CASE STUDY

Overcoming the Challenges of Recording High Speed Flight Test Data

CURTISS-WRIGHT

DEFENSE SOLUTIONS

Challenge

- Data acquisition and recording of flight test data at 300 Mbps
- Record direct camera data and capture in industry standard format
- Quick offload of captured data for analysis

Solution

- Integrated data acquisition and recording system
- Rugged recorder with removable storage
- Support for Ethernet packet capture and GbE data offload programs

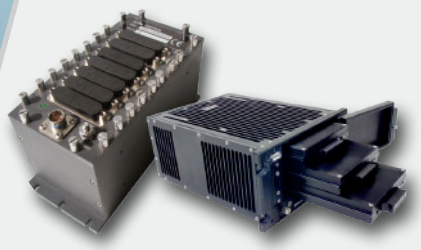
Results

- Standard file format eased data analysis
- Future proof system with Gigabit recording capabilities
- Seamless, high-speed data off-load with optional remove storage

Challenge

When a leading defense prime contractor was conducting flight tests to exercise a new sensor system on-board a helicopter platform they contacted Curtiss-Wright for flight test instrumentation that could acquire and record flight test data for After Action Review (AAR) by the engineering and test staff. Because the test required two channels of direct IP camera data, running at 1 GbE as well as the recording of Ethernet data at 300 Mbps, which is higher than what a standard flight test recorder (NET/REC/002) could provide, a high bandwidth standalone recorder was required as well as data acquisition hardware. Additionally, the customer also wanted to standardize the testing procedures and monitoring of all test subsystems.

In order to make the analysis of the flight test data as easy as possible the recorder needed to capture and store the data in a network packet format. Essentially the customer required a network sniffer. The sniffer would sit on the network and capture any network traffic. This data would be stored in an industry standard PCAP (packet capture) file format. Storing the data in PCAP would allow for the use of common analysis tools. The recorder needed to provide means for fast offload. In order to meet this requirement the customer was considering removable drives that could be replaced with another set while the data was offloaded.



KAM-500 and DTS3 with RMCs

Solution

After reviewing the customer requirements it was determined the Acra KAM-500 data acquisition unit (DAU) and DTS3 recorder would best meet their needs. A 6 user module DAU and several modules including an Ethernet backplane controller, MIL-STD-1553 and ARINC 429 bus monitors, and an H.264 video encoder were selected to provide a SWaP optimized, rugged solution. The DTS3 is a SWaP-optimized, rugged network attached storage (NAS) device that supports industry-standard storage protocols (NFS, CIFS, HTTP and FTP) through four copper 1 GbE ports. In addition to standard NAS operation, the DTS3 has a special mode that allows the capture of Ethernet packets on a specific Ethernet port. This is essentially a sniffer mode where every character is captured and stored into a PCAP file. Packet capture is a perfect feature for flight test instrumentation systems and for troubleshooting Ethernet problems. Either case is an example where post mission analysis of not only the data, but also the actual packets is important. The PCAP files are stored on a specific removable memory cartridge (RMC) in the DTS3 as directed by the user command. These files can be opened with shareware like Wireshark®.

The DTS3 supports three RMCs and is ruggedly designed for durability in high-insertion applications that require data storage plus transport to other locations. For reliable long-term usage, the RMC features a 100,000 insertion cycle connector and is tested to harsh environmental specifications including -40 to +71°C operating temperature, MIL-STD-810 shock and vibration, MIL-STD-461 EMI and MIL-STD-704 power.

Results

By sourcing both the data acquisition hardware and recorder from Curtiss-Wright the customer was able to seamlessly integrate the two systems, reducing integration and development time. Both the Acra KAM-500 and DTS3 have been developed for use in harsh environments like that found on-board a helicopter. Having been tested during IRAD development, the DTS3 provided a low risk technical solution. Based on industry standards the NAS was able to be quickly adapted to include PCAP recording. Thus the system was quickly adaptable to fit the helicopter, avoiding any cost and schedule overruns.

The DTS3 ability to capture data in PCAP format allowed the customer to use already available tools and shareware for data analysis. This saved the customer development time it would have taken to write software to convert data to a proper format. Having this capability readily available enabled the customer to start flight tests immediately.

The system's GbE capabilities made the capture of the high speed data possible. The GbE ports on the recorder were also used for both data capture from the DAU and for high-speed data offload, allowing the customer to pull data off the recorder faster than previous recording systems. Lastly, the ability to remove the storage from the recorder and plug in another set of drives allowed for the continuation of flight tests while the data was being removed. This allowed the customer to complete the flight tests quicker than previous test scenarios. With a simple SATA-to-USB converter, all the data files were able to be off-loaded by any computer with a USB port.

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