Five keys to digitizing aerospace and defense companies

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Most aerospace and defense companies have launched digital transformation efforts. Few of them are working out. Here's how to get better results.

For decades, aerospace and defense (A&D) companies have been early, ambitious adopters of advanced technologies such as stealth, composites, and computer-aided design. Much of this innovation occurred in response to customer demand. In recent years, though, A&D companies have been slower to implement analytics, automation, cloud services, the Internet of Things, and other cutting-edge digital technologies than companies in other industries, such as retail banking.

This is not for a lack of interest or awareness. All of the top 10 and two-thirds of the top 50 A&D companies have announced a digital initiative of some kind. And most of the A&D business leaders we have spoken to recognize that digital technologies can make their operations more efficient, boost their revenues, enhance customer experiences, and help them navigate complex risk and regulatory environments. Our experience is consistent with this outlook: we find that digital technologies can boost A&D companies' revenue by 5 to 15 percent and lower their costs by 5 to 10 percent.

Nevertheless, A&D executives consistently tell us they would like their companies' digitization efforts to proceed more quickly and produce greater financial and operational benefits. From what we've seen, their approaches tend to lag for one, or more, of several reasons: a lack of focus, too little attention to customers' needs, weak technical capabilities, a shallow talent pool, and rigid organizational structures.

These problems aren't unfamiliar to companies undergoing digital transformations. Digital frontrunners in the A&D sector and others have shown how to work around them. In this article, we offer a closer look at how addressing these five areas can help A&D companies accelerate their digitization programs and amplify their benefits.

Focus on no more than ten high-value digital initiatives

A&D companies have countless ways to apply digital technologies. The sheer abundance of options has led some businesses to start more digital initiatives than they can effectively manage at once, without concentrating those initiatives on their top business priorities or coordinating their implementation. While individual initiatives can pay off under these circumstances, our experience shows it is much more effective to define the company's overall priorities for its digitization program, then translate those priorities into a list of no more than ten digital initiatives that cascade from the CEO to the front line.

Companies should start with a long menu of potential initiatives, ranging from those aimed at powering growth with better products, services, and customer experiences, to those seeking greater efficiency in operations such as engineering, supply-chain management, and back-office support (Exhibit 1).

Looking at growth and operational initiatives side by side may sound like an obvious tactic, but it is seldom done—and it's essential to allocating limited digital resources. Consider that A&D companies looking for growth opportunities often feel constrained by business partners and regulators. In such situations, companies can create more value, more quickly by using digital technology to transform their own operations. Applying

Exhibit 1

Aerospace and defense companies can use digital technologies in many ways, spanning a wide range of customer and operational needs.

Products and services

Commercial aerospace

Aircraft
- Real-time data transfer to cloud
- In-flight Internet connectivity
- Health data to leasing companies

Airline operations
- Real-time performance dashboards
- Spare-parts inventory management (eg, blockchain)
- Spare-parts entitlement modeling
- Fuel optimization
- Flight and gate planning and scheduling
- Automated disruption response
- Individualized training
- Global fleet optimization based on health

Airport operations
- RFID[1] tracking for baggage and cargo
- Automated taxiing and takeoff
- Crew deployment
- Equipment monitoring and handling
- Monetizing passenger data for shopping

Defense

Readiness and efficiency
- Enhanced, adaptive training (eg, virtual reality, real-time pilot feedback)
- Supply-chain optimization (eg, remote 3-D printing)
- Inventory management (eg, blockchain)

Warfighting effectiveness
- Artificial-intelligence platforms
- Advanced visualization and decision support
- Unmanned vehicle-to-vehicle communication
- Digital soldier systems
- Analytics-enhanced operational planning; real-time replanning
- Big data intelligence analytics

Maintenance, repair, and overhaul
- Real-time health monitoring (including use of digital twins)
- Predictive maintenance
- Dynamic maintenance records
- Customized or augmented-reality instructions for workers
- Unmanned inspection and servicing

Operations

Customer experience
- Omnichannel
- Digital front-end processes
- Full life-cycle customer relationship management
- Advanced commercial and pricing models

Engineering and R&D
- Rapid experimentation and simulation
- Concurrent engineering
- Customer cocreation and open innovation
- Productivity and performance analytics
- Data-driven design to value

Support functions
- Automated knowledge work
- Performance management
- Guided self-service

Supply-chain management
- Predictive analytics and demand forecasting
- End-to-end connectivity
- Real-time planning
- Automated root-cause analysis
- Automated warehouses
- Electronic sourcing (eg, auctions)
- Advanced spend analytics
- Automated compliance monitoring

Operations
- Predictive maintenance
- Advanced/statistical process control
- Remote monitoring and control
- Remote maintenance
- Human/robot collaboration
- Equipment efficiency optimization

[1] Radio-frequency identification.

automation technologies to aircraft maintenance, for example, can increase safety, improve defect detection, and reduce time wasted (Exhibit 2).

