**AVIONIC SYSTEM DESCRIPTION**

(Example document for LSA applicants – v1 of 17.02.16)

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# Introduction

This document describes the Avionic System of the ABCD aircraft according to the requirements as referenced in the certification programme (ref.1).

*The aim of this document to describe the avionic system of the aeroplane and demonstrate compliance to the requirements. This document is essential, when the applicant’s design contains non-certified elements. (e.g. instruments what aren’t ETSO certified)*

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| **NOTICE**  The aim of this document is to provide an example of an avionic system description document for an aircraft type certificate application in accordance with CS-LSA.  This document is intended to assist applicants in applying for an LSA RTC/TC and therefore demonstrating compliance of the design to the requirements but it does not substitute, in any of its parts, the prescriptions of Part-21 and its amendments.  The document should not be read as a template and it should not be used as a form to fill. The final content of the document is under responsibility of the user.  The required information can be presented entirely in this document, or in additional documents appropriately identified and referred to.  Comments and notes to the user are provided throughout the document *with “blue highlighted and italic text”.*  **IMPORTANT: All the statements and/or conclusions provided in this guideline can be considered realistic and have a reasonable technical basis but the designer is solely responsible of each of the statements that he/she will provide** |

# References

1. Certification Programme ABCD-CP-00

Contents

[0. Introduction 2](#_Toc442868031)

[1. References 2](#_Toc442868032)

[2. List of Abbreviations 4](#_Toc442868033)

[3. Description 4](#_Toc442868034)

[4. Requirements 5](#_Toc442868035)

[5. Instrument panel layout 6](#_Toc442868036)

[6. EFIS screen details 7](#_Toc442868037)

[7. Parts of the EFIS screen 8](#_Toc442868038)

[8. Field of view 10](#_Toc442868039)

[9. System schematics 12](#_Toc442868040)

[10. Flight instrumentation 12](#_Toc442868041)

[a. Pitot-static instruments 12](#_Toc442868042)

[b. Navigation instruments 13](#_Toc442868043)

[c. Backup engine instruments 16](#_Toc442868044)

[d. Warning lights 18](#_Toc442868045)

[e. Main switches 19](#_Toc442868046)

[f. Circuit Breakers 19](#_Toc442868047)

[11. Other instruments and switches 19](#_Toc442868048)

[a. Transponder 19](#_Toc442868049)

[b. Flap switch, and flap position indicator 19](#_Toc442868050)

[12. Units integrated into the EFIS display 20](#_Toc442868051)

[13. Antenna and sensor locations 20](#_Toc442868052)

[a. Antenna types 20](#_Toc442868053)

[b. Antenna and sensor location layout 21](#_Toc442868054)

[14. Qualification of the equipment 22](#_Toc442868055)

[15. Assessment of failures of the PFD 23](#_Toc442868056)

[16. Instrument panel Hazard Assessment 24](#_Toc442868057)

[17. Compliance statements 25](#_Toc442868058)

# List of Abbreviations

A/C – Aircraft

A/D – Analog/Digital

AC – Alternate Current

AC (2) Advisory Circular (FAA)

ADC – Air Data Computer

ALT – Altitude indicator

Amp – Amperes

AOA – Angle of Attack

AP – Alternative Procedures of Design Organization

ASI – Airspeed Indicator

ASTM – American Society for Testing and Materials

ATM – Air Traffic Management

CB – Circuit Breakers

CDI – Course Deviation Indicator

CHT – Cylinder Head Temperature

COM – Communication

CS – Certification Specifications

CS-LSA – Certification Specifications for Light Sport Aircraft

DC – Direct Current

DOA – Design Organization Approval

EASA – European Aviation Safety Agency

EFIS – Electronic Flight Instrument System

ELA – European Light Aircraft

ETSO – European Technical Standard Order

FAA – Federal Aviation Administration

FOV – Field-of-View

GNSS – Global Navigation Satellite System

GPS – Global Positioning System

HSI – Horizontal Situation Indicator

Hg In – Inches of Mercury

IC – Intercom

ILS – Instrument Landing System

LH – Left Hand (side)

MFD – [multi-function display](https://en.wikipedia.org/wiki/Multi-function_display)

NAV – Navigation

OAT – Outside Air Temperature

OP – Oil Pressure

OT – Oil Temperature

P/N – Part Number

PFD – Primary Flight Display

PMA – Parts Manufacturer Approval

RH – Right Hand (side)

RPM – Revolution per minute

S/N – Serial Number

SAE – Society of Automotive Engineers

TSO – Technical Standard Order

V – Volts

VHF – Very High Frequency

VOR – VHF Omnidirectional Range

W – Watts

# Description

The aircraft ABCD has a semi-conventional instrument panel, intended for Day-VFR operation. The conventional “sixpack” is replaced with an EFIS display on the pilot side, and contains the necessary flight data and engine data. The display has controls for the remote-controlled VHF radio, and NAV radio including VOR/ILS, GNSS. The ignition switch is located on the left side of the panel. The master switch and the electrical switches (lights, avionic master, fuel pump, etc.) are located below the display. Above the display, a placard shows the applicable limitations (MTOW, Operational limitations, manoeuvring speed, manoeuvres, IMC limitations).

The instrument panel is divided into five sections: LH, centre, RH, instrument panel cover, and centre console. The EFIS display is located on the LH section together with the analogue indicators for airspeed and altitude. The stack for radio, transponder, navigation and GPS are located on the centre panel. Engine analogue instruments are located to the right.

Location of circuit breakers (CB) are divided. The primary C/B’s, such as battery master, avionic master, flaps, etc. are placed in front of the pilot, the secondary circuit breakers, such as C/B’s for the conventional engine instruments are placed to the right side.

# Requirements

The applicable requirements of CS-LSA.15 (Reference standard: ASTM F2245-12d) as defined in the Certification programme (Ref.1), are shown in the table below.

*(NOTE: at the time of issue of this template, the CS-LSA amdt 1 is in place which includes the ASTM F2245-12d. If later amendments of the CS-LSA or ASTM are in place, they should be considered. The structure of the document remains the same, but the requirements defined in the certification basis agreed with the Agency shall be considered)*

| **Requirement from CS-LSA.15**  (ASTM F2245-12d) | **Subject of requirement** | **Reference** |
| --- | --- | --- |
| 6.10 | Pilot comfort, appropriate visibility | chp 6., see “Field of view” assessment |
| 6.11 | Airspeed indicator, calibration and errors | chp 9, see table “Airspeed Indicator (ASI)” and the related part from the Flight Test Program |
| 7.3.1 | Unusable fuel quantity | chp 9, see table “Fuel quantity indicator” and the related part from the Flight Test Program |
| 8.2.1 | Flight and Navigation instruments – Airspeed indicator | chp 9, see table “Airspeed Indicator (ASI)” |
| 8.2.2 | Flight and Navigation instruments – Altimeter | chp 8, see table “Altitude indicator” |
| 8.3.1 | Powerplant instruments | chp 8, see table “Fuel quantity indicator” and the related part from the Flight Test Program |
| 8.3.2 | Tachometer (RPM) | chp 8, see table “RPM indicator” |
| 8.3.3 | Engine “kill” switch | chp 1 |
| 8.3.4 | Engine instruments | chp 8, see the tables of engine instruments |
| 8.6.1 | ATC equipment must be approved. | see table in chp 8 and Appendix 1 |
| 8.6.2.1 | equipment must be installed according to limitations | see appendix 1 |
| 8.6.2.2 | not adversely affect other equipment | see appendix 1 |
| 8.6.2.3 | proper functioning of the equipment | see appendix 1 |
| 8.6.2.4 | labelling of equipment (1) | see appendix 1 |
| 8.6.2.5 | labelling of equipment (2) | see table in 8 |

