



Managing O&S Costs

A Framework to Consider

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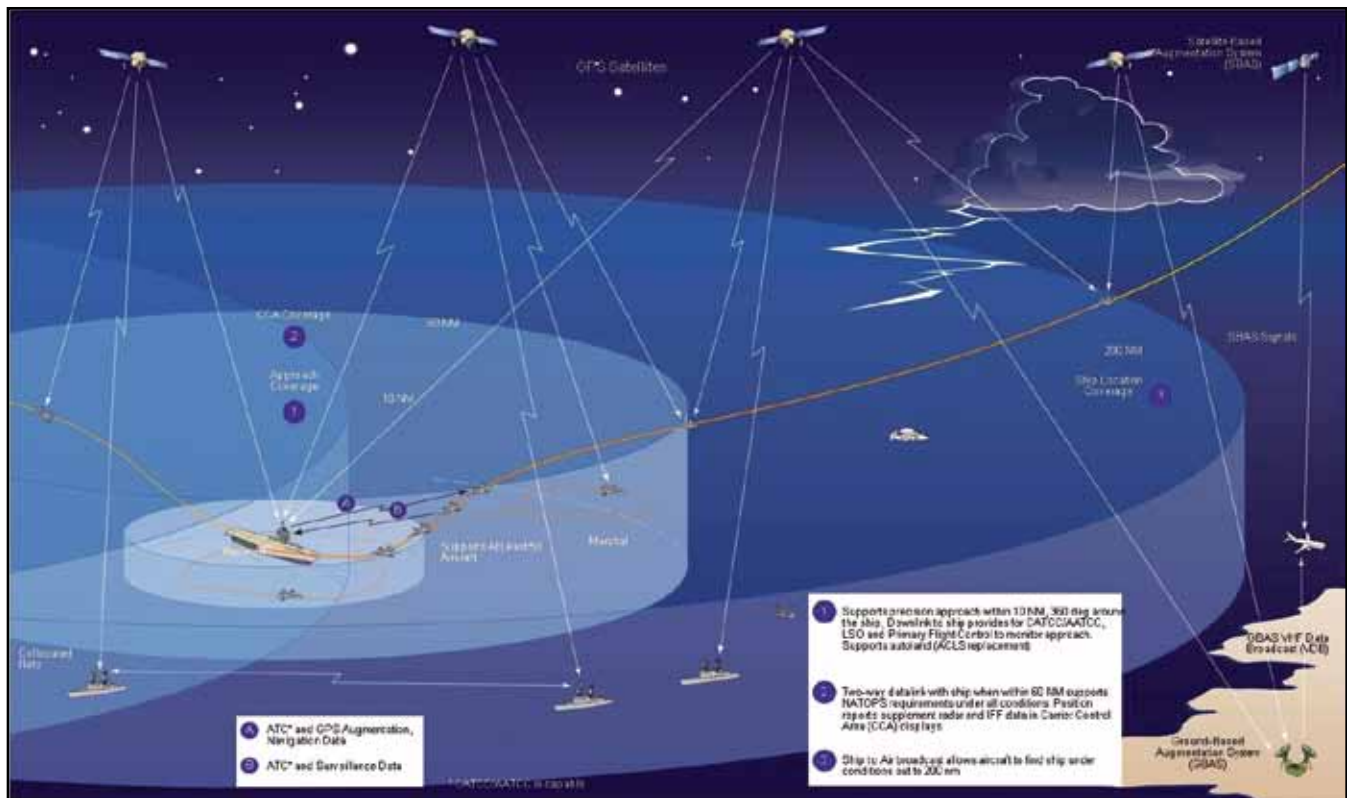
For most weapon system program management offices (PMOs), dealing with cost, schedule, and technical trade-offs is a way of life. Although research, development, test and evaluation, and procurement costs tend to garner the attention, 60 to 70 percent of a weapon system's life cycle costs are associated with day-to-day operations and support (O&S) costs.

Therefore, in today's austere budget environment, it should also come as no surprise that a weapon system's day-to-day O&S costs are a major focus area for DoD acquisition program managers as one way to achieve cost efficiency.

