SECTION 9

Pilot's Operating Handbook Supplement AS-06

VFR-DAY and VFR-NIGHT operation

Garmin G500 / G500 TXi, MVP-50P-AQ

This POH supplement is applicable and must be inserted into Section 9 of the Pilot's Operating Handbook when the AQUILA AT01-100C is equipped for Day- and Night-VFR.

Section 1, 2, 3, 4 and 7 of the basic POH must be <u>completely</u> replaced by the section 1, 2, 3, 4 und 7 of this supplement.

The information in this supplement adds to or replaces information in the basic POH.

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

03.03.21 AQUILA Head of Airworthiness

Date, Signature Office of Airworthiness

0.1 RECORD OF REVISIONS

Issue	Reason for Change	Effected Pages	Date of Issue
A.01	Initial Issue	All	28.05.2013
A.02	Editorial Changes	All	15.10.2013
A.03	Amendment to Normal Procedures	4-1 to 4-20	19.10.2015
A.04	Minor Changes	chapter 2, 3, 7	26.06.2017
A.05	G500TXi, G5 Stby AI	All	01.06.2018
A.06	Editorial Changes	All	25.05.2020
A.07	Editorial Changes	chapter 2, 4	03.03.2021

0.2 LIST OF CURRENT PAGES

Page	Issue	Date
1-1 to 1-12	A.06	25.05.2020
2-1 to 2-10	A.07	03.03.2021
3-1 to 3-22	A.06	25.05.2020
4-1 to 4-20	A.07	03.03.2021
7-1 to 7-26	A.06	25.05.2020

Page	Issue	Date

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SECTION 1

GENERAL

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1.1 INTRODUCTION

This Pilot's Operating Handbook contains all the information the pilot and instructor require for the safe and efficient operation by day and night of the AQUILA AT01-100 aircraft.

It includes all information required in accordance with JAR-VLA and additional information considered by the manufacturer to be of value to the pilot.

This Manual consists of nine sections which cover all operational aspects of the aircraft equipped with Garmin G500 / G500 TXi and MVP-50P-AQ.

Optional equipment which has been installed on request of the customer (COM, NAV, GPS and others) is included in Section 9 "Supplements" of this Manual.

Information regarding equipment approved for installation in the AQUILA AT01-100 is provided in Section 6 of this manual and in the approved equipment overview list in the Maintenance Manual (Document Number MM-AT01-1020-110).

This handbook includes the material required to be furnished to the pilot by the Federal Aviation Regulations and additional information provided by the manufacturer. It constitutes the FAA approved airplane flight manual.

1.2 AIRCRAFT TYPE CERTIFICATION

The aircraft model AQUILA AT01 is type-certified in accordance with the certification specifications of the *Joint Aviation Requirements for Very Light Aeroplanes (JAR-VLA,* including the revision VLA/92/1) by the Luftfahrt-Bundesamt, the National Aviation Authority of Germany.
The Type Certificate under the Type Certificate Data Sheet No. 1106 was issued on the 21st of September 2001.

In accordance with „Certification Review Item A-01“ (15.06.2007) as a Change to the Type Certificate of EASA.A.527, the AQUILA AT01 is certified for flights under N/VFR condition.

Category of Airworthiness: Normal

Noise Certification Basis: CS-36 (Amendment 3)

Approved for following operations: VFR by day

VFR by night

1.3 WARNING, CAUTIONS AND NOTES

Throughout the text, special text boxes marked WARNING, CAUTION and NOTE are used. These terms are defined as follows:

WARNING

Procedures, practices, etc. which may result in personal injury or loss of life if not strictly adhered to. The issues addressed under these text boxes directly affect the airworthiness and the safe operation of the aircraft.

CAUTION

Procedures, practices, etc. which may result in damage to or destruction of equipment if not strictly adhered to. The issues addressed under these text boxes have an indirect or minor impact on the airworthiness and the safe operation of the aircraft.

NOTE

Calls attention to additional procedures or information which are not directly associated with flight safety but are nevertheless important or deviate from standard practices.

1.4 PRINCIPLE AIRCRAFT DIMENSIONS

1.4.1 Overall Dimensions

Wing Span:	33.79 ft	(10.3 m)
Length:	24.28 ft	(7.4 m)
Height:	7.87 ft	(2.4 m)

1.4.2 Wings

Airfoil:	HQ-XX mod.	
Area:	113.02 sq. ft	(10.5 m^2)
Aspect Ratio:	10.1	
Mean Aerodynamic Chord (MAC):	3.51 ft	(1.07 m)

1.4.3 Horizontal Stabilizer / Elevator

Area:	21.52 sq. ft	(2.0 m^2)
Span:	9.84 ft	(3.0 m)

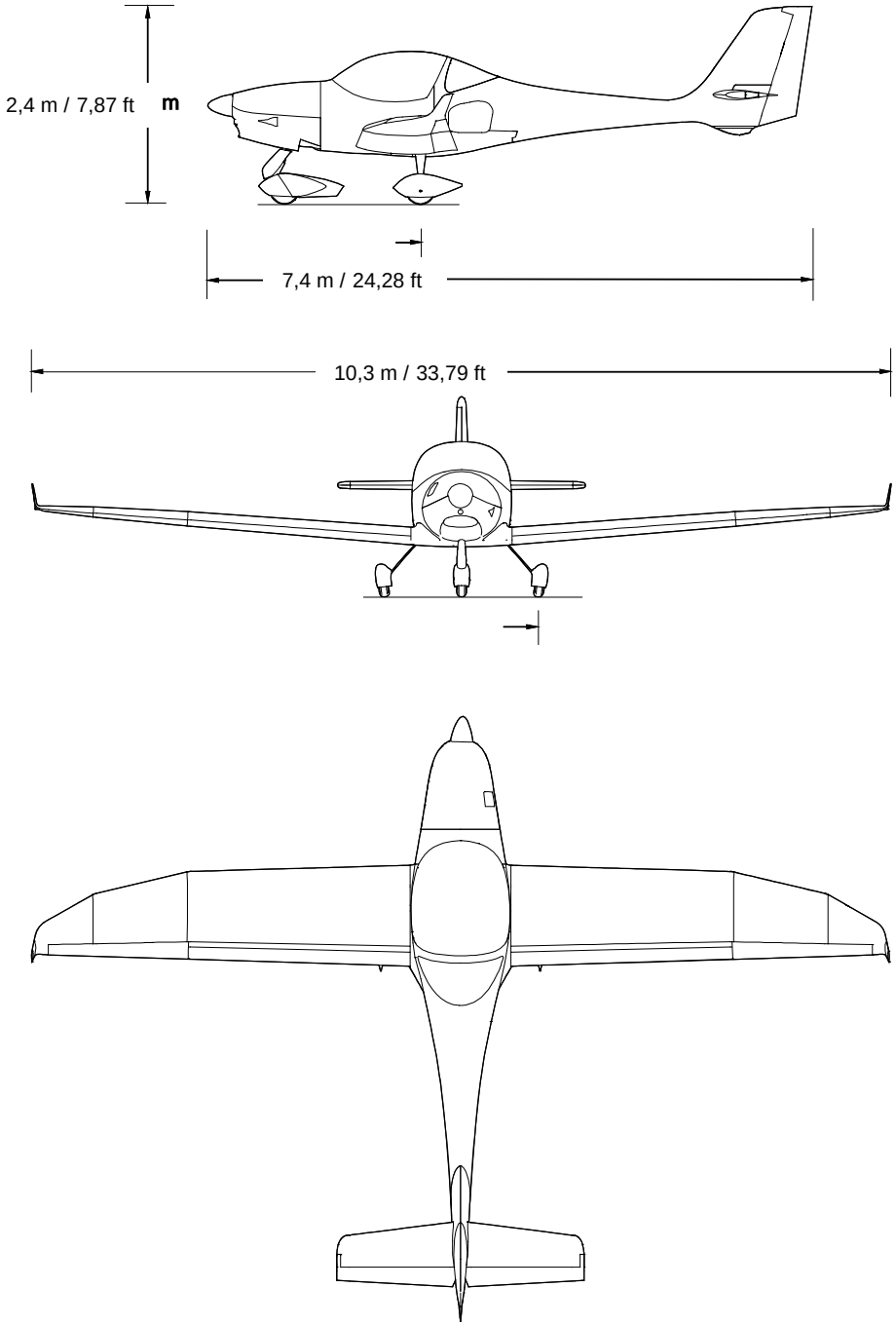
1.4.4 Fuselage and Vertical Stabilizer / Rudder

Maximum Fuselage Width	3.94 ft	(1.20 m)
Length	24.28 ft	(7.40 m)
Area (Vertical Tail):	15.61 sq. ft	(1.45 m^2)

1.4.5 Landing Gear

Wheel Track:	6.37 ft	(1.94 m)
Wheel Base:	5.54 ft	(1.69 m)
Tire Size:	5.00-5	

1.5 AQUILA AT01-100 – THREE VIEW DRAWING



1.6 ENGINE

The ROTAX® 912 S3 is a 4-cylinder 4-stroke engine with air cooled cylinders and liquid cooled cylinder heads.
The Propeller is driven via an internal reduction gearbox with an integrated overload clutch and a hydraulic constant speed propeller governor.

Reduction Ratio of internal gearbox:	2.43 : 1	
Displacement:	82.5 in³	(1352 cm³)
max. Takeoff power (5 min.):	98.6 BHP	(73.5 kW)
at max. Takeoff propeller speed:	2385 RPM	
max. continuous power:	92.5 BHP	(69.0 kW)
at max. continuous propeller speed:	2260 RPM	

1.7 PROPELLER

Hydraulic two-blade, constant speed propeller

Manufacturer:	mt-Propeller	
Type:	MTV-21-A/170-05	
Diameter:	66.9 in	(170 cm)

1.8 FUEL

The following fuel grades are approved for use (min. RON 95):

EN228 Super	ASTM D4814
EN228 Super plus	
AVGAS 100LL	ASTM D910
AVGAS UL 91	ASTM D7547

	Left Fuel Tank	Right Fuel Tank
Fuel Capacity (total):	15.8 US gal (60 l)	15.8 US gal (60 l)
Usable Fuel (total):	14.48 US gal (54.8 l)	14.48 US gal (54.8 l)
Unusable Fuel:	1.37 US gal (5.2 l)	1.37 US gal (5.2 l)

Due to the higher lead content in AVGAS 100LL, wear of the valve seats, deposits in the combustion chamber and lead sediments in the lubrication system will increase when using this type of fuel. Therefore AVGAS should only be used if you encounter problems with vapor lock or if the other fuel types are not available.

Lead free AVGAS UL 91 is similar to AVGAS 100LL (MON 91 ⇒ RON > 95) when it comes to vapor lock susceptibility. However, it does not suffer from lead induced problems.
(Please refer to the current issue of the operating manual for the ROTAX® 912 engine series)

1.9 ENGINE OIL AND COOLANT

1.9.1 Engine Oil

Use only oil with an API classification of “SG” or higher. Heavy duty 4-stroke motor oils tend to meet these requirements. For more information regarding engine oil selection, please refer to the Operator’s Manual for all versions of the 912 engine series, section 10.2.3, and to the current issue of the ROTAX® Service Instruction SI-912-016.

The following chart shows the recommended oil viscosity as a function of the climatic conditions. The use of multi-grade oils is recommended.

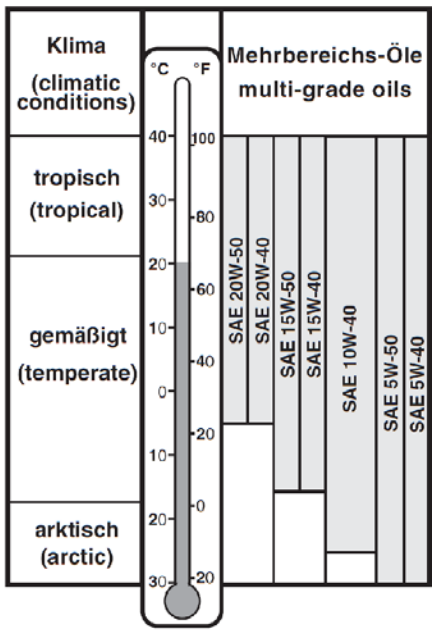


Figure 1-2

CAUTION

Do <u>not</u> use aviation grade oil!

*When operating the engine with AVGAS do **<u>not</u>** use full synthetic oil!*
If the engine is operated extensively on AVGAS 100LL (more than 30hrs within 100hrs) the interval between oil changes shall be reduced to 50 hrs!
(please refer to the current issue of the ROTAX® Service Instructions SI-912-016)

Max. Oil Capacity:	3.17 US quarts	(3.00 l)
Difference between Max/Min:	0.475 US quarts	(0.45 l)
Max. Oil Consumption:	0.063 US quarts/hr.	(0.06 l/h)

1.9.2 Engine Coolant

A conventional, ethylene glycol and water based coolant is used.

Please refer to the Operator's Manual for the 912 engine series, section 10.2.3, and to the current issue of the ROTAX® Service Instructions SI-912-016 when choosing an engine coolant.

Description	Ethylenglycol	Water
Mixture ratio [%] anti-freeze / water	50 + 15	50 - 15

CAUTION

Low quality or contaminated coolant may lead to deposits in the cooling system which may result in insufficient engine cooling.

Coolant Quantity:	Minimum:	2.54 US quarts	(2.4 l)
	Maximum:	2.64 US quarts	(2.5 l)
Overflow Bottle:	Minimum:	0.106 US quarts	(0.1 l)
	Maximum:	0.21 US quarts	(0.2 l)

1.10 WEIGHTS

Maximum Takeoff Weight (MTOW):		1653 lb.	(750 kg)
Maximum Landing Weight (MLW):		1653 lb.	(750 kg)
Empty Weight (MZFW):		Refer to section 6	
Max. Weight in Baggage Compartment:		88.2 lb.	(40 kg)
(All baggage must be adequately strapped and secured)			
Max. Wing Loading:		14.6 lb./ft²	(71.4 kg/m²)
Min. Wing Loading:	ca.	10.77 lb./ft²	(52.6 kg/m²)

1.11 TERMINOLOGY AND ABBREVIATIONS

1.11.1 Speeds

IAS: (Indicated Airspeed) - the speed shown on the airspeed indicator

KIAS: IAS expressed in knots

CAS: (Calibrated Airspeed) - the indicated airspeed, corrected for position and instrument error. CAS is equal to true airspeed in standard atmosphere conditions at sea level.

KCAS: CAS expressed in knots

TAS: (True Airspeed) - the airspeed relative to undisturbed air, which is the CAS corrected for altitude, temperature and compressibility.

GS: (Ground speed) - speed of the aircraft relative to the ground

V_A: Maneuvering Speed

V_S: Stall speed without engine power

V_{S0}: Stall speed without engine power in the landing configuration

V_X: Best Angle-of-Climb Speed

V_Y: Best Rate-of-Climb Speed

V_{FE}: Maximum Flap Extended Speed

V_{NE}: Never Exceed Speed - The speed limit that must not be exceeded at any time

V_{NO}: Maximum Structural Cruising Speed is the speed that should not be exceeded except in smooth air and then only with caution.