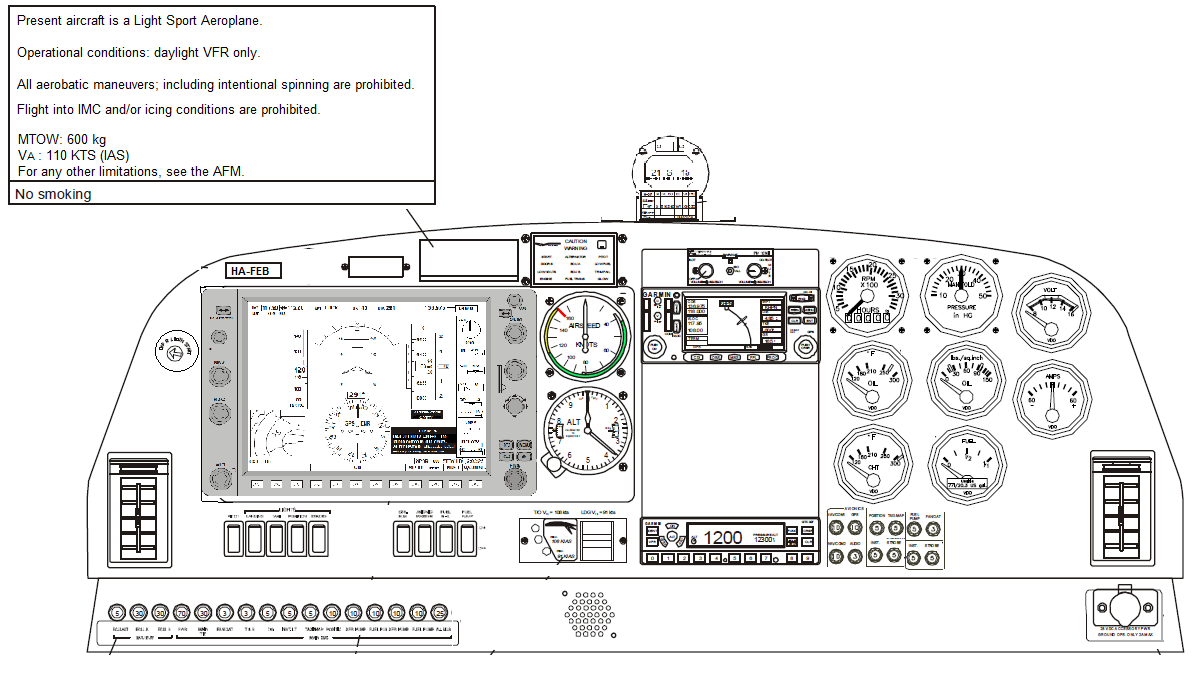
**Table 1** – Cross reference table for CS-LSA requirements

The design of the avionic system of the Airplane ABCD meets also the standards provided by the certification memo “Acceptance of Electronic Flight Instrument Systems without own equipment approval in Small Aeroplanes (ELA1)”. A cross reference table is provided in Appendix 1.

*NOTE: at the date of issue of this template, the certification memo is still in consultation. Since the certification memo is not published yet, It might happen that the final version of the Certification Memo will differ in some aspects, nevertheless the intent of the certification memo is expected to remain the same.*

# Instrument panel layout

*(NOTE: this document has been written considering a typical hybrid digital/analog solution of the instrument panel. This is not aimed to suggest a “desirable” solution by the Agency. Any solution, as long as it complies to the requirements, can be proposed and should be evaluated with the approach shown in this document)*



**Figure 1 –** Instrument Panel Layout

# EFIS screen details

|  |
| --- |
| T:\CT2\2.1 DATA\19_Procs_Pol_Disc_RM\10_GA traineeships\traineeship October 2014 - Balazs Feher\working folder\Avionic system description document\Drafts\display_to_manual_wo_coffee_alert.png  Figure 2 – EFIS screen |

The display is an 8”, high resolution VGA screen, with built-in features:

* Air data computer
* VOR and ILS LOC radio
* COM radio
* GPS receiver
* Glideslope receiver
* Solid-state attitude and heading reference system
* A/D converter

An audio panel is installed in the central section of the instrument panel. It contains controls for the pilot’s and the passenger’s audio output. The audio panel communicates with the avionics unit using RS-232 digital interface. Each microphone input has a dedicated VOX circuit to ensure that only the active microphone(s) is/are heard when squelch is broken. After the operator has stopped talking, the intercom channel remains momentarily open to avoid closure between words or normal pauses.

Remote VHF NAV/COM receiver is located in the avionics rack, behind the co-pilot’s seat.

Panel-mounted VHF NAV/COM/GPS receiver is located in the central section of instrument panel. Both COM radios are able for 8.33 kHz channel spacing.

The frequencies can be displayed additionally on the PFD. The COM radio is able for 8.33 kHz channel spacing.

# Parts of the EFIS screen

1. Attitude indicator is located in the centre of the screen.
2. Airspeed tape is located on the left side of the attitude indicator. True airspeed is digitally displayed in a small window below the airspeed tape. The airspeed indicator also displays speed ranges for different airplane configurations (flaps retracted or extended), airspeed trends and ‘V’ speeds. If the airspeed indicator fails, the display marks the airspeed display area with a red ’X’ and red text spelling out ‘AIRSPEED FAILURE’.
3. The altimeter is located on the RH side of the attitude indicator. The altimeter displays the airplane altitude in feet on a rolling number gauge (like a drum-pointer altimeter) using a moving tape. The altimeter also shows an ‘altitude bug’ at the selected altitude or on the top or bottom of the tape. If the altitude indicator fails, the display marks the tape display area with a red ’X’ and red text spelling out ‘ALTITUDE FAILURE’.
4. The vertical speed indicator is located to the right of the altitude indicator. The indicator displays the airplane vertical speed in feet/min. A numeric pointer moves vertically up/down a fixed tape. The vertical speed indication is shown digitally on the pointer. The scale on the tape gives the positive or negative multiplication factor on a 1000 feet/min ticks scale. A negative sign is shown on the pointer to indicate negative vertical speeds (airplane descending). If the VSI fails the display marks the tape display area with a red ’X’ and yellow text spelling out ‘VERT SPEED FAIL’.
5. Horizontal situation indicator (HSI). The HSI is located in the center of the screen at the bottom. The HSI displays a rotating circular compass with heading markings. The HSI shows the following information:
   1. Heading information, as a direct reading compass. The heading is shown digitally in a window at the top of the rotating compass.
   2. Turn rate indicator. A turn rate indicator is located between the digital heading window and the rotating compass.
   3. Course deviation indicator (CDI). The CDI is a line with an arrowhead that points to the airplane heading on the rotating compass. The line can slide left or right of the center marking to show the deviation of the actual course being flown to the required course. Course data can be supplied from the airplane VOR, LOC or GPS system. If the heading data is invalid the digital heading display window is marked with a red cross and yellow text spelling ‘HEADING ERROR’.
6. Vertical deviation (glideslope) indicator. The glideslope indicator is located to the left of the vertical speed indicator.
7. Alerts window. The alerts window is located on the right side of the screen. This window opens when an alert is activated. (*NOTE: the list of alerts should be provided*)
8. Warnings and cautions window. The warnings and cautions window is located above the alerts window. When an alert occurs, it supersedes the cautions and warnings. (*NOTE: the list of warning/caution messages should be provided*)
9. The navigation map (moving map) window is located in the lower left of the screen. The window shows a pictorial view of the airplane on a moving map.
10. Small bezels in the top left corner of the screen show active and standby NAV frequencies. Small windows in the top right of the PFD show active and standby COM frequencies. A larger horizontal band in the top centre of the PFD shows flight planning data when activated.
11. A small window in the bottom left of the PFD shows the outside air temperature (OAT). A small windows on the bottom right of the PFD shows the transponder settings and operational state. Another small window in the right bottom corner of the PFD shows a digital clock. A set of labels along the very bottom of the PFD identifies the function of the softkeys for the current page being displayed on the PFD.
12. The engine indication system window is on the right side of the screen, that displays a full-time dedicated display of these engine parameters (backup engine instruments are placed on the right side of the instrument panel):

