



Global Aerospace and Defense Outlook

The dawn of a new day

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KPMG International



About the authors



Doug Gates

Global Sector Chair, Industrial Manufacturing and Global Head of Aerospace and Defense

KPMG International

T: + 1 404 222 3609

E: dkgates@kpmg.com

For more than 35 years, Doug has helped the world's leading Aerospace and Defense organizations to grow their business, defend their markets and secure competitive advantages. Doug spent more than 20 years 'in the trenches' at major A&D organizations before joining the consulting industry and is now Chairman of KPMG's Industrial Manufacturing Industry sector and Head of KPMG's Global Aerospace and Defense practice.

"A&D organizations recognize they simply can't deliver on shareholder expectations without doing something different. It's an extremely exciting and increasingly risky period for the A&D sector."



Tom Mayor

National Service Group Leader, Industrial Manufacturing Strategy

KPMG in the US

T: + 216 875 8061

E: tmayor@kpmg.com

Tom focuses on supporting industrial manufacturers in their supply and manufacturing strategies, operations turnarounds, purchasing and supply base management. With 25 years of consulting experience, Tom's clients represent a broad range of discrete products industries with a focus on aerospace, industrials, construction products and automotive. Tom frequently participates as a panelist and speaker on manufacturing strategy at prominent industry and business conferences.

"Moving from a 'make in' to a 'sell to' strategy for an emerging market requires a very different approach from A&D manufacturers."



Erich L. Gampenrieder

Global Head of Operations Advisory and Global Head of Operations Center of Excellence

KPMG International

T: + 49 89 9282 1700

E: egampenrieder@kpmg.com

Erich leads KPMG's Global Operations Advisory Practice and Global Operations Center of Excellence. During his almost 20 years of experience, he has been responsible for high profile cross-border programs for a number of Fortune 500 companies in the industrial, high tech, chemicals, healthcare and consumer industries. Erich joined the consulting industry following a 12-year career with the German Army, where he served as an Electronic Warfare Officer.

"Supply chain visibility must improve, particularly for those with ambitions of expanding into new international markets where supplier quality and capabilities may be untested."

Methodology

This report is based on a survey of 76 senior aerospace and defense (A&D) executives conducted in early 2016 by Forbes Insights.

Approximately half of respondents are based in Europe, while 21 percent are based in the Americas. Almost one-third of respondents represent companies with annual global revenues of more than US\$5 billion and 8 percent represent organizations with revenues of more than US\$25 billion.

To support the survey data, KPMG International conducted a series of interviews with leading A&D manufacturers around the world. Their experiences, combined with insights from KPMG professionals around the world, provide valuable context for today's manufacturers.





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CHAPTER 01

Optimistic about growth

If A&D executives are right, the next few years should be thrilling. Growth is now well and truly in the organizational crosshairs and our respondents suggest they will be aggressive in hunting it down. As the leaders recognize that a new day is dawning, many are stretching themselves outside of their comfort zones, leveraging their existing capabilities to grab hold of new opportunities. A&D executives have every reason to be confident.

Feeling good about growth

A&D executives are certainly bullish about their growth prospects and competitive positioning.

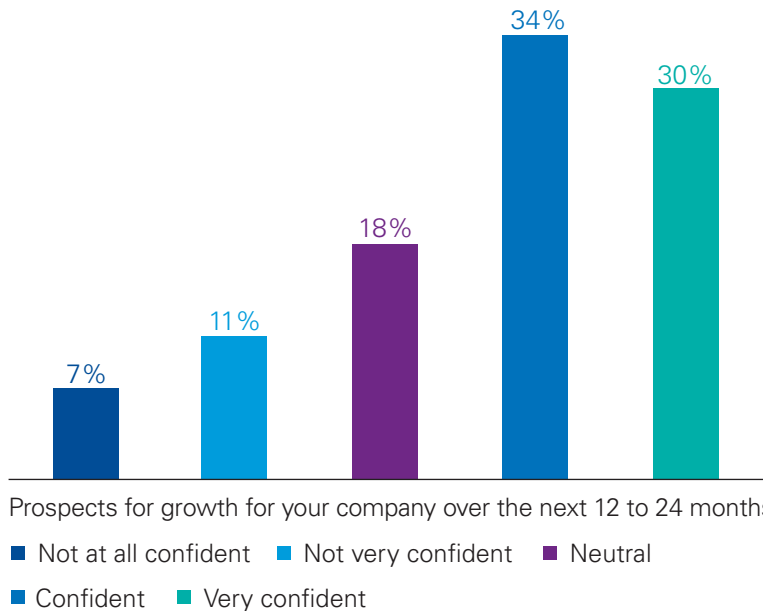
Almost two-thirds of our respondents say they are confident or very confident in their company growth prospects over the next 2 years. Aircraft OEMs and major defense contractors seem particularly confident in their growth strategies, with 100 percent of the respondents from larger organizations (those with global annual revenues of more than

US\$10 billion) voicing confidence in their growth prospects.

“Change is everywhere — in new technologies and automation, in new markets and sectors, in new business models and connected platforms — and it is creating significant new opportunities for A&D players around the world,” notes Doug Gates, KPMG’s Global Head of Aerospace and Defense. “Most A&D organizations recognize that they simply can’t deliver on shareholder expectations without doing something different. It’s an extremely exciting and increasingly risky period for the A&D sector.”

High expectations for growth

Please indicate your level of confidence in terms of growth prospects with the following:

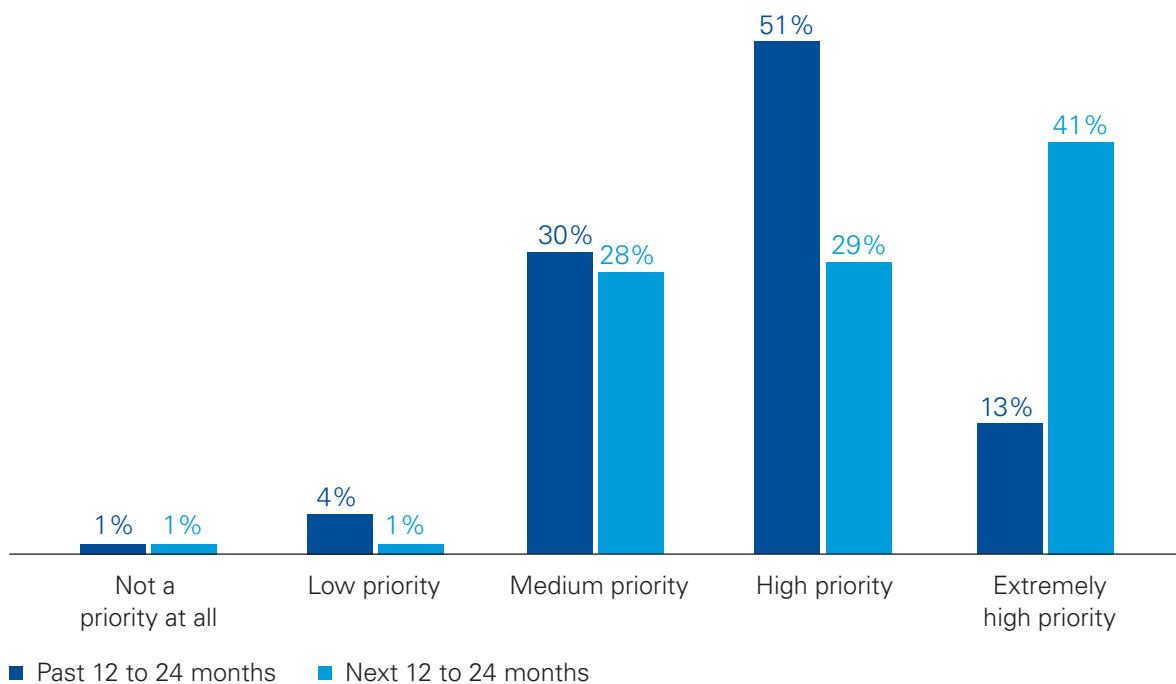


Source: Forbes Survey, 2016

Note: Percentages may not add up to 100 due to rounding.

Growth becomes a high priority

Please rate each of the following in terms of how they have been a priority for your organization over the past 12 to 24 months and how they will be over the next 12 to 24 months.



