Aberdeen Group
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Promoting Product Development Efficiency for Aerospace and Defense

Data from Aberdeen Group's December 2007 *Product Innovation Agenda 2010* study found that aerospace and defense manufacturers are focused on improving product profitability by continually streamlining product development. This attention to shortening time to market windows is consistent with what Aberdeen found across their peers in all other industries, where there is a growing recognition that corporate growth lies in bringing innovative products to market ahead of the competition. But how do you do this in an industry where parts number in the thousands, complexity is commonplace, and product development schedules are measured in years?

Goals for Product Development

Improving product profitability is on the top of the executive agenda for aerospace and defense manufacturers (Table 1). These companies report a relatively equal focus on increasing revenue along with decreasing product and product development costs, with a slight emphasis on the top line.

Table 1: Goals for Product Development

"A lot of emphasis" on:	All Respondents	Aerospace & Defense
Increasing product revenue	82%	64%
Decreasing product cost	60%	54%
Decreasing product development cost	36%	54%
Increasing value of intellectual property	36%	31%
Decreasing corporate risk	36%	38%
Decreasing product lifecycle cost	29%	31%

Source: Aberdeen Group, December 2007

Product development costs, which include labor costs, can be considerable for an industry where development cycles can span several years and the workforce is both highly specialized and expensive. Product development for aerospace and defense requires heavy investments of money and time before a product can be brought to market. Even once a design is complete, the testing phases can be extremely long, creating further delays to product release. For example, engines require tests that last three thousand hours just to be certified; assuming certification is awarded on the first attempt. Consequently, it makes a lot of sense that aerospace and defense

Sector Insight

Aberdeen's Sector Insights provide strategic introspective and analysis of primary research results by industry, market segment, or geography

Sector Definition

For the purposes of this study, respondents who indicated that they operated within the aerospace or defense space were isolated and aggregated for comparison against peer manufacturers across industries in Aberdeen Group's performance framework.

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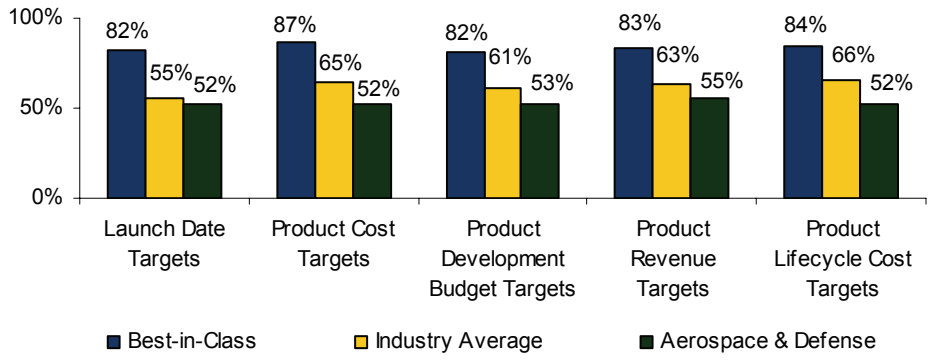
manufacturers place a much higher focus on product development costs than all other industries.

The ability to improve the efficiency of product development processes, then, can have a major impact on profitability. It is not only about bringing innovative products to market ahead of competitors, but reducing the costs of unnecessary and additional work. But, these long development cycles mean there is a lot of opportunity to reduce their length, as well as development cost.

Aberdeen Analysis

Balancing product performance with streamlined development processes is not accomplished easily. With such significant challenges to overcome, it is understandable that Aberdeen Group's December 2007 *Product Innovation Agenda 2010* report found the performance of aerospace and defense manufacturers is slightly behind the Industry Average across key product development metrics that drive profitability (Figure 1).

Figure 1: Performance Framework



Source: Aberdeen Group, December 2007

Much of this lower performance can be attributed to both the complexity of the products developed and the length of the development processes. The impact of these factors can be seen most keenly in their ability to meet launch dates, product cost targets, and development cost targets, areas that see the greatest performance gap between aerospace and defense and the Best-in-Class.