*NOTE: in this example, the primary source of information is provided by the EFIS display.*

* 1. Engine RPM. The engine RPM indicator is located on the top of the engine parameters side. A pointer on a gauge-like circle moves to show the engine rpm. If the system fails the display shows a red cross on the rpm indicator.
  2. Manifold pressure (MP) The manifold pressure indicator is a horizontal bar below the RPM indicator, with an arrow-like pointer. The exact MP value in inches of mercury is displayed above the horizontal bar. The operating range of MP values is marked with a green band. The pointer moves from left to right to show the increasing manifold pressure.
  3. Cylinder-head temperature (CHT) indicator. This indicator is found below the MP indicator. This is also a horizontal bar, with an arrow-like pointer. The operating range of CHT values is marked with a small green band, the caution areas are marked with bigger yellow bands. The exact value of CHT is shown on the right side of the indicator in ◦C.
  4. Oil temperature indicator (OT). This indicator is placed below the CHT indicator, and this is also a horizontal bar, with a pointer, with green-marked operating range. The exact value in ◦C.
  5. Oil pressure indicator (OP) is located below the oil temperature indicator. This indicator is a horizontal bar, with an arrow-like pointer. A small number on the right side shows the oil pressure digitally (in bars). If the OP drops suddenly, a yellow bezel is shown around the indicator to get the pilot’s attention.
  6. The main bus voltage is displayed below the RPM indicator. A pointer above a horizontal range bar shows the main bus voltage. The horizontal range bar is color coded, too. The green central section of the bar indicates that the voltage is within limits. The red section at the left end of the range bar indicates too low a voltage. The red section at the right end of the range bar indicates too high a voltage. Above the range bar is a window displaying the main bus voltage digitally.
  7. Amps. The generator load is shown by an indicator located below the Volts indicator. A pointer above a horizontal range bar shows the generator load. The pointer moves from left to right to show the load on the generator. When the generator output and the electric demands is in balance, the pointer remains in middle. When the pointer moves to right, it means the generator charges the battery. When the pointer moves to left, it means the generator’s performance is insufficient to supply the electrical demands, so the battery energizes the electrical system.
  8. Fuel quantity. The fuel quantity indication is located at the bottom of the engine parameters annunciator. Pointers above and below a range bar indicate the fuel quantities. The pointers move from left (low) to right (full) to indicate the fuel quantity. The pointer above the range bar indicates the quantity of fuel in the left fuel tank and the pointer below the range bar indicates the quantity of fuel in the right fuel tank. The indicator is color-coded, when the fuel-quantity reaches the amount of 11 liters (the fuel needed for 30 minutes flight +10% safety margin at 1500’ above sea level+ the unusable fuel amount) the indicator becomes red. The 11 liter (2.9 USG) total fuel quantity (5.5 liters / 1.45 USG for each fuel tank) is marked with a red band on the horizontal bars. The exact fuel amount is shown on the top of the fuel bar. (Left and Right side tanks).

# Field of view

Because of the absence of more precise requirements within CS-LSA / ASTM F2245-12d for the visibility of instrumentation, an analysis of the primary field of view has been performed following AC 23.1311-1C. The aim is to give to the pilot the ability to use all the required instruments with “minimum head and eye movement”.

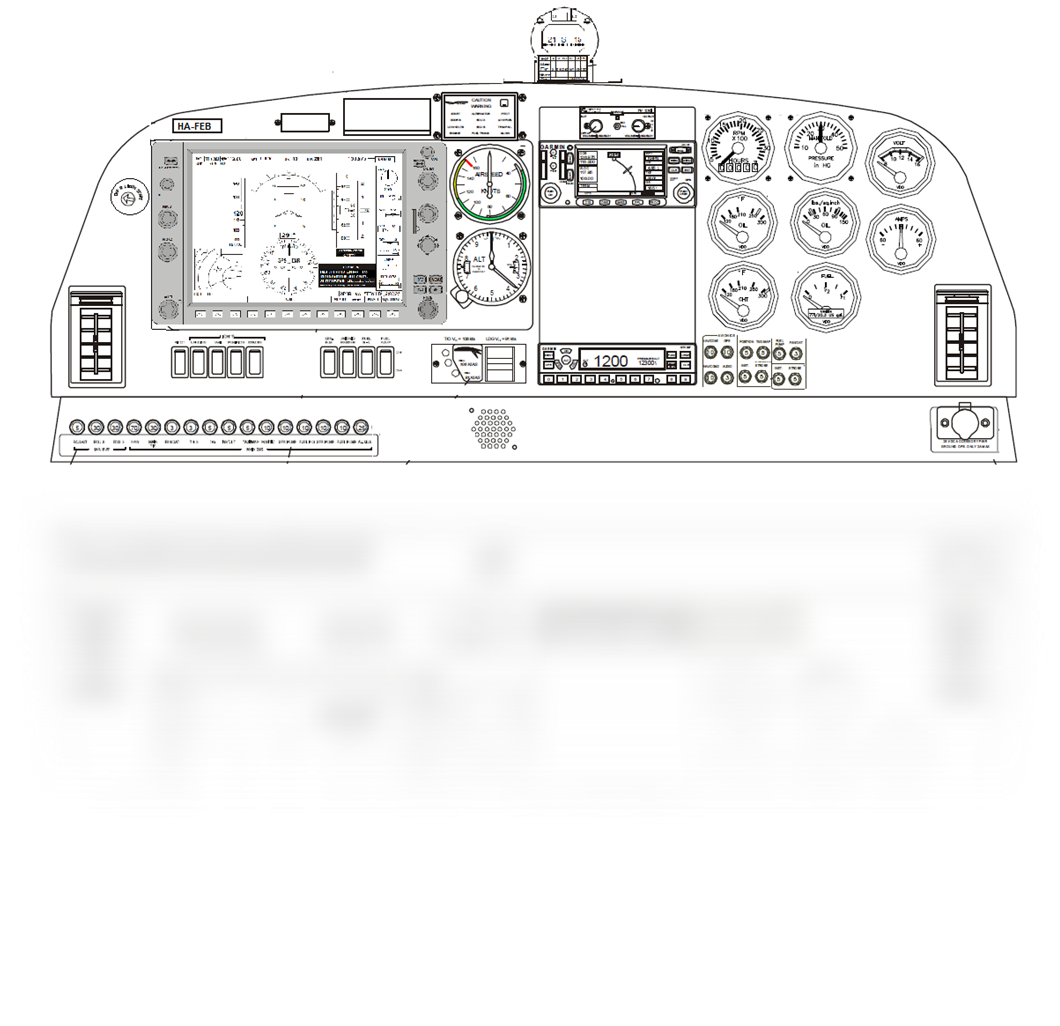
The definitions below of AC 23.1311-1C are considered.

