using the Garmin WFDE Prediction program, Garmin part number 006-A0154-04 (included in GTN trainer) software version 3.00 or later approved version with Garmin approved antennas or the FAA's en route and terminal RAIM prediction website: www.raimprediction.net, or by contacting a Flight Service Station.
- Within Europe, RAIM availability can be determined using the Garmin WFDE Prediction program or Europe's AUGER GPS RAIM Prediction Tool at http://augur.ecacnav.com/augur/app/home.
- For other areas, use the Garmin WFDE Prediction program.

This RAIM availability requirement is not necessary if SBAS coverage is confirmed to be available along the entire route of flight. The route planning and WFDE prediction program may be downloaded from the Garmin website on the internet. For information on using the WFDE Prediction Program, refer to Garmin WAAS FDE Prediction Program, part number 190-00643-01, 'WFDE Prediction Program Instructions'.

For flight planning purposes, for operations within the U.S. National Airspace System on RNP and RNAV procedures when SBAS signals are not available, the availability of GPS RAIM shall be confirmed for the intended route of flight. In the event of a predicted continuous loss of RAIM of more than five minutes for any part of the intended route of flight, the flight shall be delayed, canceled, or rerouted on a track where RAIM requirements can be met. The flight may also be re-planned using non-GPS based navigational capabilities.

For flight planning purposes for operations within European B-RNAV/RNAV-5 and P-RNAV airspace, if more than one satellite is scheduled to be out of service, then the availability of GPS RAIM shall be confirmed for the intended flight (route and time). In the event of a predicted continuous loss of RAIM of more than five minutes for any part of the intended flight, the flight shall be delayed, canceled, or rerouted on a track where RAIM requirements can be met.

Applicable to dual installations consisting of two Garmin GNSS units:

> For flight planning purposes, for operations where the route requires Class II navigation the aircraft's operator or flight crew must use the Garmin WFDE Prediction program to demonstrate that there are no outages on the specified route that would prevent the Garmin GNSS navigation system to provide GPS Class II navigation in oceanic and remote areas of operation that requires RNP-10 or RNP-4 capability. If the Garmin WFDE Prediction program indicates fault exclusion (FDE) will be unavailable for more than 34 minutes in accordance with FAA

Order 8400.12A for RNP-10 requirements, or 25 minutes in accordance with FAA Order 8400.33 for RNP-4 requirements, then the operation must be rescheduled when FDE is available.

Both Garmin GPS navigation receivers must be operating and providing GPS navigation guidance for operations requiring RNP-4 performance.

North Atlantic (NAT) Minimum Navigational Performance Specifications (MNPS) Airspace operations per AC 91-49 and AC 120-33 require both GPS/SBAS receivers to be operating and receiving usable signals except for routes requiring only one Long Range Navigation sensor. Each display computes an independent navigation solution based on its internal GPS receiver.

Whenever possible, RNP and RNAV routes including Standard Instrument Departures (SIDs), Standard Terminal Arrival (STAR), and enroute RNAV "Q" and RNAV "T" routes should be loaded into the flight plan from the database in their entirety, rather than loading route waypoints from the database into the flight plan individually. Selecting and inserting individual named fixes from the database is permitted, provided all fixes along the published route to be flown are inserted. Manual entry of waypoints using latitude/longitude or place/bearing is prohibited.

It is not acceptable to flight plan a required alternate airport based on RNAV(GPS) LP/LPV or LNAV/VNAV approach minimums. The required alternate airport must be flight planned using an LNAV approach minimums or available ground-based approach aid.

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

2.5 System Use

In installations with two GTNs and an external GPS annunciator (See Table 2) the GTN connected to the external GPS annunciator must be used as the navigation source for all IFR operations.

The only approved sources of course guidance are on the external CDI, HSI, or EHSI display. The moving map and CDI depiction on the GTN display are for situational awareness only and are not approved for course guidance.

2.6 Applicable System Software

This AFMS/AFM is applicable to the software versions shown in Table 3.

The Main and GPS software versions are displayed on the start-up page immediately after power-on. All software versions displayed in Table 3 can be viewed on the System – System Status or Connext Setup pages.

Software Item	Software Version *(or later FAA Approved versions for this STC)*
Main SW Version	6.11
GPS SW Version	5.0
Com SW Version	2.20
Nav SW Version	6.02
Flight Stream 210	2.30

Table 3 - Software Versions

2.7 SD/Database Card

It is required that the SD/database card be present in the unit at all times. The card must not be removed or inserted during flight and/or while the GTN is powered on.

NOTE

Removal of the SD card will result in certain features/databases not being available and/or slow system performance.

2.8 Navigation Database

GPS/SBAS based IFR enroute, oceanic, and terminal navigation is prohibited unless the flight crew verifies and uses a valid, compatible, and current navigation database or verifies each waypoint for accuracy by reference to current approved data.

"GPS", "or GPS", and "RNAV (GPS)" instrument approaches using the Garmin navigation system are prohibited unless the flight crew verifies and uses the current navigation database. GPS based instrument approaches must be flown in accordance with an approved instrument approach procedure that is loaded from the navigation database.

Discrepancies that invalidate a procedure should be reported to Garmin International. The affected procedure is prohibited from being flown using data from the navigation database until a new navigation database is installed in the aircraft and verified that the discrepancy has been corrected. Navigation database discrepancies can be reported at FlyGarmin.com by selecting "Aviation Data Error Report." Flight crew and operators can view navigation database alerts at FlyGarmin.com then select "NavData Alerts."

If the navigation database cycle will change during flight, the flight crew must ensure the accuracy of navigation data, including suitability of navigation facilities used to define the routes and procedures for flight. If an amended chart affecting navigation data is published for the procedure, the database must not be used to conduct the procedure.

2.9 Ground Operations

Do not use SafeTaxi or Chartview functions as the basis for ground maneuvering. SafeTaxi and Chartview functions do not comply with the requirements of AC 20-159 and are not qualified to be used as an airport moving map display (AMMD). SafeTaxi and Chartview are to be used by the flight crew to orient themselves on the airport surface to improve flight crew situational awareness during ground operations.

2.10 Approaches

a) Instrument approaches using GPS guidance may only be conducted when the GTN is operating in the approach mode. (LNAV, LNAV +V, L/VNAV, LPV, LP, or LP +V)
b) When conducting instrument approaches referenced to true North, the NAV Angle on the System -Units page must be set to **True.**
c) The navigation equipment required to join and fly an instrument approach procedure is indicated by the title of the procedure and notes on the IAP chart. Navigating the final approach segment (that segment from the final approach fix to the missed approach point) of an ILS, LOC, LOC-BC, LDA, SDF, MLS, VOR, TACAN approach, or any other type of approach not approved for GPS, is not authorized with GPS navigation guidance. GPS guidance can only be used for approach procedures with GPS or RNAV in the procedure title. When using the Garmin VOR/LOC/GS receivers to fly the final approach segment, VOR/LOC/GS navigation data must be selected and presented on the CDI of the pilot flying.
d) Advisory vertical guidance deviation is provided when the GTN annunciates LNAV + V or LP +V. Vertical guidance information displayed on the VDI in this mode is only an aid to help flight crews comply with altitude restrictions. When using advisory vertical guidance, the flight crew must use the primary barometric altimeter to ensure compliance with all altitude restrictions.
e) Not all published Instrument Approach Procedures (IAP) are in the navigation database. Flight crews planning to fly an RNAV instrument approach must ensure that the navigation database contains the planned RNAV Instrument Approach Procedure and that approach procedure must be loaded from the navigation database into the GTN system flight plan by its name. Pilots are prohibited from flying any approach path that contains manually entered waypoints.
f) IFR approaches are prohibited whenever any physical or visual obstruction (such as a throw-over yoke) restricts pilot view or access to the GTN and/or the CDI.

2.11 Barometric Setting

The barometric altimeter setting used for any barometric corrected altitude source interfaced to the GTN must be set appropriate to the altitude type depicted on the procedure (QNH or QFE).

2.12 RF Legs

This STC does not grant operational approval for RF leg navigation for those operators requiring operational approval. Additional FAA approval may be required for those aircraft intending to use the GTN as a means to provide RNP 1 navigation in accordance with FAA Advisory Circular AC 90-105.

The following limitations apply to procedures with RF legs:

- Aircraft is limited to 180 KIAS while on the RF leg
- RF legs are limited to RNP 1 procedures. RNP AR and RNP <1 are not approved
- Primary navigation guidance on RF legs must be shown on an EHSI indicator with auto-slew capability turned ON
- GTN Moving Map, EHSI Map, or Distance to Next Waypoint information must be displayed to the pilot during the RF leg when flying without the aid of the autopilot or flight director.
- The active waypoint must be displayed in the pilot's primary field of view.

2.13 Autopilot Coupling

The flight crew may fly all phases of flight based on the navigation information presented to the flight crew; however, not all modes may be coupled to the autopilot. All autopilots may be coupled in Oceanic (OCN), Enroute (ENR), and Terminal (TERM) modes.

