Top 10 risks in aerospace and defense (A&D)

About this report

As the global economy undergoes several ups and downs, and different countries change their defense priorities in the face of terrorism and political disruption, the risk universe in A&D keeps on changing. As A&D players design and implement strategies to grow in this business environment, they need to adapt their plans to consider the key risk drivers.

EY has developed ***Top 10 risks in A&D*** to identify the most critical risks in the industry and analyze how these impact the industry players. The report also highlights EY's experience around these risk areas.

The issues we present here, while not exhaustive, provides a snapshot of the risks the industry as a whole is encountering at this time. In this light, they provide a basis for exploration and discussion of the risk impact on your organization and how you can respond.

This report has been produced through three important steps: firstly, to evaluate the most important strategic challenges for leading players in the industry; and secondly, to rate the severity of these risks for the sector. This has been executed through analysis of the latest annual reports for the top 15 global A&D players* in terms of revenues. In the third step, EY's professionals have shared their experience from working with clients around each of these risk areas.

The ability of A&D players to identify and seize opportunities in the industry will depend upon understanding and managing the corresponding risks. Unless a company has a solid foundation of risk management, it will be unable to achieve a sustainable growth in the longer run.

*Top 15 A&D players considered in the report (in alphabetical order): Airbus, BAE Systems, Boeing, Bombardier, General Dynamics, General Electric (GE Aviation), Honeywell (Honeywell Aerospace), Leonardo, Lockheed Martin, Northrop Grumman, Raytheon, Rolls Royce, Safran, Thales and United Technologies.

EY risk radar for A&D

The EY risk radar presents a snapshot of the top 10 business risks in an industry sector by dividing risks into four quadrants that correspond to EY's Risk Universe model. These quadrants are:

- **Compliance threats** – originating in politics, law, regulation or corporate governance
- **Operational threats** – impacting the processes, systems, people and overall value chain of a business
- **Strategic threats** – related to customers, competitors and investors
- **Financial threats** – stemming from volatility in the markets and in the real economy

The radar below plots the top 10 risks for A&D players on the risk radar.

Top 10 risks in A&D

1. Volatility in geopolitical and economic environment
2. Managing the supply chain
3. Competition in domestic and international markets
4. Managing and retaining talent
5. Ability to perform on key contracts
6. Compliance to a wide range of regulations and restrictions
7. Capacity to innovate
8. Failure to realize the benefits of M&As and partnerships
9. Exposure to cybersecurity events
10. Foreign currency and commodity price fluctuations

Overview and introduction

Global defense market outlook

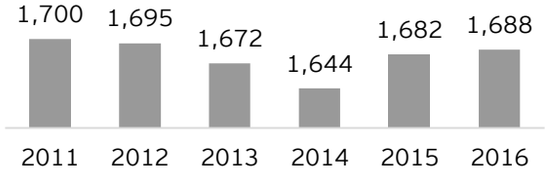
The global defense market has been in a rapid transition over recent years as traditional leading players address declining domestic markets through pursuit of export markets. High investment by emerging market nations has both driven demand and also created new domestic champions, which are now also pursuing export opportunities. The post-Cold War peace dividend and end of the Afghanistan drawdown are now history and across the globe, defense budgets are increasing, rebalancing spend toward developed nations as threats are reassessed.

Global defense spending increased marginally in 2015–16 and is estimated to further increase in 2017 after declining steadily since 2011. The reversal in the decline trend was a response to increased geopolitical uncertainty driven by measures taken by the governments to counter terrorist activities. Such measures include:

- Upgrade capabilities to prepare their militaries to face the challenges arising out of political uncertainties at different parts of the globe.
- Russia's political tensions with Ukraine has cautioned the members of the North Atlantic Treaty organization (NATO) to revisit their defense strategies.
- Increased threat from terrorist organizations, especially the Islamic State of Iraq and Syria (ISIS), has caused the attack-prone countries to modernize and upgrade their military arsenal.

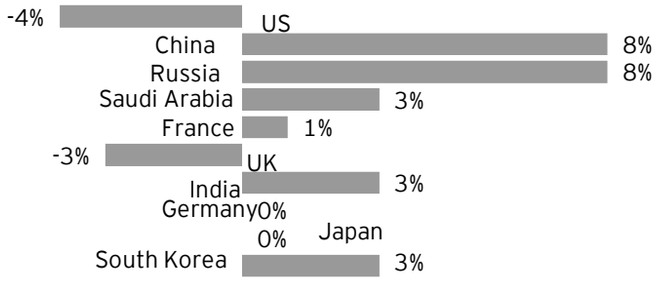
The top defense spending nation, the US, reduced its defense expenditure by an average of 4% every year during 2011–16, primarily because of sequestration, while Russia and China have increased their defense expenditure at 8% compound annual growth rate (CAGR), during 2011–16. During 2011–16, the declining defense spending in the Americas and Europe were largely offset by the increasing defense expenditures by Asia.

Global defense expenditure in US$ billion (2015 constant US dollar prices) during 2011–16



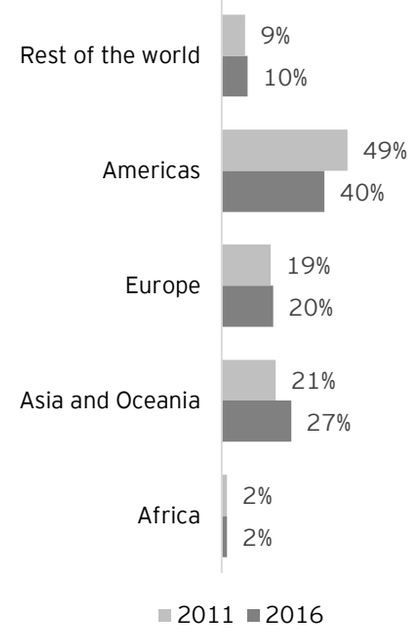
Source: *Stockholm International Peace Research Institute (SIPRI),* EY Analysis.

Growth in defense expenditure for top 10 defense spending countries, 2011–16 CAGR



Source: *SIPRI*, EY Analysis.

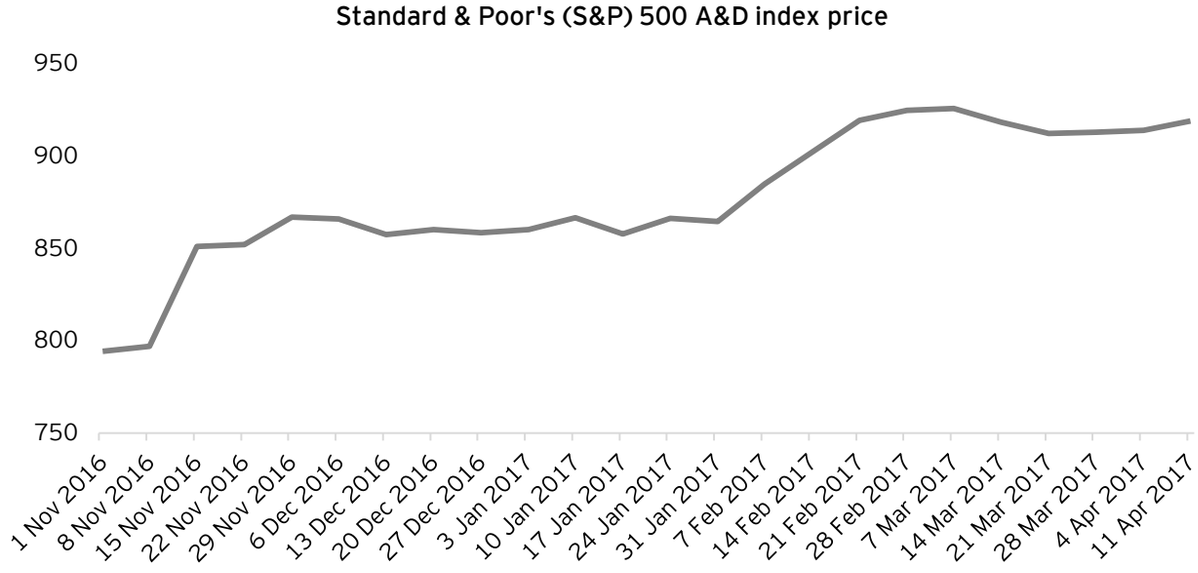
Region-wise share of global defense spending, 2011 vs. 2016



Source: *SIPRI*, EY Analysis.

Outlook for the US defense market

The US passed the National Defense Authorization Act for US$618.7 billion defense budget for 2017, a 2% increase over the US$607 billion authorization in 2016. With the new US President, Donald Trump taking office, US Government might take steps to further increase its defense budget in the next few years. President Trump had made pro-military promises during his election campaign, leading to expectations for an increase in defense spending by the US Government. He promised to grow the US Navy's arsenal of surface ships and submarines by close to 30% and to increase the manpower in the US Army by more than 10%. Furthermore, the new administration's focus on tax regulations, infrastructure development, and other initiatives to encourage manufacturing in the US are expected to give an opportunity to A&D players to re-shore a significant portion of their manufacturing facilities to the US. In response to anticipated increase in the US defense budgets, the A&D stock prices grew by 7% in just one week after the 2016 US election results were declared. Just four months after the elections, as on 11 April 2017, the A&D stock prices grew by 15% as compared to the pre-election levels.



Source: Capital IQ, EY Analysis.

However, to what extent new administration is able to boost the defense industry in the US is still to be watched. Given the increasing defense spending by Middle Eastern and Asian nations, companies would continue to seek opportunities in these markets. How the trade relation between the US and other countries take shape in the upcoming years, will also play an important role in the future of international businesses of the large defense players.