Source: Forbes Survey, 2016

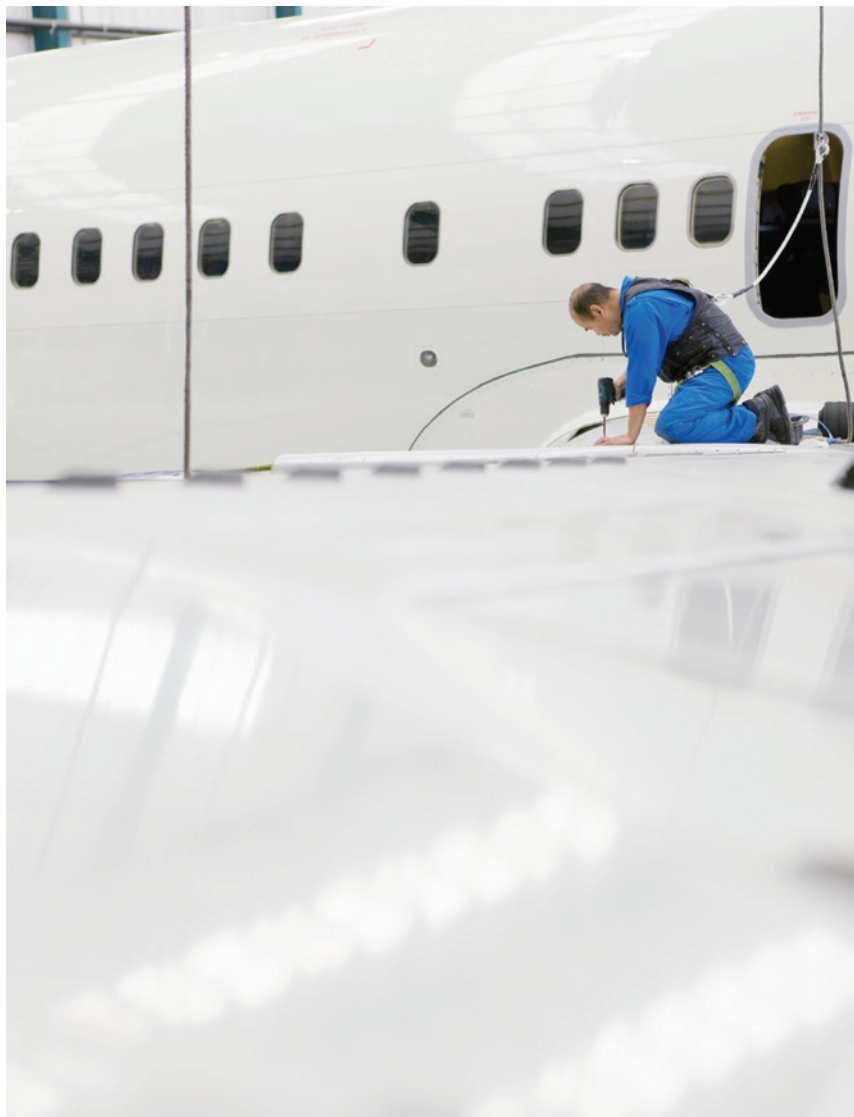
Note: Percentages may not add up to 100 due to rounding.

Growth for new, cost for old

According to our survey, A&D organizations will be much more focused on growth than they were in the past. Just 13 percent of our A&D respondents say that growth was an extremely high priority for their organization over the past year, but 41 percent say it will be an extremely high priority over the next 2 years.

That being said, our data also clearly demonstrates that cost and performance management are still high on the agenda for A&D organizations, suggesting that many organizations are placing growth-oriented bets on new technologies, while emphasizing cost reduction and consolidation in their slower-growth or declining segments.

"A&D organizations will need to think about how they drive profitable growth in new segments while simultaneously managing costs within slower-growth segments," says Gates. "Executives are going to need to stretch their organizations outside of their comfort zones to explore new approaches and team up with new partners that can help to rapidly and cost-effectively exploit these emerging opportunities."



What's the point?



A&D organizations are highly optimistic about their growth prospects and are exploring new opportunities to drive growth

What did A&D manufacturers say?

- Sixty-four percent are confident about their companies' growth prospects.
- Seventy percent say growth will be a high priority for the next 2 years.
- Eighty-one percent are focused on improving cost and performance management.

How are leading A&D manufacturers responding?

- evaluating new technologies and investing into innovation and partnerships to identify and quickly exploit new opportunities for growth
- stretching their organizations to look outside of their comfort zones for opportunities that leverage existing capabilities into new markets
- reassessing their cost structures to drive growth in new segments, while further reducing costs and improving performance in traditional segments.



The double-edged sword of low commodity prices on the commercial aircraft sector

By Constance Hunter

Chief Economist

KPMG in the US

T: + 1 212 954 3396

E: constancehunter@kpmg.com

While many manufacturers rejoice in the current low level of energy prices (and therefore reduced input costs), the commercial aircraft sector may likely experience both risks and benefits from the cheap oil environment.

KPMG expects the price of light sweet crude oil will edge up from its recent low of \$28 per barrel but the abundance of global supply suggests crude will probably remain below \$50 through 2017. Low commodity prices are certainly helping to lift the margins and profits in the airline industry.

Low fuel costs, however, will lessen the need for airlines to replace their existing fleet with more fuel-efficient aircraft. Past research suggests that in previous periods of low oil prices, replacement rates dropped to around 1 percent per year. In addition, low commodity prices are likely eroding the finances of resource-based nations which may, in turn, slow the growth of passenger demand across those emerging markets.

That slowdown will be more than offset by the prospect of increased air travel among economies less dependent on commodity production. Among those countries, low energy bills have improved household budgets, increasing the amount of money spent on air travel globally. Demand will also be buoyed if airlines continue to pass along a portion of their fuel-cost savings in the form of lower fares.

Thus, oil prices might cut both ways for the commercial aircraft sector, but the expected rise in air travel globally suggests that airlines will replace their fleet at a rate of between 2.5 percent and 3 percent per year with new growth adding about 5 percent of capacity for the next few years.

In their words:

Airbus manages market volatility

Philippe Balducchi

Head of Finance Operations
Airbus

As the commercial aircraft manufacturers start to reach the apex of their recent growth cycle, **Harald von Heynitz with KPMG in Germany**, sat down with **Philippe Balducchi, Head of Finance Operations at Airbus** to talk about how that company is investing in growth while managing market uncertainty.

Harald: There are signs that low oil prices may impact demand for new aircraft. What is Airbus doing to manage that risk?

Philippe: One of our strongest assets is our backlog of orders which supports our production plans. Therefore, we manage it very proactively in order to identify and respond to any potential risk. We are continuously monitoring our short-term order book — airline-by-airline and delivery-by-delivery — and are constantly talking to our customers so that we have time to react and, if necessary, reallocate aircraft to other customers. We are also rather cautious in terms of production and maintain overbooking in future years to protect us from unpredictable events.

Harald: What steps is Airbus taking to align manufacturing investments with growth?

Philippe: Over the past few years, we have opened two new final assembly lines outside of Europe for our A320 family, bringing us closer to our key customers and closer to two of the most dynamic markets in the world. Our facility in China produces A320 for the Chinese and Asian markets and our new facility in the United States (the largest market for Single Aisle aircraft) made its first delivery this year, making us the only non-US aircraft manufacturer with a final assembly line in the US.

Harald: How have the introduction of new models and shifts in the manufacturing footprint impacted suppliers?

Philippe: The reengineering of the A320 is bringing significant additional volume to our current suppliers. This provides us with the opportunity to seek cost relief from our suppliers which helps us drive down our overall cost structure and improve our long term competitiveness.

Harald: Are you concerned about the potential for increased risk going forward?

Philippe: Since the 2000s, the commercial aircraft market has demonstrated its resilience despite numerous external shocks (9/11, SARS, financial crisis, ...) and maintained its long term growth trajectory. Having said that, even if the macro environment is economically rather favorable for Airbus, the unstable geopolitical situation is a risk for the worldwide economy as a whole. But as long as we continue to focus on our risks and take the right steps to manage our production and backlog, it remains an industry with strong potential.

Airbus, one of the largest commercial aircraft manufacturers in the world, produces the Airbus family of passenger aircraft as well as corporate jets and military transports. Airbus employs more than 70,000 people at manufacturing facilities in Europe, China and the United States.