A&D companies sometimes find it difficult to choose a starting set of ten or fewer digital initiatives. In our experience, a simple but effective method for screening potential initiatives is to answer the following questions for each:

- Does the initiative unlock one of your biggest available value pools with respect to either growth opportunities or operational improvements?
- Will the initiative endow the company with a sustainable, distinctive capability or offering? How easily could a rival duplicate the same initiative?
- How easily can customers be convinced to pay for the proposed capability or offering? For digital initiatives focused on operations, what is the expected return on investment?
- Are you willing to invest both the time and the resources that the initiative will require? If you assume it will take twice as long and cost twice as much, would you still pursue it?

Once management has chosen a set of digital initiatives to pursue, executives should reinforce their importance by articulating how the choices met the four criteria above. They should also tell employees, business partners, and customers what benefits to expect and how they can (or should) contribute to the company's digitization program.

Reframe the company's relationship with customers

Recent McKinsey research suggests that digital technologies are raising customers' expectations for the extent and quality of the services they buy, while blurring traditional boundaries between sectors by allowing companies to offer integrated access to entire suites of products and services. To reap maximum value from their investments in digital, A&D companies should look for opportunities to develop data-driven offerings that meet more customer needs than they address today.

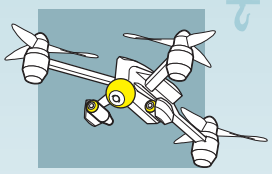
This is a matter of determining what unique insights the company can offer, whether customers are willing to pay for those insights, and how the company can obtain the data it would need to produce the insights. A few decades ago, jet-engine makers collected enough data on their maintenance costs that they figured out how to profitably bill customers by hour of engine service, rather than by selling engines and charging separately for maintenance. In commercial aerospace today, the right combination of data and analytical tools (such as machine learning) could improve predictive maintenance for a fuel-control system—a change that would produce significant gains in operational efficiency, without requiring customers to make drastic changes to their existing processes.

One concern that A&D companies frequently encounter while developing digital offerings such as analytics, platforms, and services is that these offerings will require new business models, including customer-service capabilities. That concern has been powerful enough to discourage some companies from pursuing business opportunities that are otherwise attractive.

When A&D companies face such a concern, we recommend that they borrow a tactic from their tech-industry counterparts and focus on their prospects for value creation. If a new digital offering credibly answers the four questions outlined in the previous section, then in most cases the company should be able to identify or create an effective business model and payment structure for it.

Exhibit 2

For aircraft maintenance, automation promises to increase safety, improve defect detection, and reduce time wasted on walking and waiting.



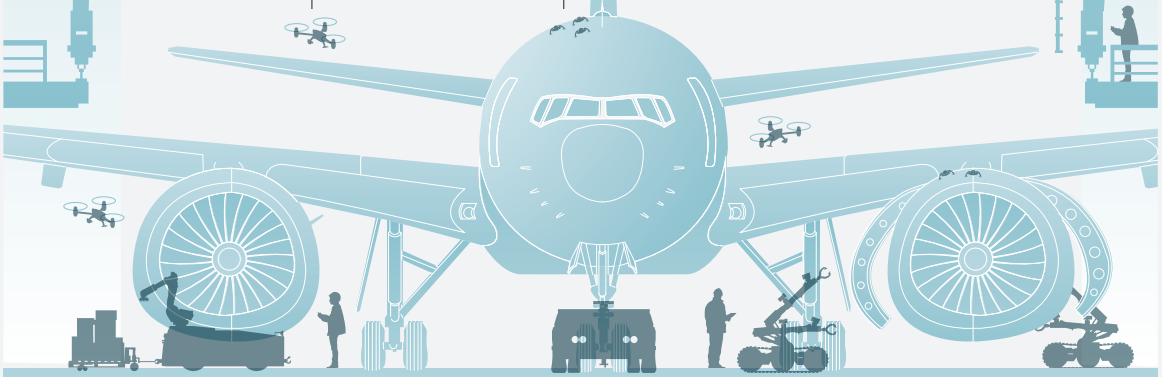
Instead of humans searching for wear and tear visually, **drones inspect exterior**, and tiny insect-inspired robots check airframe without removal of panels

Machine vision to identify many common defects. Predictive maintenance is far less costly than reactive maintenance

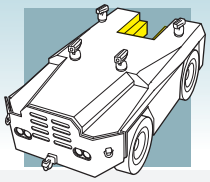
Fewer technicians remain on the maintenance hangar floor, but they spend more time on problem solving and require continual training

In place of logging inspection status manually, compliance documents are automatically routed to a secure site for easy regulator access

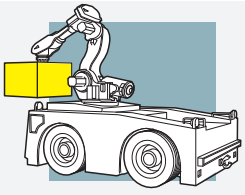
Diagnostic algorithms and inspection robots record all their own compliance information automatically