A PMO's Challenge

With the requirement for DoD programs to become more efficient and more effectively use increasingly scarce budget dollars, maximizing affordability and productivity in defense spending is a must. Program managers must

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continually be able to defend whether their program is affordable. When answering that top-level question, a program will likely be asked to describe the guidelines used to determine the affordability question. When a program considers adding the next increment or adding an increase in capability, how are all of the cost-versus-technology trades made while keeping a focus on “out-year” sustainment O&S costs? In that light, PMOs must proactively plan every aspect of weapons systems acquisition—especially O&S costs, which are inherently the largest cost driver in the total ownership cost (TOC) equation.

All weapon system PMOs would like to continue to deliver technical improvements to meet a warfighter’s original set of requirements. However, if a PMO is not diligent in following a well-defined, rigorous process to capture all impacts that result from incorporating a new “requirement,” the PMO may overlook one or more factors that may cause major increases to a weapons system program’s O&S costs.

So the challenge is whether your PMO has a disciplined approach to manage your program’s O&S costs. And, if so, is your organization’s approach dynamic enough to support all aspects of your program’s O&S planning, to include the management of all technical improvements to your weapons system such as Engineering Change Proposals (ECP’s) and/or increment upgrades?

PMA-213 Story

PMA-213, the Naval Aviation Air Traffic Management Systems PMO, is part of the Naval Air Systems Command (NAVAIR) Program Executive Office for Tactical Aircraft Programs (PEO-

(T)). Within the PMA-213 program portfolio, the Joint Precision Approach and Landing System (JPALS) program was established to develop a global positioning system-based system that provides a high level of accuracy in position and landing information. JPALS will initially be integrated onto aircraft carriers, L-class ships, naval aircraft, and ground-based landing fields to provide a survivable, all-weather, day/night precision approach and landing capability. The system is for joint Services both ashore, afloat, and expeditionary. The Navy is currently designated as the lead Service. JPALS Increment 1A (Sea-Based) is currently in the Engineering and Manufacturing Development acquisition phase.

As the JPALS program progressed through the acquisition life cycle, the program was being asked more frequently to ensure O&S costs were as fully captured as possible—and being managed. In order to accomplish this tasking, PMA-213 leadership recognized that any approach to capture this type of O&S cost information needed to be discernible at any stage of the JPALS life cycle, not just major events or milestones. An O&S picture needed to be available at a moment’s notice to cover the multitude of a program’s interactions ranging from planned major milestones and events to “what-if” drills.

An O&S Framework

In response to this tasking, the JPALS Team set out to develop an “O&S framework” methodology. In addition to drawing upon key elements from across the PMO, representation was also sought from NAVAIR 6.0 (Sustainment), NAVAIR 4.2 (Cost Estimating), and both primary industry partners (Rockwell Collins and Raytheon) to ensure the developed

framework achieved buy-in from the program’s major stakeholder community.

The team’s desired outcomes were to:

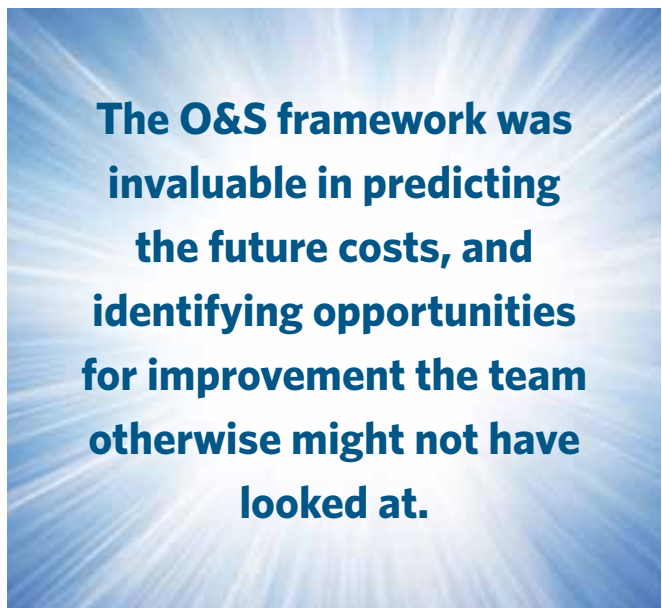
- Increase the level of cost detail (specifically out-year costs);
- Increase the level of confidence in the program’s O&S estimates so that they could serve as a foundation for credible and defensible budget submissions;
- Establish a robust approach allowing for real-time cost-versus-technology trades;
- Effectively manage the O&S portion of the PM’s TOC;
- Ensure that reliability, availability, and maintainability (RAM) as well as any program Key Performance Parameters and/or Key System Attributes were considered as part of O&S costs; and
- Adapt the systems engineering technical review (SETR) process to ensure that the O&S cost portion was included as part of the evaluation criteria.

