SECTION 9

Pilot's Operating Handbook Supplement AS-25

Garmin G3X Touch

GDU460 Primary Flight Display and Engine Indication System with GDU470 Back-up Display

This supplement is applicable and must be integrated into the Airplane Flight Manual if a Garmin G3X Touch Primary Flight Display and Engine Indication System with an additional Garmin G3X Touch Back-up Display is installed into the AQUILA. Information in this supplement compliments or replaces chapters in the basic Airplane Flight Manual and, in the case of night VFR, also information in the Supplement AS-01.

The technical content of this document is approved under the authority of the DOA ref. EASA.21J.025.

25.05.2020

AQUILA Head of Airworthiness

Date, Signature Office of Airworthiness

0.1 RECORD OF REVISIONS

Issue	Reason for Change	Affected Pages	Date of Issue
A.01	Initial Issue	all	25.05.2020

0.2 LIST OF CURRENT PAGES

Page	Issue	Date
1 - 10	A.01	25.05.2020

Page	Issue	Date

0.3 TABLE OF CONTENTS

1. General

1.1. Introduction

The information found in this Airplane Flight Manual Supplement is to be used alongside the basic Airplane Flight Manual.
This Airplane Flight Manual Supplement contains additional information required for the safe operation of an AQUILA equipped with a Garmin G3X Touch Primary Flight Display and Engine Indication System (EIS) with an additional Garmin G3X Touch Back-up Display.
The chapters of this Airplane Flight Manual Supplement follow the same structure as the basic Airplane Flight Manual. Only the chapters listed in this document are affected by the installation of the Garmin G3X Touch Primary Flight Display and Engine Indication System with an additional Garmin G3X Touch Back-up Display.

For further information and comprehensive operating instructions, please reference the current issue of the Garmin G3X Touch Pilot's Guide. Please keep in mind that the Garmin G3X Touch Pilot's Guide must be kept on board the aircraft and be accessible to the pilot at all times. It is the pilot's responsibility to familiarize him or herself with the operation, characteristics and limitations of the Garmin G3X System.

2. Operating Limitations

System Requirements

- The Garmin G3X Touch Primary Flight Display and the additional Garmin G3X Touch MFD must utilize the following or later software versions:

Component	**Software Version**
GDU 460 (10") Garmin G3X Touch Primary Flight Display und EIS	GDU 4XX non STC version **8.61** (both units equal)
GDU 470 (7") Garmin G3X Touch Back-up Display	

2.5 MARKINGS on the ENGINE INFORMATION SYSTEM of the Garmin G3X Touch

The following table shows the instrument markings on the EIS and their meaning.

G3X EIS	**Red Line** (minimum)	**Green Arc** (normal operating range)	**Yellow Arc** (caution)	**Red Line** (maximum)
Tachometer [RPM]	---	0 – 2260	2260 - 2385	2385
Oil Temperature [°F] ([°C])	122 (50)	122 - 266 (50 – 130)	---	266 (130)
Cylinder Head Temperature [°F] ([°C])	---	---	---	248 (120)
Oil Pressure [psi] ([bar])	11.6 (0.8)	29 – 72.5 (2.0 – 5.0)	11.6 – 29 (0.8 – 2.0) 72.5 – 101.5 (5.0 – 7.0)	101.5 (7.0)
optional: Fuel Pressure [psi] ([bar])	2.2 (0.15)	2.2 – 7.2 (0.15 – 0.5)	---	7.2 (0.5)
Voltmeter [V]	11	12.5 - 15.5	11 - 12.5	15.5

2.6 MARKINGS ON OTHER INSTRUMENTS

none

2.12 Kinds of Operation Limits / Minimum Equipment

Certified for: visual flights by Day and Night (if AS-01 is applied in addition)

