

# Deloitte.

Aerospace Innovation—  
A New Dawn

How some innovation  
leaders excel despite risks  
and declines in funding

December 2015



## Introduction

Today's Aerospace and Defense (A&D) sector is at an inflection point—markets are incredibly dynamic and a number of forces are pushing companies to develop new technologies and pursue new markets or create them. This story is not new to A&D, but the methods to achieve these goals are being re-written by the most innovative companies in the industry, despite the overwhelming challenges. Historically, the A&D industry has created some of the most game-changing technology innovations including commercial aircraft, human space flight, the Internet, GPS navigation and satellites. These innovations have changed the way we travel, live, communicate, explore, and when necessary, defend our way of life.



The A&D industry as a whole has traditionally relied on the US Department of Defense (DoD) to fund major innovation initiatives, but with declining budgets and affordability challenges, the sources of innovation are changing and new players are emerging. Technology innovations emanating from the private commercial sector are partially driven by the value creation opportunities experienced in the commercial sector especially over the last three decades. At the same time, there have been long term declines in government support for innovation funding as well as company-funded research. Deloitte's analysis found that spending on aerospace innovation has declined sharply since 2009, both on independent research and development (IRAD) spending, down by 26.5%, and DoD innovation spending, down by 21.1% in the sector.

Despite these challenges, some of the leading A&D companies are developing innovative technologies, creating new markets, and expanding their growth opportunities. It is important to note that innovation is focused on not only the technology products themselves, but also the process for using innovation effectively, using a mix of non-traditional industry partnerships, rapid evolution/commercialization of core technologies and collaboration with ideation partners.

Given this shift, achieving growth through innovation can also involve risk taking, a different business model, a different development environment, creative financing and differentiated leadership. For example, in a shift towards private commercial markets, US Defense Secretary Ashton Carter recently approached Silicon Valley and established a Manufacturing Innovation Institute for Flexible Hybrid Electronics to pursue innovation in wearable technology.<sup>1</sup> In addition, certain defense firms and commercial companies alike are taking big gambles with their own money to develop innovative technologies they believe will create markets that currently don't exist.

Ultimately, many effective innovators look beyond traditional business models to incubate technology innovations and vastly improve product performance. Achieving meaningful growth through innovation within the A&D industry requires rethinking the standard approach to innovation.

### Drivers of Change

Historically, significant leaps forward for the A&D sector have been due to major armed conflicts or innovators creating demand, thus inventing new products. WWII and the Cold War both drove increased government investment in new defense technologies. In commercial aerospace, deregulation ushered in an era of competition and access to new markets, both of which spurred innovation investments in new products and services to differentiate and attract more customers. Similar in both cases, value was created by addressing new requirements, both for game-changing military technology to create the asymmetric advantage in warfare, or to create new functionality and improved direct operating cost advantages for the paying commercial customer.

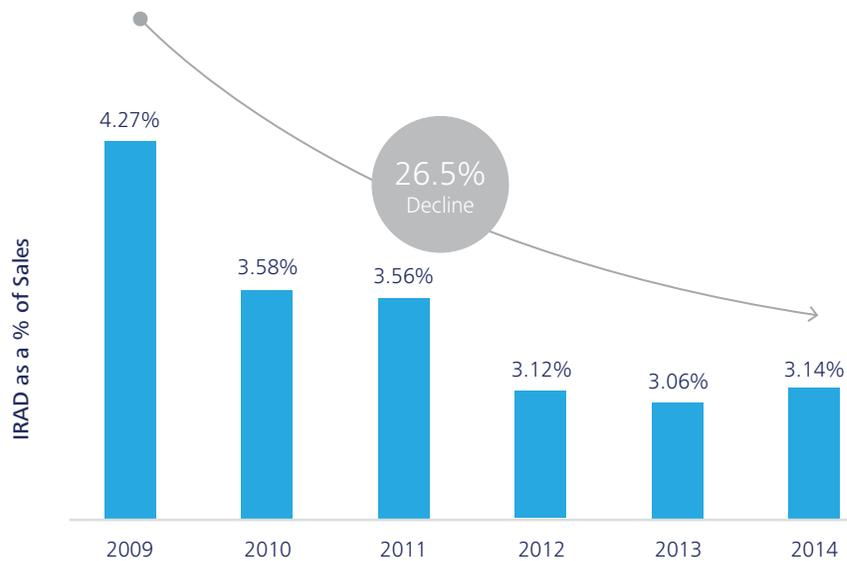
However, this model is changing. Achieving growth and accessing new methods of innovation have become increasingly challenging due to three primary factors:

- Declining defense spending
- Growth and pressure on commercial markets
- Pace of technology advancement enabled cost reduction

### Innovation Spending On the Decline

Recent Deloitte analysis<sup>2</sup> indicates that investment indicators are dropping across the industry, despite the constant pressure for innovation and growth. Our findings conclude that company-funded IRAD has declined from 4.27% in 2009 to 3.14% in 2014, a 26.5% drop. Additionally, the DoD reduced its Research Technology Development & Evaluation (RTD&E) funding from \$79.7 billion in 2009 to \$62.9 billion in 2014, a 21.08% decline. The iconic technological innovations that characterize the sector's history have been largely dependent on funding from the US Government, as well as internal company sources.

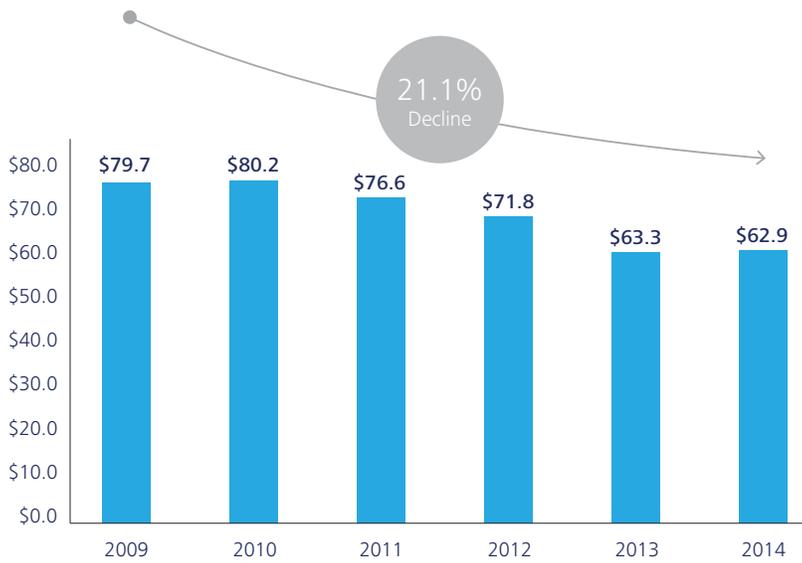
**IRAD Spending as a % of Sales  
20 Largest Global A&D Companies**



Source: Public company annual reports, and Deloitte analysis

Less spending on the development of next-generation technologies could result in fewer new product introductions over time, contributing to a potential decline in competitiveness for the sector. This is occurring at a time of heightened global tensions, aggressive military actions by America's adversaries, and increased competition in commercial markets.

**DoD RTD&E 2009 - 2014**  
Spending (in billions)



Source: National Science Foundation [www.nsf.gov/statistics/fedbudget](http://www.nsf.gov/statistics/fedbudget)

Yet some companies are adapting and finding incredibly lucrative ways to innovate and grow in what appears to be a market where innovation investment is declining.

