2018

VLA Report 2018_10

PDR REVIEW REPORT

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1. Avionics and BFI

1.1. Avionics

General info about chosen avionics, will be detailed with specific details such as weight and dimension infos.

1.1.1. Garmin G500 TXI

The G500 TXi is a display and sensor system available in three display options:

- GDU 1060 – 10”display
- GDU 700P – 7”portrait display
- GDU 700L – 7”landscape display

Display options can be seen at Figure 8. Depending on system specifics one or more of the following functions may apply:

1. **Primary Flight Display (PFD)** – provides attitude, heading, air data, and navigation information to the pilot
2. **Multi-Function Display (MFD)** – provides pilot awareness of factors that may affect the overall conduct of a flight
3. **Engine Indicating System (EIS)** – provides engine and airframe operating parameters to the pilot

Figure 1 Display Options for G500 TXI

EIS TXi

10.6" G500 TXi Integrated EIS - Single 4 Cylinder Piston Engine

$4,595.00 USD

Class of Aircraft

CLASS 1 & 2 | CLASS 3

Display

7" PORTRAIT | 7" LANDSCAPE | 10.6" G500 TXI/G600 TXI

Type of Engine(s)

PISTON - 4 CYLINDER | PISTON - 6 CYLINDER

Number of Engines

ONE | TWO

Figure 2 Garmin EIS TXI

Due to its natural support to EIS, we decided to use G500 TXI over G500. With an integrated EIS at Figure 9, G500 TXI can simply display any vital engine information at its screen. Considering the display configurations for the 1060, 700P and 700L at Figures 10, 11 and 12 respectively, we decided to use 10" configuration of the G500 TXI instead of dual 7" option. Using MFD/PFD/EIS (MFD/PFD now) configuration, pilots can be informed about the plane mostly from one device. According to cockpit group, there is enough space for additional 7" display, so we are now using 10"+7" [illegible]G 500 TXI, 7" one is EIS only.

Figure 3 GDU 1060 Display Configuration

Figure 4 GDU 700P Display Configuration

Figure 5 GDU 700L Display Configuration

PFD	MFD	EIS [2]
GDU 700( )/1060	GDU 700P/1060 [3]	GDU 700( )/1060 [3]
• Attitude • Airspeed • Altitude • Vertical Speed • Turn Coordinator • HSI • HSI Map [4] • Clock • Lateral and Vertical Deviation Indicators • Datalink Weather Display [1] • Radar Altimeter [1] • Autopilot Annunciations [1] • Flight Director [1] • Synthetic Vision [1] • Flight Path Marker [1] • System Advisories • Safety Monitors [1] • GPS NAV Status • Display Backup [1] [4] • Terrain Avoidance [1]	• Navigation Map • Traffic [1] • Terrain • Charts • Flight Plan • Weather [1] • Waypoint Information • Music Services [1] • Terrain Avoidance [1] • Engine Data [1] • System Advisories • Video [1]	• Fuel Qty (Main, Aux) • RPM/Tach • Propeller Sync Display • Manifold Pressure • Oil Pressure • Oil Temperature • Fuel Flow • Fuel Pressure • Fuel Calculations • Cylinder Operating Temperatures (CHT, EGT) • TIT • Lean Assist Mode • Carburetor Air Temperature • Intercooler Temperatures (IAT, CDT, Difference) • Amps/Volts • User Selectable Fields • User Adjustable Advisories

[1] Function availability dependent upon aircraft interfaces or enablement.
[2] Displayed engine operating parameters dependent upon configuration.
[3] GDU 700( ) MFD/EIS provides the same MFD and EIS functionality listed with the exception of weather radar and multi-engine.
[4] Not available for GDU 700L.

Figure 6 System Functions

System functions of G500 TXI can be seen at Figure 13 while electrical loads of subsystems of G500 TXI can be seen at Figure 14.

LRU	14 Volt Current Draw		28 Volt Current Draw	
	Typical	Maximum	Typical	Maximum
GDU 700( )	3.0 A	6.0 A	1.5 A	3.0 A
GDU 1060	5.0 A	8.0 A	2.5 A	4.0 A
GRS 79/GMU 44	480 mA	958 mA	240 mA	479 mA
GRS 77/GMU 44	600 mA	1.0 A	300 mA	1.0 A
GSU 75( )/GMU 44/GTP 59	760 mA	958 mA	380 mA	479 mA
GDC 72/GTP 59	420 mA	958 mA	210 mA	479 mA
GDC 74( )/GTP 59	410 mA	480 mA	200 mA	235 mA
GAD 43	410 mA	720 mA	210 mA	350 mA
GAD 43e	790 mA	1.22 A	390 mA	590 mA
GCU 485	120 mA	357 mA	64 mA	179 mA
GEA 110	0.30 A	0.60 A	0.15 A	0.30 A

Figure 7 Electrical Load of Subsystems of G500 TXI

1.1.1.1. Physical Dimensions of G500 TXI

Physical Dimensions of G500 TXI can be seen at Figure 15.

Physical - GDU 1060

Unit Size	7.25 inches high
	11.4 inches wide
	3 inches deep
	6.49 lbs. (without integral ADAHRS), 7.25 lbs. (with integrated ADAHRS)

Figure 8 Physical Dimensions of G500 TXI (10")

1.1.2. Garmin GTN750

will be detailed with specific details such as dimensions/electrical load

Figure 9 Garmin GTN750

1.1.3. Garmin GMA345

will be detailed with specific details such as dimensions/electrical load

Figure 10 Garmin GMA 345

1.1.4. Garmin GTX345

will be detailed with specific details such as dimensions/electrical load

Figure 11 Garmin GTX 335/345

1.1.5. Garmin G5

will be detailed with specific details such as dimensions/electrical load

Figure 12 Garmin G5

1.1.6. Some Usage Scenarios

Can be omitted.

Figure 13 GTX 345 (Bottom) coupled with GTN 750 (Top)

Figure 14 G500 TXI (Left) Coupled with GTN 750 (Top-Right)

1.2. Avionic Selection

There will be paragraph explaining tables.

