SUPPLEMENT A32
TO THE AIRPLANE FLIGHT MANUAL DA 40 D

INTEGRATED AVIONICS SYSTEM
G1000
GARMIN
IFR-OPERATION

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0.1 RECORD OF REVISIONS

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1	IFR Operation without Autopilot	0 1 2 7	9-A32-1 through 9-A32-5 9-A32-6, 9-A32-7 9-A32-10, 9-A32-17 through 9-A32-20 9-A32-44	26 Feb 2007	[approved by H. Lackner for DAI]	18 May 2007		
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0.2 LIST OF EFFECTIVE PAGES

Chapter	Page	Date
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0.3 TABLE OF CONTENTS

1. GENERAL

This Supplement supplies the information necessary for the efficient operation of the airplane when the Integrated Avionics System Garmin, G1000 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 G1000 is installed.

Refer to Section 7.14 for approved modes of operation (i.e. BRNAV, MNPS) of the G1000´s GPS receiver.

1.5 DEFINITIONS AND ABBREVIATIONS

(f) Designation of the circuit breakers on the instrument panel

ESSENTIAL BUS

HORIZON	Artificial Horizon (Attitude Gyro)
ADC	Air Data Computer
AHRS	Attitude and Heading Reference System
COM1	COM Radio No. 1
FLOOD	Flood Light
GPS/NAV1	Global Positioning System and NAV Receiver No. 1
XPDR	Transponder
LANDING	Landing Light
PFD	Primary Flight Display
PITOT	Pitot Heating System
FLAPS	Flap System
AP WARN	Autopilot Warning (if autopilot is installed)
MASTER CONTROL	Master Control (Avionics Relay)

ESS TIE	Bus Interconnection
ENG INST	Engine Instruments

MAIN BUS

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

ECU BUS

ECU ALT.	ECU Alternate power relay
ECU A	ECU A
ECU B	ECU B

AVIONICS BUS

GPS/NAV2	Global Positioning System and NAV Receiver No. 2
COM2	COM Radio No. 2
AUDIO	Audio Panel / Marker Beacon Receiver
AP	Autopilot System (if installed)
ADF	Automatic Direction Finder
DME	Distance Measuring Equipment
WX500	Stormscope

2. LIMITATIONS

2.4 POWER-PLANT LIMITATIONS

g) Oil temperature

	TAE 125-01	TAE 125-02-99 (MÄM 40-256 carried out)
Minimum	-32 °C	-30 °C
Maximum	+140 °C	+140 °C

i) Coolant temperature

	TAE 125-01	TAE 125-02-99 (MÄM 40-256 carried out)
Minimum	-32 °C	-30 °C
Maximum	+105 °C	+105 °C

2.5 ENGINE INSTRUMENT MARKINGS

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

If the TAE 125-01 engine is installed:

Indi-cation	Red arc/bar = lower prohibited range	Yellow arc/bar = caution range	Green arc/bar = normal operating range	Yellow arc/bar = caution range	Red arc/bar = upper prohibited range
RPM	--	--	up to 2400 RPM	2400 to 2500 RPM	above 2500 RPM
Oil pressure	below 1.2 bar	1.2 to 2.3 bar	2.3 to 5.2 bar	5.2 to 6.5 bar	above 6.5 bar
Oil temp.	below -32 °C	-32 to 50 °C	50 to 130 °C	130 to 140 °C	above 140 °C
Coolant temp.	below -32 °C	-32 to 60 °C	60 to 101 °C	101 to 105 °C	above 105 °C
Gearbox temp.	--	--	up to 115 °C	115 to 120 °C	above 120 °C
Load	--	--	0 - 100 %	--	--
Fuel temp.	below -30 °C	-30 to 5 °C	5 to 70 °C	70 to 75 °C	above 75 °C
Ammeter	--	--	up to 85 A	85 to 90 A	above 90 A
Volt-meter	below 11 V	11 to 12.6 V	12.6 to 15.0 V	15.0 to 15.5 V	above 15.5 V
Fuel qty.	below 0.45 US gal	--	0.45 to 14 US gal	--	--

If the TAE 125-02-99 engine is installed (MÄM 40-256 is carried out):

