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Focus

Roland Berger

**Backlogs and balancing acts –
Aerospace & Defense Top Management
Issues Radar 2019**



Roland
Berger



Backlogs and balancing acts / *Aerospace & Defense Top Management Issues Radar 2019*

A lot to think about: Production at full throttle, disruptive crosswinds and a rapidly changing landscape

The past year has brought turbulence from unexpected quarters. The grounding of Boeing's 737 MAX, followed recently by a complete halt to its production, triggered seismic shockwaves that challenge North American suppliers in particular. At the same time, airlines came under pressure from growing climate awareness and calls to urgently slash CO₂ emissions. Although these events were already unfolding, industry leaders were more optimistic in 2019 than they have been for some years.

Largely convinced that the current "supercycle" will continue for at least another five years, A&D companies have their hands full working off order backlogs that will see them well into the coming decade as new aircraft models (e.g. COMAC, A321LR, A321XLR) come on line. Manufacturing is thus again the most important topic on boardroom agendas, with digital transformation, in second place, increasingly seen as a tool to boost effectiveness and efficiency.

Meanwhile, a series of disruptive technologies are gaining altitude, keeping senior executives busy with many other issues related to production. Many see increasing electrification as the main technological disruptor, albeit flanked by advances in artificial intelligence and new levels of automation – all within the next five years or so, in the view of our survey respondents. Buoyed by these innovations, urban air mobility will soon mark the first step toward electric aircraft and, a little later, autonomous flight.

As aviation strives to rein in its carbon emissions, alternative jet fuels are another of the many topics pulling A&D leaders in all kinds of different directions: It is hard to stay focused on production when further consolidation and vertical integration lie ahead, and when emerging technologies could change the entire market landscape beyond recognition. Faced with so many disruptive variables, it is no surprise that our survey saw product strategy return to prominence among decision-makers. Companies are also becoming increasingly aware of the need to revisit and realign the operating models that enable them to deliver on their chosen strategies.

- 5 **1 Boardroom priorities: No change at the top**
Order backlogs keep manufacturing at the top of boardroom agendas – Digital seen more as a means to an end
- 8 **2 Market outlook: Long live the supercycle!**
With plenty of work for years to come, the market outlook is bright – Proportional increase in CO₂ emissions raises concerns
- 12 **3 Market disruptors and new frontiers: Fasten your seatbelts**
Technological disruption and new segments to bring turbulence and change – The only certainty is continuing consolidation
- 22 **4 Strategy and operating model: Strategy revisited?**
As product strategies move back center stage, companies also need operating models that deliver excellence in implementation

About the survey

METHODOLOGY AND SURVEY UNIVERSE

This is the eleventh annual edition of the A&D Management Issues Radar, which aims to support executive-level thinking across the entire industry. For our survey this year, we received responses from over 200 senior industry executives across 100 companies, including Airbus, BAE Systems, Boeing, Embraer, MTU and Rolls-Royce and many others. The respondents represent OEMs, tier-1 and tier-2 suppliers and various adjacent sectors such as data analytics, the aftermarket, government agencies, research and development, engineering services and cluster management.

Of the respondents, 64% work for companies with more than 1,000 employees, while 96% do business in Western Europe, 60% in North America and 60% in Asia. A large proportion are employed by companies active in the commercial aircraft segment (87%) and in the military aircraft segment (63%).

SCOPE OF THE SURVEY

This publication collates the key findings of the above survey. Conducted in July and August 2019, the survey asked questions in the following areas:

Top priorities in 2019

- What are the main topics on your company's agenda in 2019?

Market outlook

- For how long do you expect the current favorable market conditions in the civil aerospace sector to persist?
- How will the market for electric aircraft develop?
- When, how and where will urban air mobility emerge?

Realignment of the market landscape

- What types of companies will be affected most?
- Will we see more horizontal or vertical consolidation?
- Who will be the winners?

Strategy and operating models

- Are companies' operating models fit for purpose?
- What changes must be made to improve operational performance and reinforce accountability?