Defense outlook in Europe

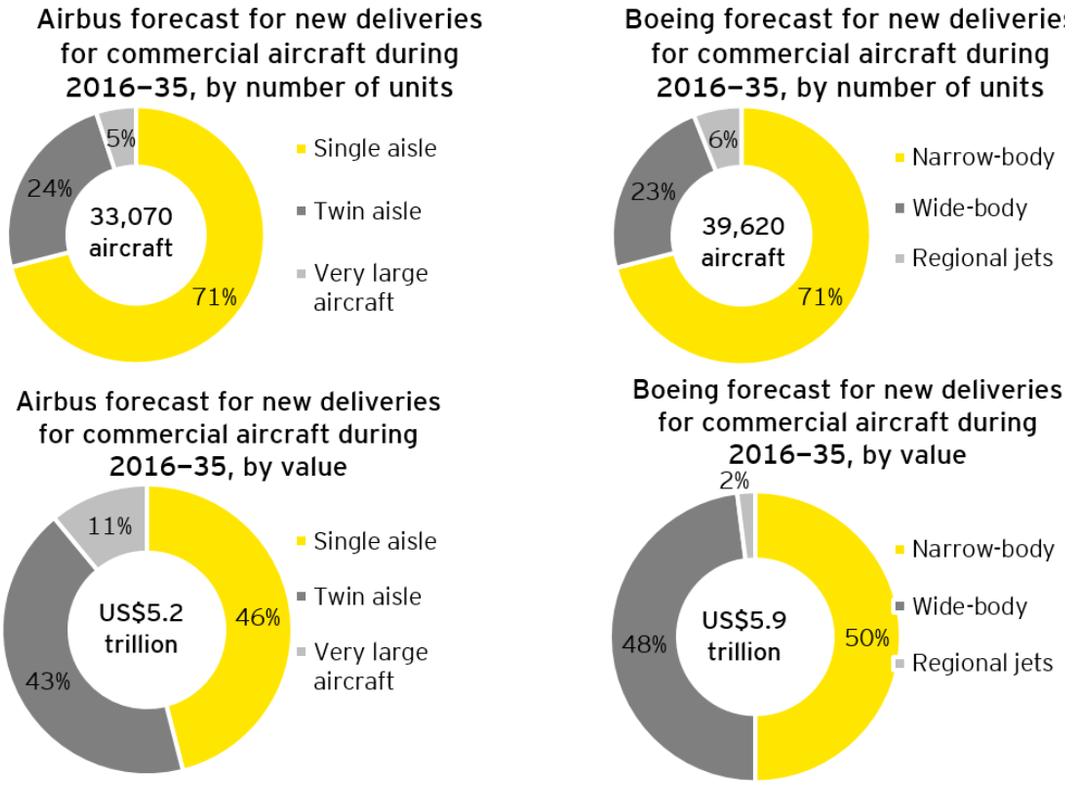
European nations are also increasing defense spending. Members of the NATO are considering a target of allocating 2% of their gross domestic product (GDP) for defense expenditure. In 2015, France, the UK, Germany, Italy and Sweden announced higher defense spending than previously planned. The increases were modest in most cases, but reflect a major change in domestic political sentiment and US political landscape.

Defense outlook in Asia and the Middle East

In Asia, China's resurgence and regional power play are driving its neighboring nations to strengthen their military strength. On the other hand, Middle Eastern nations will continue to ramp up defense spending to modernize their military forces. However, the rise in defense budget in the Middle East would be subject to constrained budgets because of lower oil receipts.

Global commercial aerospace market outlook

The commercial aerospace market has attractive opportunities with a positive long-term outlook, supported by rising global GDP, increasing global air traffic and record order books, which underpin 8–10 years forward production for the original equipment manufacturers (OEMs) and the supply chain. However, it is not without near-term challenges: the industry is executing an unprecedented ramp up of production over the next three to five years when it is already operating at capacity. Additionally, there is a transition from older aircraft and engines to new variants with more fuel-efficient engines, some of which are continuing to have quality issues as they enter into service.



Source: "Current Market Outlook 2016-2035," *Boeing, 2016;* "Global Market Forecast – Mapping demand 2016/2035," *Airbus, 2016;* EY Analysis.

The global commercial aircraft fleet size is expected to grow at 3%–4% CAGR over the next two decades, leading to a doubling in the global fleet to 45,000. Approximately 40% of the demand for new aircraft will be attributable to replacements of older and less-efficient aircraft, while 60% will be attributable to the growth in fleet size. Boeing estimates that during 2016–35, the demand for global commercial aircraft will be worth US$5.9 trillion for 39,620 new units, while Airbus predicts a demand for 33,070 new units worth US$5.2 trillion during the same period.

This growth in the fleet size will be driven by increased air travel, particularly in the emerging economies. Passenger traffic in different routes across the globe is expected to grow on an average at close to 5% CAGR till 2035. More than 70% of the demand for new aircraft will be for the narrow body segment, which are designed for shorter distance travel. Geographically, Asia-Pacific will contribute most of the growth in air travel, air traffic volume in the region estimated to increase three folds by 2035. Asia's share in the global commercial aircraft fleet by volume is expected to grow from 28% in 2016 to 38% in 2035. The region is expected to contribute to 40% of the global aircraft fleet by value in 2035.

In addition to the growth in demand for air travel, there will be an increasing demand for improvements in quality and comfort . This will necessitate OEMs to offer airlines increased efficiency combined with better passenger offerings, e.g., cabin comfort, in-flight entertainment and connectivity.

As A&D players gear up to tap these opportunities in both their commercial and defense businesses, they also face significant risks in pursuing them. These risks encompass their strategic initiatives, their financial position, their global operations as well as the compliance requirements in the different markets where they operate. The players with the best understanding of these risks will be in a better place to win the race of sustainable profitable growth.

We will now analyze the top 10 risks that major A&D players from across the globe are focusing upon.

1 Volatility in geopolitical and economic environment

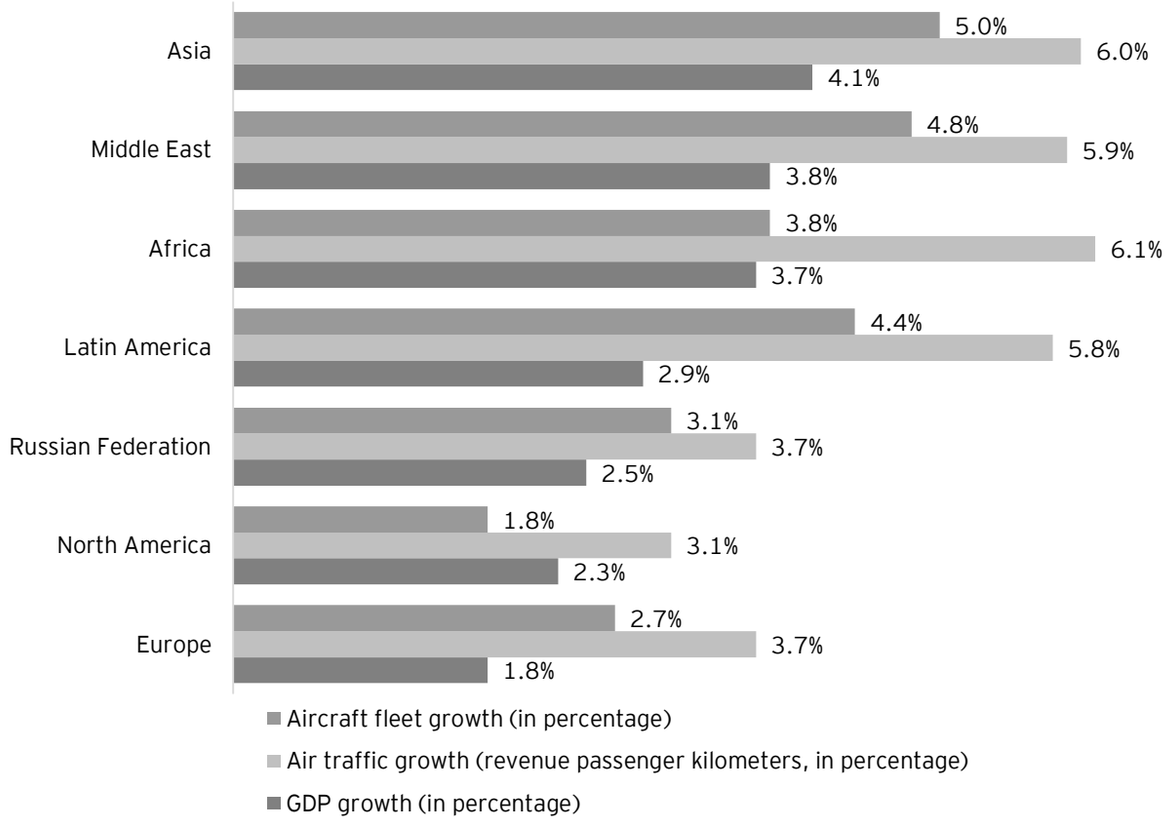
Threat of economic slowdown and rising political tension

Most A&D companies have a global footprint, so their operational as well as financial performance depend significantly on the geopolitical and economic conditions in their key markets. On the commercial aerospace side, sustained economic growth and political stability are major underlying factors to drive long-term growth in air traffic. On the defense side, political and economic conditions of the developed as well as emerging countries play an instrumental role in dictating the governments' allocation of funds for military purpose.

In the recent years, European financial markets went through significant disruptions due to concerns regarding the ability of certain countries in the eurozone to reduce their budget deficits and refinance or repay their sovereign debt obligations. On the other side of the globe, China has reduced its GDP growth target, indicating apprehensions of a slowdown of the world's largest growing economy.

Historically, economic growth has shown a great correlation with the growth in demand for commercial aircraft. The chart below highlights the expected growth in GDP, air traffic and aircraft fleet size across different geographic regions.

