

## Military Maintenance For Results

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Military maintenance is moving to a new model, with payments earned for keeping aircraft flying and available for deployment. In the United States, the trend is called Performance Based Logistics (PBL), while British planners call it Availability Based Contracting (ABC). Other countries are moving in a similar direction, not as fast or as fully, but toward the same general goal: paying private firms for the effectiveness of their work, not just for work done or parts supplied.

While the overall trend is clear, there are still plenty of choices and complications. PBL contracts differ widely along several dimensions. The first dimension is the level supported. Kate Vitasek, who teaches PBL techniques at the University of Tennessee's Center for Executive Education and is a co-author of a study called "Performance Based Logistics: The Changing Landscape in Support Contracting," classifies PBL in four levels:

Level 1: Components, for example aircraft tires. Performance is the consistent and timely delivery of needed components.

Level 2: Major subsystems, such as aircraft engines. Availability is the main performance metric here.

Level 3: Entire aircraft. Availability is the goal.

Level 4: Mission Capability. Defense officials eventually may pay private firms for providing both readiness and steady enhancements in capabilities for military aircraft. According to the study, which was co-authored by Vitasek, Jerry Cothran, Steve Geary and Steve Rutner, the second dimension is functional integration. Individual firms may provide only parts, repairs or technical services such as design and maintenance manuals. Or one firm may be responsible for integrating all three functions. For aircraft, thoroughly integrating all three functions offers the greatest potential gains, but integration also makes the greatest demands on both companies and the government agencies that negotiate and work with them.

Payment terms are another critical difference. Companies can receive traditional fixed and time-and-material payments, adjusted by rewards or penalties for meeting contract goals. Or firms may be paid for actual performance, for example per flying hour. Either way the choice of the performance metric(s) is crucial. Readiness of aircraft and timely delivery of parts are the most common metrics, but there can be many more measures that suit the complicated needs of different systems.

Finally, PBLs can run for short periods and be rolled over frequently, or they can be negotiated for much longer terms. Short contracts give both government and industry a chance to learn, develop

trust and make alternative choices. Longer contracts give government more certainty and allow private firms to plan for the most thorough optimization of design, repair and logistical support.

Despite complications, defense planners are moving ahead. The United Kingdom has been very aggressive in shifting to the new maintenance model.

### **PBLs in Action**

BAE Systems' Customer Solutions and Support (CS&S) unit has been working for the U.K. Defense Logistics Organization (DLO) on a series of ABC pilot programs for five years. In December 2005, the Ministry of Defense announced a Defense Industrial Strategy that aims for through-life capability on all new aircraft acquisitions.

The pilot programs achieved impressive results and built valuable experience. For example, under a six-year contract to support the Nimrod, BAE's CS&S increased aircraft availability by 40 percent while reducing costs by 8 percent. Processes and information technology from this program will be applied to the VC10 and E-3 Sentry.

Major pilot programs also were run on the Tornado for radar, avionics and other components. These built confidence. The DLO wanted to make sure BAE had the resources, skills, capabilities, facilities and ability to manage the project. BAE beefed up its resources in line with the planned strategy.

These tests too produced favorable results. At one Royal Air Force base, CS&S reduced Tornado downtime by 35 percent and man-hours by 40 percent. Tornado radar support now requires 50 percent less inventory, and costs are down 45 percent. Secondary power systems on the aircraft cost 23 percent less under ABC than they did previously. Overall, Tornado support costs 30 percent less and has achieved all of its milestone objectives.

The DLO now wants to move to a 10-year ABC with BAE for both support and upgrade of the entire Tornado, except engines, which will be sustained by Rolls-Royce. The agency aims to cut costs by up to 50 percent while improving availability. BAE submitted its proposal for this deal, the "Air Transformation: Tornado Availability Contract," in February and expects to learn the result by autumn. The DLO hopes to save \$44 million and free up for operations for 11 aircraft by applying a similar program to the Sea Harrier.

Success in one ABC thus builds naturally to the next step. The Tornado ABC approach is expected to apply to the Eurofighter Typhoon, and the Sea Harrier program will translate to the F-35 Joint Strike Fighter, according to BAE spokesman Mike Sweeney. One reason is the importance of information systems applicable to several programs. BAE and DLO developed trilogi, a web-based application that generates, manages and stores maintenance documentation and interfaces with supply chain software acquired by BAE. Lockheed Martin has selected trilogi for the JSF, and BAE hopes it will become an industry standard.

In the U.S., there are more than 200 PBL contracts in place. Boeing Integrated Defense Systems has two major PBL contracts, one on the C-17 Globemaster and another on the F-18 Hornet.