1.11.2 Weight and Balance

Reference Datum:	An imaginary vertical plane from which all horizontal distances are measured for balance purposes
Reference Line:	fixed horizontal reference line
Lever Arm:	The horizontal distance from the reference datum to the center of gravity (C.G.) of an item
Moment:	The product of the weight of an item multiplied by its lever arm
Empty Weight:	Weight of the aircraft including unusable fuel, full operating liquids and full oil.
Max. Takeoff Weight:	Maximum permissible weight approved for the conduction of the takeoff run
Useful Load:	Difference between takeoff weight and basic empty weight
Usable Fuel:	Fuel available for flight planning
Unusable fuel:	Fuel remaining in the fuel tanks that cannot be safely used in flight.
Center of Gravity (C.G.):	The point at which the aircraft would balance if it were possible to suspend it at that point
MAC:	Mean aerodynamic chord
MTOW:	Maximum take off weight
MWL:	Maximum landing weight
MZFW:	Empty weight

1.11.3 Meteorological Terminology

ISA:	International Standard Atmosphere
MSL:	Altitude above sea level
OAT:	Outside Air Temperature
QNH:	Barometric pressure adjusted to sea level
SAT:	Static Air Temperature - equal to OAT
VFR, Day:	Beginning of morning civil twilight until end of evening civil twilight (sun 6° below horizon)
VFR, Night:	End of evening civil twilight until beginning of morning civil twilight (sun 6° below horizon)
DVFR:	Flight during the day according to visual flight rules
NVFR:	Flight during the night according to visual flight rules

1.11.4 Engine and Performance

TOP:	(Take-off Power) - maximum power permissible for takeoff
MCP:	(Max. Continuous Power) - maximum power permitted for continuous operation

1.11.5 Various

Serial No. (S/N):	Serial Number of the Aircraft
Part No. (P/N):	Part Number
GFRP:	Glass Fiber Reinforced Plastic
CFRP:	Carbon Fiber Reinforced Plastic
ACL:	Anti Collision light
VFR:	Visual Flight Rules
PFD:	Primary Flight Display
ADC	Air-Data Computer
AHRS	Attitude and Heading Reference System
GDU	Garmin Display Unit
MFD	Multi-Function Display
AI	Attitude Indicator or Artificial Horizon
LDG:	Flaps - landing position
T/O:	Flaps - takeoff position
UP:	Flaps - cruise position
MP:	Manifold Pressure
COM:	Communication
NAV:	Navigation
CB:	Circuit Breaker
ATC:	Air Traffic Control
FF:	Fuel Flow
rpm:	revolutions per minute
AS:	AQUILA Supplement
EMS:	Engine Monitoring System

1.12 CONVERSION FACTORS

1.12.1 Length

1 ft	=	0.304	m	
1 in	=	25.4	mm	

1.12.2 Speed

1 kt	=	1.852	km/h	
1 mph	=	1.609	km/h	

1.12.3 Pressure

1 hPa	=	100	N/m^2	=	1 mbar
1 in. Hg	=	33.865	hPa		
1 psi	=	68.97	mbar		

1.12.4 Mass (“Weight”)

1 lb	=	0.454	kg	

1.12.5 Volume

1 US Gallon	=	3.78	Liter	
1 Imperial Gallon	=	4,546	Liter	

1.12.6 Temperature

(t) °C (Celsius)	=	5/9 ((t) °F-32)		
(t) °F (Fahrenheit)	=	9/5 (t) °C+32		

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LIMITATIONS

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2.1 INTRODUCTION

This section includes all operating limitations, instrument markings and basic placards necessary for the safe operation of the aircraft, its engine, standard systems and standard equipment.

WARNING

The aircraft must be operated in compliance with the operating limitations.

The GARMIN G500 / G500 TXi Cockpit Reference Guide and the Operating Instructions for the Glass Panel Engine Monitor MVP-50P-AQ must be carried on board the aircraft and be accessible to the crew during flight.

2.2 AIRSPEED LIMITATIONS

The airspeeds given below are expressed in Indicated Airspeeds (IAS), the airspeed shown on the airspeed indicator:

Indicated Airspeed (IAS)	[kts]	Remarks
V_A Maneuvering speed	**112**	Do not make full or abrupt control movements above this speed. This may result in overloading the aircraft structure.
V_{FE} Maximum flap extended speed	**90**	Do not exceed this speed with flaps in T/O or LDG position.
V_{NO} Maximum structural cruising speed	**130**	Do not exceed this speed except in smooth air, and then only with caution.
V_{NE} Never exceed speed	**165**	Do not exceed this speed in any operational condition.

2.3 AIRSPEED INDICATOR MARKINGS

The airspeeds given below are expressed in Indicated Airspeeds (IAS):

Marking (IAS)	[kts]	Remarks
White arc	**39-90**	Full flap operating range
Green arc	**49-130**	Normal operating range
Yellow arc	**130-165**	Operations in this region must be conducted with caution and only in smooth air.
Red line	**165**	Maximum speed for all operations.

2.4 POWER PLANT LIMITATIONS

2.4.1 Engine

a) Manufacturer: BRP-ROTAX GmbH & Co KG, Gunskirchen, Austria

b) Model: 912 S3

NOTE

The engine is equipped with a hydraulic propeller governor and drives the propeller via a reduction gearbox. The gearbox reduction ratio is 2.43 : 1.

The tachometer indicates the propeller speed. As a result, all rpm readings in this manual are expressed as propeller speeds, unlike the data in the Engine Operator's Manual.

c) Power Plant Limitations

Maximum Takeoff Power:	98.6 BHP	(73.5 kW)
Maximum Takeoff Prop Speed (5 min.):	2385 RPM	
Maximum Continuous Power:	92.5 BHP	(69.0 kW)
Maximum Continuous Prop Speed:	2260 RPM	

d) Oil Pressure

Minimum :	11.6 psi	(0.8 bar)	below 590 RPM
Normal:	29 –72.5 psi	(2.0-5.0 bar)	above 590 RPM
Maximum during a cold start: (only for a short time)	101.5 psi	(7.0 bar)	

e) Fuel Pressure

Minimum:	2.2 psi	(0.15 bar)
Maximum:	7.2 / 5.8* psi	(0.5 / 0.4* bar)

f) Oil Temperature

Maximum:	266 °F	(130 °C)
Minimum:	122 °F	(50 °C)

g) Cylinder Head Temperature (CHT)

Maximum:	248 / 264** °F	(120 / 129**) °C

h) Minimum temperature to start the engine

Minimum:	-13 °F	(-25 °C)

At an OAT below -13 °F (-25 °C) the engine must be preheated.

2.4.2 Propeller

a) Manufacturer: mt-Propeller Entwicklung GmbH, Atting, Germany

b) Model: MTV-21-A/170-05

c) Propeller diameter: (66.9 in) 1,70 m

d) Propeller speed limitations

Maximum take-off propeller speed (max. 5 min): 2385 RPM

Maximum continuous propeller speed: 2260 RPM

* mechanical fuel pump before S/N 11.0036 (see SB-AT01-031)

** old type of cylinder head at cylinder no. 3 (see SB-AT01-029)

2.5 MARKINGS ON THE ENGINE MONITOR MVP-50P-AQ

The following table shows the instrument markings shown on the MVP-50P-AQ and their meaning.

MVP-50P-AQ	**Red Line** (minimum)	**Green Arc** (normal operating range)	**Yellow Arc** (caution)	**Red Line** (maximum)
Tachometer [RPM]	---	535 – 2260	2260 - 2385	2385
Oil Temperature [°F] ([°C])	122 (50 °C)	122-266 (50 – 130 °C)	---	266 (130 °C)
Cylinder Head Temperature [°F] ([°C])	---	---	---	248 / 264** (120 / 129**)
Oil Pressure [psi] ([bar])	11.6 (0.8 bar)	29 – 72.5 (2.0 – 5.0 bar)	11.6 – 29 (0.8 – 2.0bar) 72.5 – 101.5 (5.0 – 7.0bar)	101.5 (7.0 bar)
Fuel Pressure [psi] ([bar])	2.2 (0.15)	2.2 – 7.2 / 5.8* (0.15 – 0.5 / 0.4*)	---	7.2 / 5.8* (0.5 / 0.4*)
Voltmeter [V]	11	12.5 - 15.5	11 - 12.5	15.5

* mechanical fuel pump before S/N 11.0036 (see SB-AT01-031)

** old type of cylinder head at cylinder no. 3 (see SB-AT01-029)

2.6 WEIGHT LIMITS

Maximum Takeoff Weight	1653 lb	(750 kg)
Maximum Landing Weight	1653 lb	(750 kg)
Max. Weight in Baggage Compartment	88.2 lb	(40 kg)

WARNING

Exceeding the weight limits can overload the aircraft and is prohibited. In addition, aircraft performance and handling characteristics may be detrimentally affected. The stall speed will increase, so that the instrument markings are no longer accurate.

2.7 CENTER OF GRAVITY LIMITS

The reference datum is located at the wing leading edge, at the fuselage-wing junction.
With the aircraft leveled, the reference datum and the vertical fall in a plane.

The center of gravity must be within the following limits:

Forward Limit:	16.8 in.	(0.427 m)	aft of Datum
Rearward Limit:	20.6 in.	(0.523 m)	aft of Datum

WARNING

Exceeding the center of gravity limits is prohibited. Exceeding the limits reduces the controllability and stability of the aircraft.

The procedure to determine the center of gravity location for flight is provided in Section 6 of this handbook.

2.8 MANEUVER LIMITS

The aircraft is certificated in accordance to the JAR-VLA. That certification includes the following maneuvers:

a) All normal, non acrobatic maneuvers.

b) Stalls: Wings level stall

c) Steep Turns: Angle of Bank ≤ 60°

d) Chandelle: Entry Speed 120 kts

e) Lazy Eight: Entry Speed 110 kts

NOTE

All acrobatic maneuvers as well as maneuvers with a bank angle exceeding 60° are prohibited.

2.9 FLIGHT LOAD FACTORS

The following flight load factors may not be exceeded while performing any approved maneuvers.

Flight Load Factor [g]	at V_A	at V_{NE}	With Flaps Extended
Positive	4.0	4.0	2.0
Negative	-2.0	-2.0	0

WARNING

Exceeding the flight load factors limits may result in damage to the aircraft structure.

CAUTION

Maneuvers that include intentional negative flight load factors are not permitted.

Intentional Spinning is not permitted.

2.10 CREW

Maximum number of people on board: 2

Minimum crew: 1 Pilot

With only one person on board, the aircraft may only be operated from the left seat.

2.11 KINDS OF OPERATION LIMITS / MINIMUM EQUIPMENT

Certified for: visual flights by Day and Night

Table 1	For VFR by Day and Night*
Flight and navigational instruments	• Garmin G-500 / G500 TXi • Magnetic Compass • Working timepiece with a seconds hand *** • VHF Transceiver * • GPS Receiver Garmin 400W/500W Series or GTN (6XX/7XX) • Attitude Indicator**** • Transponder with altitude encoding or a Transponder without altitude encoding plus an altimeter • Speed Indicator*****
Power Plant Instruments	• MVP-50P-AQ • Annunciator panel AP7DAQ
Lighting	• Position lights • Anti Collision Lights • Landing Lights • Instrument lighting • Cabin lighting • Flashlight
Other Equipment	• Seat belts for each occupied seat • Emergency Hammer • Battery ≥ 26 Ah • Second 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.

**** Not valid for FAA registered aircrafts

***** Valid only for FAA registered aircrafts

NOTE

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

2.12 FUEL LIMITATIONS

	Left Fuel Tank	Right Fuel Tank
Fuel capacity (total):	15.85 US gal (60.0 l)	15.85 US gal (60.0 l)
Usable fuel (total):	14.48 US gal (54.8 l)	14.48 US gal (54.8 l)
Unusable fuel:	1.37 US gal (5.2 l)	1.37 US gal (5.2 l)

For approved fuel grades, please refer to paragraph 1.8.

CAUTION

To ensure both fuel tanks are emptied evenly, switch to the other tank at least every 60 minutes.

NOTE

The amount of unusable fuel was determined with flap on LDG and V_{FE} = 90 kts. It is the worst case fuel supply configuration within section 4 "NORMAL PROCEDURES".

NOTE

The fuel quantity, fuel used and fuel remaining functions of the G500 / G500 TXi / MVP-50 are advisory information only and must be verified by the pilot.

2.13 TEMPERATURE LIMITATIONS

Parts of the aircraft structure that are exposed to direct vertical sunlight must be painted WHITE.

2.14 OPERATING ALTITUDE

The Aquila AT01-100 has a maximum operating altitude of 14,500 ft.

2.15 PLACARDS

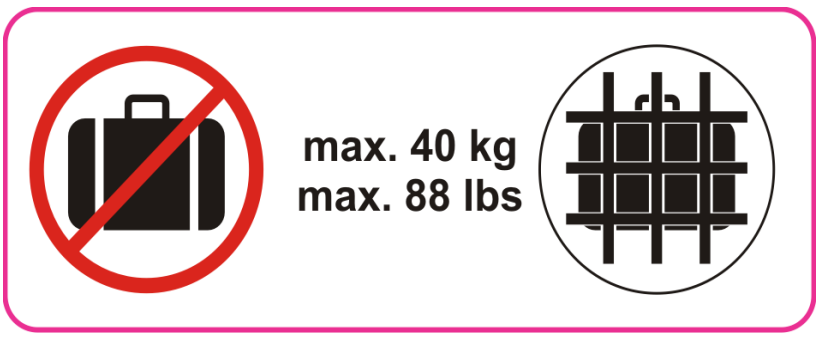
1) On the instrument panel, in the lower middle section of the panel:

This aeroplane is classified as VLA (Very Light Aeroplane) for Day and Night VFR in non-icing conditions. All aerobatic maneuvers including intentional spinning are prohibited. See Flight Manual for other limitations.

2) On the instrument panel below the Airspeed Indicator:

MANEUVERING SPEED
V_A = 112 KIAS

3) On the inner surface of the baggage compartment door:



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3.1 INTRODUCTION

This section provides checklists with the recommended procedures for coping with various emergency situations.
Emergencies caused by aircraft or engine malfunctions are extremely rare if all pre-flight inspections and required maintenance is properly conducted.
However, should an emergency situation occur, the procedures provided here are recommended to correct the problem and master the situation.

Not all types of emergency situations or combinations can be described in the POH. A pilot must therefore always use good airmanship and have a sound knowledge of the aircraft and its systems.

3.1.1 Resetting Circuit-breakers

The **one time only** resetting of a tripped circuit breaker or safety switch is considered a recommendation for the following emergency procedures.

Applicable for all switches: pushing the top = ON; pushing the bottom = OFF

CAUTION

A tripped circuit breaker or safety switch should only be reset if it is needed for continued safe flight and landing. In extreme cases, resetting a circuit breaker may cause an electrical fire.