|  |
| --- |
| *“****15.2 Primary Field-of-View.***  *Primary optimum FOV is based on the vertical and horizontal visual fields from the design eye reference point that can be accommodated with eye rotation only. With the normal line-of-sight established at 15 degrees below the horizontal plane, the values for the vertical and horizontal (relative to normal line-of-sight forward of the aircraft) are +/-15 degrees, as shown in figure 1* (*of* AC 23.1311-1C)*. This area is normally reserved for primary flight information and high priority alerts. Table 3* (*of* AC 23.1311-1C) *also provides examples of information recommended for inclusion in this visual field. In most applications, critical information that is considered to be essential for safe flight, with warning or cautionary information that requires immediate pilot action or awareness, should be placed in the primary FOV.* |
| ***15.3 Primary Maximum Field-of-View.***  *Primary maximum FOV is based on the vertical and horizontal visual fields from the design eye reference point that can be accommodated with eye rotation and minimal head rotation. These values are +/–35 degrees horizontal, and +40 degrees up and –20 degrees down vertical, as shown in figure 1* (*of* AC 23.1311-1C)*. These areas are normally used for important and frequently used information. A pilot’s visual scan and head rotation is minimized when information is placed in this area. Placement of information in this area also reduces the potential for spatial disorientation.”* |

The definition of the ***Primary Maximum Field-of-View*** of AC 23.1311-1C has been considered with one exception: a Field of View larger than +/–35 degrees horizontal and including almost the whole instrument panel has been considered acceptable. The justification is based on the reduced size of the instrument panel and the reduced number of needed information for a VFR-DAY airplane.

This has been assessed through an in-flight review and pilot assessment, which is recorded in document ABCD-FTR-00B “Qualitative pilot statements”, where it is shown that all the displayed info, including engine analog instruments, are visible through pilot’s visual scan and minimized head rotation.

*Note: the assessment above is very specific but it can be acceptable after review of EASA Flight test pilot.*



**Figure 3 –** Field of View

The table below shows the location of the equipment with respect to the above definitions of the Field of Views.

|  |  |  |
| --- | --- | --- |
| Data | Primary field of view | Primary maximum  field of view |
| Airspeed | Primary + Back-up |  |
| Altitude | Primary + Back-up |  |
| Vertical speed | Primary |  |
| Slip-skid | Primary |  |
| Direction | Primary |  |
| Magnetic heading |  | Primary |
| Com freq | Back-up | Primary |
| IC |  | Primary |
| Nav freq | Back-up | Primary |
| Nav CDI | Primary |  |
| Moving map | Primary |  |
| Engine instruments | Primary | Back-up |
| Flap control/display |  | Primary |

**Table 2** – location of the displayed information on the instrument panel

# System schematics

|  |
| --- |
| **Audio Panel**  **PFD/MFD**  Integrated with:  – AHRS  – Engine I/O  – Air Data Computer  – Integrated Avionics Unit (VHF COM/ NAV/GPS)  **Analog sensor inputs**:  – RPM  – CHT  – OT  – Oil press.  – Voltage / amperes  – Fuel qty.  – Manifold press.  **Magnetometer**  **COM/NAV/GPS**  **Transponder**  **Secondary instruments**  ALT  ASI  **Pitot head** (dynamic press.)  **Static Port** |

# Flight instrumentation

This sections provide a more detailed description of the individual equipment (information displayed, type of calibration performed, level of qualification, environmental conditions, scale range, etc.).

It is important to consider that the primary source of information for flight data is the EFIS. Thus the analogue serves as backup.

# Pitot-static instruments

| **Airspeed indicator – ASI (Analog)** | | |
| --- | --- | --- |
| Manufacturer | | XYWZ |
| Type | | Airspeed 01 |
| P/N | | ASI-01-00-KT |
| Units | | Kt or km/h as requested by the customer |
| Scale range | | 44 KT – 160 KT  79 – 296 km/h |
| Markings | White arc | 44 KT – 90 KT  79 – 162 km/h |
| Green arc | 50 KT – 120 KT  80 – 216 km/h |
| Yellow arc | 120 – 160 KT  216 – 296 km/h |
| Red line | 160 KT  296 km/h |
| Grades | | 5 units |
| Identification | | Dial shows applicable units |
| Accuracy | | +/– 3 kts |
| qualification | | see **Table 3** |
| Calibration | | During initial flight tests with swivel-head pitot-tube. See Flight Test Report no. ABCD-FTR-05 “Pitot-static calibration report” for details. |

|  |  |
| --- | --- |
| **Altitude indicator (Analog)** | |
| Manufacturer | XYWZ |
| Type | Alt 10 000-3 |
| P/N | AL-10K-00 |
| Units | Feet or meter as requested by the customer |
| Scale range | 10 000 m (metric model)  35 000 feet (feet model)  Barometric scale: mbar |
| Grades | Major scale: 200 feet minor scale 20 feet |
| Identification | Dial shows applicable units |
| Accuracy | +/– 30 feet or 10 m |
| Qualification | see **Table 3** |
| Alternative qualification | ETSO C10b  SAE Aerospace Standards AS392C |
| Setting | With barometric scale |

# Navigation instruments

|  |  |
| --- | --- |
| **Magnetic compass** | |
| Manufacturer | XYWZ |
| Type | Comp-10-001 |
| P/N | W-01-D-123-00 |
| Temperature range | –20 °C to +50 °C |
| Compensation ability | present |
| Accuracy | Errors within 5° when properly installed and compensated |
| Operation range | Allow reading within LH/RH 20° of banking and/or +/–20° of pitching |
| Grades | In every 5 and 10 degrees, numbers on every 30° and showing N, S, E and W |
| Equipment qualification | ETSO C7c  SAE Aerospace Standards AS 398A  *NOTE: ETSO qualification is not mandatory for magnetic compass* |

|  |  |
| --- | --- |
| **Radio, VOR, and GPS unit** | |
| Manufacturer | XYZ |
| Type | GPS-COM 400 |
| P/N | GC-400-578-00 |
| Temperature range | –20 °C to + 50 °C |
| Voltage | 10 to 40 VDC |
| Frequency range | 118 to 136.975 MHz (COM) 108 to 117.95 MHz (NAV) |
| Channel spacing: | 8.33 kHz (COM), 5 kHz (NAV) |
| Output W | 8 Watts (28 Watts input) |
| Antennas | Operation is verified by ground test before first flight. |
| Qualification | ETSO 2C34f, 2C36f, 2C37e, 2C38e 2C40c, 2C128 and C129a  *NOTE: ETSO qualification for radio is mandatory.* |

|  |  |
| --- | --- |
| **Transponder** | |
| Manufacturer | XYZ |
| Type | XPNDR 123 |
| P/N | XP-2-4143-00 |
| Temperature range | –20 °C to + 50 °C |
| Voltage | 10 to 40 VDC |
| Altitude range (encoder) | –100 to 33000 feet |
| Accuracy: | +/– 20 feet (max. +/– 50 feet) |
| Mode: | A, C, S |
| Output W | 8 Watts (28 Watts input) |
| Antennas | Operation is verified by ground test before first flight. |
| Qualification | ETSO 2C112, Encoder: ETSO C88  *NOTE: ETSO qualification for transponder is mandatory.* |

