Degraded Visual Environment: Uncovering the Invisible

CURTISS-WRIGHT

DEFENSE SOLUTIONS

Challenge

- Hazardous landings in adverse weather conditions
- Long development cycles and high costs of custom solutions
- High speed sensor data capture

Solution

- Graphics processing and switching
- COTS network attached storage solution
- Scalable removable memory storage

Results

- Reduced risk, development time, and program costs
- Increased operational efficiencies
- Safer landings

Challenge

Thousands of helicopters, both in military and commercial applications, experience non-optimal weather conditions caused by snow storms, sea spray, blowing sand, dust, fog, smoke etc. on a daily basis. These degraded visual environments (DVE) contribute to aircraft crashes and reduced operational effectiveness. In the desert for example, military helicopter rotor downwash can produce a brownout, reducing pilot visibility to near zero and often resulting in hard landings that cause downtime and costly repairs. Brownouts occur during a landing approach or departure where the helicopter's own rotor wash kicks up loose dirt and debris, so much so that it eliminates the pilots visual cues that normally help them determine the right position, attitude, and motion of the helicopter in relation to the earth. Though brownouts are challenging, they are made worse when other non-optimal conditions such as darkness, rain, or snow compound the issue. In the worst case, this DVE can cause a crash and loss of life. More often landings in DVE are aborted or pilots come in too hard causing structural damage to the aircraft, which results in in aircraft downtime and repairs. Aircraft downtime can cause the delay of critical missions and can increase the vulnerability of war-fighters awaiting those aircraft.

Though systems to combat DVE and enable pilots to safely land in these conditions have been in development for years, these systems are often custom developed, incurring high costs and long development times. The price of these custom systems push project deadlines out and inflate the price of helicopter programs, lowering the overall

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DTS3 3-slot rugged
network file server

return on investment. Platform developers are searching for solutions that will save their already constrained budget, while providing them with the advanced technology needed to safely land their aircraft and keep their businesses or missions on track.

Today's military DVE systems typically consist of a number of passive and active, high resolution and deep penetrating sensors to provide real time multi-sensor fused imagery that provides a clear picture of the environment around the aircraft, enabling a safe, smooth descent to the landing target.

When an existing customer required graphics processing and data storage that could handle their DVE sensor system requirements, they contacted Curtiss-Wright to provide a commercial off-the-shelf (COTS) solution that could reduce their cost and time-to-market, while at the same time providing a long lifecycle.

Solution

Having successfully supported the customer on a number of programs over the last decade with a range of COTS modules, Curtiss-Wright provided technical guidance to help develop a DVE solution (including a network switch, data recorder, and safety certifiable graphics processor) that would meet their program requirements. The VPX3-652 3U VPX 20-port Ethernet Switch and the DTS3 3-Slot Rugged Network File Server were chosen because they met or exceeded the program requirements, and the development of the VPX3-719 DO-254 and DO-178C Safety Certifiable 3U VPX/OpenVPX AMD E8860 Graphics and Video Capture Module was driven by the program to exactly meet their specifications.

To aid in reducing the development time, Curtiss-Wright worked closely with the customer and provided a loaner DTS3 to use for laboratory testing. These tests proved that the system would provide the customer with superior read/write performance than competing products on the market. Replacing an existing data loader on the aircraft, the size, weight, and power (SWaP) optimized DTS3 also provided an increase in data capacity and feature set. Supporting three removable memory cartridges (RMC), the DTS3 allows the customer to scale the storage capacity up to 6 TB. As well, the 100,000-insertion cycle connector and the ground station data off-loader that enables data download via USB, reduces risk, increases operational efficiency, and ensures a long product lifecycle.

Results

The tight relationship that was developed over the last decade between Curtiss-Wright's sales and technical teams and the customer team enabled us to gain valuable feedback during the development phase of this program. This feedback, in turn, resulted in Curtiss-Wright's ability to further lower the customer's risk and speed up their development time.

Seamless integration of the plug-and-play DTS3 as well as graphics card and switch enabled the customer to field the system on test aircraft in record time. As well, the proven hardware enabled the aircraft to pass the tests required to move to bidding on the production aircraft project. Through the use of COTS products that exactly met their program requirements, the customer was able to integrate their DVE solution on schedule and within their budget constraints.

VPX3-719 graphics and video capture module

VPX3-652 20-port Ethernet switch