CASE STUDY

# Flight Recorder Delivers SWaP-C Benefits for Legacy Avionics Systems

CURTISS-WRIGHT

DEFENSE SOLUTIONS


## Challenge

- ADR replacement that fits in existing space
- Minimum installation changes
- Future proof system with underwater locator beacon
- Improved reliability

## Solution

- Form/fit replacement combined voice and flight data recorder
- 25 hour FDR and 4 channel, 2 hour CVR capability
- Mounting bracket for interface adaption

## Results

- Fully environmentally qualified solution
- Tested over complete flight envelope
- Increased data download speeds

## Challenge

The BAe Systems T1 Hawk aircraft used an Accident Data Recorder (ADR) which provided parametric flight data recording functionality, acquired a standard data stream and recorded it in a hardened enclosure designed to survive crash tests defined in the 1980's. This enclosure protected a magnetic tape based media operating on an endless loop principle.

The recorders had been installed at aircraft delivery and maintained in service for a number of years. As the media aged, there was a more frequent need for in service maintenance for reconditioning and replacement of the magnetic tape media and other electronic components, which resulted in a very low operational Mean Time Between Failure (MTBF) and high maintenance service rate.

The aircraft operator sought a replacement ADR that would ideally fit in the existing aircraft with minimum changes to the installation as well as provide an improved MTBF, an underwater locator beacon and additional functionality to enable an aircraft system upgrade to include a Cockpit Voice Recorder (CVR).



Multi-Purpose Flight Recorder (MPFR)

## Solution

Prior to the launch of this replacement ADR program, Curtiss-Wright had released the Multi-Purpose Flight Recorder (MPFR) that offered combined voice and flight data recording (FDR) and provided a minimum of 25 hours FDR and 4 channel, 2 hour CVR capability.

Although physically different both in size, weight and interface connection (the MPFR is smaller and lighter than the existing recorder, utilizes a different mounting method and a different electrical system interface connector) it supported the necessary FDR interface, is powered by 28VDC and could be mechanically adapted therefore making it suitable as a functional replacement. The MPFR has also been environmentally qualified to RTCA-DO160D and various MIL-STD-810 procedures as a stand-alone item.

To provide mechanical and electrical interfacing, a mounting tray was developed that allowed the MPFR to use the mechanical spigot and hold-down hook mounting arrangement of the existing installation. To resolve the electrical connection from the aircraft to the recorder an interface wiring harness was created to convert from the MPFR connector to the aircraft electrical connector. To ensure that there were no problems with aircraft wiring, the aircraft interface connector was positioned in the same place with respect to the mounting points as that of the previous recorder. All additional interfaces that would provide for the future expansion of audio recording were taken out to a second dedicated connector. As the CVR functionality would not be initially used, a connector cap and stowage receptacle were provided to protect the pins of the new connector.

The final assembly was subjected to environmental qualification with test reports generated and approved by the aircraft design authority.

## Results

The final assembly underwent a full environmental qualification test program to meet the aircraft requirements. The resultant assembly was installed and proven with a flight test regime to ensure that data was captured over the flight envelope.

In addition to the provision of the airborne equipment, new ground station software and rugged PCs were supplied. The MPFR provided the benefit of a 4 wire Ethernet interface for data download. Evaluation found that the installation could utilise the same aircraft wiring as the previous recorder therefore the ADR could now be ‘milked’ on aircraft much faster than the tape based system without further change to the installation.

Adaption of MPFR for this application opened up other replacement ADR opportunities where the core functionality of the recorder was utilized with the mechanical arrangement being changed to suit the new aircraft platform.

The same principle can be applied to that of the next generation Fortress recorder. Fortress utilizes the same physical footprint of the MPFR while providing more functionality and greater recording performance.


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