

MISSION CORE SYSTEM



At the core of the mission



GALILEO AVIONICA

A Finmeccanica Company

Mission Core System - MCS

The Mission Core System (MCS) has been developed by Galileo Avionica to meet today and tomorrow requirements for aircraft display and control, navigation, system and mission management. The high level of functional integration and the growth potential of the MCS are the result of Galileo Avionica experience acquired on major Avionics European programmes (Eurofighter, EH101, NH90).

- > Full comprehensive integrated avionic suite including display and control equipment set;
- > Integrated Embedded Training System (ETS), with relevant ground preparation facility;
- > Validated operational flight programs packages for navigation, health monitoring, mission data handling and raster/stroke graphics.



The Mission Core System (MCS) innovative open architecture is based on a proprietary core Avionic Suite composed by Mission Computer/Symbol Generators (MCSG) hosting the Operational Flight Program (OFP), Multi Function Displays and Head Up Displays.

The MCS "Open Architecture" has been conceived to have an easily expandable avionic system capability and the "Avionic Suite" modular and flexible design is based on the use of digital, proven and off-the-shelf avionics.

The customised solutions for aircraft core avionics offered by Galileo Avionica include:

- > Single or Dual Redundant mission computer system for fighter/trainer applications including aircraft modernization programmes, tactical system management on helicopters/aircraft and surveillance application;
- > Smart or dumb Multifunction Head Down Display;
- > Smart or dumb Head up Display.

Above equipment can be furthermore customized both in their HW and SW according to specific customer's requirements. The resulting modular, open system and scalable Mission Core System architecture allow managing of:

- > Communications: handling of MIL-STD 1553, ARINC 429, high/low speed serial links;
- > Displays (Cockpit & Tactical): symbology generation on HUD and MFD;
- > Navigation (interfaced to): doppler, GPS, radar altimeter, etc;
- > Mission sensors: sensor data collection and tactical data base management;



- > Sensors data acquisition and "Crew Alerting" control (EICAS – Engine Instruments Crew Alerting System);
- > Map presentation;
- > Weapon aiming;
- > Store management;
- > Identification.

MCS products are currently on-board of several platforms:

- > Aermacchi M346
- > AMX ACOL
- > AgustaWestland EH101 Export
- > AgustaWestland EH101 MCSP
- > Lockheed Martin / AW US101
- > AgustaWestland A139-M
- > Dassault Mirage III/V
- > NH90 TTH (all variants)
- > NH90 NFH Nahema
- > NH90 NFH Norway
- > SH3D Italian Navy
- > AB212 Italian Navy

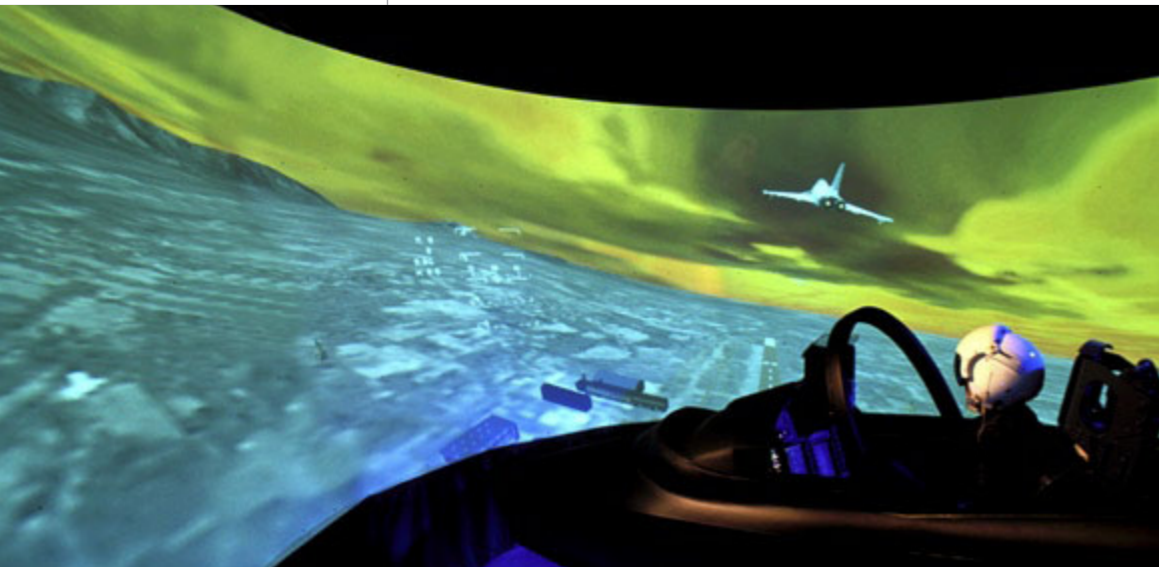
Galileo Avionica product support policy, aiming to supply customers "value for money", is provided by a dedicated Logistics and Services business unit. The high quality standard of the after sales service, guarantees the products quality and performance, for the entire scheduled service life. Galileo Avionica product support services catalogue includes, traditional services like: maintenance, spares, ground support Equipment, technical publications, training, field service engineering etc.; together with the most advanced "turn-key" services.