Forecasted growth in GDP, air traffic and aircraft fleet (2016–35)

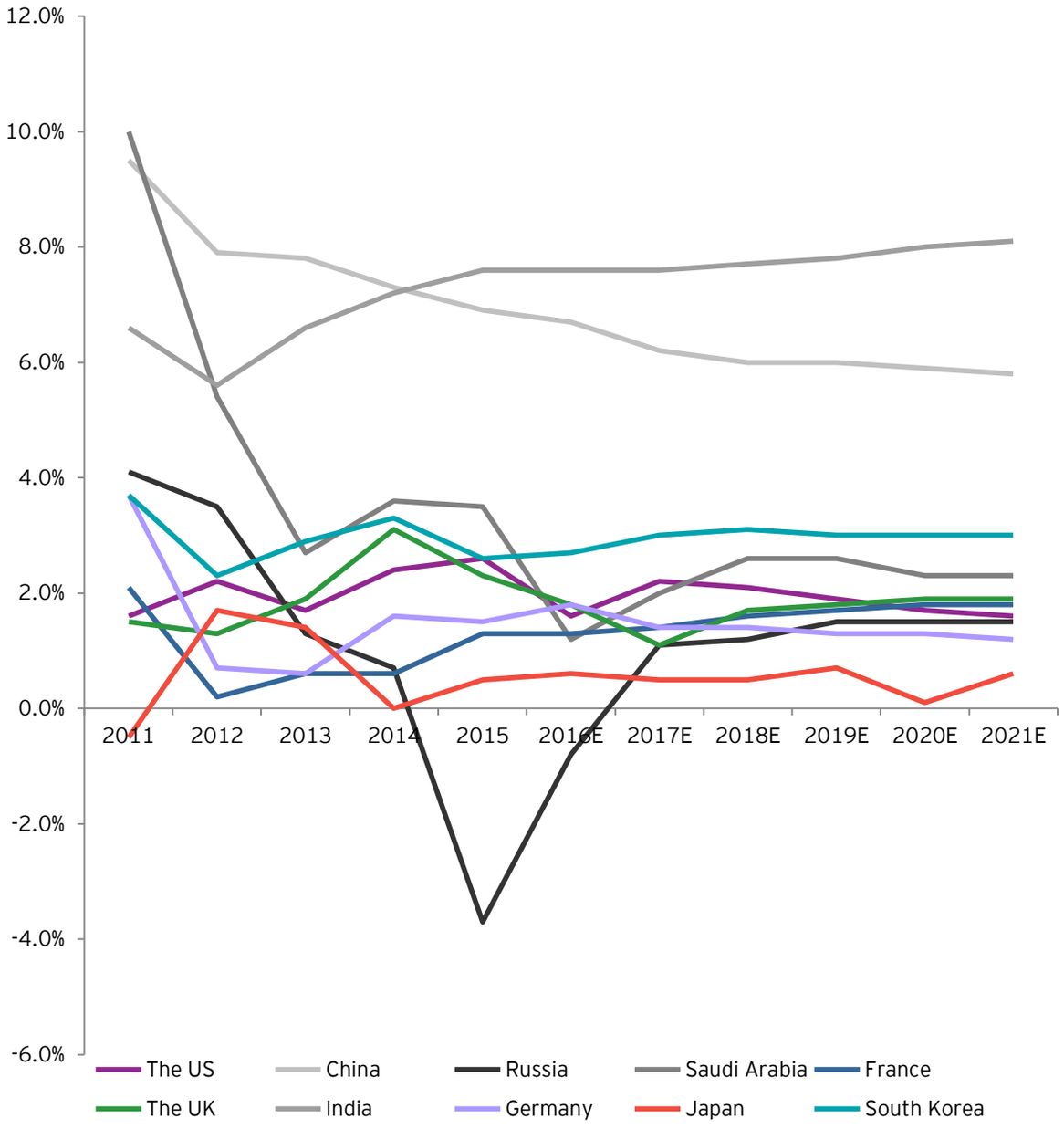


Source: "Current Market Outlook 2016-2035," *Boeing, 2016*.

The chart clearly shows that Asia and Middle East are expected to witness the highest economic growth in the next two decades. In line with the GDP growth in these regions, air traffic and aircraft fleet size are also expected to grow significantly during the same period. On the other hand, aircraft fleet growth as well growth in air travel would grow at a slow rate in North America and Europe, as the economic growth in both these regions are expected to be subdued at close to 2% per annum.

In the last five years, there has been much volatility in the GDP growth of the top five defense markets. Over the next five years, while the GDP of seven of the top 10 defense markets (the US, France, Japan, the UK, Korea, Russia and Germany) are expected to remain near-stagnant, China's GDP growth rate is expected to decline and India and Saudi Arabia's GDPs are expected to increase.

GDP growth rate of top 10 A&D markets (2011–2021E)



E: estimate

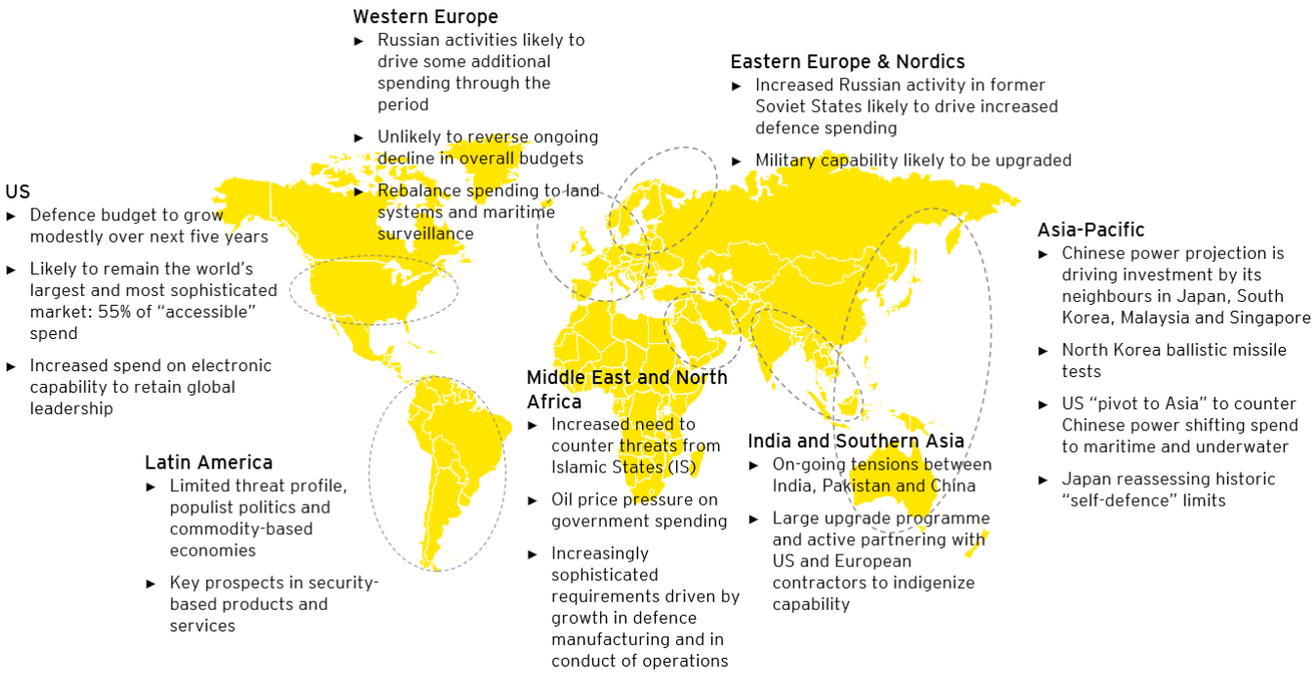
Source: *International Monetary Fund*, EY Analysis.

The world is more unstable — the fastest growing defense markets abut regions of significant national security tension

Terrorist activities are on a rise, particularly in the Middle East, Africa and Asian countries. The resurgence of the military power of Russia has started to destabilize the political situation in Eastern Europe. On the other hand, unstable geopolitical situations in the Middle East and North Africa are leading to heightened threat levels, insecurity and border uncertainty with increased migration and threats to people and assets. The ongoing need to monitor and protect borders in Europe, North America and Asia is leading to increased defense and homeland security spending by nations with a focus on intelligence, detection and monitoring.

The chart below highlights the changing threat environment in different parts of the world.

Global defense and security landscape — changing threat environment



Source: EY Analysis.

All these geopolitical factors are expected to lead to rising defense spending in most parts of the world. The changing geopolitical environment is also driving changed priorities for defense spending: while the 2000s saw the US and partners fighting "asymmetric wars" against terrorists and insurgents, the focus now is on high-value assets; reinvestment in fleets; and command, control, communications, computers, intelligence, surveillance and reconnaissance (C4ISR).

Companies must prepare themselves to counter the threat of a tight credit environment and order cancellations

An economic slowdown in any of the key markets for A&D players could potentially result into tightening in the credit markets; low liquidity; and extreme volatility in credit, currency, commodity and equity markets.

Customers might review their order intake strategies and eventually postpone or cancel existing orders for aircraft. In face of the declining financial health of their customers, A&D companies would need to provide increased sales financing to the customers to support their purchases, increasing its exposure to the risk of customer defaults.

After reaching a peak in 2015, order intake for commercial aircraft is expected to gradually slow over the next few years. Airbus's net orders for new aircraft declined by 32% in 2016 (731 in 2016 compared with 1,080 in 2015), while Boeing's net orders declined by 13% (668 in 2016 as compared with 768 in 2015). Order intake in first two months of FY17 has slowed further. While this is not a problem given the order books, it suggests growth will flatten once production has ramped.

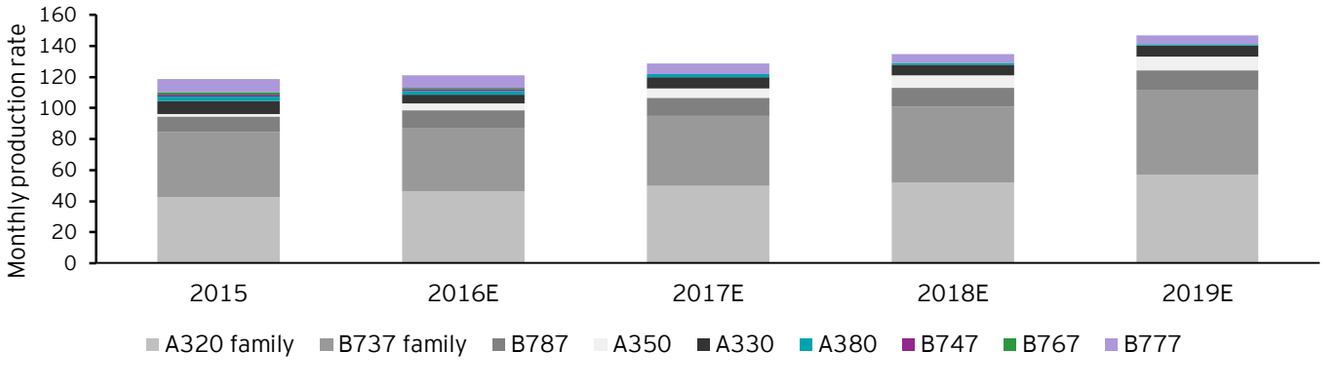
Furthermore, reductions in public spending for defense, homeland security and space activities could also result into loss of sales. In addition, changes in the economic environment and a reduction in defense budgets may adversely affect the financial stability of the key suppliers and their ability to meet their performance requirements, impacting the ability of OEMs to meet their customer obligations.

2 Managing the supply chain

Large supply chain network lead to risks of product delays and cost overruns

Record order books for commercial OEMs support forward production for 8-10 years. To deliver record order books, both Airbus and Boeing plan aggressive ramp up in production of narrow- and wide-body models. Additionally, new engine options are expected to accelerate growth in Airbus A330.

Monthly production rate forecast for Airbus and Boeing programs



E: estimates
Source: EY Analysis.