Under the C-17 agreement, Boeing is responsible for the entire aircraft, subcontracting depot repairs to the U.S. Air Force at Warner-Robins, engine work to Pratt & Whitney and components to other firms. About two-thirds of payments to Boeing are in fixed fees per year, the other third is time-and material payments, and there are incentive bonuses for aircraft availability.

According to Pat Finneran, president of support systems at Boeing IDS, C-17 availability was

more than 83 percent in 2005, 10 percent above average for aircraft of this type. Finneran estimates that \$10 million in annual costs have been saved and \$500 million in duplicate infrastructure costs were avoided by the PBL approach.

The chief advantage of this highly integrated PBL approach is that Boeing can allocate its investment and efforts where they will produce the most increase in availability for the least cost. Boeing formed a Public Private Partnership (PPP) with Warner Robins Air Logistics Center for the depot maintenance and signed a contract with the Air Force including performance measures, just as it did with private subcontractors.

Boeing's other major, fully integrated PBL, for the F-18 E/F, also began modestly. Initially, the company supported only a handful of components, but now it is responsible for readiness of about 4,000 Hornet components, including airframe and avionics. Finneran reports that depot turnaround time on repairs has been cut 33 percent, Hornet readiness is the highest among the U.S. Navy's tactical aircraft, mission-capable rates are up 20 percent, and the Navy cut its total cost of ownership by 20 percent. Almost all of the contract's goals already have been met or exceeded.

One reason for progress is that, in this integrated contract, Boeing works regularly with component subcontractors to improve designs and boost reliability, generating high returns on small investments. The plan is to apply this contract to other F-18 models.

Boeing is discussing support of the CH-47 Chinook, on terms similar to those of the C-17, with U.K. defense officials. Finneran argues that the key to making PBL work is concentrating responsibility for integrating systems and functions in a single organization, either public or private. He believes private sector integration can work very well, given the powerful incentives private firms have to meet readiness goals. If government handles integration, these same profit incentives might prompt companies working on separate PBLs to maximize their own metrics and revenue, but not that of the entire weapon systems.

Rolls-Royce has eight PBL-type contracts, about half in the United States and half elsewhere in the world. The company recently won a \$73 million contract to support AE 2100D3 engines on the U.S. Air Force' C-130J Hercules II aircraft, and the U.S. Navy will continue the purchase of both AE 1107Cs for V-22 Ospreys and their power-by-hour maintenance from Rolls. The company also will support EJ200 engines on Eurofighter Typhoons and continue to maintain engines on T-45 Goshawks. Rolls usually takes responsibility for repairs, parts and technical configuration in these contracts, although in some cases it shares configuration management on engines made by other manufacturers with defense officials.

"Typically, there is a bonus for meeting goals," said Jeffrey Thomas, director of Rolls-Royce Defense Services North America. Penalties and incentives are in place for engine availability and the timeliness of deliveries to military depots. Individual contracts also contain other metrics, such as mean time between unscheduled removals (MTBURs). For these contracts to work, it is essential to project flight hours accurately at the outset, but Thomas notes that defense departments must do this anyway to budget for fuel and crews.

"Recently, the U.S. government has tended to move away from tip-to-tail solutions, breaking up PBLs into at least two parts, airframes and engines," Thomas said. Most Rolls PBLs are thus done directly with the government, rather than with a prime contractor. It can be costly to accumulate costs through what Thomas calls "a thin prime contractor."

Thomas' colleague Vic Malhotra manages availability contracts in the U.K. He says that other nations tend to watch the U.S. and U.K. in military procurement. "Then they tend to implement similar solutions even faster."

Lockheed Martin Aircraft Logistics Center has broad experience with PBL contracts. Tom Goudreau, director of supply chain programs, estimates that LMALC has about \$1 billion of PBLs in place covering air, naval and land forces.

These PBLs include both U.S. and international military customers. Lockheed is currently in discussions on the F-16 Falcon and C-130 with Singapore defense officials. LMALC partners with OGMA-Indústria Aeronáutica de Portugal to provide support for the French Air Force's C-130s, with the Portuguese company doing maintenance and the American firm handling part supply.

Goudreau says the big difference between international and U.S. PBLs is compliance with local laws. "There are different business practices, legal systems, liabilities, payment terms and rules on intellectual property," he noted. "In addition, the sovereignty issue can affect our ability to support certain countries."

LMALC once had to interrupt support of the Pakistan Air Force due to U.S. sanctions on that country. International contracts thus need a "good off ramp" from PBL contracts if arrangements are suspended by one government or another.

International customers often want price schedules that match their budget and usage schedules. The aim is to avoid "lumpy" procurement costs, an aim that can be achieved through flight-hour charges. But some customers just want traditional fixed-price repairs with some guarantees of cost containment. Generally, the performance aim is improved aircraft readiness or, as in one U.K. program, improved availability of materials.