Requirement	Chosen Avionic
ODTÜ-VLA-SRD-017	Garmin G500-Garmin GTN 750
ODTÜ-VLA-SRD-018	Garmin G500-Garmin GTN 750
ODTÜ-VLA-SRD-019	Garmin G500-Garmin GTN 750
ODTÜ-VLA-SRD-020	Garmin G500-Garmin GTN 750
ODTÜ-VLA-SRD-021	Garmin G500-Garmin GTN 750
ODTÜ-VLA-SRD-022	Garmin GTN 750
ODTÜ-VLA-SRD-023	Garmin GTN 750-Garmin GTX 335
ODTÜ-VLA-SRD-024	Garmin GMA 340
ODTÜ-VLA-SRD-026	Garmin GTN 750
ODTÜ-VLA-SRD-027	Garmin GTN 750
ODTÜ-VLA-SRD-028	Garmin GTN 750
ODTÜ-VLA-SRD-029	Artex ME406 ELT
ODTÜ-VLA-SRD-030	Garmin GTX 335
ODTÜ-VLA-SRD-025	Garmin GMA 340

Required Equipment	Chosen Avionic
Seyrüsefer Ekipmanı	Garmin GTN 750
Transponder	Garmin GTX 335
Hız/İrtifa Göstergesi	Garmin G500
Motor &Yakıt Kontrol Paneli	Garmin G500
Elektrik Kontrol Paneli	Garmin G500
Saat	Garmin G500
ELT (Emergency Locator Transmitter)	Artex ME 406 ELT
Magnetic Compass	Garmin G500
Statik Port	Garmin G500
Pitot Tube	Garmin G500
Stall Uyarısı	Garmin G500?
Haberleşme Sistemi	Garmin GMA 340

1.3. Proposed Avionic Architecture

Figure 22 shows our design for the avionic architecture. The avionic architecture relies mainly on ARINC-429 standard, which is well known to be wide spread in non-military avionic applications. However, the system also employs discrete and Ethernet connections. To denote briefly the individual components on the architecture:

- **CV / FDR** stands for “Cockpit Voice / Flight Data Recorder”, is the black box of the aircraft.
- **G500** represents Garmin G500 dual screen electronic display.
- **BFI** or more commonly BFS is the “Backup Flight System”.
- **ADC** is the air data computer.
- **INS / GPS** stands for the Inertial Navigation System and the Global Positioning System.
- **ELT** is the Emergency Locator Transmitter.
- **ICS** is the Intercom equipment.
- **V/UHF** is the Very High and Ultra High Frequency Radio.
- **Mode-S** is the Mode-S Transponder.

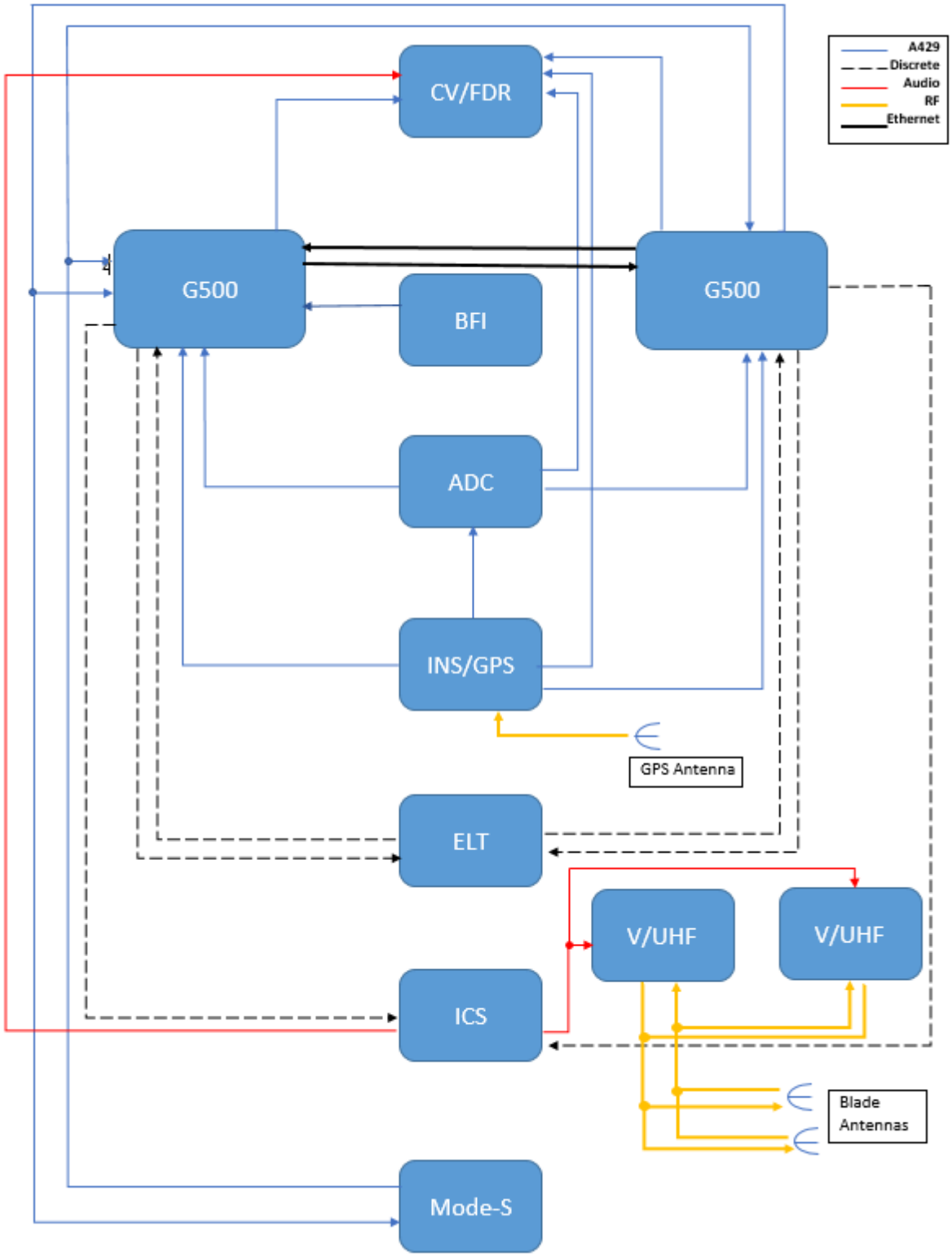


Figure 15 : The proposed avinoic architecture. Notice the legend.

1.4. Garmin StarBus

Not many information available online, research about topic continues.