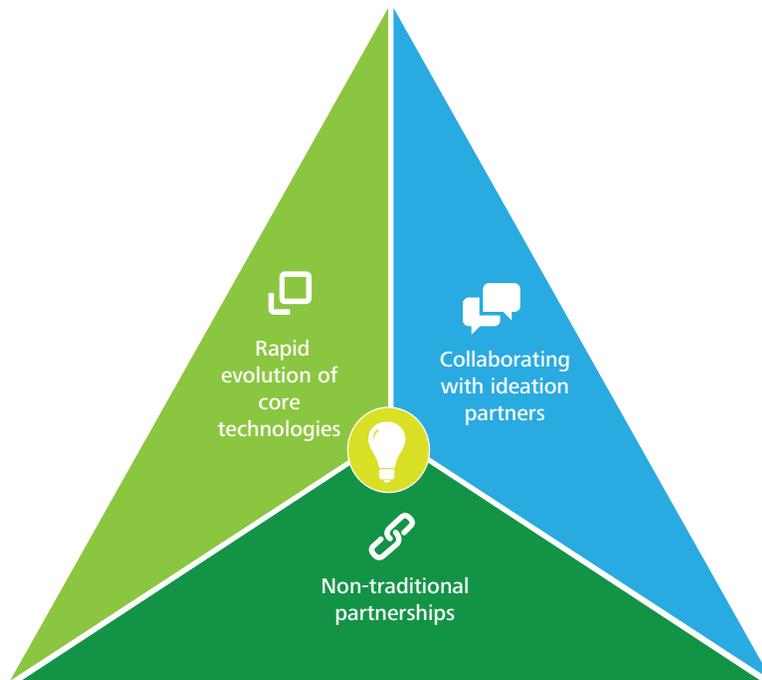


### How the Leading Innovators are Thriving

Despite the challenging environment in the sector today, a number of companies are forging ahead with innovation using non-traditional approaches that not only provide increased revenues, but also help avoid being disrupted by new technologies and establish defensible competitive advantages in new markets.

Based on our analysis, innovative A&D companies are reshaping their thinking by focusing on non-traditional partnerships, rapid evolution of core technologies, and collaborating with ideation partners.

### Three Innovation Levers for A&D Companies



### Non-Traditional Partnerships

While M&A has been the traditional inorganic method to acquire new technology, acquisitions are not the only way to acquire or develop new innovation externally. Several A&D firms have engaged in uncommon, non-traditional partnerships to achieve their growth goals.

For BAE Systems, this meant collaborating with Intelligent Textiles, Denchi Power, and Cynetic Designs to develop new methods to reduce the war fighters' load of batteries while maintaining technological supremacy. Developing such a revolutionary approach to power usage for the war fighter required merging the tactical requirements with the technological elements: e-textiles, conformable batteries, and a wireless charging pouch. The four companies are leveraging their own shared investment as well as those by their individual governments in each of their respective emerging technologies—effectively boosting their investment and incorporating thought leaders from across industries and government agencies.

Safran's collaboration with Albany International is another example. This partnership is focused on developing new fan blades and casings for the LEAP jet engine, planned for the Airbus A320neo and Boeing 737 MAX. The shared investment by both companies across new facilities in both France and the US was strongly backed by both respective governments for its focus on innovation and creation of jobs.

Perhaps the most talked about action in recent months was Raytheon's controlling investment in commercial cybersecurity company Websense, which while not a partnership should be viewed in the same light: Raytheon is seeking to rapidly increase its ability to innovate by leveraging another company's experience in markets that are traditionally non-core for Raytheon. This \$1.6B investment can't be classified as IRAD, or internal R&D, but Raytheon's intentions are clear: pursue growth in commercial markets by leveraging Websense's core capabilities, while also delivering new levels of innovation to their customers. Both of these outcomes can help Raytheon redefine how other A&D companies evaluate and value their innovation and growth portfolios in the years to come.

Other examples in the sector include partnerships between Textron and AirLand Enterprises, and GE and 3D Systems.