| **Intercom** | |
| --- | --- |
| Manufacturer | XYZ |
| Type | IC 2000 |
| P/N | 2000-00-00 |
| Outside air temperature (OAT) range | –30°C – +50°C |
| Voltage | 13.5–27.8 V nominal |
| Capabilities | Two places  Pilot isolation |
| Qualification | see **Table 3** |
|  | |
| **AOA indicator** | |
| Manufacturer | PFD Enterprises Llc |
| Type | AOA 001 |
| P/N | AO-13456-00 |
| Temperature range | –30° to 50° C |
| Voltage | 10 – 30 V DC |
| Max. operating altitude | max. 30.000 ft |
| AOA limits | –10 + 20 degrees |
| Qualification | see **Table 3** |

|  |  |  |
| --- | --- | --- |
| **EFIS** | | |
| Manufacturer | | PFD Enterprises Llc |
| Type | | G3XXX |
| P/N | | 5678-00-00 |
| Firmware Version | | 2.5 |
| Airframe settings | | Settings that represent aircraft limitations are locked against inadvertent change by the  pilot and accessible only following a special key combination that is not obvious during system operation in flight.  Airframe settings are set in a configuration file. |
| Installation methods | | As per Installation Manual. |
| Acceptance criteria | | This is described in document ABCD-WI-POA-01 “Working instructions for Production Organisation” |
| Brightness | | adjustable by crew |
| Controls | | Softkeys, push-buttons, dials, joysticks |
| Operating range | Altitude detection | 20 000 feet |
| Airspeed | 20…200kts or 30…370km/h |
| Vertical speed | Up to 2000 feet / min |
| Minimal displayed data | | Airspeed, altitude, vertical speed, heading, attitude. For additional data and accuracy see the operation manual doc. no. G3-OM-00 |
| Temperature range | | –30° to 50° C |
| Voltage | | 10 – 30 V DC |
| Max. operating altitude | | max. 30.000 ft |
| Airspeed information | | by measuring static and total pressure |
| Altitude information | | By measuring static pressure |
| Vertical speed | | By measuring static pressure |
| Slip/skid | | gravity signal and / or attitude  information g-meter detecting gravity |
| Magnetic heading | | Data from the magnetometer |
| NAV DATA | | Data from the GPS and NAV unit |
| Qualification | | see **Table 3**.  in addition:  The equipment has no ETSO qualification. The equipment is certified for this installation as shown in table in Appendix I.  Post-installation test flight will be performed. |
| Documentation | | G3XXX installation manual, doc. no G3-IM-00, G3XXX operation manual, doc. no G3-OM-00 |

# 

# Backup engine instruments

|  |  |  |
| --- | --- | --- |
| **Cylinder Head Temperature (CHT) indicator** | | |
| Manufacturer | | ENG |
| Type | | CHT 001 |
| P/N | | CH-001-00 |
| Units | | °C |
| Operating Range | | 0–150 °C |
| Markings | Yellow arc | 60–75 °C |
| Green arc | 75–110 °C |
| Yellow arc | 110–120°C |
| Red line | 120 °C |
| Outside air temperature (OAT) range | | –30°C–50°C |
| Accuracy | | +/– 3% |
| Operational voltage | | +10…32 V DC |
| Current | | 0.1 A max |
| Qualification | | see **Table 3** |

|  |  |  |
| --- | --- | --- |
| **Oil temperature indicator** | | |
| Manufacturer | | ENG |
| Type | | OTI 123 |
| P/N | | OT-12-00 |
| Outside air temperature (OAT) range | | –30°C–50°C |
| Units | | °C |
| Markings | Yellow range | 40–60 °C |
| Green range | 60–80 °C |
| Yellow range | 80–110 °C |
| Red line | 110 °C |
| Operating range | | 0–150 °C |
| Accuracy | | +/– 3% |
| Voltage | | +10…32 V DC |
| Current | | 0.1 A max |
| Qualification | | see **Table 3** |

|  |  |  |  |
| --- | --- | --- | --- |
| **Oil pressure indicator** | | | |
| Manufacturer | | | ENG |
| Type | | | OP 0001 |
| P/N | | | OP-001-00 |
| Outside air temperature (OAT) range | | | –30°C–50°C |
| Units | | | bar |
| Markings | | Red line | 0.8 bar |
| Yellow range | 0.8–2 bar |
| Green range | 2–4 bar |
| Yellow range | 4–7 bar |
| Red line | 7 bar |
| Operating range | | | 0–10 bar |
| Accuracy | | | +/– 3% |
| Voltage | | | +10…32 V DC |
| Current | | | 0.1 A max |
| Qualification | | | see **Table 3** |
| **Voltmeter** | | | |
| Manufacturer | | ENG | |
| Type | | VM 12345 | |
| P/N | | VM-12-00 | |
| Outside air temperature (OAT) range | | –30°C–50°C | |
| Units | | Volts (V) | |
| Markings | Red line | 12 V | |
| Yellow range | 12–12.5 V | |
| Green range | 12.5–15 V | |
| Yellow range | 15–16 V | |
| Red line | 16 V | |
| Operating range | | 9–20 V | |
| Accuracy | | +/– 3% | |
| Voltage | | +10…32 V DC | |
| Current | | 0.1 A max | |
| Qualification | | see **Table 3** | |

|  |  |  |
| --- | --- | --- |
| **Ammeter** | | |
| Manufacturer | | ENG |
| Type | | AM 1234 |
| P/N | | AM-12-00 |
| Outside air temperature (OAT) range | | –30°C–50°C |
| Units | | Amperes (not shown) |
| Markings | Left side limit (discharging) | –30 A |
| Center | 0 |
| Right side limit (charging) | + 30 A |
| Operating range | | +/– 30 A |
| Accuracy | | +/– 3% |
| Voltage | | +10…32 V DC |
| Current | | 0.1 A max |
| Qualification | | see **Table 3** |

|  |  |  |
| --- | --- | --- |
| **Fuel quantity indicator** | | |
| Manufacturer | | ENG |
| Type | | FQI 678 |
| Outside air temperature (OAT) range | | –30°C–50°C |
| Units | | Litres |
| Markings | | None (only the “Empty” value is shown, what has been calibrated to 2 litres, the unusable fuel quantity) |
| Operating range | | 2 litres – 80 litres |
| Accuracy | | +/– 30% |
| Voltage | | +10…32 V DC |
| Current | | 0.1 A max |
| Qualification | | see **Table 3**  in addition:  calibration on ground and check in flight for proper operation. Unusable fuel quantity has been calibrated through flight test campaign. See Flight Test Program for details. |
| **Manifold pressure indicator** | | |
| Manufacturer | ENG | |
| Type | MPI 456 | |
| P/N | MP-45-00 | |
| Outside air temperature (OAT) range | –30°C–50°C | |
| Units | Hg In | |
| Markings | At each 1.0 and 0.5 values | |
| Operating range | 10 – 35 Hg In | |
| Accuracy | +/– 3% | |
| Voltage | +10…32 V DC | |
| Current | 0.1 A max | |
| Qualification | see **Table 3**  in addition:  Delivery according to order number with confirmation of accuracy.  Verification in check flight for proper operation | |

|  |  |  |
| --- | --- | --- |
| **RPM indicator** | | |
| Manufacturer | | ENG |
| Type | | Revol 001 |
| Outside air temperature (OAT) range | | –30°C–50°C |
| Units | | RPM |
| Markings | Green range | 500–2450 RPM |
| Yellow range | 2450–2550 RPM |
| Red line | 2550 RPM |
| Operating range | | 100–3000 RPM |
| Accuracy | | +/– 3% |
| Voltage | | +14 V DC |
| Current | | 0.15 A max (incl. flight hours meter) |
| Qualification | | see **Table 3**  in addition:  Delivery according to order number with confirmation of accuracy.  Verification in check flight for proper operation |
| Flight hours meter | | Integrated to the RPM indicator |
| Flight hours meter units | | Hours and 1/10 hours |
| Flight hours meter accuracy | | ±0.03% |
| Flight hours meter current rating | | 0.05 A max |