*A circuit breaker or safety switch should only be reset **once** and be inspected after flight.*

3.2 AIRSPEEDS FOR EMERGENCY OPERATION

Airspeed (IAS)		**[kts]**
Maneuvering speed	V_A	112
Speed for best glide ratio		
Flaps	UP	78
Flaps	T/O	73
Precautionary landing with / without engine power		
Flaps	LDG	60
Landing without engine power		
Flaps	T/O	65
Flaps	UP	70

3.3 ENGINE FAILURES – CHECKLISTS

3.3.1 Engine Failure before Take-off

1.	Throttle	IDLE
2.	Brakes	APPLY as required

3.3.2 Engine Failure Immediately After Take-off and during Climb

1.	Airspeed (IAS)	70 KIAS

WARNING

Depending on the own speed and altitude, the wind condition and the remaining engine power a forced landing must be initiated under consideration of the local conditions.

Turning back to the runway only at adequate altitude, otherwise land straight ahead ! Pay attention to the speed !

Check the following items (if time allows):

2.	Fuel selector valve	SWITCH to fullest or other tank
3.	**Fuel Pump** switch	ON
4.	Ignition switch	BOTH
5.	Throttle	wide OPEN
6.	Propeller control lever	START position
7.	Choke	PRESS (OFF)
8.	Carburetor heat	PULL (ON)

Before landing (if possible):

9.	Fuel selector valve	OFF
10.	Ignition switch	OFF
11.	**ALT1 / BAT** switch	OFF

WARNING

*With **BAT** switch in OFF position:* *Stall warning system inoperative and flap position cannot be changed !*

3.3.3 In-flight Engine Failures

A) ENGINE ROUGHNESS

1. Carburetor heat	PULL (ON)
2. **Fuel Pump** switch	ON
3. Ignition switch	SWITCH through the positions L-BOTH, then R-BOTH
4. Throttle	Maintain setting

If roughness continues:

5. Throttle	REDUCE to min. required for flight

If roughness is acceptable:

6. Precautionary Landing	PERFORM (see 3.4.1)

If roughness is unacceptable:	gas bowden cable may be broken
6. Throttle	wide OPEN (increase engine power until engine is running as calm as possible)
7. Propeller control lever	KEEP RPM in green range

When safe approach altitude for nearest landing field is reached:

8. Perform emergency landing with engine off according to section 3.4.2.

WARNING

If the gas bowden cable is broken, the spring-loaded throttle valve in the carburetor is opening completely. With the failure only on one side, the engine will run very roughly and only by setting full throttle on the still controllable carburetor safe climbing is still possible. For landing the engine has to be turned off at a safe approach altitude.

B) LOSS OF OIL PRESSURE

1. Oil Temperature	CHECK

If oil pressure sinks below the green range and the oil temperature remains normal:

2. Land at the nearest airfield

If oil pressure sinks below the green range and the oil temperature rises:

2. Throttle	REDUCE to min. required for flight
3. Precautionary landing	PERFORM, Engine may fail suddenly!

C) LOSS OF FUEL PRESSURE

1. **Fuel Pump** switch	ON
2. Fuel selector valve	SWITCH to fullest or other tank
3. **Fuel Pump** switch	OFF, when fuel pressure in green range

NOTE

After switching fuel tanks, it may take up to 8 seconds for full fuel pressure to be built up.

4. If fuel pressure remains below the green range:

Land at the nearest airfield
Engine may fail suddenly!

D) ENGINE RESTART PROCEDURE WITH STOPPED PROPELLER

1.	Non-essential electrical equipment		OFF
2.	**ALT 1 / BAT** switch		ON
3.	Propeller control lever		START position
4.	Fuel selector valve		SWITCH to fullest tank
5.	**Fuel Pump** switch		ON
6.	Throttle	warm engine	OPENED 2 cm
		cold engine	IDLE
7.	Choke	warm engine	PUSHED (OFF)
		cold engine	PULL (ON)
8.	Ignition switch		BOTH, then START

When power is restored:

9.	Oil pressure	CHECK
10.	Choke	PUSHED (OFF)
11.	Electrical equipment	SWITCH ON (as required)
12.	Oil temperature	CHECK

NOTE

The engine can also be restarted by Windmilling if the airspeed is increased to approx. 120 kts. Approx. 1000 ft / 300 m of altitude is required in this method.

E) ENGINE RESTART PROCEDURE WITH WINDMILLING PROPELLER

At airspeeds above 60 kts the propeller continues to windmill with the engine off.

1.	Airspeed	78 KIAS
2.	**ALT1 / BAT** switch	ON

3.	Fuel selector valve		SWITCH to fullest or other tank
4.	Propeller control lever		START position
5.	**Fuel Pump** switch		ON
6.	Ignition switch		BOTH
7.	Throttle	hot engine	OPENED 2 cm
		cold engine	IDLE
8.	Choke	hot engine	PUSHED (OFF)
		cold engine	PULL (ON)

When power is restored:

9.	Oil pressure	CHECK
10.	Choke	PUSHED (OFF)
11.	Electrical equipment	SWITCH ON (as required)
12.	Oil temperature	CHECK

3.4 FORCED LANDINGS

Generally the flight path should always be chosen such that, in the event of an emergency, a suitable landing field can be reached.

CAUTION

If, after a forced landing, the aircraft flips over, an emergency hammer can be used to break through the canopy. For this purpose an emergency hammer is attached to back of the right hand seat.

3.4.1 Precautionary Landing

NOTE

A precautionary landing occurs when the pilot decides to discontinue flight to avoid a situation degrading into an emergency. This way the pilot has time to make decisions and choose an adequate landing site or divert to an airfield. The procedure for a precautionary landing is fundamentally the same as a normal landing, which is described in Section 4.
The choice of the landing field is here of particular importance.
Deteriorating weather is a leading cause of precautionary landings.

1.	Locate Suitable Field	CONSIDER wind direction, terrain and obstructions.
2.	Seat Belts and Harnesses	TIGHT
3.	Initiate descent	
4.	If possible: Overfly landing site at a low altitude and inspect (wind direction, terrain and obstructions)	

5. Abeam the touchdown point:

Throttle	AS REQUIRED
Propeller Control Lever	START position
Carburetor Heat	PUSHED (OFF)
Fuel Pump switch	ON
Flaps	LDG
Airspeed	60 KIAS

6. Touch down with lowest possible airspeed.
7. After touch down:

Brakes	APPLY as required
Fuel selector valve	OFF
Ignition switch	OFF
ALT1 / BAT switch	OFF

NOTE

*After switching off the **ALT1/BAT** switch, the landing light will also switched OFF. A suitable illumination of the landing area is not possible.*

3.4.2 Emergency Landing

NOTE

An emergency landing occurs in a state of distress, such as an engine failure, fuel starvation or mechanical problems with the aircraft. In this case a pilot typically has significantly less time to choose a landing site compared with a precautionary landing.

1. Airspeed:

Flaps in LDG position	60 KIAS
Flaps in T/O position	65 KIAS
Flaps in UP position	70 KIAS

2. Fuel selector valve — OFF
3. Ignition switch — OFF
4. Seat belts and harnesses — TIGHT
5. COM (ATC) — REPORT location and intention
6. **ALT1 / BAT** switch — OFF
7. ELT — activate manually, if necessary

WARNING

*With **ALT1/BAT** switch OFF:*

⇨ *Stall warning inoperative*

⇨ *Flap position cannot be changed*

⇨ *Landing light is OFF*

3.5 SMOKE AND FIRE

3.5.1 Engine Fire on the Ground

1.	Fuel selector valve	OFF
2.	Throttle	WIDE OPEN
3.	**ALT1 / BAT** switch	OFF
4.	Ignition switch	OFF
5.	Aircraft	EVACUATE immediately once engine stops

3.5.2 Engine Fire In-flight

1.	Throttle	WIDE OPEN
2.	Fuel selector valve	OFF
3.	Cabin heat	PUSHED (OFF)
4.	Canopy slide-window	OPEN
5.	Perform a precautionary landing without engine power as described in Sect.3.4.2	

3.5.3 Electrical Fire with Smoke on the Ground

1.	**ALT1 / BAT** switch	OFF

If engine is running:

2.	Throttle	IDLE
3.	Fuel selector valve	OFF
4.	Ignition switch	OFF
5.	Canopy	OPEN
6.	Fire extinguisher (if installed)	USE as required

3.5.4 Electrical Fire with Smoke in Flight

1.	**ALT1 / BAT** switch	OFF
2.	**ALT 2** circuit breaker	PULL
3.	**Avionics** switch	OFF
4.	All switches (except Ignition)	OFF
5.	Cabin ventilation and canopy slide-window	OPEN
6.	Flashlight	ON
7.	Fire extinguisher (if installed)	Use only if smoke persists
8.	Land immediately	Refer to Section 3.4 Forced Landings

After landing and aircraft comes to a halt:

9.	Engine	Shut down
10.	Canopy	OPEN
11.	After engine stops	Evacuate aircraft

CAUTION

When a large amount of smoke is present or the fire extinguisher has been used, ventilate the cabin by unlocking the canopy latch. If possible, the fire extinguisher should be secured after use.

WARNING

*Turning the **ALT1 / BAT** switch OFF and simultaneously pulling OFF **ALT 2** circuit breaker turns off all electrical and electronic equipment, including the flaps, stall warning and landing light !*

Possibilities for stabilizing the attitude at N/VFR:

- ⇨ Visual external references (e.g. horizon, lights on ground)
- ⇨ Standby Attitude Indicator
  - o With its own battery (e.g. GARMIN G5 AI, if installed) or
  - o switch **BAT** to ON or PUSH **ALT 2** circuit breaker for 10 seconds and repeat it all 30 seconds to keep AI running

3.6 INADVERTENT FLIGHT IN ICING CONDITIONS

WARNING

Intentional flight in icing conditions is prohibited. During unintentional flight in icing conditions proceed as follows:

1. Carburetor heat — PULL (ON)
2. Leave icing conditions immediately by flying a reciprocal heading and/or changing altitude
3. **P/S Heat** switch (if installed) — ON
4. Propeller Control Lever — START position
5. Cabin heat — PULL (ON)
6. Move the control surfaces periodically to keep them from freezing

CAUTION

The stall speed increases with ice accumulation on the wing leading edge.

Airspeed indicator, altimeter and vertical speed indicator readings may be inaccurate with ice accumulation on the leading edge of the wing. Additionally, the stall warning system may be inoperative or may not work correctly.

3.7 SPIN RECOVERY PROCEDURE

1.	Rudder	Full deflection opposite direction of rotation
2.	Elevator	Neutral or slightly forward
3.	Aileron	Neutral
4.	Throttle	IDLE
5.	Flaps	UP
6.	Rudder	Neutral when rotation stops
7.	Elevator	Carefully ease out of dive

Make a smooth recovery from the dive to regain a level flight attitude. Do not exceed V_{NE}.

WARNING

During spin recovery, adherence to the recovery sequence is essential!

3.8 POWER-OFF GLIDE

Achievable gliding distances vary depending on altitude and current wind conditions. This is very important when choosing a landing site or reaching a near-by airfield.

To achieve maximum gliding distance:

1.	Flaps	UP
2.	Airspeed	78 KIAS
3.	Demonstrated glide ratio	14 This means approx. 2.3 NM can be covered for every 1000 ft of altitude (no wind)

NOTE

Headwinds, tailwinds and wing contamination can significantly influence the distance achievable in glide.

3.9 LANDING WITH A FLAT TIRE

When landing with a defective tire, or this is suspected, proceed as follows:

1. Flaps — LDG position
2. Perform touch down on the side of the runway opposite the defective tire. This allows the use of the entire runway width to correct any directional changes caused by the defective tire (for example: left tire defective, land on the right side of the runway)
3. Perform touch down with the undamaged main tire first. Lower nose wheel as quickly as possible to improve controllability on the ground.
4. Roll out with full aileron deflection in the direction of the undamaged main tire. This reduces the load on the damaged tire.
5. When landing with a defective or damaged nose wheel:
   Touch down with minimum speed.
   Keep nose wheel off the ground
   as long as possible.

3.10 ELECTRICAL SYSTEM MALFUNCTIONS

3.10.1 Complete Electrical System Failure

1. Flight Attitude	STABILISE
2. Flashlight	ON
2. **ALT1 / BAT** switch	CHECK if ON
2. **ALT 2** circuit breaker (see 3.1.1)	RESET if tripped
2. **BAT** circuit breaker *(see 3.1.1)*	RESET if tripped
3. **ALT1** circuit breaker *(see 3.1.1)*	RESET if tripped

If power cannot be restored, it is recommended to use the flashlight for the instruments and carry out a precautionary landing at the nearest airfield.

WARNING

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 N/VFR:

- ⇨ Visual external references (e.g. horizon, lights on ground)
- ⇨ Standby Attitude Indicator with its own battery (e.g. GARMIN G5 AI, if installed)

3.10.2 Alternator Failure

3.10.2.1 Warning light **ENG** (RED) with ammeter values shown in RED and/or **ALT1** warning light is illuminated

1. **ALT1** switch	SWITCH OFF then ON, approx. 10 sec. interval
2. **ALT1** circuit breaker *(see 3.1.1)*	RESET if tripped

If **ALT1** warning light remains illuminated:

3. **ALT1** circuit breaker	PULL
4. **ALT1** SWITCH	OFF

5. Instruments not required for the safe continuation of flight should be turned off or dimmed to at least half the intensity.
6. Monitor the voltmeter and ammeter
7. Land at the nearest airfield.

NOTE

ALT 2 *(internal alternator) takes over the power supply. 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 **ALT 2** also fails, the emergency procedures described under in 3.10.2.3 or 3.10.2.4 must be followed.*

Even with the audio panel turned off the pilot can still transmit with COM 1 (Failsafe Design) via his headset. Use of the Intercom is not possible.

WARNING

Before returning the aircraft to service, the problem must be resolved.

3.10.2.2 **ALT 2** warning light illuminates

1. **ALT 2** circuit breaker *(see 3.1.1)* RESET if tripped

If **ALT 2** warning light remains on:

2. **ALT 2** circuit breaker PULL

NOTE

ALT 1 *(external alternator) takes over the power supply. The flight may be continued, reducing electrical power consumption to a minimum (monitor ammeter) as sufficient power is available. If* ***ALT 1*** *also fails, the emergency procedures described under 3.10.2.3 or 3.10.2.4 must be followed.*

WARNING

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

3.10.2.3 **ENG** (RED) warning light with ammeter values in RED and / or **ALT 1** and **ALT 2** warning lights illuminate

When both alternator warning lights in the annunciator-panel and / or a RED ammeter value in the MVP-50P-AQ are illuminated, that neither alternator is supplying current to the electrical system.

1. **ALT 1** switch switch OFF then ON
2. **ALT 1** circuit breaker *(see 3.1.1)* RESET if tripped
3. **ALT 2** circuit breaker *(see 3.1.1)* RESET if tripped

If warning lights **ALT 1** and **ALT 2** remain on:

4. **ALT 1** circuit breaker PULL
5. **ALT 2** circuit breaker PULL
6. **ALT 1** switch OFF

NOTE

The battery will supply all critical aircraft systems with power for at least 30 minutes. The illumination of the ***ENG*** *(RED) warning light with RED ammeter values marks the beginning of the 30 minute power supply.*
Radio communications should be kept to a minimum and all equipment which is not required for the continuation of flight should be shut off to extend battery life.
A landing must be completed within 30 minutes.