As OEMs ramp up production to deliver their large backlogs, suppliers across different levels in the supply chain would be under pressure for timely delivery, while maintaining quality and keeping costs under control. Achieving the right level of operational excellence and ability to access capital to support the production growth can be key challenges to A&D players to keep pace with the growing demand.

A&D companies depend on thousands of suppliers and subcontractors to procure raw materials, parts and subassemblies, and outsourced processing, e.g., treatment required for manufacturing their products. They depend on the supplier network to meet performance specifications, quality standards and delivery schedule of the products and services. The costs associated with each stage of the supply chain need to be as per the cost budgets so that the overall costs of production remain in control. The diagram below lists the key processes associated with a typical A&D supply chain.

Aerospace industry value chain

Design and modeling	Tier three suppliers	Tier two suppliers	Tier one suppliers	Aircraft assembly	Maintenance, repair, overhaul
Associated processes					
▸ Design infrastructure and services Research for aerodynamics, engine and communication system ▸ Testing	▸ Castings and forging ▸ Precision machining ▸ Fasteners, bearings and standard parts ▸ Wiring harness	▸ Electric power systems ▸ Flight controls ▸ Hydraulic systems and escape system	▸ Power plant and propulsion devices ▸ Avionics ▸ Landing gear assemblies ▸ Wing assemblies	▸ Super structures ▸ Engine installations ▸ Body and final assembly	▸ Inventory management ▸ Operations management ▸ Knowledge-based engineering ▸ Technical publications

Source: EY Analysis

While the aerospace industry does not have the same lean-production processes standard as in automotive, the supply chain is highly interlinked and global. Ability of OEMs to deliver on time and within quality standards is dependent on no suppliers failing to provide the right product or part at the right time. There is also a risk that the company has disputes with the suppliers or subcontractors related to the work specifications, quality of supply or customer concerns. The inability of key suppliers to perform could lead to cost overruns and delays in production schedule. For example, Airbus's A350 deliveries were delayed when a key supplier failed to meet its delivery schedule for some critical components.

Supply chains of A&D companies are also subject to risks related to their supply and network design strategies. Furthermore, as companies increasingly integrate their supply chain network, different parts of the supply chain network become well connected with one another. As a result, disruption at any part of the supply chain might lead to a cascading effect on the entire supply chain. Such disruptions may be related to technical glitches, cyber threats or data privacy.

Niche parts and processes pose a greater risk to on-time delivery

In some instances, rather than depending on a number of suppliers, companies depend on a single supplier for a particular part or a particular process in the supply chain which are niche in nature such as composite components, wing skins and seat track assemblies. In case of a supply disruption for these niche parts or processes, companies have few options to look for an alternate supplier, even at the cost of incurring additional expenses. Thus, a disruption from those single suppliers pose a greater risk in terms of production disruptions and cost overruns. Engagement with customers to understand supplier stability and that suppliers are making a "reasonable return" on work packages is critical. For certain scarce commodities, e.g., titanium, OEMs have developed in-country JVs to secure supply.

Further risks associated with the move to low cost countries

OEMs have expanded their footprint in emerging countries to capitalize on the increasing demand and low cost environment. In some cases, OEMs work with local suppliers in the emerging markets. While working with the local suppliers has significant cost benefits, it also gives exposures to additional risks such as political instability, intellectual property right violations, production delays as well as quality issues. More recently, labor price inflation in emerging markets and foreign exchange changes have led to a refocus on "right-shoring", returning production to home markets.

Investment to fund new programmes and technologies

New programmes require massive capital investment and OEMs moved to a model where suppliers are expected to co-fund development in exchange for access to long-term production contracts. Development costs are recouped on volume production. Further new programmes are likely to require similar access to capital and also in new technologies e.g. additive manufacturing to support more rapid new product induction (NPI) and lighter, stronger components with fewer manual processes.

"Supply chain is at the heart of any A&D organization's success. When working and operating effectively and efficiently, it enables the organization to meet its strategic and financial goals.

"The A&D sector is experiencing a significant growth in demand. The growth in demand increases pressure on the production capacity for OEMs and their suppliers. In the case of critical parts and assemblies, the number of available suppliers is small. For such parts, risk of production disruption due to supply failure is even greater. In addition, there is a growing need for investment to support the development of new platforms as well as to support the ramp up of key programs. Investments are required not only by OEMs, but tier one and tier two suppliers also need to be financially ready to invest in supporting the development and ramp up programs. The financial viability of the suppliers to make these additional investments also adds to supply chain risks.

"Our supply chain capabilities help OEMs and suppliers address supply chain risks around capacity, throughput, and integrated business planning. Our advisory skills and experience help organizations to transform their manufacturing function and associated processes in relation to profitability, efficiency and their strategic goals. Furthermore, our digital capabilities help them identify and implement the right set of digital technologies to make their supply chain more efficient in terms of cost and productivity. We help our clients establish an effective supplier risk program that manages all critical supplier risk areas. By understanding, measuring and monitoring supplier risk, we help our clients improve the reliability of their suppliers and achieve their economic objectives."

Bill Colbert, Partner, Advisory — US, Ernst & Young LLP

3 Competition in domestic and international markets

Dominance of Airbus and Boeing in the commercial aircraft market

The large commercial aircraft market is a duopoly market with Boeing and Airbus collectively holding approximately 80% of the market share. Both have aggressively pursued orders with emerging market airlines and the growing low-cost-carrier segments, often with favorable financing terms. Boeing and Airbus are the only players in the wide-body segment and dominate the narrow-body segment. Other players, such as Bombardier and Embraer, are present in the regional aircraft segment. The narrow-body aircraft manufacturers also face some competition from Bombardier's C-Series and will face new entrants such as COMAC and Mitsubishi. COMAC in particular is likely to succeed given its ability to support a captive domestic market and Bombardier has secured an investment in C-Series by the province of Quebec in return for equity. However in the medium term, opportunities for the new players are likely to be limited given the dominance and long order books of the Airbus-Boeing duopoly, which has effectively locked out new entrants.

Within the fragmented commercial aerospace supply chain, consolidation has continued, in part with the support of OEMs seeking stronger suppliers with access to capital as partners, which can support and partly fund new programme development. Larger tier one and tier two suppliers have increased bargaining power with the OEMs given constrained production capacity. This has led to expanded margins at these levels at the expense of the OEMs. It has also driven increased M&A activity and increased pricing as strategic and private equity groups compete for scare assets.

In maintenance, repair and overhaul (MRO) and broader aftermarket, structural headwinds have created challenges. New sensor technology allows engine OEMs to control timing of maintenance and the OEMs have changed their business models toward "through life total care", reducing MROs share of spend. Airlines have been more rigorous on MRO costs. Aftermarket-focused businesses with long-life programmes have seen traditional high-margin pricing affected by the growth in the surplus parts market, aided by increased supply of parts as older aircraft are on verge of retirement.

Rebalancing of portfolio and consolidations in defense industry

The defense industry counts a small number of large players: major US defense primes such as Boeing, General Dynamics, Lockheed Martin, Northrop Grumman, Raytheon, and large European players such as BAE Systems, Leonardo and Thales dominate the global market, followed by national champions in the main spending countries. Airbus , Safran and Rolls-Royce are some of the major European players with balanced presence in both commercial and defense businesses. Further, the industry is witnessing consolidation where large players are rebalancing portfolios and merging to increase their capabilities and enhance their competitive position. More than 200 M&A deals have been completed every year on average since the last five years, as part of this ongoing consolidation in the industry.

Selecting the best bids to participate is an important consideration

It is important that A&D companies participates in the right bidding competitions, given the large costs and efforts associated with the bidding processes for large contracts. Competition within the industry also lead to increased bid protests as companies in the peer group, at times, pressurize government bodies to provide the rationale of awarding a contract to a specific player. For instance, Lockheed Martin filed a petition with the US Government Accountability Office (GAO) in 2015 against a US$67 billion contract awarded to Oshkosh for the Joint Light Tactical Vehicle (JLTV), triggering 100-days halt on production of the JLTV. Such bid protests might result into a delay in starting the contract activities and might also lead to award decision being overturned in more severe circumstances.

Governments are reaching out to non-traditional A&D players for information technology (IT) solutions

In the face of budget constraints, the governments are focusing on cost in their push to identify more affordable solutions. Their efforts have included performing certain work internally rather than hiring a contractor and reducing product development cycles. They also fragment large contracts, especially IT and service contracts, into multiple smaller contracts, and award the smaller contracts to comparatively smaller companies primarily on the basis of price competitiveness. This creates increased competition for large players who generally have little competition from smaller players in case of large contracts.

Furthermore, non-traditional players outside of the A&D industry, particularly IT companies are challenging A&D players in the technology and cybersecurity solution markets. Some customers including the US Department of Defense (DoD) are turning to commercial contractors, rather than traditional defense contractors, for products and services in the IT and cybersecurity domain. IT players are also offering services and products related to avionics systems, manufacturing engineering, and service life cycle management, sourcing and engineering. For instance, the US DoD awarded a US$4.3 billion contract to IT players, Accenture, Leidos and Cerner for electronic health record solutions for the DoD's Military Health System in 2015. In 2016, the US Defense Information Systems Agency (DISA) awarded a US$320 million contract to IT major IBM to update the point-of-sale system at US military commissaries worldwide.

"Assessing the impact of consolidation on a company's position in the supply chain and the ongoing relevance of its portfolio is a critical part of strategy planning:

- Aggressive acquisition pricing by consolidators and "strategic premiums" paid by emerging market entrants are seeking to acquire technology that can be deployed more broadly or in their domestic market.
- Increased activity by activist investors means companies need to continually reassess their portfolio and to understand and communicate clearly on their strategy.
- Key customers and partners need to sponsor the acquisition. The acquirers have to ensure that the customer, which is likely to need to approve the deal, see the acquirer as a stronger and better owner of the target.

"Acquisitions to rebalance the customer portfolio, e.g., to reduce dependence on one of the OEMs can work. However, value growth comes when customer trust that transferring further work packages will benefit the customer in terms of quality improvements and increased investment in new product development.

"In the defense arena, consolidation has continued, although tempered, in most markets by desire to maintain sovereign capability. Nevertheless, we expect continued consolidation of the European defense supply chain, driven by governments seeking cross-border development of common defense platforms to share development costs and enhance interoperability."

