

THE EMERGENCE OF THE INTELLIGENT SYSTEMS SUPPORT SUPPLIER

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Abstract

The main argument of this paper is that aircraft manufacturers are no longer ‘simply’ manufacturers, or even “system integrators”, but are becoming solution integrators. This requires that aircraft manufacturers have an inherent intelligent service supplier capability residing within the organization to meet the need of increasingly complex, and blurred, product service systems.

1 Introduction

The aerospace & defense industries are currently undergoing a significant, although sometimes subtle, transformation in the way it operates, the way it is structured, and even in its fundamental role [1,2,3,4]. What was once a predominately product focused industry is now morphing into a supplier of products & services designed to give an operator a capability to perform their mission. The growth in Original Equipment Manufacturer (OEM) support services (such as logistics, maintenance & in-service engineering) in recent years has been remarkable, especially with the growing number of defense customers outsourcing to OEMs & third parties the technical management of many of their technologically advanced fleets of aircraft and advanced weapon systems.

However, the mindful and accelerated transformation of OEMs from primarily product manufacturers, to suppliers of integrated solutions, poses a number of challenges. The main argument of this paper is that aircraft manufacturers are no longer ‘simply’ manufacturers, or even “system integrators”, but are becoming “solution integrators”. Thus,

traditional manufacturing and product-orientated paradigms are slowly been superseded by a new services-dominated way of thinking about aircraft programs. The paper is based on insights and observations from a PhD research project into the impact Through Life Support concepts are having on aircraft manufacturers.

2 Concept of Product-Service Systems

The term “servitisation”, coined in 1988, describes the process of creating value by adding services to products, and has since been adopted as a competitive strategy for manufacturers of many types of products (not just aerospace). [5]

The concept of “Product-Service Systems” (PSS) is described as a special case of servitisation, whereby a product’s functionality is extended by the incorporating additional services. Ultimately, the PSS concept describes the ‘sale of use’, rather than the ‘sale of product’. [6]

This requires that aircraft manufacturers have an inherent intelligent-service-supplier capability residing within the organization to meet the need of increasingly complex and blurred product-service systems.

3 The Strategic Context of Support

The paper is written in light of a number of changes in the aerospace & defense market over the past few years. There are four main market changes that are addressed to establish the context, which in turn drive detailed internal changes.

First, the past few years has seen an increased level of outsourcing of support activities to third-party entities. This is in both the commercial airline and military environments. The drive to outsource is driven by a number of factors, including greater perceived value with the external organization, the desire for an operator to focus on “core operations”, and to offload technically complex & onerous tasks onto a party who has greater expertise in such fields.

Second, there is a more specific trend of the outsourcing of these activities to the system OEM, an organization whose traditional role has been in manufacture, but not support. The rationale for such a trend is based on a similar rationale for general outsourcing, although sometimes the value proposition from the OEM can be more attractive than an independent MRO provider, for example. The third trend is the tying of revenues to aircraft/system performance measures, whereby a party is effectively contracted to provide an availability-based output/outcome solution. Contracts, such as performance-based logistics on platforms like the F117, F/A-18E/F Super Hornet, and the C17 Globemaster, are examples of where the ‘deliverable’ is the sustained operating performance of a fleet. These are also examples where there has been an outsourcing of support to the OEM. There are, however, examples where uniformed units in the armed services actually provide performance-based outcomes to internal military stakeholders such as a flying squadron.

The final trend is that of new industrial policies, especially in the UK, whereby Governments, being mindful of a projected decrease in system development projects in the future, are working with industrial firms to establish long-term support capabilities that both sustain complex systems for military customers, but also sustain the necessary industrial skills and knowledge required to operate those systems. The concept of “Through Life Capability Management” is a leading initiative encapsulating that intent.

4 Emerging Examples of the Intelligent Supplier of Support

4.1 Overview

The term “intelligent supplier” is derived from an article that appeared in *Airline Business* magazine in September 2005 investigating changes happening in the commercial airline maintenance sector [7]. One of the key themes from the article is the notion that, when outsourcing, many leading airlines did not simply want to lower the cost of a major maintenance visit, but were keen to partner with a unique support operation who would be an ‘intelligent supplier’ of support. The article, examined in more detail in the next section, describes a 2005 agreement between easyJet and SR Technics worth \$1 billion over a 10 year period in which the airline carefully chose a partner whom was able to provide more than just maintenance services, but a new level of integration and support that would be an industry leading arrangement.

The article makes several observations. To quote: “There is a space developing, albeit slowly, for somebody who can concentrate on the intelligence associated with a maintenance programme ... the concept sees a new kind of supplier working on behalf of a carrier using the accumulated experience and wealth of data on aircraft, engine and component support to produce a maintenance programme where the central theme is the constant driving down of maintenance man-hours”.