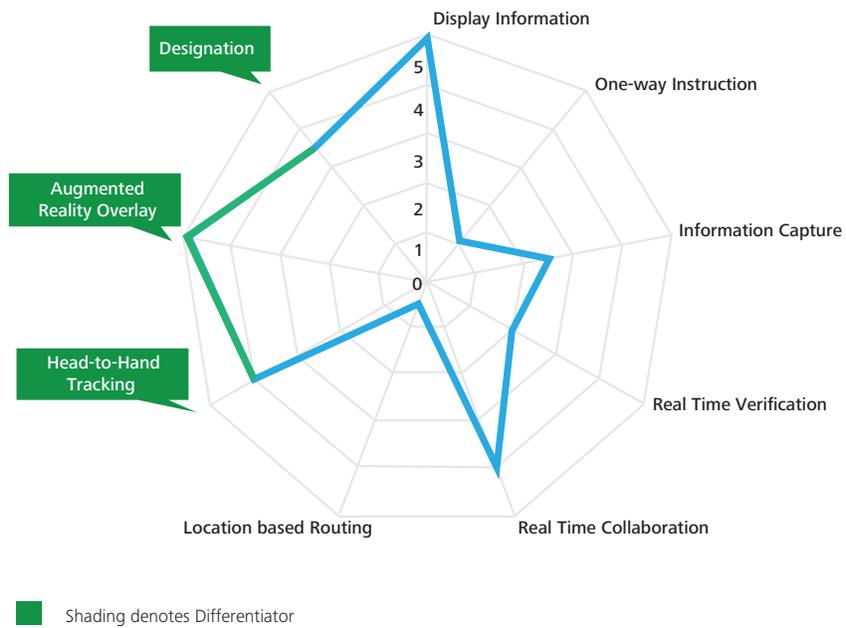
### **Rapid Evolution of Core Technologies**

Another effective trend Deloitte has witnessed is the rapid entry into new markets through the commercialization of core defense technologies. Often, defense technologies are viewed as platforms or packages that are not readily applicable to commercial applications and markets, but savvy companies who understand how to disaggregate these platforms and focus on adapting core technologies for commercial use are able to rapidly enter and dominate new markets.

One of Deloitte's clients recently approached us to help them understand the full potential for certain aspects of military-grade heads-up-display (HUD) technology. Multiple commercial scenarios requiring HUD technology can be readily envisioned in supply chain and warehousing, MRO, first responders, field maintenance, and precision manufacturing. A number of relatively low-cost, functional-specific solutions exist in nearly every market, but many are highly customized to specific applications with limited capability beyond simple supplemental data. Deloitte helped this company think through potential use-cases, likely differentiators, and value proposition for their technology across 150 market segments. Additionally, we conducted primary market research with industry participants and potential users who were able to provide real-time feedback and input into the market entry and product design process. Using a jobs-based approach to evaluating market opportunities, we were able to identify the most likely scenarios and primary differentiators for the new product. The most compelling opportunities were identified in non-traditional markets, and armed with this information, we were able to develop a rapid go-to-market plan in very select and defensible markets where our client's growth aspirations could be more easily achieved. Ultimately, our client went from concept to beta market testing in a few months and has effectively demonstrated their capability within the new market segment in ways that are truly setting the bar for innovation.

By thinking about one of their core platforms differently and taking a new approach to evaluating market opportunities, our client was able to expand into new markets using existing technology with relatively limited additional investment compared to developing an entirely new solution.

## Alignment with jobs



### Collaborating with Ideation Partners

Many of the best innovators are also seeking external support, but in the form of innovation collaboration and sharing experiences where they can openly discuss innovative ideas and concepts with a range of contributors without fearing about trade secrets or competitive concerns.

Thales' recent announcement of their xPloR innovation platform is an example, as they are seeking to engage a broader set of start-ups and an academic ecosystem to share ideas. Their initial launch involves a [collaboration](#) with the MIT Media Lab to identify potentially disruptive technologies within the US start-up and academic communities, as well as taking a design-thinking and collaboration approach to problem-solving.

### Developing an Innovation Portfolio

How can today's A&D companies begin structuring their innovation portfolios? The Ten Types of Innovation® provides a framework to begin thinking about what kinds of innovation are appropriate for your company and situation. This framework was developed by Doblin, the Innovation unit within Monitor Deloitte, and has rapidly become a strategic tool for many innovators, both entrepreneurs at startups, as well as industry leaders across the globe.