Cooperation in the new defense environment



By Miles R. McNamee

Principal, Federal Advisory Services

KPMG in the US

T: +703 286 8330

E: mrmcnamee@kpmg.com

As the United States continues to draw down its troop deployments and its defense budget allocations, global platforms and cooperation is becoming the name of the game.

No matter who wins the upcoming US election, it seems clear that the US is moving away from being the predominant player in international activities. Yes, the US will still likely continue to play a leading role in many international missions, but countries like France, Germany, Canada and Britain are now taking a different level of ownership in many theaters of operations.

What that means is that the defense community will need to be keenly focused on improving interoperability and driving collaborative platforms. The problem will be in how this is implemented. Countries committing investment to a global platform tend to expect some economic benefit as a results. Sorting out the 'quid pro quos' will be challenging. They also tend to want to change the variant of the item in order to localize their purchase, but deviation from the variant only increases the risk for defense contractors.

Complexity will undoubtedly rise. For one, defense contractors working on international platforms will likely need to broaden their supply bases to respond to localization requirements and political trade-offs. Identifying reliable, high-standard partners will require the cultivation of insight and relationships in new markets. Deploying the products into customer markets may also create challenges as training, support and maintenance capabilities may vary from market to market.

However, those defense organizations able to overcome the globalization challenge, those that are able to take a more holistic view of their markets and their strategies to create the right supply networks to deliver the right products across various markets should find the shift toward global platforms and cooperation to be a source of significant growth opportunities.



CHAPTER 02

Shaping the portfolio

To turn their growth expectations into reality, A&D organizations are thinking more holistically about their long-term growth opportunities and are taking steps to reshape their portfolios of products, services and markets to make the best of future opportunities. Significant change is coming to the A&D sector.

Entering new markets

As A&D organizations prepare to take advantage of new and emerging growth opportunities, our survey suggests that executives are exploring a wide variety of strategies and options to drive growth. Eighty-seven percent of respondents say they plan to change the range of products they offer over the next 2 years. Ninety-one percent say they plan to change the range of services that they offer.

“While A&D players are keen to improve their product range, most often through incremental improvements to existing offerings, the bigger prize lies in creating the right ecosystem of services around those products in order to drive longer-term value for customers and for manufacturers,” says Mayor. “We expect to see services start to make up larger and larger proportions

of revenues in this sector over the coming years.”

With economic growth remaining sluggish and defense budgets flat in the mature markets, many A&D organizations are now looking to new foreign markets to drive the next round of growth. In fact, more than nine out of 10 A&D respondents say they plan to expand into new geographic markets over the next 2 years and 96 percent say they will take steps to further increase their market share within their existing geographies.

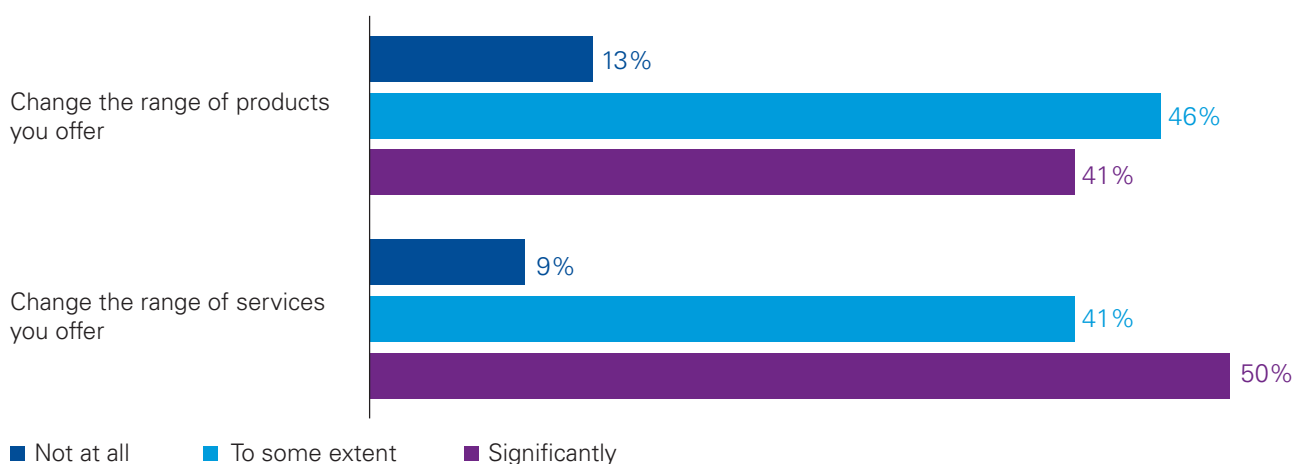
“Manufacturers are essentially looking across their range of products, services and markets to create a portfolio of growth opportunities that match their long-term objectives and strategies,” adds Gates. “Traditional businesses are being divested and spun off while new capabilities, particularly in cyber security, data management and mission software development, are being acquired.”

However, while recent market activity clearly illustrates continued appetite for mergers and acquisitions, our data suggests that today's A&D sector is highly focused on conducting organic investments to address their growth priorities. Seventy percent

of respondents say that organic investment will be their predominant strategy for growth going forward, versus just 33 percent who say their preference would be for inorganic growth through mergers and acquisitions.

Banking on new products and services

To what extent does your organization plan to do the following in the next 12 to 24 months:

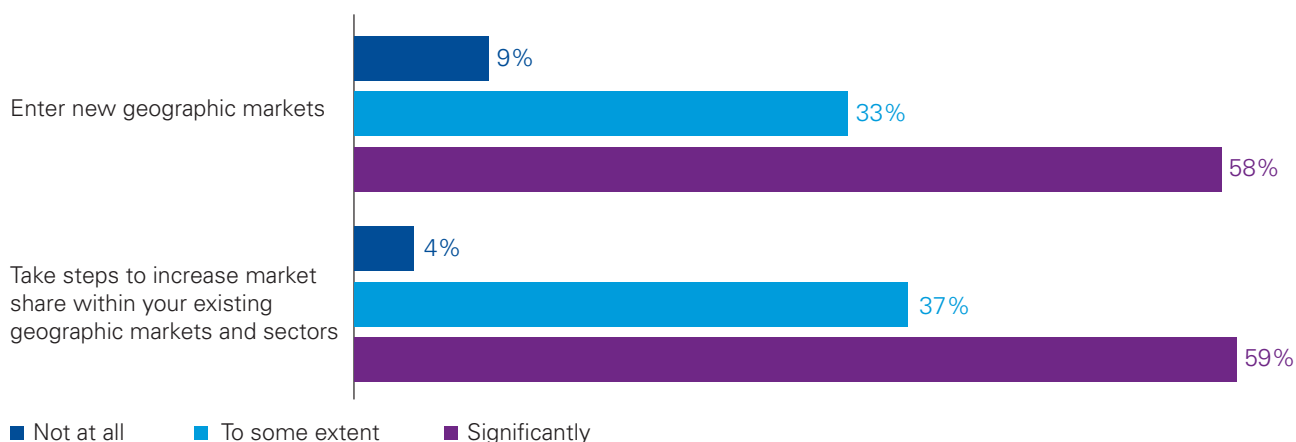


Source: Forbes Survey, 2016

Note: Percentages may not add up to 100 due to rounding.

Reexamining the footprint

To what extent does organization plan to do the following in next 12 to 24 months:



Source: Forbes Survey, 2016

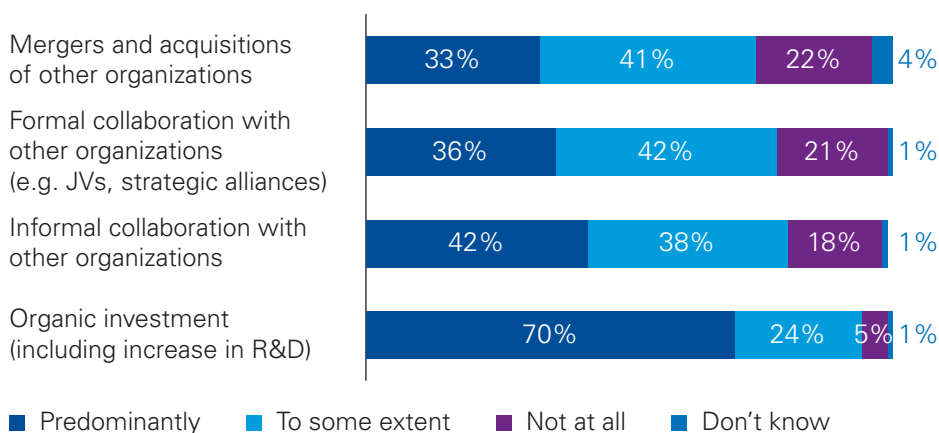
Note: Percentages may not add up to 100 due to rounding.