This installation is limited to:

☐ Lateral coupling only for GPS approaches. Coupling to the vertical path for GPS approaches is not authorized.

It is possible to create flight plan waypoint sequences, including Search and Rescue patterns, which exceed the autopilot's bank angle capabilities. The pilot shall monitor autopilot performance with regard to flight path deviation.

2.13.1 RNP 1.0 RF Leg Types

AC 90-105 states that procedures with RF legs must be flown using either a flight director or coupled to the autopilot.

This STC has demonstrated acceptable crew workload and Flight Technical Error for hand flown procedures with RF legs when the GTN installation complies with limitation set forth in Section 2.12 of this document. It is recommended to couple the autopilot for RF procedures, if available, but it is not required to do so. See section 4.5 of this manual to determine if this capability is supported in this installation.

2.14 Terrain Proximity Function (All Units)

Terrain, point obstacle, and wire obstacle information appears on the map and terrain display pages as red and amber terrain, obstacles, or wires and is depicted for advisory use only. Aircraft maneuvers and navigation must not be predicated upon the use of the terrain display. Terrain, obstacle and wire information is advisory only and is not equivalent to warnings provided by TAWS.

The terrain display is intended to serve as a situational awareness tool only. By itself, it may not provide either the accuracy or the fidelity on which to base decisions and plan maneuvers to avoid terrain or obstacles.

NOTE

Terrain and TAWS are separate features and mutually exclusive. If "TAWS B" is shown on the bottom right of the dedicated terrain page, then TAWS is installed.

2.15 TAWS Function (Optional)

Flight crews are authorized to deviate from their current ATC clearance to the extent necessary to comply with TAWS warnings. Navigation must not be predicated upon the use of TAWS.

TAWS shall be inhibited when landing at an airport that is not included in the airport database.

If an external TAWS annunciator panel is installed in the aircraft, this annunciator panel must be fully functional in order to use the TAWS system.

NOTE

Terrain and TAWS are separate features and mutually exclusive. If "TAWS B" is shown on the bottom right of the dedicated terrain page, then TAWS is installed.

2.16 Polar Operations

Use of the GTN for primary navigation for latitudes above 89.00° N and below 89.00° S is prohibited.

2.17 Datalinked Weather Display (Optional)

This limitation applies to datalinked weather products from SiriusXM via a GDL 69/69A, FIS-B via a GDL 88, and Connext via a GSR 56.

Do not use data link weather information for maneuvering in, near, or around areas of hazardous weather. Information provided by data link weather products may not accurately depict current weather conditions.

Do not use the indicated data link weather product age to determine the age of the weather information shown by the data link weather product. Due to time delays inherent in gathering and processing weather data for data link transmission, the weather information shown by the data link weather product may be significantly older than the indicated weather product age.

Do not rely solely upon data link services to provide Temporary Flight Restriction (TFR) or Notice to Airmen (NOTAM) information. Not all TFRs and NOTAMS can be depicted on the GTN.

Datalinked text weather is decoded for the convenience of the pilot, however it is possible that the decoding may be affected by anomalies in the data or differences in the units of measure between the decoding system and the text weather source. All text weather displayed on the GTN also includes the raw weather text for pilot review.

2.18 Traffic Display (Optional)

Traffic may be displayed on the GTN when connected to an approved optional TCAS I, TAS, TIS, or ADS-B traffic device. These systems are capable of providing traffic monitoring and alerting to the flight crew. Traffic shown on the display may or may not have traffic alerting available. The display of traffic is an aid to visual acquisition and may not be utilized for aircraft maneuvering.

Traffic is displayed in feet regardless of the unit settings for altitude. If the units for altitude are different than feet, a "FT" label will appear on the traffic icon on and main map page, and the dedicated traffic page will include an "ALT IN FT" notification.

2.19 StormScope® Display (Optional)

StormScope® lightning information displayed by the GTN is limited to supplemental use only. The use of the StormScope® lightning data on the display for hazardous weather (thunderstorm) penetration is prohibited. StormScope® lightning data on the display is intended only as an aid to enhance situational awareness of hazardous weather, not penetration. It is the flight crew's responsibility to avoid hazardous weather using official weather data sources.

When the GTN StormScope® page is operating without a heading source, as indicated by the "HDG N/A" label at the upper right corner of the StormScope® page, strikes must be cleared after each heading change.

2.20 Flight Planner/Calculator Functions

The Fuel Planning page uses Fuel on Board or Fuel Flow as received from an on board fuel totalizer, as entered by the pilot at system startup, or as entered by the pilot when on the Fuel Planning page. This *is not* a direct indication of actual aircraft fuel flow or fuel on board and those values are only used for the Fuel Planning page. The fuel required to destination is only a calculated and predicted value based on the data entered into the planner. It is not a direct indication of how much fuel the aircraft will have upon reaching the destination.

2.21 Fuel Range Rings

The fuel range rings displayed on the moving map are intended for situational awareness and do not represent a direct indication of endurance or fuel remaining. The distance between the segmented green reserve ring and the yellow zero fuel ring is 45 minutes by default. The reserve value can be changed from the GTN map setup menu.

Fuel range data is derived by the interfaced fuel totalizer data. Data entered in the Fuel Planning pages will not update the fuel range ring.

2.22 Glove Use / Covered Fingers

No device may be used to cover fingers used to operate the GTN unless the Glove Qualification Procedure located in the Pilot's Guide/Cockpit Reference Guide has been successfully completed. The Glove Qualification Procedure is specific to a pilot / glove / GTN 725, 750 or GTN 625, 635, 650 combination.

2.23 Demo Mode

Demo mode may not be used in flight under any circumstances.

2.24 Active Weather Radar

Radar is broadcasting energy while in Weather or Ground mapping modes. If the GTN 750/725 system is configured to control an airborne weather radar unit, observe all safety precautions, including:

- Do not operate in the vicinity of refueling operations.
- Do not operate while personnel are in the vicinity (approximately 20 feet) of the radar sweep area.

CAUTION

If a radar system is installed, it generates microwave radiation and improper use, or exposure, may cause serious bodily injury. Do not operate the radar equipment until you have read and carefully followed the safety precautions and instructions in the weather radar user manual and/or pilot's guide.

2.25 Telephone Audio

Telephone audio must not be distributed to the pilot or co-pilot unless a phone call is active.

CAUTION

Failure to turn off telephone audio when the telephone is not in use may result in telephone ringer or text message aural notifications being received during critical phases of flight.

2.26 Multi Crew Aircraft (GMA 35 Only)*

For aircraft type certified with more than one required pilot, or operations requiring more than one pilot, the "Group Co-Pilot with Passenger" audio panel option shall not be activated. This option is found in the Intercom Setup Menu when a Garmin GMA 35 audio panel is installed.

2.27 Wire Obstacle Database

Only the "Obstacle/HOT Line" database may be used. Use of the "Obstacle/Wire" database is prohibited. The database version can be viewed on the start-up database verification or System- System Status pages.

2.28 Portable Electronic Devices

This STC does not relieve the operator from complying with the requirements of 91.23 or any other operational regulation regarding portable electronic devices.

The Flight Stream 210 interface and data provided to a portable electronic device is not approved to replace any aircraft display equipment, including navigation or traffic/weather display equipment.

* Includes GMA 35 and GMA 35c Audio Panels

Section 3. EMERGENCY PROCEDURES

3.1 Emergency Procedures

3.1.1 TAWS WARNING

Red annunciator and aural "PULL UP":

Autopilot .... **DISCONNECT**
Aircraft Controls .... **INITIATE MAXIMUM POWER CLIMB**
Airspeed .... **BEST ANGLE OF CLIMB SPEED**

After Warning Ceases:

Altitude .... **CLIMB AND MAINTAIN SAFE ALTITUDE**
Advise ATC of Altitude Deviation, if appropriate.

NOTE

Only vertical maneuvers are recommended, unless either operating in visual meteorological conditions (VMC), or the flight crew determines, based on all available information, that turning in addition to the vertical escape maneuver is the safest course of action, or both.

NOTE

TAWS annunciators external to the GTN may not indicate the exact threat causing the alert. Example: WIRE alerts may be annunciated as TERR or OBSTACLE on external devices.

3.2 Abnormal Procedures

3.2.1 LOSS OF GPS/SBAS NAVIGATION DATA

When the GPS/SBAS receiver is inoperative or GPS navigation information is not available or invalid, the GTN will enter one of two modes: Dead Reckoning mode (DR) or Loss Of Integrity mode (LOI). The mode is indicated on the GTN by an amber "DR" or "LOI".

If the Loss Of Integrity annunciation is displayed, revert to an alternate means of navigation appropriate to the route and phase of flight.