WARNING

Before returning the aircraft to service, the problem must be resolved.

3.10.2.4 **ENG** (RED) warning light with ammeter values in RED

Both alternators supplies too low voltage.

1. **ALT 1** switch	switch OFF then ON; approx. 10 sec. break
2. **ALT 1** circuit breaker (*see 3.1.1)*	RESET if tripped
3. **ALT 2** circuit breaker *(see 3.1.1)*	RESET if tripped

If the low voltage warning light remains on:

4. **ALT 1** circuit breaker	PULL
5. **ALT 2** circuit breaker	PULL
6. **ALT 1** switch	OFF

NOTE

*The battery will supply all critical aircraft systems with power for at least 30 minutes. The illumination of the **ENG** (RED) warning light with RED ammeter values marks the beginning of the 30 minute power supply.*
Radio communications should be kept to a minimum and all equipment which is not required for the continuation of flight should be shut off to extend battery life.
A landing must be completed within 30 minutes.

NOTE

Even with the audio panel turned off the pilot can still transmit with COM 1 (Failsafe Design) via his headset. Use of the Intercom is not possible.

WARNING

Before returning the aircraft to service, the problem must be resolved !

3.10.3 Low Voltage Indication

A) <u>On the ground (voltmeter values YELLOW or RED)</u>

1.	Engine speed	Increase RPM until value turns GREEN (RPM should be below 1350)
2.	All non-essential equipment	OFF, until value turns GREEN.
3.	If the value remains YELLOW or RED	Do not fly before problem is eliminated.

B) <u>In flight</u>

<u>Voltmeter value YELLOW</u>

1.	All non-essential equipment	OFF, until value turns GREEN
2.	If the value remains YELLOW	Alternator is defective. Proceed in accordance with section 3.10.2

<u>Voltmeter value RED</u>

1.	Value RED	Alternator is defective. Proceed in accordance with section 3.10.2

C) <u>During approach and landing (voltmeter value YELLOW or RED)</u>

1.	After landing	Proceed in accordance with paragraph 3.10.3 A)

WARNING

If, at any point, the voltmeter value turns RED, land at the nearest airfield and solve the problem before continuing flight.

3.11 FLAP CONTROL SYSTEM MALFUNCTIONS

FLAP POSITION INDICATOR or FLAP ACTUATOR MALFUNCTION

1.	**Flap Actuator** circuit breaker *(see 3.1.1)*	RESET, if tripped
2.	**Flap Control** circuit breaker (see 3.1.1)	RESET, if tripped
3.	Flap position	visually CONFIRM on the left wing
4.	Airspeed	maintain within the WHITE ARC on the airspeed indicator
5.	Flap switch	SWITCH through all positions.

If the flap actuator is inoperative or the flap position indicator reading is incorrect, approach and landing must be conducted at airspeed safe for the current flap setting.

WARNING

During landings with the flaps not in the landing position, stall speed and landing distance increase.

3.12 TRIM CONTROL SYSTEM FAILURES

3.12.1 Trim System Inoperative

1.	**Trim Actuator** circuit breaker *(see 3.1.1)*	RESET, if tripped
2.	**Trim Control** circuit breaker *(see 3.1.1)*	RESET, if tripped
3.	Trim switch	repeatedly PRESS “Nose UP” and then “Nose Down”

NOTE

An inoperative trim system does not affect aircraft controllability. However, the control stick forces are considerably higher and may reach up to 22 lb (10kg).

4. Land at the nearest airfield.

3.12.2 Trim Actuator Runaway

1.	Control Column	HOLD in position
2.	**Trim Actuator** circuit breaker	PULL
3.	Trim switch	CHECK if pressed or jammed

If the problem is obvious, and can be solved:

4.	**Trim Actuator** circuit breaker *(see 3.1.1)*	RESET

NOTE

Approx. 8 seconds are required to trim from full nose-down to full nose-up or vice versa.

If the problem cannot be solved:

4. Land at the nearest airfield.

3.13 AVIONICS MALFUNCTIONS

3.13.1 Complete Avionics Failure

1.	**Avionics** switch	SWITCH OFF then ON, approx. 20 sec. interval

If the switch trips to the off position:

2. Land at the nearest suitable airfield.

3.13.2 Receive Mode Failure of COM-Equipment

1.	Push-to-Talk (PPT) switch	CHECK pilot's and co-pilot's PTT-switches are not pressed or jammed (also check transceiver display). CHECK connectors.
2.	Head-set If no noise is audible:	Momentarily switch off SQUELCH. CHECK head-set connectors.

3.13.3 Transmit Mode Failure of COM-Equipment

1.	Transmit-Signal TX	CHECK if displayed while transmitting.
2.	Selected frequency	CHECK, if correct
3.	Microphone	CHECK, if necessary replace head-set.

If the problem cannot be eliminated, set transponder to 7600 (radio failure) as required.

3.13.4 Primary Flight Display Failure

G500 and G500 TXi:

1. **PFD** circuit breaker *(see 3.1.1)* RESET, if tripped

G500 only:

2. **AHRS** circuit breaker *(see 3.1.1)* RESET, if tripped
3. **ADC** circuit breaker *(see 3.1.1)* RESET, if tripped

It is possible to safely continue flight, even if the PFD 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 fails:

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

3.13.5 Magnetometer Failure

1. **AHRS** circuit breaker (G500 only) RESET, if tripped

NOTE

In the event of a magnetometer failure a red X will be displayed over the course display. If the GDU 620 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. **AHRS** circuit breaker (G500 only) RESET, if tripped
2. Navigation Compass, GPS

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 AHRS Failure

1. **AHRS** circuit breaker (G500 only) RESET, if tripped

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. **ADC** circuit breaker (G500 only) RESET, if tripped
2. 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.

3.13.9 Complete MVP-50P-AQ Failure

1. **Engine Instr. 1** circuit breaker *(see 3.1.1)* RESET, if tripped

If the MVP-50P-AQ failure cannot be corrected, maintain power settings and land at the nearest suitable airfield.

NOTE

During a total failure of the Glass Engine Monitoring Instrument the throttle can be fully opened (MP). Excepting during climb, the propeller control lever should be set below the "MCP" mark.

1) Throttle (MP): OPEN

2) Propeller Control Lever (rpm):

⇒ *During climb: HIGH RPM*

⇒ *All other flight phases: below marking „MCP“*

3.14 STARTER MALFUNCTION

During engine start on ground, power transmission from the starter to the engine is defect (a continuing and excessive howling tone is audible).

1.	Throttle	IDLE
2.	Ignition switch	OFF
3.	Repair damage before conducting planned flight.	

3.15 IN-FLIGHT FAILURES AND MALFUNCTIONS

3.15.1 Inadvertent Release and Opening of the Canopy in flight

In the event of an inadvertent release and opening of the canopy in flight, a stationary canopy opening angle of about 20° - 30°, depending on the flight condition, is reached. Because the canopy opens forwards, the canopy cannot be torn off during flight. Even though the airflow conditions around the aircraft change considerably with an open canopy in flight, the aircraft remains fully controllable. Initial flight attitude changes can be easily corrected. Do not unbuckle the seat belt in order to close the canopy. During solo flights, carefully try to close the canopy without neglecting flight tasks and pilot responsibilities. If this is not possible, continue the flight with the open canopy and land at the nearest airfield.

1.	Keep calm, there is no imminent danger.	
2.	Flight attitude	Stabilize flight attitude. Under consideration of the actual conditions, establish stationary horizontal level flight.
	Airspeed	65 – 75 KIAS
3.	Canopy	If possible, close and lock canopy in flight. Check the canopy locking and the position of the Canopy Locking Lever periodically until landing. If it is not possible to close the canopy, continue flight with the open canopy and land at the nearest airfield.

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SECTION 4

NORMAL PROCEDURES

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4.1 INTRODUCTION

This section provides normal operating procedures and checklists for the aircraft as well as recommended airspeeds under D/VFR and N/VFR.

Additional information is provided in the current issues of the Operators Manual for ROTAX® engine Type 912 series and the Operation and Installation Manual of mt-Propeller® ATA 61-01-024.

Normal procedures associated with optional equipment can be found in Section 9.

4.2 AIRSPEEDS FOR NORMAL OPERATION

The following airspeeds are based on the maximum take-off weight of 1653 lbs (750 kg). They may also be used for any lower operational weight.

TAKE-OFF		
Airspeed (IAS)		**kts**
Normal climb speed to 50 Feet (Flaps **T/O**)		57
Best rate of climb speed at sea level (Flaps **UP**)	V_Y	65
Best angle of climb speed at sea level (Flaps **T/O**)	V_X	52

LANDING		
Airspeed (IAS)		**kts**
Final approach speed for landing (Flaps **LDG**)		60
Balked landing (Flaps **LDG**)		60
Maximum demonstrated crosswind component for take-off or landing		15
Maximum airspeed with Flaps **LDG**	V_{FE}	90

CRUISE		
Airspeed (IAS)		**kts**
Maneuvering speed	V_A	112
Maximum Turbulent Air Operating Speed	V_{NO}	130

4.3 DAILY INSPECTION

CAUTION

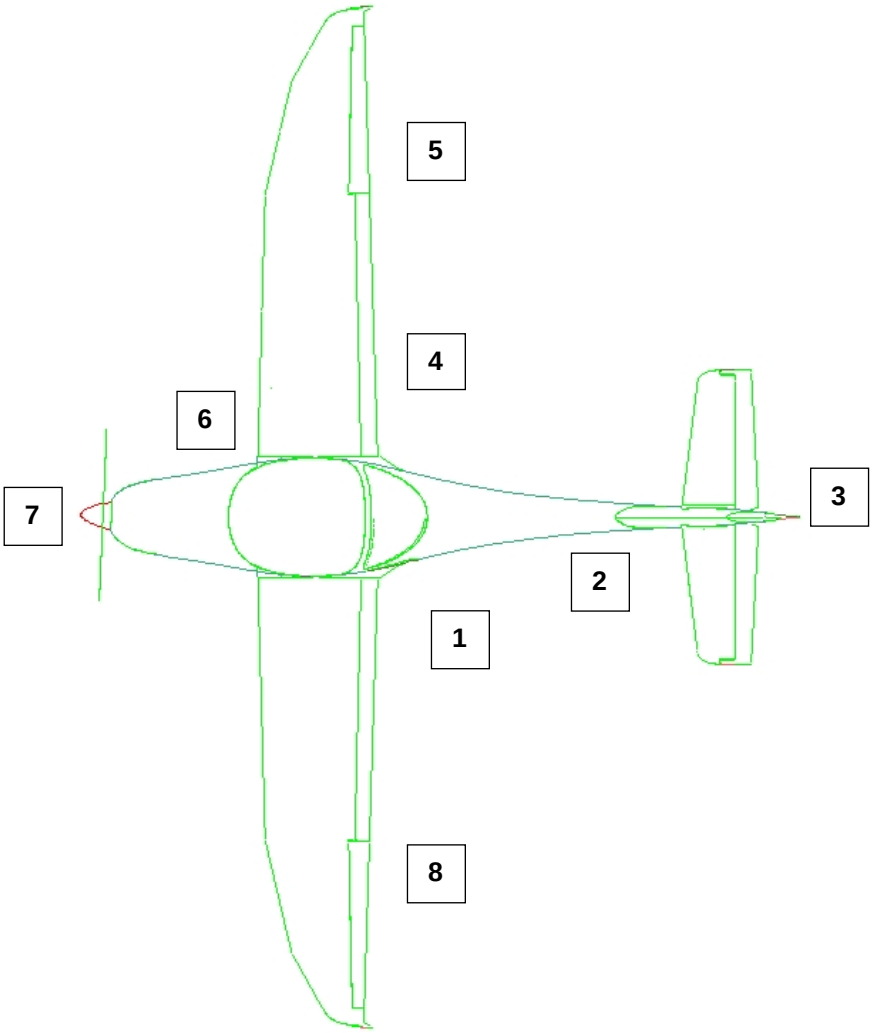
*The daily inspection is begun by checking all 3 fuel sumps for water and contamination. This must be done **before** the aircraft is moved. Otherwise the fuel in the sump may mix.*

1.	Tank drain (left / right wing)	drain and visually inspect for contamination
2.	Electrical fuel pump drain	drain and visually inspect for contamination

A) CABIN

1.	Aircraft Documentation	CHECK on board
2.	Ignition key	REMOVED
3.	**ALT1/ BAT** switch	ON
4.	Annunciator (warning lights)	Press **TEST**; check all ON
5.	**ALT1** switch	OFF
6.	Engine instruments	CHECK
7.	Fuel quantity	CHECK
8.	**Nav Lights** switch	ON, CHECK, OFF
10.	**Landing Light** switch	ON, CHECK, OFF
11.	**Instruments Lights** switch	ON, CHECK, OFF
11.	**BAT** switch	OFF
12.	ELT	CHECK operational
13.	Foreign objects	CHECK and REMOVE, when necessary
14.	Baggage	STOWED and SECURED
15.	Canopy	CHECK condition and cleanliness
16.	Flashlights	CHECK

B) EXTERIOR CHECK, Visual Inspection



CAUTION

In this manual, visual inspection means the following:
Inspect for mechanical damage, dirt, cracks, delamination, excessive play, looseness, leaks, incorrect attachment, foreign objects and general condition.

Control surfaces: in addition, check for free movement.

1. Left main landing gear

a) Landing gear strut	Visual inspection
b) Wheel fairing	Visual inspection (refer to 7.11.4)
c) Tire pressure and slip marking	CHECK
d) Tire, wheel, brake	Visual inspection
e) Chocks (if in use)	REMOVE

2. Fuselage

a) Fuselage shell	Visual inspection
b) Skid plate	Visual inspection
c) Tail tie-down	DISCONNECT

3. Empennage

a) Elevator	Visual inspection
b) Horizontal stabilizer	Visual inspection
c) Rudder	Visual inspection, CHECK: fitting and bolt connection, proper control cable connection and safe-tied.
d) Vertical stabilizer	Visual inspection

4. Right main landing gear

a) Landing gear strut	Visual inspection
b) Wheel Fairing	Visual inspection (refer to 7.11.4)
c) Tire pressure and slip marking	CHECK
d) Tire, wheel, brake	Visual inspection
e) Chocks (if in use)	REMOVE

5. Right wing

a) Entire wing surface (upper and under side)	Visual inspection
b) Fuel vent	CHECK if clear
c) Flap	Visual inspection
d) Aileron and inspection window	Visual inspection
e) Wing tip, NAV lights and ACL	Visual inspection
f) Fuel level	CHECK with dipstick (see inner surface of baggage compartment door) and verify with the indicated fuel level on the fuel gauge cockpit
g) Fuel tank filler cap	CHECK if closed
h) Wing tie-down	DISCONNECT

6. Nose section, cowling

WARNING

Before cranking the propeller:
*Ignition and **ALT1/BAT** switch: OFF*
Set the parking brake.

WARNING

RISK OF BURNS !
Only check the oil and coolant levels when the engine is cool.

a) Check oil level — Turn the propeller several times in the **direction of engine rotation** to pump oil from the engine back into the oil tank.