“We’re already seeing very aggressive moves to partner and collaborate with new players in the ecosystem, not only to create new A&D products, but also to help propel A&D organizations into new verticals and new markets as they explore growth opportunities,” adds

Gates. “You need to keep track of new opportunities and emerging trends, but you also need to keep a close eye on what your competitors are doing and where they are investing if you hope to win in new growth areas.”

A preference for organic growth

To what extent will you be addressing your company’s growth priorities through:



Source: Forbes Survey, 2016

Note: Percentages may not add up to 100 due to rounding.

What's the point?



A&D manufacturers are exploring and exploiting every potential opportunity for growth

What did A&D manufacturers say?

- Eighty-seven percent say they plan to change the range of products they offer over the next 2 years.
- Ninety-one percent plan to enter new geographic markets to address their growth objectives.
- Seventy percent will grow predominantly through organic investments.

How are leading A&D manufacturers responding?

- partnering and entering into joint ventures with non-traditional suppliers to break into new markets and drive innovation in existing market segments
- assessing future growth opportunities and existing capabilities to build market-leading propositions in new sectors and markets
- shaping their portfolio of products, markets and partnerships to align to new growth opportunities
- shifting toward a demand-driven business model and encouraging the earlier involvement of suppliers and outsourced partners.



In their words:

Northrop Grumman takes on the cyber threat

Christopher Valentino

Director of Strategy

Northrop Grumman's Cyber & Intelligence Mission Solutions Division

As governments around the world increase their investments, into cyber security and resilience, **Ryan Donley, Industrial Manufacturing Global Growth Director with KPMG in the US**, sat down with **Christopher Valentino, Director of Strategy with Northrop Grumman's Cyber & Intelligence Mission Solutions Division** to talk about the evolving role of cyber in the A&D sector.

Ryan: Why are cyber capabilities so important in the A&D sector today?

Christopher: In today's threat environment, defense organizations want systems that can start in a secure state, stay secure and, if compromised, can return to a secure state in real time. And that is why we have been progressively investing in the area of cyber resilience for some time now. Essentially, we are focused on developing and delivering capabilities that are able to recognize the agility of the threat environment and are able to then address both the known threats and the unknown threats.

With more than 30 years of experience battling cyber threats, Northrop Grumman has made aggressive technology investments in key research areas to become one of the top cyber solutions companies in the world.

Ryan: How does cyber fit into Northrop Grumman's long term vision?

Christopher: Cyber is one of the five Core Competencies of Northrop Grumman, alongside logistics, strike, C4ISR and autonomous systems. In part, cyber is viewed as a capability that we can deliver internally to improve the value of different programs and projects. But it is also seen as a set of capabilities that can be delivered as a standalone capability suite. Our Cyber Intelligence Mission Solutions Division is a major line business for us today.

Ryan: Are you facing challenges in building an ecosystem around your cyber capabilities?

Christopher: We believe partnerships are important in two main respects. The first is to help us identify, assess, acquire and access new technologies and new capabilities that improve our capabilities in this particular domain. But it is also about bringing in a new class of thinkers and thought leaders so we can bring forward the best and brightest to help drive this market segment forward.

Ryan: How do you see cyber evolving over the coming years?

Christopher: If we've seen anything over the past year, it is that customers are increasingly aware of just how challenging this problem is. I think we are going to see the role of cyber grow beyond simply being something that you deal with when you need to complete an accreditation checklist to instead becoming an active part of the solution, architecture or system that is delivered and operated.



Shaping the portfolio in the defense sector

By Adil Khan

Principal, Deal Advisory
KPMG in the US

T: +1 312 665 2525

E: aakhan@kpmg.com

Having only recently emerged from an extended period of M&A hibernation, all signs suggest that the defense sector is on the cusp of a new, more sophisticated era of M&A, driven by a focus on portfolio reshaping.

The growing appetite for M&A activity is not entirely surprising. Strategic and financial buyers, until recently held back by economic uncertainty, have started to unleash their pent up demand. Many larger defense players are also sitting on growing piles of capital and large cash balances that could be put to better use driving longer-term growth in shareholder value. Valuations in the defense sector are also improving, which is improving the environment for divestments as companies reorganize around new high-growth areas.

Continued low interest rates and favorable credit markets are also driving activity from financial buyers looking for strong returns. Expect to see more sponsor deals like Carlyle's acquisition of General Dynamic's Axletech business, Onex's acquisition of Survitech Group and Warburg Pincus & Blue Wolf Capital's acquisition of North American Rescue in the future.

Given the size and clout of the current defense majors, there is little chance that the US Department of Defense will support a mega-merger in the defense sector. However, there is clear evidence that mergers that improve vertical and horizontal integration down the supply chain will be welcomed. We also expect to see significant activity in areas with perceived overcapacity (such as in-land systems and services) and in sectors in which major contract awards (such as the recent award of the LRS-B to Northrop Grumman) are reshaping the environment.

While our survey may suggest that the A&D sector will depend largely on organic investment to achieve its growth objectives, it seems clear that there is still significant room for mergers and acquisitions as organizations move to reshape their portfolios.

CHAPTER 03

An era of innovation-fueled competition

As A&D manufacturers look to build new portfolios of products and services, investment into R&D is on the rise. Based on the responses to our survey, A&D manufacturers can expect to face an era of heightened competition fueled by innovation, new products and new service models. Innovation is real, disruption is rampant and the field of competitive battle is shifting.

Betting on new innovations

While the vast majority of A&D manufacturers say they will make changes to their existing product and service portfolios, our survey suggests that significant investment will be channeled toward developing entirely new products and services to respond to new and emerging growth areas. Of those respondents who say they are planning to make changes to their product portfolios 47 percent say they will make significant investments to launch one or more new products.

As Henk Smit, Partner, Advisory, KPMG in the Netherlands, noted in KPMG's Global Manufacturing Outlook 2016, creating successful new products and services will require a new approach to development. "To create successful products and services, manufacturers need to innovate with their customers, working to understand their full value chain and using that insight to create solutions that leverage their full enterprise capabilities to create real value for their customers," he says. "That may be manufacturers' biggest challenge going forward."

Investing into new products

If you plan to 'significantly' or 'to some extent' change the range of products offered in the next 12 to 24 months, how do you plan to change this range of products? Respondents selected all that applied.



Source: Forbes Survey, 2016

Note: Percentages may not add up to 100 due to rounding.

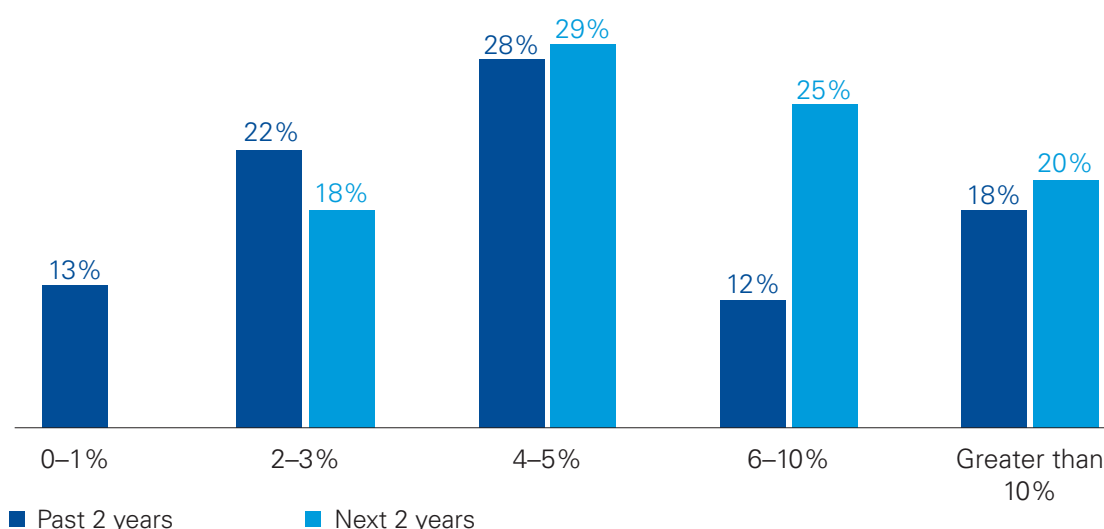
Investing for growth

What is clear, however, is that A&D organizations expect to ramp up investment into R&D significantly. Indeed, whereas a year ago, 30 percent of respondents said they spent 6 percent or more of revenues on R&D, 45 percent say they will spend at least that amount over the next 2 years. More impressive still is the fact that one-in-five respondents say they will spend more than 10 percent of revenues on R&D over the next 2 years.