# Warning lights

|  |  |
| --- | --- |
| **Generator warning light** | |
| P/N | GW-00-12-00 |
| Voltage | 12 V DC |
| Power | 3 W |
| Color | Red |

|  |  |
| --- | --- |
| **Fuel pressure warning light** | |
| P/N | FPW-00-12-00 |
| Voltage | 12 V DC |
| Power | 3 W |
| Color | Red |

|  |  |
| --- | --- |
| **Coolant level warning light** | |
| P/N | CLW-00-12-00 |
| Voltage | 12 V DC |
| Power | 3 W |
| Color | Yellow |

# Main switches

|  |  |
| --- | --- |
| **Master switch** | |
| P/N | SW-14-50-00 |
| Voltage | 14 V DC |
| Max. current | 25 A |
| Rated current | 50 A |
|  | |
| **Avionic master switch** | |
| P/N | SW-14-15-00 |
| Voltage | 14 V DC |
| Max. current | 10.1 A |
| Rated current | 15 A |

|  |  |
| --- | --- |
| **Ignition switch** | |
| Manufacturer | AC |
| Type | AC-510 |
| Qualification | FAA-PMA |

# Circuit Breakers

|  |  |
| --- | --- |
| **Circuit breakers** | |
| Type | CB01-xx (xx shows current rating) |
| Voltage | 14 V DC |
| Max. current | Selected per component or wiring specification |
| Rated current | Selected per component or wiring specification |

# Other instruments and switches

1. **Transponder**

The XPNDR 123 is a solid state Mode-S transponder. The transponder provides modes A, C and S functions. The unit is operated directly through the display’s softkeys or the panel. The transponder is linked to the avionics unit via RS-232 digital interface. The transponder is installed in the bottom part of the middle instrument panel.

1. **Flap switch, and flap position indicator**

The flap switch and position indicator have been integrated into one unit. The positions are shown by LEDs for each flap position. One for the UP, one for the 15°, and one for the 30° position.

# Units integrated into the EFIS display

**AHRS:** it provides airplane attitude and related flight data to the display. It receives data from the air data computer, the magnetometer and GPS signals.

**The Air Data Computer (ADC)** receives data from the Pitot/static system and an OAT sensor. The ADC uses this data to provide pressure altitude, airspeed, vertical speed and outside air temperature data to the EFIS system. Software and configuration data is received through RS-232 digital interface. The ADC is located inside the EFIS display unit.

**Integrated avionics unit** processes all the data that is shown on the EFIS display.

**Engine I/O unit** is integrated into the EFIS display unit itself. It is a microprocessor based unit that receives and processes signals from airframe and engine sensors. (CHT sensor, RPM sensor, OAT, etc.)

**Magnetometer:** it senses magnetic field information. Data is sent to the AHRS for processing. The magnetometer receives power from the AHRS and communicates with it using RS-485 digital interface. The magnetometer is located in the left outer wing and can accessed through a panel in the lower surface of the wing.

# Antenna and sensor locations

The GPS antenna is located on the upper side of the fuselage. The COM antenna is located on the top of the vertical stabilizer. The NAV antenna is located underside of the fuselage.

The pitot-static tube is located on the left wing.

The magnetometer is located inside of the left wing.

# Antenna types

|  |  |
| --- | --- |
| **GPS Antenna** | |
| Type | GPS-AN-01 |
| P/N | G-123-13-00 |

|  |  |
| --- | --- |
| **COM Antenna** | |
| Type | COM-AN-01 |
| P/N | C-123-13-00 |

|  |  |
| --- | --- |
| **NAV Antenna** | |
| Type | NAV-AN-01 |
| P/N | N-123-13-00 |

|  |  |
| --- | --- |
| **Transponder Antenna** | |
| Type | NAV-AN-02 |
| P/N | N-1234-34-00 |

# Antenna and sensor location layout

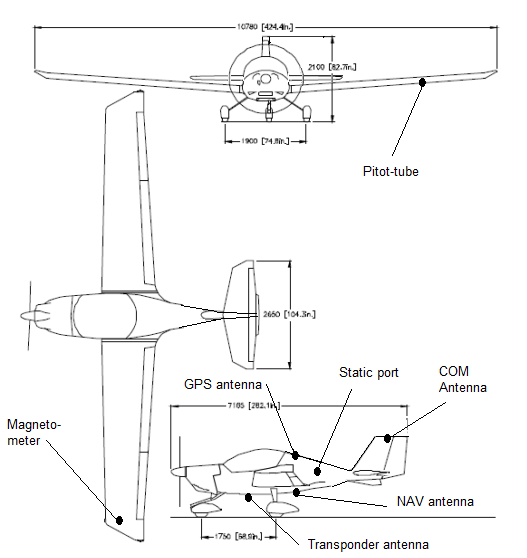


Figure 4 – Antenna and sensor locations

# Qualification of the equipment

The general approach for the qualification of the equipment is described in the following table. Three type of equipment are identified:

* Approved equipment: identifies an equipment whose design meets an ETSO standard;
* Standardized equipment: identifies an equipment whose design meets an industry standard;
* Accepted equipment: identifies an equipment which meets a certain specification defined by the equipment manufacturer;

*Note: the above definitions have a meaning limited to this document and should not be read in the context of other similar definitions given in EU regulations (e.g. :approved equipment has a different meaning here than the meaning in EU 748/2012 - part 21).*

|  |  |
| --- | --- |
| type of equipment | qualification level |
| approved | The equipment has an ETSO approval  *Note: in this case it is enough to mention the ETSO standard.* |
| standardized | The equipment has been qualified by the equipment manufacturer to an industry standard (e.g. automotive or electronic industry standard). The data sheet of the equipment is then used to cross check with the environmental operating conditions of the airplane. Calibration (if needed) is performed via ground or flight tests.  *Note: in this case the applicant should define the industry standard and provide rationale why it is found acceptable for the specific type of information.* |
| accepted | The equipment has not been qualified by the equipment manufacturer to an industry standard.  The specification of the equipment is used to cross check the environmental operating conditions of the equipment with the operating conditions of the airplane.  The equipment is found acceptable based on one the following (or a combination of):   * service experience; * supplier credibility; * assessment done by the design organisation.   Calibration (if needed) is performed via ground or flight tests.  *Note: In this case, the applicant should determine the rationale for the acceptance of the equipment. It is a case-by-case scenario and of course, the criticality of the equipment plays an important role.* |

**Table 3** – Qualifications level

*Note: the aim of this section is to define the criteria for acceptance. In the scope of this template, for most of the equipment in chapter 9, the information related to the qualification of each equipment just refer to Table 3 without adding further information (only in some cases some additional info are provided). When the applicant produces this document, she/he will have to provide more details, explaining how the criteria above are used in each single case. This is mainly needed in case of “accepted” equipment.*

# Assessment of failures of the PFD

This Safety Assessment (SA) is based on SAE Aerospace Recommended Practice (ARP) No. ARP4761 “Guidelines And Methods For Conducting The Safety Assessment Process On Civil Airborne Systems And Equipment” issued on 12-1996 (as amended). It follows the method of Failure Mode and Effect Analysis (FMEA).