ATENA

Galileo Avionica has developed an Advanced Test Environment - ATENA - for avionic system design, development, prototyping, integration, validation and test, in order to supply highly integrated avionics minimizing time and risks.

ATENA supports high-fidelity realistic simulation of the scenario in which the avionic system is requested to operate, validating the OFP under "stressful" conditions.



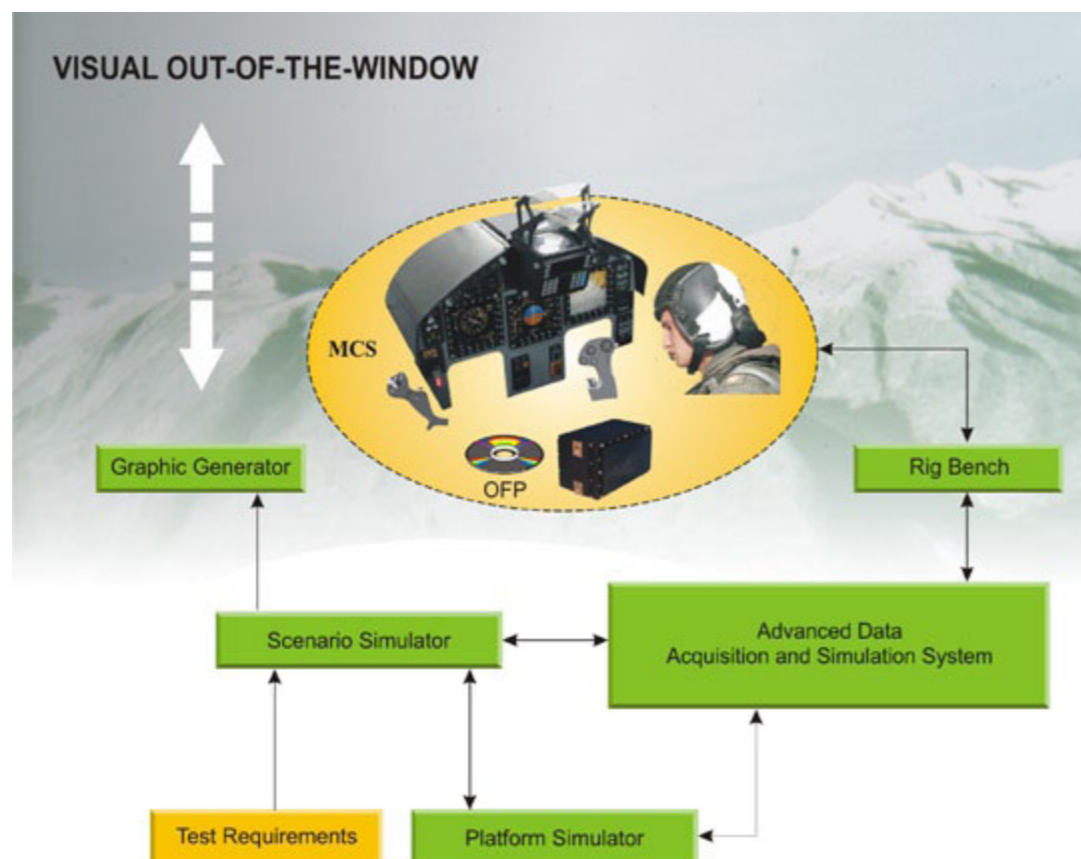
ATENA allows testing of the MCS avionic suite at level of:

Avionic system/subsystem:

with dedicated real-time environments enhancing the test coverage of the subsystem with a realistic, deterministic and repetitive simulations, including: the operational scenario, own A/C, avionics and Human Machine Interface (HMI).

Equipment:

with general-purpose ATE and development environments for functional testing, fault isolation to the module level, adjusting and aligning of avionic equipment.



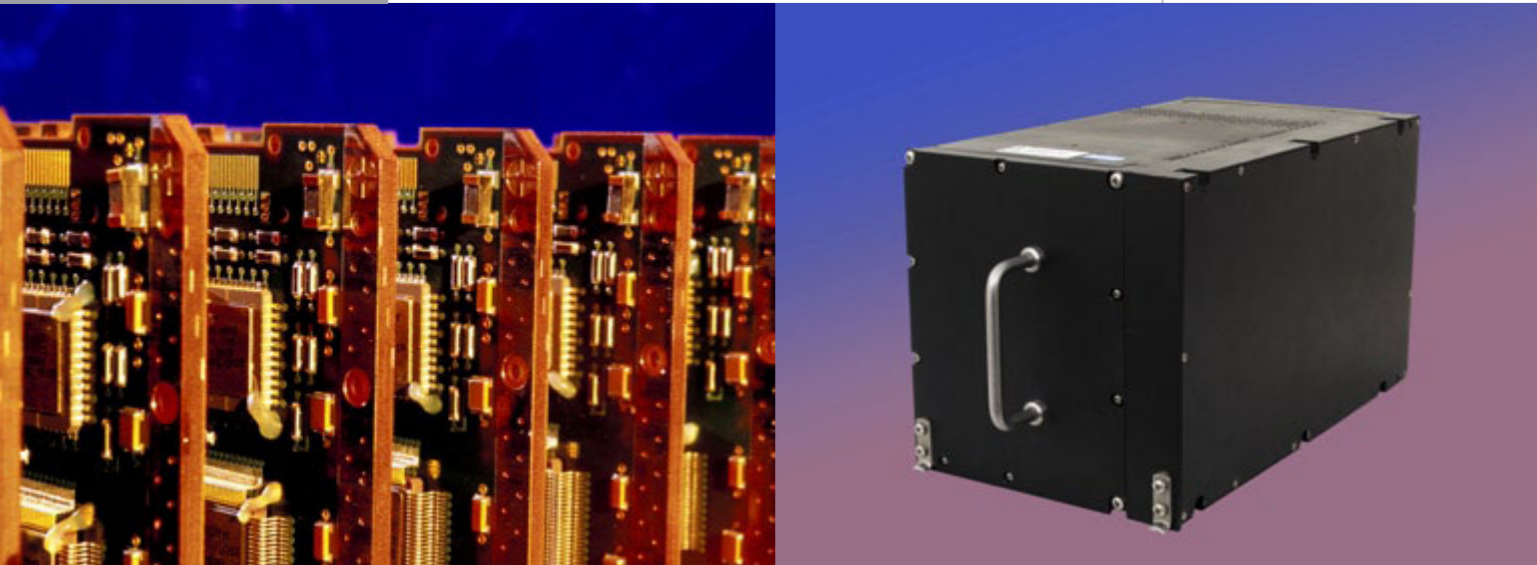
MAIN FEATURES:

- > Full comprehensive integrated avionic suite including display and control equipment set;
- > Integrated raster/stroke Head Up Display;
- > High resolution AMLCD head down displays available in dumb or smart versions and different sizes (5" x 5"; 5" x 7"; 6" x 8"; etc...);
- > Modular open system mission computer offering several off-the-shelf HW and SW modules including: last generation PPC processors, digital and analog interface modules, video and discrete modules, symbol generators, 115V / 28VDC power supplies, ATR and MCU standard chassis;
- > Integrated digital map, with relevant ground preparation facility;
- > Integrated Embedded Training System (ETS), with relevant ground preparation facility;
- > Integrated Data Transfer Unit (DTU);
- > Validated operational flight programmes packages for navigation, health monitoring, mission data handling and raster/stroke graphics developed and tested according to the DO178B standards;
- > Equipment SW based on COTS real time operating systems.

Mission Computer Symbol Generator

The Mission Computer and Symbol Generator (MCSG) is an avionic computer platform configured on the base of standard HW, SW and design tools, that can be fit and easily integrated into different architectures.

The MCSG hosts and runs the customized Operational Flight Program (OFP).



Further functions:

- > Symbol generator functions, including formats and symbology to be displayed on the MFDs and those for the HUD;
- > Digital map generator functions, including the interface to an external Data Transfer Unit (DTU);
- > Standard military and civil bus and serial interfaces management;
- > External video management;
- > Video routing functions.

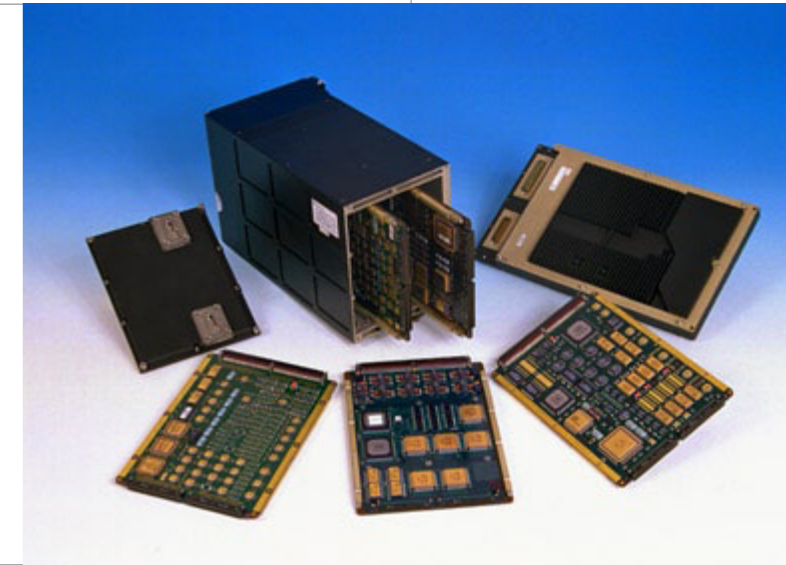
The MCSG capabilities can be enhanced by the Embedded Training Simulation (ETS) board, providing a complete embedded tactical simulation for onboard training.

MAIN FEATURES

- > Scalable architecture;
- > CPU board based on Power PC processors;
- > Easy add-on of additional processing modules, memories and I/O Interfaces;
- > Fast and efficient communication among internal resources based on internal system MCS bus (VME bus IEEE 1014.C1 plus additional services);
- > Distributed "local I/O processing" capability in all I/O modules to minimize peripherals workload;
- > Downloadable customized graphical libraries (fonts, symbols and formats);
- > SW architecture based on COTS SW operating system;
- > Comprehensive built-in test capability.