"This data clearly underscores the fact that A&D organizations are gearing up for massive changes in their product portfolios, their markets and their business models," says Gates. "Whether developing new products and services to meet emerging demand or tailoring existing products to meet the specifications of customers in new markets, A&D organizations will need to push aside the status quo to grab new opportunities and drive exceptional execution."

Investment into research and development (R&D) to skyrocket

In your best estimate, what percent of revenue did your organization spend in the last 2 years on R&D/innovation? What percent of revenue does it plan to spend over the next 2 years?



Source: Forbes Survey, 2016

Note: Percentages may not add up to 100 due to rounding.

Our data also indicates that OEMs and defense majors are investing aggressively to carve out competitive advantages and new niche markets. Larger organizations responding to our survey were two-and-a-half times more likely to say they would invest more than

10 percent of revenues into R&D over the next 2 years.

“As the US DoD and other defense departments continue to reduce their direct investment into R&D, much of the burden is being shifted onto the defense contractors who have had

to quickly ramp up their investment in order to maintain their competitive advantage,” notes Mayor. “As more investment pours into R&D, organizations are increasingly going to need to compete for the best minds and the best ideas.”

What's the point?



Investment into R&D will be massive as A&D manufacturers start to compete on innovation and new products/services

What did A&D manufacturers say?

- Forty-three percent of those planning to change their product suite will invest into entirely new products.
- Twenty percent say they will spend upwards of 10 percent of revenue on R&D over the next 2 years.
- Forty-five percent will spend more than 6 percent of revenues on R&D over the next 2 years.

How are leading A&D manufacturers responding?

- taking a more strategic view of their innovation ecosystems to identify partners that can help reduce the cost, improve the pace and unlock commercialization of their innovation investments
- exploring opportunities to adapt and leverage commercial capabilities, including infrastructure, to dramatically transform the development process
- prioritizing initiatives that can be leveraged across the enterprise or in multiple markets and lines of business.





In their words:

XCOR Aerospace creates a new frontier in low Earth orbit

Jay Gibson

CEO

XCOR Aerospace

As the low Earth orbit sector shifts from government to commercial players, new opportunities are being created for disruption. To find out how new start-ups and smaller companies are overcoming the traditional A&D barriers to market entry, **Doug Gates, KPMG's Global Head of Aerospace and Defense** sat down with **'Jay' Gibson, CEO of XCOR Aerospace** in Midland, Texas.

Doug: As the low Earth orbit market evolves and new leaders such as Space-X and Blue Origins start to build market niches, what is the opportunity for smaller companies like XCOR?

Jay: We see significant room for innovators across the food chain to participate in this rapidly expanding sector. Maybe it's innovation in engines or the launch process or maybe you are able to advance the development of spaceports and infrastructure; the market is maturing and there are opportunities emerging across the spectrum. At XCOR, we are developing engines that can be reused multiple times in a single day, day in and day out which translates to frequency and affordability which is a tremendous commercial opportunity for us and for space market in general.

XCOR Aerospace is a privately held American company focused on developing highly reusable engines and launch vehicles in the commercial space market.

Doug: The space sector, much like the wider A&D industry, is highly capital-intensive. What barriers does that create for organizations like yours?

Jay: It takes more than a great idea to actually put things into space. It takes lots of capital, particularly to move from concept through design and commercialization. So finding suitable capital and investors is a key challenge for those trying to build a new and innovative proposition in the market. But it also creates a unique, resourceful and innovative culture and drives a new level of creativity. When you can't afford to go the 'traditional' route, it really forces you to put everything on the table in search of a better solution.

Doug: What growth opportunities do you see for the low Earth orbit sector?

Jay: As the sector evolves, massive new opportunities are going to present themselves. I think today, the evolving space market is where aviation was 100 years ago. Initially, the technology and capabilities were developing and fragmented so affordability and frequency were a barrier, and the market didn't see a demand for it. But once the aerospace sector was able to prove its efficiency, its reliability and its safety, the market was open and a new level of creativity for use was born and people quickly migrated to the sector to include a full integration. In the same way, the evolving space market is also starting to prove its efficiency, its reliability and its commerciality and, as it does, the market is discovering and generating business cases and opportunities which will drive demand.

Doug: Do you expect some of the larger A&D organizations and strategic players to start to develop capabilities in this area?

Jay: Certainly. I think the strategic players are recognizing the tremendous market potential and as they look at ways to take advantage of the opportunities that emerge, they will start to make big moves, either organically or via consolidation. As they develop their strategy and execution plans, many will find significant capability gaps to fill and partnering with organizations such as ourselves, innovators that bring new ideas and key capabilities to the table, will fill the voids and be a tremendous value add.



Learning from the auto sector: When a kangaroo is not just a kangaroo

By Tom Mayor

National Service Group Leader, Industrial Manufacturing Strategy
KPMG in the US

T: + 216 875 8061

E: tmayor@kpmg.com

Gary Silberg

National Automotive Industry Leader
KPMG in the US

T: +1 312 665 1916

E: gsilberg@kpmg.com

When the first autopilot-equipped Tesla in Australia encountered its first kangaroo, it quickly classified it as a previously unidentified variety of dog. The data and an image was uploaded from the car into a deep-learning network, which quickly processed a few thousand web videos and images and correctly identified the 'roo. Within a matter of days, every Tesla in the world had learned about kangaroos: how to identify them, how to anticipate their potential trajectories and how to avoid them on the road.

The implications for the A&D sector are massive. Rather than relying on voice-to-voice, post-action reviews to make adjustments and assess impact, defense leaders could be gathering data in real time from a squadron of assets that are autonomously learning and adapting in order to better guide their crews.

For A&D organizations, the shift to autonomy, supported by these deep neural networks, will have significant implications on the product and services strategy. The auto industry is already pioneering the shift from 'product platforms' to 'platforms of products,' which bring together data from personal vehicles, traffic control systems, mobility devices and mass transit to provide the vehicle with unprecedented insight into road conditions and traffic jams. The same technology applied to the commercial aerospace sector could allow the airline sector to do away with air traffic control altogether.

In this environment, we believe that product companies will ultimately win in a world of smart, connected products. Even the likes of Google recognize that they can't win the market simply on the basis of smart software and connectivity. These advances need to be integrated into a physical vehicle to deliver real value and that will only be achieved through product-embedded sensor platforms that connect to deep-learning algorithms.

We believe that the A&D sector is on the cusp of a period of unprecedented change and opportunity. And victory will go to the visionaries. Carpe diem.



CHAPTER 04

Opening up new markets

All signs indicate that growth opportunities are shifting from the mature markets to the emerging markets. While some foreign investment is still clearly focused on reducing the overall cost structure, A&D manufacturers are increasingly using their investments to open up new markets and move closer to their customers. As a result, investment flows are changing.

The shift to emerging markets

As the center of gravity for A&D organizations continues to shift east, our survey suggests that many manufacturers are starting to rethink their foreign investment strategies. Indeed, rather than basing their investment decisions purely on cost considerations and budget forecasts, A&D players are increasingly thinking about how they can leverage their capital overseas to help them secure new growth opportunities.

Granted, half of our A&D respondents continue to say that lower manufacturing costs are the primary driver behind their non-domestic investments. But almost three out of 10 now also say that their foreign investment strategies are driven primarily by their desire to move closer to customers and to gain access to new markets.