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Reference** | **Function** | **Phase of Flight** | **Failure Condition** | **Failure Effect** | **Classification** | **Note** |
| 1. | PFD | Any | Blackout | The pilot will unable to monitor the aircraft systems, the navigation, and the flying parameters in one display | Minor | The instruments displayed on the PFD has conventional backup on the RH side, out of the |
| 2. | PFD | Any | Frozen screen | The display will not show the actual flight and engine data | Minor | Backup instruments required for VFR day flight are installed into the instrument panel, but out of primary field-of-view. |
| 3. | PFD | Any | Contradictory information | The display will not show correct data | Minor | Same as above |
| 4. | PFD | Any | Incorrect GPS data – moving map become inaccurate | The pilot will be unable to navigate with the GPS | No safety effect | In this mode of operation, the GPS is not a primary navigation equipment, for VFR flight, at least one paper-based 1:500 000 scaled map is required. |

Table 4 – Safety assessment

*Note: this chapter is aimed to provide the assessment of the failures as required by the Certification memo on non ETSO EFIS. In this case it is limited to the PFD since it is the only (non ETSO) source of safety information. In general, such analysis can be used to support the suitability of a certain equipment and the acceptability of the corresponding qualification level.*

# Instrument panel Hazard Assessment

The aim of this chapter is to assess the potential hazards that might be placed to the occupants by the equipment in the instrument panel. This is aimed to support compliance to ASTM F2245-12d chapters 8.6.

| **Hazard type** | **Mitigation** |
| --- | --- |
| High pressure lines | No high pressure fluid lines are installed in the area of the instrument panel. |
| High temperature | No high temperature lines are installed in the area of the instrument panel.  Electronic devices will not produce significant heat, and will be equipped with vent holes. A ground test has been performed (See doc. in ABCD-GTR-34 "Avionic ground test report") to check that the equipment is cooled according to the instructions provided by the Equipment manufacturer and work in the acceptable range.  *(NOTE: This functional check should be performed in conservative but realistic hot conditions.)* |
| High voltage | Only the generator is able to produce voltage out-of-normal voltage range. No TR (transformer-rectifier) are installed to the electrical system. Over-voltage relay and a fuse has been installed to the electrical system to prevent over-voltage. *(NOTE: the battery is installed in the engine compartment. However, if the applicant installs the battery to the cockpit (e.g. aft of the seats) the proper insulation and a fuse installation is necessary)* |
| Static electricity | Proper bonding is provided to each equipment and flight control. This was tested in documented in ABCD-GTR-34 "Avionic ground test report" |
| High current | Circuit Breakers (CBs) are installed to each equipment as well as the main bus and the generator to protect the equipment from higher current. |
| Short circuit | Circuit Breakers and/or Fuses are installed to each equipment. |
| Fire | Equipment are appropriately protected with fuses to reduce the risk of short-circuit and other electrical hazards  All the equipment with electronic parts, are installed into a metallic box, The installation of Electronic devices is such that excessive heat is avoided, therefore fire will be contained if produced by internal short-circuit.  No lithium battery is installed (also as part of the electronic devices).  No electronic component (large capacitor, etc.) that can produce heat, smoke and hazard, if damaged, are installed in the cockpit.  The above reduces the risk of fire, but in case fire take place, an emergency procedure is provided in AFM chapter 3, “Emergency procedures”. |
| Smoke | Smoke might be caused by fire in the cabin or be ingested from the outside. In the first case, a forced cabin ventilation may be executed with opening the cabin vent, and the sidewall windows on the canopy. In the second case, minimization of this hazard is offered by the possibility of manually shutting off all air intakes directed to the cabin.  The AFM chapter 3, “Emergency procedures” describes the corresponding emergency procedure. |

Table 5 – Safety assessment

# Compliance statements

Compliance statements are shown below.

|  |  |  |  |
| --- | --- | --- | --- |
| **Requirement reference** | **Subject** | | |
| CS-LSA F2245-12d 6.10 | 6.10.1 Pilot comfort, appropriate visibility (instruments, placards, and outside), accessibility, ability to conduct an emergency escape, and ability to reach all controls for smooth and positive operation shall be provided. | | |
| **Statement of compliance** | Because of the absence of more precise requirements within F2245-12d and/or CS-LSA for the visibility of instrumentation, an analysis of the primary field of view was performed, following AC 23.1311-1C. The result of this analysis verifies, that the upper-left and upper-center parts of the instrument panel is properly within the primary field of view, whereas lower-center and most of upper-right panel and the direct reading compass (position at the top of the instrument panel) and the secondary CBs are in the maximum primary field-of-view. An acceptable positioning of individual indications is defined on the basis of this analysis.  Furthermore a pilot assessment has been done and recorded in ABCD-FTR-00B “Qualitative pilot statements”.  Therefore, appropriate pilot visibility of all instruments is ensured. | | |
| **Verified by** |  | **Date** |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **Requirement reference** | **Subject** | | |
| CS-LSA F2245-12d 6.11 | 6.11.1 The airspeed indication system must be calibrated in flight to determine the system error from VS0 to VH.  6.11.2 The airspeed indication system error, including position error, but excluding the airspeed indicator instrument calibration error, may not exceed 5 kts or 5 %, whichever is greater, throughout the following speed ranges:  6.11.2.1 1.3 VS0 to VH with flaps retracted.  6.11.2.2 1.3 VS0 to VFE with flaps extended. | | |
| **Statement of compliance** | Airspeed indicator was calibrated throughout the flight test campaign, in the abovementioned speed range. Results are shown in Flight Test Report no. ABCD-FTR-05 “Pitot-static calibration report”, the widest error range is 3 knots, which is below the limit of the requirement. | | |
| **Verified by** |  | **Date** |  |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Requirement reference** | | **Subject** | | | | |
| CS-LSA F2245-12d 7.3.1 | | 7.3.1 The unusable fuel quantity for each tank must be established by tests and shall not be less than the quantity at which the first evidence of engine fuel starvation occurs under each intended flight operation and maneuver. | | | | |
| **Statement of compliance** | | Unusable fuel quantity is 2 litres. It has been verified by several flight tests, with various flight operation conditions and manoeuvres. See Flight Test Report no. ABCD-FTR-04 “Cruise performance test” for test details. | | | | |
| **Verified by** | |  | | **Date** | |  |
| **Requirement reference** | | **Subject** | | | | | |
| CS-LSA F2245-12d 8.1,2,3 | | 8. Required Equipment  8.1 The aircraft shall be designed with the following minimum instrumentation and equipment:  8.2 Flight and Navigation Instruments:  8.2.1 Airspeed indicator, and  8.2.2 Altimeter.  8.3 Powerplant Instruments:  8.3.1 Fuel quantity indicator,  8.3.2 Tachometer (RPM),  8.3.3 Engine “kill” switch, and  8.3.4 Engine instruments as required by the engine manufacturer. | | | | | |
| **Statement of compliance** | | The required instruments and switches are installed. The tables in chapter 9 contain all the installed equipment, and the details of these instruments and switches. | | | | | |
| **Verified by** | |  | | **Date** | |  | |

|  |  |  |  |
| --- | --- | --- | --- |
| **Requirement reference** | **Subject** | | |
| CS-LSA F2245-12d 8.6 | 8.6 Instruments and other equipment may not in themselves, or by their effect upon the aircraft, constitute a hazard to safe operation. Therefore:  8.6.1 Each item of required ATC equipment must be approved. | | |
| **Statement of compliance** | ATC equipment are ETSO approved as shown in tables in chapter 9. chapter | | |
| **Verified by** |  | **Date** |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **Requirement reference** | **Subject** | | |
| CS-LSA F2245-12d 8.6.2 | 8.6 Instruments and other equipment may not in themselves, or by their effect upon the aircraft, constitute a hazard to safe operation. Therefore:  8.6.2 Each item of installed equipment must:  8.6.2.1 be installed according to limitations specified for that equipment;  8.6.2.2 be installed in a way that it is unlikely to adversely affect the proper functioning of any other system or equipment of the aircraft;  8.6.2.3 be installed in a way to function properly | | |
| **Statement of compliance** | All equipment are appropriately labelled, calibrated and placarded (when needed) Ranges are defined according tables in chapter 9.  Further explanations about how the intent of these requirements are met are provided in Appendix I. | | |
| **Verified by** |  | **Date** |  |