If the Dead Reckoning annunciation is displayed, the map will continue to be displayed with an amber 'DR' overwriting the ownship icon. Course guidance will be removed on the CDI. Aircraft position will be based upon the last valid GPS position, then estimated by Dead Reckoning methods. Changes in true airspeed, altitude, heading, or winds aloft can affect the estimated position substantially. Dead Reckoning is only available in Enroute and Oceanic modes. Terminal and Approach modes do not support Dead Reckoning.

If Alternate Navigation Sources (ILS, LOC, VOR, DME, ADF) Are Available:

Navigation .... **USE ALTERNATE SOURCES**

If No Alternate Navigation Sources Are Available:

DEAD RECKONING (DR) MODE:

Navigation .... **USE GTN**

NOTE

All information normally derived from GPS will become less accurate over time.

LOSS OF INTEGRITY (LOI) MODE:

Navigation ....**FLY TOWARDS KNOWN VISUAL CONDITIONS**

NOTE

All information derived from GPS will be removed.

NOTE

The airplane symbol is removed from all maps. The map will remain centered at the last known position. "NO GPS POSITION" will be annunciated in the center of the map.

3.2.2 GPS APPROACH DOWNGRADE

During a GPS LPV, LP +V, LNAV/VNAV, or LNAV +V approach, if GPS accuracy requirements cannot be met by the GPS receiver, the GTN will downgrade the approach. The downgrade will remove vertical deviation indication from the VDI and change the approach annunciation accordingly from LPV, LP +V, L/VNAV, or LNAV +V to LNAV. The approach may be continued using the LNAV only minimums.

During a GPS approach in which GPS accuracy requirements cannot be met by the GPS receiver for any GPS approach type, the GTN will flag all CDI guidance and display a system message "ABORT APPROACH-GPS approach no longer available". Immediately upon viewing the message, the unit will revert to Terminal navigation mode alarm limits. If the position integrity is within these limits lateral guidance will be restored and the GPS may be used to execute the missed approach, otherwise alternate means of navigation must be utilized.

3.2.3 LOSS OF COM RADIO TUNING FUNCTIONS

If alternate COM is available:

Communications .... **USE ALTERNATE COM**

If no alternate COM is available:

COM RMT XFR key (if installed).......**PRESS AND HOLD FOR 2 SECONDS**

NOTE

This procedure will tune the active COM radio the emergency frequency 121.5, regardless of what frequency is displayed on the GTN. Certain failures of the tuning system will automatically tune 121.5 without flight crew action.

3.2.4 LOSS OF AUDIO PANEL FUNCTIONS (GMA 35 Only)†

Audio Panel Circuit Breaker ....**PULL**

NOTE

This procedure will force the audio panel into fail safe mode which provides only the pilot with communications and only on a single COM radio. If any non GTN 750 COM is installed, communication will be only on that radio. If only a GTN 750 is installed in the aircraft, then the pilot will have only the GTN 750 COM available. No other audio panel functions including aural alerting and the crew and passenger intercom will function.

† Includes GMA 35 and GMA 35c Audio Panels

3.2.5 TAWS CAUTION (Terrain or Obstacle Ahead, Sink Rate, Don't Sink)

When a TAWS CAUTION occurs, take 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.

NOTE

TAWS annunciators external to the GTN may not indicate the exact threat causing the alert. Example: WIRE alerts may be annunciated as TERR or OBSTACLE on external devices.

3.2.6 TAWS INHIBIT

The TAWS Forward Looking Terrain Avoidance (FLTA) and Premature Descent Alerts (PDA) functions may be inhibited to prevent alerting, if desired. Refer to GTN Cockpit Reference Guide for additional information.

To Inhibit TAWS:

Home Hardkey..PRESS
Terrain Button...PRESS
Menu Button..PRESS
TAWS Inhibit Button ....PRESS TO ACTIVATE

3.2.7 TER N/A and TER FAIL

If the amber **TER N/A** or **TER FAIL** status annunciator is displayed, the system will no longer provide TAWS alerting or display relative terrain and obstacle elevations. The crew must maintain compliance with procedures that ensure minimum terrain and obstacle separation.

3.2.8 DATA SOURCE - HEADING SOURCE INOPERATIVE OR CONNECTION TO GTN LOST MESSAGE

Without a heading source to the GTN, the following features will not operate:

- Roll steering will not be provided to the autopilot for heading legs. The autopilot must be placed in HDG mode for heading legs.
- Map cannot be oriented to Heading Up.
- All overlaying traffic data from a TAS/TCAS I or GDL 88 interfaced to an on board traffic system on the main map display. The flight crew must use the dedicated traffic page on the GTN system to display TAS/TCAS I or GDL 88 traffic data.
- All overlaying StormScope® data on the main map display. The flight crew must use the dedicated StormScope® page on the GTN system to display StormScope® data.

StormScope® must be operated in accordance with Section 7.8 when no heading is available.

3.2.9 DATA SOURCE – PRESSURE ALTITUDE SOURCE INOPERATIVE OR CONNECTION TO GTN LOST MESSAGE

Without a barometric corrected altitude source to the GTN, the following features will not operate:

- Automatic leg sequencing of legs requiring an altitude source. The flight crew must manually sequence altitude legs, as prompted by the system.

3.2.10 UNRECOVERABLE LOSS OF ALL ELECTRICAL GENERATORS OR ALTERNATORS

Remove power from all equipment which is not necessary for flight, including GTN #2 (NAV/GPS 2, COM 2) and the Flight Stream 210 (BT LINK), if installed.

Section 4. NORMAL PROCEDURES

Refer to the Cockpit Reference Guide defined in Section 2.1 of this document or the Pilot's Guide defined in Section 7.1 for normal operating procedures and a complete list of system messages and associated flight crew actions. This includes all GPS operations, VHF communication and navigation, traffic, data linked weather, StormScope®, TAWS, and Multi-Function Display information.

The GTN requires a reasonable degree of familiarity to avoid becoming too engrossed at the expense of basic instrument flying in IMC and basic see-and-avoid in VMC. Garmin provides training tools with the Pilot's Guide and PC based simulator. Pilots should take full advantage of these training tools to enhance system familiarization.

4.1 Unit Power On

Database.. **REVIEW EFFECTIVE DATES**
Self Test..................................**VERIFY OUTPUTS TO NAV INDICATORS**
Self Test - TAWS Remote Annunciator:
- PULL UP ....**ILLUMINATED**
- TERR..**ILLUMINATED**
- TERR N/A ....**ILLUMINATED**
- TERR INHB ....**ILLUMINATED**

Self Test - GPS Remote Annunciator:
- VLOC ....**ILLUMINATED**
- GPS...**ILLUMINATED**
- LOI or INTG...**ILLUMINATED**
- TERM ....**ILLUMINATED**
- WPT...**ILLUMINATED**
- APR ....**ILLUMINATED**
- MSG ....**ILLUMINATED**
- SUSP or OBS ....**ILLUMINATED**

4.2 Before Takeoff

System Messages and Annunciators..**CONSIDERED**

4.3 HSI and EHSI Operation

If an HSI is used to display navigation data from the GTN the pilot should rotate the course pointer as prompted on the GTN.

If an EHSI is used to display navigation data from the GTN the course pointer may autoslew to the correct course when using GPS navigation. When using VLOC navigation the course pointer will not autoslew and must be rotated to the correct course by the pilot. For detailed information about the functionality of the EHSI system, refer to the FAA approved Flight Manual or Flight Manual Supplement for that system.

CAUTION

> The pilot must verify the active course and waypoint for each flight plan leg. The pilot must verify proper course selection each time the CDI source is changed from GPS to VLOC.

See Section 4.5 for RF leg capabilities related to EHSI.

4.4 Autopilot Operation

The GTN may be coupled to an optional autopilot, if installed in the aircraft, when operating as prescribed in the LIMITATIONS section of this manual.

Autopilots coupled to the GTN system in an analog (NAV) mode will follow GPS or VHF navigation guidance as they would with existing VOR receivers.

Autopilots that support GPSS or GPS Roll Steering in addition to the analog course guidance will lead course changes, fly arcing procedures, procedure turns, and holding patterns if coupled in a roll steering mode.

The GTN supports autopilot roll steering for heading legs when an approved heading source is interfaced to the GTN. This heading interface can also provide map orientation, traffic and StormScope heading data and wind calculations.

CAUTION

> The GTN does not provide course deviation to the autopilot for heading legs. Some autopilots do not allow the use of roll steering when course deviation is not provided.

- ☐ This installation *has* a heading source. The GTN will provide roll steering on heading legs for the autopilot.
- ☒ This installation *does not have* a heading source. The crew cannot use the GTN roll steering to fly heading legs with the autopilot.

For autopilot operating instructions, refer to the FAA approved Flight Manual or Flight Manual Supplement for the autopilot.

4.5 Coupling the Autopilot during approaches

CAUTION

When the CDI source is changed on the GTN, autopilot mode may change. Confirm autopilot mode selection after CDI source change on the GTN. Refer to the FAA approved Flight Manual or Flight Manual Supplement for the autopilot.