Cost reduction through man-hours is not the only theme suggested by a number of leading airlines and industry consultants in the article. They suggest that it is the “white-collar area of technical planning and engineering” as opposed “actual spanner-turning” where many efficiencies could be found. It also argues that “the role of the intelligent supplier, which needs a large base of data and experience, cannot be fulfilled by an airline”.

4.2 SR Technics & easyJet

Whilst not an example of an aircraft manufacturer becoming a service provider, the

following example illustrates some key characteristics of what an operator looks for in a support service partner.

In August of 2005, a “landmark agreement for the aircraft maintenance industry” was signed between the independent European MRO provider SR Technics, and UK-based low cost carrier easyJet [7]. The ten-year deal is worth about \$1 billion over the life of the contract, and sees SR Technics taking responsibility for the “full technical support” of easyJet’s growing fleet of Airbus A319 aircraft (54 aircraft at time of contract signature, and will reach a total of 120 by the end of 2007).

What is unique about the deal is that it goes beyond traditional maintenance outsourcing that is predominately activities centered, but it really signified the start of a TLS-like partnership between a large airline and a maintenance provider that is based upon delivering outcomes. It is likely that this arrangement will pioneer the TLS concept in the traditionally conservative airline industry, and be a ‘test-case’ (hopefully from which much will be learned to improve any TLS program, and that will be the foundation of decisions made by airlines to sign up to such an arrangement, perhaps with the likes of a Prime Integrator such as Boeing). In addition, the contract is unique in that it is a ten year long partnership. Normally, maintenance contracts are shorter than that (in order to avoid the risk of continued poor performance in a supplier), and sometimes are ‘one-offs’.

The contract sees SR Technics taking on a variety of activities including all ‘line’ and heavy maintenance, “maintenance operations control” (presumably a pseudo maintenance control centre), as well as all component maintenance management and logistics. The contract stipulates a delivery of outcomes, in the form of cost predictability, and aircraft availability. In addition, the contract requires that there be a concentrated effort to see a reduction in maintenance costs associated with the A319 fleet (excluding the engine maintenance costs) of at least 25% (or \$USD18 million) over the ten years.

Another interesting departure from ‘normal’ maintenance contracts that is found in this example is that of the importance of

‘working together’. EasyJet describes the arrangement as saying that there needs to be an “openness on their [SR Technics] side ... [and] that we will work with them on developing other solutions [to improve the efficiency of maintenance]”. Additionally, they have said, quoting the same reference, “many [of the efficiency] solutions haven’t even been worked out yet, and it does not necessarily mean they [SR Technics] will do the work themselves”.

A final interesting point of the contract goes back to the concept of providing capability through outcomes, not through activities. EasyJet continues to explain that in “an important shift”, the airline will actually give SR Technics the freedom to make the decision they, as a supplier, believe is best. “While there are certain key agreed performance indicators ... how [SR Technics] achieve them is ... up to them”.

4.3 Boeing Goldcare

In 2006, Boeing publically announced the offer of a new service to customers of its new 787 aircraft [8]. Not only would airlines be able to buy a new, state-of-the-art aircraft, but would also have the option of having Boeing look after a significant amount of the logistics and maintenance effort associated with the new aircraft. Its model is fairly close to existing “Power-by-the-hour” arrangements that airlines have had with engine companies (such as Rolls Royce), but for the first time was offered for an entire commercial airframe.

Initially, Boeing offered two streams of support. The first, seemingly an extension of the existing Boeing service for integrated materials management – effectively the management of spare parts and inventory for an airline customer. The second, higher-value stream was for a complete turnkey solution, where Boeing would effectively sell “flight hours” to airlines and would look after all maintenance, logistics, spares, upgrades, and other services.

However, it is interesting to note that Boeing now offers four streams – everything from the fully-integrated, supply of flight-hours approach, to a Planning & Control service, to an

Engineering Management service, and finally, the inventory management service.

4.4 BAE Systems' Hawk

The move towards an intelligent-supplier approach is perhaps more noticeable in the military environment, with many emerging examples of aircraft manufacturers (such as Boeing, Lockheed Martin, and Northrop) moving more and more into the support services space.

In Australia, one current 'stand-out' example is the BAE Systems Hawk Mk. 127 jet trainer aircraft [9]. In 1997, the Royal Australian Air Force (RAAF) selected the Hawk to replace its existing fleet of Macchi Mk. 326's, however, the process by which the decision was arrived was rather unique. Instead of stipulating the number of aircraft required, the Federal Government issued a requirement for a minimum number of flight-training hours per year, as well as details about how the manufacturer would support the aircraft as part of a turn-key solution. As part of the acquisition contract, BAE Systems established a significant support presence adjacent to the RAAF's fighter jet training operations in New South Wales, and has a contract to support the Hawk aircraft by undertaking all Deeper Maintenance, logistics management, and technical support activities. The support contract is for 25 years, renewed every 5-years. Initially, hands-on maintenance tasks were carried out by a sub-contractor, but were subsequently brought out by BAE Systems. Interestingly, the RAAF's only responsibilities for the aircraft are Operational Maintenance (oil changes, ground inspections, etc), with all other technically-intensive activities being BAE Systems' responsibility.

