Tomorrow’s MRO – The Airbus Approach

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Executive Summary: Recognising the importance of time- and cost-effective quality maintenance for the operational and economic performance of the Airbus fleet for its airline customers, Airbus has launched initiatives to apply the OEM’s aircraft manufacturing know-how to MRO operations in Asia and beyond.

Working on the application of new aircraft production technologies in the fields of robotics, drones, large scans, virtual and augmented reality, tools and parts tracking to MRO operations together with EDB as well as research partners and MROs in Singapore and abroad, Airbus is looking for low hanging fruit and mid-term productivity leaps in maintenance automation and the smart utilisation of the big data delivered by modern Airbus aircraft.

The paper gives an insight into the progress of some Airbus applications and the bigger trends in the evolution of MRO operations as Airbus sees them.

Over the past years, many technologies have been developed for the future of manufacturing around the world, in particular in Europe (“Factory 4.0” in Germany, “Usine du Futur” in France) and in Asia (“Made In China”). Beyond simple automation, these initiatives are more and more about the connectivity between machines and/or companies. Individual technologies do not make a difference by themselves; it is rather their impact on an integrated environment that is considered. Airbus has developed such technologies and skills and has successfully introduced them to aircraft manufacturing.

Currently, Airbus has launched several initiatives to apply those technologies and methods from manufacturing to aircraft maintenance in order to bring value to aircraft operators through enhanced MRO performance and productivity. The Hangar of the Future (“HoaFu”) project in Singapore is at the core of these activities and provides a test-bed for the application of new technologies to the MRO environment.

MRO is a strategic industry sector in Singapore with a close to 25% share of the Asia-Pacific market. However, MRO actors in Singapore are operating in a very competitive and fast evolving environment. They face challenges from growing competition from other Asian countries with cheaper labour, increased cost pressure from their customers and not least from fleet modernisation in the region, which leads to reduced need for maintenance, but also to new opportunities for MRO productivity enhancement by using the in-built new technologies of modern aircraft (such as the manifold increase of aircraft data available for MRO analytics through Airbus Skywise).
The HoaFu project is aiming at improving the productivity of MRO activities in Singapore. In order to achieve this, a test-bed has been created to adapt the latest “factory of the future” technologies to an MRO environment. The test-bed provides an integrated environment including various technological blocks; these technologies are selected from available technologies within Airbus and external partners.

The initial test-bed helps to create an integrated scenario for the maintenance of the future for aero-structures (both fixed and rotary-wings), and it is based on realistic near-term technologies:

- Data acquisition and consolidation through 2D/3D/4D scans to detect the as-is configuration or damage/defects;
- IoT technologies to accelerate internal processes and checking;
- Automated inspection with non-destructive testing capabilities, collaborative robotics and drones to generate rapid accurate diagnosis;
- Technician support with augmented reality, wearable devices and remote expert intervention to help technicians to locate the parts they need to work on and provide visual support – from manuals or from expert guidance - during the task execution;
- 3D printing of spare parts, reducing logistics and simplifying the supply-chain for spare parts; and
- Digital thread of all maintenance action, findings and related aircraft data for the performance of MRO analytics through Airbus Skywise.

Illustration: Maintenance of the future scenario and test-bed
A key aspect of the test-bed is to bring all these building blocks into the same location and create a data management infrastructure linking the different hardware and applications together.

This allows demonstrating their use and potential value in an MRO environment and it will speed up considerably their transfer to the actual operational environment. The test-bed is based on an open architecture allowing start-ups from the digital world to demonstrate their technologies and it will allow fast implementation into operational MRO environments.

Another important productivity enabler is the use of Augmented Reality (AR) technologies to build a link between the digital world (information system) and the maintenance operations performed on the aircraft in the physical world. AR has been successfully deployed for many years in Airbus to support manufacturing activities.

In the context of the HoaFu project, the objective is to enhance MRO productivity by first reducing the time needed for technicians to guide them where they have to intervene and to localise a specific part or defect. Subsequently, the technician is guided in the execution of the maintenance tasks by AR capabilities using various modalities, such as ruggedized tablets allowing large overlay views associated to complex information display or smart glasses like the Microsoft HoloLens where the technician needs his hands free to perform a specific task. The productivity gain is generated from providing the relevant information at the relevant time and at the relevant location, saving large amounts of MRO man-hours.

Whilst working through use cases, testing and adapting the technologies in the HoaFu environment, Airbus is formalising its approach to progressive deployment of the results from the HoaFu project and the other Airbus initiatives to industrial MRO operations as the next step.