LEONARDO ELECTRONICS

SLAD-208
Smart Large Area
Display

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The SLAD-208 is a Smart Large Area Display with a wide-aspect ratio screen that allows the aircraft pilot to access content and information in an easier, more intuitive, effective and affordable manner. SLAD-208 is a step forward of the currently full digital market-deployed displays, introducing advanced technologies and enhanced functions with the aim of enabling safe operations in every flight condition, namely Visual and Instrumental Flight Rules (VFR, IFR).

The SLAD-208 is a fully redundant single glass 20x8 inch large area display, lightweight, low power consumption with a video resolution of 2560x1024 pixels, multi-touchscreen enabled and a wide brightness dimming range from sunlight to Night Vision Goggles (NVG) compatibility. The unit also offers dual redundant electronics and backlight assuring continuous high performance even in case of single failure and is developed by adopting the latest quality standards that make it certifiable according to RTCA/DO178C and DO254 up to DAL A. As a smart display, it is capable of showing video from sensors merged with graphics to provide enhanced situational awareness in all phases of flight. The SLAD-208 provides two mass memory devices used to store pre-flight data such as map databases, navigation data as well as history data for flight, mission and maintenance purposes. These memories are accessible in power-off condition by two frontal USB 3.0 ports. An ARINC 615 compliant secure Loader allows in-service Application updating of the embedded software without uninstalling the Equipment from the aircraft.
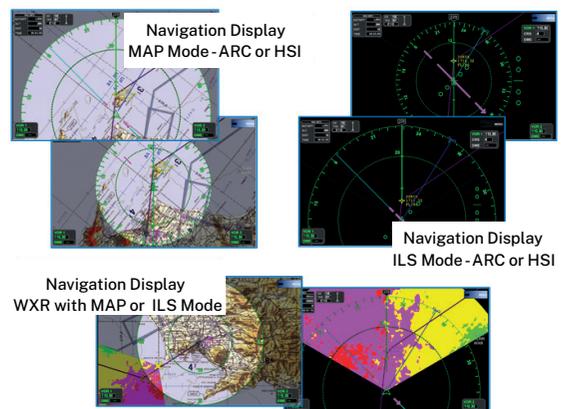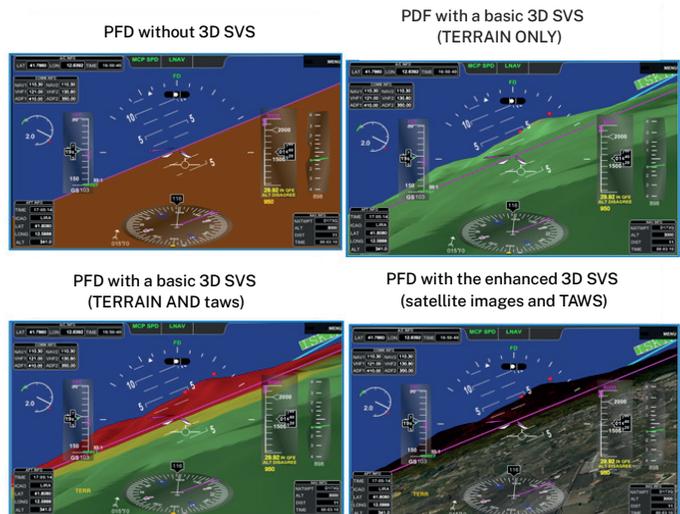
SLAD-208 provides all typical Electronic Flight Instrument System (EFIS) functionalities like Primary Flight Display (PFD), Electronic Horizontal Situation Indicator (EHSI) for Navigation Display (ND), Engine Indicating and Crew Alerting System (EICAS); optionally a Flight Management System (FMS) can be integrated.
A wide area of the display can be allocated to the embedded Digital Map Generator (DMG) functionality, which has the ability to display Digital Moving Map (DAL B), and other Situational Awareness applications (DAL C) like Synthetic Vision System (SVS), Terrain Awareness Warning System (TAWS) or Helicopter TAWS (HTAWS), Weather Radar System (WXR).
In case an IR camera sensor is available on the aircraft, SLAD-208 provides the Enhanced Vision System (EVS) capability, which can be combined with SVS to obtain the Combined Vision System (CVS) too.
All these video applications can be managed together thanks to a multiple window capability of SLAD-208, including Picture in Picture and tailoring of displayed information.
SLAD-208 can host Leonardo's Operational Flight Program (OFP) or third party OFP as well.
Moreover, it offers to the Customers and the End Users a "Customizable HMI" through the adoption of COTS "certified" Graphic Prototyping tools and ARINC 661 Graphic Server.