The support contract is a performance-based arrangement, with BAE Systems required to deliver a minimum number of aircraft for a daily flying-pool. For every aircraft not delivered, the company is penalized financially. Thus, BAE Systems' role, initially as a manufacturer, becomes more focused on service delivery, and the success of the company

depends on how well it acts with intelligence to manage the aircraft fleet.

4.5 Joint Strike Fighter

The largest aircraft development program occurring at the moment is clearly the Joint Strike Fighter, but is also a stand-out example of an aircraft manufacturer delivering an integrated "product-service system" [10]. One of the key pillars of the program is be supportable, and this is reflected through a more-integrated approach to the long-term support arrangements for the aircraft.

On the technological front, the advanced prognostic health management system, integrated into the JSF Autonomic Logistics system, is a powerful tool that enables a strong support capability. However, ever since Lockheed Martin won the 2001 contract to develop the JSF, they have also been inline to support the aircraft through a Performance-Based Logistics contract once the aircraft enters into service. Not only will they be developing and supplying a product, but will also be a service-delivery organization throughout the aircraft's service life. This approach is, to an extent, making service delivery goals a key measure in the success of the overall program, and in times to come, will probably be seen as the more important metric over the current development and production delays.

5 Analysis

5.1 What is "intelligence"?

Before continuing on the discussion about how OEMs are changing, it's important to reflect on what intelligence actually is. In 1994, more than 50 leading cognitive experts signed a statement on some of the broad characteristics of intelligence. Their definition includes that:

"Intelligence is a very general mental capability that, among other things, involves the ability to reason, plan, solve problems, think abstractly, comprehend complex ideas, learn quickly and learn from experience. It is not

merely book learning, a narrow academic skill, or test-taking smarts. Rather, it reflects a broader and deeper capability for comprehending our surroundings-“catching on,” “making sense” of things, or “figuring out” what to do.” [11]

5.2 Future role of OEMs

Based on the examples illustrated above, as well as the definition of “intelligence”, it is now possible to pass some observations on the emergence of the intelligent supplier of aircraft support services.

First, is that aircraft manufacturers are no longer simply production houses. They are increasingly becoming custodians of the technical knowledge and capabilities needed to support complex systems, with these capabilities been part of the core competence that enables a manufacturer to be an effective service provider.

Second, it’s a slow process. Whilst the rate of new service-orientated business is rising for a number of aircraft manufacturers, it would appear that the rate of internal transformation isn’t as fast. New support programs are being added to existing portfolios of work, but because OEMs have a strong engineering culture, these activities are seen more as engineering work packages, rather than operational services.

Third, when reflecting on the definition of intelligence, it can be seen how many of those attributes apply to aircraft manufacturer transformation efforts to become intelligent service partners. An intelligent supplier needs to be not only an active problem solver, but also a problem identifier – even before issues become problems. The intelligent supplier organization has the ability to reason and predict issues based on available evidence. They actively learn – fast and hard. They don’t make the same mistake twice. They respond rationally and orderly to situations, using their deep knowledge to solve issues.

Finally, customers are increasingly expecting better services, as well as more long-term partnerships (especially where it can be shown there is a financial benefit). As aircraft

become more complex, and as operators continue to focus more on their “core operations”, outsourcing of support activities is only increasing. However, challenges, such as trust, and partner alignment, are critical. It could be why Boeing has not yet sold any Goldcare packages to airlines thus far.

5.3 Customer Responses to Outsourced Support

Whilst performance-based contracts are still being pursued for various programs, like A400M [12], there are also some examples of where such arrangements are not meeting initial expectations. For example, from 2012 the United States Air Force will be ‘in-sourcing’ maintenance activity on its F22 and C17 aircraft, despite there currently being a performance-based through-life support contract in place (via contractors Lockheed Martin and Boeing, respectively) [13]. The full details of the recent decision are still emerging, but initial reasons are said to include cost/perceived value-for-money, and operational control.

6 Concluding Remarks

The main argument of this paper is that aircraft manufacturers are no longer ‘simply’ manufacturers, or even “system integrators”, but are becoming solution integrators. This requires that aircraft manufacturers have an inherent intelligent service supplier capability residing within the organization to meet the need of increasingly complex, and blurred, product service systems.

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