SECTION 9

AIRPLANE FLIGHT MANUAL - SUPPLEMENT AVE29

GLASS COCKPIT

GARMIN G 500

This AFM supplement is applicable and must be inserted into Section 9 of the Airplane Flight Manual when the GARMIN G500 is installed in the AQUILA AT01 as the Primary Flight Display. The information in this supplement adds to or replaces information in the basic Airplane Flight Manual and, in the case of night VFR, information in Supplement AVE 23.

This Airplane Flight Manual Supplement is approved by EASA pursuant to the DOA number: **10039259**

0.1 LIST OF REVISIONS AND AMENDMENTS

Issue	Reason for Amendment/Revision	Affected Pages	Date of Issue
A.01	Initial Issue	All	02.04.2012

0.2 LIST OF EFFECTIVE PAGES

Page	Issue	Date
1 - 22	A.01	02.04.2012

Page	Issue	Date

0.3 TABLE OF CONTENTS

1. General

1.1. Introduction

The information contained in this supplement must be used in conjunction with the basic Airplane Flight Manual. Aircraft approved for N/VFR must also be operated in accordance with AFM Supplement AVE 23.

This supplement provides the information necessary for the safe operation of the AQUILA AT01 when the GARMIN INTERNATIONAL G500 Primary Flight display is installed.
This supplement has been arranged in the same way as the basic Airplane Flight Manual, i.e. only the chapters listed are affected by the change Aquila AT01-00497 "Glass cockpit" with respect to the installed GARMIN G 500.

For a detailed description and full operating instructions refer too the effective issue of the GARMIN G 500 Cockpit Reference Guide P/N 190-01102-03 and the Garmin G500 Pilot's Guide, P/N 190-01102-02.

NOTE

The GARMIN G 500 Cockpit Reference Guide P/N 190-01102-03 must be kept on board the aircraft and be available to the crew at all times.

1.11. Terminology and Abbreviations

ADC	Air-Data Computer
AHRS	Attitude and Heading Reference System
GDU	Garmin Display Unit
PFD	Primary Flight Display (electronic flight instrument system)
MFD	Multi-function Flight Display
AI	Attitude Indicator (artificial horizon)
OAT	Outside Air Temperature

2. Limitations

2.1 Introduction

The GARMIN G 500 Cockpit Reference Guide P/N 190-01102-03 must be kept on board the aircraft and be available to the crew at all times.

NOTE

For VFR-Night operations, a backup attitude indicator with independent emergency battery could be installed (e.g. Mid-Continent LifeSaver).

This aircraft is equipped with an emergency battery powered attitude indicator:

☐ Yes ☐ No

2.12 Kinds of Operation Limits / Minimum Equipment

Approved kinds of operation: a) VFR day only
b) Night VFR

Table 1	VFR day only**	Additional for Night VFR**
Flight and navigation instruments	• Garmin G-500 • magnetic compass • clock with seconds displayed*** • VHF radio* • GPS receiver Garmin 400W/500W Series or GTN 6XX/7XX)	• attitude indicator (standby AI) • transponder with altitude indication or transponder with no altitude indication plus an analog altimeter
Engine instruments	• fuel indicator • oil temperature indicator • fuel pressure warning light • oil pressure indicator • cylinder head temperature indicator • suction pressure indicator • ammeter • rpm indicator • voltmeter • alternator warning light (ALT 1)	• alternator warning light (ALT 2) • low voltage indicator
Lighting		• navigation lights • anti-collision lights (ACL) • landing light • instrument lighting • cockpit lighting • flashlight for every crew member
Miscellaneous equipment	• 2 x safety belts • hand-held fire extinguisher • emergency hammer • emergency locator transmitter (ELT) for 406 MHz and 121.5 MHz	• battery ≥28Ah

* Not required in Germany for flights at airfields with no air traffic control, provided they are carried out by day and remain in the near vicinity of the airfield (§ 3a Abs. 3 Luftverkehrs-Ordnung). Local regulations of the competent authority (§ 21a Abs. 1 Luftverkehrs-Ordnung) remain intact.

** The functional operational minimum equipment for Germany is listed in Table 1 (above). Additional minimum equipment for a particular kind of operation may be required at national level and is also dependent upon flight route.

*** In Germany, this can also be a watch with seconds displayed. Attention should be paid to national derogations.

2.16 Placards

5.) On the instrument panel, to the right of the relevant circuit breakers:

For night VFR:

If the aircraft is approved for night flight, the placards shown in Supplement AVE 23, Chapter 2.16 are also applicable.

