CASE STUDY

# Instrumenting an Electric Vertical Take-Off and Landing Vehicle

CURTISS-WRIGHT

DEFENSE SOLUTIONS

## Challenge

- Short delivery deadline
- Size and weight constrained environment
- IP telemetry link with variable bandwidth

## Solution

- Pretested system delivered to work out of the box
- Compact FTI system with low weight and power requirements
- Data server system with selectable channel streaming

## Results

- Met target milestones without costly delays
- Complete FTI system installed in a SWaP constrained aircraft
- Capitalized on additional video footage when link bandwidth was sufficiently wide

## Challenge

An aviation startup with a vision to develop an on-demand air mobility service wanted to build a new type of aircraft that would meet European Aviation Safety Agency (EASA) certifications for transporting up to five people. Their aggressive timeline from concept to production meant every stage of aircraft development, including flight testing, had to occur without any delays. Flight test campaigns can be lengthy and involve several steps where delays can be introduced; avoiding these delays by optimizing FTI selection, integration, and delivery was therefore an important program requirement.

The aircraft had a strict design target to be as light and compact as possible to accommodate the unique all-electric design (including propulsion) and operational requirements. This left little room for installing FTI, forcing equipment mass and wiring to be kept to a minimum. Excessive power consumption was also to be avoided, both to keep the power draw low and to avoid the need for heavy and bulky heat sinks necessary on some data acquisition units (DAUs).

The telemetry system consisted of an Ethernet radio which added several benefits, including the removal of PCM related encoders and decoders. The bandwidth of this system was variable, however, depending on the signal strength. There were four HD cameras onboard that were continually recording, but the number which could have imagery telemetered depended on the bandwidth available. This needed to be controlled from the ground or they would be forced to assume a low bandwidth, losing the ability to view multiple video camera streams.

NSW-12GT

KAM-500

ADSR-4003

GS Works

## Solution

The key to successfully completing the flight test campaign while meeting their deadlines was to work closely with the regulatory authorities (EASA) and partner with a trusted FTI supplier with a proven track record in delivering leading technology within short time frames. Curtiss-Wright was the obvious FTI choice for this project thanks to a deep history delivering compact and power efficient systems, the ability to deliver a fully integrated system, and the availability of dedicated and reliable support.

This system included Acra KAM-500 data acquisition units, an NSW-12GT Ethernet switch, Advanced Data Server Recorder (ADSR), four HD cameras, and GS Works ground station software. The complete system was tested inside Curtiss-Wright, ensuring the shipped system would work out of the box, rather than requiring system integration by the customer.

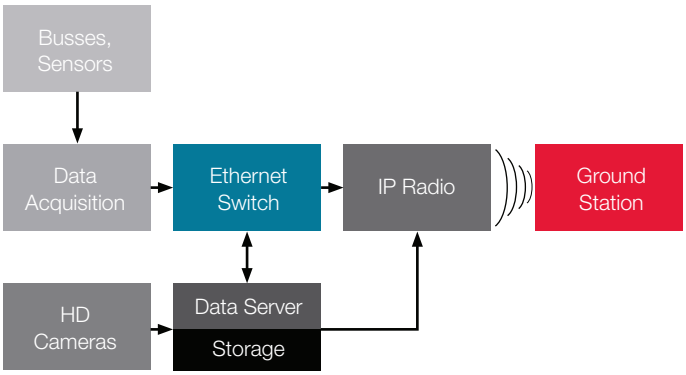


Figure 1: The system was all integrated and tested inside Curtiss-Wright before being shipped to the customer to speed installation time

The system was delivered as soon as possible, even necessitating the initial use of loaner units to keep delivery times to an absolute minimum. In addition, a Curtiss-Wright application engineer was available for on-site support, which included assistance setting-up the system to ensure they could start gathering data at the earliest opportunity.

The platform's existing IP radio system used for telemetry had a number of advantages including transparent networking functionality between the air and ground and the ability to send commands to equipment, but the links variable bandwidth created an issue with telemetering video data. By using the ADSR to serve the video streams to the IP radio, the operator can determine which video feed should be telemetered, maximizing the efficiency of the telemetry link for video purposes. Video data was stored on one of the ADSR's three independent removable media modules regardless of which streams were being telemetered to ensure full data availability post flight.

## Results

The aircraft was instrumented on time and the engineers are successfully gathering data from the FTI system thanks to the accelerated product integration and delivery times, and consultation services supplied by Curtiss-Wright. This helped minimize delays in achieving first flight and ultimately helped achieve their production target date. Due to the experimental nature of flight test campaigns, lowering risk is a critical component of meeting milestones. Delays can lead to mounting financial pressures and can be avoided, or minimized, by using a proven provider of FTI. Their engagement with Curtiss-Wright also provided them with expert advice beyond delivered products and included recommendations for other avionics systems.

The supplied FTI system was installed successfully in the extremely limited space available, helped by the low power operation that did not necessitate heavy and bulky heat sinks that are sometimes found in high performance FTI. The ADSR's ability to control the flow of data to the IP camera meant that the flight test engineers could balance the link bandwidth against the number of camera streams. This allowed, for example, viewing all four HD cameras while the aircraft was close and the link was strong, and then reducing to a single camera when the link was weaker due to distance or other disruptive obstacles.



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