Analog only autopilots should use APR mode for coupling to LNAV approaches. Autopilots which support digital roll steering commands (GPSS) may utilize NAV mode and take advantage of the digital tracking during LNAV only approaches.

☒ This installation prompts the flight crew and requires the pilot to enable the approach outputs just prior to engaging the autopilot in APR mode.

To couple an approach:
Once established on the final approach course with the final approach fix as the active waypoint, the GTN will issue a flashing message indication.

Flashing Message Button .... **PRESS**
"Enable APR Output" Button .... **PRESS**

If coupled, Autopilot will revert to ROL mode at this time.

Autopilot... **ENGAGE APPROACH MODE**

☐ This installation supports coupling to the autopilot in approach mode once vertical guidance is available.

To couple an approach:
Once established on the final approach course with the final approach fix as the active waypoint, the GTN will enable vertical guidance.

Vertical Guidance....................................... **CONFIRM AVAILABLE**
Autopilot... **ENGAGE APPROACH MODE**

☐ The installation *does not* support any vertical capture or vertical tracking.

The GTN allows for the utilization of IFR procedures that include RF (Radius to Fix) legs as part of RNP 1.0 capabilities.

- ☐ This installation is equipped to support coupled RF leg navigation up to RNP 1.0.
- ☐ This installation is equipped to support *un-coupled* RF leg navigation up to RNP 1.0.
- ☒ This installation *does not* support RF leg navigation.

4.6 Coupling the Autopilot during Search and Rescue (SAR) Operations

Search and Rescue (SAR) patterns created in the GTN flight plan may include turns that cannot be accomplished with standard autopilot turn rates. Monitor autopilot performance relative to the desired path if coupled when using Search and Rescue patterns.

Section 5. PERFORMANCE

No change.

Section 6. WEIGHT AND BALANCE

See current weight and balance data.

Section 7. SYSTEM DESCRIPTIONS

7.1 Pilot's Guide

The Garmin GTN 6XX or GTN 7XX Pilot's Guide, part number and revision listed below, contain additional information regarding GTN system description, control and function. The Pilot's Guides *do not* need to be immediately available to the flight crew.

- GTN 6XX Pilot's Guide P/N 190-01004-03 Rev J or later
- GTN 7XX Pilot's Guide P/N 190-01007-03 Rev J or later

7.2 Leg Sequencing

The GTN supports all ARINC 424 leg types. Certain leg types require altitude input in order to sequence (course to altitude, for example). If a barometric corrected altitude source is not interfaced to the GTN, a popup will appear prompting the flight crew to manually sequence the leg once the altitude prescribed in the procedure is reached.

☐ This installation *has* a barometric corrected altitude source. The GTN will automatically sequence altitude legs.

☒ This installation *does not have* a barometric corrected altitude source. The flight crew will be prompted to manually sequence altitude legs.

7.3 Auto ILS CDI Capture

Auto ILS CDI Capture will not automatically switch from GPS to VLOC for LOC-BC or VOR approaches.

7.4 Activate GPS Missed Approach

☒ This installation *will* autoswitch from VLOC to GPS when the "Activate GPS Missed Approach" button is pressed.

☐ This installation *will not* autoswitch from VLOC to GPS when the "Activate GPS Missed Approach" button is pressed. The pilot must manually switch from VLOC to GPS if GPS guidance is desired after the missed approach point.

7.5 Terrain Proximity and TAWS

CAUTION

Not all obstacles and wires are contained in the Obstacle/HOT Line database. The system provides depiction (and alerts, if TAWS is installed) only for obstacles and wires contained in the database.

NOTE

The area of coverage may be modified as additional terrain data sources become available.

☒ This installation supports *Terrain Proximity. No aural or visual alerts* for terrain or obstacles are provided. Terrain Proximity *does not* satisfy the TAWS requirement of 91.223.

☐ This installation supports *TAWS B.* Aural and visual alerts *will be* provided. This installation *does* support the TAWS requirement of 91.223.

Terrain on the dedicated terrain page or main map overlay is depicted in the following manner:

- Terrain more than 1,000 feet below the aircraft is not depicted, or depicted as black.
- Terrain between 1,000 feet and 100 feet below the aircraft is depicted as amber.
- Terrain within 100 feet below the aircraft, or above the aircraft, is depicted as red.

Obstacles and wires on the dedicated terrain page or main map are depicted in the following manner:

- Obstacles and wires more than 2,000 feet below the aircraft are not depicted.
- Obstacles and wires between 2,000 feet and 1,000 feet below the aircraft are depicted as white.
- Obstacles and wires between 1,000 feet and 100 feet below the aircraft are depicted as amber.
- Obstacles and wires within 100 feet below the aircraft, or above the aircraft, are depicted as red.

Multiple obstacles may be depicted using a single obstacle icon and an asterisk to indicate obstacle grouping is occurring. The color of the asterisk indicates the relative altitude of the tallest obstacle in the group. The asterisk does not indicate any information about the relative altitude or number of obstacles not being displayed in the obstacle group.

The Garmin GTN 6XX or GTN 7XX Cockpit Reference Guide or Garmin GTN 6XX or GTN 7XX Pilot's Guide provides additional information regarding terrain and obstacle colors and grouped obstacle icons.

7.6 GMA 35/35c Audio Panel (Optional)

The GTN 725 and 750 can interface to a GMA 35/35c remotely mounted audio panel and marker beacon receiver. Controls for listening to various radios, activating the cabin speaker, clearance playback control, and marker beacon are accessed by pressing the "Audio Panel" button on the GTN display screen. Optional Bluetooth pairing functionality can be accessed from the associated System /Connext Setup page (GMA 35c Only). Volume controls for the audio panel are accessed by pressing the "Intercom" button on the GTN display screen.

Aircraft alerting audio may be routed through the GMA 35/35c audio panel. There are no pilot controls for alert audio volumes. In the event of a loss of GMA35/35c function alert audio routed through the audio panel may not be heard.

7.7 Traffic System (Optional)

This system is configured for the following type of traffic system. The Garmin GTN 6XX or GTN 7XX Cockpit Reference Guide or Garmin GTN 6XX or GTN 7XX Pilot's Guide provides additional information regarding the functionality of the traffic device.

- [x] No traffic system is interfaced to the GTN.
- [ ] A TAS/TCAS I traffic system is interfaced to the GTN.
- [ ] A TIS traffic system is interfaced to the GTN.
- [ ] A TCAD traffic system is interfaced to the GTN.
- [ ] A Garmin ADS-B traffic system is interfaced to the GTN.
- [ ] A Garmin ADS-B traffic system is interfaced to the GTN. The ADS-B traffic system is also interfaced to an on board traffic system.

7.8 StormScope® (Optional)

When optionally interfaced to a StormScope® weather detection system, the GTN may be used to display the StormScope® information. Weather information supplied by the StormScope® will be displayed on the StormScope® page of the GTN system. For detailed information about the capabilities and limitations of the StormScope® system, refer to the documentation provided with that system.

Heading Up mode:
If the GTN system is receiving valid heading information, the StormScope® page will operate in the heading up mode as indicated by the label "HDG UP" presented at the upper right corner of the display. In this mode, information provided by the StormScope® system is displayed relative to the nose of the aircraft and *is* automatically rotated to the correct relative position as the aircraft turns.

Heading Not Available mode:
If the GTN system is not receiving valid heading information, either because a compatible heading system is not installed, or the interfaced heading system has malfunctioned, the StormScope® page will continue to operate without a heading source and indicate "HDG N/A" in the upper right corner of the GTN display. In this mode, information provided by the StormScope® system is displayed relative to the nose of the aircraft but *is not* automatically rotated to the correct relative position as the aircraft turns. When operating in this mode, StormScope® strikes must be cleared after each turn the aircraft performs.

7.9 Power

- Power to the GTN is provided through a circuit breaker labeled NAV/GPS (1/2).
- Power to the optional GTN COM is provided through a circuit breaker labeled COM (1/2).
- Power to the optional GMA 35 is provided through a circuit breaker labeled AUDIO.
- Power to the optional Flight Stream 210 is provided through a circuit breaker labeled BT LINK.

7.10 Databases and Flight Plan Waypoints/Procedures

Database versions and effective dates are displayed on the start-up database verification page immediately after power-on. Database information can also be viewed on the System – System Status page.

The Obstacle Database has an area of coverage that includes the United States and Europe, and is updated as frequently as every 56 days. The HOT Line wire database only includes the continental United States and portions of Canada/Mexico.

Only the Obstacle/HOT Line wire database may be used in accordance with the limitation found in Section 2.27.

If a stored flight plan contains a waypoint or procedure that does not correspond to a waypoint or procedure in the navigation database in use, the waypoint or procedure will become locked (depicted as "lockd") in the flight plan. Flight plans with locked waypoints may be placed in the active flight plan portion of the system but no navigation will be provided. The locked waypoint/procedure must be resolved by removing or replacing it with the correct waypoint/procedures in the flight plan before the system will provide navigation.

