CASE STUDY

Reducing Unscheduled Grounding Events with Adaptable Predictive Maintenance

CURTISS-WRIGHT

DEFENSE SOLUTIONS

Challenge

- Faulty aircraft systems were resulting in costly unscheduled maintenance
- Operator had incomplete information from existing systems to identify faults ahead of time
- An adaptable system able to accommodate more data in the future was needed

Solution

- An airline operator selected a modular COTS system to gather more data and allow for future expansion
- Used existing data links to limit installation effort
- Implemented a pilot study to test the concept before evaluating a fleet wide deployment

Results

- An adaptable data capture architecture was created quickly
- Within two weeks of receiving the first evaluation units, data was being gathered successfully
- Within three weeks, a future fault was detected and an unscheduled maintenance event was avoided

Challenge

The delays caused by faulty aircraft systems (e.g. auxiliary power units and air conditioning units) are a major inconvenience to air travelers and an ever-present headache for airline operators. They cause unscheduled aircraft groundings and frustrate customers. In recent years, some operators have taken a more progressive approach to these unscheduled maintenance events, establishing preventative maintenance programs to drive higher on-time rates.

The emerging concept of "predictive maintenance" promises to both diagnose aircraft problems and to make predictions about future events. However, assuming you gather data, using this data can be a major challenge as one needs to

1. Sift through very large data sets for every flight
2. Deal with incomplete data, as many systems have data that is not captured by the traditional ACMS (Aircraft Condition Monitoring System)

Recently, an operator realized a successful predictive maintenance program required data which was not captured by traditional onboard systems (e.g. pressure, temperature and vibration). The new data could then be used to significantly enhance the analysis process, producing

KAM-500 Data Acquisition Unit

accurate maintenance forecasts and predicting potential service disruptions.

The data capture device would need to be

1. Highly configurable
2. Capable of adapting to evolving requirements
3. Easily integrated with existing aircraft systems with very low impact
4. Capable of operating in unpressurized areas without modification

Solution

Curtiss-Wright was chosen to provide such a system. Using the extensive Acra KAM-500 catalog, Curtiss-Wright was able to provide an off-the-shelf solution that

- Covered all measurement requirements
- Was capable of operating in inhospitable environments outside pressurized cabins (e.g. landing gear bay, wings, tail cone)

The modularity of the proposed solution allowed the operator to rapidly modify the system as new measurements were added or removed from the program, and to adapt to new platforms within the fleet.

Curtiss-Wright engineers were able to give advice on the best way to integrate the unit into the existing avionics systems. By configuring the KAM-500 unit to transmit data across existing ARINC-429 links, the operator was able to avoid penetrating the pressurized bulkhead and could also communicate easily with existing ARINC-429 compatible devices such as ACARS (Aircraft Communications Addressing and Reporting System).

Results

An adaptable data capture architecture was created that is capable of truly gathering predictive trend data on passenger aircraft. This architecture is ideally suited to address evolving predictive maintenance requirements and is able to incorporate new measurement requirements across multiple platform types – without major equipment developments.

The speed with which the KAM-500 solution was delivered and the ease with which it was integrated into existing systems facilitated simplified fleet deployments. Within two weeks of receiving the first evaluation units, data was being gathered successfully.

The usefulness of the data captured by engineers during the initial evaluation stage greatly exceeded their expectations. Three weeks after installation, this airline operator reported that they had already scheduled new maintenance actions based on the first data-set analyzed, avoiding a predicted fault ahead of time.

With the success of the predictive maintenance evaluation, this pioneering approach for reducing unscheduled maintenance is now being considered for other aircraft systems and fleet types.

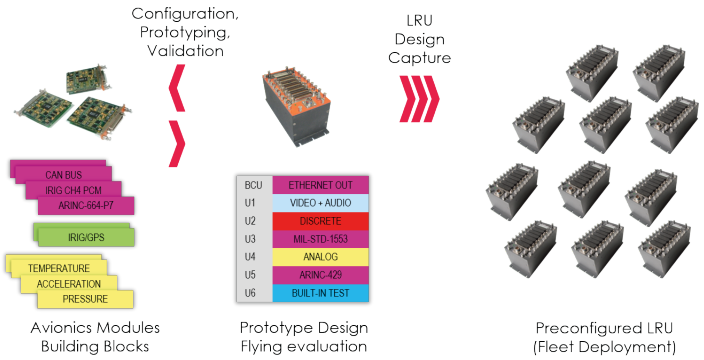

Figure 1: The rapid prototyping approach allows for quick testing and alterations before production

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