**Appendix I**

See Certification Memo of “Acceptance of non ETSO’d Electronic Flight Instrument Systems in Small Airplanes (ELA1)”

| **Points from Certification Memo** | **assessment** |
| --- | --- |
| 3.1.1. EFIS without own equipment approval may be installed under responsibility of aircraft manufacturer if |  |
| installed according to limitations and instructions specified for that equipment. | The equipment has been installed in accordance with manufacturer’s installation manual. All the equipment’s operating ranges are within the aircraft’s limitations. See also chapter 10, table EFIS, row “Documentation” for the referring document. |
| Has been verified to perform its function as intended. | The data displayed by the PFD have been calibrated and it has been checked via analysis, ground tests and flight tests that the PFD can properly operate in the operating conditions of the airplane. |
| information that is not known to be reasonably accurate should not be displayed. | The EFIS equipment has a “moving map” function, based on GPS data. The “moving map” shall not be used for navigation purposes. This limitation will be included into Subpart 2 of AFM. |
| Note: It is recommended to perform a post-installation ground and flight test to confirm accurateness. | Post-installation ground and flight test has been performed for the flight data (Airspeed, Altitude, Attitude, Heading) and engine data accuracy. This was shown in documents Flight Test Report no. ABCD-FTR-05 “Pitot-static calibration report” and ABCD-GTR-34-00 “Avionics ground test report” |
| An assessment of potential hazards to safe operation (i.e., risk of fire and smoke) does not result in unacceptable hazards. The assessment can be performed with the use of engineering judgement. | A Hazard Assessment (HA) has been carried out. See chapter 0. |
| The configuration of the EFIS and the parameters and limitations it displays are defined by the approved aircraft design, and includes | See 9. b, Table EFIS |
| Identification of the appropriate database needed to support the intended operations as well as those that are not required to be under configuration control as part of the approved aircraft design (e.g., operator checklists; aeronautical databases). | Up-to-date database is used.  Electronic check-lists are locked as a part of the airframe settings.  8.b, table EFIS, see rows “Firmware” and “Airframe settings”.  Instructions in the AFM about how to change/adjust configuration.  Instructions in the AFM to contact the Airplane manufacturer in case of any change to software. instructions in the AFM about what to do in case of sw updates coming from the OEM |
| A means to protect the defined configuration from being inadvertently altered is in place. | The airframe settings are locked. Further information: 8.b, table EFIS, see row “Airframe settings”. |
| A procedure to assess and approve Software and/or programmable firmware updates is in place. | Most of the firmware updates can be done as per equipment’s operation manual.  Criteria and Instructions are in the AFM. |
| all information has to be displayed in a way not interfering with normal operation of the aircraft and not violating generally accepted display design conventions (e.g., display principles of standard certified equipment, colour schemes, etc. Further guidance is provided in AC 23.1311-1C). | Display principles and settings are detailed in Subpart 5 “Part of the EFIS screen” and Subpart 6 “Field of view”. Proper human-machine interface operations are checked during display ground test, and summarized into doc.no. ABCD-FTR-00B “Qualitative pilot statements”. |
| Instructions for continued airworthiness for the equipment are established. | Continued airworthiness instructions are the manufacturer’s recommendation. See table EFIS in chapter 10 (row Documentation). |
| 3.1.2. Presentation of airspeed within EFIS is acceptable, when |
| Either the aircraft has a very clear stall warning and flight characteristics making it improbable to enter unsafe conditions or a second display of airspeed information is provided.  Single failures of non ETSO’d electronic equipment (e.g., display, air data sensor) do not cause complete loss of airspeed information and stall warning but it is not required to provide a full independent system (e.g. dual pitot-static). | A secondary airspeed indicator is installed as explained in chapter 8. It is independent from the EFIS system, although it uses the same dynamic and static pressure lines. For details of the airspeed indicator see 8.b table “Airspeed indicator”, for the system schematics drawing, see Subpart 7. |
| The AFM/POH describes how to detect malfunctions and how to react. This should include scenarios like “frozen” or “black” screen and information provided could include e.g. recommended power-/flap setting to stay safely within the certified envelope. | An assessment of the malfunctions is done in chapter 0. In line with this, Subpart 3/B of the AFM shows the operational instructions for malfunctions and abnormal operations of the display.  It also contains tables for recommended “pitch and power” settings. |
| 3.1.3. Equipment or systems have to be verified to assure function and quality of displayed data |  |
| Airspeed, Barometric Altitude |  |
| Instruments have to be calibrated against a reference.  When airspeed and/or barometric altitude is provided by more than one instrument, their indications should be consistent. | Errors of the pitot-static systems are calibrated. See requirements table (Subpart 2.), and Flight Test Report no. ABCD-FTR-05 “Pitot-static calibration report”. A  Airspeed indicator: All the indication errors are within +/– 3 knots, what are lower than the limit. See requirements table (Subpart 2.), and Flight Test Report no. ABCD-FTR-05 “Pitot-static calibration report”.  Altitude indicator and EFIS altitude: they have been calibrated with laboratory equipment, and during flight. See requirements table (Subpart 2.), and see Flight Test Report no. ABCD-FTR-05 “Pitot-static calibration report” and ABCD-GTR-34-00 “Avionics ground test report”.  Dual indications have been checked during flight test to stay within acceptable range of consistency. See ABCD-FTR-05 “Pitot-static calibration report” |

|  |  |
| --- | --- |
| **Points from Certification Memo** | **assessment** |
| Engine instruments |  |
| All indications should be verified for accuracy. | All the engine instruments, and EFIS system engine displays are calibrated. For details, see 8. c, engine instruments, and see Qualification row in each table. |
| Flap/Trim settings indications |
| Indications should be verified for accuracy by ground test. | Indications were checked before first flight and documented into doc.no. ABCD-GTR-00B “Ground test report before first flight” |
| Other information |
| Any other displayed information must be verified for accuracy. | All the displayed information in the cockpit were checked and calibrated. These calibrations can be found in the document ABCD-FTR-00B “Qualitative pilot statements” |
| 3.1.4. Equipment required for communication with ATM |
| If equipment for VHF communication or surveillance (including antenna, altitude encoder, user interface, ...) is installed it should be approved in accordance with the appropriate ETSO standards. | All the radio and transponder units have ETSO certification. To show compliance, see row “Qualification” of Chapter 8.b “Radio, VOR and GPS unit” and “Transponder” |
| Proper functioning of ATM equipment especially new antenna types and positions should be verified. | 8.b “Radio, VOR and GPS unit” see row “Qualification”. Calibration reports can be found in ABCD-FTR-00B “Qualitative pilot statements” |
| The certified user interface should be approved in accordance with the appropriate ETSO standards. A secondary, non-ETSO’d user interface may be used in addition. | The transponder unit has ETSO certification. However, the pilot may operate the transponder with a remote control unit integrated to the G3XXX display. To get the description, see Subpart 5. “Parts of the EFIS screen” paragraph 11. |