The Ten Types of Innovation approach centers around evaluating potential innovation options across the ten different types and three major categories:

- Configuration: How you generate profit, connect with others, align your talent and assets, and use your proprietary processes
- Offering: What products and services you offer and how you distinguish them
- Experience: What support you provide, how it's delivered, how you manage your brand and engage your customers

While not every category and type will be applicable for all A&D companies, considering many types of innovation and then developing a portfolio of options across the Ten Types provides a broad approach to consider how to provide new ideas and products/services using non-traditional partnerships, rapid evolution of core technologies, or collaboration with ideation partners.



**Figure 1: Ten Types of Innovation**

Profit Model	Network	Structure	Process	Product Performance	Product System	Service	Channel	Brand	Customer Engagement
CONFIGURATION				OFFERING		EXPERIENCE			
<p><b>Profit Model</b> <i>The way in which you make money</i></p> <p>Johnson Controls offered upside-sharing models and guaranteed lifecycle savings on infrastructure upgrades with customers. If Johnson fails to achieve the guaranteed savings, it pays the difference to the customer. If achieved, they are split between Johnson and the client.</p>		<p><b>Structure</b> <i>Alignment of your talent and assets</i></p> <p>Southwest Airlines flies only one kind of aircraft—the Boeing 737. In doing so, it has reduced costs, streamlined operations, and allowed teams to execute fast turnarounds at airport gates.</p>		<p><b>Product performance</b> <i>Distinguishing features and functionality</i></p> <p>Caterpillar<sup>3</sup> has been consistent in increasing profit margins by producing high-quality components and replacing them before they break and rebuilding them with a combination of used and new parts.</p>		<p><b>Service</b> <i>Support and enhancements that surround your offerings</i></p> <p>Recognizing that the markets and profits for traditional manufactured goods is changing, GE is also focused more on providing after-sales services to customers. This strategy helped GE differentiate itself from competitors, boosting its revenues and profitability.</p>		<p><b>Brand</b> <i>Representation of your offerings and business</i></p> <p>Siemens AG sells premium products in developed markets but develops reliable, localized, and affordable products targeted at the low- to mid-level technology markets, where consumers require essential functionality at an affordable price.</p>	
<p><b>Network</b> <i>Connections with others to create value</i></p> <p>UPS and Toshiba struck an agreement that saw UPS technicians from the company’s logistics arm, UPS Supply Chain Solutions, repair customers’ broken Toshiba laptops at the parcel service’s shipping hubs. This complementary partnership cut down on service time for Toshiba, and provided UPS with a new revenue stream.</p>		<p><b>Process</b> <i>Signature or superior methods for doing your work</i></p> <p>Toyota’s famous “lean” production system reduced waste and excess, driving astonishing efficiency and continual product and process improvements throughout the company.</p>		<p><b>Product System</b> <i>Complementary products and services</i></p> <p>Launched in the middle of the severe recession in 2009, Hyundai’s “Assurance” program guaranteed that customers who bought or leased a new Hyundai vehicle could walk away from both the car and its payments if they lost their job during the first year of its ownership.</p>		<p><b>Channel</b> <i>How your offerings are delivered to customers &amp; users</i></p> <p>ABB expands into newer markets by establishing a full range of business activities, including R&amp;D and manufacturing, through joint ventures and wholly owned companies, as well as a wide sales and service network across all the major business hubs.</p>		<p><b>Customer Engagement</b> <i>Distinctive interactions you foster</i></p> <p>SKF became a leader in the many OEM markets owing to its strong relationships with automobile manufacturers. The company invested in upgrading capabilities of all of its key stakeholders by providing specialized training courses to the suppliers, distributors, and customers.</p>	

Within A&D, SpaceX is an example of configuration innovation, while Textron AirLand's Scorpion and Juliet Marine System's Ghost are examples of offering and experience innovation.

The Ten Types of Innovation mobile app is an interactive toolkit to help you generate, create, and evaluate ideas that can lead to bigger and bolder innovations. It can be downloaded in the App Store® online store.

The Ten Types of Innovation® App for iPad® mobile digital device bundles more than 100 building blocks of innovation with a sketchpad and curated newsfeed to provide a systematic framework to discover, build, and test your ideas.