The ETS can generate a complete synthetic environment supporting two different configurations:

- > Virtual sensors ETS configuration which includes a set of virtual avionics and sensors such as:
 - > virtual radar supporting A/A and A/G modes,
 - > virtual EW,
 - > virtual tactical situation display
- > Real sensors ETS configuration, to stimulate real EW or radar with the synthetic environment.



The MCSG ETS card can also be integrated with an advanced datalink to provide network training capabilities between different A/C and ground stations.

Technical specifications

General

- | | |
|--|--|
| <p>Dimensions:</p> <p>Weight:</p> <p>Power Requirements:</p> <p>Cooling:</p> <p>MTBF:</p> <p>Connectors:</p> | <ul style="list-style-type: none"> • 6 MCU size 3/4 ATR (available also 1/2 ATR and ATR format) • 12 Kg max (growth included) • 28 VDC • 270 W (growth included) • Forced ventilation (conduction cooled) • 2000 Flight Hours • EN3862 or MIL-C-38999 |
|--|--|

Performance and Processing IO

- | | |
|--|--|
| <p>Performance (CPU board):</p> <p>Architecture:</p> <p>System Bus:</p> <p>Processor Architecture:</p> <p>CPUs:</p> <p>Serial I/O Interfaces:</p> <p>RT Operating System:</p> <p>Software Factory:</p> | <ul style="list-style-type: none"> • PIWG Test A0091 2.99 microsec. • PIWG Test A0092 156617 KWIPS • PIWG Test A0093 154185 KWIPS • VME based Multiprocessor • MCS Bus (VME Bus based) & PCI Bus • Modular architecture based on the PCI local bus • based on PPC Family • 2 dual redundant MIL-STD-1553B • 2 RS422 serial interfaces • 1 Ethernet 10/100Base T • MCS EXEC based on COTS RTOS • ADA, C |
|--|--|

Interfaces

- | | |
|---|---|
| <p>Video:</p> <p>Digital:</p> <p>Discrete & Analog:</p> | <ul style="list-style-type: none"> • RGB, Y/C, Digital • MIL-STD-1553B, RS422/485, ARINC 429 • Standard and Customized (HOTAS) |
|---|---|

Environmental

- | | |
|---|--|
| <p>Temperature/Altitude:</p> <p>Vibration (random):</p> <p>EMC:</p> | <ul style="list-style-type: none"> • -40° to +70° C / 45000 feet (operating) • 0.04 g² /Hz (lh/axis) functional • 0.09 g² /Hz (lh/axis) endurance • In accordance with MIL-STD-461 (Req.) notice 1 and 2-DOD 160 |
|---|--|

Applicable standards

MIL-STD-810D; MIL-STD-704D; MIL-STD-462 (Test) & 461 (Req.); MIL-STD-1553B; EIA-STD-RS422/485; ARINC 429

Associated test equipment

MCS Test Bench

HUD-100

With the HUD 100 Head Up Display 100 Galileo Avionica offers a state-of-the-art dual refractive combined Head-Up Display which displays a remotely generated video source in cursive, raster or cursive on raster mode.

