

# Engineering Model Improves Submarine Communications

## Viewpoint

By Capt. Edward Anderson

The U.S. Navy is transforming integrated communications on submarines and submarine shore support locations by adopting new modeling and analysis techniques that take in information across the entire enterprise instead of individually from disparate locations.

The results are improved communications among all the partners who make submarine operations successful as well as lower costs.

Led by the Navy's undersea integration program office (PMW 770), the new approach is called model based systems engineering. It offers an inno-

industry partner G2 Ops to build a full modeling environment for the submarine communications architecture with the goal to produce more efficient system processes. The new more detailed model will help give better training to new operators, will provide more detailed troubleshooting references and enable a baseline that can be examined to ensure no unauthorized/unintended alterations have occurred within any part of the architecture.

The submarine communications architecture enables all of the communications for deployed submarines, playing a critical role in fleet operations and in the strategic communications neces-

sary for the submarine force's operations, including the nuclear deterrent mission. PMW 770 used the system to conduct a detailed analysis of the submarine communication infrastructure's ability to support multiple functions critical for nuclear command, control and communications.

It employed the model to mine data by breaking down those critical functions to demonstrate how various components and interfaces support the communications at a detailed level not previously possible. In this way, not only will the model speed development, it will allow testing and certification to be done with greater accuracy and surety.

To ensure continued advantages and dominance in information delivery in the maritime domain, new technologies are frequently introduced and current systems undergo regular moderniza-

tion upgrades. The rapid insertion of new capabilities, replacement of obsolete components and the infusion of increased cybersecurity create dynamic and seemingly unceasing cycles of technology injection. These advancements mean that systems have to be replaced more often and that submarine communications architecture continues to become more complex.

The costs associated with integration and modernization increase in correlation with the growing number of disparate systems, which are managed by geographically dispersed teams. Integrating new technologies and upgrades will never be a simple process — especially in the unique operating environment of subsurface vessels — but the model-based systems engineering technique will allow PMW 770 to more easily keep pace with the changing technology.

All partners now can analyze the impacts of newly proposed changes more effectively. Program managers, design engineers and support activities are able to assess quickly how a change at one point of the architecture affects other elements. Having this knowledge prevents costly and time-consuming issues from occurring during system integration or worse, during the fielding of these new platforms.

The model is already yielding both cost benefits and risk management returns by enabling a single analyst to mine a large data repository in minutes instead of requiring days of analysis by a knowledgeable group of engineers. This detailed portrayal positively impacts mission readiness and identification of modernization investments that will have the highest impact, while reducing risks.

Moving forward, PMW 770 will expand the use of model-based systems engineering to as many of its products and platform integration efforts as feasible, which is expected to benefit the fleet by delivering new technologies more quickly, potentially at lower costs, with greater synchronization across partners. **ND**

**Capt. Edward Anderson is the program manager of the Navy undersea integration program office.**

"Model based systems engineering offers an innovative switch from more cumbersome legacy engineering methods..."



vative switch from more cumbersome legacy engineering methods by using a computer-model-driven technique to manage systems upgrades and to identify risks for submarine communications architecture. The office recently received the 2016 Navy Acquisition Innovation Team Award for this effort.

PMW 770, one of 10 program offices within the Navy's program executive office command, control, communications, computers and intelligence is using model-based systems engineering to identify and resolve problems related to how a change in one location of the submarine communications architecture impacts the rest of the architecture.

Part of that work involves increasing efficiency and lowering costs — activities mandated in the current budgetary environment. To help address the challenges, the office contracted with