

# *In This Issue - Technically*

## **Systems Engineering Execution and Knowledge Management**

The purpose of this is to refocus programs back to the basic objectives of systems engineering execution and capturing key domain knowledge during the time when organizations are adopting new processes, procedures, or technology. While change is necessary, the discipline of the systems engineering and development process (requirements, design, implementation, test, delivery, product feedback, and sustainment) can be adversely impacted in the predicament of checking the updated process and/or procedure compliance box. Simplified approaches will be provided to better manage products and teams including discussion of web and database tools. These approaches provide the ability to better understand and manage products in an age of, sometimes, overwhelming circumstances.

## **Optically Tuneable Photonic Crystal Waveguides**

Incorporation of DNA into nanoscale wells in a silicon substrate has been demonstrated to show fabrication feasibility for optically tuneable photonic crystal waveguides. A change in propagation characteristics due to DNA incorporation has been observed for a silicon-on-insulator photonic crystal waveguide.

## **Spacecraft Engineering and Research at Saint Louis University**

Parks College of Engineering and Aviation of Saint Louis University [1] has a tradition of offering an outstanding aerospace engineering education to prepare students at the undergraduate and graduate level for careers in commercial aviation, defense systems, and space systems fields. Courses are offered across the engineering spectrum (aerospace, electrical and computer engineering, and physics departments) ranging from an introduction to aerospace engineering to spacecraft design, spacecraft communications, and space physics. Students participate in courses that include orbital mechanics, space dynamics, spacecraft engineering, and space systems. Senior capstone project work is also included. A separate Astronautics Engineering track as well as a Minor in Space Systems Engineering for non-aerospace engineering students is currently being developed. A number of student-driven space systems projects are in process that involve design, development, and test of small satellites similar to those recently highlighted in the March 2009 *Systems* article entitled *The First one Hundred University-Class Spacecraft 1981 - 2008*.

## **Techniques for Building Excellent Operator Machine Interfaces (OMI)**

Establishing a process to continually improve understanding of operator requirements – the why as well as the how – is key to developing an optimal Operator-Machine Interface (OMI) for a large program. The P-8A program is one example of a complex software development, with over 2 million lines of code and a unique and complex OMI.

The OMI itself is used as a tool for achieving and is designed in parallel with understanding end goals, operator decision making chains, and thought processes. The OMI can be designed to support and anticipate information needs and alert operators to unusual occurrences.

Operator actions and decision-making techniques can be discovered by using expert operators and capturing their knowledge through the use of multiple tools to identify the problem set: storytelling, decision mapping, and is/is not matrices.

## **SVSS: Intelligent Video Surveillance System for Aircraft**

Safety and security are the most discussed topics in the aviation field. The latest security initiatives in the field of aviation propose [1] the aircraft carriers to implement video surveillance within the aircraft at strategic locations. The current proposals allow the video surveillance data to be stored within the aircraft and monitored by one of the flight crew. The monitoring crew will be responsible for identifying the anomaly within the aircraft and take necessary preventive actions. With the introduction of additional technology within the aircraft, mere human perception may not be sufficient to make a decision. In this research work, the authors explore the possibility of implementing a smart video surveillance system (SVSS) within the aircraft that is tuned toward detecting the behavioral anomaly within the aircraft.

## **Design Considerations for Systems Hosted on Integrated Modular Avionics**

System architects are accustomed to developing systems hosted in federated environments that allow for developmental independence. However, the system boundaries are different when systems are hosted in an Integrated Modular Avionics (IMA) platform. The boundaries lie within shared resources, and thus lead to greater dependencies between systems. This drives new design considerations for system architects. The natural tendency is to leverage traditional federated design concepts when building systems for IMA environments, but this can lead to inefficient use of system resources, and a lack of preparedness for the inevitable change that will occur within the integrated set of systems. IMA has become a standard in the civil and military aviation industries, so it is important to understand these new design considerations.

The question addressed is “What unique design considerations are there for systems hosted on an IMA platform?”

## **Trust and Decision-Making: An Empirical Platform (CCP 204)**

The trust literature emphasizes trust in automation, thus neglecting the interpersonal aspects of how distributed personnel develop trust. Interpersonal trust represents the willingness of individuals to accept vulnerabilities from the actions of others. Vulnerability is a critical aspect of trust research, yet few studies have manipulated vulnerability. Non-verbal cues may have an influence on the trust process, suggesting that features of collaborative tools may influence how individuals build trust. The present study will implement a 3 × 4 mixed design.

## **Data Processing Through Optical Interfaces**

Herein, we propose a *physical process* inspired routing that routes data from a high-bandwidth data port to multiple processing tiles. Our routing is named Magnetic Based Routing (MBR); data is “attracted” toward the processing tiles that need the data and is “repulsed” from other data flows.