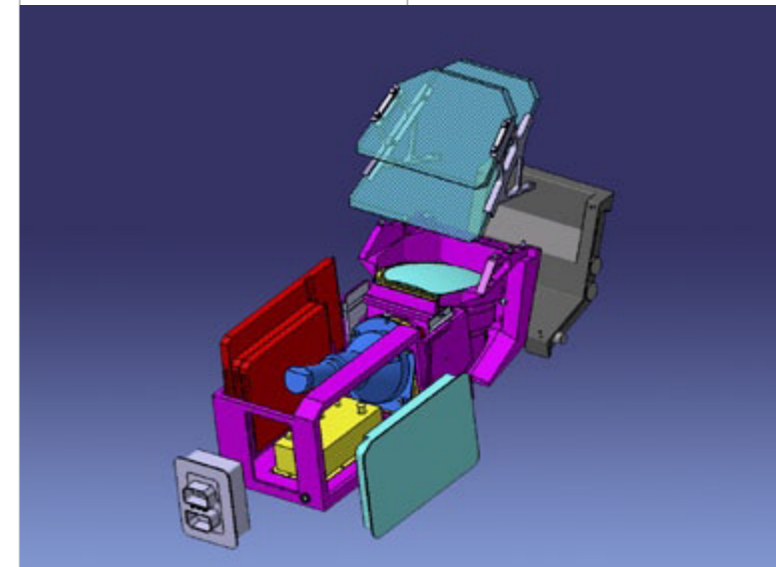
HUD 100 light weight and high integrability makes it an ideal solution for aircraft upgrading, providing powerful performance for a broad range of missions when integrated with the MCSG.



S-HUD 1000

The Smart Head Up Display 1000 (S-HUD 1000) is a state-of-the-art dual refractive combiner Head Up Display capable of displaying locally generated video formats in "cursive only" or in "cursive on raster" mode (video provided by an external source).

The S-HUD 1000 interfaces the avionics systems via a dual redundant 1553B remote terminal and elaborates the incoming symbology data to generate the HUD formats.



Technical specifications

Physical characteristics

Dimensions:	450L x 170W x 393H (mm) including combiners and UFCP
Weight:	Max 14,0 Kg
Cooling system:	Natural convection only
UFCP controls:	48 momentary pushbuttons Rotary
UFCP display:	80 characters led dot matrix

Display characteristics

Display type:	Dual Refractive Combiner
Exit pupil:	140 mm
TFOV:	25 circular
Accuracy:	< 0,3 mrad - centre < 1,3 mrad - 0 ÷ 5 circular < 3,0 mrad - 5 ÷ 10 circular < 0,5 mrad - 0 ÷ 8 circular < 0,7 mrad - 8 ÷ 12 circular
Parallax vertical:	< 0,5 mrad - 0 ÷ 8 circular < 0,7 mrad - 8 ÷ 12 circular
Parallax horizontal:	< 0,5 mrad - 0 ÷ 12 circular
NVIS compatibility:	Type II, class B, MIL-L-85762A
Brightness:	0 ÷ 6000 cd/m2 Cursive 0 ÷ 300 cd/m2 Raster
Writing speed (@ 6000 cd/m ²):	50 mm/ms
Contrast (@ 100000 lux):	> 1,2:1

Electrical interface

Raster Video Input	One monochrome video signal 50/60 Hz
Cursive Video Input	X, Y deflections and bright up control
System communications:	One dual redundant 1553B RT interface One RS422 serial link
Power:	Two separate power 28VDC aircraft according to MIL-STD-704E. 5VDC, 1A max, lighting power for UFCP backlight.
Power consumption:	140W max

Environmental characteristics

Temperature:	-40 °C, +70 °C - MIL-STD-810E (oper.) -55 °C, +90 °C - MIL-STD-810E (stor.)
Reliability:	> 3300 hrs

The HUD-100 incorporates an intelligent Up Front Control Panel (UFCP), NVIS compatible capable to perform Mission Data Entry (MDE) functions and to interface the avionics system either as an additional remote terminal unit on a 1553B bus or via a RS422 dedicated serial link.

The HUD-100 NVIS compatibility is obtained by a special glass treatment for NVIS filter.



The S-HUD 1000 also incorporates an intelligent Up Front Control Panel, NVIS compatible capable to perform Mission Data Entry (MDE) functions and to interface the avionics system either as an additional remote terminal unit on a 1553B bus or via a RS422 dedicated serial link.