Opportunities for Aerospace and Defense

To improve their performance in these areas, aerospace and defense manufacturers can look to the steps the Best-in-Class have taken to improve the efficiency of their product development processes. These steps include the adoption of a number of capabilities that can streamline product development and help the Best-in-Class achieve the performance lead they currently hold. Many of these are also capabilities that aerospace and

defense companies plan to adopt in the coming years as part of their strategic initiatives.

Product Innovation

In general, aerospace and defense companies tend to be dogmatic about six sigma and productivity-oriented metrics rather than focus on innovation. This explains why Aberdeen's *Product Innovation Agenda 2010* report found aerospace and defense companies are giving innovation less attention than other industries (Table 3). With the exception of the measurement of innovation performance with formal metrics (where they approach the Best-in-Class), aerospace and defense manufacturers fall behind the Industry Average in the capabilities that support effective innovation. The Best-in-Class, by contrast, are taking steps to transform innovation into a formal, repeatable process. In particular, the Best-in-Class are 1.9-times as likely as aerospace and defense manufacturers to identify a process owner for innovation and 1.5-times as likely to assign this responsibility to a C-level, executive role.

While aerospace and defense manufacturers are currently not able to take advantage of the opportunities that a focus on innovation can provide, they do indicate that they are planning to increase their innovation focus significantly. In particular, they project 112% growth in the adoption of formal innovation metrics and 80% growth in the institution of formal innovation process owners. Despite this, they still have a lot of ground to make up, and they are likely to remain behind the Best-in-Class and Industry Average.

Table 3: The Competitive Framework - Product Innovation

	Best-in-Class 2008	Industry Average 2008	Aerospace and Defense		
			2008	2010	Growth
Measure innovation performance with formal metrics	36%	22%	33%	70%	112%
Process owner for the innovation process	68%	49%	35%	63%	80%
Open innovation processes	72%	31%	33%	59%	79%
Ability to retrieve and leverage related innovations (patents, etc.)	70%	53%	45%	74%	64%
Chief Product / Innovation Officer or equivalent executive responsible for product innovation	54%	35%	35%	42%	20%

Source: Aberdeen Group, December 2007

Finally, one capability where aerospace and defense manufacturers report Industry Average adoption, but could benefit from even more is in the adoption of an open innovation strategy. Open innovation broadens the available channels of new product ideas to resources outside the four walls

of the enterprise, including customers, partners, and other external entities such as academics and researchers in other industries. Effectively, this means that an enterprise is able to select the best innovation that fits its needs and to hedge its bets that internal research and development will discover the next greatest product or technology. Implementing this approach can help aerospace and defense manufacturers achieve their top strategy for product innovation, increasing product fit to customer and market requirements.

Product Development

Aerospace and defense companies report more attention to streamlining and promoting efficiency in product development than they do in product innovation. In fact, these companies exceed the Industry Average and report the adoption of the same capabilities the Best-in-Class use to improve product development (Table 4). This includes the application of Lean concepts to product development, the measurement of formal metrics, and the implementation of formal feedback processes from suppliers and contract managers. While aerospace and defense companies are currently taking advantage of these capabilities, these are also strong growth areas for aerospace and defense (particularly Lean product development, which shows 136% projected growth) as well as the Best-in-Class. This suggests that aerospace and defense companies working toward improving the efficiency of their product development processes.

"On the defense side of the business, we have put an umbrella on improvement processes under Lean. There has been a lot of effort on streamlining processes and reducing NVA (non value added) steps, along with a big emphasis on education."

~ Carolyn Castillo, Integrated Defense Systems Boeing

However, the area where aerospace and defense are behind the Best-in-Class and, even if adoption plans are fulfilled, will remain behind the Best-in-Class is in the centralization or coordination of product development decisions across the enterprise. Considering the complexity and sheer number of programs, people, and components involved in aerospace and defense, this is an area that stands to provide substantial benefits.

