Product Support Planning
Regardless of organization type—government or commercial—managers are responsible for mission accomplishment. Effective allocation of scarce resources is a key factor in achieving mission accomplishment. Major resource investments, such as capital equipment, require in-depth cost/benefit analysis and management. Well thought-out acquisition and supportability strategies are essential to optimizing total ownership costs (TOC) (acquisition cost and life-cycle operating cost) and operational availability (Ao).

Capital equipment requires support over the product life cycle. Effective support does not just happen. Planning for support is essential to ensure equipment availability and control of operating costs. A Product Support Plan (PSP) delineates how the organization intends to support and sustain the product over its life cycle. Effective Product Support Planning enables managers to optimize equipment availability to attain equipment performance capabilities and control operating costs.

The Product Support Plan: A Roadmap for Success
The PSP is an integrated life-cycle plan that addresses customer performance requirements, product attributes, support processes, performance measurement, and resource requirements. The PSP explains how managers will meet customer-defined operational availability, supportability, and affordability objectives. A PSP is a roadmap identifying product life-cycle milestones, performance metrics, and plans of action to ensure equipment is available to fulfill the mission.

Product Support Planning: Adding Value
Booz Allen Hamilton adds value to the PSP development process by applying a disciplined approach, as well as the knowledge and skill of subject matter experts (SME) in acquisition and operational logistics, systems engineering, performance-based supportability planning, and cost analysis. These SMEs leverage lessons learned on major acquisitions, modifications and upgrades, and sustainment programs across government and commercial projects when developing a PSP. Exhibit 1 (see page 2) shows examples of these lessons learned.

Product Support Planning: Optimizing Availability and Cost
Having equipment available when needed, attaining the required return on investment (ROI), and controlling operating costs are key management objectives. Equipment does not last forever. All durable equipment has a useful life. Effective
preventive and corrective maintenance, as well as product improvements, can prolong equipment useful life. To achieve maximum effectiveness, organizations must plan maintenance and product improvements in advance to ensure resources are available. Ninety percent of total life-cycle costs are determined in the design and development phase, highlighting the criticality of developing a PSP early in the project life cycle.

**Exhibit 1**
Lessons Learned

---

**Designing for Availability:** Define RMA key performance parameters to achieve operational needs. An aircraft acquisition program defined only one measure, operational availability (Ao), leaving individual component RMA and other measures undefined. Allocate RMA at the individual product level (down to configuration items) and include support processes. Translate these measures into performance specifications and contract requirements using detailed descriptions of deliverables and test requirements.

**Right-sizing Logistics:** Spiral or Evolutionary development programs require tailored logistics support to fit the scale, cost, and timing of the program. Technology turnover, production lead times and program schedules must drive spares, support equipment, and technical data requirements to fit scale and timing of changing product baselines. Using contractor maintenance/logistics until reaching an end state is a best practice.

**Integrating Commercial Off the Shelf Products:** An avionics program missed schedule milestones and was unsupportable because the team failed to manage interface control between COTS systems and the legacy ship. Interface control must be defined up-front, and diligently managed. Define commonality and modularity for integration and to minimize logistics needs. Ensure built-in test has the reliability needed to support the maintenance plan. Clearly define technical data use rights, form/format, and means for updates. Use best-value performance based contracting for long term out-sourced support.

**Supporting Software Intensive C4 Products:** Failure to define change management processes & responsibilities, engineering authority, and data rights will prevent timely, effective support. Define life cycle CM up-front. Define how, when, and by whom patches, updates, and certification/accreditation will be supported to integrate into the common operating picture network. Use open systems architecture to facilitate future product upgrades.

---

Source: Booz Allen Hamilton

Product Support Planning enables managers to influence design during product development by integrating logistics performance measures and requirements into engineering design analysis and reviews. Defining logistics requirements, such as technical data, spare parts strategy, and support equipment needs, ensures sufficient lead time to acquire these items, takes advantage of economy of scale (e.g., spares can be acquired in conjunction with production), and allows for concurrent development, which mitigates the risks of late delivery of logistics support. Integrating logistics into design enables managers to make informed design trade-off decisions with respect to their impact on life-cycle support.