Technical specifications

Physical characteristics

Dimensions:	450L x 185W x 393H (mm)
Weight:	Max <16,5 Kg
Cooling system:	Natural convection only
UFCP controls:	48 momentary pushbuttons Rotary
UFCP display:	80 characters led dot matrix

Display Characteristics

Display type:	Dual Refractive Combiner
Exit pupil:	140 mm
TFOV:	25 circular
Combiner displacement error:	< ± 0,1 mrad TFOV
Combiner distortion error:	< ± 0,2 mrad TFOV
Accuracy:	< 0,3 mrad - centre < 1,3 mrad - 0 ÷ 5 circular < 3,0 mrad - 5 ÷ 10 circular < 0,5 mrad - 0 ÷ 8 circular < 0,7 mrad - 8 ÷ 12 circular
Parallax vertical:	< 0,5 mrad - 0 ÷ 8 circular < 0,7 mrad - 8 ÷ 12 circular
Parallax horizontal:	< 0,5 mrad - 0 ÷ 12 circular
NVIS compatibility:	Type II, class B, MIL-L-85762A
Brightness:	0 ÷ 6000 cd/m2 Cursive 0 ÷ 300 cd/m2 Raster
Writing speed (@ 6000 cd/m ²):	50 mm/ms
Contrast (@ 100000 lux):	> 1,2:1

Electrical interface

Raster Video Input	One monochrome video signal 50/60 Hz
Cursive Video Input	X, Y deflections and bright up control
System Communications:	two dual redundant 1553B RT interface One RS422 serial link
Power:	Two separate power 28VDC aircraft 5VDC, 1A max, lighting power for UFCP backlight.
Power consumption:	200W max

Environmental characteristics

Temperature:	-40 °C, +70 °C - MIL-STD-810E (oper.) -55 °C, +90 °C - MIL-STD-810E (stor.)
Reliability:	> 3300 hrs

Multifunction Displays: HDDUE-S

The Head Down Display Unit Enhanced – Short (HDDUE-S) is a 5 inches by 5 inches high performance Active Matrix Liquid Crystal Display with full colour capability under all conditions, from full sunlight to NVG operations.

The control function is performed through a rotary switch, three rocker switches and sixteen soft keys allocated on the keypanel.



Technical specifications

Physical characteristics

Dimensions:	235 mm (L) x 161 mm x 174 mm (H)
Weight:	Less than 6,0 Kg.
Cooling system:	Natural convection with internal cooling fan

Display characteristics

Display type:	(AMLCD)
Active area:	5,01" x 5,01"
Resolution:	600 x 600 RGB triads.
Viewing angle:	± 45° H, +35° / -10° V
luminance 685 cd/m	
NVIS compatibility:	Type I, class B
Dimming range:	> 6000 : 1

Electrical interface

Video input:	Two RGB video
Video output:	One RGB video output
Two RS422 serial links	
Power:	28 VDC
Power consumption:	90W in normal operations 170 W during cold start

Environmental characteristics

Temperature:	Operating: -40°C, +55°C continuous operation+70°C Intermittent – Storage: -55°C, +90°C
Vibration:	0.033 g /Hz, MIL-STD-810E,
Reliability:	> 4000 hrs

The HDDUE-S is designed to:

- > Manage two RS422 serial interface used to receive controls and transmit internal status and soft key codes
- > Accept two selectable RGB video input according to STANAG 3350 Class B/C
- > Provide 1 RGB video output according to STANAG 3350 B/C or RS170 (to videorecorder)

The active thermal management allows the unit to operate in full environmental range without external cooling.

The HDDUE-S is especially optimized for cockpit viewing featuring the best AMLCD technology in terms of luminance intensity and contrast regulation today available in airborne applications.

Multifunction Displays: SMD 55

The Smart Multi Function Display (SMD –55) is a 5 inches by 5 inches high performance Active Matrix Liquid Crystal Display with full colour capability under all conditions, from full sunlight to NVG operations.

The control function is performed through a rotary switch, three rocker switches and twenty soft keys allocated on the keypanel.