KEY BENEFITS

- Developed in accordance to DO178 and DO254 DAL A; CAST-32A certifiable.
- Fully redundant architecture: both LCD glass and electronic units as multicore processors ARINC 653, graphic modules and power supplies.
- 20x8 inches Large Area Display with 2560x1024 resolution, based on a single glass without any black area, multi-touchscreen, NVG compatible
- Display Management for EFIS/EICAS, for Navigation, Mission and Tactical information.
- 2 SSD mSATA of 1Terabyte to store pre-flight data as map databases and navigation data and history data for mission and maintenance purposes.
- Embedded Situational Awareness and Symbol Generation applications, implemented by ARINC 661 Graphic Server.
- Image/data fusion and sensors management.
- ARINC 615 compliant SW secure Loader.
- ITAR Free.

PFD without 3D SVS

PDF with a basic 3D SVS (TERRAIN ONLY)

PFD with a basic 3D SVS (TERRAIN AND taws)

PFD with the enhanced 3D SVS (satellite images and TAWS)

SVS

EVS from I7R camera sensor

CVS

Navigation Display MAP Mode - ARC or HSI

Navigation Display ILS Mode - ARC or HSI

Navigation Display WXR with MAP or ILS Mode

OPERATIONAL MODES

The SLAD-208 provides all its functionalities in three different operational modes:
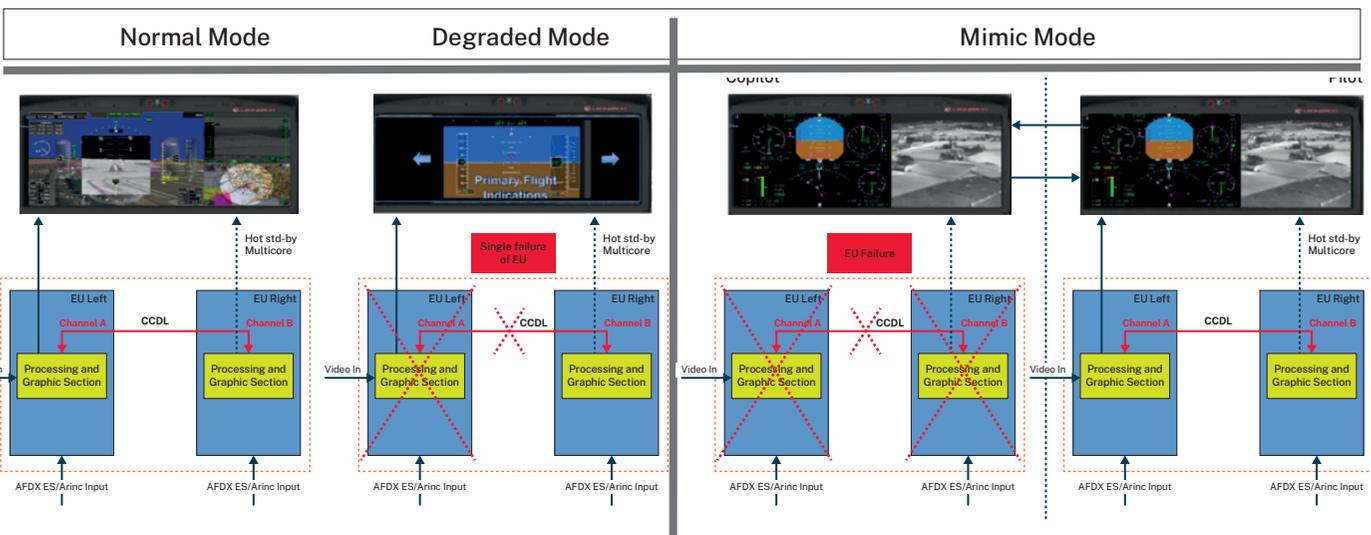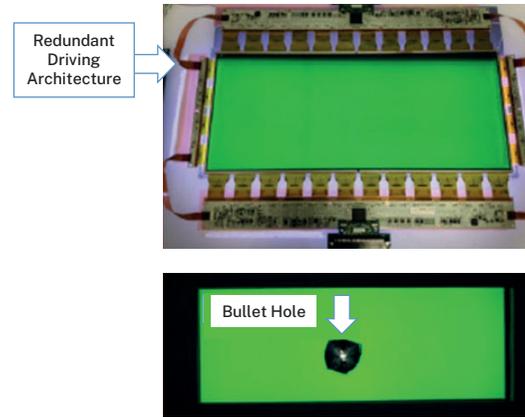
- Normal Mode operation, the SLAD provides all the required functionalities (e.g. DMG, PFD, ND, TAWS, SVS)
- Degraded Mode In the event of single Electronic Unit (EU) channel failure, the SLAD continues to operate driven by the secondary EU channel, providing the Primary Flight, Engine, Navigation and some synthetic information (e.g. SVS or DMG)
- Mimic Mode In the event of both EUs failure, in a dual seat cockpit architecture, the failed SLAD displays the video image received from the paired operating SLAD and any touch on the failed SLAD will not produce any action. Pilot and Copilot Cockpit shares the same display format. Mimic Mode could be activated by means a dedicated command too, for training purpose.