3. Emergency Procedures

3.1 Introduction

This section provides checklists and recommended procedures for coping with various emergency situations, especially during night VFR operation. Should an emergency occur, the basic procedures provided here are recommended to master the situation. It is not possible to account for all kinds and combinations of emergencies that may arise in this manual. The pilot must, therefore, be familiar with the aircraft and its flight behavior and possess sufficient knowledge to counter any problems which may occur.

3.4 Precautionary Landing

Most of the recommendations made in the emergency procedures section of the main Airplane Flight Manual with respect to precautionary landings put a greater demand on the pilot during night VFR operations as the choice of an appropriate landing area is more difficult in the dark.
The general recommendation to switch off the **BAT** switch before touch-down/standstill should only be followed if there is a real danger of colliding with obstacles.
Switching off the **BAT** switch also turns off the Primary Flight Display and the landing light. The landing area is no longer illuminated.

3.5 Smoke and Fire

3.5.4 In-flight electrical fire

The first indication of a cable fire is the smell of burning or smoldering insulation material.

1.	**ALT1/BAT** switch	OFF
2.	**Alternator 2** circuit breaker	PULL
3.	**Avionics Master** switch	OFF
4.	All other switches (except ignition switch)	OFF
5.	Cabin vents and side window	OPEN
6.	Hand-held flashlight (NVFR)	remove from side pocket - ON
7.	Fire extinguisher	activate, as required
8.	Land immediately	see 3.4 PRECAUTIONARY LANDING

CAUTION

In case of extreme formation of smoke and after using the fire extinguisher, unlatch the canopy for ventilation (refer to 3.15.1).

After using the fire extinguisher fix it in its holder, if possible, or secure it otherwise.

CAUTION

Switching **ALT1/BAT** to OFF and pulling the **Alternator 2** circuit breaker simultaneously leads to a total loss of all electrical and electronic devices.

This also effects the Standby Attitude Indicator (AI) and stall warning.

Possibilities for stabilizing the attitude at NVFR:

- ⇨ Visual external references (e.g. horizon, lights on ground)
- ⇨ Standby Attitude Indikator
  - With its own battery (e.g. Life Saver, if installed) or
  - switch GEN1/BAT to ON for 10 seconds and repeat it all 30 seconds to keep AI running

When airplane has stopped:

9.	Canopy	open
10.	Airplane	evacuate immediately

3.10 Electrical Power Supply System Malfunctions

3.10.1 Complete Failure of Electrical System

1. Hand-held flashlight (if available)	remove from side pocket - ON
3. **Alternator 2** circuit breaker	RESET if tripped
4. **Battery** circuit breaker	RESET if tripped
5. **ALT1/BAT** circuit breaker	CHECK if IN
6. **Alternator 1** circuit breaker	RESET if tripped

If the power failure has not been rectified, illuminate the instruments using the flashlight and execute a precautionary landing at the next operational airfield.

CAUTION

A total loss of all electrical sources is relative improbable due to redundancy. In case of a total loss all electrical and electronic devices (e.g. Standby Attitude Indikator (AI) and stall warning) will fail.
Possibilities for stabilizing the attitude at NVFR:

- ⇨ Visual external references (e.g. horizon, lights on ground)
- ⇨ Standby Attitude Indikator
  - With its own battery (e.g. Life Saver, if installed) or
  - switch GEN1/BAT to ON for 10 seconds and repeat it all 30 seconds to keep AI running

3.10.2 Alternator Failure

NOTE

If the aircraft is approved for night operations, it is equipped with two alternators. Alternator 1 is installed in aircraft which are not approved for night VFR. If this alternator fails, it should be treated as if all alternators have failed.

3.10.2.1 Alternator 1 (external alternator) – warning light illuminates

1. **ALT 1** switch	switch OFF then ON
2. **Alternator 1** circuit breaker	RESET if tripped

If Alternator 1 warning light remains on:

3. **Alternator 1** circuit breaker	PULL
4. **ALT 1** switch	OFF
5. **Anti-collision lights** switch	OFF
6. Audio panel	OFF (if installed)
7. COM/NAV2	OFF (if installed)
8. Devices connected at receptacle	OFF (if installed)

NOTE

Alternator 2 (internal alternator) takes over the power supply for the entire aircraft system (excepting instruments listed above). The flight may be continued as limited power supply is available. However, the battery will no longer be charged and could indeed discharge. The ammeter must be monitored and a landing at the next suitable airfield considered. If Alternator 2 also fails, the emergency procedures described under "both alternator warning lights illuminate" or "low voltage warning light illuminates" must be followed.