CAUTION

***NEVER** turn the propeller against the direction of engine rotation.*

Stop turning the propeller when air begins to return to the oil tank. This is indicated by the sound of air rushing from the open oil tank.
Use the oil dip stick, to check that the oil level is between the -min./max.- markings. The difference between -min./max.- is approximately 0.48 US Quarts (0.45 l).

CAUTION

The oil specification in Section 1.9.1 must be adhered to!

b) Check coolant level: Verify coolant level in the **expansion tank** and replenish as required. (The expansion tank must be at least 2/3 filled or coolant has to be visible at the gauge-glass.)

Verify coolant level in the **overflow bottle** and replenish as required. (The coolant level must be between the min. and max. markings.)

CAUTION

The coolant specification in Section 1.9.2 must be adhered to!

c) Air Intakes — CHECK if clear
d) Cooler intake — CHECK if free from obstructions
e) Cowling — Visual Inspection; CHECK Camloc fasteners
f) Propeller and Spinner — Visual inspection
g) Propeller blades — CHECK for cracks and other damage

7. Nose landing gear

a) Nose gear strut	Visual inspection
b) Wheel fairing	Visual inspection

CAUTION

Both parts of the 2 piece nose wheel fairing must always be installed on the aircraft

c) Tire pressure and slip marking	CHECK
d) Tire, wheel	Visual inspection
e) Shock absorber unit	Visual inspection
f) Chocks and tow bar	REMOVE

8. Left wing

a) Entire wing surface (upper and under side)	Visual inspection
b) Fuel vent	CHECK if clear
c) **BAT** switch	ON
d) Stall warning	press to upper detent, warning tone is audible
e) **BAT** switch	OFF
f) Pitot / Static tube	REMOVE cover, CHECK if all openings are clear
g) Wing tip, NAV lights and ACL	Visual inspection
h) Aileron and inspection window	Visual inspection
i) Cooler cover (if installed)	Visual inspection
j) Fuel level	CHECK with dipstick and verify with the indicated fuel level on the fuel gauge
k) Fuel tank filler cap	CHECK if closed
l) Flap	Visual inspection
m) Wing tie-down	DISCONNECT

4.4 PRE-FLIGHT INSPECTION (Walk Around)

1. Daily Inspection — Confirm has been carried out.
2. Tow bar — Remove
3. Fuel level — CHECK with dipstick and verify with the indicated fuel level on the fuel gauge

WARNING

Before cranking the propeller:
*Ignition and **ALT1/BAT** switch: OFF,*
Set the parking brake.

WARNING

RISK OF BURNS !
Only check the oil and coolant levels when the engine is cool.

4. Check oil level — Turn the propeller several times in the direction of engine rotation to pump oil from the engine back into the oil tank.

   Stop turning the propeller when air begins to return to the oil tank. This is indicated by the sound of air rushing from the open oil tank.

   Use the oil dip stick to check that the oil level is between the min. and max. markings. The difference between min. and max. is approx. 0.48 US Quarts (0.45 l).

CAUTION

The oil specification in Section 1.9.1 must be adhered to!

5. Check Coolant Level — Verify coolant level in the overflow bottle and replenish as required. (The coolant level must be between the min. and max. markings)

CAUTION

The coolant specification in Section 1.9.2 must be adhered to!

6.	Tie-down straps	remove
7.	Baggage door	CHECK if closed and locked
8.	Pitot cover	remove
9.	Control locks	remove
10.	Seating position	adjust and lock, check that nose wheel steering and brakes can be operated
11.	Carburetor heat	CHECK for free movement, then PUSH (OFF)
12.	Cabin heat	CHECK for free movement, then PUSH (OFF)
13.	Choke	CHECK for free movement and automatic reset
14.	Throttle	CHECK for free movement, then set IDLE
15.	Propeller Control Lever	CHECK for free movement, then set in START Position
16.	Weight and balance	within limits?

4.5 CHECKLISTS FOR NORMAL PROCEDURES

4.5.1 Before Engine Start-up

1.	Daily and Pre-Flight Inspection	COMPLETED
2.	Passenger Briefing	COMPLETED
3.	Seats	ADJUSTED
4.	Seat Belts and Harnesses	FASTENED
5.	Canopy	CLOSED and LOCKED Check locking mechanism
6.	Parking Brake	SET (pull lever back)
7.	Control column	CHECK for free movement and correct control surface deflections
8.	Fuel Selector Valve	LEFT or RIGHT
9.	Carburetor Heat	PRESS
10.	Throttle	IDLE
11.	Propeller Control Lever	START position
12:	**Avionics** Switch	OFF
13.	**P/S-Heat** (if installed)	OFF
14.	Circuit Breakers	CHECK all set

NOTE

*Cage the Attitude Indicator (if installed) before switching **ALT1/BAT** on.*

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 given on the Garmin G500 / G500 TXi display.

16.	**ALT 1** warning light	ILLUMINATES
17.	**ALT 2** warning light	ILLUMINATES
18.	**FUEL** warning light	ILLUMINATES
19.	**P/S-HEAT** warning light (if installed)	ILLUMINATES
20.	**ACL** switch	ON

4.5.2 Engine Start-up

1.	**Fuel Pump** switch		ON
2.	Fuel Pressure		within GREEN range
3.	Throttle	- Cold Engine	IDLE
		- Hot Engine	0.8 in. (2 cm) OPENED
4.	Choke	- Cold Engine	PULL, and keep pulled
		- Hot Engine	RELEASE (automatic reset)
5.	Brakes		PRESS both pedals
6.	Propeller area		CLEAR
7.	Ignition switch		START, then BOTH
8.	Oil Pressure		in GREEN range within 10 seconds

CAUTION

If the oil pressure does not reach at least 21 psi (1.5 bar) within 10 seconds after engine start, shut down the engine immediately!

NOTE

The starter may not be operated for more then 10 seconds at a time. Allow the starter to cool off for at least 2 minutes between attempts.

9.	**ALT 1** warning light	OFF
10.	**ALT 2** warning light	OFF
11.	**Fuel Pump** switch	OFF

.

4.5.3 Before Taxiing

CAUTION

Warm up the engine for approx. 2 min at 800 RPM and then at 1000 RPM until the Oil Temperature reaches a temperature of at least 122°F (50°C)

1.	**Avionics** switch	ON
2.	Avionics and flight instruments	SET

The GARMIN G500 / G500 TXi has an integrated sensor that automatically adjusts the brightness of the display.

It is also possible to adjust the brightness of the display manually. Using the large knob of the G500 MFD to change to the AUX page. Use the small knob to adjust the brightness. When finished press the ENT button to save the changes. To manually adjust the brightness of a G500 TXi use the MFD touch-screen to change into menu “Home” than “System” and into “Backlight”.

3.	Annunciator panel	PRESS **TEST** and check that the **ALT1, ALT2, ENG** (YELLOW) and **ENG** (RED) warning lights illuminate
4.	Engine instruments	CHECK

NOTE

Oil can be brought up to temperature during taxiing.

5.	Voltmeter	CHECK if GREEN
6.	Amperemeter	CHECK if GREEN
7.	Trim switch and indication	functional CHECK
8.	Flap switch and indication	functional CHECK, afterwards UP
9.	P/S Heat switch (if installed)	ON, **P/S HEAT** warning light goes off
10.	P/S Heat switch (if installed)	OFF, **P/S HEAT** warning light goes on

ALTERNATORTEST at 1000 RPM:

CAUTION

There are two independently protected alternators installed, which are constantly in use during D- and N/VFR. Especially for night operation the proper function of both alternators is important.

11.	**Nav Lights** switch	ON	
12.	**Landing Light** switch	ON	
13.	**Instrument Lights** switch	ON	
	⇒ ammeter indication with GREEN (positiv) values (charge)		
14.	**ALT 1** switch	OFF	
	⇒ ammeter indication with YELLOW (negative) values (discharge)		
15.	**ALT 2** circuit breaker	PULL	
	⇒ increase of discharge		(**ALT 2** o.k.)
	⇒ no change		(**ALT 2** damaged)
16.	**ALT 2** circuit breaker	PUSH	
17.	**ALT 1** switch	ON	
	⇒ ammeter indication bounce up to high positive GREEN values (strong charge) and decline thereafter		(**ALT 1** o.k)
	⇒ no change		(**ALT 1** damaged)
18.	all switches	AS REQUIRED	

4.5.4 Taxiing

1.	Parking Brake	RELEASE
2.	Brakes	CHECK
3.	Nose Wheel Steering	CHECK (function, free movement)
4.	Flight instruments and Avionics	CHECK

CAUTION

Do not operate the engine at high RPM when taxiing to prevent damage to the propeller through stones or other foreign objects.

4.5.5 Before Take-off (at the Taxi Holding Position)

1.	Brakes	APPLY
2.	Parking Brake	SET
3.	Compass and gyro Instruments	CHECK setting
4.	Fuel Selector Valve	LEFT or RIGHT, switch to the fuller tank
5.	Fuel Pressure	CHECK if in the GREEN range (otherwise, do not attempt take-off)
6.	Engine instruments	CHECK if in the GREEN range
7.	Throttle	SET 1700 RPM
8.	Ignition switch	Magneto check: SWITCH through: "L-BOTH-R-BOTH" – positions. CHECK RPM-drop max. RPM-drop: 120 RPM max. difference L/R: 50 RPM RPM drop must be noticeable then: BOTH position
9.	Carburetor heat	PULL (ON) (RPM drop: 20 to 50 RPM)
10.	Carburetor temperature indicator (if installed)	CHECK
11.	Carburetor heat	PUSH (OFF)
12.	Propeller control lever	SWITCH 3 times between HIGH RPM and LOW RPM positions (end stops) Check points: 1) RPM drop: 200 ± 50 RPM 2) increase manifold pressure 3) constant oil pressure (± 0,5 bar then: START position

CAUTION

Pull back the propeller control lever slowly to minimize the load on the two-piece crankshaft!
For training operation switching between HIGH RPM and LOW RPM once is sufficient.

13.	Throttle	IDLE
14.	**Fuel Pump** switch	ON
15.	Flap switch	T/O
16.	Trim switch	white marking
17.	Circuit breakers	CHECK all set
18.	Control column	CHECK for free movement
19.	Lap belt	FASTENED and TIGHTENED
20.	Canopy	CLOSED and LOCKED
21.	Parking brake	RELEASE

4.5.6 **Take-off** (up to 50 ft)

1.	Throttle	WIDE OPEN
2.	Tachometer	CHECK if within 2300 - 2385 RPM
3.	Elevator, control column	NEUTRAL during initial ground roll
4.	Rudder pedals	Maintain direction
5.	Rotatespeed	50 KIAS
6.	Climb speed	57 KIAS

CAUTION

*To **increase power setting raise RPM first** and **open throttle second**.*
*To **decrease power setting close throttle first** and **lower RPM second**.*

CAUTION

For the shortest take-off distance over a 50-feet obstacle at sea level:

7.	Rotate speed	50 KIAS
8.	Climb speed (V_X)	52 KIAS

4.5.7 **Climb**

1.	Throttle	WIDE OPEN
2.	Propeller control lever (max. 5 minutes)	2385 RPM, afterwards 2260 RPM
3.	Engine instruments	CHECK if in GREEN range

NOTE

*During take-off and climb at take off power the yellow **ENG** warning illuminates because the maximum continuous rpm is exceeded. This is acceptable for max. 5 minutes.*

4.	Flap switch	UP
5.	Climb speed	65 KIAS
6.	**Landing Light** switch	OFF
7.	Trim switch	SET as required

NOTE

The best rate-of-climb speed, V_Y, is a function of the operating weight and decreases with altitude. For more information, refer to Section 5.2.6.

4.5.8 Cruise

1.	Throttle	AS REQUIRED (Ref. to Section 5, Page 5-11)
2.	Propeller control lever	SET 1650 to 2260 RPM

CAUTION

Continuous operation with throttle wide open and propeller revolution below 2140 RPM should be avoided to prevent engine damage in particular at pressure altitudes below 3000ft and at high CHT (see SL-912-016)

NOTE

For best manifold pressure/propeller speed combinations: Refer to Section 5, page 5-11

3.	Flaps switch	UP
4.	**Fuel Pump** switch	OFF
5.	Trim switch	SET as required
6.	**P/S Heat** switch (if installed)	AS REQUIRED, OFF AT OAT >59°F (15°C)
7.	Engine instruments	CHECK if in GREEN range
8.	Carburetor temperature indicator (if installed)	MONITOR

CAUTION

*Illumination of the red **ENG** warning due to low fuel pressure is **acceptable for up to 10 seconds and with displayed values ≥ 0.10 bar**. If the fuel pressure falls below the GREEN range in excess of this span the **Fuel Pump** must be switched ON to prevent fuel vapor formation in the fuel system.*

4.5.9 Descent

1.	Throttle	First decrease AS REQUIRED
2.	Propeller control lever	Second SET above 2000 RPM
3.	Carburetor heat	AS REQUIRED
4.	Carburetor temperature indicator (if installed)	MONITOR

CAUTION

For a rapid descent proceed as follows:

Throttle	*First IDLE*
Propeller control lever	*Second START*
Carburetor heat	*PULL (ON)*
Flaps	*UP*
Airspeed	*130 KIAS*
Oil and cylinder head temperature	*maintain in GREEN range*

4.5.10 Landing

1.	Seat belts and harnesses	CHECK SECURE
2.	**Fuel Pump** switch	ON
3.	Carburetor heat	PULL (ON)
4.	Throttle	AS REQUIRED
5.	Airspeed	90 KIAS
6.	Flaps switch	T/O or LDG
7.	Trim switch	AS REQUIRED
8.	Flaps switch	LDG
9.	Approach speed	60 KIAS
10.	Propeller control lever	START
11.	**Landing light** switch	ON (as required)

CAUTION

In strong headwinds or crosswinds, in turbulent air or in wind shear, it may be desirable to approach using less flaps and at a higher airspeed.

4.5.11 Go-Around (Balked Landing)

1.	Throttle	First WIDE OPEN
2.	Propeller control lever	Second START
3.	Carburetor Heat	PUSH (OFF)
4.	Flaps switch	T/O
5.	Airspeed	65 KIAS

CAUTION

Any operation with throttle wide open and carburetor heat engaged should be avoided to prevent engine damage.

4.5.12 After Landing

1.	Throttle	AS REQUIRED
2.	Flaps switch	UP
3.	**P/S Heat** switch (if installed)	OFF
4.	Carburetor Heat	PUSH (OFF)
5.	**Fuel Pump** switch	OFF
6.	Transponder	OFF
7.	**Landing light** switch	OFF

4.5.13 Engine Shutdown

1.	Throttle	IDLE
2.	Parking Brake	SET
3.	Flaps switch	LDG
4.	ELT	CHECK (frequency 121.5 MHz)
5.	**Avionics** switch	OFF
6.	Ignition Switch	OFF
7.	Electrical equipment	OFF
8.	**Instrument Lights** switch	OFF
9.	**ALT1 / BAT** switch	OFF

NOTE

*The GARMIN G500 / G500 TXi and the MVP-50P-AQ are turned off with the **ALT1/BAT** switch.*

10.	Chocks and tie-downs	AS REQUIRED

4.5.14 Refueling

1. Engine Shutdown as in Section 4.5.13
2. Ground the aircraft

CAUTION

*During refueling, the aircraft **must** be grounded (for example at the end of the exhaust pipe.)*

3. Open fuel tank filler cap
4. Refuel both tanks equally

NOTE

Insert the fuel pump nozzle carefully into the tanks to avoid damage.