During the operations and support (O&S) phase, Product Support Planning helps managers sustain operations, increase equipment availability, and deliver operational effectiveness at an acceptable cost. The PSP is developed with two generally accepted facts in mind: more than 60 percent of product life-cycle cost is incurred during O&S, and more than 80 percent of federal government agencies’ (e.g., Department of Defense [DoD], Department of Homeland Security [DHS]) budgets are allocated to O&S. Therefore, managing cost is a primary purpose and benefit of Product Support Planning. By defining measures that identify negative trends in equipment performance, integrated logistics support (ILS) analysis and a well-developed PSP can help product managers anticipate, control, and resolve diminishing manufacturing source/material shortage (DMSMS), obsolescence problems, and product material failures caused by product reliability erosion. Using equipment performance trend information and understanding technology cycles enables managers to be proactive by planning product improvements and budgeting to execute these efforts. Effective Product Support Planning arms managers with knowledge of when to insert new technology or redesign low-reliability parts before these items adversely affect equipment availability and operating costs. Exhibit 2 shows how effective Product Support Planning can improve a notional product life-cycle total cost growth line.

---

1 ILS focuses on 10 elements of support: maintenance planning, supply support, technical data, training and training equipment, support equipment, facilities, computer resources, manpower and personnel, packaging/ handling/storage/transportation, and design interface.
Product managers can control availability and cost using metrics and action plans created from analysis and PSP development. The objective is to enable managers to anticipate the need for product improvements and implement change before product availability or cost problems affect mission readiness. Prompt management actions taken when trigger points are reached (such as a steep increase in operating costs or a significant decline in equipment availability or logistics response times) will lower total life-cycle operating costs and increase equipment availability. PSP-generated improvements will lower TOC (see the dotted white line in Exhibit 2). It is important to note that the dotted line has a higher total upfront cost during the development and production phases as a result of the acquisition of detailed technical data to facilitate competitive component manufacturing and greater reliability, maintainability, availability (RMA) analysis. These upfront investments enable the development of robust repair capabilities, such as highly reliable diagnostics, and yield long-term returns, such as lower TOC and higher ROI.

**Product Support Planning: Delivering Product Availability**

The influence of Product Support Planning on supportability, availability, and total costs is not limited to the design, development, and production phases of a project. The analysis and planning for logistics support involved in PSP development lays out a roadmap for life-cycle support. Integration of logistics engineering and performance-based logistics (PBL) into Product Support Planning is essential to achieving product performance and cost goals. Understanding performance trends and having a plan to eliminate/mitigate adverse impacts are goals of Product Support Planning. Establishing triggers to prompt action, such as a 10-percent decline in operating costs, enables logistics to influence product design.

**Exhibit 2**

*Life-Cycle Product Support Planning*

---

<table>
<thead>
<tr>
<th>Concept Development</th>
<th>Technical Development Stage</th>
<th>System Development &amp; Demonstration</th>
<th>Production &amp; Deployment</th>
<th>Operations &amp; Support</th>
</tr>
</thead>
<tbody>
<tr>
<td>SRR</td>
<td>PDR</td>
<td>CDR</td>
<td>PRR</td>
<td>IOC</td>
</tr>
<tr>
<td>TRR</td>
<td>IOC</td>
<td>FOC</td>
<td></td>
<td>PSP benefit is lower TOC, higher availability</td>
</tr>
</tbody>
</table>

- Decisions affecting O&S costs are made early during development
- Appropriate PSP investment upfront yields significant return on investment across the life cycle

**LEGEND**

SRR = System Requirements Review; PDR = Preliminary Design Review; CDR = Critical Design Review; TRR = Test Readiness Review; IOC = Initial Operational Capability; FOC = Full Operational Capability; TOC = Total Ownership Cost; PSP = Product Support Planning

Source: Booz Allen Hamilton
in equipment availability over a prescribed time period, drives a root cause investigation to identify a way to reverse the trend. Root cause analysis may lead to possible product design improvement, changes in maintenance, or changes in operation to reverse negative performance trends. Exhibit 3 shows a notional example of the positive impact of a PSP. The horizontal line (with diamonds) shows a notional 80 percent availability requirement, the black line (with triangles) indicates achieved equipment availability with the positive impact of improvement actions resulting from Product Support Planning, and the white line (with squares) indicates notional equipment availability without the benefit of product and process improvements resulting from a PSP.