Table 1	For VFR by Day*	Additional for VFR by Night*
Flight and navigational instruments	• Garmin G3X 10" Landscape PFD and Garmin G3X 7" Portrait Back-up Display indicating at least: - Altitude (0 – 20,000 ft) - Airspeed (0 – 200 kts) • Magnetic Compass • Working timepiece with a seconds hand** • VHF Transceiver***	• Garmin G3X 10" Landscape PFD indicating: - Attitude - Side Slip - Directional Gyro - Outside Air Temperature (OAT) - Vertical Speed • Stby. Flight Display with independent Emergency Battery (e.g. G5 or SAI340) indicating: - Attitude and Altitude • Transponder with altitude encoding • VOR navigation receiver
Power Plant Instruments	• any Garmin G3X EIS indicating at least: - Fuel Quantity remaining - Oil Temperature and Pressure - Cylinder Head Temperature - Manifold Pressure - Tachometer - Amperemeter - Voltmeter • Warning Light FUEL • Warning Light ALT 1	• Warning Light ALT 2 • Warning Light VOLT
Lighting		• navigation lights • anti-collision lights (ACL) • landing light • instrument lighting • cockpit lighting • flashlight for every crew member
Other Equipment	• Seat belts for each occupied seat • Emergency Hammer	• Battery ≥ 26 Ah • Alternator ALT 2

* The minimum equipment listed in Table 1 is valid for Germany. Other countries may require different minimum equipment. This may depend on the type of flight being carried out and the route being flown.

** In Germany a watch with a seconds hand may be used as a working timepiece. Please observe all differing national regulations.

*** In Germany a VHF Transceiver is not required for flights that do not leave the vicinity of an uncontrolled airfield (§4 Abs. 3 FSAV). Regulations of other nations must still be observed.

NOTE

For specific operations, additional equipment may be necessary. It is the aircraft operator's responsibility to observe the applicable requirements.

2.13 Fuel Limitations

NOTE

The fuel quantity, fuel used and fuel remaining functions of the G3X are advisory information only and must be verified by the pilot.

3. Emergency Procedures

3.13 Avionics Malfunctions

3.13.4 Primary Flight Display and/or MFD Failure

1. **PFD** circuit breaker *(see 3.1.1)* RESET, if tripped
2. **ADAHRS 1** circuit breaker *(see 3.1.1)* RESET, if tripped
3. **MFD** circuit breaker *(see 3.1.1)* RESET, if tripped
4. **ADAHRS 2** circuit breaker *(see 3.1.1)* RESET, if tripped
5. **GAD PWR** circuit breaker *(see 3.1.1)* RESET, if tripped

It is possible to safely continue flight, even if the PFD and/or MFD failure cannot be corrected in flight, by referencing the remaining instruments. It may, none the less, be prudent to land at the nearest airfield.

NOTE

Following information is still available when the PFD and MFD fails:

Attitude:	*Natural horizon or standby attitude indicator (if installed)*
Altitude:	*Transponder altitude, ground visibility*
Heading/Track:	*Compass*
Airspeed:	*stall warning*

3.13.5 Magnetometer Failure

1. **GMU** circuit breaker — RESET, if tripped

NOTE

In the event of a magnetometer failure a red X will be displayed over the course display. If the GDU 460 / 470 is receiving a valid GPS ground track signal, the magnetic heading display will be replaced with the GPS ground track. The GPS ground track is displayed in magenta.

3.13.6 Complete Navigation System Failure

1. **ADAHRS 1** circuit breaker *(see 3.1.1)* — RESET, if tripped
2. **ADAHRS 2** circuit breaker *(see 3.1.1)* — RESET, if tripped
3. Navigation — Compass

NOTE

In the event of a complete navigation system failure (magnetometer and GPS ground track) a red X will be displayed over the course display and the markings on the compass rose disappear.

3.13.7 ADAHRS Failure

1. **ADAHRS 1** circuit breaker *(see 3.1.1)* — RESET, if tripped
2. **ADAHRS 2** circuit breaker *(see 3.1.1)* — RESET, if tripped
3. Attitude — Natural horizon or standby attitude indicator (if installed)

NOTE

In the event of an AHRS Failure, the horizon is no longer displayed on the PFD. Additionally a red "X" and in yellow "AHRS FAILURE" is displayed. A Navigation System Failure, as described in section 3.13.6, accompanies an AHRS Failure.

3.13.8 ADC Failure

1. **AHRS 1** circuit breaker *(see 3.1.1)* — RESET, if tripped
2. **AHRS 2** circuit breaker *(see 3.1.1)* — RESET, if tripped
3. Continue flight — Using stand-by instruments (see 3.13.4)

NOTE

Failure of the Air Data Computers (ADC) is indicated through a red X and yellow text above the airspeed indicator, the altimeter, the vertical speed indicator, the TAS and the OAT indicators. Certain functions, such as TAS and wind calculation, are no longer usable.