Despite the audio panel being switched off, the pilot can use the COM 1 radio and his headset. The fail-safe design of the audio panel ensures that COM 1 is still active when the audio panel is switched off. The intercom is no longer functional.

WARNING

The problem must be ascertained and eliminated before the next flight!

3.10.2.2 Alternator 2 (internal alternator) – warning light illuminates

NOTE

Alternator 2 is only installed if the aircraft is approved for night VFR.

1. **Alternator 2** circuit breaker RESET if tripped

If the **Alternator 2** warning light remains on:

2. **Alternator 2** circuit breaker PULL

NOTE

Alternator 1 (external alternator) takes over the power supply for the entire aircraft system (excepting instruments listed above). The flight may be continued, reducing electrical power consumption to a minimum (monitor ammeter) as sufficient power is available. If Alternator 1 also fails, the emergency procedures described under "both alternator warning lights illuminate" or "low voltage warning light illuminates" must be followed.

WARNING

The problem must be ascertained and eliminated before the next flight!

3.10.2.3 Both alternator warning lights illuminate

When both alternator warning lights illuminate, the low voltage warning light will simultaneously illuminate indicating that neither alternator is supplying power to the electrical system.

1. **ALT 1** switch	switch OFF then ON
2. **Alternator 1** circuit breaker	RESET if tripped
3. **Alternator 2** circuit breaker	RESET if tripped

If both alternator warning lights remain on: :

4. **Alternator 1** circuit breaker	PULL
5. **Alternator 2** circuit breaker	PULL
6. **ALT 1** switch	OFF
7. **Anti-collision lights** switch	OFF
8. Audio panel	OFF (if installed)
9. COM/NAV2	OFF (if installed)
10. Devices connected at receptacle	OFF (if installed)

NOTE

The instruments required for safe operation and landing of the aircraft can be supplied with power from the battery for at least 30 minutes. The 30 minute period begins when the low voltage warning light illuminates.
Economical use of the radio and switching off all non-essential instruments extends the period the essential instruments remain functional.
A landing must be carried out at a suitable operational airfield within the 30 minute period.

WARNING

The problem must be ascertained and eliminated before the next flight!

3.10.3 Low Voltage Warning Light illuminates

Neither alternator supplies power to the electrical system.

1. **ALT 1** switch	switch OFF then ON
2. **Alternator 1** circuit breaker	RESET if tripped
3. **Alternator 2** circuit breaker	RESET if tripped

If the low voltage warning light remains on:

4. **Alternator 1** circuit breaker	PULL
5. **Alternator 2** circuit breaker	PULL
6. **ALT 1** switch	OFF
7. **Anti-collision lights** switch	OFF
8. Audio panel	OFF (if installed)
9. COM/NAV2	OFF (if installed)
10. Devices connected at receptacle	OFF (if installed)

NOTE

The instruments required for safe operation and landing of the aircraft can be supplied with power from the battery for at least 30 minutes. The 30 minute period begins when the low voltage warning light illuminates.
Economical use of the radio and switching off all non-essential instruments extends the period the essential instruments remain functional.
A landing must be carried out at a suitable operational airfield within the 30 minute period.

NOTE

Despite the audio panel being switched off, the pilot can use the COM 1 radio and his headset. The fail-safe design of the audio panel ensures that COM 1 is still active when the audio panel is switched off. The intercom is no longer functional.

WARNING

The problem must be ascertained and eliminated before the next flight!

3.13.4 Primary Flight Display Failure

1. Attitude	STABILIZE (STANDBY AI)
2. **PFD** circuit breaker	RESET if tripped
3. **PFD** switch	ON (if OFF)
4. **ADS** circuit breaker	RESET if tripped

If the PFD failure cannot be rectified, the flight may be continued using the remaining indicators. A landing at the next suitable airfield should be considered.

The following indicators are available as alternatives to the failed PFD:

Attitude:	standby attitude indicator (for night VFR), natural horizon
Altitude:	GPS altitude, transponder altitude, ground view
Course:	magnetic compass, GPS track
Air speed:	GPS ground speed, stall warning, propeller rpm, attitude (standby attitude indicator)

3.13.5 Magnetometer Failure

1. **AHRS** circuit breaker	RESET if tripped

NOTE

A "red X" appears over the heading indication when the magnetometer fails. If the GDU 620 receives a valid GPS ground track from the GPS receiver, the heading indication will be replaced by the GPS ground track, shown in "MAGENTA"

3.13.6 Complete Heading Failure

1. **AHRS** circuit breaker — RESET if tripped
2. Heading determination — magnetic compass, GPS

NOTE

During a complete heading failure (magnetometer and GPS ground track failure), the heading indication will be replaced by a "red X" and the compass rose digits will disappear.