“The evolution of China and India from low-cost destinations to thriving markets in their own rights has had a significant impact on overall investment flows. Capital from North America and Europe is moving to the emerging markets while, at the same time, capital from the emerging markets

is moving to lower-cost destinations,” notes Gates. “Over the coming years, we expect to see significant interest in western assets, as emerging suppliers in China and India look to acquire and integrate the production systems, quality systems, processes and capabilities required to build to western standards.”

However, the data suggests that investment priorities (and therefore channels) are also shifting. North American A&D organizations were the most likely to say they are using their foreign investment to gain access to new markets. Respondents from India and China, on the other hand, were

among the most likely to say they are looking for reduced manufacturing costs from their foreign investments.

New investment flows

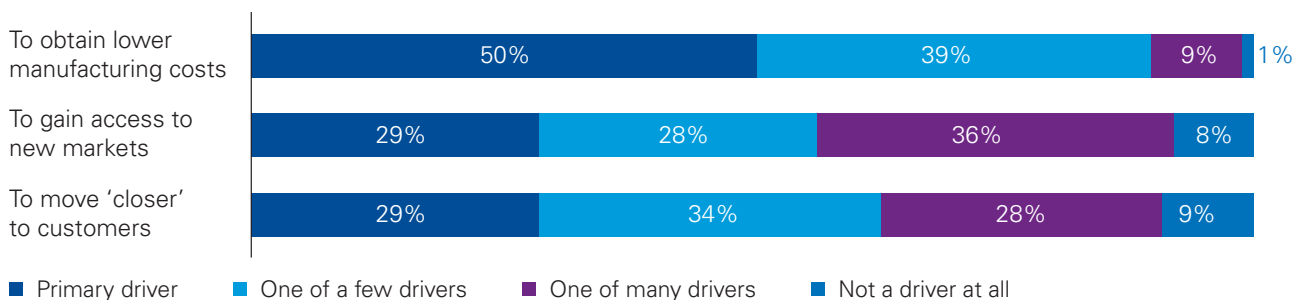
Our respondents’ planned investment flows tell a compelling story. Two-thirds of our non-US based respondents say they will make investments into the US and Canada, presumably to move closer to key customers. Similarly, 66 percent of our US-based respondents say they will invest into India and 50 percent say

they will invest into mature ASPAC (including Japan, South Korea, Australia and Singapore), likely for similar reasons.

“A&D organizations are continuing to move manufacturing operations to the emerging markets. Just think of Boeing and Airbus, which have both recently opened final assembly lines in China. But as they do so, they are also thinking about how these investments help them better serve and attract the high-growth regional markets,” adds Mayor. “Moving from a ‘make in’ to a ‘sell to’ strategy for an emerging market requires a very different approach.”

Balancing costs and relationships

How significant are the following drivers for your international (non-domestic) investments?



Source: Forbes Survey, 2016

Note: Percentages may not add up to 100 due to rounding.

What's the point?



As A&D organizations reshape their portfolio of markets to secure growth, new investment flows are emerging.

What did A&D manufacturers say?

- Fifty percent say their foreign investment is primarily driven by cost considerations.
- Twenty-nine percent say they are driven by a desire to move closer to customers and open up new markets.
- the US remains the top destination for A&D investment.

How are leading A&D manufacturers responding?

- shifting their supply chain and product assembly east to capitalize on new growth markets and opportunities
- evaluating their foreign supply requirements and assessing the quality and capability of new foreign suppliers
- tightening the integration of their supply chain and enhancing flexibility and agility through new tools and extended enterprise solutions.

In their words: **Embraer invests into new markets and products to drive growth**

José Antonio Filippo

Executive Vice-President, CFO & Investor Relations
Embraer

With R&D and innovation high on the A&D agenda, **Márcio Serpejante** **Peppe with KPMG in Brazil** sat down with **José Antonio Filippo, Executive Vice-President, CFO & Investor Relations at Embraer**, to talk about that company's investments into new markets and new products.

Márcio Serpejante: Where does Embraer see growth potential in the regional jet market?

José Antonio: The Americas have always been a key driver of growth in the regional jet market and we are very focused on delivering the right products to the market through excellent customer service and delivery and a more effective cost per seat. We are currently developing a new generation of the regional jet that will respond directly to the needs of this market.

Márcio Serpejante: What new products is Embraer developing and why?

José Antonio: We currently have four models of our e-Jet in development, which are entirely new equipment: new engines, new wings, new avionics and new interiors. We are already in early production on our first model, the E-190, with deliveries expected as soon as 2018. In subsequent years, we will launch the E195 e-Jet and the E175.

Márcio Serpejante: How has competition changed in the regional jet segment over the past decade?

José Antonio: There are, of course, new entrants in this market. And we know that companies in China, Japan and Canada are working on developing competitors to our models. We recognize that we live in a highly competitive world, but we firmly believe that we have the right mix of models and capacity to maintain our leadership position in the segment.

Márcio Serpejante: Will continued low oil prices impact your longer-term order book?

José Antonio: I think lower oil prices may delay some replacement orders in very specific situations, but on the opposite side, we are also enjoying historically low interest rates, which makes these purchases much more attractive, regardless of the oil price. I also believe that fuel efficiency is just one reason that our customers want to purchase newer models. They want newer technology, improved comfort and newer planes, so while we watch the impact of the oil price, we are very confident about our position.

Embraer is one of the world's leading regional, business and military jet manufacturers, with a dominant position in key segments. Between 2011 and 2014, the Brazilian company is reported to have spent more than US\$1.1 billion on R&D into commercial and corporate aviation.

[Source: Company filings]

CHAPTER 05

The need for supply chain visibility

Given the shift toward new products and new geographic markets, it is not surprising that A&D executives are highly concerned about the risk of supply chain failure. What is surprising, however, is that only a handful of A&D players seem to have complete visibility into their supply chain, a proven approach to reducing the potential for supply chain failure.

Risk rises

A&D organizations increasingly recognize that exploiting new growth opportunities requires an agile and flexible supply chain that helps manage risk. For some, the challenge is in identifying and partnering with new suppliers and creating new ecosystems to support the launch of new products and services. For others, localization requirements and new facilities in the emerging markets are forcing A&D manufacturers to take on new suppliers that are often untested to Western standards.

Our survey demonstrates that supply chain failure continues to be viewed as a major risk for A&D organizations, with 87 percent of respondents citing this as a major threat to achieving their growth agendas. Supply chain risk was ranked as the second-greatest risk facing A&D manufacturers, behind only concerns about the threat of another economic downturn.

“A&D organizations know there is great opportunity in new markets and by leveraging new capabilities, but they worry about trusting their growth objectives with new partners and suppliers who may look good on

paper but struggle to meet the OEM's global standards and expectations," says Gates.

Urgent need for improved visibility

While A&D executives may voice clear concerns about supply chain risk, less than one-in-10 reports they have visibility down into their Tier 2 suppliers. Only about half of our respondents are able to claim that they have 'enhanced visibility' into their Tier 1 suppliers and some Tier 2 suppliers.

Interestingly, it is the larger OEMs and defense contractors that seem to be struggling the most with visibility, likely due to the scope and complexity of their supply networks. In fact, two-thirds of our respondents from larger organizations admitted that they only enjoyed some visibility into their Tier 1 suppliers or no visibility at all.

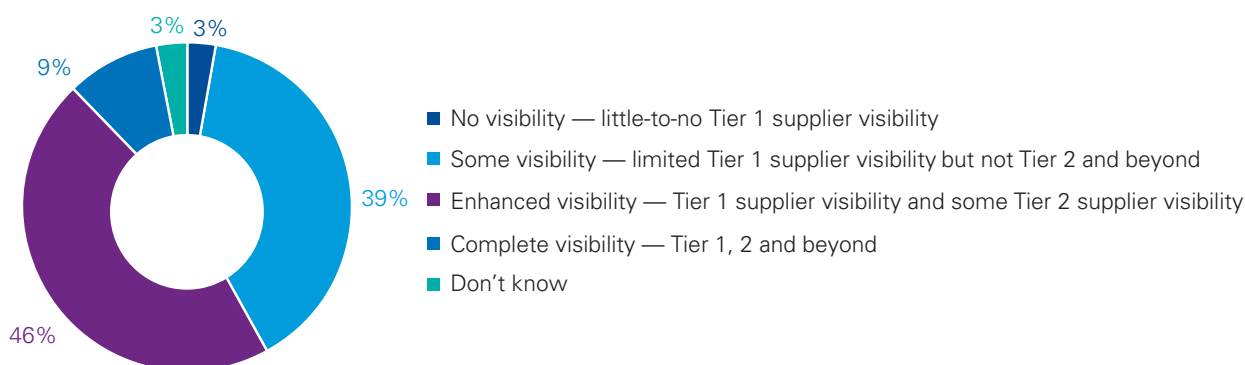
As Erich L. Gampenrieder, KPMG's Global Head of Operations Advisory noted in the 2016 Global Manufacturing Outlook, "The best way to reduce the risk of supply chain failure is by achieving greater visibility and managing it cross-functionally deeper into the end-to-end supply chain. The fact that so few manufacturers can claim complete visibility suggests that much more will need to be done, particularly for those with ambitions of expanding into new international markets and adjacent segments where supplier quality and capabilities may be untested."