Indi-cation	Red arc/bar = lower prohibited range	Yellow arc/bar = caution range	Green arc/bar = normal operating range	Yellow arc/bar = caution range	Red arc/bar = upper prohibited range
RPM	--	--	0-2300 RPM	--	above 2300 RPM
Oil pressure	below 1.2 bar	1.2 to 2.3 bar	2.3 to 5.8 bar	5.8 to 6.5 bar	above 6.5 bar
Oil temp.	below -30 °C	-30 to 50 °C	50 to 130 °C	130 to 140 °C	above 140 °C
Coolant temp.	below -30 °C	-30 to 60 °C	60 to 101 °C	101 to 105 °C	above 105 °C
Gearbox temp.	--	--	up to 115 °C	115 to 120 °C	above 120 °C
Load	--	--	0 - 100 %	--	--
Fuel temp.	below -30 °C	-30 to +5 °C	+5 to 70 °C	70 to 75 °C	above 75 °C
Ammeter	--	--	up to 85 A	85 to 90 A	above 90 A
Volt-meter	below 11 V	11 to 12.6 V	12.6 to 15.0 V	15.0 to 15.5 V	above 15.5 V
Fuel qty.	below 1 US gal	--	1 to 14 US gal	--	--

2.6 WARNING, CAUTION AND ADVISORY ALERTS

NOTE

The ECU BACKUP UNSAFE warning light is located below the ECU Test button on the instrument panel.

NOTE

Airplanes equipped with the Garmin G1000 have no annunciation panel. All annunciations are displayed on the G1000. The annunciations differ from those listed in the main part of the AFM.

The following tables show the color and significance of the airplane related warning, caution and advisory alerts lights on the G1000.

NOTE

The G1000 Cockpit Reference Guide and the G1000 Pilot's Guide contains detailed descriptions of the annunciator system and all warnings, cautions and advisories.

Color and significance of the warning alerts on the G1000

Warning alerts (red)	Meaning / Cause
WARNING	One of the Warnings listed below is being indicated.
ENG TEMP	Engine coolant temperature is in the upper red range (too high / > 105 °C).
OIL TEMP	Engine oil temperature is in the upper red range (too high / >140 °C).
OIL PRES	Engine oil pressure is in the lower red range (too low / < 1.2 bar).
L/R FUEL TEMP	Fuel temperature is in the upper red range (too high / > 75 °C)
GBOX TEMP	Engine gearbox temperature is in the upper red range (too high / > 120 °C).
ALTN AMPS	Engine alternator output is in the upper red range (too high / > 90 amps).
ALTN FAIL	Engine alternator has failed.
STARTER	Engine starter is engaged.
DOOR OPEN	Front and/or rear canopy are/is not closed and locked.
AP TRIM FAIL	Failure in the automatic trim system of the autopilot (if autopilot is installed).
POSN ERROR	G1000 will no longer provide GPS based navigational guidance.
ATTITUDE FAIL	The display system is not receiving attitude reference information from the AHRS.
AIRSPEED FAIL	The display system is not receiving airspeed input from the air data computer.

Warning alerts (red)	Meaning / Cause
ALTITUDE FAIL	The display system is not receiving altitude input from the air data computer.
VERT SPEED FAIL	The display system is not receiving vertical speed input from the air data computer.
HDG	The display system is not receiving valid heading input from the AHRS.
WARN	RAIM position warning. The nav deviation bar is removed.
ECU BACKUP UNSAFE	ECU Backup Battery has less than 70% electric charge. This warning is displayed by a separate warning light.

Color and significance of the caution alerts on the G1000

Caution-alerts (yellow)	Meaning / Cause
CAUTION	One of the Cautions below is being indicated.
ECU A FAIL	* Engine ECU A has failed or * is tested during FADEC-test procedure during before take-off check.
ECU B FAIL	* Engine ECU B has failed or * is tested during FADEC-test procedure during before take-off check.
FUEL LOW	Left fuel quantity is low.
VOLTS LOW	Engine bus voltage is too low (< 12.6 volts).
COOL LVL	Engine coolant level is low.
PITOT FAIL	Pitot heat has failed.
PITOT HT OFF	Pitot heat is OFF.
AHRS ALIGN: Keep Wings Level	The AHRS (Attitude and Heading Reference System) is aligning.
DR	Dead Reckoning-System is using projected Position rather than GPS position to compute navigation data and sequence active flightplan waypoints.
LOI	Loss of Integrity monitoring - GPS integrity is insufficient for current phase of flight.

Color and significance of the advisory alerts on the G1000

advisory alerts (white)	Meaning / Cause
GLOW ON	Engine glow plug active.
FUEL XFER	Fuel transfer from auxiliary to main tank is in progress.
PFD FAN FAIL	Cooling fan for the PFD is inoperative.
MFD FAN FAIL	Cooling fan for the PFD is inoperative.
GIA FAN FAIL	Cooling fan for the GIAs is inoperative.