The table below shortly represents the supported Operational Modes as either Single Seat cockpit or Dual Seat cockpit

COCKPIT	MODES		
	Normal	Degraded	Mimic
Single Seat	√	√	
Dual Seat	√	√	√

SINGLE FAULT-TOLERANT TOUCH DISPLAY

Thanks to a special redundant driving architecture, even in case of hard damage to the LCD glass, the affected area remains limited to a small portion of the full display area. Here below a picture of bullet test perforating the LCD display.

Redundant Driving Architecture

Bullet Hole

Normal Mode	Degraded Mode	Mimic Mode

Copilot   Pilot

Hot std-by Multicore

Single failure of EU

EU Failure

EU Left		EU Right
Channel A	CCDL	Channel B

Video In   Processing and Graphic Section   Processing and Graphic Section

AFDX ES/Arinc Input   AFDX ES/Arinc Input

TECHNICAL SPECIFICATIONS

PHYSICAL CHARACTERISTICS

- **Dimensions** 556 mm (W); 265 mm (H); 215 mm (Depth) including connectors
- **Weight** 16.2 kg
- **Power Requirement** 28 VDC
- **Power Dissipation** Less than 320 W (heater off)
- **Cooling** Convection and self-contained fans
- **MTBF** 4900 Flight Hours @ AIC 25°C (according to MIL-HDB-217F Notice 2)
- **Connectors** MIL-STD-38999

PERFORMANCES PROCESSING AND GRAPHIC

- **Performance (Multicore)** Quad Core(Freq.1.4 GHz; RAM 3GB DDR3; 3.0 DMIPS/MHz per core)
- **GPU Frequency** 575 MHz
- **GPU Memory** 2GByte DDR5 graphic memory @1000 Mhz
- **Display type** Active Matrix Liquid Crystal Display
- **Display Viewing Angle** Horizontal ± 60° Typical; Vertical -5°+ 35° Typical.

  Narrower Viewing Angle can be obtained onceinstalled in cockpit,with suitable Filter in ordeto avoid canopy reflection

- **Output Video Resolution** 2560x1024 pixels on a 20" x 8 " inch display
- **NVG** TYPE 1-CLASS B
- **Touch Screen** Resistive multi touch with gesture recognition
- **Gesture Recognition** tap, double tap, press and hold, pinch, rotate, drag, flick

EQUIPMENT CONFIGURATION

- **Display Head Assembly** Nr. 1 fully redundant
- **Processor Function** Nr. 2 CPU MultiCore modules (+ 1 CPU as growth capability)
- **Graphic Function** Nr. 2 graphic mezzanine card module
- **Video & I/O Function** Nr. 2 module (6U format)
- **PSU Function** Nr. 2 modules (3U format)
- **Removable Mass Memory** Nr. 2 (1 TB capacity SSD mSATA)

SOFTWARE

- **RT Operating System** Green Hills Integrity tuMP (including ARINC 653) RTCA-DO178C DAL A
- **Graphic Library (OpenGL)** RTCA/DO-178C DAL A (Safety Critical subset)
- **ARINC 661 Graphic Server** RTCA/DO-178C DAL A
- **Software Factory** ADA, C, C++

I/O INTERFACES   Q.ty

- **ARINC 429 In** 56
- **ARINC 429 Out** 20
- **Discrete In Open/Ground** 60
- **Discrete Out Open/Ground** 20
- **RS-422/485 In/Out** 8
- **RS-232** 2
- **Ethernet external link 10/100/1000 MB** 7
- **AFDX ARINC 664 P7** 2
- **DVI IN** 1
- **ARINC 818 IN** 2
- **SMTPE IN** 5
- **CVBS IN** 2
- **Ethernet H264** 1
- **Video out vs DVDR** 1
- **Video out for SW Testing** 1
- **Video out for Mimic Mode (SDI-3G)** 1
- **USB 3.0** 2
  (database up/download when unpowered)

ENVIRONMENTAL

- **Temperature** -40° to +55° C (Full operative) 56° to +70° C (Limited time)
- **EMC** RTCA/DO-160G
- **Environmental** MIL-STD-810G, RTCA/DO-160G
- **Power** MIL-STD704/DO160G (50ms Transparency)

SOFTWARE FUNCTIONS

- **Equipment SW** RTCA DO-178C DAL A
- **Digital Map Generator** RTCA DO-178C DAL B
- **Combined Vision Sys (SVS+EVS) RTCA DO-178C DAL C**
- **TAWS / HTWAS** RTCA DO-178C DAL C

HARDWARE

- **Graphic Function** DO-254 DAL A
- **Processor Function** DO-254 DAL A
- **Video & Sensor Management** DO-254 DAL C
- **I/O Function** DO-254 DAL A

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