5. Replace the fuel tank filler caps
6. Remove grounding cable

4.5.15 Flight in Heavy Rain and/or with Wing Contamination

CAUTION

When flying with wet and/or contaminated wings and control surfaces, performance and handling qualities may be reduced. This applies in particular to take-off distance, climb performance, cruising speed and stall characteristics.

The stall speed may increase up to 3 kts and the air speed indicator may give false readings.

Visibility may deteriorate considerably in rain.

SECTION 7

DESCRIPTION OF THE AIRCRAFT AND ITS SYSTEMS

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7.1 INTRODUCTION

Section 7 of the Pilot's Operating Handbook contains a description of the entire aircraft and its systems, including the integration of the GARMIN G500 / G500 TXi system, the Glass Panel Engine Monitor MVP-50P-AQ as well as information related to their use.

Refer to Section 9 for the description and operating instructions of optional equipment and systems.

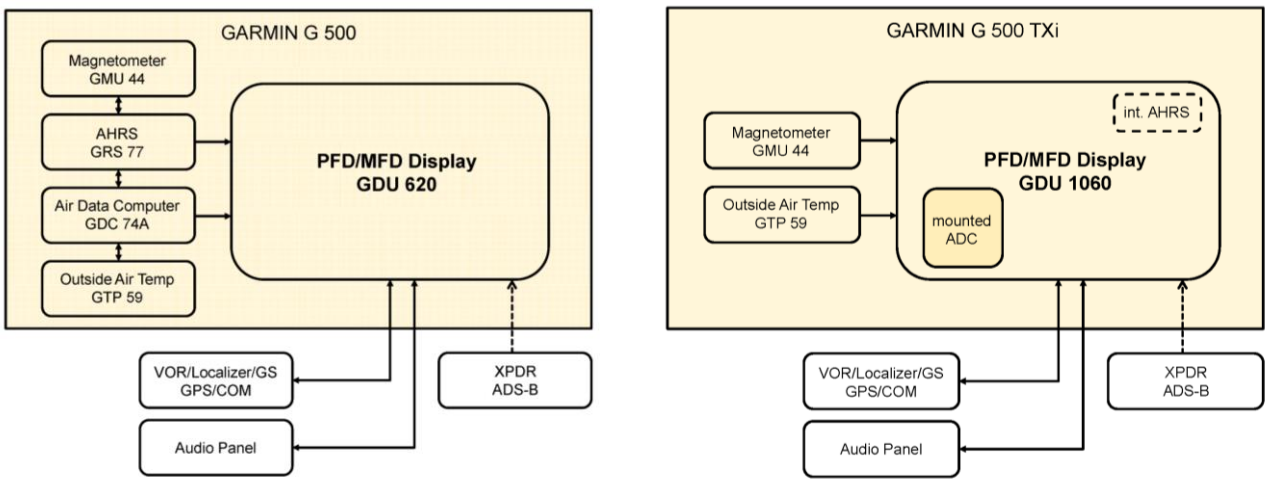
NOTE

A more in depth description and the user manuals of the GARMIN G500 / G500 TXi and the MVP-50P-AQ can be found in the GARMIN G500 / G500 TXi Pilot's Guide and MVP-50P-AQ Operating Instructions.

7.1.1 Garmin G500 / G500 TXi System (Primary Flight Display)

Both GARMIN G500 systems have 2 displays, the PFD and the MFD. Together they form the Garmin Display Unit (GDU). In addition, the GDU has an Attitude and Heading Reference System (AHRS unit) and an Air-Data Computer (ADC unit). The GARMIN G500 TXi display has an integrated AHRS and the ADC is installed directly onto the back side of the GDU. The Garmin G500 has both units installed separately into the fuselage.

Both systems are organized as shown in the following illustrations.



For the G500 and G500 TXi system the GDU is attached to the aircraft power supply through its own push-pull type circuit breaker. The circuit breaker is located on the right side of the instrument panel and is labeled **PFD**. This circuit breaker also protects all other components of the G500 TXi system, because they all are connected via the display unit.

The G500 AHRS unit and the G500 magnetometer are attached to the power supply through their own push-pull circuit breaker. The circuit breaker is located on the right side of the instrument panel and is labeled **AHRS**.

Also the G500 ADC and its OAT probe are protected by a dedicated push-pull circuit breaker. The circuit breaker is located on the right side of the instrument panel and is marked with **ADC**. Current flows through all G500 and G500 TXi circuit breakers as soon as the **ALT1 / BAT** switch has been turned on.

7.1.2 Glass Panel Engine Monitor MVP-50P-AQ

The MVP-50P-AQ consists of an indication / actuation interface (MVP-50), an engine data converter (ECD-33) and the attached probes.

When engine limits are exceeded, the warning light **ENG** in the annunciator panel of the MVP-50P-AQ will illuminate YELLOW (caution) or RED (operating limit).

The MVP-50P-AQ system is attached to the aircraft power supply via a push-pull circuit breaker which is located on the right side of the instrument panel and is labeled **MOTOR INSTR 1**.

The MVP-50P-AQ system is organized as shown in the following illustration:

7.2 AIRFRAME

The Aquila AT01-100 is a modern single engine two seater in a side-by-side configuration. Due to its high useful load, roomy cockpit, large baggage compartment, good cruise performance and light yet incredibly sturdy airframe, the Aquila is not only a great aircraft for longer tours but also an ideal training platform.
The aircraft is a low wing configuration with a mid mounted horizontal stabilizer.
With the exception of the landing gear, the engine mount, and a few fittings the Aquila AT01-100 is built entirely of composite material. Most components are fabricated using glass-fiber-reinforced plastic (GFRP), with carbon-fiber-reinforced plastic (CFRP) being employed where extra strength is required.

7.3 FUSELAGE

The fuselage and the vertical stabilizer are fabricated in two half shells. While the fuselage portion of the shell is fabricated from solid fiberglass laminate, the vertical stabilizer portion has a sandwich structure.
On the engine side the firewall, which is made of a GFRP/CFRP sandwich, is covered with a special fire-resistant ceramic fleece and a stainless steel sheet.
The landing gear frame, together with the seat frame, supports the main landing gear struts. The frame continues upwards and forms a massive roll cage made from GFRP and CFRP.

7.4 WING

The wing is designed with a triple trapezoid planform and a swept-back leading edge. The wing is fastened to fuselage from below using 4 bolts.
The wing shells are GFRP/foam sandwich composite constructions and are reinforced locally by CFRP unidirectional bands.
The fuel tanks are integrated into the leading edge of the wing structure. The 2 fuel tanks, one on each side, have a volume of approx. 15.8 US gal (60 l) each. The inner surface of the fuel tank is sealed with a special surface lining to protect the wing structure from damage.
The position lights, ACL (Anti-Collision Light) and the fuel tank vents are integrated into the winglets.

7.5 EMPENNAGE

The vertical and horizontal stabilizers, as well as the elevator and rudder are semi-monocoque sandwich composite constructions. The shells are fabricated from a GFRP sandwich reinforced by carbon fiber bands.
The horizontal stabilizer assembly is bonded directly to the fuselage and cannot be removed.

7.6 FLIGHT CONTROLS

The flight controls of the Aquila AT01-100 are of conventional design using a control column and non-adjustable rudder pedals. The elevator and ailerons are controlled via push-pull-rods, the rudder via cables.

The flaps and the trim system are electrically actuated.

7.6.1 Ailerons

The ailerons are controlled using push-pull-rods.

A bell crank in the middle of the main wing spar sets the differentiation of the ailerons. Adjustable stops near the control column are used to limit the aileron deflection.

7.6.2 Elevator and Trim System

The elevator is controlled using push-pull-rods.

Adjustable stops near the control column are used to limit the elevator deflection.

The trim system is an electrically actuated spring trim. Even in a situation such as trim runaway, the aircraft remains controllable, though the stick forces may become some what higher. The trim is controlled by a spring-loaded switch. The trim indicator is located in the middle of the instrument panel.

The take-off position of the trim is marked on the indicator.

Switch forward:	nose down
Switch aft:	nose up

In addition, the trim system is protected by a resettable circuit breaker.

7.6.3 Rudder

The rudder is controlled by the rudder pedals by way of cables running in special guides. The control surface travel is limited by stops at the lower rudder attachment fitting.

Precise control and good maneuverability during taxiing on the ground is accomplished by linking the nose wheel steering mechanism directly with the rudder pedals. Differential breaking may be used to further reduce the turning radius.

The seat can easily be adjusted to allow the pilot to comfortably reach the rudder pedals.

7.6.4 Flaps and Flap Position Indication

The flaps are driven by an electric motor, via a spindle and push-pull-rods.

A three-position selector switch is incorporated in the instrument panel for flap operation. A flap position indicator is also located on the instrument panel.

In cruise position the upper green light is illuminated (UP)

In take-off position the middle green light is illuminated (T/O)

In landing position the lower green light is illuminated (LDG)

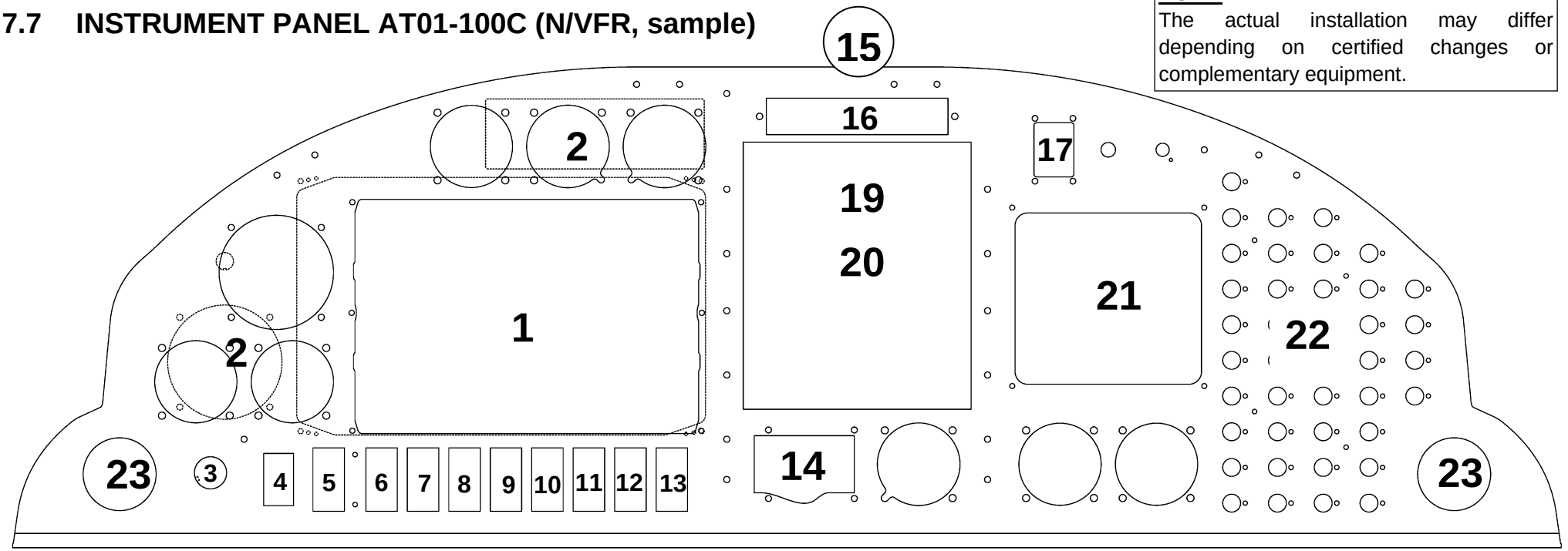
The flap selector switch position corresponds accordingly to the flap position.

Stripe markings on the flap leading edge offer an additional possibility to visually check the flap position.

A self locking spindle will maintain a flap position, even in the event on an electrical failure.

7.7 INSTRUMENT PANEL AT01-100C (N/VFR, sample)

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

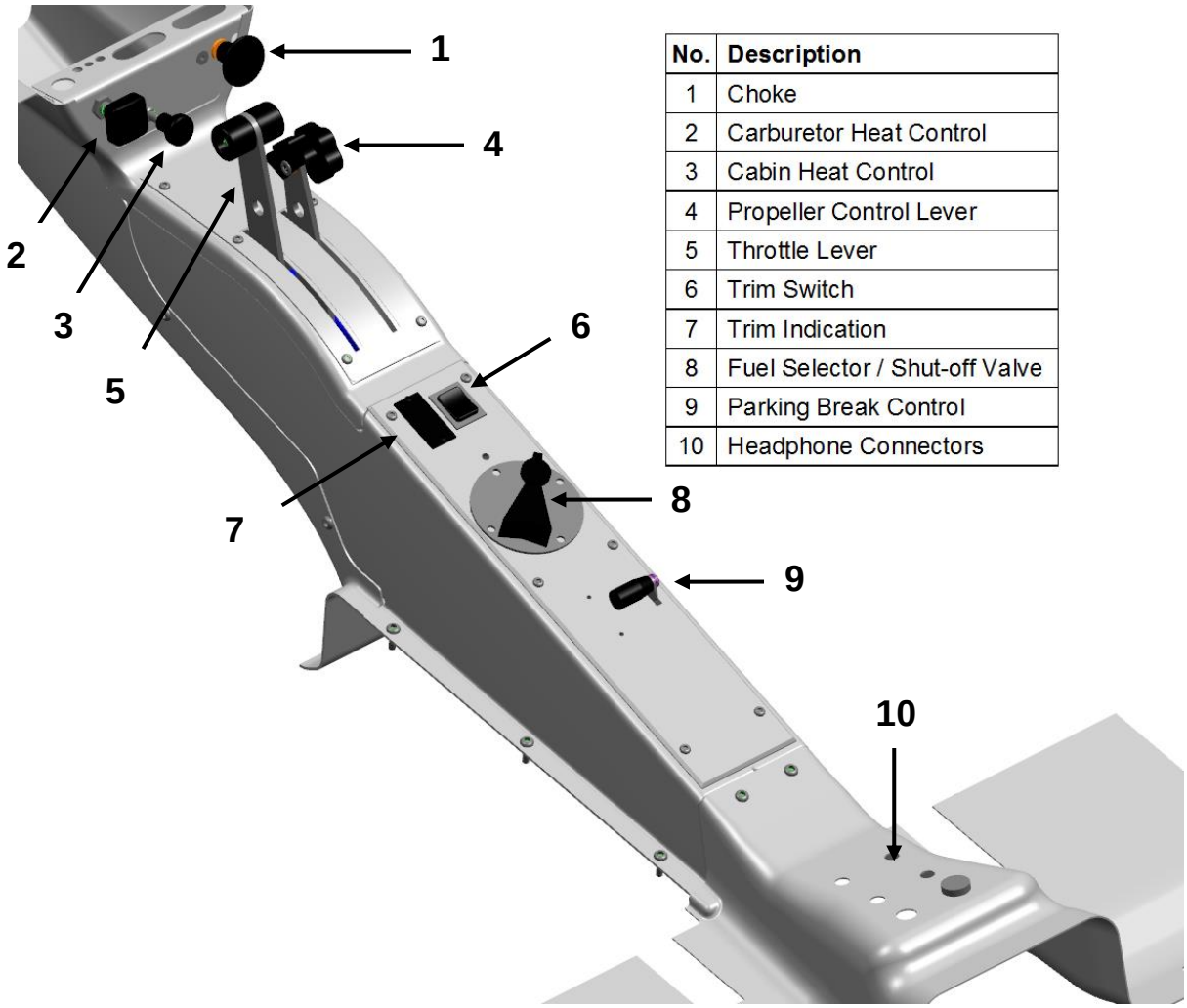


For minimum instrument requirements, refer to Section 2.12 of this manual

No.	Description	No.	Description	No.	Description	No.	Description	No.	Description	No.	Description
1	GARMIN G500 / G500 TXi	5	Fuel Pump	9	Landing Light	13	Reserved	17	ELT	21	Glass Panel Engine Monitor MVP-50P-AQ
2	Attitude Gyro (N/VFR)	6	Avionics	10	Instrument Light (opt)	14	Flap Control Switch	18	Not Occupied		
3	Ignition Switch	7	Nav-Lights	11	P/S Heat (opt.)	15	Compass	19	COM/NAV/GPS	22	Circuit Breakers
4	ALT1/BAT	8	ACL	12	Reserved	16	Annunciator Panel	20	Transponder	23	Ventilation Nozzle

7.7.1 Overview Control Panel

Controls and displays located on the control panel which is located below the midsection of the instrument panel, are placed so as to be easily viewed and operated from both seats.