2. Cockpit Design

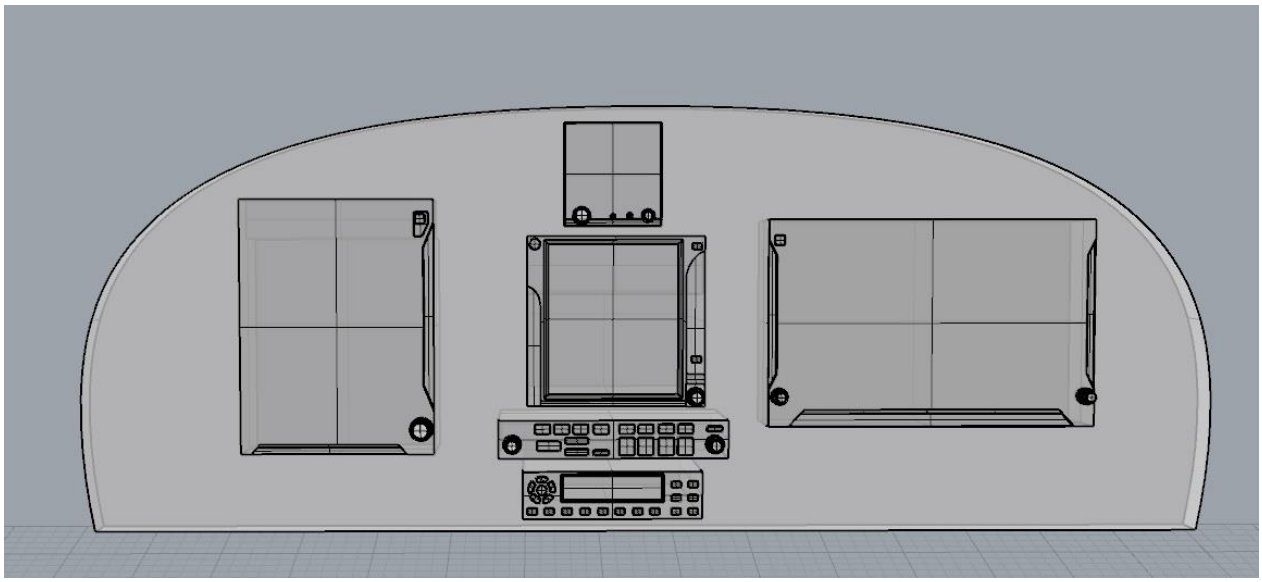


Figure 16 Proposed Cockpit Design

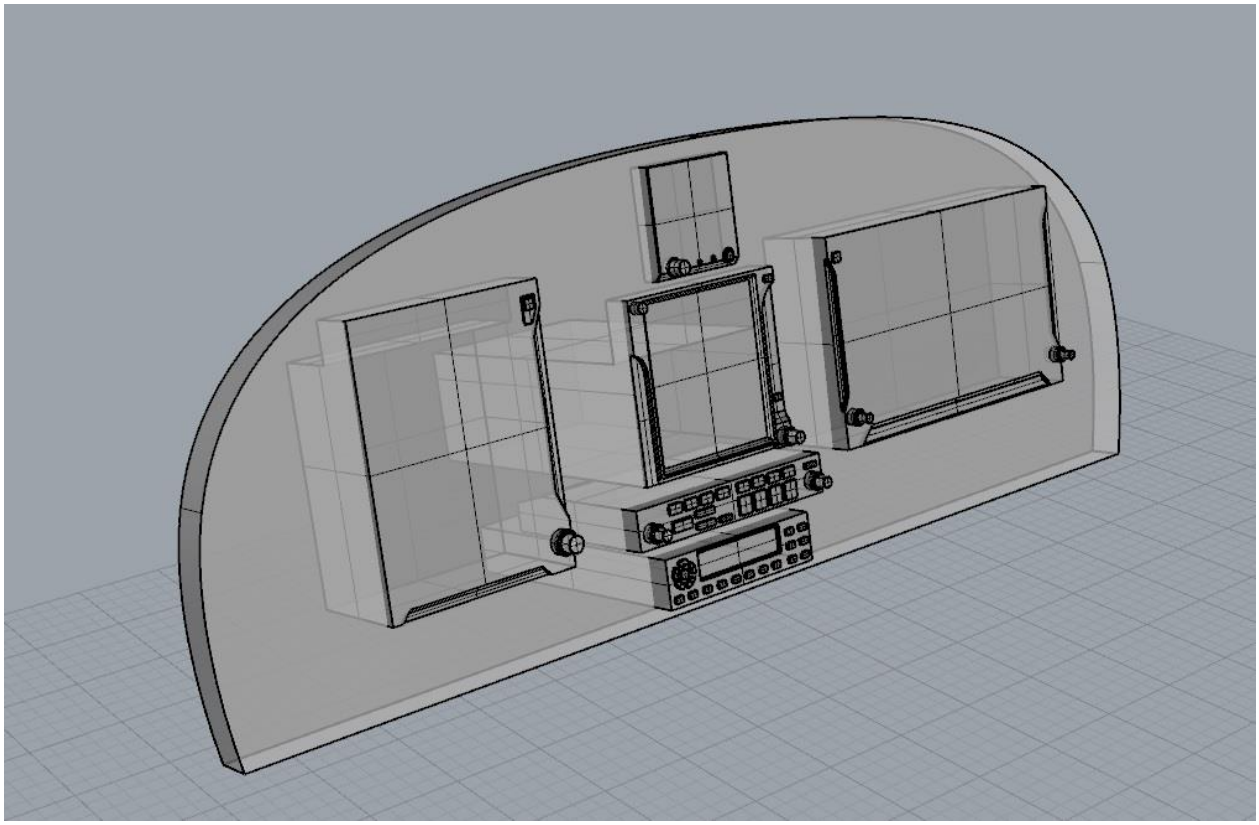


Figure 17 Proposed Cockpit Design

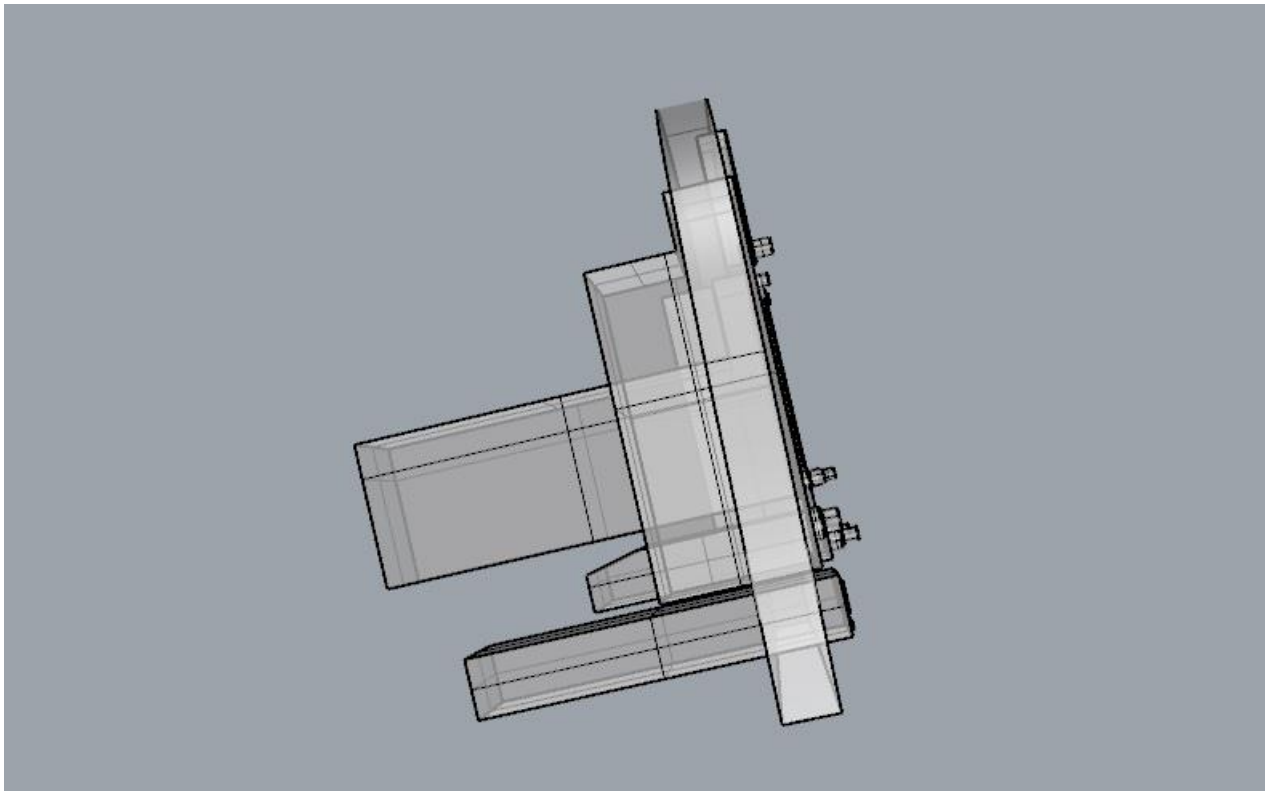


Figure 18 Proposed Cockpit Design

Kokpit için önerilen ön tasarım. Kokpit genel hatlarıyla böyle olacak.

3. Motor Interface

3.1. GEA 110 Engine Interface

The GEA 110 is a remote mount engine interfacing and monitoring module used for gathering sensor input parameters from the engine and processing the signals for the G500/G600 TXi system. The GEA 110 can be mounted to the back assembly of the GDU 1060 or it can be remotely mounted in the fuselage or in the engine compartment. The GEA 110 communicates with the G500/G600 TXi using an RS-485 digital interface. Device can be seen at Figure 26.

Figure 19 GEA 110 Engine Interface

3.2. EIS Components

3.2.1. Engine Annunciator

An engine annunciator will only be installed if the EIS display is not installed within 8 inches of the center of the pilot's field-of-view.

Figure 20 Engine Annunciator

3.2.2. Carburetor Temperature Probe

The carburetor temperature probe is a Type-K thermocouple (Chromel and Alumel) probe.

Figure 21 Carburetor Temperature Probe

3.2.3. Oil Temperature Probe

The oil temperature probe is a Type-K thermocouple (Chromel and Alumel) probe.

Figure 22 Oil Temperature Probe

3.2.4. Fuel Flow Sensors

The fuel flow sensor is incorporated in an aluminum housing that is installed in-line to the engine fuel supply. There are two STC approved options available for installation to suit most aircraft applications.

Figure 23 Fuel Flow Sensor FT-60 (Left) and FT-90 (Right)

3.2.5. Brass Pressure Sensors

The brass pressure sensors are small sensors that are supplied with a compatible plug. Depending on the installation, these sensors may be used to measure oil, fuel, and manifold pressure.

Figure 24 Brass Pressure Sensors

3.2.6. Stainless Steel Pressure Sensors

The stainless pressure sensors are unamplified, high-reliability sensors for harsh installation environments. There are four sensors available to measure oil, fuel, and manifold pressure.

Figure 25 Stainless Steel Pressure Sensors

P-Lead RPM Pickup

A wire with two parallel resistors in-line connects from each P-lead, at the Magneto or the ignition switch, to the GEA 110 to sense RPM.

3.3. Rotax 912 Connection

Will be detailed with an information regarding exact connection between engine and EIS system.

4. Sensors

This section will not be included in the 16.10.18 Report. But, the research about topic continues for the following report including wiring.