3.13.7 AHRS Failure

1. **AHRS** circuit breaker — RESET if tripped

NOTE

The horizon will disappear and a red X and "AHRS FAILURE" shown in yellow will be displayed on the PFD when the AHRS fails. A heading failure as described in Chapter 3.13.6 can also occur.

3.13.8 ADC Failure

1. **ADC** circuit breaker — RESET if tripped
2. For continued flight — use stand-by instruments (cf. 3.13.4)

NOTE

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

4.0 Normal Procedures

4.5.3. Before Taxiing

2. Avionics and flight instruments set up

NOTE

Immediately after switching on the master switch, the "pull to cage" button on the attitude indicator (if installed) must be pulled. It should be pulled again 3 to 4 minutes later.
Do not allow the "pull to cage" button to snap back. Allow it to slowly return to its starting position!

NOTE

Pay attention to any messages on the PFD/MFD monitors during the start-up phase!

4.5.3.1 Dimming display brightness

The GARMIN G500 has a light sensor which automatically adjusts the brightness of the display to ambient light conditions. In addition, it is also possible to alter the brightness using the instrument menu. The large rotary button on the MFD is used to change to the "AUX" system page. The brightness of the GARMIN G500 can then be set using the small rotary button on the MFD . Press the "ENT" key to save the setting.

4.5.5. Before Take-off

Attitude indicator Check for correct setting

NOTE

The artificial horizon(s) (AHRS module and standby attitude indicator) require(s) several minutes to stabilize. Watch for relevant messages on the G500 display.

4.5.13 Engine Shut-down

The Garmin G500 is switched off using the master switch.

5.0 Performance

There is no change regarding the information in the basic Airplane Flight Manual.

6.0 Weight and Balance

There is no change regarding the information in the basic Airplane Flight Manual.

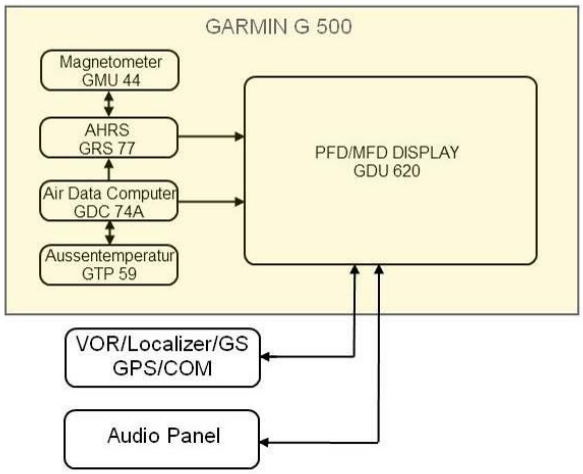
7.0 Systems Description

NOTE

This supplement contains a general description of the integration of the GARMIN G500 into the instrument panel of the AQUILA AT01. For a detailed description and full operating instructions refer to the effective issue of the GARMIN G 500 Pilot's Guide (P/N 190-01102-02).

The GARMIN G500 comprises a primary flight display and a multi-function display housed in a single Garmin display unit (GDU). The system also comprises an attitude heading reference system (AHRS module) and an air data computer (ADC module).

The general arrangement of the GARMIN G500 is shown below.