7.11 External Switches

External switches may be installed and interfaced to the GTN. These switches may be stand alone, or integrated with a TAWS or GPS annunciator. Table 4 lists the switches and function they perform:

Switch Label	Function
CDI	Toggles between GPS / VLOC sources. This switch may be part of an external annunciator panel.
COM CHAN DN	Toggles down through the preset com frequencies.
COM CHAN UP	Toggles up through the preset com frequencies.
COM RMT XFR	Transfers the COM active / standby frequencies.
NAV RMT XFR	Transfers the NAV active / standby frequencies.
OBS	Performs an OBS or SUSP function. This switch is part of an external annunciator panel and is placarded with the following: "Green OBS indicates OBS or SUSP mode – GTN annunciator bar indicates which is active. Push OBS button to change OBS or SUSP mode."
OBS/SUSP	Performs an OBS or SUSP function.
TERR INHB	Toggles the TAWS Inhibit function on/off. This switch is part of an external annunciator panel. The terrain display is still presented if TAWS is Inhibited.

Table 4 – External Switches

7.12 7.12 Airspace Depiction and Alerts

The GTN aides the flight crew in avoiding certain airspaces with Smart Airspace and airspace alerts. Smart Airspace de-emphasizes depicted airspace that is not near the aircraft's current altitude. Airspace Alerts provide a message indication to the flight crew when the aircraft's current ground track will intercept an airspace type that has been selected for alerting.

NOTE

Smart Airspace and Airspace Alerts are separate features. Turning on/off Smart Airspace does not affect Airspace Alerts, and vice versa.

7.13 Garmin ADS-B Traffic System Interface (Optional)

A Garmin ADS-B traffic system may be interfaced to the GTN. The *nose* of the ownship symbol on both the GTN main map page and dedicated traffic page serves as the actual location of your aircraft. The *center* of the traffic target icon serves as the reported location for the target aircraft. Motion vectors for traffic may be displayed in either absolute or relative motion. The location of the traffic targets relative to the ownship are the same, regardless of the selected motion vector.

Absolute motion vectors are colored either cyan or white, depending on unit configuration. Absolute motion vectors depict the reported track of the traffic target referenced to the ground. An absolute motion vector pointed towards your ownship symbol *does not* necessarily mean the traffic target is getting closer to your aircraft.

Relative motion vectors are always colored green and depict the motion of the traffic target relative to your ownship symbol. The direction the traffic target is pointed may vary greatly from the motion vector and a target may be getting closer to your aircraft independent of the direction the target is pointed. A green relative motion vector pointed towards your ownship indicates that the traffic target *is* converging on your aircraft.

If more than one target is occupying the same area of the screen, the GTN will combine the two or more traffic targets into one traffic group. The presence of an asterisk to the left of a target indicates that traffic has been grouped. The highest priority traffic target in the group is displayed to the pilot. When applied to airborne targets the asterisk will be displayed in white or cyan depending on the traffic depiction color used in the installation. The asterisk will be brown for grouped ground targets. The asterisk will not turn amber, even if an alerted target is included in the group.

An alerted target may be placed in the same group as non-alerted targets. In this case, the alerted target will be displayed. Two alerted targets will not be placed in the same group. All alerted targets will be displayed on the screen.

Traffic targets displayed on the dedicated traffic page may be selected in order to obtain additional information about a traffic target or to view all targets in a grouped target. When a grouped target is selected, the "Next" button on the dedicated traffic page will cycle through all targets located in close proximity to where the screen has been touched.

7.14 GWX 70 Weather Radar (Optional)

The GWX 70 Weather Radar uses Doppler technology to optionally provide advanced features to the flight crew such as turbulence detection and ground clutter suppression. Turbulence detection can detect turbulence up to 40nm from the aircraft and will be displayed at radar ranges of 160nm or less.

NOTE

Turbulence detection does not detect all turbulence especially that which is occurring in clear air. The display of turbulence indicates the possibility of severe or greater turbulence, as defined in the Aeronautical Information Manual.

7.15 Charts (Optional)

The GTN 750/725 can display both procedure charts and weather data on the main map page at the same time. When datalinked NEXRAD or Precipitation is overlaid on the main map page, the weather data is displayed *below* an overlaid procedure chart. When airborne weather radar is overlaid on the main map page, the radar data is displayed *above* an overlaid procedure chart.

7.16 Transponder Control (Optional)

The GTN can be interfaced to a Garmin transponder for control and display of squawk code, mode, and additional transponder functions. The activation of the "Enable ES" button on the transponder page does not indicate the aircraft is in full compliance with an ADS-B Out solution in accordance with TSO-C166b (1090ES). Consult your transponder documentation for additional information.

7.17 Telephone Audio (Optional)

Telephone audio distribution to the crew defaults to OFF on each power cycle of the GTN. Prior to utilizing the telephone function the crew must distribute telephone audio to the desired recipients. If the crew is utilizing the telephone function it is required that the telephone audio be turned off upon completing telephone usage.

7.18 Depiction of Obstacles and Wires

7.18.1 Dedicated Terrain Page

The dedicated Terrain page will always depict point obstacles at zoom scales of 10 nm or less and depict wire obstacles at zoom scales of 5 nm or less. The obstacle or wire overlay icon (see Figure 3) will be shown near the bottom of the display when the obstacle or wire depiction is active based on the zoom scale.

NOTE

Only obstacles and wires within 2,000 feet vertically of the aircraft will be drawn on the Terrain page. It is therefore possible to have an obstacle or wire overlay icon displayed with no obstacles or wires being depicted on the display.

Figure 3 – Obstacle Overlay Icon (Left), Wire Overlay Icon (Right)

7.18.2 Map Page

The Map page may be configured to depict point obstacles and wire obstacles at various zoom scales by the pilot by using the Map page menu. The obstacle or wire overlay icon (see Figure 4) will be shown near the bottom of the display when the obstacle or wire overlay is active based on the current zoom scale and setting selected by the pilot.

The settings chosen by the pilot on the Map page menu (including obstacle and wire display ranges) are saved over a power cycle.

NOTE

Only obstacles and wires within 2,000 feet vertically of the aircraft will be drawn on the Map page. It is therefore possible to have an obstacle or wire overlay icon displayed with no obstacles or wires being depicted on the display.

NOTE

The Map page may be configured by the pilot to not show any obstacles or wires at any zoom scale.

Figure 4 – Obstacle Overlay Icon (Left), Wire Overlay Icon (Right)

7.19 Flight Stream 210 (Optional)

The Flight Stream product line uses a wireless transceiver to provide data to and from a GTN to personal electronic devices (PEDs).

The Flight Stream 210 is a remotely mounted unit that provides the capability to interface Portable Electronic Devices (PEDs) to the GTN.

Data such as traffic, flight plan, datalinked weather, entertainment audio information, and attitude information is sent form the Flight Stream to the PED. The PED is capable of sending flight plans to the Flight Stream which will then be available on the GTN.

Garmin provides a list of tested and compatible devices that can be used with the Flight Stream. Connection to the Flight Stream may be possible with devices other than those on the supported device list, but Bluetooth® stability and wireless data integrity cannot be guaranteed.

For details about the Garmin supported devices and apps for use with the Flight Stream product line, please visit: http://garmin.com/connext/supported_devices

7.20 Map Page

7.20.1 Configuration

The moving map and weather pages are capable of displaying a large quantity and variety of data. Map data is layered to ensure that data which is typically more critical is drawn above less critical data, however at some zoom scales and configurations the map may be cluttered with large amounts of data. Controls are provided on the Map and Weather pages for the pilot to select which data displayed, the declutter level, and the zoom scales at which data is added to or removed from the display. It is the responsibility of the pilot to select settings for the map page that will provide the display of data most appropriate to the operation being conducted.

7.20.2 Flight Plan Depiction

The map page depicts the current active flight plan. When an Off Route Direct To is active the flight plan will no longer be depicted on the map.

7.20.3 Fuel Range Ring

The distance between the segmented green reserve ring and the yellow zero fuel ring is 45 minutes at the current aircraft groundspeed by default. The pilot may change the fuel reserve time value on the map setup menu. Changes to the fuel reserve time are persisted over GTN power cycles.

Visibility of the fuel range ring may be affected by the underlying map data selectable by the pilot. The pilot may make changes to the topographic or terrain data in order or more clearly observe the fuel range ring at any time.

Fuel range data is derived from the interfaced fuel totalizer data. Data entered in the Fuel Planning pages will not update the fuel range ring.

7.21 User Defined Waypoints

When a User Defined Waypoint is created a default name will automatically be provided and the pilot is given the option to provide a different name for the waypoint. Pages which have the autofill function will prevent some waypoint names from being used. If it is desired to name the waypoint with a name that is a subset of the name of an existing waypoint in the database then this must be accomplished on the Waypoint Info / User Waypoints page.

