Defense Daily

Lockheed Martin's Open Architecture Efforts Transitioning Into P-3, BAMS

By Geoff Fein

Lockheed Martin [LMT] is using open architecture (OA) systems developed for the P-3 Orion aircraft and migrating them into its Broad Area Maritime Surveillance (BAMS) effort to evolve the mission capability of both systems. Additionally, the company is leveraging open architecture efforts from its work on submarines into the P-3 to enable the two platforms to share data.

BAMS is looking at significant reuse of the open architecture concepts that have been developed for the P-3, Chuck Martello, BAMS business development, told Defense Daily in a recent interview.

"Not only to operate with the P-3 and its follow-on, but also to evolve systems in BAMS down stream past the baseline system," he said. That means being able to rapidly insert either alternate mission capability or evolve the mission capability of the baseline system, Martello said. "So there is pretty significant reuse."

Martello describes BAMS as an off-board sensor capability as it relates to the P-3 and eventually to the P-3 replacement.

"The ability to transfer information from that off board sensor set, which is BAMS, through the P-3 to a surface ship user, to a shore based user, for example, requires a commonality and architecture for that pass through," Martello added.

A lot of the capability that mission operators have on the P-3 will be resident in BAMS systems, Jim Courtright, director of maritime surveillance programs, told Defense Daily. "Some of those capabilities will be in the ground system rather than on the vehicle. There are a lot of corollary capabilities in the BAMS system to the P-3 maritime surveillance system, [but] physical mapping of those is somewhat different."

"One of the key areas we focus on is the mission processor and mission system software--all the integration of this activity and the integration of all the sensors--and that is a core area where we think we have significant discriminator both in the P-3 mission area and the BAMS mission area," Courtright explained. "There is a lot of commonality of sensor types, a lot of commonality of mission, between what the P-3 does today and what the BAMS capability is expected to do in the future, and that has been a key area we have invested in year after year, going back for a long time."

Along with its efforts to move technologies from the P-3 into BAMS, Lockheed Martin has been upgrading and inserting technology into the P-3 Anti Surface Warfare Improvement Program (AIP). The company is now migrating its mission system capabilities toward a service-oriented architecture that will enable it to take advantage of the current generation of commercial technologies that are available, Courtright said.

Every year Lockheed Martin releases a capability upgrade that goes out to the entire fleet. The current version of that is called service oriented architecture, Courtright added.

"This allows us to more easily share information between the different applications on the aircraft and also, more importantly, it allows us to interact with the new emerging capabilities in the other ground

systems," he said. "It provides the next generation architecture for integration with the Navy's Global Information Grid (GIG) structure."

The same approach Lockheed Martin is using on the P-3 allows the company to integrate with future emerging programs such as BAMS, Courtright said.

"It allows us to insert acoustic upgrades and technologies. That's an over arching architecture that allows us to continue to upgrade, to insert, new sensor technologies and also provide additional application processing to counter the emerging threats," he said. "It allows us to do things a lot easier, a lot more quickly, and a lot more integrated throughout the rest of the battle group."

Lockheed Martin is currently delivering the Integrated Tactical Picture (ITP) that enables operators to have a single integrated view of all the information available from both on the aircraft and from sources off the aircraft, Courtright said.

"It allows him to see a common view of all the information [he is] receiving from his own sensors and correlate with any information he is receiving from off-board sensors," he said. "It allows him to develop tactics in an integrated fashion to be much more effective in his mission and allows him to determine and create combined composite information that he can then also transmit and share with other assets."

And there is some commonality between systems on the P-3 and shipboard systems, Courtright added. "A lot of the common command and control architecture elements, communications elements, or applications, are used in both places now."

However, much of the architecture elements are primarily software driven, he pointed out.

Unlike on ships, weight becomes an issue on aircraft and that impacts how much processing power can be put on a platform such as the P-3, Courtright said.

"But as processing power has gotten better and better we have tried to move toward more and more of the capability being in software, which has helped us on the weight side," he said. "The other thing that we have done is with making the system more integrated, we have been able to reduce some of the redundancy, in terms of physical hardware or processing, and that has allowed us to take out additional weight."

In Lockheed Martin's case, on the aircraft side, some of the weight issues are driven by the sensor packages--how big are the apertures, how much power do you want to carry, and things like that tend to be some of the weight limiting items, Courtright added.

Aircraft also have to deal with unique power and cooling requirements, too, that are significantly different from either surface ships or submarines, Dave Dietzen, Lockheed Martin's program manager for P-3 acoustic programs, told Defense Daily.

Lockheed Martin's P-3 program has mirrored what the submarine world did in the Acoustic Rapid COTS (Commercial-off-the-shelf) Insertion (ARCI) program and leveraged that into an air ARCI program, Dietzen noted.

"We've pulled displays and algorithms from both the surveillance submarines and surface ship community and we are embedding those into the P-3 leveraging forth the 'developed once, used many times' theory that is a catch phrase in industry these days," he added.

At Lockheed Martin's Maritime Systems and Sensors facility in Manassas,

Va., the development lab that helped create the ARCI process and the folks who worked that program are linked up with the people working the P-3 effort, Dietzen said.

"We have developers working the P-3 program physically sitting in the sub lab, and vice versa, where they are able to link the two systems back and forth and share data across," he said. "In the latest version of software we are creating right now, we actually picked up and mirrored the submarine and surveillance display functionality as well as the common processing elements to where we are physically architecting the systems to be similar to where anything being developed on P-3 can be hand carried over and put into the submarine surveillance, or surface ship lab and [vice versa]."

The company, along with its Navy partner, ran some unique lean six sigma events where they looked at value streaming and physically compared the development process on the acoustic processor side, the development process that the P-3 folks were using, and compared it to the development process that the sub folks were using, Dietzen said.

And like submarines and surface ships, cost is also a driver when it comes to incorporating open architecture into the P-3.

"The P-3 area has not been an area traditionally that gets large chunks of money so over the years Dave's (Dietzen) folks and ours and a number of other people and industry partners have worked together on this road map approach where we have defined a set of items or technologies available and mature and [that] have scalability and cost where we can go insert technology in small pieces," Courtright said. "We've learned to be efficient. We have had to develop these architectural approaches that allow us to put things in, in small pieces, and it’s given us some increased capability without having to change out the whole system."