Exhibit 3
Notional Availability Impacts

Product Support Planning is Performance Based
The PSP is the product of integrated planning involving the coordination of equipment users, project managers, engineering, ILS analysts, financial managers, other managers, and SMEs across acquisition and sustainment organizations. Product Support Planning is inherently performance based and focuses on key product and support process attributes to achieve operational effectiveness. The PSP defines operational availability in measurable terms for test, verification/validation, and operational logistics assessment. Ensuring design performance specifications and operational performance measures are complementary is a critical step to ensuring traceability to customer-defined requirements throughout the product life cycle. Defining the “right” performance metrics to trigger product manager action is essential to PSP development. Metrics must be tailored to the customer’s mission and organization, logistics processes, and product attributes. Metrics identify trends and trigger points, telling managers to implement product improvements or change support processes to deliver needed product availability at an affordable cost. Exhibit 4 contains an example of commonly used logistics metrics (listed in no specific order).
Operational Availability (Ao) Cost per Operating Hour
Maintenance Man-Hours Per Operating Hour Parts Repair Turnaround Time
Mean Time Between Maintenance Customer Wait Time
Mean Time to Repair Supply Effectiveness (order fill rates)
Built-In Test Reliability Warranty Parts Return Time

Exhibit 4
Examples of Logistics Metrics

<table>
<thead>
<tr>
<th>Metric</th>
<th>Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operational Availability</td>
<td>Cost per Operating Hour</td>
</tr>
<tr>
<td>Maintenance Man-Hours Per</td>
<td>Parts Repair Turnaround Time</td>
</tr>
<tr>
<td>Operating Hour</td>
<td></td>
</tr>
<tr>
<td>Mean Time Between</td>
<td>Customer Wait Time</td>
</tr>
<tr>
<td>Maintenance</td>
<td></td>
</tr>
<tr>
<td>Mean Time to Repair</td>
<td>Supply Effectiveness (order fill</td>
</tr>
<tr>
<td></td>
<td>rates)</td>
</tr>
<tr>
<td>Built-In Test Reliability</td>
<td>Warranty Parts Return Time</td>
</tr>
</tbody>
</table>

Source: Booz Allen Hamilton

Product Support Planning: Integrating Engineering and Logistics

Understanding the measures of operational performance that affect supportability (e.g., equipment availability and life-cycle costs) enables program managers to make informed trade-off decisions. A PSP leverages the inherent interdependence of engineering and logistics, regardless of whether the product is a major weapons system or an upgrade or modification project, or whether the product is hardware, software, developmental, commercial off-the-shelf (COTS), or a non-developmental item (NDI). Integrating supportability into the design and engineering processes allows key product support considerations to influence engineering decision making. ILS analysis forms much of the input used in Product Support Planning. To influence design, organizations must define product support and complete key analysis before major technical reviews. Integrating Product Support Planning and ILS into technical reviews is essential to delivering supportable equipment. Exhibit 6 (see page 6) identifies key ILS and PSP activities related to project design reviews.

Product Support Plan Elements

PSPs are tailored to customer needs, product attributes, and support processes. A comprehensive PSP addresses a variety of topics, including ILS; supportability and logistics engineering concerns, such as reliability, maintainability, and availability; configuration control; PBL; equipment deployment and outfitting plans; product life-cycle sustainment and modernization; technology refreshment; and product management transition, from development and acquisition offices to life-cycle logistics support offices.