4. Normal Procedures

4.5.1 Before Engine Start-up

15. **ALT1 / BAT** switch ON

NOTE

Pay attention to messages that may appear on the PFD and MFD displays while the system is loading.

The attitude indicators (AHRS module and stand-by indicator) require several minutes to stabilize. Pay attention to information on the Garmin G3X displays.

Both GARMIN G3X Touch Display units have an integrated sensor that automatically adjusts the brightness of the display.

It is also possible to adjust the brightness of each display manually.

PRESS TWICE the Menu Key of the G3X Touch display unit to change to Setup page. Select "Display" and "Backlight Control" to switch to "Manual".

To manually adjust the brightness change into “Backlight Intensity” and touch the slider for the appropriate backlight setting. When finished press the ENT button to save the changes.

4.5.13 Engine Shut-down

8. **ALT1 / BAT** switch OFF

NOTE

The Garmin G3X displays are turned off with the ALT1/BAT switch.

5. Performance

There is no change regarding the information in the basic Pilot's Operating Handbook.

6. Weight and Balance

There is no change regarding the information in the basic Pilot's Operating Handbook.

7. System Description

NOTE

This supplement includes a general description of the integration of the Garmin G3X Touch System into the AQUILA AT01-100. A Complete description and extensive operating instruction can be found in the Garmin G3X Touch Pilot's Guide.

7.1 Introduction

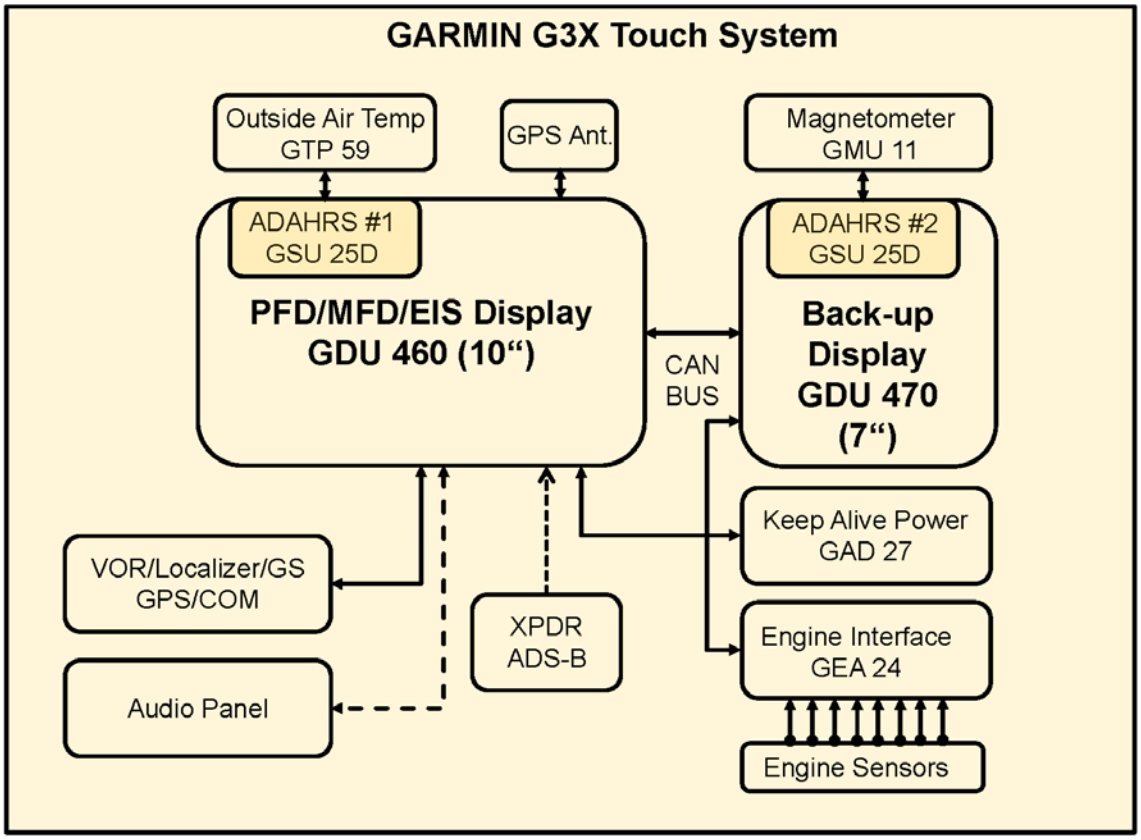
The Garmin G3X Touch is an Electronic Flight Instrument System (EFIS) which provides an intuitive touch screen user interface with a wide array of features.
The system is capable of providing the following functionalities:

- Primary Flight Display (PFD)
- Multi-Function Display (MFD)
- Engine Indication System (EIS)
- Optional Traffic Receiver Display (ADS-B and FLARM)

7.2 Integration into the AQUILA AT01-100

The Garmin G3X Touch System is composed of several sub units or Line Replaceable Units (LRUs). The LRUs have a modular design and are installed behind or in case of a Garmin Display Unit (GDU) directly into the panel. The GPS Antenna (required for the G3X Touch) is mounted on-top the aft section of the fuselage.
The GMU 11 Magnetometer is located inside the fuselage, behind the baggage compartment.
When installed into the AQUILA the Garmin G3X Touch System includes the following LRU´s:

GDU 460	10,6 inch PFD
GDU 470	7 inch MFD
GSU 25D (2x)	Attitude and Heading Reference System and Air Data Computer
GMU 11	Magnetometer (fuselage mounted)
GTP 59	Outside Air Temperature Sensor (fuselage mounted)
GAD 27	Power Stabilization Unit during Engine Startup
GEA 24	Engine Sensor Interface Module
GPS Antenna	for the G3X Touch internal GPS receiver, limited to VFR navigation only



Electrical protection of the G3X Touch System

Circuit Breaker	Current	LRU
PFD	5A	G3X Touch GDU 460 10,6" PFD
MFD	5A	G3X Touch GDU 470 7" MFD
ADAHRS 1	2A	PFD`s GSU 25D
ADAHRS 2	2A	MFD`s GSU 25D
GMU	2A	GMU 11
GAD PWR	10A	GAD 27
ENG SNSR	2A	GEA 24

The Garmin G3X Touch System receives power via the aircrafts MAIN BUS and is powered up as soon as the aircrafts MASTER SWITCH is turned ON.

G3X Touch display messages

The following tables show the color and significance of the warning, caution, and advisory messages which may appear on the G3X Touch display.

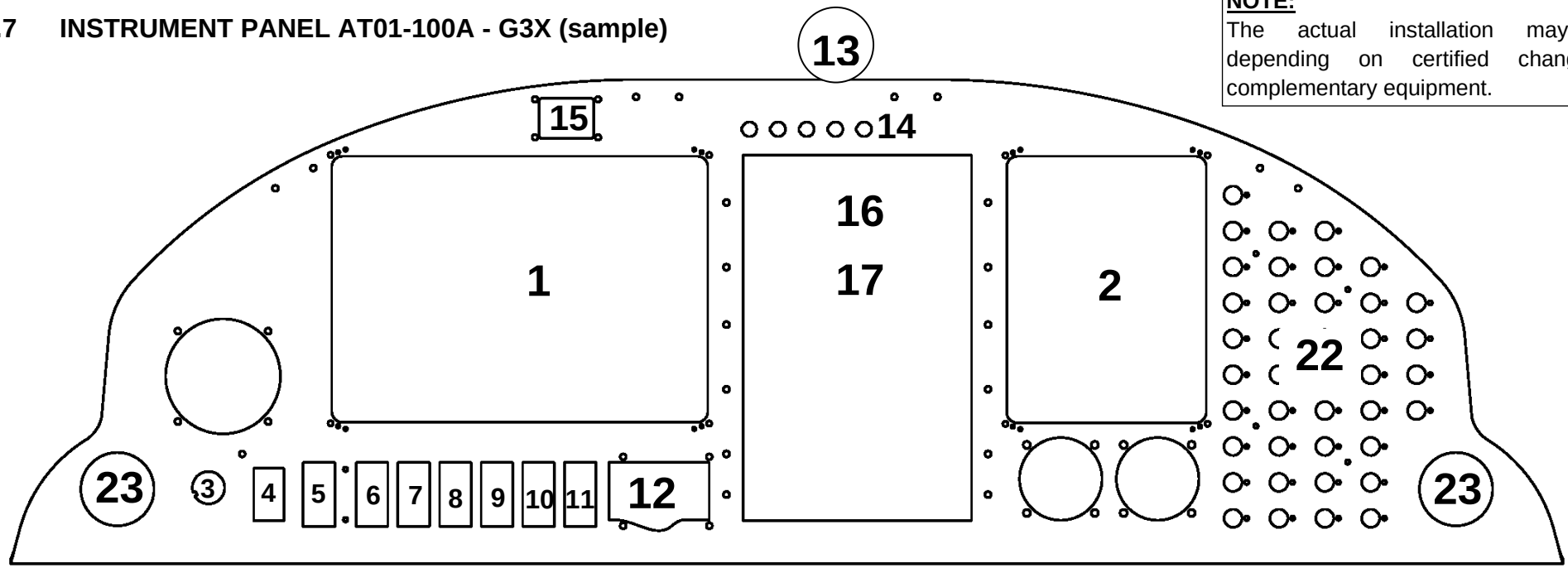
Annunciation- Red	Pilot Action	Cause
Red X	Reference the data source or alternate equipment.	A red X through any display field indicates that display field is not receiving data or is corrupted.
Red Engine Parameter	Take appropriate action to correct condition causing engine parameter exceedance.	The engine parameter has exceeded the warning threshold.
	Select full screen mode on display to view WARNING annunciations.	Display is in split screen mode and WARNING annunciations are not displayed.