1 / No change at the top

ORDER BACKLOGS KEEP MANUFACTURING AT THE TOP OF BOARDROOM AGENDAS – DIGITAL SEEN MORE AS A MEANS TO AN END

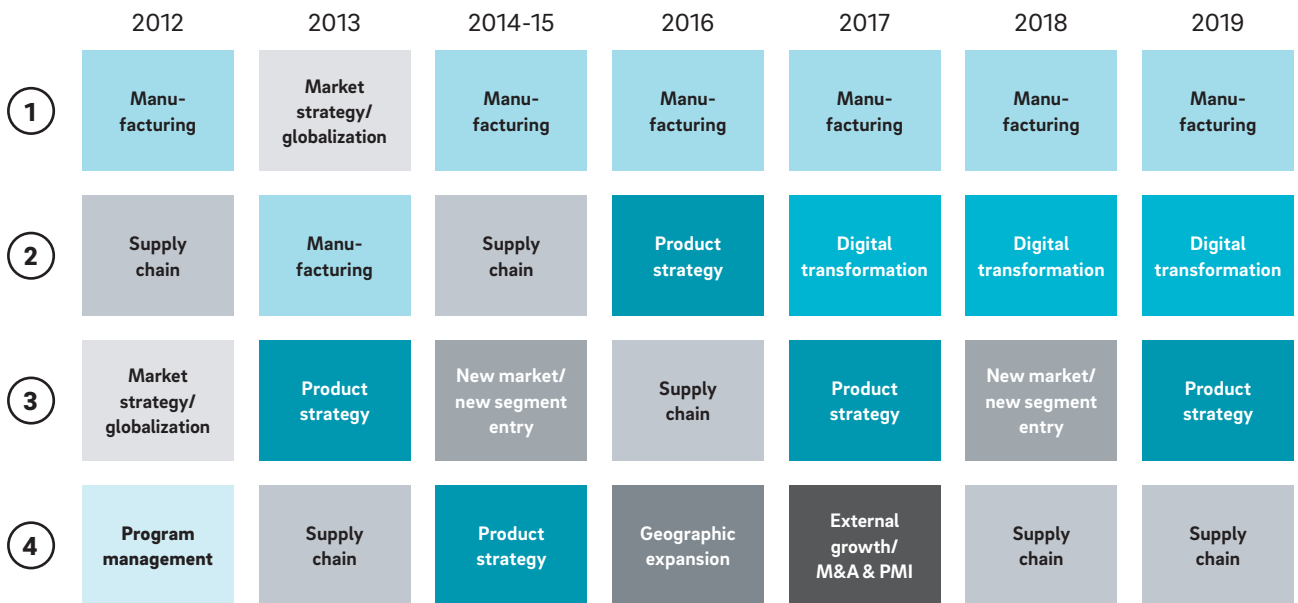
For the third year in a row, the two key issues dominating CEOs' thinking in the A&D sector remained unchanged in 2019. Manufacturing has been priority number one for a full five years, and even OEMs – who last year saw digital transformation as the most important factor overall – now have manufacturing at the top of their agenda. With order books still bursting at the seams and major production shifts in the pipeline, this is only logical. Tier-1 and tier-2 suppliers clearly concur in the importance of manufacturing, evidence of their profound commitment to fast product delivery.

Digital transformation is still on everyone's agenda,

but this year occupies second place. However, its application seems to be focused on improving and streamlining operations rather than developing new products. As with supply chain (in fourth place), industry players currently see digitalization not as an end in itself, but as a tool to help them boost manufacturing performance. And although the pendulum has also swung back toward product strategy (in third place) to some extent, companies seem reluctant to focus too strongly on product strategy for fear of overlooking other vital matters. They know that change is needed in many areas: But which are the most important ones? → [A](#)

A: Delivering the goods

Manufacturing continues to dominate corporate agendas in 2019



Source: Roland Berger "Top Management Issues Radar 2019" Survey

1

MANUFACTURING

The A&D industry as a whole remains very strongly focused on manufacturing and delivery for the fifth year running. And once again, this is no surprise: OEMs have seen last year's already huge order backlogs grow longer still, forcing them to give top priority to efficient production and higher output rates. The higher up the value chain one looks, the greater the importance also attached to the supply chain, which ranked fourth overall in our survey. This reflects OEMs' urgent need to avoid any interruptions that could further clog up their delivery schedules.