An Integrated Logistics Support Plan (ILSP) defines the foundation of product support in addressing how the 10 ILS elements will be applied for a product. The maintenance concept

The Product Support Planning Process

No two PSPs and planning efforts are the same. A disciplined, repeatable process is needed to accommodate differences in product attributes and support infrastructure to deliver an executable PSP. The process follows a systems engineering approach that involves five basic steps: identify, analyze and allocate, develop, implement, and assess. Feedback is an essential function in the process. It provides information on verification/validation of customer-defined requirements throughout the product life cycle. Exhibit 5 depicts the Booz Allen Product Support Planning process.

Exhibit 5
PSP Process

Source: Booz Allen Hamilton

The value of this process is in translating customer operational performance needs into meaningful, measurable, and achievable metrics for use during product development, manufacture, and operations.
determines, at a high level, most of the other 10 elements, including technical data, training, supply support, support equipment, facilities, manpower, computer resources support, packaging, handling, storage, and transportation requirements. The product design influences these ILS elements, which in turn influences the engineering process in RMA performance measure development and analysis. The ILSP plans the support in the acquisition phase and ensures the plan’s support in the sustainment phase.

RMA measures are performance requirements documented in equipment performance specifications. These measures enable supportability concerns to influence design and to allow project managers to make informed trade-off decisions with knowledge of possible impacts on equipment availability and operating costs. Maintainability considerations and approaches, such as reliability-centered maintenance and condition-based maintenance, affect equipment performance by either extending equipment availability or lowering operating costs. To support operational use, logistics engineers translate product design parameters into operational performance measures that failure reporting and corrective action system (FRACAS) tools collect during equipment operations and support. FRACAS provides the data that identifies the need for product improvements and allows managers to sustain product availability and manage operating costs in a timely manner.

An effective PSP is much more than an ILSP. An effective PSP integrates these various elements by linking engineering and logistics analysis, planning, and implementation into a seamless life-cycle process. Exhibit 7 shows the possible elements of a PSP.

Configuration management (CM) of the hardware and software components of equipment or systems is also based on the maintenance concept. To be effective, a PSP must identify who will have authority over functional and product baselines, how and when audits will be conducted, how configuration items will be identified, and what process and information technology (IT) tools will be used to track configuration status accounting.
and engineering changes. CM applies not only to hardware and software items but also to technical data. Change authority, distribution rights, and use of technical data are critical issues affecting every major system product support effort.

Exhibit 7
PSP Elements

Product Support Plan

- Integrated Logistics Support Plan
- Reliability, Maintainability, Availability Plan
- Configuration Management Plan
- Performance Based Logistics Plan
- Equipment Deployment Plan
- Product Management Transition Plan
- Product Improvement & Technology Refresh Plan

Source: Booz Allen Hamilton

PBL is a sustainment outsourcing methodology intended to deliver the best value support. PBL analysis is mandated for DoD major acquisition programs. PBL strategies are related to ILS factors, product design, and life-cycle cost constraints. These strategies and plans drive requirements for ILS, such as technical data, sparing levels, configuration management, and life-cycle costs. The PSP includes PBL plans.

Product deployment plans define the distribution of equipment to operating locations. Deployment affects and is influenced by key ILS elements. For example, safety, security, environmental, and support infrastructure are key issues affecting deployment. The availability of support equipment, facilities, spare parts, trained personnel, and other ILS elements affects the deployment plan. As a result, the PSP must address these elements.

In many organizations, one office manages equipment development and initial production, and a different office manages the operation and support of that equipment. A transition plan delineating product management responsibilities of the acquiring and sustaining offices is needed to avoid confusion over roles and responsibilities, CM and engineering authority, contract management, and support responsibilities. The transition plan is an integral component of the overall PSP. Effectively managing the project management hand-off from acquisition to sustainment precludes organization change impacts from degrading equipment readiness and availability.

