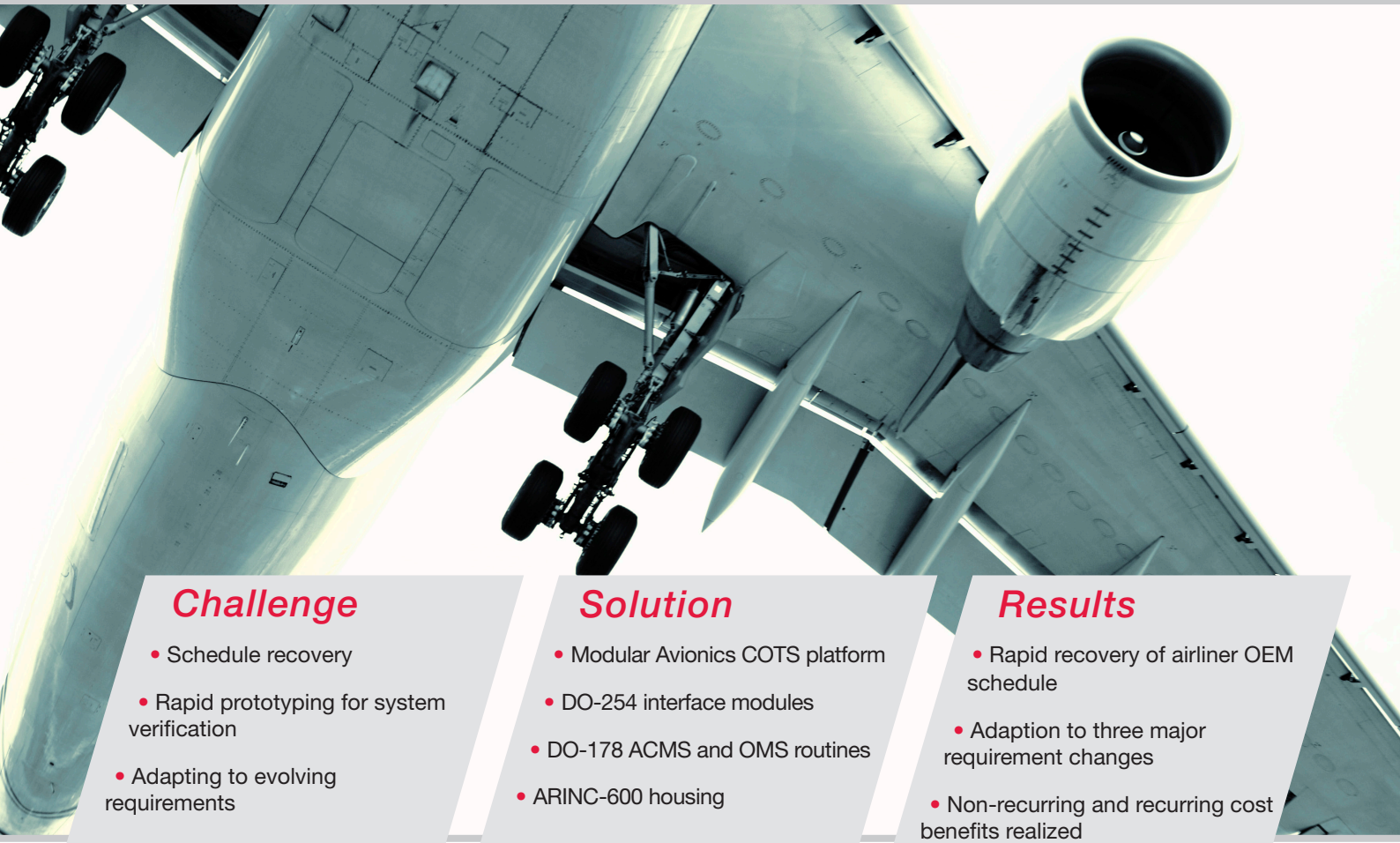
CASE STUDY

Overcoming DAL-D Development Pitfalls with Modular Avionics COTS

CURTISS-WRIGHT

DEFENSE SOLUTIONS



Challenge

- Schedule recovery
- Rapid prototyping for system verification
- Adapting to evolving requirements

Solution

- Modular Avionics COTS platform
- DO-254 interface modules
- DO-178 ACMS and OMS routines
- ARINC-600 housing