The Smart MFD is designed to:

- > Manage dual redundant 1553B bus used to receive controls and real time symbology parameter updating and to transmit internal status and soft key codes.
- > Accept two selectable RGB video input according to STANAG 3350 Class B/C
- > Provide 1 RGB video output according to STANAG 3350 B/C or RS170 (to videorecorder)

The embedded symbol generator is based on high performance "SHARK 21060 DSP" and on the last generation of graphic co-processor ASICs.

The SMD-55 is especially optimized for cockpit viewing featuring the best AMLCD technology in terms of luminance intensity and contrast regulation today available in airborne applications.

Technical specifications

Physical characteristics

Dimensions:	224 mm (L) x 166 mm (W) x 176 mm (H)
Weight:	5,25 Kg max
Cooling system:	Natural convection with onboard cooling fan

Display characteristics

Display type:	Colour (AMLCD)
Active area:	5,03" x 5,03"
Resolution:	600 x 600 RGB triads.
Viewing angle:	± 45° H, +35° / -10° V
Luminance:	685 cd/m ²
NVIS compatibility:	Type I, class B
Dimming range:	> 6000 : 1

Electrical interface

Video input:	Two RGB
Video output:	One RGB
	One dual redundant 1553B RT interface
	Two RS422 serial links
Power:	28 VDC aircraft
Power consumption:	<100 W in normal operations <200 W during cold start

Environmental characteristics

Temperature:	Operating: -40°C, +70°C Storage: -55°C, +90°C
Vibration:	0.033 g ² /Hz, MIL-STD-810E,
Reliability:	> 4000 hrs

Multifunction Displays: S-MFD 68

The Smart Multi Function Display (S-MFD 68) is a 6 inches by 8 inches high performance “smart” device, based on an Active Matrix Colour Liquid Crystal Display (AMLCD), capable to display internally generated symbology and colour video provided by an external source.

The control function is performed through a rotary switch, three rocker switches and 26 soft keys allocated on the keypad.

The AMLCD array is illuminated by innovative backlight based on high efficiency LEDs.



Technical specification

Physical characteristics

Dimensions:	245 mm (L) x 194 mm (W) x 274 mm (H)
Weight:	7,00 Kg max
Cooling system:	Natural convection with onboard cooling fan

Display characteristics

Display type:	Colour Active Matrix Lyquid Crystal (AFFS technology)
Active area:	6,21" x 8,28"
Resolution:	768 x 1024 pixel with
Viewing angle:	± 80° H, ± 80° V
Luminance:	Up to 820 cd/m ²
Dimming range:	> 8000 : 1

Electrical iinterface

Video input:	Two RGB
Video output:	One RGB
	One dual redundant 1553B RT interface
	Two RS422 serial links
Power:	28 VDC aircraft
Power consumption:	85 W in normal operations 180 W during cold start

Environmental characteristics

Temperature:	Operating: -40°C, +71°C Storage:-55°C, +90°C
Vibration:	0.033 g ² /Hz, MIL-STD-810E,
Reliability:	> 4000 hrs

The LEDs are installed in the backlight assembly providing an efficient uniform light source through the use of reflecting surfaces and optical diffusing element.

The AMLCD display is realized with AFFS (Advanced Fringe Field Switching) technology, that due to a superior control of the Electric field, is capable of providing:

- > Greater control over liquid crystals;
- > Optimization of the electrode surface (fringe field effect);
- > Removal of shadowed areas between pixels;
- > Horizontal alignment of the electric fields;
- > Replacement of metal electrodes with transparent ones.

The outcome of these enhancements is an increase in transmittance, greater viewing angle (full 180 degrees in both planes), ripple free imaging and superior contrast.

Galileo Avionica
2005 Financial Highlights

Revenues: 574 Million €

Orders: 615 Million €

Backlog: 1186 Million €

R&D: 118 Million €

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