Regardless of the level of investment, applying a structured approach to evaluating innovation alternatives and options is required to determine a broad set of opportunities are being considered. Ten Types of Innovation<sup>4</sup> of 138 top companies indicates that the most effective innovators integrate 3-10 types of innovation, more than twice their underperforming counterparts. These same top innovators outperform the S&P 500, and those deploying a higher number of innovations generate higher returns.

**Figure 2: 5-year Indexed Stock Price Returns of the Top Innovators vs. S&P 500**



### Innovation and Deloitte

Innovation is one of the last remaining sources of trend-breaking growth, yet many companies fail at it too often because they approach innovation as if it were an art, assuming brainstorming and random moments of genius will help them win. They likely won't. Experience shows that innovation often results from the convergence of a wide range of perspectives, knowledge, and insight, focused on specific industries and issues. Our organization has made contributions to this approach:

- Singularity University (SU), an interdisciplinary and international organization, and Deloitte have entered into a strategic alliance that combines our strategic consulting and innovation practices with SU's world-class educational programs and events.
- Deloitte, Singularity University, and the XPRIZE Foundation together established the Innovation Partnership Program to spur global economic development and business commerce. We offer a business innovation program that helps prepare senior executives to lead their organizations to thrive in an era of disruption.
- The XPRIZE Foundation, a non-profit, and Deloitte have created an alliance to offer pro-bono Deloitte professional services to support XPRIZE in its mission to solve humanity's grandest challenges using the highly-leveraged innovation models of incentive competitions, crowd-sourcing, and gamification.

### In Conclusion

Throughout history, A&D companies have demonstrated their significant aptitude for innovation, yet often it has been driven by increased government funding or external events, which does not always translate well to commercial markets. In today's climate of declining innovation investment, companies should consider seeking new methods to drive innovation and avoid disruptive technologies.

Many effective innovators are integrating more types of innovation and also reaping improved returns. In line with this thinking, today's A&D innovators are deploying new methods of innovation to achieve growth through innovation, incorporating new partnerships, rapidly commercializing core technologies, and collaborating with thought partners from start-ups to academic communities. Evaluating innovation options across configuration, offering, and experience should be considered to generate a full view of potential options for A&D industry participants.

Actively developing an innovation agenda should be a priority for each A&D executive. The risk of doing nothing can be huge, as A&D's history is littered with examples of companies that failed to innovate or predict innovation and were ultimately disrupted. A recent Deloitte study of Canadian companies<sup>5</sup> indicated only 13% were actively evaluating possible disruptive technologies or exploring innovation alternatives to avoid disruption. A&D companies who actively manage innovation and disruptions can be better positioned to manage change and outperform their peers, even in today's challenging A&D environment.

### Endnotes

<sup>1</sup> [www.defense.gov/News/News-Releases/News-Release-View/Article/615132/dod-announces-award-of-new-flexible-hybrid-electronics-manufacturing-innovation](http://www.defense.gov/News/News-Releases/News-Release-View/Article/615132/dod-announces-award-of-new-flexible-hybrid-electronics-manufacturing-innovation)

<sup>2</sup> Public company annual reports on Form 10-K, and National Science Foundation: [www.nsf.gov/statistics/fedbudget](http://www.nsf.gov/statistics/fedbudget)

<sup>3</sup> [http://www.ellenmacarthurfoundation.org/case\\_studies/caterpillar](http://www.ellenmacarthurfoundation.org/case_studies/caterpillar)

<sup>4</sup> Ten Types of Innovation Study: [www2.deloitte.com/global/en/pages/strategy/articles/ten-types-of-innovation.html](http://www2.deloitte.com/global/en/pages/strategy/articles/ten-types-of-innovation.html)

<sup>5</sup> [www2.deloitte.com/ca/en/pages/insights-and-issues/articles/future-of-productivity-2015.html](http://www2.deloitte.com/ca/en/pages/insights-and-issues/articles/future-of-productivity-2015.html)

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## Acknowledgments

The authors thank Aijaz Hussain, Aerospace & Defense Sector Research Leader from the Deloitte Center for Consumer & Industrial Products, for his significant contribution towards the research, analysis, and writing of this report.

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