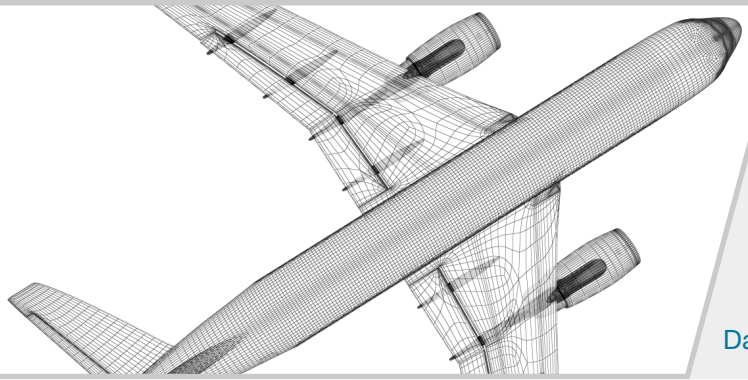
Results

- Rapid recovery of airliner OEM schedule
- Adaption to three major requirement changes
- Non-recurring and recurring cost benefits realized

Challenge

Modern aircraft developments place huge demands on avionics designers as multiple sub-systems are developed in parallel without full knowledge of how they will eventually interact. As manufacturers of flight data recorders, Curtiss-Wright was subcontracted to provide a crash-protected recorder which would interface to the DMU (data management unit) of a new mid-range commercial airliner. The original DMU development plan was aborted twelve months into the development phase, and Curtiss-Wright was asked to take over the DMU development, with the caveat that the original delivery schedule still be achieved.

In addition to needing compressed development time, the OEM needed early prototypes of the DMU, to allow for design validation and verification with other sub-system interfaces. Due the parallel development of multiple sub-systems, there was an awareness from the outset that specifications of interfacing sub-systems would not be 100% complete before design of the DMU commenced. This was an indeterminate risk that needed to be managed and adapted to by Curtiss-Wright.



Data Management Unit (DMU)

Solution

Curtiss-Wright has developed a uniquely adaptable modular Avionics COTS platform that naturally mitigates program risk and achieves savings for OEMs in terms of recurring and non-recurring costs. We used our industry leading Acra KAM-500 data acquisition system as the functional basis for a new DAL-D based Avionics COTS architecture. This new paradigm retains the adaptability of the modular KAM-500 system allowing unique specification data management units (DMU), data concentration units (DCU), remote interface units (RIU) and flight data acquisition units (FDAU) to be realized without the development costs associated with a bespoke development.

The unique DAL-D DMU required not only data concentration of avionics bus data, but also analog acquisition, specific video acquisition and quick access recorder (QAR) functionality. The configuration was rapidly realized using a functional equivalent KAM-500 prototype to confirm requirements definition and commence ground testing. Once each module was verified to work as intended, the specification was frozen and then re-designed using DO-254 level D processes.

Two dedicated processing modules were included in the original configuration to allow for the hosting of on-board maintenance (OMS) and aircraft condition monitoring system (ACMS) routines, both of which were developed to DO-178C level D.

The final production units were within a traditional ARINC-600 MCU form-factor to allow for plug-and-play installation in avionics bays. Other form-factors can be easily accommodated depending on the application.

Results

Curtiss-Wright took ownership of the DAL-D DMU development and achieved the schedule recovery required to keep the avionics program on-track. The rapid prototyping of the DMU significantly reduced program risk, moving very quickly beyond a “design-on-paper” to a testable solution.

Specification changes anticipated at the program outset manifested themselves as three major alterations to the DMU during the design phase. By purposely avoiding a monolithic design, these changes were easily accommodated by the modular avionics COTS architecture.

- Specification for the DMU output format changed 6 months prior to agreed delivery from an ARINC-664 part 7 packet format to an ARINC-717 format. Accommodating this change allowed the removal of switching circuitry and reduced avionics shipset recurring costs by ~$40K per shipset.
- The ACMS routine was removed from the DMU requirement when it was recognized that similar functionality already existed in EMU (engine monitoring unit). The easy removal of this interface allowed for recurring cost reduction of 6%.
- Several interface specifications (e.g. OMS routines) were incomplete at the beginning of design phase. Natural hardware partitioning and streamlining of the verification process allowed fully defined modules to be tested without delay, with other modules being scheduled later in verification cycle.

The final specification for the DMU has been realized in the Curtiss-Wright Avionics COTS architecture and qualified for use on the target commercial airliner. The first units will ship in Q2 2015 as part of the aircraft flight test phase and production of the certified DMU units will begin in 2016.

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