CASE STUDY

Solving Display Computer Thermal Challenges in a Jet Trainer Aircraft

CURTISS-WRIGHT

DEFENSE SOLUTIONS

Challenge

- Tight project deadlines
- Graphics display computer
- Challenging thermal requirements

Solution

- In-country, local support
- Passive cooling
- Multi-Platform Mission Computer (MPMC-9165)

Results

- Fielded system
- On time, spec, and budget
- Long standing supplier relationship

Challenge

A leading aerospace company with a long history of commercial and defense aircraft and engine development has established itself as a global Tier 1 supplier. Supporting a host of large, international programs, they have been collaborating with Curtiss-Wright for a number of years due to the flexibility in our approach to program management and product development, the support provided both for legacy and new products, and the track record of dependability and reliabilityof the in-region support. Recently they contacted Curtiss-Wright to take part in a competitive bid for a graphics display computer for a space constrained jet trainer aircraft. The limited on-board space meant that there was no room to support a fan cooled system, nor was there a desire to support the logistics required for an inherently limited-life fan on a hard-working jet trainer aircraft. This presented a passive cooling challenge as well as a custom ARINC-818 video interface for the system to be interoperable with existing aircraft systems. Also, because the flight trials were already scheduled, the project required meeting tight deadlines. Typical of most programs, an economical solution was required in terms of both the recurring and non-recurring (NRE) costs; trading off NRE for a more bespoke but significantly lower cost solution was required because the system was going to be deployed across a fleet of at least 60 aircraft.

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TRUSTED PROVEN LEADER

MPMC-9165 Multi-Platform Mission Computer

Solution

Curtiss-Wright proposed a Multi-Platform Mission Computer (MPMC) for the program. The MPMC is a tailored system based on commercial off-the-shelf (COTS) components. The computer consisted of a 6U VME Power Architecture single board computer (SBC) with integrated MIL-STD-1553 interfaces and a graphics mezzanine to provide processing power. To support the custom ARINC-818 video interface, Curtiss-Wright leveraged their broad experience developing RADAR and video management solutions to create a tailored version of the XMC-FC1 dual channel format converter mezzanine. This involved converting the standard DVI output, available from the graphics card that was selected and used for prototype development work, to the interface required for the rest of the aircraft video systems. In addition, to provide support to the customer's development program, Curtiss-Wright also designed physical layer adapter modules to match the non-standard physical layer output from the system, to industry-standard ARINC-818 test equipment from third parties. The customized XMC-FC1 was hosted on the COTS Power Architecture VME SBC, along with a COTS graphics accelerator, the DVI output of which was converted to ARINC-818 by the customized format converter.

An SSD module and custom VME backplane were also integrated into the system, which was enclosed in a custom convection cooled rugged enclosure with 38999 connectors, mounted on a tailored ½-ATR mounting tray inside the vehicle. This solution required a significant amount of thermal modelling and simulation to tailor the enclosure to ensure the chassis matched the customer's unique thermal environment and supported the required performance. Detailed thermal analysis was a critical contributor to success; having decades of experience in thermal design, the Curtiss-Wright mechanical team is able to rapidly, and with confidence, find solutions to the most exacting thermal challenges. The computer also completed extensive environmental qualification with a comprehensive list of documentation deliverables to ensure reliability in harsh environments.

During the course of development, the system required a change in the cooling method from pressurized air to pure convection. As with most development programs, even with the most comprehensive initial requirements, change is necessary, and Curtiss-Wright was ready to adapt to the customer's emerging requirements with a positive and timely approach. The most successful system development programs are a partnership between customer and vendor, and this approach is one that Curtiss-Wright wholeheartedly embraces.

Results

Leveraging decades of experience with COTS products and thermal simulation resulted in a hiccup free program; the prototype system went through to manufacture with only minor tweaks that were mostly customer change requests. Because the system re-used existing building blocks, the transition from prototype to production went very smoothly with all of the required documentation in place at time of delivery and qualification testing completion without design changes, ultimately reducing system design and integration risk for the customer. With a relationship that has lasted almost two decades, Curtiss-Wright provided a foundation of trust and leadership to the supplier-customer relationship that assured them that their best interests were top priority and their program would remain on time, on spec, and on budget.