Planning for technology refresh and product improvements is an essential element of a PSP. In 21st-century equipment systems, new capital equipment uses COTS/NDI components and electronics extensively. The rapid technology turnover rate for electronics and IT in end items and support equipment, as well as DMSMS and obsolescence issues, requires advance planning to mitigate adverse impacts of equipment availability and life-cycle cost. Planning for technology refresh from the start of equipment design facilitates the integration of commonality and modularity, allowing for ease of product changes later.
In addition, planning can significantly influence ILS elements, such as supply support, technical data, and support equipment.

**Product Support Planning: Summary**

Product Support Planning addresses supportability throughout the product’s life cycle, from initiation to disposal. The PSP integrates planning for acquisition and sustainment processes, statutory and policy requirements, and systems engineering and logistics support functions into a comprehensive plan of action and milestones. It focuses on achieving needed levels of operational effectiveness at affordable costs. PSPs help managers identify key product and process supportability metrics, which are traceable to needed capabilities, and manage acquisition and sustainment activities to achieve those metrics throughout the product life cycle. PSP development requires a disciplined, systems-focused process that supports planning for complex major acquisition programs or can be tailored to support smaller upgrade or modification projects. PSP development, maintenance, and implementation are not trivial tasks. They require management commitment to allocate sufficient resources, often taking those resources away from demanding daily tasks. Booz Allen’s logistics experts’ knowledge, experience, responsiveness, adaptability, and scalability provide an effective tool to meet client product support needs.

**The Booz Allen Product Support Planning Advantage**

Booz Allen has the people, skills, and PSP process to add value to program management organizations. Booz Allen’s logistics professionals include acquisition and operational logisticians, program managers, and supportability SMEs with experience developing, analyzing, planning, managing, and implementing PSPs.

Complementing the PSP team, Booz Allen has extensive reachback to commercial and government experts in supply chain management, modeling and simulation, economic business analysis, systems engineering, configuration management, IT, logistics process design, PBL, and logistics engineering.

**List of Acronyms Used**

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ao</td>
<td>Operational Availability</td>
</tr>
<tr>
<td>CBM</td>
<td>Condition-Based Maintenance</td>
</tr>
<tr>
<td>CDR</td>
<td>Critical Design Review</td>
</tr>
<tr>
<td>CM</td>
<td>Configuration Management</td>
</tr>
<tr>
<td>COTS</td>
<td>Commercial Off-the-Shelf</td>
</tr>
<tr>
<td>DHS</td>
<td>Department of Homeland Security</td>
</tr>
<tr>
<td>DMSMS</td>
<td>Diminishing Manufacturing Sources Material Shortages</td>
</tr>
<tr>
<td>DoD</td>
<td>Department of Defense</td>
</tr>
<tr>
<td>FMECA</td>
<td>Failure Modes, Effects, Criticality Analysis</td>
</tr>
<tr>
<td>FOC</td>
<td>Full Operational Capability</td>
</tr>
<tr>
<td>FRACAS</td>
<td>Failure Reporting and Corrective Action System</td>
</tr>
<tr>
<td>ICS</td>
<td>Interim Contractor Support</td>
</tr>
<tr>
<td>ILS</td>
<td>Integrated Logistics Support</td>
</tr>
<tr>
<td>ILSP</td>
<td>Integrated Logistics Support Plan</td>
</tr>
<tr>
<td>IOC</td>
<td>Initial Operational Capability</td>
</tr>
<tr>
<td>IT</td>
<td>Information Technology</td>
</tr>
<tr>
<td>LORA</td>
<td>Level of Repair Analysis</td>
</tr>
<tr>
<td>NDI</td>
<td>Non-Developmental Item</td>
</tr>
<tr>
<td>O&amp;S</td>
<td>Operation and Support Phase</td>
</tr>
<tr>
<td>PBL</td>
<td>Performance-Based Logistics</td>
</tr>
<tr>
<td>PDR</td>
<td>Preliminary Design Review</td>
</tr>
<tr>
<td>PRR</td>
<td>Production Readiness Review</td>
</tr>
<tr>
<td>PSP</td>
<td>Product Support Plan</td>
</tr>
<tr>
<td>RCM</td>
<td>Reliability Centered Maintenance</td>
</tr>
<tr>
<td>RMA</td>
<td>Reliability, Maintainability, Availability</td>
</tr>
<tr>
<td>ROI</td>
<td>Return on Investment</td>
</tr>
<tr>
<td>SCM</td>
<td>Supply Chain Management</td>
</tr>
<tr>
<td>SME</td>
<td>Subject Matter Expert</td>
</tr>
<tr>
<td>SORA</td>
<td>Source of Repair Analysis</td>
</tr>
<tr>
<td>SRR</td>
<td>System Requirements Review</td>
</tr>
<tr>
<td>TOC</td>
<td>Total Ownership Cost</td>
</tr>
<tr>
<td>TRR</td>
<td>Test Readiness Review</td>
</tr>
</tbody>
</table>
What Booz Allen Brings