4.1. GPS Antenna Installation on AQUILA AT01 (A21)

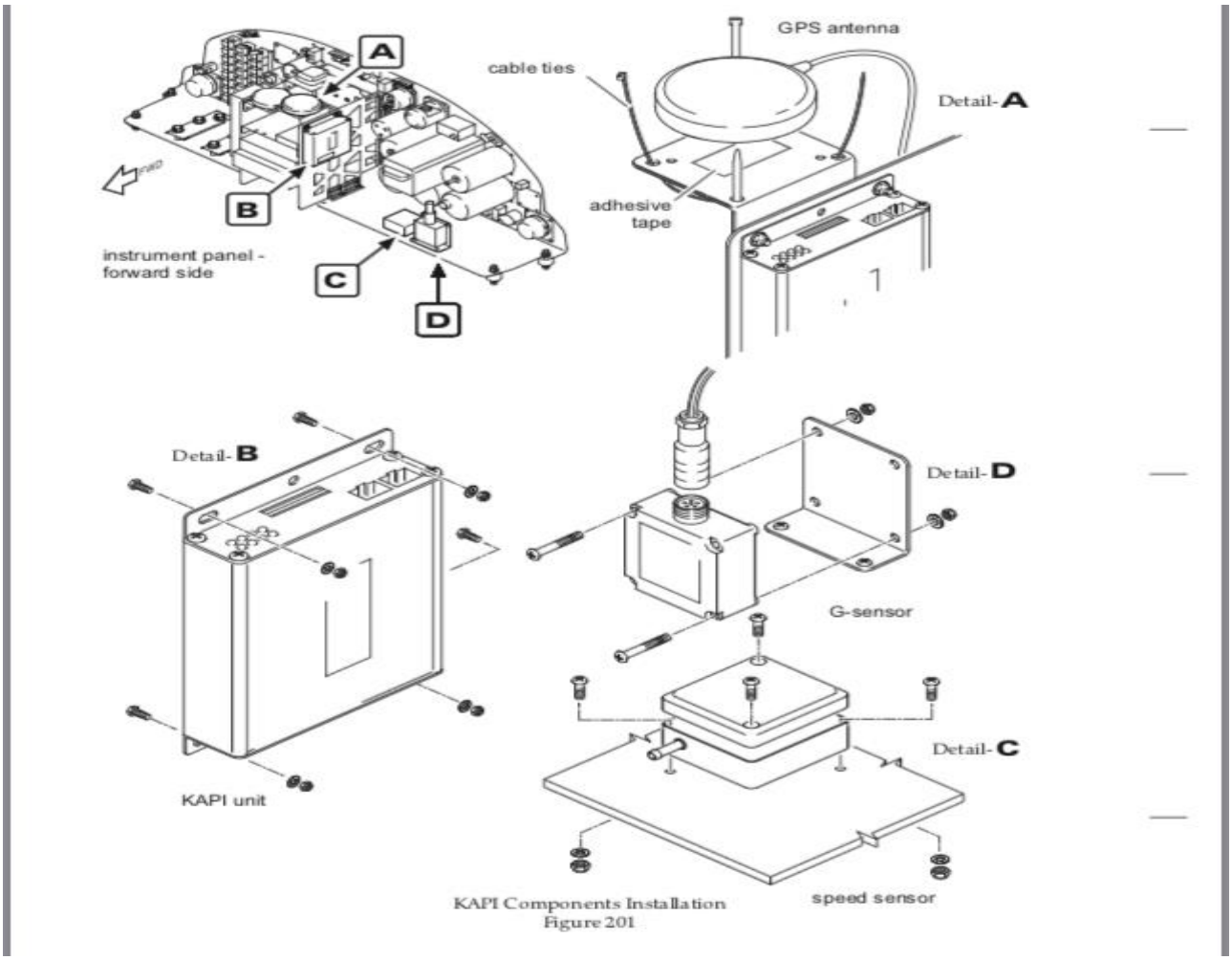