The challenge for the team was to select some appropriate elements tailored to the JPALS program that would allow the program and PMO to manage the JPALS O&S costs. From a JPALS context, “manage” meant the inclusion of O&S estimates resulting from program milestone reviews, technical reviews, logistics reviews, etc., as well as potential impacts based on the incorporation of an ECP.

The framework used considered cost estimating rules based on the cost analysis requirements document (CARD) and Office of the Secretary of Defense’s Cost Assessment and Program Evaluation (CAPE) O&S cost element structure as their initial guidance to determine how to tailor the JPALS program-specific cost elements. The CAPE’s six major cost element categories include:

- Unit-Level Manpower
- Unit Operations
- Maintenance
- Sustaining Support
- Continuing System Improvements
- Indirect Support

While the CAPE’s elements provided an O&S roadmap, the JPALS program wanted to fine-tune the CAPE elements to arrive at a set of “JPALS O&S cost elements” deemed by the JPALS program to be critical when attempt-



ing to track the impact of identified O&S costs and potential O&S cost changes.

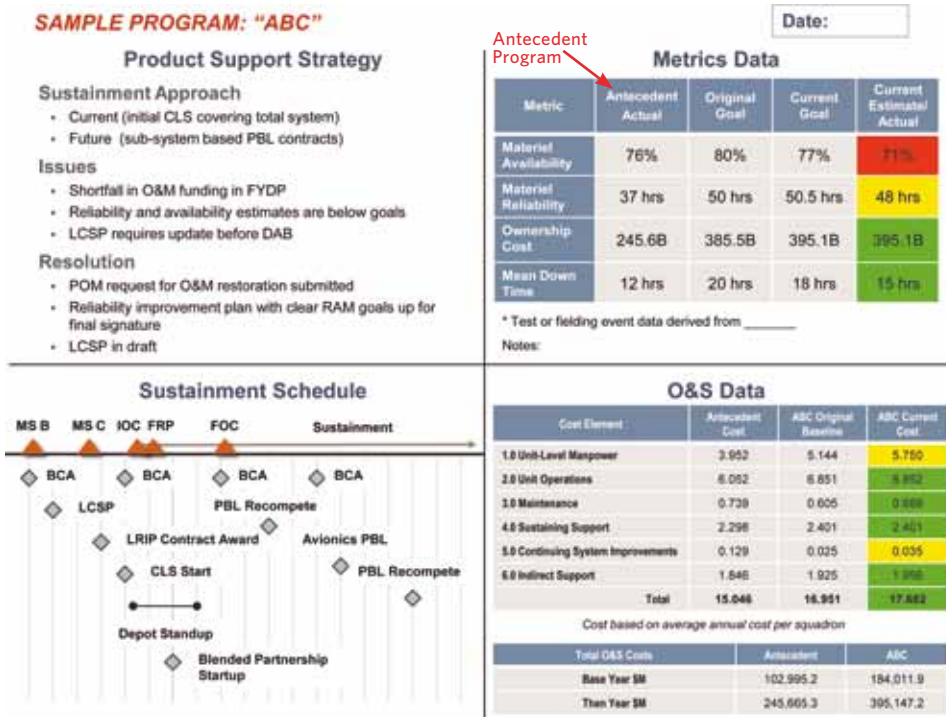
The JPALS program also set out to formulate its O&S framework as a “living” tool applicable to any point in the JPALS acquisition life cycle. That is, the O&S framework being developed had to be more robust than simply capturing O&S costs as major program events, such as milestone reviews and technical reviews. The O&S framework tool being sought needed the fidelity to capture any potential O&S cost increases at any point along the JPALS program’s acquisition life cycle.