Matt Ward, Director, A&D Transaction Advisory Services (TAS) — UK, Ernst & Young LLP

4 Managing and retaining talent

Highly engaged, talented workforce can help companies to gain an edge in the marketplace

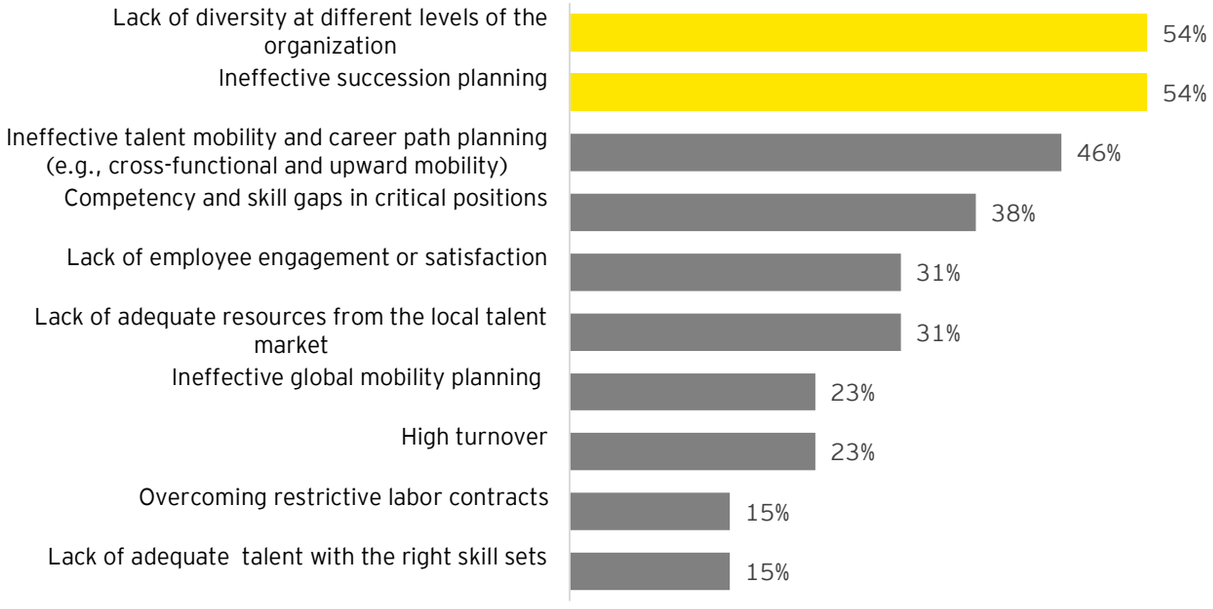
Because of the specialized nature of the business, companies are highly dependent on the continued services of key engineering personnel and executive officers. They are also dependent on the development of additional management personnel and the hiring of newly qualified engineering, manufacturing, marketing, sales and management personnel for operations.

The products and services provided by A&D players involve sophisticated technologies and engineering, along with complex manufacturing and system integration processes. Because of the highly specialized nature of the business, companies must hire and retain the skilled and qualified personnel necessary to perform the business-critical processes. In addition, certain personnel may be required to receive security clearance and substantial training in order to work on certain programs or perform certain tasks.

Ineffective succession planning, a lack of diversity and limited options for talent mobility are the major challenges for talent management in A&D

EY conducted a survey to identify the major challenges faced by A&D companies around talent management. Respondents identified ineffective succession planning, and lack of diversity as key areas of opportunity for improvement. A list of the top talent management challenges faced by A&D companies is given below.

Top talent management challenges in A&D*



*Percentage of HR survey respondents

Source: "What are your top talent management challenges?," *Enabling talent to drive innovation in aerospace and defense*, June 2016, EY, 2016.

Companies need to manage leadership development and succession planning throughout their business. While most of the companies have processes in place for management transition and the transfer of knowledge, the loss of key personnel, coupled with an inability to adequately train other personnel, hire new personnel or transfer knowledge, could significantly impact their ability to perform under their

contracts. On the other hand, as A&D players expand their operations internationally, it becomes increasingly important to hire and retain personnel with relevant experience in local laws, regulations, traditions and business practices. Inability to attract and retain qualified personnel, and maintain a diversified workforce at different levels of the organization might lead to materially adverse effect on revenue and earnings. Additionally, the average workforce demographic continues to shift toward a higher proportion of employees nearing retirement. To the extent that companies lose experienced personnel, it is critical that they develop other employees, hire new qualified personnel, and successfully manage the transfer of critical knowledge.

Competition for skilled personnel is intense, and companies are subject to the risk of not being able to hire or retain personnel with the requisite skills or clearances. A&D companies have to increasingly compete with commercial technology companies outside of the industry for qualified technical, cyber and scientific positions as the number of qualified engineers is decreasing and the number of cyber professionals is not keeping up with demand. As commercial technology companies grow at a faster rate or face fewer cost and product pricing constraints, they may be able to offer more attractive compensation and other benefits to candidates. To the extent that the demand for skilled personnel exceeds supply, A&D companies could experience higher labour, recruiting or training costs in order to attract and retain skilled employees. If they are unable to hire or retain talent, they could experience difficulty in performing key contracts. Furthermore, at difficult times, endeavors to increase operational efficiency through workforce reductions, and consolidating and relocating certain operations may challenge the companies' ability to retain talent.

"A highly engaged talent pool helps A&D companies to gain competitive edge in the market and is critical for the success of an organization.

- There is a need to broaden the talent pool to avoid skill shortages, foster innovation and encourage growth. Businesses must attract people from broader talent pools to build a sustainable growth in the competitive marketplace.
- In addition to maintaining a talent pool with the right technical and operational skills, diversity of talent is also extremely important for an organization's performance. An EY survey has shown that companies with diverse teams report better financials than those with homogenous teams. Diverse teams produce more accurate and reliable results and a diverse workforce also enhances an organization's ability.
- The global nature of business in the 21st century creates a growing need for an inclusive workplace environment. Companies need an understanding of international, cross-cultural competencies because they have to regularly deal with suppliers, customers, and partners from various countries and cultures around the world.

"We work with organizations to assess where they stand in the journey of equality, diversity and inclusiveness (EDI) and how they compare with industry peers. We guide them to identify the strengths and improvement areas, and assist them to develop an EDI strategic delivery plan."

Arun Batra, CEO, National Equality Standard — UK, Ernst & Young LLP

5 Ability to perform in key contracts

Failed contracts or programmes adversely affects the brand value and financial performance of A&D companies

A&D players are typically involved in multi-million dollar contracts and have huge backlogs. New development programs involve complex design and new technologies which are, in many cases, untested or unproven. As a result, A&D players can experience technological challenges and other performance hindrances resulting in delays, setbacks, cost overruns and product failures. In some instances, product requirements or specifications may also be modified during the course of the program. The delays might result in termination of contract resulting in financial losses for the OEM. For instance, an aircraft OEM had lost billions of dollars primarily because of cancellation of contracts due to delay in deliveries in a next generation aircraft program. The company will also likely face over US$30 million loss for each of its first 50 deliveries of the aircraft.

Source: EY Analysis.

A&D players are witnessing a rise in cost-reimbursable contracts, especially with the governments. The increasing commitment of companies to guarantee a certain level of performance is translating into higher risk exposure in case the performance level is not achieved. This is even more critical in a highly competitive environment where companies accept more challenging guarantees on performance and availability.

Failure to deliver major programs on time as well as adhering to quality and technical standards within budget, in case of both fixed price and cost performance contracts, might lead to negative consequences such as termination of orders, imposition of penalties and loss of orders. The estimated delivery timeline for Boeings KC-46 tanker program has already been delayed by 14 months than initially planned, because of additional costs related to design changes, supply chain issues, testing and manufacturing complexity. Delivery delays and performance issues with key programs also lead to contract renegotiations with key customers. For instance, one of the gulf-based airline companies refused to take deliveries of Airbus A320neos since December 2015 after performance issues with the engines of the aircraft. The company is renegotiating with Airbus to change its orders for A320neo to A321neos with a different engine option.

Ability to deliver the challenging production ramp up on new programmes

In both civil and defense businesses, the challenge of delivering the production ramp up is critical, at all value chain levels. Both Airbus and Boeing are focusing on ramping up production to keep pace with heavy delivery commitments for their key programs. Boeing plans to ramp up the production of 737 Max from 42 units per month in 2016 to 57 units per month in 2019, while Airbus plans to ramp up a number of major programs including A350 XWB, A380 and A320 Neo.

"All companies in the sectors have some major program under development and in the first stage of development. In the commercial aircraft business, with a limited number of players, the innovation lead is critical and designing the most competitive aircraft to fill the growing market segments is the key for long-term series and profits. Achieving the development milestones on time and containing the engineering costs is a huge challenge, but the most complex piece of the game often comes at the start of the industrialization phase, and continues with production ramp up. Delivering major programmes on time, within budget and to specifications is fundamental to generate sustainable growth and free cash flows to invest into the next generation of product.

"Project management is, of course, at the core of the success: speed of decision-making, clear accountabilities, integration of customer needs and supplier constraints, ambitious but realistic targets, an open culture enabling to raise issues and a clear understanding of the risks. The supply chain plays a critical role in the whole value creation chain and are vital to the new programmes. To manufacture an A380, more than six million parts are assembled, from 7700 suppliers in 20 different countries. Some suppliers, in particular, engine manufacturers and cabin suppliers, are facing significant difficulties to deliver the ramp up expected by the aircraft manufacturers and have been at the origin of the delay in some recent new programmes entry into service. As supply chains have become more interconnected and global, they have also become more vulnerable, with more potential points of failure and less margin of error for absorbing delays and disruptions.

"Auditing A&D programmes to confirm the risks are properly reflected in the financial statements of the company is also a challenging exercise. We have developed within our A&D sector a group of auditors having a sound understanding of the business and a strong experience in long-term contracting and accounting. Our teams are involved in the audit of aircraft manufacturers, engine manufacturers, tier one and tier two suppliers, and also defense contractors, all around the world and are connected to share the best practices among our teams and to share them with our clients. Recently, we have organized several roundtables with the key A&D players on the difficulties and opportunities to apply the new revenue recognition standard the valuable input of International Accounting Standards Board (IASB) and Financial Accounting Standards Board (FASB) task force members. The objective of these A&D roundtables is to build a community to share points of view and leading practice on arising topics in accounting, regulation, tax or advisory and to engage discussions on new trends in the industry."