Figure 26 A

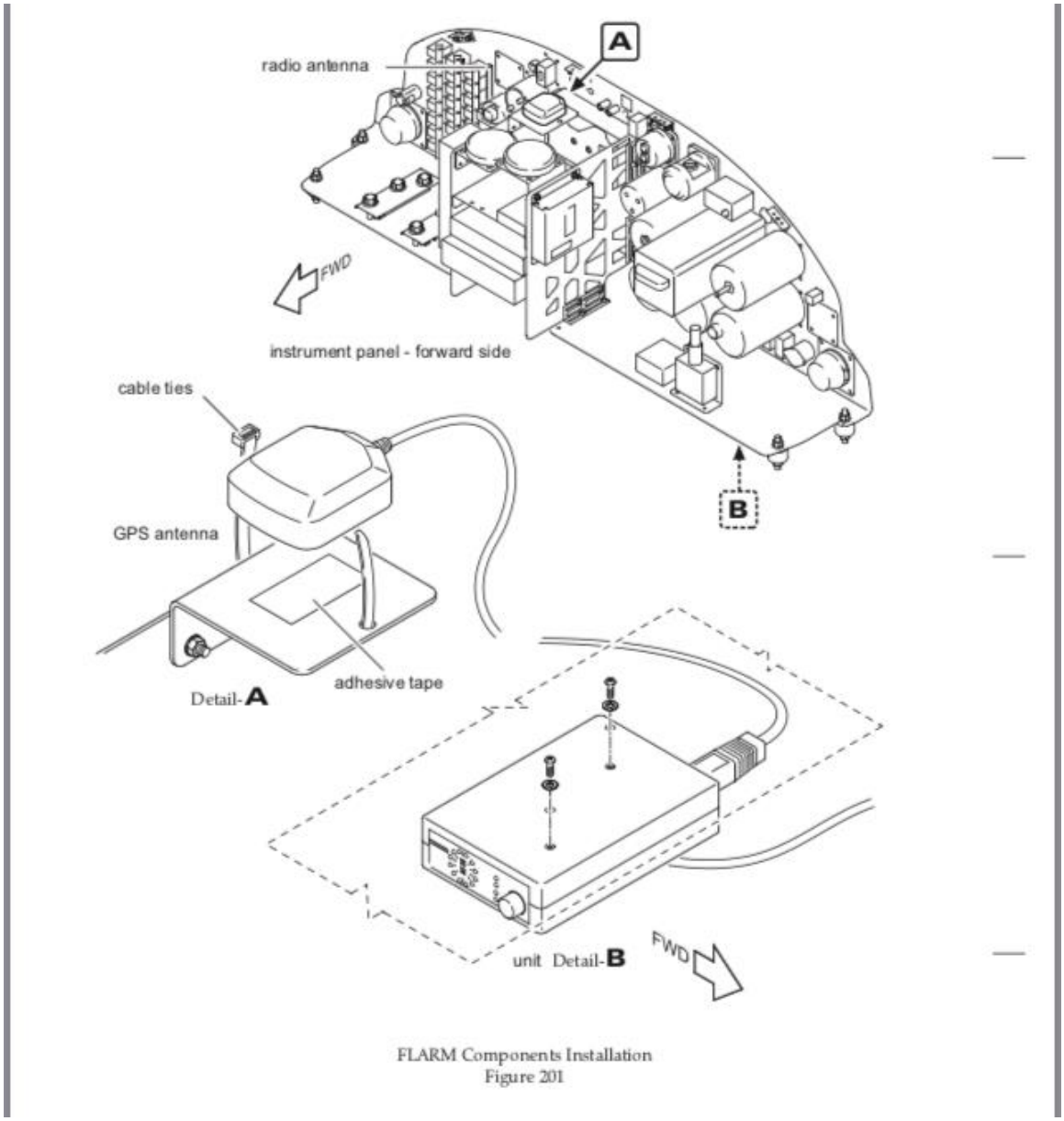
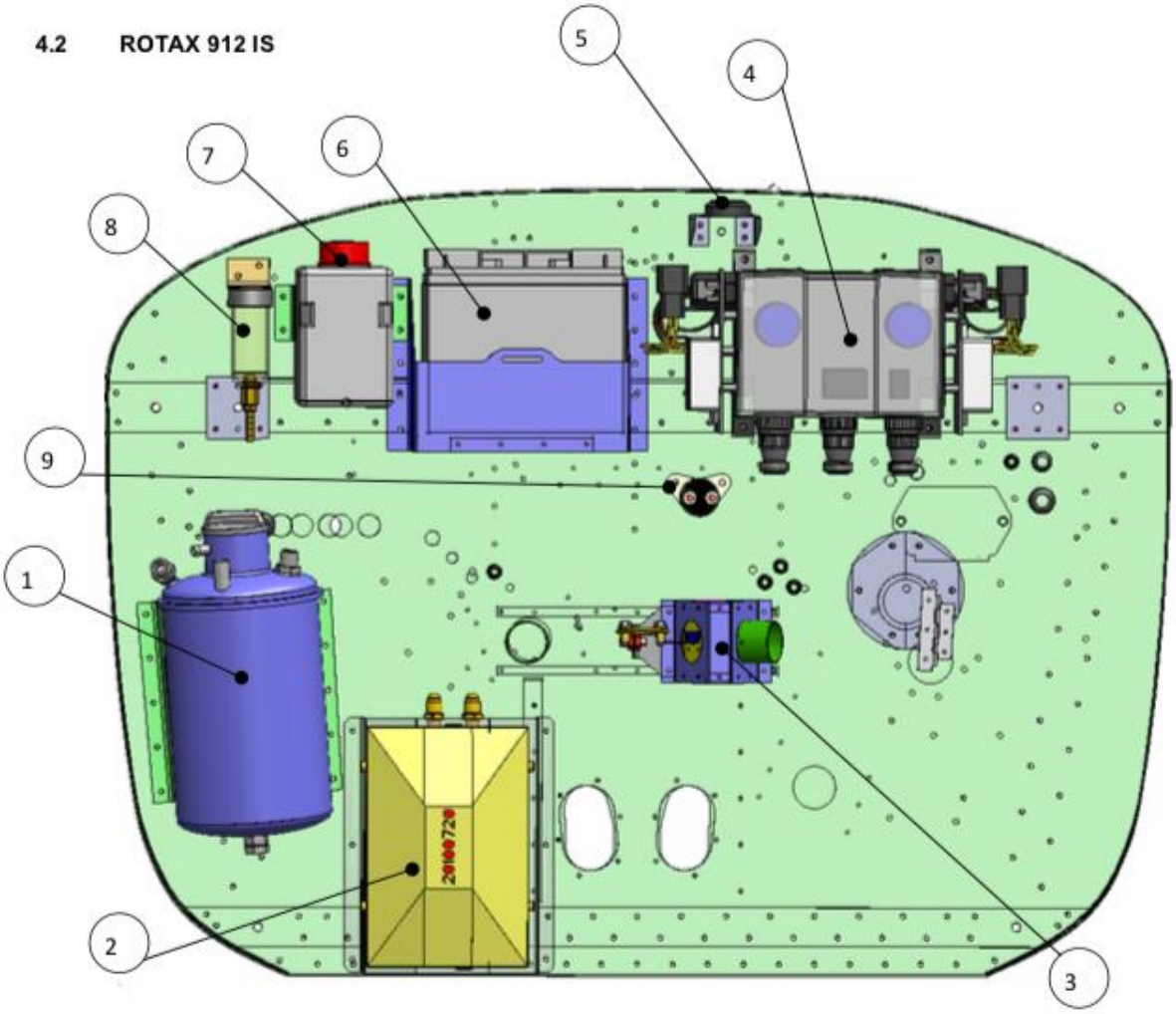


