CASE STUDY

# Regional Jet with Custom High Speed Data Acquisition Meets Tight FTI Deadlines

CURTISS-WRIGHT

## Challenge

- Pressure to conduct a smooth Flight Test Instrumentation program
- Required custom data acquisition equipment for new avionics busses
- Manage large system with high data throughput

## Solution

- Select off the shelf solutions from proven supplier
- Choose a modular system with a partner that can develop custom modules
- Use high speed Ethernet switches and optimized software

## Results

- Smooth FTI system integration with hot bench integration completed on time
- New modules developed successfully acquired the required data seamlessly
- System was able to support high data throughput

## Challenge

A flight test organization was tasked with instrumenting a new regional airliner to gather flight test data. This jet was a flagship project that holds a great deal of significance for the organization in terms of competing on the world stage. Not unlike any major aircraft development, it needed to complete testing smoothly which meant the Flight Test Instrumentation (FTI) needed to provide quality data reliably.

New aircraft often utilize new avionics busses and this means new data acquisition hardware can be necessary to capture the relevant data. In this case the FTI had to capture data from two new busses – the ARINC 664 pt7 and Intermodule Data Bus (IDB). These had never been fitted to an aircraft the organization had tested before. As the ARINC 664 pt7 bus used proprietary packets, there was no off-the-shelf data acquisition solution available, a similar issue for the IDB.

There was a significant amount of data that needed to be gathered and therefore a large data acquisition system was required. The challenge was to install and operate a large distributed network of Data Acquisition Units (DAU) that could capture all this data coherently and synchronously.

New modules and Ethernet switches supported the coherent collection of the required data.

## Solution

There are many risks associated with instrumenting a new aircraft that may lead to delays or problems gathering data. One way to reduce this risk is to use proven hardware that is available immediately. This cuts down on the risk that hardware may not function as expected – both in isolation and as part of a large system. There is also the advantage of knowing delivery times will be short as no additional development will be needed. The flight test organization chose a Curtiss-Wright Data Acquisition System (DAS) that consisted of 18 DAUs and 8 switches.

To address the acquisition of data from the two new avionics interfaces, two new modules were developed – the KAD/EBM/104 and the KAD/IBM/101. The KAD/EBM/104 receives ARINC-664 P7 traffic on a dual redundant interface and splits messages into two groups: parametric messages containing known placed data and non parametric messages containing ARINC-429 words. The KAD/IBM/101 monitors up to two IMB busses and coherently parses traffic (up to 65 words) and tags for up to 1024 messages (including one catchall slot) per bus.

To manage a system with a large amount of data flowing through the distributed system, an interconnection backbone was chosen that could both cope with the high data throughput and ensure all the data remains coherent. The best solution today is to use a high performance Ethernet switch. The flight test group selected the NSW-8GT and NSW-5GT Gigabit IEEE-1588 enabled off-the-shelf switches from Curtiss-Wright.

## Results

The FTI system with hot bench integration was completed smoothly and on time. There were no significant issues from design to delivery to system test. This ensured that the data collection equipment did not delay the flight test project. The large data acquisition system also successfully delivered the large quantity of data. Its pedigree of reliability should also ensure the successful collection of quality data.

When development is needed, a modular system provides the lowest risk path by isolating the required new functionality to new modules. Typically, there will be no need to modify the majority of the commercial off-the-shelf solution as the new requirements will simply plug in to one or more DAUs like any other module. In this case, two new modules were quickly developed – one for the ARINC 664 pt7 bus and the other for the IDB – that meant no further modification to the system was necessary.

The system was successfully integrated using several Ethernet switches. These five and eight port non-blocking switches are fully ruggedized for airborne applications and connect the data acquisition systems, the control system, recorders, gateways and network management interfaces and systems. Synchronization was successfully implemented using the IEEE1588 precision time protocol (PTP). To date this strategy has allowed the low risk collection of all the data the program needs in a smooth manner to help the organization successfully test their flagship aircraft.

INFO: CURTISSWRIGHTDS.COM
EMAIL: DS@CURTISSWRIGHT.COM