Waypoints which are created when a Search and Rescue pattern is created are not considered User Waypoints and therefore functions associated with User Waypoints are not provided for these waypoints.

7.22 Times and Distances

Time and Distance data to the next waypoint is always calculated from the present position to that waypoint and does not account for the path which may be flown (such as intercepting a course) to reach the waypoint.

When navigating using GPS guidance most legs are TO type legs where distance to the next waypoint decreases along the route. However some procedures include FROM type legs. When navigating on a leg that is a FROM leg indications that it is a FROM leg include the TO/FROM flag indicating FROM and distances increasing in distance fields.

7.23 GTN-GTN Crossfill

Certain data will sync between GTNs when installed in a dual GTN configuration. The following data will crossfill between the two GTNs with crossfill enabled or disabled:

- User Waypoints
- FPL Catalog
- Traffic Alerts
- Missed Approach Popups
- Altitude Leg Popups
- Heading
- Date/Time Conventions
- CDI Scale

The following items are crossfilled only when the GTNs are set to CROSSFILL ON:

- User Holds
- Approaches
- Flight Plan Changes
- Direct-To
- Selected OBS Course Changes

Additionally, the following unit changes will crossfill:

- Temperature
- NAV Angle (User, °T or Magnetic)
- Fuel

7.24 Direct-To Operations

When conducting Direct-To operations the Flight Plan tab provides a list of waypoints in the flight plan for which Direct-To is available. Some entries in the flight plan such as Holds and Course Reversals are not eligible for Direct-To and the user must instead select the associated waypoint if Direct-To operation is desired.

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EASA APPROVED

AIRPLANE FLIGHT MANUAL SUPPLEMENT
or
SUPPLEMENTAL AIRPLANE FLIGHT MANUAL
for the
Garmin GTN 625, 635, 650, 725, or 750 GPS/SBAS Navigation System
as installed in

Diamond DA40
Make and Model Airplane

Registration Number: OE-DGE Serial Number: 40.079

This document serves as an Airplane Flight Manual Supplement or as a Supplemental Airplane Flight Manual when the aircraft is equipped in accordance with Supplemental Type Certificate 10037574 for the installation and operation of the Garmin GTN 625, 635, 650, 725, or 750 GPS/SBAS Navigation System. This document must be carried in the airplane at all times.

The information contained herein supplements or supersedes the information made available to the operator by the aircraft manufacturer in the form of clearly stated placards or markings, or in the form of an approved Airplane Flight Manual, only in those areas listed herein. For limitations, procedures and performance information not contained in this document, consult the basic placards or markings, or the basic approved Airplane Flight Manual.

Signed By:

Michael Warren
ODA STC Unit Administrator
Garmin International Inc.
ODA-240087-CE

Date: 11-APR-2016

EASA STC No.: 10037574 Rev. 3

LOG OF REVISIONS				
	Page			
Revision Number	Date	Number	Description	EASA Approval
1	07-08-13	All	Complete Supplement	Jannes Neumann EASA Approved Date: *07-Aug-2013*
2	09-03-16	5	Added Flight Stream Limitation	See Page 1

Table of Contents

Section 1. GENERAL

1.1 Garmin GTN Navigators

The information in this supplement is EASA-approved material and must be attached to the FAA Approved STC Airplane Flight Manual Supplement, P/N 190-01007-A2 or 190-01007-A5, when the airplane has been modified by installation of the Garmin GTN Navigation System in accordance with STC 10037574.

This EASA approved Airplane Flight Manual Supplement is required in addition to the FAA approved Airplane Flight Manual Supplement, P/N 190-01007-A2 or 190-01007-A5.

All references to TSO-C146c in 190-01007-A2 or 190-01007-A5 are replaced by ETSO-C146.

Electronic Flight Bag section information is pertinent to FAA certified aircraft only.

Additional References:

Temporary Guidance Leaflet 10, Rev 1: Airworthiness and Operational Approval for Precision RNAV Operations in Designated European Airspace

Acceptable Means of Compliance 20-4, Airworthiness Approval and Operational Criteria for the Use of Navigation Systems in European Airspace Designated for the Basic RNAV Operations

Acceptable Means of Compliance 20-27, Airworthiness Approval and Operational Criteria for RNP APPROACH (RNP APCH) Operations Including APV BARO-VNAV Operations

Acceptable Means of Compliance 20-28, Airworthiness Approval and Operational Criteria for RNAV GNSS Approach Operation to LPV Minima using SBAS

Section 2. LIMITATIONS

2.1 Display of Distance to Waypoint (for European registered aircraft only)

During installation, the GTN was configured to display distance to current waypoint on the Map Page (GTN 7XX) or Default Navigation Page (GTN 6XX). The display location of distance to current waypoint must not be altered or removed from these pages.

2.2 Phone/SMS Suppress Visuals Setting (for European registered aircraft only)

During installation, the GTN was configured to suppress visual alerts during approach, missed approach, and terminal operations for the GSR 56 Iridium Phone and SMS features. The Suppress Visuals setting on the Service-Phone page must not be changed from "On During APR/MAPR/TERM".

2.3 Flight Stream with Portable Electronic Devices

The Flight Stream interface and data provided to a portable electronic device is not approved to replace any required or installed aircraft display equipment, including navigation or traffic/weather display equipment. The data presented on the PED may not have the required integrity to be used as the sole source of information to base tactical or strategic decision making.

Use of the Flight Stream for flight plan importing during critical phases of flight by the pilot flying is prohibited.

Section 3. EMERGENCY PROCEDURES

No Change.

Section 4. NORMAL PROCEDURES

No Change.

Section 5. PERFORMANCE

No change.

Section 6. WEIGHT AND BALANCE

No Change.

Section 7. SYSTEM DESCRIPTIONS

No Change.

OE-DGE

CHARTERWARE

Flottenmanagement für die allgemeine Luftfahrt

charterware UG (haftungsbeschränkt)

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Doc No.: CS23var-010715-01-ASM-01, Rev.01

Aircraft
Flight Manual Supplement

Aircraft Interface for Flight Logger
Charterware OBU

in

Aircraft Type and Model: DA 40-180

Serial No.: 40078

This Aircraft Flight Manual Supplement is approved by EASA under Approval No.: ~~__________~~

SC-DGE-1910241

List of effective Pages

Page	Title	Issue Date
1	Title Sheet	09.07.2015
2	List of effective Pages, Revision History	09.07.2015
3	Sections I to VIII	09.07.2015
4	Annex 1	09.07.2015

Revision History

Issue	Date	Revision Items
Initial	09.07.2015	n/a

Section I: General

This document describes an electrical interface (jack) mounted in the right half of the front panel. That jack is dedicated to connect a Charterware flight logger also called OBU (OnBoardUnit). The flight logger itself is not part of this installation. That device has to be handled as a PED. The pilot/operator must make sure that the applicable European respectively national operating rules (and the associated guidance material) are met.

Section II: Limitations

Do not use the interface jack for other purposes than connecting a Charterware flight logger OBU

Section III: Emergency Procedures

no change to basic flight manual

Section IV: Abnormal Procedures

In case of interference between the flight logger and aircraft instruments:

Pull the Sub-D connector out of the front panel mounted jack.

Section V: Normal Procedures

Additional items for pre-flight check:

Ensure that the flight logger and its associated wiring is properly stowed and fixed. Check the flight logger plug for proper connection to the jack. Tighten the screws of the Sub-D connector only by hand without gloves. Do not use screwdrivers or other tools! Ensure that the plug can be removed immediately if necessary (see IV).

Section VI: Performance

no change to basic flight manual

Section VII: Weight and Balance

no change to basic flight manual

Section VIII: Technical Description

For details concerning the flight logger see Charterware document User's Manual OBU..
For details concerning the installation see Charterware Installation and Continued Airworthiness Manual **CS23var-010715-01-INM-01Rev.01**.
For an installation example see annex 1.

Annex 1: Example Photographs of the mounted Flight Logger

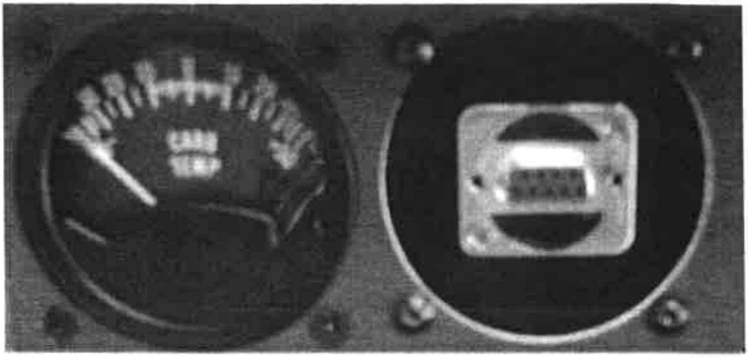

Figure 1.1.: Jack for OBU Logger mounted within metallic faceblade of an instrument slot

Figure 1.2.: OBU Logger during a flight in a typical Cockpit on Top Environment

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FAA Approved
AIRPLANE FLIGHT MANUAL SUPPLEMENT
or
SUPPLEMENTAL AIRPLANE FLIGHT MANUAL
for the
GARMIN G5 ELECTRONIC FLIGHT INSTRUMENT
as installed in

Diamond DA40

Make and Model Airplane

Registration Number: OE-DGE Serial Number: 40079

This document serves as an Airplane Flight Manual Supplement or as a Supplemental Airplane Flight Manual when the aircraft is equipped in accordance with Supplemental Type Certificate SA01818WI for the installation and operation of the Garmin G5 Electronic Flight Instrument. This document must be carried in the airplane at all times.