Figure 27 B

- Put gasket and antenna from outside,
- Install washers and nuts securing antenna to fuselage. Simultaneously connect ground cable to backing plate.
- Seal the antenna and gasket to fuselage using a good quality electrical sealant (Sikaflex-221 or equivalent, silicone-free).
- Connect antenna cable.
- Close baggage compartment door and install access / inspection plate 211 KC (refer to 25-12-00).

4.2. GPS Antenna Installation on SLING 2



1	Oil reservoir	7	Coolant overflow bottle
2	Fuel pump assembly	8	Brake fluid reservoir
3	Cabin air inlet / splitter box	9	Starter relay
4	Fuse box		
5	GPS antenna		
6	Main battery		

Figure 28 C

- The GPS antenna is mounted in the engine compartment on a bracket attached to the firewall.

Geçenki belgede : Alttakine benzer sekilde bir temsili ucak uzerinde yaptiginiz gosterimleri alttan kanatli ucak bulup onun uzerinde yapin. Diye bir geri bildirimde bulunmuşsunuz ama çizimleri 3 boyutlu model üstünde mi yok yine foto üzerinde mi yapmamız gerekiyor tam anlamadık.

4.3. General Light Aircraft Sensors

On light aircraft, the comm, nav, GPS, and the transponder antennas are generally in the same locations.