2.13 KINDS OF OPERATION

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

- daytime flights according to Visual Flight Rules (VFR)
- with the appropriate equipment: night flights according to Visual Flight Rules (VFR)
- with the appropriate equipment: flights according to Instrument Flight Rules (IFR)

Flights into known or forecast icing conditions are prohibited.

Flights into known thunderstorms are prohibited.

Minimum operational equipment (serviceable)

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

NOTE

Many of the items of minimum equipment listed in the following table are integrated in the G1000.

	for daytime VFR flights	in addition for night VFR flights	in addition for IFR flights
Flight & navigation instruments	• airspeed indicator (on G1000 PFD or backup) • altimeter (on G1000 PFD or backup) • magnetic compass • 1 headset, used by pilot in command	•vertical speed indicator (VSI) •attitude gyro (artificial horizon; on G1000 PFD or backup) •turn & bank indicator •directional gyro •VHF radio (COM) with speaker and microphone •VOR receiver •transponder (XPDR), mode A and mode C •GPS receiver	• second airspeed indicator (both, on G1000 PFD and backup) • second altimeter (both, on G1000 PFD and backup) • second attitude gyro (both, on G1000 PFD and backup) • second VHF radio (COM) • VOR-LOC-GP receiver • second GPS receiver
engine instruments	• fuel qty. • oil press. • oil temp. • coolant temp. • coolant level indicator • gearbox temp. • load • prop. RPM • fuel temp. left & right tank	•ammeter •voltmeter	

	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 • alternate means for fuel quantity indication (see Section 7.9) • safety belts for each occupied seat • Airplane Flight Manual	•Pitot heating system •alternate static valve	• emergency battery (for backup attitude gyro and flood light) • ECU-Backup Unsafe Warning Light

2.16.8 GARMIN G1000 AVIONICS SYSTEM

1. The Garmin G1000 Cockpit Reference Guide, P/N 190-00324-03 Rev. A or later approved revision must be immediately available to the flight crew. If MÄM 40-570 is installed, the Garmin G1000 Cockpit Reference Guide, P/N 190-00706-01 Rev. A or later approved revision must be immediately available to the flight crew.

2. The G1000 must utilize the software Garmin P/N 010-00370-11, or later approved software in accordance with the mandatory service bulletin DAI MSB D4-045, latest version. If MÄM 40-570 is installed, the G1000 must utilize the software Garmin P/N 010-00628-00 or later approved software in accordance with the mandatory service bulletin DAI MSB D4-045, latest version.

NOTE

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

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

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

NOTE

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

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

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

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

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

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

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

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

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

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

(c) MAP DATUM : WGS 84 (sets map datum to WGS-84, see note below)

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

NOTE

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

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

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

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

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

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

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

   (f) South of 70° S latitude between longitude 120° E and 165° E (Regegion south of Australia and New Zealand.

7. If an autopilot is installed: CDI sequencing of the ILS must be set to MANUAL for instrument approaches conducted with the autopilot coupled. If the CDI source is changed when the autopilot is engaged in NAV mode, the autopilot lateral mode will revert to ROLL ATTITUDE mode and NAV mode must be manually preselected by the pilot (not applicable, if MÄM 40-570 is installed).

8. The fuel quantity, fuel required, and fuel remaining functions on the Fuel Page (displayed when pushing the FUEL button as shown in Section 7.9.4) of the FMS are supplemental information only and must be verified by the flight crew.

9. The pilot's altimeter is the primary altitude reference during all operations using advisory vertical navigation (VNAV) information.

10. Navigation must not be predicated upon the use of the Terrain or Obstacle data displayed by the G1000.

NOTE

The terrain display is intended to serve as a situational awareness tool only. It may not provide either the accuracy or fidelity, or both, on which to solely base decisions and plan maneuvers to avoid terrain or obstacles.

11. The Terrain/Obstacle/Airport databases have an area of coverage as detailed below:

    1. The Terrain Database has an area of coverage from North 75° Latitude to South 60° Latitude in all longitudes.

    2. The Airport Terrain Database has an area of coverage that includes the United States, Canada, Mexico, Latin America, and South America.

    3. The Obstacle Database has an area of coverage that includes the United States.

12. The GPS is not approved for SBAS (WAAS & MSAS & EGNOS) operations:

    1. The G1000 integrated avionics system is NOT approved for GPS SBAS operations including GPS SBAS approach procedures such as “LPV”, ”LNAV/VNAV”, and “LNAV+V”.