Booz Allen Hamilton has been at the forefront of management consulting for businesses and governments for more than 90 years. Providing consulting services in strategy, operations, organization and change, and information technology, Booz Allen is the one firm that helps clients solve their toughest problems, working by their side to help them achieve their missions. Booz Allen is committed to delivering results that endure.

With more than 19,000 employees on six continents, the firm generates annual sales of $4 billion. Booz Allen has been recognized as a consultant and an employer of choice. In 2007, for the third consecutive year, *Fortune* magazine named Booz Allen one of “The 100 Best Companies to Work For,” and for the past eight years, *Working Mother* has ranked the firm among its “100 Best Companies for Working Mothers.”

To learn more about the firm, visit the Booz Allen Web site at www.boozallen.com. To learn more about the best ideas in business, visit www.strategy-business.com, the Web site for *strategy+business*, a quarterly journal sponsored by Booz Allen.

Contact Information:

**ATLANTA**

Kirk Waldrop  
Sr. Associate  
404-589-4127  
waldrop_kirk@bah.com

**ARLINGTON**

Dick Lohrmann  
Sr. Associate  
703-526-2420  
lohrmann_dick@bah.com

Timothy Surabian  
Associate  
703-526-2468  
surabian_timothy@bah.com

**MCLEAN**

Mike Jones  
Vice President  
703-902-3833  
jones_mike@bah.com

Tony Kime  
Principal  
703-377-6599  
kime_anthony@bah.com
**Worldwide Offices**

**Asia**

**Australia**
Bangkok
Beijing
Brisbane
Canberra
Hong Kong
Melbourne
Seoul*
Shanghai
Sydney
Tokyo
Wellington

**New Zealand**

**North America**

Aberdeen, MD
Annapolis Junction, MD
Arlington, VA
Atlanta
Boston
Chantilly, VA
Charleston, SC
Chicago
Cleveland
Colorado Springs
Dallas
Dayton, OH
Detroit
Eatontown, NJ
Falls Church, VA
Herndon, VA
Honolulu
Houston
Huntsville, AL
Leavenworth, KS
Lexington Park, MD
Linthicum, MD
Los Angeles
McLean, VA
Newark
New York City
Norfolk, VA
O’Fallon, IL
Omaha
Parsippany, NJ
Pensacola, FL
Philadelphia
Rockville, MD
Rome, NY
Salt Lake City
San Antonio
San Diego
San Francisco
Stafford, VA
Tampa, FL
Washington, D.C.

**Latin America**

Bogotá
Buenos Aires
Caracas
Mexico City
Rio de Janeiro
Santiago
São Paulo

**Europe**

Amsterdam
Berlin
Copenhagen
Dublin
Düsseldorf
Frankfurt
Helsinki
Istanbul*
London
Madrid
Milan
Moscow
Munich
Oslo
Paris
Rome
Stockholm
Vienna
Warsaw
Zurich

**Middle East**

Abu Dhabi
Beirut
Cairo
Dubai
Riyadh

* An associated firm

The most recent list of our office addresses and telephone numbers can be found by clicking the Worldwide Offices link under About Booz Allen on www.boozallen.com.