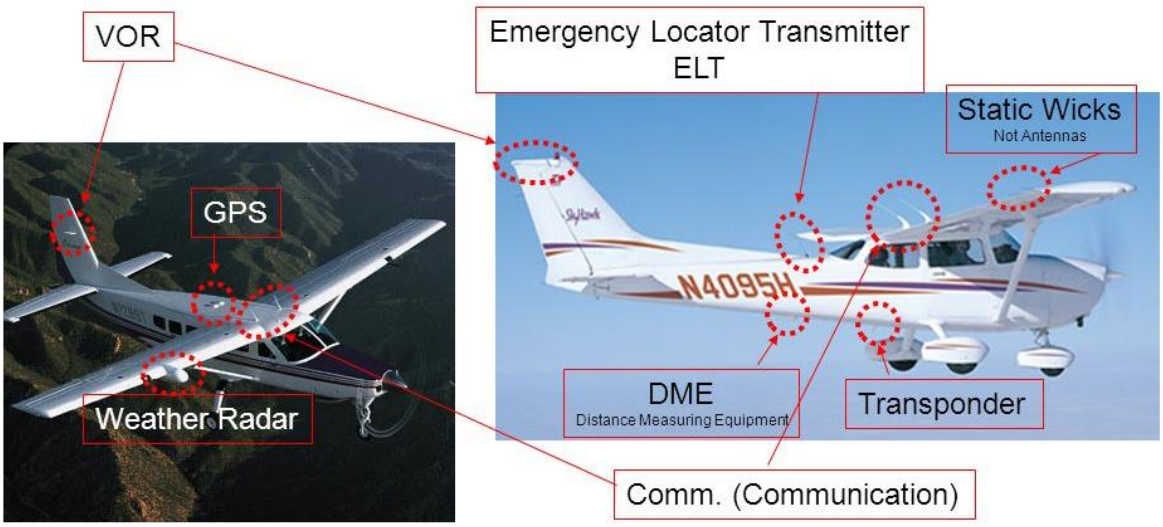


Figure 29 D

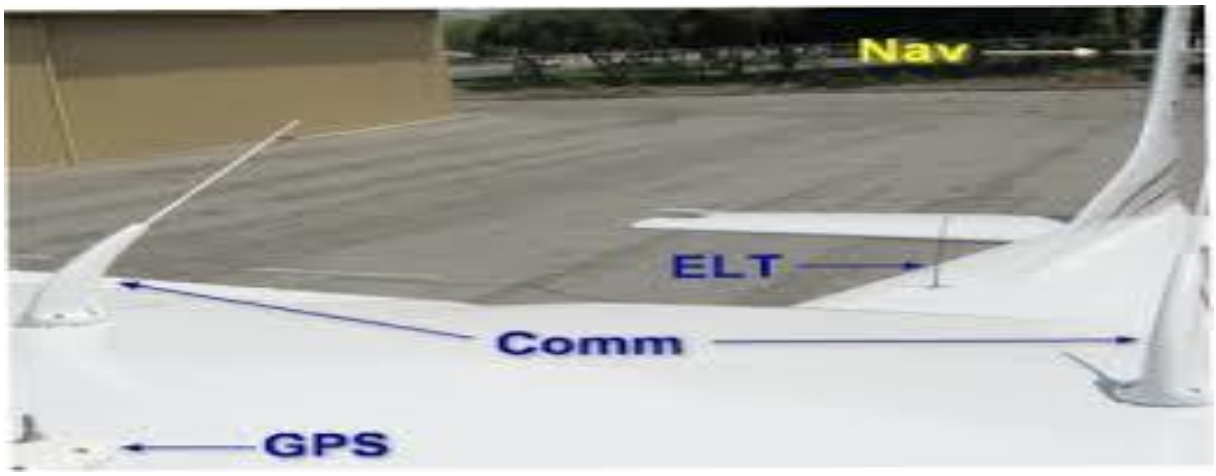


Figure 30 E

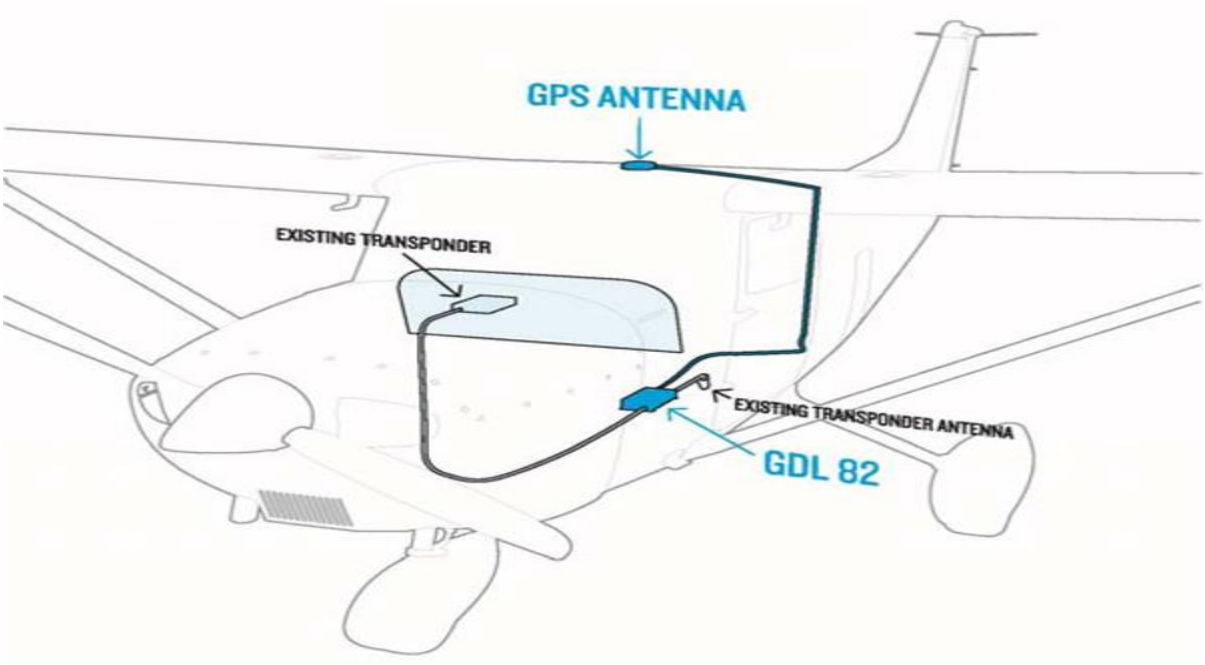


Figure 31 F

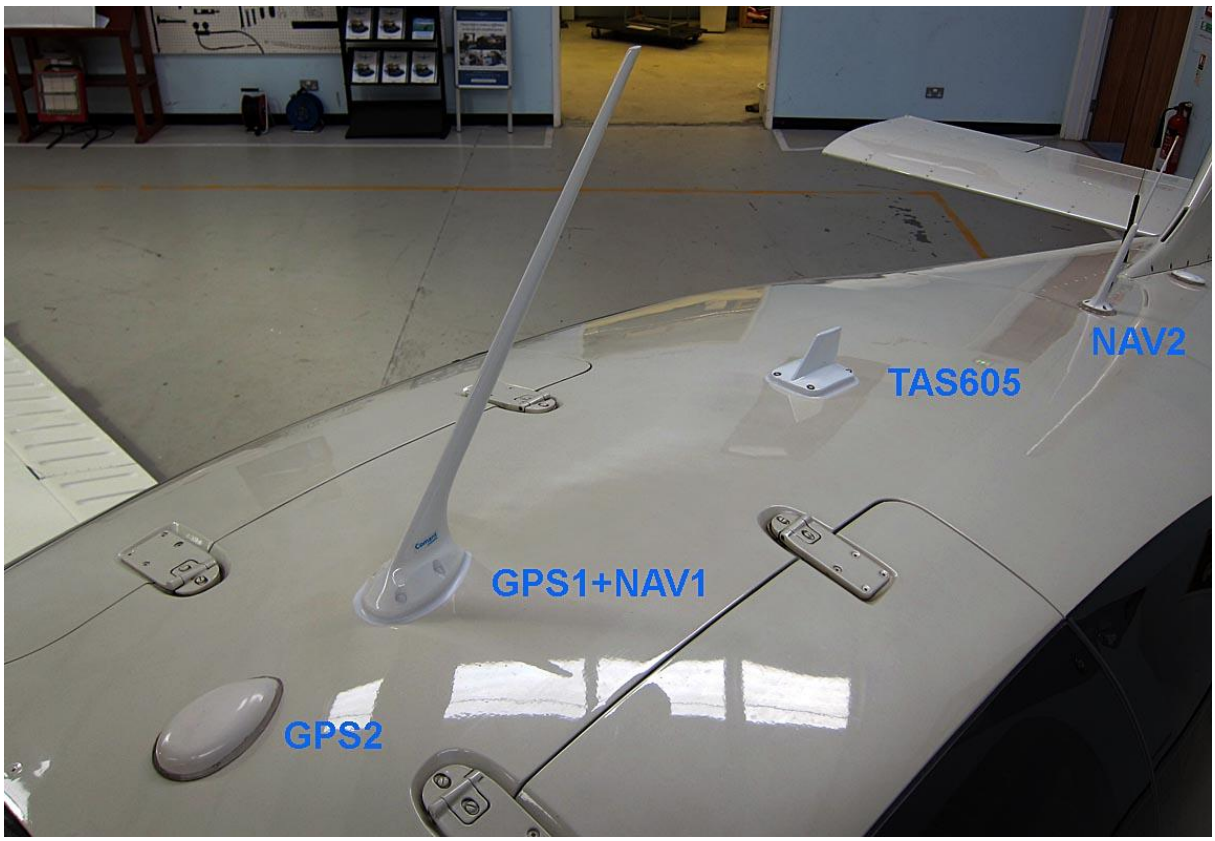


Figure 32 G

5. Circuit Diagram

5.1. Will be drawn again with sensors in professional manner.

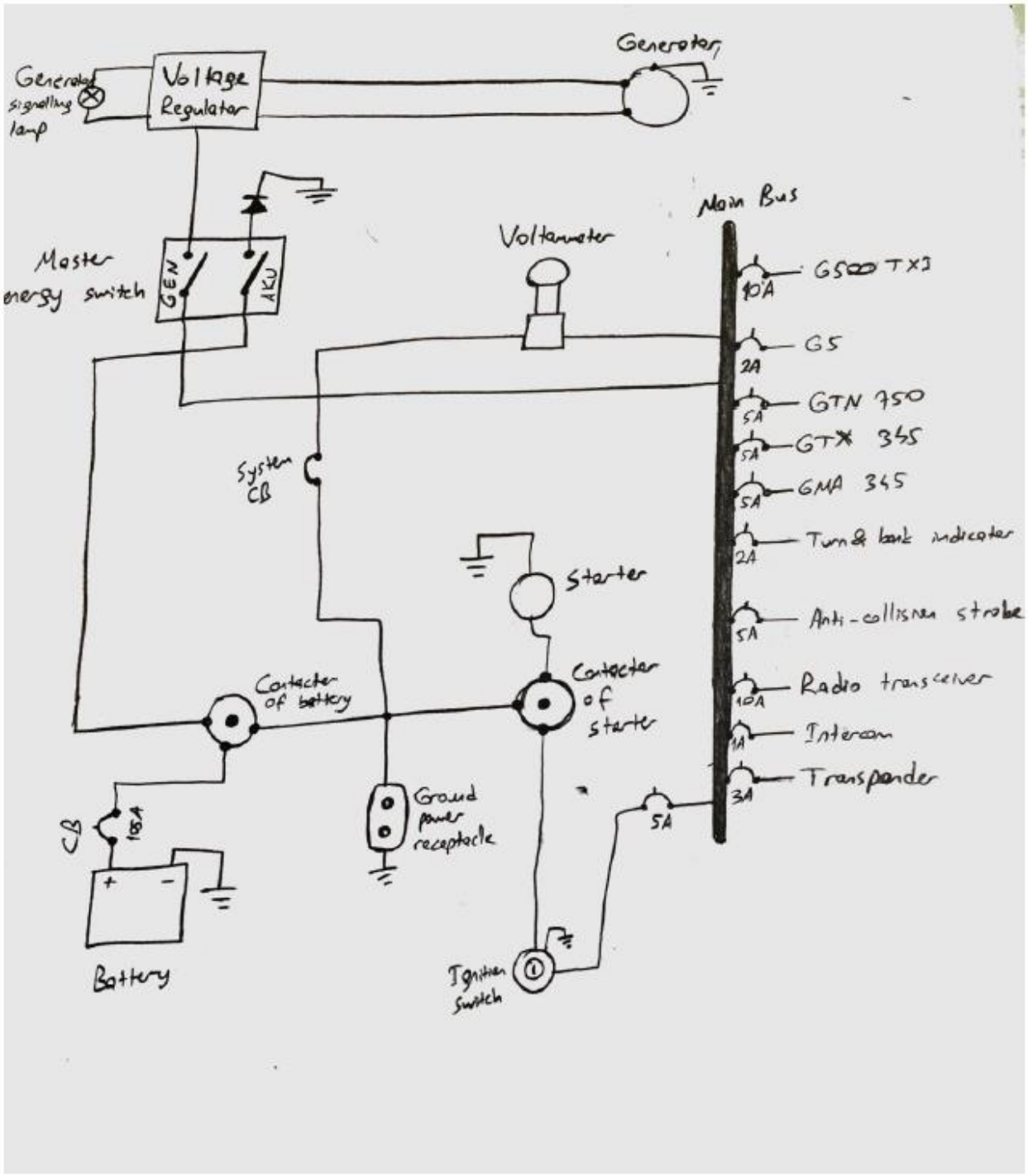


Figure 33 Circuit Diagram

6. Crude Electrical Architecture