    2. SBAS functionality must be disabled on the G1000 GPS Status page (refer to the G1000 Pilot’s Guide for procedure).

3. EMERGENCY PROCEDURES

3.1.3 SELECTING EMERGENCY FREQUENCY

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

3.8 AIRPLANE RELATED G1000 WARNINGS

NOTE

Airplanes equipped with the Garmin G1000 have no annunciation panel. All annunciations are displayed on the G1000. The annunciations differ from those listed in the main part of the AFM.

3.8.1 WARNINGS / GENERAL

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

3.8.2 ENG TEMP

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

- Check coolant qty. caution (COOL LVL).

if off:

during climb:

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

during cruise:

- Reduce power.
- Increase airspeed.
- Check coolant temperature in green range.

CAUTION

If the coolant temperature does not return to the green range, perform a precautionary landing on the nearest airfield in accordance with the procedures given in the AFM.

if on:

- Reduce power.
- Expect loss of coolant.

WARNING

A further increase in coolant temperature must be expected. Prepare for an emergency landing in accordance with the procedures given in the AFM.

3.8.3 OIL TEMP

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

- Check oil pressure.

if the oil pressure is low:

- Reduce power.
- Expect loss of oil with engine failure. Prepare for an emergency landing in accordance with the procedures given in the AFM.

if the oil pressure is within the green range:

- Reduce power.
- Increase airspeed.

3.8.4 OIL PRES

OIL PRES	Engine oil pressure is in the lower red range (too low / below 1.2 bar).

NOTE

If the RPM indication is less than 1500 RPM with the power lever at IDLE, the oil pressure must drop into the red range to cause the OIL PRES warning to illuminate.

- Reduce power.
- Expect loss of oil with engine failure. Prepare for an emergency landing in accordance with the procedures given in the AFM.

3.8.5 GBOX TEMP

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

- Reduce power.
- Increase airspeed.

3.8.6 L/R FUEL TEMP

L/R FUEL TEMP	Fuel temperature is in the upper red range (too high / above 75 °C).

- Reduce power.
- Increase airspeed.

3.8.7 ALTN AMPS

ALTN AMPS	Engine alternator output is in the upper red range (too high / above 90 amps).

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

Possible reasons are:

- A fault in wiring or equipment

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

if the problem does not clear itself:

2. Land on the nearest suitable airfield.

3.8.8 ALTN FAIL

ALTN FAIL	Engine alternator has failed.

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

1. Circuit breakers . . . . . check; if all are O.K., proceed with step 2
2. ESSENTIAL BUS . . . . . ON
3. Electrical equipment . . . . . switch OFF all equipment which is not needed
4. Land on the nearest suitable airfield

WARNING

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

CAUTION

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 backup attitude gyro (artificial horizon) and flood light. This battery is switched on with the Emergency Switch, located on the top left side of the instrument panel.

3.8.9 STARTER

STARTER	Engine starter is engaged

A 'STARTER'-warning on the G1000 System is equivalent to a 'START'-warning indicated on the annunciator panel as described in the AFM and all its procedures, whereby the 'STARTER'-warning of the G1000 is steady-on when appearing.

3.8.10 DOOR OPEN

DOOR OPEN	Front and/or rear canopy door are/is not closed and locked.

A 'DOOR OPEN'-warning on the G1000 System is equivalent to a 'DOOR'-warning indicated on the annunciator panel as described in the AFM and in all its procedures.

3.9 G1000 SYSTEM WARNINGS

NOTE

The G1000 Cockpit Reference Guide and the G1000 Pilot's Guide contain detailed descriptions of the annunciator system and all warnings, cautions and advisories.

3.9.1 RED X

A red X through any display field, such as COM frequencies, NAV frequencies, or engine data, indicates that display field is not receiving valid data.

3.9.2 POSN ERROR

POSN ERROR	The system will flag and no longer provide GPS based navigational guidance.

Revert to the G1000 VOR/ILS receivers or an alternate means of navigation other than the G1000 GPS receivers.

3.9.3 ATTITUDE FAIL

ATTITUDE FAIL	The display system is not receiving attitude reference information from the AHRS; accompanied by the removal of sky/ground presentation and a red X over the attitude area.

Revert to the standby attitude indicator.

3.9.4 AIRSPEED FAIL

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

Revert to the standby airspeed indicator.

3.9.5 ALTITUDE FAIL

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

Revert to the standby altimeter.

3.9.6 VERT SPEED FAIL

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

Determine vertical speed based on the change of altitude information.