After much deliberation, the team deemed 15 elements critical for JPALS to effectively and accurately track the program’s O&S costs throughout the acquisition life cycle. (See Fig. 1.)

Figure 1. JPALS O&S Framework Cost Elements

Technical assumptions for sustainment (documented in each CARD and LCSP iteration)	Net cost of reparable replacement and unit cost of consumables at the O-Level	Supply Chain Management costs
OPTEMPO (op or flight hours)	Schedule maintenance labor and material	Software support
Anticipated life cycle to include demilitarization and disposal	Any applicable IMA repair labor and material replacement costs	Sustaining/In Service Engineering and program management costs after fielding
Iterative configuration managed architecture baseline	Tech Refresh to avoid DMSMS	Corrective ECP estimates beyond tech refresh
Maintenance/Failure calculations based on fielding plan	Depot costs beyond net cost for each DLR above (traditional or PBL based)	Anticipated technology insertion costs

Figure 2. Example of Sustainment Chart



level of importance. All reviews, regardless of where they may be slotted in the program's review hierarchy, are viewed as critical to an accurate O&S cost estimate, which is the primary purpose of the framework. To a large degree, a program's acquisition category drives the level and frequency of reporting with the goal of improving affordability fidelity, to include as early as possible in the development of a weapon system. However, the intent of the JPALS O&S cost estimate process is to provide a continuous improvement of performance and sustainment tracking to O&S requirements throughout the life cycle.

The JPALS O&S framework helps populate the O&S Data portion of the four-quadrant Sustainment Chart found in the *Product Support Manager (PSM) Guidebook* (Figure 2). The importance is that O&S Costs are one of our key Life

This is not to imply that all programs would arrive at the same 15 elements. PMs should apply critical thought and analysis to determine which elements best fit their particular program.

A Living Management Tool

The JPALS O&S framework can be viewed as a three-tiered approach. At the top tier are O&S cost estimates established at the major technical reviews. For example, an O&S cost is quantified at the preliminary design review (PDR), which is based on the allocated baseline architecture and planned sustainment strategy.

Subsequent to these major technical reviews are numerous middle-tier reviews focused on specific functional areas, such as systems engineering and logistics—for example, an initial operational capability supportability review (IOCSR) and full operational capability supportability review (FOCSR) for fielding decisions.

On a more frequent basis, the JPALS O&S cost estimates are addressed at the program's weekly "drum beat" program meeting to ensure that O&S costs, in general, stay in front of PMA-213 and JPALS leadership. The review of these and other technical assumptions and related costs are measured against each technical review baseline: functional (System Functional Review), allocated (PDR), and initial product (Critical Design Review).

Note that the categorization of specific reviews within the JPALS program's hierarchy should not be viewed as a review's

Cycle Sustainment Outcome measures as shown in the Metric Data quadrant (upper right). In addition, O&S Costs are one of three Life Cycle Sustainment Outcome measures mandatory for Joint Requirements Oversight Council (JROC) interest programs with materiel solutions. Therefore, a program can start to now fully appreciate how critical O&S costs are to senior leadership and how a program's O&S costs can be used as a metric for the PSM to create an aligned product support strategy.

As the JPALS system architecture evolved, the program and sustainment assumptions and cost estimates were updated with continuous improvements or performance trades between the mission and sustainment systems. These were triggered to ensure both mission and support systems are optimized within performance and cost (affordability) parameters. Business cases were generated to continuously capture the performance within cost constraints as they evolve through development, T&E, and operational use. The PMO then used the O&S framework to provide future-year cost data estimates which enabled the PMO team to make informed technical and programmatic decisions on evaluation of system upgrade options.

Meeting the Objectives?

To answer this question, we will provide an overview of the JPALS approach. For Sea-Based JPALS (Increment 1A), it was applied after milestone B prior to PDR. The use of the tool bounded PMA-213's milestone B cost estimate in 2007 through December 2011, with a stable CDR and plans for mile-

stone C in May 2013. Use of the framework identified cost savings of over \$100 million in O&S during the PMO design change process.