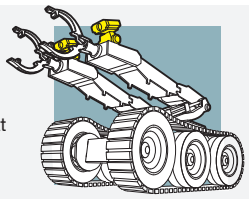


Automated warehouse is linked to procurement department with **robotic part and tool delivery.** Automatic ordering based on forecast demand raises efficiency



Automated tugs rather than technicians move plane in and out of hangar. Less human time spent on tasks that could be done by automation cuts waste





Robots do physical tasks. Humans can avoid danger zones, and parts are installed faster and with less variability

Potential economic benefits of automation

66% Labor substitution

34% Performance gain

Performance gains

- Improved safety
- Better defect detection
- Predictive maintenance
- Elimination of time wasting

25% Relative impact[1]

1 Ratio between additional net impact and operating cost.

Source: McKinsey Global Institute

Integrate capabilities from the company's ecosystem of digital partners

Even as they look for opportunities to develop their market-facing and internal digital offerings, A&D companies shouldn't hesitate to rely on the broader ecosystem of technology providers for functions that will help them meet their digitization goals. Creating new digital capabilities and customer offerings is difficult enough. Rather than make the task harder by developing their own IT infrastructure and solutions, A&D companies can avail themselves of technology services that are on the market. Using third-party services also allows a company to cut out development time and get its digital initiatives up and running much faster.

That said, companies should resist the urge to cast every decision about new technologies as a binary choice between developing a technology from scratch and buying it from a vendor. Instead, they should frame these decisions in terms of a development spectrum that ranges from proprietary one-off solutions, to open platforms that a network of developers can build on, to using algorithms created by a partner or even a customer.

Attract and retain digital talent

To pursue their digital priorities and reposition themselves within digital ecosystems, A&D companies need employees who have advanced technical skills and a keen awareness of the links between business processes and digital technologies. They also need talent with up-to-date knowledge of the capabilities offered by technology partners, along with the ability to evaluate capabilities, to procure solutions, and to collaborate with vendors.

Several tactics can help A&D companies to shore up their technical staff. Increasing compensation is a start, but few A&D companies can match the pay packages offered by pure-play digital companies. They can, however, appeal to digital workers in other ways. One is to award promotions to the highest-achieving employees, while giving extra responsibility to high-potential workers even if they are early in their tenure with the company. Another, requiring only modest investments, is to place digital teams in work environments that resemble the ones provided by digital-native companies, with respect to everything from their physical location to the collaboration tools and working methods they use. For example, Thales, a diversified A&D player, has set up a so-called digital factory in Paris to create technology products using agile development and other digital-native techniques. A&D companies can also appeal to digital specialists by touting the challenges and importance of the work they would do, such as helping to protect their country or building the planet's logistics systems.

Some talent can be brought on through acquisitions rather than direct hires, though this approach comes with challenges. In the A&D sector, CFOs must answer to investors who are accustomed to judging performance on the basis of margins and conventional growth targets. Digital ventures, on the other hand, are often valued according to unconventional measures of growth. When assessing potential acquisitions, A&D companies must understand how pure-play digital companies are valued, be prepared to pay for firms that might be valued at several multiples of the price suggested using conventional valuation methods, and make their expectations clear to stakeholders inside and outside the company.

Build an organizational model that favors digital transformation

Regardless of how A&D companies choose to build up their digital talent, they should resist the temptation to place all their digital specialists in a single division or suddenly spread them throughout the company. Each digital initiative

should be clearly assigned to a champion who has the clout within the organization to push it forward, such as a business-unit leader from a new acquisition or the original company, or a new digital executive. Initiative leaders should also be given the authority to make decisions and draw on the resources they need, even if that means pulling in staff from other functional groups, such as operations and engineering, or hiring additional technology talent.

A&D companies might also have to introduce a new measure of flexibility to their organizational structures and processes, so digital initiatives can proceed without undue delays. For example, digital factories might be given exceptions that let them apply development methods, such as agile, that are not in wide use across the company but provide real business benefits, like the ability to pilot solutions before scaling them up for broader delivery. A&D companies should also establish frameworks for evaluating their digital initiatives, and lend more support to initiatives that pay off and withdraw it from those that fail quickly.

Although A&D companies have a notable history of putting sophisticated technologies to good use, few have capitalized on the opportunities associated with advanced software and hardware applications. The five practices described in this paper can help them mount digitization efforts that will have transformative effects on performance. Focusing digital initiatives on a company's top business priorities will increase the odds that digitization leads to desirable improvements. Repositioning a company within its digital ecosystem can create growth opportunities and speed the development of new capabilities. And new talent and organizational models can enable a company to sustain a digitization program beyond the first or second wave of digital initiatives. None of these practices is necessarily easy to adopt, but they are worthwhile. A&D companies that get started now stand to gain a lasting edge over their competitors. ■

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