On Figure 32, you can observe the crude electrical architecture. Two busses – main and essential- are used on the architecture, typical for such aircraft. The generator relies on the engine to provide power while battery is used to provide a steady and safe source of energy in the case of a discrepancy.

- **GMFD** stands for the control panels.
- **CVR** is the black box.
- The rest is given below.

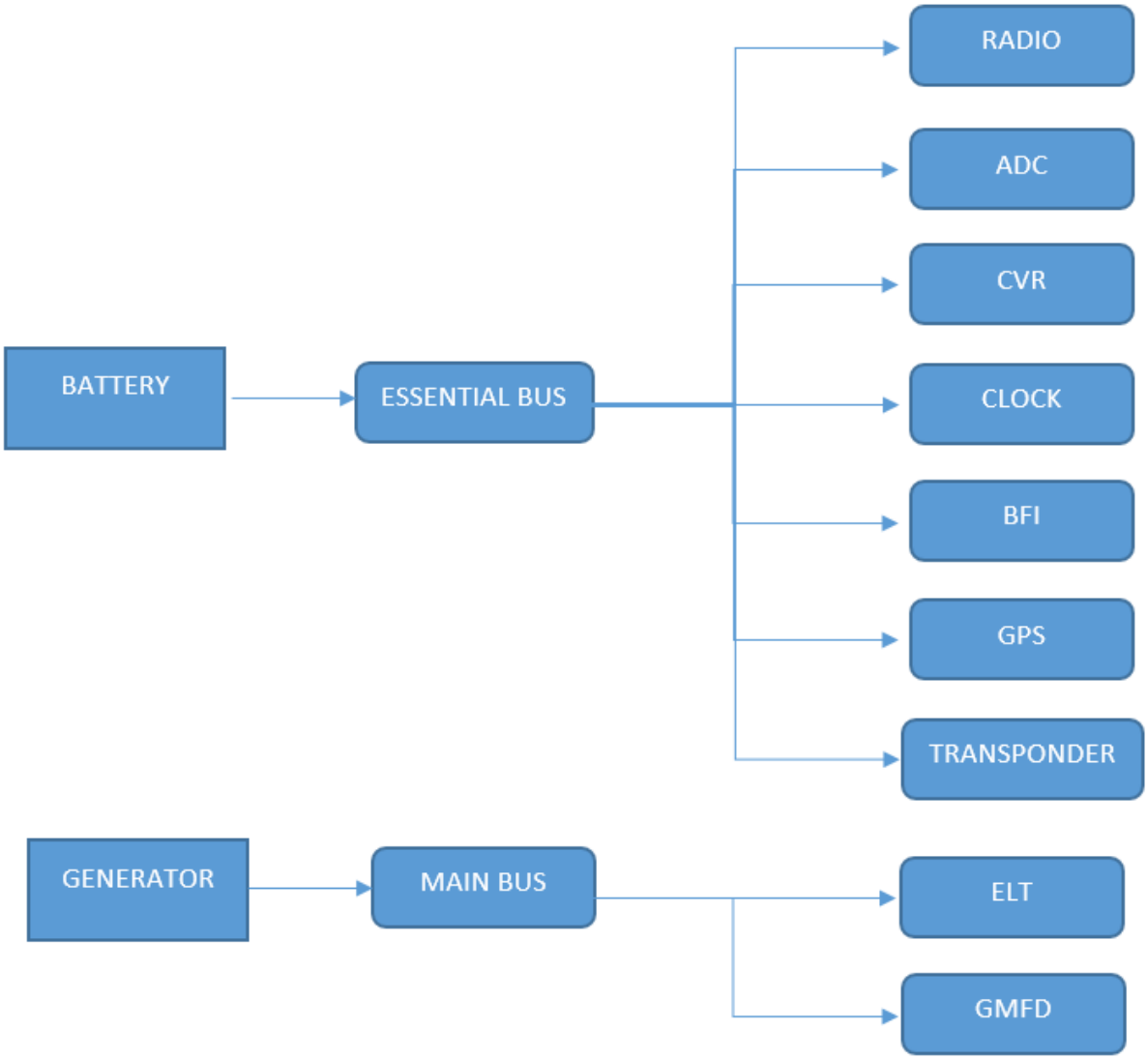


Figure 34 : The crude electrical architecture