No.	Description
1	Choke
2	Carburetor Heat Control
3	Cabin Heat Control
4	Propeller Control Lever
5	Throttle Lever
6	Trim Switch
7	Trim Indication
8	Fuel Selector / Shut-off Valve
9	Parking Break Control
10	Headphone Connectors

7.7.2 Cabin Heat

The cabin heat control knob, by which the hot-air flap is opened and closed, is located in the forward section of the control panel.

At the front section of the instrument panel cover the heated air is divided up for windshield defrosting and cabin heating.

7.7.3 Cabin Ventilation

Two adjustable ventilation nozzles are located on both sides of the instrument panel to supply fresh air to the cabin. The amount and direction of fresh airflow can be adjusted individually for each seat by pivot-mounted nozzle outlets. If required, the sliding windows in the canopy may also be opened for additional ventilation of the cabin.

7.7.4 Additional lighting (N/VFR)

When the AQUILA AT01-100 is equipped for N/VFR operations a redundant instrument lighting system is installed. The lighting system includes the following:

⇒ Panel lighting in the glare shield (controlled by a dimmer unit on the right side of the instrument panel)

⇒ Individual instrument lighting by internal instrument lights and additional lighting for instruments, controls on the control panel, and switches and circuit-breakers.

In the event of an emergency a flashlight must be available for every person on board the aircraft.

7.8 SEATS, SEATBELTS AND HARNESSES

The seats of the AQUILA AT01-100 are fabricated from composite materials and are equipped with integrated head rests and removable, energy-absorbing seat cushions.
An oil/gas spring strut with locking mechanism holds the seat in the adjusted position. To adjust the seating position, the spring strut must be unlocked by pushing a handle located by your thigh.

Both seats are equipped with four-part seat belts with a central rotary buckle. The shoulder harnesses are connected to inertial reels.

To fasten the seat belts, put each belt fitting successively into the associated receptacles of the rotary buckle until a distinctive “snap” sound is heard. The seat belts can be released by turning the handle of the rotary buckle clockwise.

7.9 BAGGAGE COMPARTMENT

The AQUILA AT01-100 incorporates a large baggage compartment behind the seats which can be loaded through a lockable baggage door. The baggage compartment is also accessible through the cabin.

The maximum permissible load in the baggage compartment is 88 lbs (40 kg). The weight and centre of gravity limits of the aircraft (refer to Section 6 of this handbook) must be observed when loading. The baggage door must be locked during flight.

Tie-down rings for straps are provided on the floor panels of the baggage compartment to strap down baggage and other payload. Suitable tie-down straps may be purchased from the aircraft manufacturer. For small or loose articles, a baggage net is recommended, which is also available for purchase.

7.10 CANOPY

The large canopy of the AQUILA AT01-100 offers an excellent all around view and allows unrestricted access to the cabin. Small sliding windows on both sides of the canopy serve as emergency view windows and can be used for additional cabin ventilation. The canopy is operated by a hand lever located on the left hand side of canopy frame. A gas spring strut adds support while opening the canopy.

7.11 LANDING GEAR

The landing gear consists of a steerable nose gear that is equipped with a shock absorber and a main landing gear. To provide precise control of the aircraft while taxiing on the ground, the nose gear strut is linked directly to the rudder pedals. The main gear struts are made of spring steel to absorb the touch-down loads during landing. Hydraulically actuated disc brakes are provided on the main landing gear.
Because of the robust landing gear and the 5.00 x 5 wheels on the nose and main wheels the AQUILA AT01-100 can be easily operated from a grass surface.
The aircraft can be operated with full size wheel pants or, for soft field operation, mud guards.

7.11.1 Nose Landing Gear and Nose Wheel Steering

The direct linkage between nose wheel and rudder pedals minimizes brake wear.

Good shock absorption and suspension characteristics are provided by a shock absorber made of stacked rubber springs located in the nose wheel fork.

The direct linkage between the nose wheel steering and rudder operation allows swift taxiing, precise taxi maneuvers and small turn radii, also in crosswind conditions without excessive braking.

Differential breaking may be used to reduce the turning radius even further.

7.11.2 Main Landing Gear and Brake System

The main landing gear consists of two cantilever struts which act as leaf-springs to absorb the touch-down loads.

The main wheels are equipped with hydraulically actuated disc brakes. The brakes are activated individually on each side by tilting the corresponding rudder pedal in the cockpit forward with the toe. Due to separate brake circuits, the left and right wheel brakes can be actuated individually.

7.11.3 Parking Brake

The parking brake lever is located in the central control panel. Actuating the parking brake locks the main wheel brakes.

To set the parking brake, the wheel brakes are applied simultaneously with the rudder pedals and, when the desired brake pressure is achieved, the control lever is pulled into the locked position.
To release the parking brake, push the parking brake lever all the way forward.

7.11.4 Wheel Fairings

It is important that no dirt or snow accumulate underneath the wheel pants. For this reason the Aquila AT01-100 can be operated with either full wheel pants (high-speed), with mud guards (soft-field), or without any wheel fairings. The aircraft can also be flow with a combination of wheel fairings, as long as the left and right main wheels have the same fairing.

NOTE

Flying without any kind of wheel fairing increases the chance of damage due to stones which, in turn, may lead to extensive, unscheduled maintenance work.

NOTE

Flying without any wheel fairings or with mud guards reduces performance up to 10%.

7.12 POWER PLANT

7.12.1 Engine

The ROTAX 912S is a 4 cylinder, 4 stroke, horizontally opposed engine with liquid-cooled cylinder heads and air-cooled cylinder barrels. It has brushless magnetos, 2 carburetors, a mechanical fuel pump, a reduction drive, an integrated alternator (**ALT2**), an alternator (**ALT1**) and an attachment for a hydraulic constant speed propeller.

Reduction ratio of internal gearbox:	2.43 : 1		
Displacement:	82.5	in^3	(1352 cm^3)
max. takeoff power (5 min.):	98.6	BHP	(73.5 kW)
at max. takeoff propeller speed:	2385	RPM	
max. continuous power:	92.5	BHP	(69.0 kW)
at max. continuous propeller speed:	2260	RPM	

Other information can be found in the engine handbook.

NOTE

*In addition to the external alternator **ALT 1**, the integrated alternator (**ALT 2**) is also in use for N/VFR.*

7.12.2 Propeller

A two-blade, hydraulically controlled, variable pitch propeller (constant speed propeller) of wood-composite-hybrid construction.

Manufacturer:	mt-Propeller	
Type:	MTV-21-A/170-05	
Diameter:	66.9 in	(170 cm)

The propeller blades are wrapped in composite material and protected along the leading edge by a stainless steel sheath. Near the blade root, the propeller is protected additionally by a thick plastic film.

7.12.3 Throttle and Propeller Control

The black throttle lever and the blue propeller control lever are located on the central control panel.

The throttle controls the manifold pressure (MP):

Throttle forward:	Full throttle (high MP)
Throttle aft:	Idle (low MP)

The propeller control lever controls the pitch of the propeller blades:

Propeller control lever forward:	Low pitch (high RPM)
Propeller control lever aft:	High pitch (low RPM)

To obtain maximum engine power (max. manifold pressure), place both the throttle and the propeller control levers in their full forward positions.

During climb and cruise, the manifold pressure (throttle position) and the propeller pitch (propeller control lever position) are normally matched to each other. Refer to Section 5 of this manual and to ROTAX® 912S Operator's Manual for more information.

During the final approach for landing, the low pitch setting of the propeller is used to increase the propeller drag at low power settings and to have full climb power available in case of a missed approach (throttle aft and propeller control lever forward).

The adjustment of the propeller blade pitch is accomplished by a hydraulically operated propeller governor that increases the pitch against a spring load. The oil-hydraulic governor keeps the preselected propeller speed at a constant value regardless of manifold pressure and airspeed (constant-speed control). In the case of oil pressure loss, the blades will be automatically set into lowest pitch position. This ensures the further availability of full power.

CAUTION

In the case of governor loss, the propeller behaves like a non-adjustable propeller. Manifold pressure is set to ensure that max. permissible RPM is not exceeded.

The propeller does not have a feathered position.

7.12.4 Choke

The choke control knob is located on the control panel to the right of the carburetor heat and cabin heat controls.

The choke may only be used for a short time when starting the engine in cold conditions. The throttle must remain in Idle. The choke knob is spring-loaded and returns to the OFF position when released.

7.12.5 Carburetor Heat

The carburetor heat push-pull type control element is located on the control panel to the left of the choke and cabin heat.

The correct use of carburetor heat prevents the formation of carburetor ice that can cause the engine to run rough and, in the worst case, complete engine failure. If carburetor icing is encountered, it is usually possible to slowly melt the ice by activating the carburetor heat while maintaining the same power setting.

A carburetor temperature gauge with a caution zone marked is available from the manufacturer as optional equipment.

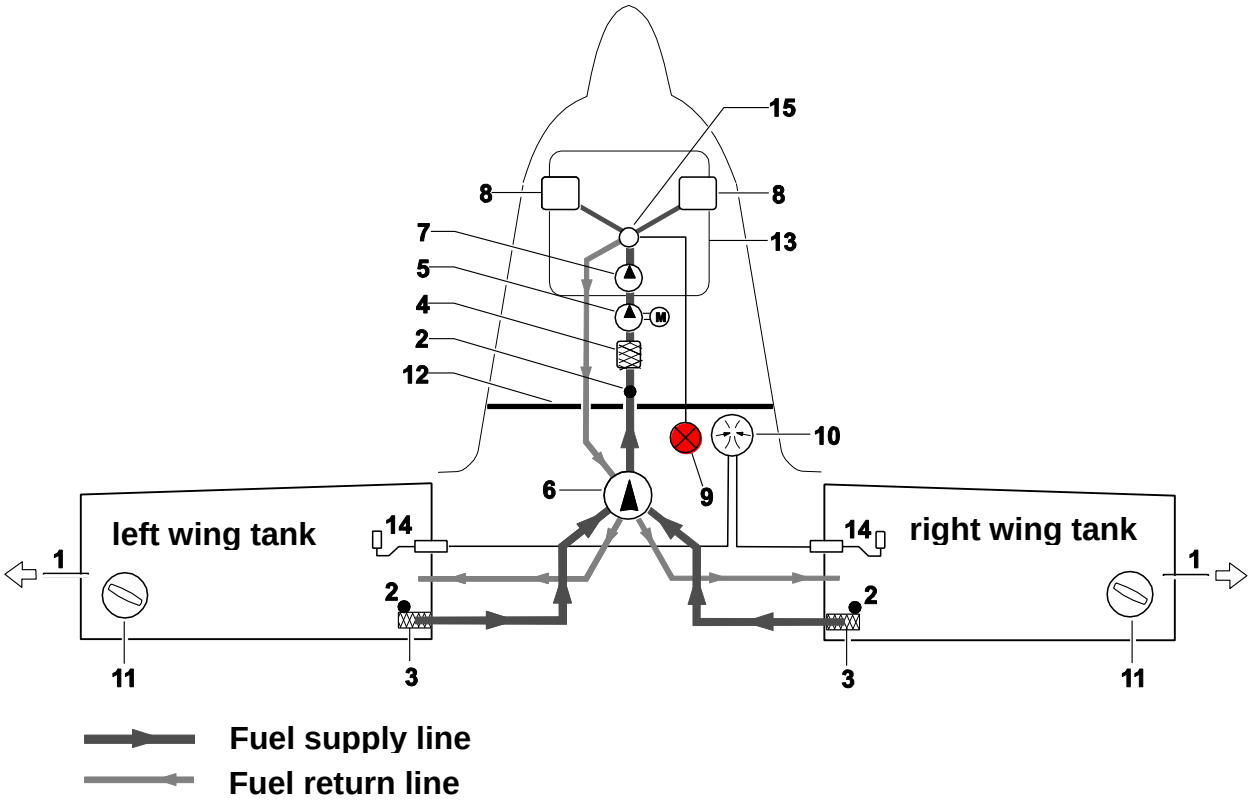
The functionality of the carburetor heat should be tested before every flight.

NOTE

Carburetor heat reduces engine power and must be used in accordance with standard rules and procedures.

7.13 FUEL SYSTEM

7.13.1 Overview



1	Fuel Vent	8	Carburetor
2	Drain valve	9	Fuel pressure warning light
3	Coarse fuel filter element	10	Dual fuel level indicator
4	Fuel strainer	11	Fuel filler cap
5	Electrical fuel pump	12	Firewall
6	Fuel selector/shut-off valve	13	Engine
7	Engine-driven mechanical fuel pump	14	Fuel level probe
15	Fuel distributor on engine side		

Fuel System Schematic

7.13.2 Fuel Tank

Each wing is equipped with an integral fuel tank. The fuel line of each tank is equipped with a removable coarse fuel filter. The fuel filler caps can be locked.

A drain valve is located at the lowest point of each fuel tank. Another drain valve is located at the firewall. All drain valves can be easily operated.
A drainage cup is located on the inside of the baggage compartment door.
Fuel is supplied to the engine by a mechanical fuel pump built into the engine. The mechanical fuel pump has an integrated fuel strainer. When needed, an electrical fuel pump can also be switched on.

The electrical fuel pump is controlled by a switch on the instrument panel labeled **Fuel Pump**. The electrical fuel pump must be turned on during take-off and landing, when low fuel pressure is suspected or during critical phases of flight.