Annunciation- Amber	Pilot Action	Cause
HDG (amber background)	Use standby compass	Displayed heading is outside of the internal accuracy limits.
	Select full screen mode on display to view CAUTION annunciations.	Display is in split screen mode and CAUTION annunciations are not displayed.
AHRS ALIGN – Keep Wings Level	Fly aircraft manually and crosscheck attitude indication with standby attitude indicator and other sources of attitude information. Limit aircraft attitude to ±10º bank and ±5º pitch as AHRS Aligns - OK to taxi.	Attitude and Heading Reference System is aligning. AHRS may not align with excessive pitch/bank angles.
AHRS ALIGN	Fly aircraft manually and crosscheck attitude indication with standby attitude indicator and other sources of attitude information (airspeed, heading, altitude, etc.)	The AHRS monitors have detected a possible AHRS malfunction or an error with the attitude presentation. The AHRS is attempting to realign itself.
ADC FAIL	Use standby airspeed and altimeter indicator.	Both GSU 25 air data computer have failed.
(Flashing) MESSAGE	Press the flashing message annunciation to view a new system message.	A new system message has annunciated.
Amber Engine Parameter	Take appropriate action to correct condition causing engine parameter exceedance.	The engine parameter has exceeded the caution threshold.
TRAFFIC	Visually acquire the traffic to see and avoid.	The interfaced traffic system has determined that nearby traffic may be a threat to the aircraft.
ECS FAIL	NONE	The Electrical Control System has failed (GAD 27 FAILED, no Backup power via GAD 27)

For a detailed description and full operating instructions please refer to the current issue of the Garmin G3X Touch Pilot's Guide.

7.7 INSTRUMENT PANEL AT01-100A - G3X (sample)

NOTE:
The actual installation may differ depending on certified changes or complementary equipment.



For minimum instrument requirements, refer to Section 2.12 of this manual

No.	Description	No.	Description	No.	Description	No.	Description	No.	Description	No.	Description
1	GARMIN GDU460 - 10"	5	Fuel Pump	9	Landing Light	12	Flap Control Switch	15	ELT	22	Circuit Breakers
2	GARMIN GDU470 - 7"	6	Avionics	10	Instrument Lights (opt)	13	Compass	16	COM/NAV/GPS	23	Ventilation Nozzle
3	Ignition Switch	7	Nav-Light	11	P/S Heat (opt.)	14	Warning Lights	17	Transponder		
4	ALT1/BAT	8	ACL								

8. Handling, Servicing and Maintenance

Display Cleaning

The display uses a lens with a special coating that may be sensitive to skin oils, waxes, and abrasive cleaners. CLEANERS CONTAINING AMMONIA WILL HARM THE ANTIREFLECTIVE COATING.
It is very important to clean the lens using a clean, lint-free cloth and a cleaner that is specified as safe for anti-reflective coatings. Avoid any chemical cleaners or solvents that can damage plastic components.