3.9.7 HDG

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

Revert to the emergency compass.

3.9.8 WARN

NOTE

This Paragraph is not applicable, if MÄM 40-570 is implemented.

WARN	RAIM position warning - nav deviation bar removed.

1. CDI softkey . . . . . switch to VOR/LOC

3.10 G1000 FAILURES

3.10.1 NAVIGATION INFORMATION FAILURE

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

3.10.2 PFD OR MFD DISPLAY FAILURE

1. DISPLAY BACKUP button on audio panel . . PUSH

Automatic Entry of Display Revisionary Mode

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

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

NOTE

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

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

- If the system returns to normal mode, leave the DISPLAY BACKUP button IN and continue.

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

3.10.3 AHRS FAILURE

NOTE

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

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

3.10.4 AIR DATA COMPUTER (ADC) FAILURE

NOTE

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

1. Use standby airspeed indicator and altimeter.

3.10.5 ERRONEOUS OR LOSS OF ENGINE AND FUEL DISPLAYS

NOTE

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

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

3.10.6 ERRONEOUS OR LOSS OF WARNING/CAUTION ANNUNCIATORS

NOTE

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

1. If an annunciator appears, treat it as if the condition exists. Refer to the procedures given in the AFM.
2. If a display indicates an abnormal condition but no annunciator is present, use other system information, such as engine displays, GPS fuel quantity and flow, to determine if the condition exists. If it cannot be determined that the condition does not exist, treat the situation as if the condition exists. Refer to the procedures given in the AFM.

4A. NORMAL OPERATING PROCEDURES

NOTE

Airplanes equipped with the Garmin G1000 have no annunciation panel. All annunciations are displayed on the G1000. The annunciations differ from those listed in the main part of the AFM.

4A.3.4 BEFORE TAXIING

WARNING

Do not load a new departure procedure in the flight plan of the G 1000 if one currently exists without first removing the existing departure procedure. Failing to observe this limitation can cause erroneous course deviation indications, loss of GPS navigation information and other display anomalies.

NOTE

If display anomalies are noted after editing the flight plan on the G 1000, perform either a direct to or activate leg operation as appropriate on the flight plan to ensure correct flight plan sequencing and guidance.

4A.3.11 DESCENT

WARNING

Do not load a new arrival procedure in the flight plan of the G 1000 if one currently exists without first removing the existing arrival procedure. Failing to observe this limitation can cause erroneous course deviation indications, loss of GPS navigation information and other display anomalies.

NOTE

If display anomalies are noted after editing the flight plan on the G 1000, perform either a direct to or activate leg operation as appropriate on the flight plan to ensure correct flight plan sequencing and guidance.

4A.1 ADVISORY ALERTS ON THE G1000

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

4A.4.1 ADVISORY / GENERAL

CHARACTERISTICS	White color coded text

4A.4.2 GLOW ON

GLOW ON	Engine glow plug active

4A.4.3 FUEL XFER

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

4A.4.4 PFD/MFD/GIA FAN FAIL

PFD FAN FAIL	Cooling Fan for the PFD is inoperative
MFD FAN FAIL	Cooling Fan for the MFD is inoperative
GIA FAN FAIL	Cooling Fan for the GIA is inoperative

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

4B. ABNORMAL OPERATING PROCEDURES

4B.8 ENGINE INSTRUMENT INDICATIONS OUTSIDE OF GREEN RANGE ON THE G1000

4B.8.1 HIGH RPM

Proceed according to:

4B.2.1 RPM in the main part of the AFM.

4B.8.2 HIGH OR LOW COOLANT TEMPERATURE

Proceed according to:

4B.2.2 COOLANT TEMPERATURE CT in the main part of the AFM.

4B.8.3 HIGH OR LOW OIL TEMPERATURE

Proceed according to:

4B.2.3 OIL TEMPERATURE OT in the main part of the AFM.

4B.8.4 HIGH OR LOW OIL PRESSURE

Proceed according to:

4B.2.4 OIL PRESSURE OP in the main part of the AFM.

4B.8.5 HIGH GEARBOX TEMPERATURE

Proceed according to:

> 4B.2.5 GEARBOX TEMPERATURE GT in the main part of the AFM.

4B.8.6 HIGH OR LOW FUEL TEMPERATURE

Proceed according to:

> 4B.2.6 FUEL TEMPERATURE FUEL TEMP in the main part of the AFM.

4B.8.7 HIGH OR LOW VOLTAGE

Proceed according to:

> 4B.4.2 VOLT of the AFM in the main part of the AFM.