Innovating the supply chain

While improved visibility will be key, A&D organizations are taking many steps to improve their supply chains' flexibility and responsiveness. Almost two-thirds (64 percent) of A&D respondents say they have

Lacking visibility

How much visibility of supply and capacity information do you have across your suppliers and logistics partners?



Source: Forbes Survey, 2016

Note: Percentages may not add up to 100 due to rounding.



plans to invest in demand sensing to improve their supply chain operations. And 60 percent say they will invest in supply chain analytics.

The rapid adoption of sensors and internet of things (IoT) technology is capturing significant attention and investment from supply chain leaders. Almost a third (32 percent) of respondents said they would definitely be investing into IoT

technologies for their supply chains. And an almost equal number said they would be prioritizing data and analytics capabilities in order to support improved visibility into their evolving supply chains.

"A&D organizations are seeing massive opportunity that can be achieved and value that can be delivered by connecting their products and improving their value

through IoT, sensors and new business models enabled by data and analytics," says Gates. "The more advanced organizations are thinking about how they combine data from their sensors with external data sources to create even more value for their customers and more sustainable growth opportunities for themselves through the creation of new service offerings."

What's the point?



A&D executives are worried about supply chain risk but lack visibility into their lower-tier supply networks. Investments into new technologies and systems should help reduce the risk.

What did A&D manufacturers say?

- Eighty-seven percent rank supply chain failure as a risk to their growth objectives.
- Nine percent have complete visibility into their supply chain.
- Sixty percent will invest into D&A to improve their supply chains.

How are leading A&D manufacturers responding?

- looking across their product and service lifecycles to identify opportunities to improve collaboration with partners and suppliers to drive project certainty and investment returns
- streamlining and harmonizing processes across the supply chain network to improve agility, create flexibility and enhance visibility
- collaborating across the supply chain and IT to better manage the increasing number of connections with suppliers and enhance access security.

Key takeaways

What's the point?

A&D organizations are highly optimistic about their growth prospects and are exploring new opportunities to drive growth.

A&D manufacturers are exploring and exploiting every potential opportunity for growth.

Investment into R&D will be massive as A&D manufacturers start to compete on innovation and new products/services.

As A&D organizations reshape their portfolio of markets to secure growth, new investment flows are emerging.

A&D executives are worried about supply chain risk but lack visibility into their lower-tier supply network. Investments into new technologies and systems should help reduce the risk.

How are leading A&D manufacturers responding?

- evaluating new technologies and investing into innovation and partnerships to identify and quickly exploit new opportunities for growth
- stretching their organizations to look outside of their comfort zones for opportunities that leverage existing capabilities into new markets
- reassessing their cost structures to drive growth in new segments, while further reducing costs and improving performance in traditional segments.

- partnering and entering into joint ventures with non-traditional suppliers to break into new markets and drive innovation in existing market segments
- assessing future growth opportunities and existing capabilities to build market-leading propositions in new sectors and markets
- shaping their portfolio of products, markets and partnerships to align to new growth opportunities
- shifting toward a demand-driven business model and encouraging the earlier involvement of suppliers and outsourced partners.

- taking a more strategic view of their innovation ecosystem to identify partners that can help reduce the cost, improve the pace and unlock commercialization of their innovation investments
- exploring opportunities to adapt and leverage commercial capabilities, including infrastructure, to dramatically transform the development process
- prioritizing initiatives that can be leveraged across the enterprise or in multiple markets and lines of business.

- shifting their supply chain and product assembly east to capitalize on new growth markets and opportunities
- evaluating their foreign supply requirements and assessing the quality and capability of new foreign suppliers
- tightening the integration of their supply chain and enhancing flexibility and agility through new tools and extended enterprise solutions.

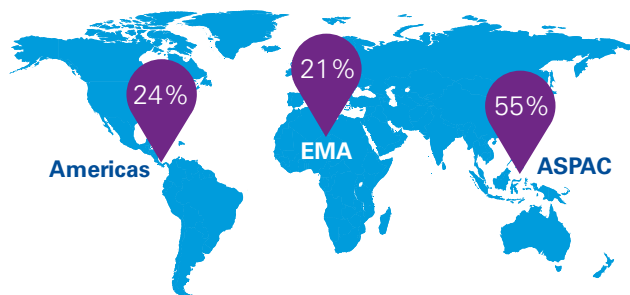
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About the survey

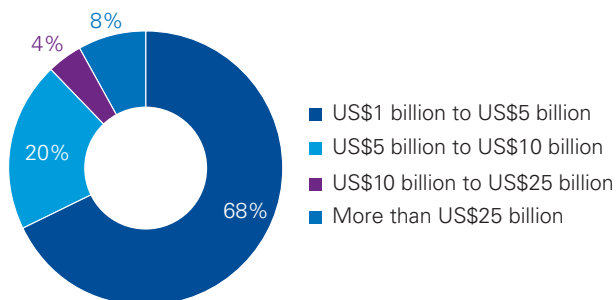
KPMG International's 2016 Global Aerospace and Defense Outlook is based on a survey of 76 senior Aerospace and Defense executives as part of KPMG International's Global Manufacturing Outlook survey. Responses were collected in early 2016 by Forbes Insights and reviewed by KPMG's network of A&D professionals, who provided commentary and insights in June 2016.

Participants in the survey represent a broad cross-section of the industry, with almost a third of our respondents representing larger organizations with annual revenues of US\$5 billion and above and 8 percent representing OEMs and defense majors with revenues of more than US\$25 billion per year.

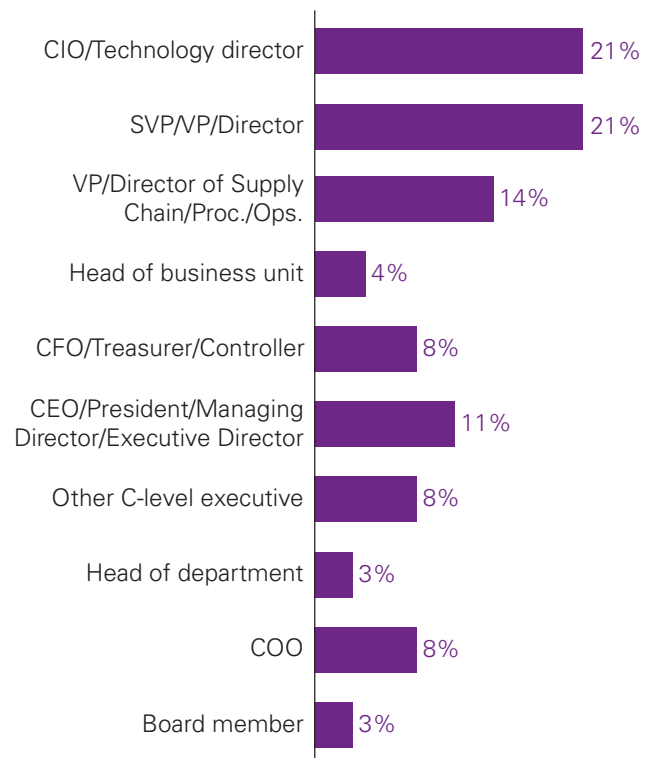
Where are you personally located?



What are your organization's global annual revenues?



Which of the following best describes your title?



Source: Forbes survey, January 2016

Note: Percentages may not add up to 100 due to rounding.

