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Passive RFID Tags for Aircraft Parts Enter Volume Production

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In anticipation of our MRO Americas conference in Dallas, we're posting a few stories on that sector. The following was written by Graham Warwick.

Technology has matured to commercial availability, data standards are close to approval, and by year's end Airbus and Boeing could be instructing suppliers to put radio-frequency identification (RFID) tags on aircraft parts.

It has been a long journey. RFID on aircraft parts has required the development of technology and standards for fully passive UHF tags. These are powered by the interrogation signal from a handheld reader, and their availability has been paced by development of high-memory tags capable of recording and storing data through the life-cycle of a part.

"It has to be a passive tag," says Boeing's Steve Kopecki, who leads the RFID service-ready program for the 787. "Active tags need a power source, and batteries on 3,000 parts with active tags would be a serious maintenance issue, not to mention weight." But it has taken time to develop passive RFID tags that approach the functionality of active tags.

Boeing said in 2005 it would enable RFID on the 787, but that timeline proved premature. "The technology was not quite mature enough," says Kopecki. "So the program directive was rescinded and requirements defined to mature the technology and address regulatory issues."

Four years later, the technology and standards are almost in place. "All the footwork is to be completed by the summer, so we can go back to the 787 program in August/September," he says. "The program will decide the line number at which to cut in the technology. That could be up to 24 months down the road."

One of the final steps, planned for last week, was an evaluation of RFID on parts in the production environment, for which a 777 crew rest area manufactured in-house at Everett, Wash., was selected as the pilot project. "We will follow the process from raw material to customer delivery to find the optimum place to install a tag and see the effect of an RFID-enabled part in the production system," says Kopecki.

The basic case for RFID on parts was established by a study of 767 maintenance productivity, which showed that only 20% of the technician's time involves productive "value-added" work, defined as changing the state of a part through removal, replacement or testing. "Eighty percent of the time, the technician is in hunter-gatherer mode, gathering information, parts and equipment to set up the job," Kopecki says.

"RFID can take a big bite out of the non-value-added time," he says. Linked to a company's back-end data system, the hand-held reader

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provides information at the point of engagement with the aircraft. “A screen interaction triggers the back-end office system and says this maintenance location, this bay, this aircraft needs this action. It condenses non-value-added activity.”

Boeing’s RFID team plans to tag around 1,800 parts on the 787, principally rotable components that require routine removal and replacement for maintenance. Different components will require different tag technology. “You don’t put a high-memory tag on a life vest where only four pieces of information are needed,” he says. “You use high-memory tags for parts with a routine overhaul cycle."

An advantage of RFID is that parts can be queried, and data read from and written to tags, beyond line of sight, at distances of 3-6 ft. Hardware design and environmental testing standards are in place to ensure tags can survive in any aircraft environment for up to 20 years. “There are some concerns about data retention in extreme environments,” Kopecki says, citing the thermal cycles in unpressurized areas. But manufacturers like Tego believe their tags can withstand even the challenging environment of an aircraft engine for longer than 20 years.

Waltham, Mass.-based Tego, formed in 2005 to develop passive high-memory tags for aviation, is working on launch projects with initial customers and plans to have a family of tags in volume production by mid-summer. Early projects include tagging life vests and oxygen bottles, allowing a technician with a hand-held reader to walk down the aircraft and make sure they are there and none have expired.

“There is a lot of low-hanging fruit,” says Tim Butler, president and CEO of Tego, but the key is getting suppliers up to speed on the technology. The company is producing fully passive tags with up to 32KB of memory, in several different form factors. Tego has also developed software—“the DOS for the tag”—that allows users to link hand-held devices to back-office systems and create tags.

The company is offering a launch kit that includes the application software, hand-held reader and tags. This allows users to pull information from their Oracle or SAP back-end system, create a “birth record” for a part and write the data to a tag. “It is designed to help people understand the process, and what types of tags are needed,” says Butler.

FAA regulations still require a data nameplate with human-readable code on all parts, so for now the RFID tag is an ancillary means of identification. Butler thinks it will take 3-5 years for RFID to be certificated as the tag of record, but believes the industry is at a tipping point.

Tego’s road map includes harvesting energy to power the tags, attaching sensors, and using the power and memory to perform on-tag processing to tell users when it’s time to remove a part.

RFID on parts is gaining momentum, says Kopecki. “We’d like to see an intelligent aircraft that gives you information.”

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