4B.9 CAUTION-ALERTS ON THE G1000

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

4B.9.1 CAUTIONS / GENERAL

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

4B.9.2 ECU A FAIL

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

A 'ECU A FAIL'-caution on the G1000 System is equivalent to a 'ECU A'-caution indicated on the annunciator panel as described in the AFM and all its procedures, whereby the 'ECU A FAIL'-caution of the G1000 is steady-on when appearing.

4B.9.3 ECU B FAIL

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

A 'ECU B FAIL'-caution on the G1000 System is equivalent to a 'ECU B'-caution indicated on the annunciator panel as described in the AFM and all its procedures, whereby the 'ECU B FAIL'-caution on the G1000 is steady-on when appearing.

4B.9.4 L FUEL LOW

FUEL LOW	Left fuel quantity is low.

A 'FUEL LOW'-caution on the G1000 System is equivalent to a 'LOW FUEL'-caution indicated on the annunciator panel as described in the AFM and all its procedures.

4B.9.5 LOW VOLTAGE CAUTION (LOW VOLTS)

VOLTS LOW	Bus voltage is too low (less than 12.6 volts)

A 'VOLTS LOW'-caution on the G1000 System is equivalent to a 'LOW VOLTS'-caution indicated on the annunciator panel as described in the AFM and all its procedures.

4B.9.6 COOL LVL

COOL LVL	Engine coolant level is low.

A 'COOL LVL'-caution on the G1000 System is equivalent to a 'WATER LEVEL'-caution indicated on the AED-125 as described in the AFM and all its procedures.

4B.9.7 PITOT FAIL / HT OFF

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

A 'PITOT FAIL'-caution on the G1000 System is equivalent to a 'PITOT'-caution indicated on the annunciator panel as described in the AFM and all its procedures.

A 'PITOT OFF'-caution on the G1000 System informs the pilot that the Pitot heating system is switched off.

4B.9.8 INTEG-RAIM NOT AVAILABLE

NOTE

This Paragraph is not applicable, if MÄM 40-570 is implemented.

INTEG **RAIM not available**	RAIM (Receiver Autonomous Integrity Monitor) is not available.

(a) Enroute, oceanic, terminal, or initial approach phase of flight

If the "INTEG-RAIM not available" annunciation is displayed in the enroute, oceanic, terminal, or initial approach phase of flight, continue to navigate using the GPS equipment or revert to an alternate means of navigation other than the G1000 GPS receiver appropriate to the route and phase of flight. When continuing to use GPS navigation, position must be verified every 15 minutes using the G1000 VOR/ILS receiver or another IFR-approved navigation system.

(b) Final approach

If the "INTEG-RAIM not available" annunciation is displayed while on the final approach segment, GPS based navigation will continue for up to 5 minutes with approach CDI sensitivity (0.3 nautical 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 and integrity by executing the missed approach.

4B.9.9 AHRS ALIGNING - KEEP WINGS LEVEL

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

Keep wings level using standby attitude indicator.

4B.9.10 LOI

NOTE

This Paragraph is only applicable, if MÄM 40-570 is implemented.

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

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

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

(b) Final Approach

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

4B.9.11 DR

NOTE

This Paragraph is only applicable, if MÄM 40-570 is implemented.

If the G1000 system reverts to Dead Reckoning mode (indicated by DR displayed on the HSI), the moving map will continue to be displayed. Airplane position will be based upon the last valid GPS position and estimated by Dead Reckoning methods. Changes in winds aloft can affect the estimated position substantially. Dead Reckoning is only available for 20 minutes in Oceanic and Enroute modes; Terminal and Approach modes do not support DR.

