

## Tech focus

***This month's focus is on select SAE standards activities and the ramifications of those activities on industry.***

### Boeing steps up for RFID standard

Dreaded is too strong a word. Apprehensive is perhaps a more apt description of Daryl Remily's disposition months ago when he was being pressed to take over as head of an SAE Aerospace committee whose chairman had resigned.

Heartfelt though they might have been, his misgivings did little to discourage his colleagues from electing him chairman, and Remily now finds himself Chairman of the SAE G-18 Committee on radio frequency identification (RFID) at a time when the technology is taking off.

Remily laughs while recalling how he came to become chair, and in an interview with *Aerospace Engineering* aired no complaints about what it has entailed.

Aerospace engineers can understand Remily's apprehension at serving on a committee, much less as chairman, given the devotion of time and energy required for the unpaid position. But he, like many others serving as members or officers of an SAE committee, also understands that some issues are of such importance that someone must step forward to take a leadership role.

As Technical Principal in the Automated Identification Group at **Boeing**, Remily is certainly qualified for the post.

Asked what a standard-less RFID aerospace world would look like, Remily said, "I'll answer with one word: chaos." In elaborating later, he said industry standards are an "absolute necessity." He noted that **Airbus** and Boeing "have 70% commonality in suppliers, and to generate more than one standard would be foolish and certainly would not be cost-effective—not only for the suppliers but for the airlines as well."

It's with airlines in mind that the standard was developed. "We're looking at RFID technology to improve configuration control and help airlines reduce



Boeing is releasing limited information about the number of RFID tags it plans to use on the 787.



"The only limitation for use of RFID is our imagination," said Boeing's Daryl Remily.

costs by allowing them to better manage their part maintenance and repair history," said Remily. "We think it will enhance parts traceability and reduce cycle time to solve in-service reliability problems. And we want to improve the accuracy of the information exchange between the customers, the suppliers, as well as Boeing."

The G-18 standard AS5678, Passive RFID Tags Intended for Aircraft Use, establishes the documentation required for the development, testing, and identification of passive-only RFID tags.

Bonded to parts with adhesive, the

tags have the chips and antenna embedded into them. But they lack a transmitter—hence the descriptor "passive."

According to Boeing's Kurt Roberts, former G-18 chairman and author of the AS5678 standard, the tags "transmit" information via the energy provided to them by an RFID reader. "The more energy that the tag can capture from the omnidirectional zap [of a reader], the more it can reflect back," said Roberts, who serves as Project Manager and liaison between the program management office and the lifecycle product team on the 787. The amount of energy a tag can capture and reflect is a function of antenna size, he noted.

Boeing has announced that it will use passive RFID technology on the 787 Dreamliner. To what extent it will do so, "the only thing that would be valid to say at this time is that we're going through the development process and we've looked at studies from limited quantities to very large quantities," said Remily. "The actual number could change from today to tomorrow."

Remily also declined to say at which frequency, or frequencies, the RFID system will operate. "The UHF band [860-960 MHz] is what we're [focusing on] at this time," he said. "Now, can we find opportunities for other frequencies? Absolutely." Boeing still has options to work through, he noted. "What we use and how we use it is still being developed, and what frequency we use is

## Tech focus

going to be developed. But for the 787 or for any other application, it could be more than one frequency."

About the transmitting aspect of RFID technology that will be employed on the 787, Remily is more sure, saying the choice has been made to use passive RFID. But he did not rule out the possibility that at some point Boeing will implement active RFID technology on the 787 and other aircraft. With active RFID, the tags have their own power source and can transmit signals rather than simply reflect signals as the passive type does.

Active RFID is among the topics the SAE G-18 committee will address in the future, Remily said.

In March, Boeing announced that it had selected **Intellex** to supply the silicon chips that will enable passive RFID tags to be used on "maintenance-significant" parts of the 787. The tags, called "smart labels" by Boeing, will contain part identification as well as main-

tenance and inspection data. At 64 kbit UHF (ultra-high frequency), the chip has the largest memory in the industry, according to Boeing.

Boeing, Intellex, and other players in the industry are "pushing to achieve some level of maturity," said Remily. "There was technology available in the past, but it was low-memory—something we'd see at the Wal-Marts world or the Kmarts. But that's more of a license-plate-type technology, and we're looking at a higher level of technology."

Two well-publicized trials involving **FedEx** demonstrated the viability of RFID technology for aircraft, according to Remily. In the first trial, a frequency of 13.56 MHz was used. It was found to be insufficient in terms of reading distance. So, for the next trial, Boeing used UHF (915 MHz), and reading distance jumped from 6 to 12 in. to 8 to 15 ft.