Sarah Kokot, Partner, Assurance — UK, Ernst & Young LLP

6 Compliance to a wide range of regulations and restrictions

A&D players operate in a highly regulated environment across many jurisdictions

Companies have to comply with the laws and regulations related to the award, administration and performance of contracts, especially for the government contracts. They face various laws and regulations relating to the export of products and services as well as use of technology. Failure to comply with any of the regulations could result into severe consequences, such as imposition of fines and penalties, termination of the whole contract, suspension or debarment from bidding on or being awarded government contracts, and civil or criminal investigations or proceedings.

High exposure to bribery and corruption risk

As the customer base for A&D companies include government customers and defense agencies, they have to operate in a highly regulated environment. This subjects A&D companies to added scrutiny around corruption and bribery. Furthermore, A&D companies often work in partnerships a number of small and non-consolidated entities. These entities have a lower level of control and oversight from their parent groups and presents higher risk of fraud and corruption. Operating in countries with high level of corruption often multiplies the level of exposure to corruption and bribery litigations. Involvement in bribery or corrupt practices may lead to severe consequences, such as order cancellations or even blacklisting. For instance, a leading European defense company was blacklisted by the Government of India on the face of alleged corruption charges related to a helicopter acquisition program.

A&D players have to comply with a large set of laws and regulations

In defense contracts, the contractors have to comply with several procurement regulations and several mandates around information security, contract pricing and project costs. They are also subject to audit and product integrity requirements. Another key regulation for the defense contractors is the offset obligation. In certain countries foreign A&D players must abide by specific offset terms and conditions to become eligible to supplying defense equipment to those countries. For instance, for large supply contracts with the Indian Government, a foreign player must invest back 30% of a contract value to the local industry. Similarly, Israel has an offset requirement of 35% of the total value of a contract.

In commercial aerospace, there are regulations around aircraft design and maintenance, typical airline flights, pilot training activities, lighter-than-air aircraft, man-made structure heights, obstruction lighting and marking, model rocket launches, model aircraft operation and drone operations. In the US, the Federal Aviation Administration (FAA) has authority to regulate all aspects of civil aviation in the country, including airports, air traffic control, aviation safety and commercial space transportation. The design, production and maintenance of all the aircraft to be flown in US require FAA approval. While these regulations are critical for passenger and operator safety, they also makes it imperative for OEMs and suppliers to maintain high-quality standards of their products and services.

Furthermore, A&D players are also subject to risks associated with changes in accounting and revenue recognition standards. For instance, the FASB recently proposed a new revenue recognition standard, Accounting Standards Codification (ASC) Topic 606, which outlines a model to determine how and when to recognize revenue on a contract-by-contract basis. Under this standard, A&D players would need to recognize revenue at a single point in time for contracts that don't qualify for revenue recognition over time. As a result of this, companies may see periodic and variable impacts on their revenue due from adjustments in contract estimates, particularly on large contracts with a longer performance period.

Being a technologically advanced market, the A&D industry is subject to intellectual property infringement risks

A&D companies own intellectual property portfolios consisting of patents, unpatented trade secrets and know-how, data, software, trademarks and copyrights. They enter into different types of confidentiality agreements, such as intellectual property (IP) agreements and non-disclosure agreements, with their employees, suppliers and some customers to prevent disclosure of trade secrets and other proprietary information. However, in some cases these measures may not be sufficient to deter misappropriation confidential information. Furthermore, the IP laws vary from one country to another. The protection provided to the IP by the laws and courts of foreign nations may not be as adequate for A&D players. As a result, operating in large number of foreign countries exposes the companies to risk of IP rights violations. For instance, sensitive IP owned by two US-based military aircraft manufacturer was stolen by hackers and was allegedly passed on to an emerging country manufacturer a few years back.

Export control laws and regulations can significantly affect financials of a company

Export of some critical defense products is subject to licensing and export controls by the jurisdiction where those are produced. The export controls can become more restrictive driven by political factors or changing international circumstances and are highly dependent on the relation of the involved countries. Lower number of export markets where the defense contractors can export, may have a significant adverse effect on the business, results of operation and financial condition as more than 50% of the revenues for A&D players comes from export markets. As the companies operate in a large number of markets, they are subject to different regulatory mandates in different markets. Some of these regulations might be very much local in nature, meaning the regulation in one country might be in contradiction to that in another. Complying with such a wide range of regulations is a further challenge. Any failure to comply could result in suspension of the export privileges.

"The use of third-party agents is a valuable, if not sometimes critical business tool, particularly when entering new or emerging markets. At the same time, a significant proportion of historic bribery cases have centred on the use of agents as a conduit to channel bribes. Therefore there has been significant guidance, and increasingly some sanctions, from the regulators with regard to the use of third-party agents. This has typically focused on the need for clients to undertake (and document) thorough due diligence on an agent or third-party intermediary, to include their reputation, background and potential connections to governments or government officials. The guidance has also focused on having companies ensure their agents are aware of, and sign up to compliance with companies own anti-bribery policies and procedures.

"In reality however, it is not necessarily the due diligence that will flag up the risk of the intermediary, but it is the nature of transactions they are being paid for and the substance of these transactions. Unfortunately, compliance departments too often rely on the due diligence and contract process rather than examining the transactions themselves. The company needs to understand the commercial rationale of the agents contract – what are they actually doing for us and how does this equate to what we are paying them? For distributors, the margins will be important – is a distributor earning a disproportionate amount of margin compared with others, which may indicate he is obtaining slush funds to pay a bribe. Our forensic teams have developed specific analytics to be run against third-party agents and consultants in those countries that we deem to be of higher risk, from tracking suspicious payments to analyzing the contractual terms using unstructured text analyzer."

Richard Abbey, Partner, Anti-Bribery and Corruption — UK, Ernst & Young LLP

7 Capacity to innovate

Innovation requires large upfront financial investments

Offerings in the A&D industry involve high-end technologies and engineering, as well as complex manufacturing and system integration processes. The demand from the end users is evolving and changing regularly. To strive in the current era of rapidly evolving technologies across industries, A&D companies need to constantly focus on innovations on their product and services offerings. It is also very important for A&D players to create the right infrastructure for fostering innovation through funding in-house R&D, collaborating with industry partners and partnering with the academia.

Some of the technologies that A&D players use in their manufacturing and other business processes are decades old. They need to upgrade these technologies on regular basis as well as adopt new and advanced technologies to stay competitive. The advancements in internet of things and digital technologies makes it even more important for aircraft manufacturers and their suppliers to look for opportunities to offer new products and services in both original equipment (OE) and aftermarket sides of their businesses. While OEMs are using the digital technologies to improve the performance and efficiency of their aircraft and parts, aftermarket service providers are extensively using sensors to capture in-flight data to facilitate predictive maintenance and associated services.

A&D players are also increasingly adopting digital and advance manufacturing technologies in design and production of their products. Digital technologies, such as industrial internet, and advance manufacturing technologies, such as 3D printing, help them reduce supply chain lead time, improve reliability and productivity, and simplify designs. For instance, GE Aviation is using 3D printing for manufacturing of fuel nozzles, which has drastically reduced the number of parts required per nozzle from 18 to 1. To further enhance its advanced manufacturing capabilities, GE announced the acquisitions of Europe-based Arcam AB and Concept Lasers and is establishing a "GE Additive Customer Experience Center" in Germany. Among OEMs, Boeing has about 50,000 3D printed parts flying on its commercial, space and military products. Airbus, on the other hand, is focusing on using additive manufacturing for not only prototyping and parts manufacturing for a wide range of aircraft, but also for spare parts solutions.

In addition, A&D companies need to improve engineering processes to improve time to market, improved quality, product reuse and significantly cut costs. Simplifying engineering would also simplify supply chain complexity. The future performance of A&D players would largely depend on a number of factors related to innovation, such as:

- Ability to recognize the emerging trends in technology in the current and future markets
- Identify additional uses for existing technology to address customer needs
- Capacity to develop new technologically advanced offerings and enhance them by adding innovative features
- Ability to develop, design, manufacture and bring innovative offerings to market at cost-effective prices
- Enhance product designs for export that are in accordance with all the compliances and regulations of the export destinations

As A&D companies undergo a significant growth in their business, they need to make an effort to streamline their operations. They also need to focus on a number of transformational activities including consolidation, lean initiatives and system integration. To support the growth in business, companies need to adapt to innovative ways to manage their internal operations and business transformation processes. It is also extremely important to anticipate the market's future direction and to understand the needs of the customers with foresight and clarity. Innovation enables companies to create early product or service concepts that help them remain ahead of competition.

Inability to innovate new products and services can significantly hamper the future businesses of A&D players. Further, innovation requires large R&D investments and players need to continuously invest financial resources to develop new offerings. These expenditures could divert attention and resources from other projects, and might result in delay in those projects.

Leading OEMs, such as Airbus and Boeing, are focusing on establishing new technology and innovation centres to boost their capacity to innovate. For instance, Airbus has opened an innovation centre at San Jose in the US with a fully independent VC fund, while Boeing has opened its new research and technology centre at St. Louis in the US. Companies are also focusing on new appointments for improving innovations. For example, Airbus appointed Paul Eremenko as its new chief technology officer (CTO) and Marc Fontaine as the digital transformation officer (DTO) in 2016.

"A company's greatest opportunity to drive both top-line and bottom-line business results is through investments in R&D. In addition to being a reflection of a firm's business strategy, the R&D portfolio is also one of the primary tools to manage risk through the diversification of investments. The ability to ensure that both financial and human capital resources are in the right place at the right time will largely determine whether or not a company will achieve their innovation or business objectives.

"The successful management of R&D spending requires three primary capabilities. The first is the ability to estimate a company's resource requirements on the basis of the physical attributes of their R&D investment portfolio. The second is the ability to allocate those resources across the competing demands in such a way that maximizes business results. The third capability is the ability to manage resources in real time. As everyone knows, all plans need to evolve when put into action.

"We provide an integrated services to our customers that supports capital planning and forecasting business processes used to manage thousands of engineering resources and billions of dollars in annual capital investment. The solution improves resource allocation and decreases the time required to deploy budget, thereby supporting increased productivity and improving investment efficiency."