Table 4: The Competitive Framework - Product Development

	Best-in-Class 2008	Industry Average 2008	Aerospace and Defense		
			2008	2010	Growth
Implement Lean product development concepts	48%	18%	33%	78%	136%
Product development metrics used to drive continuous improvement	48%	29%	37%	84%	127%
Different product development processes by type of project	50%	33%	33%	66%	100%
Formal feedback process from suppliers / contract managers	48%	25%	36%	72%	100%
Measure performance of products with formal metrics	48%	35%	42%	82%	95%
Centralized or coordinated product development decisions across the enterprise	76%	45%	44%	67%	52%

Source: Aberdeen Group, December 2007

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Product Design and Engineering

aerospace and defense companies' focus on efficiency continues into product design and engineering. Here as well, they report the implementation of formal metrics and collaboration processes ahead of the Industry Average (Table 5). The additional two areas that Aberdeen's *Product Innovation Agenda 2010* report found as differentiators of Best-in-Class performance are areas that aerospace and defense companies have recognized that they have the opportunity to improve.

Table 5: The Competitive Framework - Engineering

	Best-in-Class 2008	Industry Average 2008	Aerospace and Defense		
			2008	2010	Growth
Digital simulation and prototyping of manufacturing processes	40%	28%	30%	98%	227%
Formal feedback process from supplier / manufacturers	58%	39%	24%	72%	200%
Integrating product design with manufacturing process design	60%	54%	29%	72%	148%
Visibility to manufacturing feedback / experience in design processes	72%	46%	29%	69%	138%
Metrics used to drive continuous improvement in engineering	56%	32%	46%	84%	83%
Formal collaboration processes	56%	37%	42%	75%	79%
Centralized product data	63%	49%	59%	86%	46%
Digital simulation and prototyping of products	80%	54%	70%	98%	40%

Source: Aberdeen Group, December 2007

The first area is adopting an "outside-in" approach, involving more of their collaborators, both suppliers and internal manufacturing departments in the engineering process. Sources outside of engineering are untapped resources for aerospace and defense companies and there is a lot of opportunity to follow the example of the Best-in-Class. In fact, the Best-in-Class are far more likely as aerospace and defense manufacturers to involve both the manufacturing organization and suppliers to solicit feedback on the design. By involving these groups and soliciting feedback, aerospace and defense companies may be better positioned to identify issues that could save manufacturing costs or even avoid manufacturing problems, which can mean time saved on downstream rework. This is a planned high growth area for aerospace and defense, but, again, their late start will keep them behind both the Industry Average and Best-in-Class.

Additionally, the use of simulation in product development is a major growth area for aerospace and defense, both for product prototypes and as part of manufacturing process planning. Currently simulation sees higher adoption among aerospace and defense manufacturers than the Industry

> "We perform analyses to make sure we are arriving at the most weight and cost effective design. In short, we want to get the biggest bang for our buck. Additionally, an analysis identifies all the potential failure modes whereas building and breaking a prototype will reveal just one… the one that broke the prototype."
>
> ~ Jochen Hessemann, Smith Aerospace

Average. By 2010, the use of simulation by these companies will exceed Best-in-Class levels, including both digital prototyping (98% projected versus 96% of Best-in-Class) and digital manufacturing (98% projected versus 72% of Best-in-Class). Simulation is particularly valuable for aerospace and defense, enabling the ability to detect problems earlier in the design cycle while designs are still fluid and problems can be avoided. This is because digital simulation of designs helps find problems during the design process rather than test. For aerospace and defense, this can make a huge impact on both engineering schedules and budgets. For example, finding problems in a simulation can avoid finding them during an expensive 3,000 hour engine test, which will then have to be repeated after the problem is addressed.