How KPMG's Aerospace and Defense practice can help

As A&D organizations respond to the changing environment and look toward the dawn of a new day, KPMG's network of dedicated A&D professionals has emerged as the trusted advisor for companies with big ambitions and a strong desire for results.

With more than 1,800 professionals with functional A&D experience across more than 130 markets, our network understands the realities of new market entry and combines global experience with local insight to help A&D organizations grow their footprints. Our deep experience transforming business processes and driving innovation across complex organizations allows us to help A&D organizations create forward-looking product and service portfolios. Our advisory professionals know what it takes to create innovative, collaborative and mutually-beneficial partnerships and joint ventures.

By bringing together global industry knowledge and involvement in key industry events, we believe we are among the advisors of choice to the A&D industry.

Companies looking for proactive, forward-thinking services count on KPMG member firms to help them take advantage of the sector's growth potential and overcome the complex issues and challenges they face today and in the future. Forward into the dawn of a new day.

- business model transformation
- high-growth market strategies
- market entry and expansion
- M&A and transaction services
- corporate finance and valuations
- private equity investment



The growth agenda

- supply chain and distribution solutions
- procurement transformation
- improving operational efficiencies
- finance transformation
- internal improvement and sourcing advisory
- R&D management strategies



Cost and competitiveness

- enterprise risk management
- IT advisory solutions
- governance, reporting and regulatory services
- debt advice and securitization
- global tax and transfer pricing services
- sustainability and the environment



Risk, governance and regulatory matters

KPMG Global Aerospace and Defense leadership

Doug Gates

Global Sector Chair, Industrial Manufacturing

Global and US Aerospace and Defense Leader

T: +1 404 222 3609

E: dkgates@kpmg.com

Aerospace and defense country leaders:

Tom Woods

Ireland

T: +35314102589

E: tom.woods@kpmg.ie

Grant McDonald

Canada

T: +1 613 212 3613

E: gmcdonald@kpmg.ca

Bernard Brown

United Kingdom

T: +44 (0) 20 7311 6605

E: bernard.brown@kpmg.co.uk

Luis Alejandro Bravo

Mexico

T: +52 55 52468360

E: labravo@kpmg.com.mx

Kai C. Andrejewski

Germany

T: +49 211 475 7900

E: kandrejewski@kpmg.com

Renato Naschi

Italy

T: +390680961343

E: rnaschi@kpmg.it

Mohammed Aloyaidi

Saudi Arabia

T: +966118748500

E: maloyaidi@kpmg.com

Jean-Luc Guitera

France

T: +33 155 686962

E: jguitera@kpmg.fr

Hervé Michelet

France

T: +33 1 55 68 75 44

E: hmichelet@kpmg.fr

Thore Kleppen

Norway

T: +4740639515

E: thore.kleppen@kpmg.no

Atsushi Kobayashi

Japan

T: +81335485801

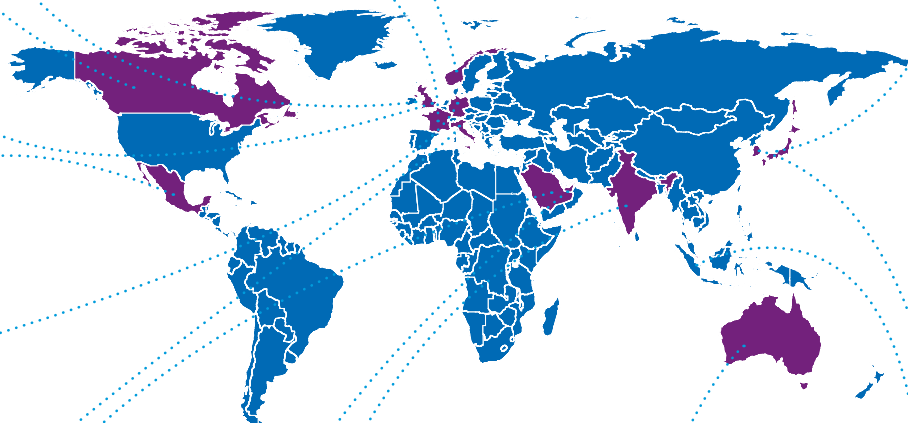
E: atsushi.kobayashi@jp.kpmg.com

Koichiro Tanaka

Japan

T: +81335485165

E: koichiro.tanaka@jp.kpmg.com



Avtar Jalif

United Arab Emirates

T: +97124014860

E: ajalif1@kpmg.com

Ken Drover

Australia

T: +613 92 88 6623

E: kdrover@kpmg.com.au

Ja Young Jo

Korea

T: +82 2 2112 0640

E: jjo@kr.kpmg.com

Amber Dubey

India

T: +91 987 1933711

E: adubey@kpmg.com

Mike Kalms

Australia

T: +61 3 9288 6426

E: mkalms@kpmg.com.au

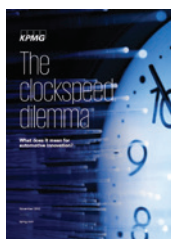
Shu Ping Quek

Singapore

T: +6562132637

E: squek@kpmg.com.sg

Related industrial manufacturing publications



The Clockspeed Dilemma (November 2015)

Innovation in the automotive industry will transform the very nature of transportation and change people's lives along the way. But this kind of innovation is also really hard. Most organizations do not embrace imaginative solutions to problems. In fact, they stifle them.



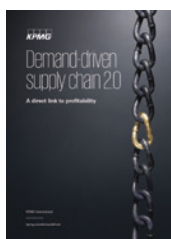
Global Automotive Executive Survey (January 2016)

The KPMG Global Automotive Executive Survey is an annual assessment of the current state and future prospects of the worldwide automotive industry.



Growth and Uncertainty: Highs and lows in the Aerospace and Defense sectors (April 2016)

This research white paper analyzes the state of the A&D industry, highlighting the economic trends and landscape while providing KPMG insights on these findings.



Demand-driven supply chain 2.0 — a direct link to profitability (May 2016)

This report examines how companies can provide an improved customer experience and outpace the competition by upgrading to a demand-driven, responsive supply chain that meets customers' needs and outlines steps to help our clients achieve a new level of customer responsiveness.



Global Manufacturing Outlook 2016 (May 2016)

The Global Manufacturing Outlook report provides a comprehensive overview of the global manufacturing sector, along with the observations and insights from KPMG member firm partners, clients and is based on a survey of 360 industry executives from around the world. The GMO explores significant areas such as growth strategies, entering new markets and products and services, R&D, technology, supply chain and more.



The Factory of the Future (May 2016)

What do you need to do to be sustainable in volatile, fast-moving and customer-driven markets? To keep pace with ever quicker product lifecycles, shorter order lead times and growing product variants? The key term is called Industry 4.0. KPMG's Factory of the Future guide sets out to give you information and concrete support in order to successfully meet the challenge of Industry 4.0.



Global Metals and Mining Outlook (New! Limited edition coming July 2016)

KPMG's Metals and Mining global leadership comes together to explore the results of KPMG International's survey of Metals executives and explain how shifts in the metals and mining sector will drive change in the mining industry.

Contacts

Doug Gates
Global Sector Chair, Industrial Manufacturing
T: +1 404 222 3609
E: dkgates@kpmg.com

Ryan Donley
Global Growth Director — Industrial Manufacturing United States
T: +1 703 286 8667
E: rdonley@kpmg.com

Michele Hendricks
Global Executive for Industrial Manufacturing
T: + 1 203 406 8071
E: mhhendricks@kpmg.com

Leona Mickelson
Global Senior Marketing Manager, Industrial Manufacturing
T: + 1 416 777 8822
E: lmickelson@kpmg.ca

Additional contributing authors

Constance Hunter
Chief Economist
KPMG in the US
T: + 1 212 954 3396
E: constancehunter@kpmg.com

Adil Khan
Principal, Deal Advisory
KPMG in the US
T: +1 312 665 2525
E: aakhan@kpmg.com

Manuel Parra
Partner, Head of Industrial Manufacturing. KPMG in Spain
T: +34 91 456 35 11
E: mparra@kpmg.es

Miles R. McNamee
Principal, Federal Advisory Services
KPMG in the US
T: +703 286 8330
E: mrmcnamee@kpmg.com

Gary Silberg
National Automotive Industry Leader
KPMG in the US
T: +1 312 665 1916
E: gsilberg@kpmg.com

kpmg.com/aerospaceanddefense

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