Bart Huthwaite, Partner, Performance Improvement Advisory Services — US, Ernst & Young LLP

8 Failure to realize the benefits of M&As and partnerships

Improper due diligence can lead to undesired results from M&As and partnerships

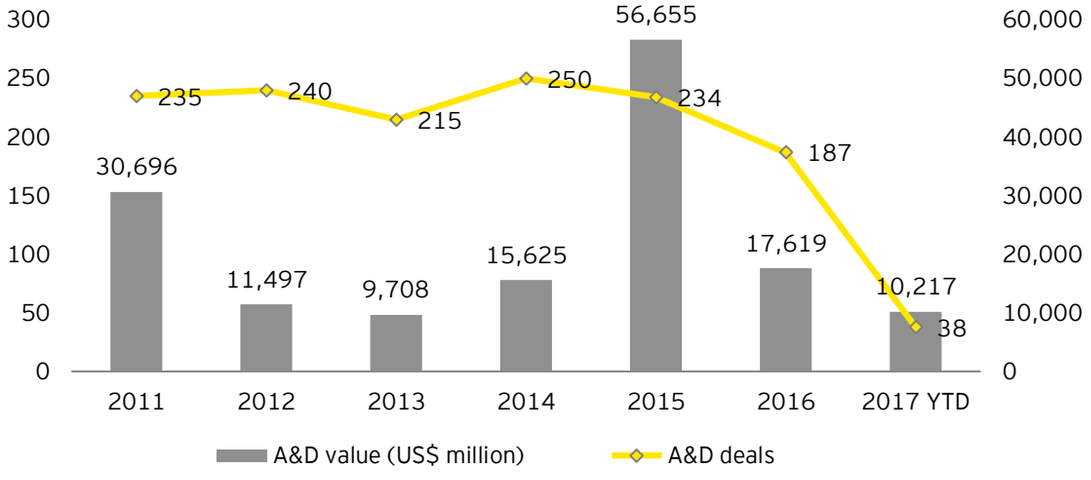
Through M&As, A&D players identify opportunities that will complement their existing products, technologies, services or customer base. M&As also help them to expand their offerings to new markets. The anticipated benefits from acquisitions, JVs, partnerships and related activities broadly depends on the following factors:

- Ability of the acquirer to integrate its existing operations to the operations of the acquired business
- Performance of the underlying product and service portfolio of the acquired company
- Performance of the management team and other personnel of the acquired company

The A&D industry witnessed a surge in the deal values in 2015, where the total deal values were more than US$56 billion compared with US$15.6 billion in 2014. The surge included a record US$31 billion acquisition of Precision Castparts by Berkshire Hathaway.

In 2016, approximately 187 M&A deals were completed or announced in the A&D industry, with a total deal value of over US$17 billion. In 75 of these deals, the acquirer companies were based in the US, while in 25 of these deals the acquirer companies were based in China. In 2017, 38 A&D deals were completed or announced till 31 March 2017, with a total deal value of over US$10 billion. The largest deal announced during the first quarter of 2017 was the acquisition of Zodiac Aerospace by Safran Group for over US$9 billion.

Year-wise M&A deals completed and announced in A&D, 2011–17 year to date (YTD)



*Number of deals includes deals with undisclosed values; 2017 YTD: 1 January 2017–31 March 2017

Source: Thomson One, EY Analysis.

While evaluating new M&A transactions, companies are required to take decisions regarding the value of business opportunities, technologies, other assets and cost of potential liabilities. Poor M&A decisions might result into overvaluation of the acquired business, failure in achieving synergies, inability to retain talent, and financial challenges.

"One the keys to realizing the benefits from an acquisition is successful integration and synergy capture. Boards are demanding improved and accelerated results from M&A activities. Shareholders and analysts are also more critical of financial performance immediately post-close. A well-planned and executed integration is paramount to a successful acquisition.

"Despite being influenced by many internal and external factors, inadequate integration planning and execution are cited as the most common points of failure. More specifically, many integrations fail to meet their expectations for one or more of the following reasons:

- Failure to articulate coherent vision and strategy
- Failure to completely quantify and capture deal value
- Failure to control the integration process
- Failure to understand the impact of the significant change

One or more of these failures will lead to organizational uncertainty, missed synergy targets, loss of value, and poor morale and loss of talent.

"The key to integration and synergy capture is to coordinate very dynamic and complex activities, in a manner that meets objectives as effectively as possible. Synergy focus should start at the transaction onset with identification, tracking and measurement incorporated throughout the integration process. This establishes the framework for value creation on the transaction. Using synergies as a "North Star," with clearly defined targets, owners, metrics and processes is paramount to a successful integration. What gets measured, gets done. Some of the leading practices for companies that integrate well are:

- Begin early and with urgency
- Establish clear goals and expectations
- Align the strategic rationale with the integration approach
- Plan for a seamless day one and accelerated end state
- Deliver meaningful change management and employee communications
- Utilize effective governance, project management office (PMO) structure and tools"

Mike Iacono, Senior Manager, A&D TAS — US, Ernst & Young LLP

Faced with decreasing growth in core OE production, the OEMs are actively pursuing aftermarket opportunities, looking for distribution and service models. This is creating tension with MRO providers, historically a key customer group, particularly within the engine segment where the OEMs are moving toward through life support models underpinned by ownership of operational data. Data capture provides new revenue models and increased predictive maintenance, which drives airlines availability.

A&D companies also form JVs in international markets to increase their global presence as well as to bring services closer to their customer base. Furthermore, many defense companies need to form JVs in developing countries as part of their offset obligations. In some of the offset arrangements, the global players need to transfer some technology know-hows to their local partners in these. The technology transfer related to the JVs carry the risks of IP violations and copyright infringements.

Large players also make strategic divestitures on a regular basis to focus on their core business or dispose underperforming businesses. For instance, Lockheed Martin has divested its Information Systems and Global Solutions (IG&S) businesses to focus on its core businesses while Leonardo-Finmeccanica has already sold off its transportation business. These divestments can sometimes result in continued financial involvement in the divested businesses through guarantees or other financial arrangements. Non-performance by those divested businesses could affect the future financial results through additional payment obligations, higher costs or asset write-downs.

"Rigorous assessment of the attributes of an acquisition and honest assessment that an acquirer has a realistic chance of acquiring the target is critical in assessing how and where to deploy scarce capital. Deal success comes down to a number of factors including:

- Target's strategic fit is well understood and the capabilities it brings are complementary: our global A&D transaction teams have supported buyers acquiring in emerging markets and Eastern Europe to "right-shore" the supply chain, balancing low cost with proximity to customers' sites, IP protection and quality of management and staff. Additionally, technology developments, e.g., additive manufacturing, which is a game changer for the production process, increased use of sensors and capture of data, drives acquisitions to future proof the business by gaining positions in growth areas. Rigorous and regular portfolio analysis against relevant criteria enhances this decision-making.
- Ability to transact and competitive risk in the transaction process is understood: which of my competitors are keen on the asset and can I compete at the likely price. Lining up funders with early knowledge of the asset and the opportunity will increase their speed in providing new funds to support the deal.
- Understanding the quick wins and value-accretive levers: optimizing working capital can free up cash and provide rapid payback on a deal and benchmarking against current business and peers is a quick "acid-test" of the size of the opportunity.

"Capturing this requires a broad internal deal team involving corporate and business unit leads and well-resourced experienced advisors."

Matt Ward, Director, A&D TAS — UK, Ernst & Young LLP

9 Exposure to cybersecurity events

Increased digitization increases the threat of cyber attacks on the A&D players

A&D players transfer large volume of data including flight data monitoring, flight operations quality assurance and load management between end users, manufacturer and service provider. Companies involved the A&D value chain routinely exchange confidential data on specifications, technology and performance of equipment or services with the objective of enhancing collaboration on design, development and support. All such data is valuable for cyber terrorists with unethical clients in the industry, who use this stolen data to copy products and undercut prices to outperform competition.

In commercial aerospace, key aircraft functions, such as flight navigation and control, propulsion, landing and braking, and information systems, are managed by embedded electronic systems and safety-critical software. The critical data generated during the time of the flight is analyzed for better flight safety and optimization. On the defense side of the business, upgradation of existing weapons as well as increased focus on intelligence, surveillance, and reconnaissance (ISR) systems have increased the information flow within the supply chain. Furthermore, the confidential and sensitive nature of the information around program specifications and technologies involved necessitates the usage of reliable and enhanced cybersecurity solutions.

With increasing dependency on internet network by military organizations, the frequency of sophisticated and organized cyber attacks is on the rise. Furthermore, the traditional methods of defenses against cyber threats become ineffective against new types of cyber attacks and advanced malwares. Companies need to invest in next generation cybersecurity solutions to be able to prevent themselves against advanced cyber attacks.

The total losses incurred by companies across different industries because of cybercrimes is estimated to be approximately US$400 billion per year. Leading A&D players have to constantly defend themselves against large cyber attacks by hackers backed by enemy countries as well as against attacks from less sophisticated and unorganized hackers. For instance, press reports assert that companies such as BAE Systems resist hundreds of cyber attacks by foreign government-backed hackers in a year.

The US DoD and the defense agencies of other countries are making significant investments in cybersecurity. Realizing the opportunity in the cybersecurity market, leading A&D players including Lockheed Martin, Raytheon, Northrop Grumman, as well as a number of smaller A&D companies are investing in developing cybersecurity solutions with both offensive and defensive capabilities.

Cyber attacks leading to compromising of confidential data of suppliers, customers or the government can lead to legal trouble

Major A&D players are implementing integrated supply chain management (ISCM) platforms to facilitate uninterrupted information exchange between the different supply chain participants, from suppliers to customers. This involves continuous to-and-fro flow of vulnerable data through the ISCM platform, a part of which might also be confidential in nature. Any data theft or cyber attack on any part of the ISCM platform would potentially lead to a threat to the entire supply chain network, creating a multiplier effect on the risk of cybersecurity events.

In addition, most of the contracts in the A&D industry have strict rules on loss of confidential and critical information and can attract contractual penalties for data loss. Loss of confidential data also exposes companies to legal claims from upstream and downstream companies in the supply chain.

