Defining Systems

I have heard many different definitions and uses for the term *system* with respect to software. Some consider a system to be a collection of software, while others consider it to be the combination of hardware and software merged to perform functions not possible by the individual parts. Some take a holistic approach, including hardware, software, documentation, communication, cost, quality, and even people in their definitions. Perhaps this myriad of definitions is why we also have so much controversy over what systems engineering truly entails.

Apparently, *system* is in the eye of the beholder. An avionics system often consists of a guidance system, a radar system, a flight control system, a fire control system, and others. However, the avionics system is only one part of an aircraft system. Different stakeholders will draw boundaries around the *system* at different locations. Our authors this month each have their own perspective for system as it relates to the information they are trying to share. However, they do keep in common Webster's definition of system: "a group of interrelated, interacting, or interdependent constituents forming a complex whole."

We begin this month with Ivy Hooks' article, *Managing Requirements for a System of Systems* (SOS). Hooks' concerns go beyond the already-present issue of systems and address SOS. The SOS performs functions not possible by any of the individual systems operating alone; the whole is greater than the sum of the parts. An SOS continually evolves as needs change and newer technologies become available. Such large groups have complex requirements that must be carefully planned and managed.

In *Applying CMMI to Systems Acquisition*, Brian P. Gallagher and Sandy Shrum try to alleviate the difficulties faced by organizations acquiring systems by introducing the Capability Maturity Model® Integration (CMMI®) Acquisition Module (AM). The CMMI-AM is a streamlined version of CMMI best practices that can be implemented to help establish effective acquisition practices within acquisition programs.

Dr. Norman F. Schneidewind discusses the needed revisions to the American Institute of Aeronautics and Astronautics' (AIAA) publication, "AIAA Recommended Practice for Software Reliability (R-013-1992)" in *A Recommended Practice for Software Reliability*. While focusing on software reliability, this document and its proposed revision also consider hardware and ultimately systems characteristics.

Dr. Robert Charette, Laura M. Dwinnell, and John McGarry lead our collection of supporting articles with *Understanding the Roots of Process Performance Failure*. In this article, the authors reference the results of numerous program assessments to provide guidance on how to counteract prevalent program performance issues.

Next, Lawrence Bernstein and Dr. Chandra M. R. Kintala discuss one approach to software fault tolerance in *Software Rejuvenation*. Bernstein and Kintala recommend stopping a software program at opportune intervals as a way of cleaning up the internal state of the system and then restarting it at a known, healthy state to prevent a predicted future failure.

Finally, in *Enterprise Composition,* John Wunder discusses enterprise composition as an approach to enterprise information system architectures and shares how it supports the creation and evolution of large enterprise information system architectures such as the Air Force's Global Combat Support System.

We need to look at our mission as part of the big picture described by John Gilligan, Air Force chief information officer, in his January 2004 CROSSTALK article: "… individual software solutions must be integral to and tightly integrated with all components of a system, or in most cases with the *system of systems*. We need to integrate software into our overall systems engineering processes."

Whether your focus thus far has been on software engineering or systems engineering, there exists a need in our defense community to focus on systems engineering and to understand how software engineering plays a critical role in this interdisciplinary approach.

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