The information contained herein supplements or supersedes the information made available to the operator by the aircraft manufacturer in the form of clearly stated placards or markings, or in the form of an FAA approved Airplane Flight Manual, only in those areas listed herein. For limitations, procedures and performance information not contained in this document, consult the basic placards or markings, or the basic FAA approved Airplane Flight Manual.

FAA approved sections of this supplement are labeled as "FAA APPROVED." Sections not labeled "FAA APPROVED" are provided for guidance information only.

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FAA Approved AIRPLANE FLIGHT MANUAL SUPPLEMENT

or

SUPPLEMENTAL AIRPLANE FLIGHT MANUAL

GARMIN G5 ELECTRONIC FLIGHT INSTRUMENT

REV NO.	PAGE NO(S)	DESCRIPTION	DATE OF APPROVAL	FAA APPROVED
1	ALL	Original Issue	7/22/2016	Robert Murray ODA STC Unit Administrator
2	ALL	Added information regarding G5 DG/HSI.	4/28/2017	Robert Murray ODA STC Unit Administrator
3	ALL	Added interface to 3rd party autopilots.	10/18/2017	Robert Murray ODA STC Unit Administrator
4	ALL	Added note to General section.	10/26/2017	Paul Mast ODA STC Unit Administrator
5	ALL	Reformatted document. Updated system messages interface. Added DG/HSI reversion description.	12/20/2017	Robert Murray ODA STC Unit Administrator
6	ALL	Added interface description to GAD 13. Added information regarding multiple NAV source inputs.	7/19/2019	David G. Armstrong ODA STC Unit Administrator
7	ALL	Added information regarding FAA approved content. Updated SW ver. and references to GAD 29B to GAD 29B/GAD29D	9/28/2021	Paul Mast ODA STC Unit Administrator
8	3-4 4-2 4-3	Addition of NO BATT emergency procedure. Update normal procedure: *Prior to Flight in IMC.* Update Roll Steering (GPSS) emulation normal procedure.	See Cover	See Cover

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SECTION 1 – GENERAL

The G5 Electronic Flight Instrument can display the following information to the pilot depending on the installation and location of the G5 instrument.

- Primary attitude
- Primary slip and turn rate information
- Primary heading
- Secondary airspeed
- Secondary altimeter
- Secondary ground track

When installed in place of the attitude indicator, the primary function of the G5 is to provide attitude information to the pilot. When installed in place of the rate of turn indicator, the primary function of the G5 is to provide turn rate and slip ball information to the pilot. When installed in place of the directional gyro, the primary function of the G5 is to provide directional information to the pilot.

NOTE:

The pilot is reminded to perform appropriate flight and navigation instrument cross checks for the type of operation being conducted.

In case of a loss of aircraft electrical power, a backup battery (optional when installed as a DG/HSI) sustains the G5 Electronic Flight Instrument for up to four hours.

An optional GAD 29B/GAD 29D may be installed to provide course and heading datum to an autopilot based on the data selected for display on the HSI.

An optional GAD 13 and OAT probe may be installed to provide measured outside air temperature (OAT) to the G5 for display of true airspeed (TAS), outside air temperature, winds, and density altitude.

This STC allows the removal of the aircraft's vacuum system if it is not required to support any other airframe system.

Abbreviations and Terminology

The following glossary is applicable within the airplane flight manual supplement

ADI	Attitude Direction Indicator
AFMS	Airplane Flight Manual Supplement
ATT	Attitude
CDI	Course Deviation Indicator
DG	Directional Gyro
DR	Dead Reckoning
FAA	Federal Aviation Administration
GPS	Global Positioning System
GPSS	GPS Roll Steering
HDG	Heading
HSI	Horizontal Situation Indicator
ILS	Instrument Landing System
LOC	Localizer (no glideslope available)
LOI	Loss of Integrity
OAT	Outside Air Temperature
TAS	True Airspeed
VFR	Visual Flight Rules
VHF	Very High Frequency
VOR	VHF Omni-directional Range

SECTION 2 – LIMITATIONS

System Software Requirements

The G5 must utilize the following or later FAA approved software versions for this AFMS revision to be applicable:

Component	Software Version
G5 Electronic Flight Instrument	8.00

Use of Secondary Instruments

The original type design approved instruments for airspeed, altitude and vertical speed remain the primary indications for these parameters.

If the G5 Electronic Flight Instrument is installed in place of the rate of turn indicator, the original type design approved instrument for attitude remains in the primary indication for attitude.

If the G5 Electronic Flight Instrument is installed in place of the directional gyro, the original type design approved instruments for attitude remains the primary indication for attitude.

NOTE:

For aircraft approved for VFR-only operations, the G5 Electronic Flight Instrument may be installed as an attitude indicator and rate of turn indicator.

Kinds of Operations

No Change except for the following:

- When a portable navigation source is selected on the G5, it shall not be used for the primary means of navigation for IFR operations.

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SECTION 3 – EMERGENCY PROCEDURES

G5 Failure Indications

If a G5 function fails, a large red 'X' is typically displayed over the instrument(s) or data experiencing the failure. Upon G5 power-up, certain instruments remain invalid as equipment begins to initialize. All instruments should be operational within one minute of power-up. If any instrument remains flagged and it is not likely an installation related problem, the G5 should be serviced by a Garmin-authorized repair facility.

Attitude Failure

Attitude failure is indicated by removal of the sky/ground presentation, a red X, and a yellow "ATTITUDE FAIL" on the display.

Rate-of-turn and slip information will not be available.

1. Use standby instruments.
2. Seek VFR conditions or land as soon as practical.

Heading Failure, Loss of Magnetometer Data, or Magnetic Field Error

A heading failure, loss of magnetometer data, or magnetic field error is indicated by removal of the digital heading readout, a red X, and a yellow "HDG" on the display.

1. Use standby magnetic compass.

NOTE:

If the G5 DG/HSI has a valid GPS signal the G5 DG/HSI instrument will display the GPS track information in magenta.

GPS Failure

If GPS navigation receivers and/or navigation information are not available or invalid, the G5 will display Dead Reckoning mode (DR) or Loss of Integrity mode (LOI) on the HSI in the lower left corner.

If Alternate Navigation Sources (ILS, LOC, VOR) Are Available:

1. Use alternate navigation source.

If No Alternate Navigation Sources Are Available:

If DR is Displayed on HSI:

1. Use the amber CDI for course information.
2. Fly toward known visual conditions.

If LOI is Displayed on HSI:

1. Fly toward known visual conditions.

For aircraft equipped with a GAD 29B/GAD 29D interfaced to an autopilot, GPSS will be displayed in amber text when GPSS emulation has been selected from the G5 menu.

1. Deselect GPSS from the G5 menu and select a different autopilot mode.

Attitude Aligning

During system initialization, the G5 displays the message 'ALIGNING' over the attitude indicator. The G5 will typically display valid attitude within the first minute of power-up. The G5 can also align itself while taxiing and during level flight.

If the "ALIGNING" indication occurs during flight and attitude remains displayed, the attitude display is acceptable for use for flight in instrument conditions. The message will clear when the attitude solution is within the systems internal accuracy tolerances. It is recommended to maintain wings level to reduce the time for the system to align.

Attitude Aligning / Keep Wings Level

If the "ALIGNING KEEP WINGS LEVEL" indication occurs during flight, the G5 has detected an invalid attitude solution and will not display any attitude information.

1. Use standby instruments to maintain wings level flight. The system will display attitude when internal accuracy tolerances have been met.
2. If attitude does not return, seek VFR conditions or land as soon as practical.

Loss of Electrical Power to the G5 Display

In the event of a loss of aircraft electrical power to the G5 attitude display, the indicator will continue to function on its internal battery. If an internal battery is installed on the optional G5 HSI, the indicator will continue to function on the internal battery if aircraft power is lost. Internal battery endurance is indicated on the G5 display in hours and minutes. The charging symbol will be removed and the internal battery will not be charged.

In the event the G5 attitude display powers down, the optional G5 HSI will automatically revert to displaying attitude information. It will not revert back to the DG/HSI format if the G5 attitude unit regains power. The DG/HSI presentation may be selected from the G5 menu on the G5 DG/HSI unit after reversion to the attitude display.