Too low fuel pressure (below 2.2 PSI/0.15 bar) is detected by a pressure probe and annunciated on the MVP-50P-AQ. When the fuel pressure is low, the electrical fuel pump must be turned on.

NOTE

When flying near the ground, such as during take-off and landing or when low fuel pressure is indicated, the electrical fuel pump must be turned on

The fuel tanks are vented via a vent line outlet located in the winglets.

7.13.3 Fuel Selector / Shut-Off Valve

The fuel selector is conveniently mounted on the control panel in full view of the pilots.
The red, arrow-shaped selector handle has a LEFT, RIGHT, and OFF-position. Each position is notched and has a self-centering mechanism using a spring-loaded pin. The selector handle points to the chosen position.

In both normal operating positions (LEFT/RIGHT), the fuel supply and corresponding return line of the selected fuel tank are opened. The fuel supply and return line of the other fuel tank are closed.
It is recommended to keep both tanks at approximately the same fuel level.

NOTE

Recommendation: Fuel tanks should be switched at least every 60 minutes.

When the fuel selector valve is in the OFF position, the fuel flow in the supply and return lines is interrupted and functions as a fuel shut-off valve.

To switch the valve into the OFF-position, the knob located at the top of the handle must be PULLED while simultaneously turning the handle clockwise into the OFF-position.

7.13.4 Fuel Level Indication

A floating sensor which is easy to maintain supplied information concerning fuel levels which are then displayed on the MVP-50P-AQ. The floating gauge is located above the fuel supply; therefore fuel indication depends on the flight attitude. All filling levels above ¾ will be indicated as FULL due to the dihedral angle.

Additionally, a dipstick to visually verify the fuel level is delivered with the aircraft. With the aircraft horizontal, the dip-stick is inserted straight into the fuel tank so that the handle of the dipstick lays flat with the upper surface of the wing.

After pulling the dipstick out of the fuel tank, the fuel level can be determined by the “wetted” area of the dipstick. This can then be compared with the electrical fuel level indication on the instrument in the cockpit.

The dip-stick must always be carried with the aircraft. It is stowed on the inboard side of the baggage compartment door.

CAUTION

The fuel level indication in the cockpit must be verified with the fuel dipstick daily. For this purpose level the aircraft out as much as possible.

The dipstick has markings showing ½ and ¾ of the maximum fuel tank content.

NOTE

The fuel quantity, fuel used and fuel remaining functions of the G500 / G500 TXi / MVP-50 are advisory information only and must be verified by the pilot.

7.14 ELECTRICAL SYSTEM

The AT01-100 is equipped with a 12 V direct current (DC) electrical system that is powered by an engine-driven alternator and a battery. When the **ALT1 / BAT** switch is engaged, the electrical equipment can be operated and controlled by rocker switches located on the lower left section of the instrument panel. All electrical circuits are protected by circuit breakers that are accessibly arranged on the right hand section of the instrument panel.

The engine ignition systems are independent of the aircraft power supply system.

7.14.1 Power Supply and Battery System

The 12 V lead-acid battery (capacity depending on type installed) is connected to the electrical system of the aircraft via a 50-amp circuit breaker and the **ALT1 / BAT** switch. With the engine operating, the battery is charged by a 40-amp alternator that is equipped with an internal regulator and protected by the 50-amp alternator (**ALT1**) circuit breaker. The alternator is air-cooled and driven by a V-belt drive geared down from the propeller shaft.

Flight operations at night require an additional alternator, which is protected by a circuit-breaker marked ALT 2. For this purpose the alternator built into the ROTAX 912S power plant is used. During day and night VFR flight both alternators are in use.

If the alternator regulator fails, the red alternator warning light **ALT1** located in the annunciator panel will illuminate.
The charging current of the battery is monitored by the amperemeter in the MVP-50P-AQ which also displays aircraft voltage level. In an emergency, the battery is able to supply all essential electrical equipment for at least half an hour, provided that the battery is correctly maintained and in a good condition.

7.14.2 Ignition System and Starter

The engine is equipped with 2 electronically controlled ignition systems that have two independent ignition circuits. The ignition system is activated by the ignition switch. An internal control unit interrupts the ignition if the propeller speed drops below 100 RPM.

With the ignition key in the R or L position, an ignition circuit is deactivated. In the BOTH position, both ignition circuits are active. When the key is turned to the START position, the starter motor is activated. When the key is released it returns to the BOTH position and the starter is disengaged.

Further information for engine operation and pre-flight checks are contained in the Operator's Manual for all versions of ROTAX® 912 engines.

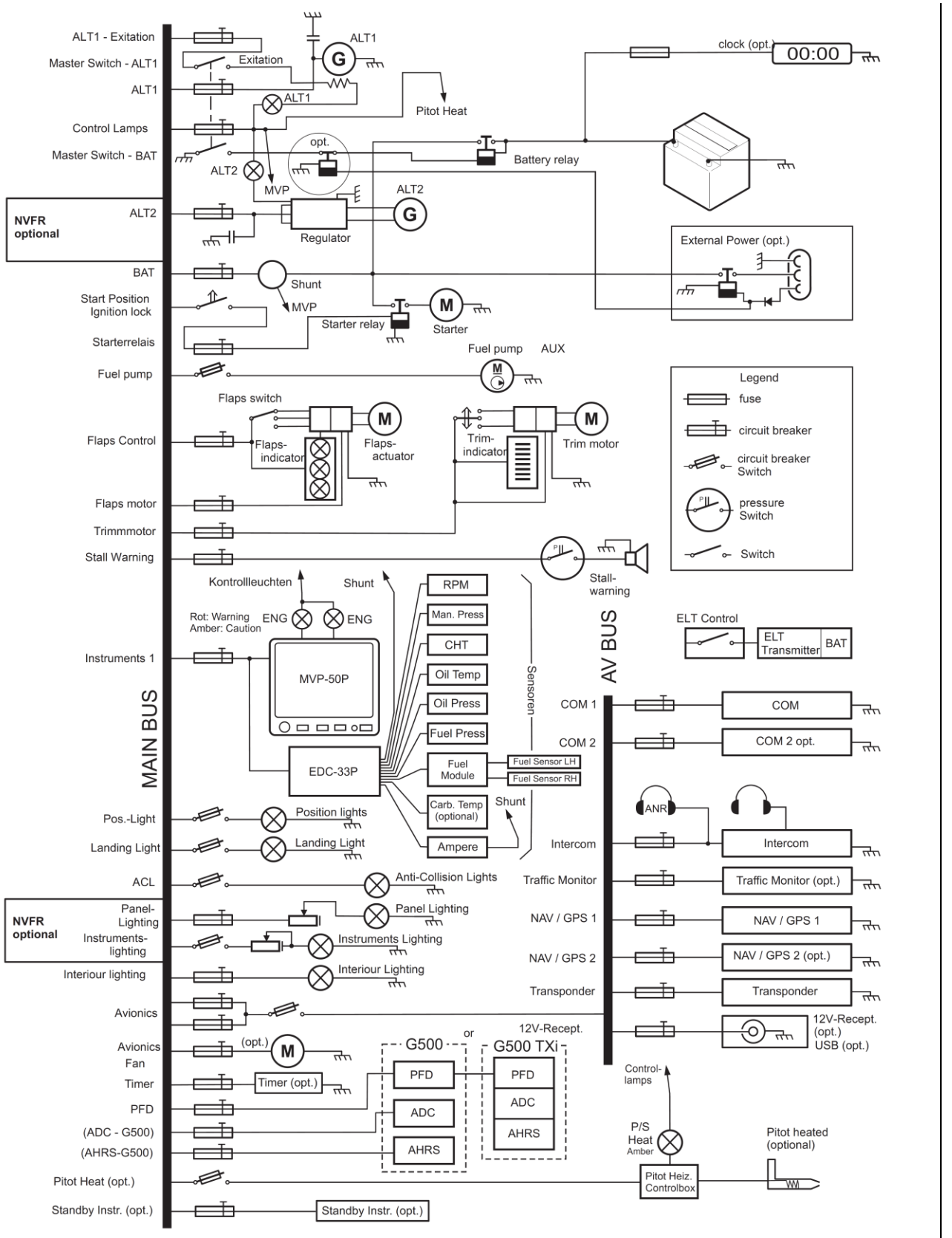


Fig.: Electrical System Schematic

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7.14.3 Electrical Equipment and Circuit Breakers

All electrical equipment can be turned on or off by push-pull type circuit breakers or by rocker switches with built-in circuit breaker function.
COM/NAV-equipment along with other avionic equipment is supplied with electrical power through the **Avionics** switch. Additionally, the avionic equipment is protected by separate circuit breakers.
Equipment regularly used in flight (fuel pump, ACL, etc.) are controlled by their own rocker switches with built-in circuit breaker function.

The lighting installed in the glare shield above the instrument panel is protected by a circuit-breaker labeled **Panel Light**. This lighting is turned on and adjusted by the control knob of the dimmer unit. The knob is located in the upper right side of the instrument panel.
The lighting of individual instruments as well as the post lights are turned on and off with the switch labeled **Instrument Lights**. This lighting can be adjusted separately through a Dual-Dimmer.
The lighting mounted on the roll cage is protected by a circuit-breaker labeled **Dome Light**.

7.15 GLASS PANEL ENGINE MONITOR MVP-50P-AQ

The MVP-50P-AQ displays the following information:

1	Propeller rpm	10	Voltage
2	Carburetor manifold pressure	11	Battery charge/discharge
3	Oil temperature	12	Time
4	Oil pressure	13	Up / down timer
5	Cylinder head temperature	14	Flight time
6	Fuel level in each tank	15	Engine operating hours
7	Total fuel capacity	16	Estimated c.g.
8	Fuel flow	17	OAT (optional)
9	Carburetor temperature		

The keys of the MVP-50P-AQ have the following functions:

Select press to move the cursor, select functions and change data or values
Exit press to choose section or return to menu
Screens press to switch between various menus
Menu press to show sub-menus (if available)

Further information is contained in the Glass Panel Engine Monitor MVP-50P-AQ Operating Instructions.

7.15.1 Engine Monitoring Instruments

The following applies to propeller rpm, carburetor manifold pressure, cylinder head temperature, oil temperature, fuel flow, oil pressure, carburetor temperature and fuel tank gauge:

Data or values shown in GREEN mean that they are within normal operating limits. If they are shown in YELLOW, they are in the caution range and if they are displayed in RED, they are either below or above operating limits.

If a yellow or red range is reached, the affected data or value will blink in the appropriate color. In addition, the yellow or red **ENG** warning light in the annunciator panel will illuminate. In the case of a YELLOW warning light, the blinking can be stopped and the alarm confirmed by pressing any switch on the MVP-50P-AQ.

7.15.2 Voltmeter and Amperemeter

The voltmeter shows the system voltage generated by the power sources.

The amperemeter shows the current flowing between the battery and the electrical system of the aircraft. When the battery is being charged, the ampere values are shown in GREEN. When the battery is discharging, the values are shown in YELLOW. This means that when the battery is supplying the electrical system of the aircraft, YELLOW values will be shown. During normal operation, this is a sign of an alternator malfunction.

7.16 ANNUNCIATOR PANEL

The warning lights **ALT1, ALT 2**, **ENG** (YELLOW), **ENG** (RED), **P/S HEAT** (optional) and **TEST** (test switch) are incorporated in the annunciator panel.

7.16.1 Warning Light ALT 1 and ALT 2

The red alternator warning lights **ALT1** and **ALT 2** should not illuminate during normal operation.
The warning lights illuminate only if:

- An alternator failure (**ALT1** or **ALT 2** produces no current) occurs

In this case the electrical power is supplied by the battery or the other alternator.

The ignition system of the engine is independent of the external alternator and is therefore unaffected.

7.16.2 Warning Light ENG (YELLOW / RED)

The warning light **ENG** (YELLOW) appears as soon as a value in the MVP-50P-AQ reaches the caution range. The warning is confirmed by pressing the EXIT key and the light goes out.

The warning light **ENG** (RED) appears if a value falls below or exceeds the operating limits and cannot be reset.

7.16.3 Warning Light P/S-HEAT

Refer to Section 7.18.1.

7.17 EXTERNAL POWER UNIT (optional)

It is recommended to use an External Power Unit (EPU) for engine start-up at outside air temperatures below –10° C. The EPU receptacle is optional and is mounted on the right fuselage side below the battery. Access is provided by a service door in the lower cowling.

Electrical power for the engine starter and the electrical buses is provided by a three poled plug (MIL standard) protected from reverse polarity by a relay circuit. A second relay disconnects the on-board battery as long as the external power source is connected to the aircraft. This second relay prevents an uncontrolled charging or discharging of the battery during the EPU operation.

WARNING

Before starting the engine with external power, make sure that NO persons or objects are in the vicinity of the propeller disk.

Procedure for starting up the engine with an external power source:

- Plug in and switch on the external power
- **ALT1 / BAT** switch ON
- Start-up engine (in accordance with section 4.5.2 “Engine Start-up”)
- Disconnect external power source.

7.18 PITOT-STATIC SYSTEM

A pitot-static tube is installed on the lower surface of the left wing which, via two separate connections, supplies total pressure and static pressure (from 6 vents distributed on the diameter). Total pressure and static pressure lines travel through the interior of the wing to the wing root where they are connected to water separators. The pressure lines have connections installed at the wing root to simplify disassembly of the wing.

Error in the static system can be neglected for altitude measurement. An airspeed calibration chart is provided in Section 5 of this manual.

NOTE

When the aircraft is parked the pitot static tube should be covered with the supplied pitot tube cover to protect it from dirt and other contamination. The cover is attached to a large "Remove Before Flight" ribbon.

7.18.1 Pitot Heat (optional)

On request, a heated pitot-static tube can be installed. The heater is turned on using the **P/S Heat** switch.

The size and location of the heated pitot static tube are identical to the unheated version. Temperature is controlled automatically.

Function:
The **P/S HEAT** warning light illuminates when:

⇒ **P/S Heat** switch OFF or
⇒ Pitot heat is defective

CAUTION

*This aircraft is **not certified** for flight into icing conditions, even if a heated pitot-static tube is installed.*

*Switch **P/S Heat** OFF when OAT exceeds + 59° F (+15° C).*

7.19 STALL WARNING SYSTEM

The stall warning system causes a loud buzzing sound at least 5 kts before the stall is reached in all flap settings.

As the aircraft approaches a stalled condition, a switch on the wing leading edge is activated due to a change in airflow as the angle-of-attack increases. The switch generates a loud buzzing sound as long as this condition is maintained.

NOTE

The stall warning system (a small metal plate on the leading edge) is delicate and must be handled with care.

7.20 AVIONICS

Depending on the installed optional avionic equipment, a NAV/COM transceiver, a transponder or a multi-functional display may be located in the centre section of the instrument panel. Detailed information on the operation of this equipment and descriptions of their systems are provided in the POH Supplements in Section 9.

The COM transmitter is activated by a push-to-talk button, integrated into each control column. The microphone and headphone jacks are located in the rear section of the centre pedestal between the seats.

Operating instructions for COM/NAV equipment are supplied in Section 9.

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