The JPALS Sea-Based system milestone B O&S life cycle cost estimate defined in the CARD and low fidelity cost assumptions were \$331 million. Today it is \$339 million. The PMO team was pleased with the results, considering the significant number of changes to the system design over the past 4 years. The tool was instrumental in analyzing low maturity cost areas and trades with performance and sustainment. The O&S framework was invaluable in predicting the future costs, and identifying opportunities for improvement the team otherwise might not have looked at. It took a creative, motivated team to accomplish it.

Examples of Success

Here are several examples of how the tool was used and the results achieved:

Remote Status Panel.

Early in the development program the need for a Remote Status Panel was determined with \$9 million cost grow recognized that included O&S. Using the O&S framework, the PMA-213 team sought an offset to keep cost stable. The design team honed the development cost. NAVAIR 4.2 honed their production using the Acquisition Program Baseline (APB) cost architecture as a baseline to reduce Procurement Unit Cost (PUC). The O&S team found sufficient savings by improving material repair to offset the potential growth.

Data-link. During development, the data-link subsystem was assessed for achievable built-in-test (BIT) capability and it was found that the current support to meet the required performance requirement was inadequate and would require significant change to the design and potential schedule impact. The projected cost growth would add about \$75 million to the O&S life cycle cost estimate in maintenance. Use of the tool ultimately provided options for the PMO that would realize cost savings in the amount of the projected O&S increase.

CARD Estimate Fidelity. The sustaining engineering cost estimate fidelity in the CARD for PMA-213 was higher than NAVAIR 4.2 had seen in any program at this point in the acquisition process—i.e., pre-IOT&E. Thus the tool allowed

a better understanding of the costs associated with technical design and production and their impact of O&S costs throughout the system life cycle. It also provided the PMO team the ability to highlight potential system improvement opportunities.

Challenges and Lessons

As with all processes, there are always challenges and hopefully some lessons learned. The O&S framework is no exception. Here are the key challenges that were faced by the PMA-213 PMO and some best practices that were realized.

Challenges:

- PMO Team (including OEM) lacked understanding of all the aspects that impacted Reduced Total Ownership Cost (RTOC) and how the O&S framework tool could be applied. This was a key aspect that had to be addressed before mov-



ing ahead to the development of the business cases and excel data base (basis of framework tool).

- Standardizing the process (specifically who would be involved and how the tool would be utilized) to be used by PMO Team to conduct O&S performance trades during technology and EMD phases.
- Agreement on “when” in the process the tool would be applied to ensure the process was not done “too late” in the design consideration process.
- Standardization of the application of consistent performance and sustainment measures throughout the system life, especially for legacy systems which may not have specific measurable performance requirements.

Lessons:

- In a statement of objectives (SOO)/statement of work (SOW) environment, technical discussions related to RTOC and O&S framework tool language must include

specific expectations and desired outcomes (to include source selection and/or contract negotiations).

- Alpha contracting techniques should be employed to the maximum extent possible.
- Strong top-level leadership buy-in: There must be commitment from the program management, chief engineer, cost lead, and assistant program manager logistics (APML) to iteratively and collectively mandate affordability throughout established goals and agreements.
- Affordability must be a performance consideration from the beginning throughout the life cycle. There must be a balance between performance and affordability during any trade-off analysis during design/development.



Conclusion

Use of a tool like the O&S framework will hopefully enable your PMO to aggressively manage future O&S costs as part of your overall acquisition strategy. As is shown in the PMA-213 JPALS example, to incorporate a standardized process requires top management buy-in from the entire PMO team (including the industry counterpart), and will require planning and oversight as early as possible within a program's acquisition life cycle. It will be these programmatic planning and oversight steps that will help identify the O&S cost elements for each program

to track—because each program will need to arrive at their specific O&S cost elements as the way to best monitor their program's O&S cost status.

The expectation is that the emphasis on “affordability” will not be diminishing any time in the future. So spend the necessary time to determine what key O&S cost elements are right for your program and then manage to those cost elements to a fault. &

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