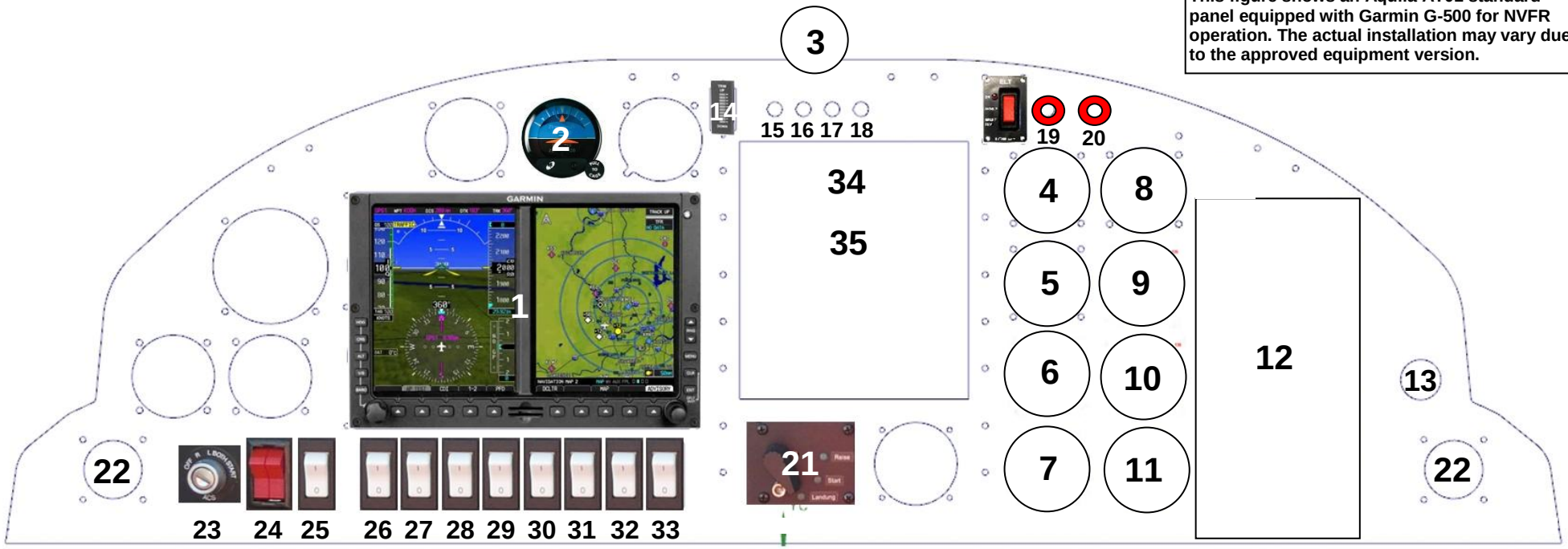
The GDU is protected by a push-pull circuit breaker which is located on the right side of the instrument panel and labeled "PFD/MFD" (cf. Chapter 2.16 of this supplement).

The AHRS module and the magnetometer are protected by a separate push-pull circuit breaker which is located in the right side of the panel and labeled "AHRS" (cf. Chapter 2.16 of this supplement). The AHRS module is installed below the right baggage compartment floor and is connected to the GDU via its own wiring harness.

The ADC and the outside air temperature sensor are protected by a separate circuit breaker which is located on the right side of the panel and labeled "ADC" (cf. Chapter 2.16 of this supplement).
The ADC is installed below the cabin floor on the left side.
These 3 circuit breakers are active when the master switch is activated.

7.4 INSTRUMENT PANEL Garmin G-500

NOTE:
This figure shows an Aquila AT01 standard panel equipped with Garmin G-500 for NVFR operation. The actual installation may vary due to the approved equipment version.



For minimum instrument requirements in accordance with kind of operation, refer to Section 2.12 of this AFM supplement.

N..	Description	No.	Description	No.	Description	No.	Description	No.	Description	No.	Description
1	**GARMIN G500**	7	Ammeter	13	12V receptacle	19	Dimmer instr. Panel (NVFR)	25	Electrical fuel pump	31	Reserve
2	Attitude indicator (NVFR)	8	Rpm indicator (prop)	14	Trim indicator	20	Dimmer instr./post light (NVFR)	26	Avionics master switch	32	Reserve
3	Compass	9	Cylinder head temperature	15	Alternator warning ALT1	21	Flaps switch	27	NAV lights	33	Reserve
4	Manifold pressure indicator	10	Oil temperature	16	Alternator warning ALT2	22	Ventilation nozzle	28	Anti-collision lights	34	COM/NAV/GPS
5	Fuel indicator	11	Oil pressure indicator	17	Fuel pressure warning	23	Ignition switch	29	Landing light	35	Transponder
6	Voltmeter	12	Circuit breakers	18	Low voltage indicator	24	ALT/BAT switch	30	Instrument lighting		

7.11.3 Electrical Equipment and Circuit Breakers

All electrical equipment may be turned on or off by push-pull circuit breakers or by rocker switches with built-in circuit breaker function.
The instrument panel lighting (flood light) is protected by a push-pull circuit breaker and is switched on and/or dimmed using the rotary knob in the dimming unit (cf. Chapter 7.4, item 20).
Individual instrument lighting and the post lights are switched on by the instrument lighting switch and can be individually dimmed using a dual dimmer.

8. Handling, Service and Maintenance

There is no change regarding the information in the basic Airplane Flight Manual.