Loss of Electrical Power to the GAD 29B/GAD 29D (If Installed)

In the event of a loss of aircraft electrical power to the optional GAD 29B/GAD 29D, the heading and course datum will be unavailable to the autopilot and the autopilot may deviate from the intended path or may disconnect. GPS flight plan course information may be displayed on the HSI and VFR will be displayed in amber text on the HSI. GPSS will be displayed in amber text, if GPSS mode is selected.

1. Deselect GPSS from the G5 menu and select a different autopilot mode.
2. Lateral GPS course guidance may only be used in VFR conditions.

Loss of Electrical Power to the GAD 13 (If Installed)

In the event of a loss of aircraft electrical power to the optional GAD 13, the OAT and TAS indications will be replaced with a red X. The Density Altitude indication will be removed, and "No Wind Data" will be displayed in the wind field.

1. Use an alternate source of outside air temperature to calculate true airspeed, density altitude, and winds.

Internal Battery Failure

In the event of a failure of the G5 internal battery, “NO BATT” will be displayed with a red X. This indicates that the G5 internal battery is not functional.

1. If “NO BATT” is displayed on the G5 attitude indicator, do not fly in instrument meteorological conditions.

WARNING

If NO BATT is displayed on the G5 attitude indicator, the unit will not function in the event of a loss of aircraft electrical power to the G5 attitude indicator. Do not fly in instrument meteorological conditions if NO BATT is displayed on the G5 attitude indicator.

SECTION 4 – NORMAL PROCEDURES

G5 Power Button and Knob

The G5 display will power on with the application of aircraft power. The G5 power button is used to turn the display on and off. Press and hold the power button to turn the display off.

The knob performs the following functions:

Press	Press to access the Menu. From the Menu, press to select the desired menu item. Press to accept the displayed value when editing numeric data or selecting from a list. Press to sync the heading or track bug for the HSI.
Turn	From the Menu, turn the Knob to move the cursor to the desired menu item. For the ADI, rotate to adjust the baro setting on the secondary altitude display. For the HSI, rotate to adjust the heading or track bug. Turn to select the desired value when editing numeric data or selecting from a list.

Backlight Intensity Adjustment

The power up state of the G5 backlight is in Auto adjustment mode.

To adjust the backlighting:

To select Manual mode from Auto mode:

1. While the unit is turned on, press the Power button.
2. Turn the knob to manually adjust the backlight intensity.
3. Press the knob to close the backlight page.

To select Auto mode from Manual mode:

1. While the unit is turned on, press the Power button.
2. Press the Power button again to select Auto.
3. Press the knob to close the backlight page.

Prior to Flight in Instrument Meteorological Conditions

1. Press the Power button on the G5 attitude indicator.
2. Verify the battery status indicator is green on the G5 attitude indicator.
   (The battery status indicator will change from green to amber or red when battery status has decreased below 41%).

Valid Battery Indication

No Battery Detected

WARNING

If NO BATT is displayed on the G5 attitude indicator, or green battery status is not shown after pressing the power button on the G5 attitude indicator, do not fly in instrument meteorological conditions.

Autopilot Operations with the G5

The G5 and optional GAD 29B/GAD 29D offer various integration capabilities dependent upon the type of autopilot installed in a particular aircraft.

The G5 Electronic Flight Instrument installation in this aircraft provides the following autopilot functions (appropriate boxes will be checked):

- ☑ This installation does not interface with the autopilot (basic wing leveling autopilot or no autopilot is installed in the aircraft).
- ☐ A GAD 29B/GAD 29D Adapter is installed in this aircraft.
  - ☐ Course Selection coupling to the autopilot.
  - ☐ NAV Selection coupling to the autopilot.
  - ☐ Heading Bug coupling capability to the autopilot.
  - ☐ Roll Steering (GPSS) emulated via heading mode.

    OR

  - ☐ Roll Steering capable autopilot (GPSS menu function for emulation not applicable).

Course / NAV Selection Coupling to the Autopilot (If Configured)

When operating the autopilot in NAV mode, the deviation information from the installed navigation sources (i.e. GPS or NAV) is switched via the navigation source. The NAV source displayed on the HSI is the NAV source the autopilot is following. Many autopilots also use the course datum to determine the best intercept angles when operating in NAV mode.

Heading Bug Coupling Capability to the Autopilot (If Configured)

When operating the autopilot in HDG mode, the difference between the HDG bug location on the HSI and the actual aircraft heading creates an error signal which the autopilot will minimize by turning in the direction of the bug. If the bug is turned more than 180 degrees, the autopilot may turn the airplane in the opposite direction of the desired turn.

Roll Steering (GPSS) Emulated via HDG Mode (If Configured)

For autopilots that do not support digital GPSS signals, GPSS functionality may be emulated by operating the autopilot in HDG mode and selecting GPSS from the G5 menu. If the autopilot is already designed to receive roll steering information, the data is transmitted digitally from the navigator to the autopilot.

When GPSS is selected on the G5 menu, the heading bug on the ADI and HSI changes to a hollow outline and a crossed-out heading bug appears on the G5 ADI and HSI display indicating that the autopilot is not coupled to the heading bug. The bug is still controllable and may still be used for reference.

When GPSS is selected on the G5, GPSS turn commands are converted into a heading error signal to the autopilot. When the autopilot is operated in HDG mode, the autopilot will fly the turn commands from the GPS navigator. If the GPSS data is invalid (for example, if there is no active GPS leg) or the selected navigation source on the G5 ADI and HSI is not GPS, the annunciated GPSS text will be yellow and a zero turn command will be sent to the autopilot.

HSI Source Selection (If Configured)

For aircraft configured with two navigation inputs to the G5, the desired source may be selected using the G5 knob and menu selection. Press the G5 knob to cycle between the NAV1 and NAV2 input.

HSI Portable Navigation Device GPS VFR Annunciation (If Configured)

For aircraft configured for a portable navigation device input to the G5, a GPS VFR indicated in magenta will be displayed on the HSI. When the G5 with a portable navigation device is interfaced there is not enough guidance data for IFR use.

SECTION 5 – PERFORMANCE

No change.

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SECTION 6 – WEIGHT AND BALANCE

See current weight and balance data.

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SECTION 7 – SYSTEM DESCRIPTION

Refer to Garmin G5 Electronic Flight Instrument Pilot's Guide for Certified Aircraft, part number 190-01112-12 Rev A (or later approved revisions), for a description of the G5 electronic flight instrument. This reference material is not required to be on board the aircraft but does contain a more in-depth description of all the functions and capabilities of the G5.

The ATT circuit breaker supplies power to the G5 instrument for normal power operation and to charge the internal battery.

The DG circuit breaker supplies power to the G5 instrument for normal power operation when configured as a DG, and to charge the internal battery (if installed).

The HSI circuit breaker supplies power to the G5 instrument for normal power operation when configured as an HSI, and to charge the internal battery (if installed).

The GAD circuit breaker supplies power to the optional GAD 29B/GAD 29D adapter and optional GAD 13 adapter for normal power operation.

System Messages

The G5 has the capability to display system messages to the crew along the bottom of the display. A system message is indicated through a white indication on the G5.

Messages can be displayed by pressing the G5 knob and selecting the Message menu item.

(For Reference Only)

The following table shows the meaning of each message. System messages are displayed in white text.

Message	Meaning
External Power Lost	Aircraft power has been removed from the G5.
Critical battery fault! Powering off	Battery has critical fault condition and the unit is about to power off to avoid damage to the battery.
Battery fault	Battery has a fault condition – unit needs service.
Battery charger fault	Battery charger has a fault condition – unit needs service.
Low battery	Battery charge level is low.
Hardware fault	Unit has a hardware fault – unit needs service.
Power supply fault	Unit power supply fault detected – unit needs service.
Unit temperature limit exceeded	Unit is too hot or too cold.
Network address conflict	Another G5 with the same address is detected on the network (most commonly a wiring error on one of the units).
Communication error	General communication error (most commonly appears in conjunction with Network Address Conflict message).
Factory calibration data invalid	Unit calibration data not valid – unit needs service.
Magnetic field model database out of date	Internal magnetic field database is out of date - software update required.
Magnetometer Hardware fault	The magnetometer has detected a fault – unit needs service. Heading data may not be available.
Using external GPS data	GPS data from another network LRU is being used. The unit's internal GPS receiver is enabled, but unable to establish a GPS fix.
Not receiving RS-232 data	The G5 is not receiving RS-232 data from the GPS navigator – system needs service.
Not receiving ARINC 429 data	The G5 is not receiving ARINC 429 data from the navigation source – system needs service.
GPS receiver fault	The G5 on-board GPS receiver has a fault.
ARINC 429 interface configuration error	The G5 ARINC 429 port is receiving information from an incorrect source – system needs service.
Software version mismatch	The G5 attitude indicator and the G5 HSI units have different software. Cross fill of baro, heading and altitude bugs is disabled.

These messages remain while the condition persists.