Technology Investment Areas

In addition to the capabilities discussed thus far, a crucial differentiator of Best-in-Class performance is the deployment of Product Lifecycle Management (PLM) applications. Fifty-eight percent (58%) of Best-in-Class performers report that they have adopted PLM (compared to 31% of the Industry Average). PLM provides central location for data and automates a number of development processes; helping improve time to market as well as enabling aerospace and defense manufacturers to overcome a number of their challenges.

It is not surprising, then, that adoption of PLM among aerospace and defense manufacturers is ahead of the Industry Average (44%) and remains one of the top technology growth areas for these manufacturers over the next two years. If adoption follows projections, aerospace and defense manufacturers will be ahead of the Best-in-Class adoption in this area (95% versus 79% of the Best-in-Class). In fact, PLM shows such broad adoption by 2010, with a majority of both the Best-in-Class and Industry Average using it, that it may cease to be a performance differentiator and become simply a prerequisite for remaining competitive.

Expanding from PLM, then, will be critical in continuing to improve and support speed and efficiency of product development. Table 6 lists the top 10 technology growth areas for aerospace and defense manufacturers. The top area is Digital Rights Management (DRM) software, which helps to protect outsourced design data. When the amount of time goes into developing innovation within these industries, loss of design data can be devastating. While only 12% currently have DRM, as many as 45% will have it in the next two years, a rapidly emerging trend. There is also a lot of growth in involving manufacturing organizations in the product development process, which helps companies to identify manufacturing-related problems much earlier in the design process, when they can be more easily rectified.

Table 6: Top 10 Innovation Technology Investments 2008-2010

	Currently Use	Plan to Adopt by 2010	Growth 2008 to 2010
Digital Rights Management (DRM)	12%	45%	275%
Advanced search capabilities	33%	82%	148%
Digital manufacturing / manufacturing process simulation	33%	71%	115%
Digital manufacturing / manufacturing process planning	30%	61%	103%
Product Lifecycle Management (PLM) defined as PDM with integrated business processes	44%	86%	95%
Integration with enterprise applications (ERP, SCM, CRM, etc.)	47%	86%	83%
Obsolescence management	37%	67%	81%
Product portfolio management	36%	64%	78%
Real-time design collaboration	40%	71%	78%
Product cost management	56%	93%	66%

Source: Aberdeen Group, December 2007

Required Actions

Aerospace and defense manufacturers report top goals around improving product profitability and corresponding actions around improving the efficiency of product development processes. However, while they've taken a number of strides toward adopting formal processes and measuring performance, they retain an unfocused approach to innovation and lack many of capabilities that distinguish the Best-in-Class. As they continue to adjust their programs, these companies must look to the following steps:

- **Centralize or coordinate innovation decision-making.** Focus on innovation among aerospace and defense manufacturers is behind the Industry Average. The Best-in-Class are 94% more likely than aerospace and defense companies to identify a process owner for innovation and 56% more likely to possess the ability to retrieve and leverage related innovations. With a more programmatic approach, new innovations can lower product development costs and reduce delays. To accomplish this, central visibility will help make sure innovation investments are aligned across the enterprise.
- **Establish PLM.** PLM will become commonplace in 2010 meaning it will become less of a competitive differentiator. Eighty-six percent (86%) of aerospace and defense manufacturers will have adopted PLM by 2010, so those still without it will be at a considerable disadvantage. PLM supports many aerospace and defense initiatives and plans for 2010, helping to centralize data, support collaboration, and automate business processes, all of which will help accelerate the development process.

- **Bridge the gap between engineering and manufacturing.** Involve manufacturing and suppliers during the design process. The Best-in-Class are 2.4-times as likely as aerospace and defense manufacturers to possess formal processes for feedback from suppliers and manufacturing organizations. Doing so can help identify problems that could lead to delays in manufacturing or add to costs.

For more information on this or other research topics, please visit www.aberdeen.com.

Related Research	
Product Innovation Agenda 2010; December 2007	*Global Design Strategies in the Aerospace and Defense Industry*, February 2008
The Lean Product Development Benchmark Report; May 2007	*Configuration Management for Aerospace and Defense*; December 2007

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