5. PERFORMANCE

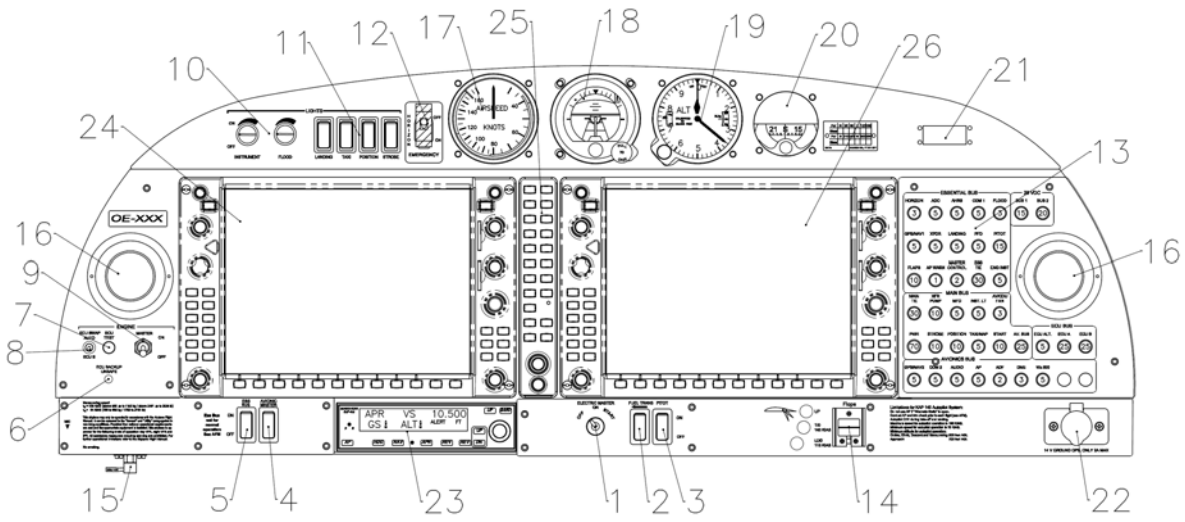
No change.

6. MASS AND BALANCE

Upon removal or installation of the Garmin G1000 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. DESCRIPTION OF THE AIRPLANE AND ITS SYSTEMS

7.4 INSTRUMENT PANEL



Major instruments and controls			
1	Electric Master switch	14	Flap selector switch
2	Fuel Transfer switch	15	Alternate static valve
3	Pitot Heat switch	16	Ventilation nozzles
4	Avionics Master switch	17	Backup airspeed indicator
5	Essential Bus switch	18	Backup artificial horizon
6	ECU Backup Unsafe light	19	Backup altimeter
7	ECU Test button	20	Emergency compass
8	ECU Swap switch	21	ELT control unit
9	Engine Master switch	22	Accessory power socket
10	Rotary buttons for instrument lighting and flood light	23	Autopilot control unit (if autopilot is installed)
11	Light switches	24	Primary Flight Display (PFD)

Major instruments and controls	
12 Emergency switch	25 Audio amplifier / Intercom / Marker beacon receiver
13 Circuit breakers*	26 Multi Function Display (MFD)

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

NOTE

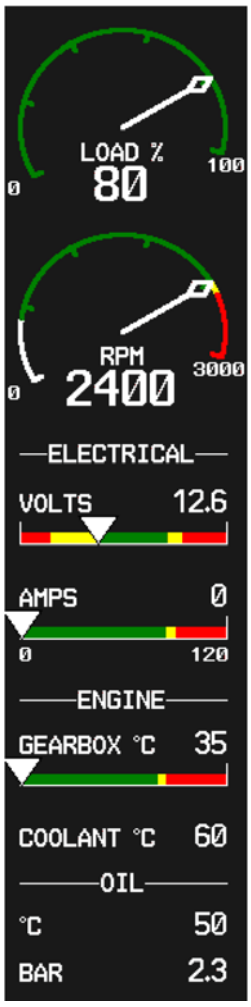
The figure on previous page shows the typical DA 40 D installation positions for the equipment with the G1000 System installed. The actual installation may vary due to the approved equipment version.

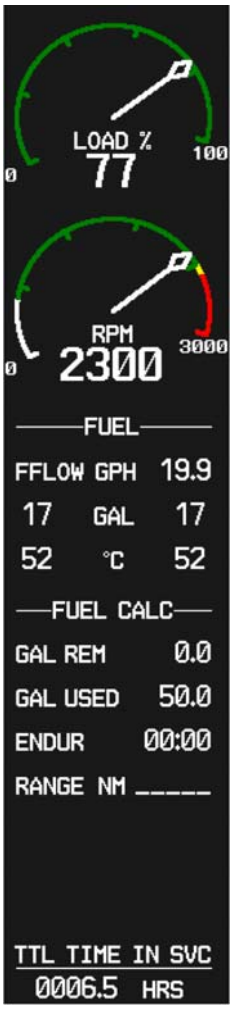
7.9 POWERPLANT

7.9.4 ENGINE INSTRUMENTS

The engine instruments are displayed on the Garmin G1000 MFD. Also refer to Section 7.14.3 - MULTI-FUNCTION DISPLAY (MFD).