For defense officials new to PBLs, Goudreau recommends consulting their peers in France, the U.K. and Canada, many of whom have plenty of experience with the performance concept. Both private and public parties should allow for long lead times, 24 to 36 months, to develop sound PBL agreements. And U.S. companies must take into account the desire of many non-U.S. governments to include substantial local content in a PBL partnership.

Rockwell Collins began the PBL approach to maintain components in commercial aviation, said Scott Gunnufson, vice president of business operations for Rockwell Collins Services. The company now has more than 5,000 commercial aircraft under this sort of arrangement. "We then migrated it over to the military, and we now have tremendous experience in PBLs with the U.S. Navy, Coast Guard and Army for both our and other company's products."

Gunnufson says the chief difference between commercial and military PBLs is that the latter often split responsibilities for repairs and asset management between two offices. "The separate offices have different buckets of money, and they may or may not be well connected," he noted. "But I think that is changing."

The keys to making PBLs work are: first, developing trust during the initial phase of estimating baseline maintenance costs; and second, making sure the right performance metrics are chosen.

Defense officials, maintenance providers and industry experts generally applaud the principles of the PBL approach. But several independent observers have offered cautions on specific methods of implementation.

### **Caveat Emptor**

Dennis Wightman, program director at the Logistics Management Institute, said anecdotal evidence on PBL performance is very positive. But he notes some potential problems.

For instance, without a fully integrated PBL, a contractor may optimize performance of a specific component, but an aircraft may be unavailable due to another cause. Wightman has seen a few such cases where PBLs have created "too much readiness" in particular components.

On the other hand, thoroughly integrated aircraft-level PBLs can create a different challenge, especially over the long term. Defense planners need to think hard about what kinds of engineering, buying and decision-making expertise they need in-house to manage private contractors.

"The life of Lockheed Martin's JSF support could be 50 years," Wightman observed. "Government may not have the ability to jump ship if it goes south." No matter what contract terms say, the practical ability of Defense offices to switch support responsibilities on a major aircraft will require, first, adequate technical data, second, the right skills in government offices, and third, competent replacement firms. "It is one thing to have technical data, it is another to be able to read it," Wightman noted. "What if you have not used the drawings in many years?"

PBLs create commitments that must be paid out each year, regardless of other demands on defense. A PBL is like buying a house, rather than renting. The government gets a better long-term deal, but it must make the mortgage payments.

LMI program manager Steve Ericson says government information systems to support true performance measurement still "have a long way to go."

Full PBL needs four kinds of information: 1) business processes for handling needed parts and repairs 2) information on fleet performance; 3) data on parts, their configuration and location, and 4) performance data and interpretation to flag the need for parts or repairs in a timely fashion. This fourth type, performance data and interpretation, is still in the future.

Nevertheless, PBLs have worked well wherever they have been tried, so the real question is how far the approach should be taken, according to Jerry Cothran, program director for PBL at the Defense Acquisition University. PBLs are always different, because components, systems and aircraft are never the same. "The way we teach PBL is to teach that the right answer is always, 'it depends,'" Cothran said. Setting up even component-level PBLs can take 24 to 30 months, while implementing PBL for an entire new aircraft may require four to six years. But Cothran argues that the F-18 PBL proves integrated PBLs can work, as does the C-17 program, which has evolved steadily since a modest start in 1996.

Kate Vitasek says current information systems can at least provide reliable measurements of inventory commitments and component delivery. "As prime contractors and other firms acquire experience with PBLs, they will get better at it. There is a changing landscape. Companies like Boeing and Lockheed need to do it, and they are getting much more competent at it."

Jim Beggs, a PBL consultant at Booz Allen Hamilton, strongly endorses the performance concept, but argues it is not the ultimate goal. "The overall aim is not PBL, but to come up with an acquisition strategy that makes sense, which could be either PBL or traditional procurement," Beggs said. The two fundamental questions that must always be addressed up front are: does the industrial base have the competencies required; and can government impose metrics in the contract that align with goals of war-fighters.

Beggs believes fully integrated PBLs are very attractive because of a common problem in military maintenance. "In any maintenance shop that is struggling, you will find a lack of integration between maintenance, technical documentation and parts supply." Sprawling defense establishments are not very good at this integration, but not all manufacturers are especially good at it either.

Decisions to go PBL and how to do it should be based on a thorough business case analyses. Booz Allen does it in four basic steps. It first surveys experts to come up with about five alternative support concepts. It then projects the logistic, engineering, training, parts and other resources necessary. The third step is a cost analysis of different ways of providing these resources. Last comes the evaluation of alternatives, including sensitivity to estimating assumptions. Business Case Analyses are thus simple in principle, but can be complicated in practice, much like PBLs.

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