Connected Aircraft Cockpit and Maintenance Process Improvements Panel

Connected vs. Interoperable

Rolls-Royce view of the future Maintenance Process and Connected Aircraft

Isabella Panella
Chief of Systems for the Advanced Concept Centre
isabella.panella@rolls-royce.com
Overview

- Connectivity vs. Interoperability - How to make systems work together rather than just exchanging data

- Rolls-Royce plc. Vision for integrated air space for the next generation of aircraft vision

- Open System Architecture (OSA) – What is it and how can we use it – Not just about open standards but need for a common architecture

- Initial Exploitation of OSA for Health Management System – Improve maintenance and pilot situation awareness

- Discussion
Connectivity vs. Interoperability

Optimised Flight Paths – Improved Air Traffic Management

Avionics
- Electrical power
- Flight control
- APU
- Aircraft structure
- Engine
- Landing gear


Enhanced Decision Support On Board

Data and Information Portability – Ease Access to Data

Better Scheduling and Asset Utilisation

Advanced Maintenance and Logistics

Empowered Ground Support and Decision Support Off-Board
Rolls-Royce’s next generation of connected aircrafts

VISION: Not just a connected aircraft but an interoperable air space

Rolls-Royce is not just about *connectivity* – We believe in **Interoperability** and **Full Collaboration** with Valued Partners – Hence, we propose Exchange among partners through an **Open Standards** and **Open Architecture Approach**
Open System Architecture

System wrapper for seamless integration

Avionics
Engine EHM
“New System”

Data fusion

Communication update and Information Sharing
Advisory system

On-ground

Data shared and utilised among systems

Air Traffic Control
Operations Room
MRO shop
Logistics

Software updates

Plug and Play

New System
Software updates

Open System Architecture

Global Connected Aircraft
2014 Summit

June 3-4, 2014 | Renaissance Long Beach Hotel | Long Beach, CA

Rolls-Royce Data – Commercial In Confidence
Properties of Open System Architecture

- **Open** - OSA supports software components written in multiple languages and on multiple platforms;
- **Distributed** – The software that compose an application can run on physically distributed platforms;
- **Extensible** – Software components can be added or removed from the system while running in real time
- **Mobile** – OSA applications can be run from Portable Devices such as iPad and PDA, which would allow the full connectivity of the A/C pilot in the cockpit with the Air Traffic Controller and neighbouring platforms
- **Collaborative** – Dynamic interfaces are used to ensure easy exchange of information among users, whereby by users we intend Human (ATC, Pilot, Manufacturers) as well as other systems (system to system communication);
- **Multiple modalities** – supports the different mission phases and possible multiple utilisation of the architecture on heterogeneous platforms;
- **Multimodal interaction** – ability to interface with different software components, heterogeneous platforms, different human machine interfaces (Air Traffic Controllers (ATCs), cockpits, radio controller and satellites navigation, etc.).
Open System Approach for Health Management Architecture (OSHMA)

Open System Architecture – On-Board

- Hydraulic Systems
- Pilot
- FCS
- Avionics Systems
- Ground Control Station (ATC)
- Communication Systems

BIG DATA – Data transfer, analysis, filtering, classification, storage, retrieval, knowledge creation, information flow, information manipulation

Open System Health Management Architecture (OSHMA) – On-Board

- Vehicle Health Management System (VHMS)
- Sensor Health Management System (SHMS)
- Structural Health Management System (StHMS)
- Software Health Management System (SWHMS)
- Communication Health Management System (CHMS)
- Engine Health Management System (EHMS)
OSHMA - Open Architecture Approach, Industrial Internet, and Big Data Development Platform

OSHMA approach is envisaged to:

- Maximise operational availability of the aircraft;
- Improve life cycle maintenance;
- Facilitate logistic management in terms of availability and accessibility of Line Replacement Units (LRU) and spares;
- Reduce maintenance costs; and
- Coupled interfaces among subsystems optimisation,
- Support the development of local and network interfaces (Industrial Internet): maintenance crew, cockpit, etc.
- Require cyber security (Big Data exchange issue) – ensure interfaces protection when exchanging data, whether internal or external.

Data Transfer and Big Data

- Data flow to and from a specific component;
- Data Management and knowledge creation;
- Information Exchange;
- Quick Access Recorder (QAR) data.