Default page	Display when pushing	Display when pushing
Engine	the SYSTEM button	the FUEL button





NOTE

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

NOTE

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

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

7.10 ELECTRICAL SYSTEM

7.10.3 WARNING, CAUTION AND ADVISORY MESSAGES

Crew Alerting System (CAS)

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

WARNING

CAUTION

ADVISORY

Crew alerts will appear in the Alerts Window on the PFD. In this window Warnings will appear at the top, followed by Cautions and Advisories, respectively. Within the criticality levels, messages will appear from newest (top) to oldest (bottom).

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

1. Pressing the MSG key acknowledges a new master warning / caution / advisory indication.

2. An additional MSG key press with no master alert indication active will open a pop-up Auxiliary Flight Display (AFD) page that contains information for all active alerts.

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

Alert levels

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

Warning, Caution and Advisory Alerts

A list of all alerts is given in Section 2.6 WARNING, CAUTION AND ADVISORY ALERTS in this Supplement.

7.14 GARMIN G1000 INTEGRATED AVIONICS SYSTEM

7.14.1 GENERAL

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

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

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

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

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

- Oceanic/Remote per FAA Notice 8110.60 - Two FMs are required to be installed, operating and receiving usable signals from independent GPS sensors (one GPS sensor for those routes requiring only one Long Range Navigation (LRN) sensor. This does not constitute operational approval.
- North Atlantic (NAT) Minimum Navigation Performance Specifications (MNPS) Airspace as defined in AC 91-49 and AC 91-70 - Provided two FMSs are installed, operating and are receiving useable signals from any two GPS navigation sensors (one GPS sensor for those routes requiring only one Long Range Navigation (LRN) sensor). The GPS sensor meets the requirements of FAA Notice 8110.60 for primary navigation sensors. This does not constitute operational approval.
- RNAV (GPS) Approaches - The G1000 GPS meets the requirements of AC 20-138(A) for GPS based RNAV approaches. This includes RNAV approaches labeled as RNAV (GPS), provided GPS sensor data is valid.
- The systems meets RNP5 airspace (BRNAV) requirements of AC 90-96 and in accordance with AC 20-138A, and FAA Order 8110.60 for oceanic and remote airspace operations, provided it is receiving useable navigation information from the GPS receiver. The system meets the accuracy requirements of EASA AMC 20-4 for Basic RNAV.

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

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

Refer to the Garmin G1000 Cockpit Reference Guide, Garmin P/N 190-00324-03 Rev. A, and Pilot's Guide, P/N 190-00363-01, Rev. B for complete descriptions of the G1000 system and operating procedures.

If MÄM 40-570 is installed, refer to Garmin G1000 Cockpit Reference Guide, Garmin P/N 190-00706-01 Rev. A and Pilot's Guide, P/N 190-00705-01, Rev. A for complete descriptions of the G1000 system and operating procedures.

7.14.2 PRIMARY FLIGHT DISPLAY (PFD)

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

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

The PFD displays the crew alerting (annunciator) system. When a warning or caution message is received, a warning or caution annunciator will flash on the PFD, accompanied by an aural tone. A warning is accompanied by a repeating tone, and a caution is accompanied by a single tone. Acknowledging the alert will cancel the flashing and provide a text description of the message. Refer to the procedures given in the AFM and to Section 7.10.3 - WARNING, CAUTION AND ADVISORY MESSAGES of this supplement.

Advisory messages related to G1000 system status are shown in white and are accompanied by a white flashing ADVISORY alert. Refer to the G1000 Pilot's Guide and Cockpit Reference Guide for descriptions of the messages and recommended actions (if applicable).

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

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

7.14.3 MULTI-FUNCTION DISPLAY (MFD)

The Multi-Function Display (MFD) typically displays engine data, maps, terrain, traffic and topography displays, and flight planning and progress information. The display unit is identical to the PFD and contains the same controls as previously listed.

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

Also refer to Section 7.9.4 - ENGINE INSTRUMENTS.

7.14.4 AUDIO PANEL

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

7.14.5 ATTITUDE AND HEADING REFERENCE SYSTEM (AHRS)

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

7.14.6 AIR DATA COMPUTER (ADC)

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

8. AIRPLANE HANDLING, CARE AND MAINTENANCE

8.5 CLEANING AND CARE

8.5.5 INTERIOR SURFACES

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

CAUTION

The PFD and MFD displays use a lens coated with a special anti-reflective coating that is very sensitive to skin oils, waxes, and abrasive cleaners. CLEANERS CONTAINING AMMONIA WILL HARM THE ANTI-REFLECTIVE COATING. It is very important to clean the lens using a clean, lint-free cloth and an eyeglass lens cleaner that is specified as safe for anti-reflective coatings.