Mission Computing
Safety, Performance and Apps in true Synergy
Mainstream Solutions Delivering Airborne Functions

With increasingly challenging operational requirements, aircraft mission systems are being designed to become even more powerful. Within mission computing safety critical and non-safety critical functions have to be developed and certified according to the highest safety standards. Development for certification is complex, time-consuming and costly. All this leads to limited means of configuration, flexibility and steers programs to proprietary solutions. In order for end users to adapt to changing mission profiles they require a method of updating their mission computer in a fast and flexible way, even during an aircraft’s lifecycle.

The World of Commercial Electronics...

... allows end users access to millions of applications. For almost every requirement there is a corresponding app, easy to get access and easy to use. Further advantages include short product cycles and ongoing development - off-the-shelf hardware - software components and support libraries - modularity - performance. However, in mission computing these advantages do not necessarily apply.

Mission Computing - Fully Compliant, Plug-in COTS and Apps

End Users

Can now quickly and easily adapt their aircraft mission computers to new mission requirements during the in-service lifecycle of the aircraft just by adding new applications. To do so, they can reuse existing and proven applications or choose new, advanced applications from elsewhere.

OEMs

Can now apply commercial Windows/Linux software to the safety-critical environment of aircraft mission systems. Reducing the amount of safety critical software, new mission applications can be developed faster and more efficiently.

Non-safety critical functions benefit from powerful multi-core processors and clustering technologies.

In-service aircraft mission systems can be upgraded with relevant COTS (Commercial off-the-shelf) hardware modules without an entire mission system requiring replacement.

With HENSOLDT mission computing solutions, commercial hardware and software can be embedded in a safety-critical airborne environment certifiable to DO-254 and DO-178C up to DAL B aviation safety standards.
The architectural concept is based on two physically segregated functional areas which are assigned to safety critical or non-safety critical requirements. Each area features assigned hardware components which are designed to specific functional and criticality requirements of the applications.

**SAFE AREA** hosts safety-critical functions at DO-254, DO-178C DAL C or higher (e.g. Digital Map or Terrain Awareness) and provides the interfaces to the aircraft avionics system.

**APP AREA** hosts Apps from the world of Commercial Electronics. These Apps implement specialized data processing functions incorporating sensor and cockpit data e.g. video processing, sensor data fusion. Apps run on commercial operating systems.

**SEGREGATOR** performs hardware segregation of both areas and intelligent software monitoring of the APP AREA. It prevents direct access from the APP AREA to the safety critical elements of an aircraft avionics system. Data such as computation results can be exchanged between APP AREA and SAFE AREA through a well-defined protocol. With this concept, new Apps can be developed independently from the hardware and aircraft environment. Cyber resilience is integrated by security shell technologies.

### Key Advantages

- Multi-core processor technology
- HD video and graphics
- High-speed interfaces
- FACE compatible
- Safe and secure
- Highly robust and reliable
- SWaP-optimized
- ITAR free
1. Configurable and Safety-Certifiable Computing Platform
The Computing Platform combines safety and high-performance characteristics within one chassis. It implements complete hardware abstraction through pre-integrated platform software, ready to host selected safety-critical functions and customer furnished Apps to feature user requirements of an advanced Mission Computer.

Core Elements
- VITA 46 OpenVPX 3U Hardware Building Blocks
- related operating systems, drivers, board support packages, utilities
- customised chassis form factors
- certifiable and deterministic FPGA based interface solution
- compatible with FACE standard
- safety-certification artefacts for hardware and software in SAFE AREA available according to DO-254 and DO-178C DAL C, DAL B on request

Operating Systems, Graphic Drivers and Support Libraries

<table>
<thead>
<tr>
<th>SAFE AREA</th>
<th>APP AREA</th>
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<tbody>
<tr>
<td>Wind River VxWorks 6.9 or VxWorks 653 V2.5</td>
<td>Windows or Linux, other OS on request</td>
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<tr>
<td>Graphics driver CoreAVI OpenGL SC 1.0.1 and 2.0</td>
<td>App Development Kit</td>
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<td>Full multi-core library support and x86 / x64 ecosystem e.g. Intel MKL, IPP, OpenCL, OpenCV and others</td>
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Hardware Building Blocks
- Building Blocks from HENSOLDT and Curtiss-Wright catalogues can be integrated
- Catalogues include production ready Single Board Computers, MPSoC, Graphics Modules, Interface Modules, Power Supplies, etc.
- Integration of 3rd Party hardware components is available on request

Example configuration of a multipurpose Computing Platform

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Operating Systems</th>
<th>Hardware Building Blocks</th>
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<tbody>
<tr>
<td>Memory: min. 256 GB</td>
<td>SAFE AREA</td>
<td>SAFE AREA</td>
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<tr>
<td>Interfaces: MIL-STD-1553, ARINC 429, UART, I2S, SPI, Discrete, Gbit Ethernet, HD-SDI (SMPTE-292M) or analog/STANAG in/out, DVI</td>
<td>APP AREA</td>
<td>APP AREA</td>
</tr>
<tr>
<td>Housing: ARINC 600 3U VPX</td>
<td></td>
<td>Single Board Computer with Intel Kaby Lake Xeon 7th Generation Processor</td>
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<td>Weight: ~7 kgs</td>
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<td>Solid State Disk</td>
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<td>Power: 28 VDC</td>
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<td>Environmental: -40°C - +70°C</td>
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Curtiss-Wright is HENSOLDT’s global trade partner for mission computing modules.

As our graphics technology partner, CoreAVI delivers drivers and graphics processing optimization tools to maximize performance within safety critical systems.
2. Mission Computer
The Mission Computer is plug-in ready and can be pre-configured by HENSOLDT to support advanced missions.

<table>
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<tr>
<th>Core Functions</th>
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<tbody>
<tr>
<td>• Digital Mapping</td>
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<td>• Synthetic Vision System</td>
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<td>• Terrain Awareness</td>
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<tr>
<td>• Tactical Datalink management and control: Link 16, VMF</td>
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<td>• Enhanced Tactical Information</td>
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<tr>
<td>• Automated Sensor Data Processing</td>
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<tr>
<td>• H.264 video encoding and decoding</td>
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3. App Development Support
HENSOLDT provides full support for customer's own software development and integration within the APP AREA and SAFE AREA. Depending on the safety requirements of the aircraft, customer applications will be embedded in the SAFE AREA or in the APP AREA.
• App Development Kit
• App Development Training
• Integration support for customer furnished software packages

Mission Computer Paves the Way for Integrated Mission Sensor Suites

The Mission Computer can integrate all elements of a modern aircraft mission sensor suite in one device. Powerful applications can process and fuse sensor data with other information. This can reduce pilot and operator workload within mission related tasks allowing greater capacity to perform new, complex operations within networked environments (NCE).

Integrated and Fused Applications
• Sensor Steering and Tasking
• Sensor Exploitation
• Data and Information Fusion
• Image and Video Processing
• Pilot Assistance

The Integrated Mission Sensor Suite is just one tentative solution to enable new mission profiles. The Mission Computer enables you to fulfill your advanced mission requirements.
Years Experience in Mission Computing

For over 20 years HENSOLDT has delivered thousands of Mission Computer, in operation on all major European military fixed-wing and rotary-wing platforms. HENSOLDT has the appropriate experience, cutting-edge technologies and capable partners to meet complex and sophisticated requirements of modern mission computing.