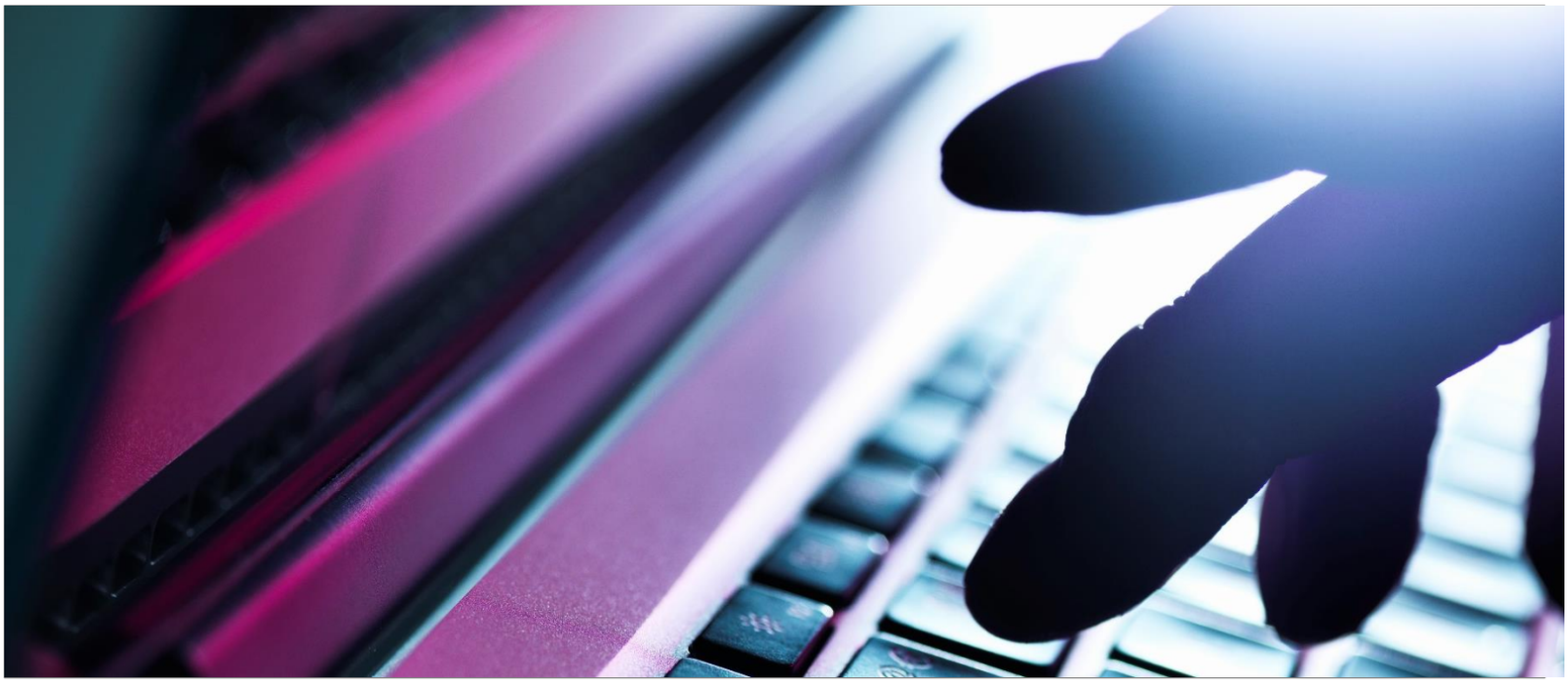
A&D players must have a significant focus on designing or procuring enhanced cloud computing solutions, operating systems and virtual machine technologies to defend their cyber space against cyber attacks from hostile states cyber-terrorists in the near future. Companies can also turn to insurance as a financial protection against the threat of cyber attacks.

"A&D firms possess valuable IP that is also valuable to cyber criminals. Whether a firm builds weapons, ships, aircraft or spacecraft, their cyber data contains sensitive information about capabilities, limitations, and weaknesses of their products, which could be exploited and monetized by cyber criminals. Cyber attacks can result in loss of competitive advantage through intellectual property theft, potential degradation of national security if stolen data is used by foreign militaries. Cyber attacks can have adverse impact on a company's public image, increased scrutiny from federal regulators and stakeholders, operational interruptions as well as legal issues.

"In the digital world that we live in today, the risks and consequences of cyber attacks gets magnified by the complexities of our integrated value chain. With increased interconnection across the value chain, a cyber attack on one company can cascade across the network and affect other parts of the value chain as well. The vulnerability is not only limited to OEMs and their suppliers, but also extends to customers.

"The stakes in this game are significant. EY member firms provide our clients a holistic approach to cyber defense, including threat assessment, design and build of defensive cyber systems aligned with the importance of protecting the valuable data assets of the A&D industry. Our cyber transformation services focus on how cybersecurity is managed and helps clients to improve their cybersecurity position, while cyber threat management helps focus on 'monitor, detect and respond,' leading to active defense."

Bill Colbert, Partner, Advisory — US, Ernst & Young LLP

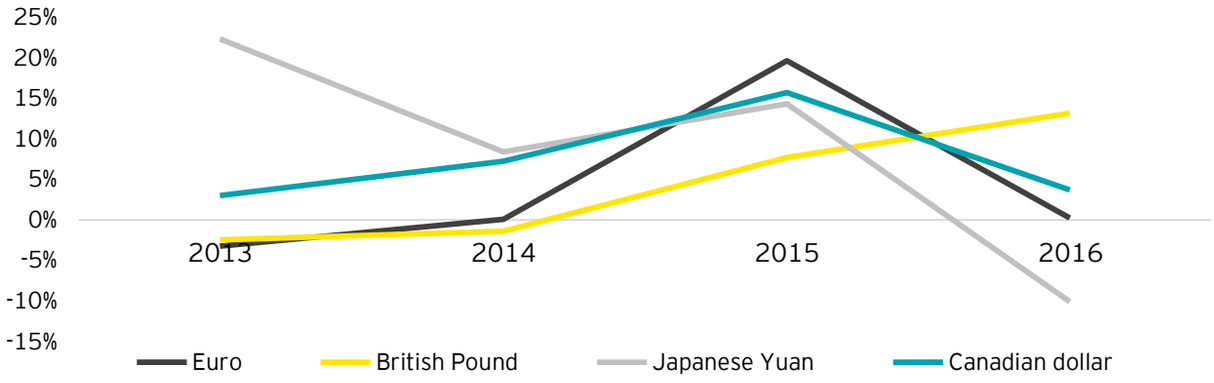


10 Foreign currency and commodity price fluctuations

Revenues from international operations are impacted by fluctuations in foreign currencies

Operating in a number of countries across continents, A&D companies are susceptible to fluctuations in foreign currency exchange rates. The following chart highlights the fluctuations in the yearly growth rate of the average value of major currencies against the US dollar over the last five years.

Annual growth of foreign currencies against the US dollar (2013- 2016)



* Source: Thomson One, EY Analysis.

Given that most of the A&D companies have a global footprint, they earn significant portion of their revenues in currencies other than the currency of their home market. With foreign currency fluctuations, value of the revenues earned in foreign currencies fluctuates. The impact of currency rate fluctuations on the overall financials of a company is even more magnified when a significant portion of its revenue comes in foreign currencies.

In addition to its effect on the revenues earned, currency fluctuations also affects the receivables, payables and return on assets denominated in foreign currencies. Furthermore, production in various countries add to the risks associated with fluctuations in foreign exchange rate as compared with the home currency.

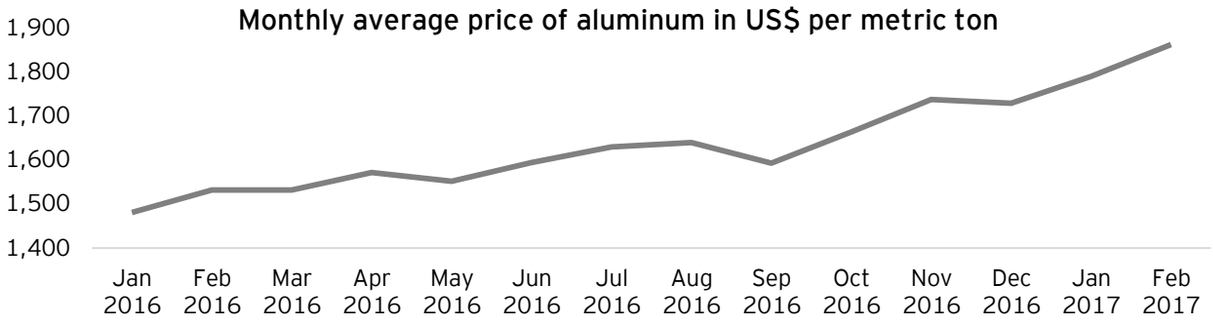
In the first half of 2016, General Dynamics reported negative foreign exchange impacts of US$100 million and in the second quarter of 2016, and Northrop Grumman reported a US$30 million decrease in its cash balances because of the strengthening of the US dollar. On the other hand, Leonardo recorded approximately €200 million negative impact on revenue in the first nine months of 2016, primarily due to strengthening of euro against the British Pound.

"Firms usually use both financial and operational hedges to manage currency risk. Financial hedges are implemented via the use of currency derivatives, while operational hedges includes devising long-term structuring of transactions between firm's home office and foreign subsidiaries. Financial hedges incorporates usage of forward transactions, currency swaps and currency options. Such instruments can provide short-term hedging opportunity. Operational hedges involve moving production bases or manufacturing bases for major components to foreign or home markets, depending on whether home currency is strong or weak respectively."

Harsh Suri, Senior Manager, Valuation and Business Modeling — US, Ernst & Young LLP

Commodity price increase puts pressure on the profitability of A&D companies

Financial performance of A&D companies is also impacted by the fluctuations in the prices of key commodities or raw materials such as aluminum, titanium and composites. The following chart shows the monthly average price for aluminium in the global market since January 2016.



Source: *World Bank*, EY Analysis.

Prices of these raw materials directly reflect in the manufacturing costs of the A&D products. They also impact the costs associated at all stages of the A&D supply chain and have a cascading effect on the final product. Given the huge pressure companies have on the pricing side due to high negotiating power of the customers as well as the competitive nature of the industry, increased costs of production directly affects the profitability of the companies.

"Fluctuations in commodity prices can lead to issues along the supply chain. It might lead to late delivery, increased failure probability by smaller suppliers, commodity price fluctuation risks are generally mitigated via structured contracts or financial hedges.

"Contracts, known as pass through contracts, can be structured such as to link the prices to a certain index. Pass through contracts can mitigate risks in cases where the supplier is sufficiently large to accommodate fluctuations in the index. Pass through contracts are vulnerable to disruption in supply chain. Another type of contract utilizes the principal of "first best" where the same profit is achieved throughout the supply chain like a single firm. Such contracts, known as coordinating contracts are appropriate for short lead times. Over longer lead times, the financing costs can lead to financing frictions and fail to meet the objective of first best.

"A combination of pass through contracts with financial hedging by the downstream supplier can achieve optimal results given sufficient coordination between the manufacturers and the suppliers."

Harsh Suri, Senior Manager, Valuation and Business Modeling — US, Ernst & Young LLP

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