Not all applications require that type of range, which would accommodate such tasks as checking landing gear ar-

reas from the ground. Remily noted that a shorter transmitting distance would be required when airline personnel carry an RFID reader/transmitter down an airplane's aisles to check for the presence of life jackets under the seats. This underlines the potential for using RFID tags of various capability, he said.

RFID technology is used for three main purposes, according to Remily:

- Identification of parts on an aircraft
- Tracking of parts within the manufacturing facility
- Tracking of parts in shipping/receiving.

"Each application is a little different," he said. "They could be of different frequencies, they could be of different memory size."

"The only limitation for use of RFID is our imagination. We can look toward the future for other uses that we haven't thought of yet."

Patrick Ponticel

## New brake technology leads to new standard

As is often the case, a new technology requires a fresh look at industry standards. Electric actuation of brakes is such a new technology, and **SAE** is addressing it.

AS5663, developed by the SAE A-5 Aerospace Landing Gear Systems Committee, sets out performance and reliability parameters for such systems.

Prior to AS5663 there was an industry standard, TSO-C135, governing brake performance. "The TSO has evolved to maturity specifically around the technology of hydraulic brake actuation," said AS5663 sponsor Heather Beaton, Chief Engineer, Mechanical Systems, Core Systems Engineering, **Bombardier Aerospace**. "With the introduction of electric brake actuation into civil aviation on the **Boeing 787** program, the industry and certification authorities needed with some urgency to review and modify the TSO to permit the use of this new technology, while ensuring the same level of design integrity and performance is achieved."

The standard creates new terms to replace those used for hydraulic pressure, and replaces traditional hydraulic

structural demonstrations of yield and over-pressure tests with equivalent mechanical system demonstrations of limit and ultimate tests. It also introduces some basic design requirements associated with power electronics.

"It was an important mandate for the team not to expand the scope of the document beyond that of the TSO—strength, robustness, stopping capability, and energy absorption—to both streamline the document creation and ultimately ensure its acceptance by the certifying authorities, and industry in general, as an equivalent minimum performance document to the TSO," said Beaton.

A separate SAE document from the A-5 Committee, AIR5937, provides a basic guide to electric brake technology.

Patrick Ponticel



Goodrich is supplying the electric brakes for Boeing's 787.

## ARP for emissions accommodates future test developments

SAE has updated its aerospace recommended practice (ARP) on gaseous emissions from aircraft turbine engines to more accurately reflect best modern practices.

ARP1256C from SAE Committee E-31 permits the use of alternative instrumentation and a gas divider-type tool to determine the linearity properties of measurement devices. High-purity nitrogen is recommended for both span diluent and zero gas on infrared and chemiluminescence analyzers such that corrections do not have to be applied to these instruments' zero and span readings.

Instrument linearity requirements and span gas tolerances have been made more stringent from earlier versions of this ARP, reflecting the im-

Engineers at Honeywell, sponsor of ARP1256C, monitor results from engine testing.

proved accuracy from both modern analyzers and gas suppliers, respectively. It is recognized that there probably will be major advances in measurement technology, and so the ARP does not exclude alternative analysis techniques; however, it is the responsibility of the analyst to demonstrate that alternative measurement technology has compa-

rable or better performance than the techniques described in the ARP.

The measured gas species include carbon dioxide, nitric oxide, nitrogen oxide, total hydrocarbons, and water vapor.

The ARP is not intended for in-flight testing, and it does not apply to engines operating in afterburner mode.

Patrick Ponticel



## Position, Pressure, Force

For nearly 50 years, Kavlico has provided innovative sensing solutions for commercial, civil, and military aerospace applications. Kavlico LVDT's, RVDT's, pressure and force sensors have accumulated millions of hours of service worldwide.

At Kavlico, we can provide all the sensor requirements for a complete aircraft system. We have designed and manufactured over 10,000 custom configurations satisfying high volume aerospace applications.

Our robust sensors provide input and feedback for control of critical systems such as flight control surface position, autopilot, engine, fuel and steering controls, thrust reversers, valve controls, and more.

Our highly experienced sales, design engineering, and application support staff, works with you to formulate the specifications for the custom LVDT, RVDT, force or pressure sensor that meets your application-specific criteria.

Call us at (805) 523-2000 or check us out on the Web at: [www.kavlico.com](http://www.kavlico.com)



14501 Princeton Avenue, Moorpark, CA 93021 • Tel: (805) 523-2000 Fax: (805) 523-7125 • [www.kavlico.com](http://www.kavlico.com) • e-mail: [sales@kavlico.com](mailto:sales@kavlico.com)