While Boeing had to temporarily halt production of the 737 MAX, Airbus is focusing on ramping up its manufacturing operations rather than developing entirely new products. The European OEM is understandably keen to fill the gap and capitalize on the difficulties facing its American rival. This perhaps explains why, overall, new market/new segment entry has evidently dropped down the pecking order since last year.

Market optimism has rebounded sharply in the past two years and is largely rooted in the industry's ever-lengthening backlog of orders for single-aisle aircraft.

2

DIGITAL TRANSFORMATION

Since it was introduced to our survey three years ago, digital transformation has made second place its own regular slot. True, some of the initial hype may have died down. But that simply shows how digital development has become "business as usual": It is now an open secret that digital transformation is not an end in itself, nor does it constitute a revolution. It is a tool that can play a key part in helping market players solve their current problems, especially in relation to manufacturing. Digitalization can facilitate production ramp-ups, add transparency to reduce production costs (for quality assurance and quality officers, for example) and help automate production.

Awareness in this area has grown and matured, and many companies have already launched or are planning to launch digital services. Success stories have also been written, with big data being harnessed to achieve significant advances in predictive maintenance and aircraft condition monitoring – not to mention the seminal importance of digitalization for the whole complex of autonomous flight (see below), for example.

Yet despite such widespread acceptance, uncertainty persists on many levels: How is the digital transformation to be funded? What risks will arise from implementation? How can data privacy be ensured? What, indeed, are the long-term benefits that can realistically be expected? For all the acceptance and approval of digital "tools", there is still a pervasive sense in the A&D industry that questions whether a deep commitment to digital transformation genuinely makes sense, given that the "end product" itself is difficult to digitalize in the short term. Perhaps logically, therefore, our survey also found that many players are increasingly perceiving digitalization as a subset of the concept of Industry 4.0, which essentially embraces the bigger, end-to-end picture of the A&D sector.

3

PRODUCT STRATEGY

After consistently featuring among the four most important topics since 2013, product strategy took a breather in 2018 but is this year back in third place. There are several reasons for this return to prominence, most of them relating to serious areas of uncertainty in the industry. After being grounded worldwide in the wake of two crashes attributed by investigators to automated on-board systems, questions have been raised about whether Boeing will ever be able to fully restore confidence in the 737 MAX. Whatever ultimately transpires, the impact on product strategy across the industry will be profound and lasting. At Airbus, a healthy influx of orders has seen the A321XLR make a successful debut.

Yet all industry players are also currently pondering several strategic challenges. One is how to improve cabin and service offerings. Another covers the various aspects of electrification. A third challenge stems from the need to reduce CO₂ emissions and improve sustainability – a topic explored in greater depth in the chapters that follow.

With so many issues up in the air, suppliers too need to think in terms of different product strategy scenarios as they seek to follow the lead given by OEMs that have themselves become moving targets.

4

SUPPLY CHAIN

Supply chain issues naturally interlock with all of the above concerns, which is one reason why they have missed a top-four slot only once (in 2017) in the past seven years. As we noted earlier, the supply chain necessarily follows the rhythms and the pace set by OEMs. Suppliers (and their suppliers!) must thus be ready to jump – to ramp up or shift production – when the OEMs set the direction. It is therefore no wonder that tier-1 and tier-2 players rank the supply chain as their second and third priorities respectively. Linked to the industry's key focus on manufacturing and the need to increase output rates to work off the towering order backlog, players throughout the A&D sector are currently examining the resilience of their supply chains and engaging in supply chain recovery and transformation, the aim being to minimize risks and preferably avoid interruptions. Here again, digitalization is seen merely as an important tool: an enabling factor that helps OEMs and tier-1/tier-2 suppliers achieve these goals by developing "digital supply chains".

2 / Long live the supercycle!

WITH PLENTY OF WORK FOR YEARS TO COME, THE MARKET OUTLOOK IS BRIGHT – PROPORTIONAL INCREASE IN CO₂ EMISSIONS RAISES CONCERNS

As ever, our survey examined market conditions in the aerospace and defense industries. The key findings are outlined below.

AEROSPACE

After bottoming out in 2017, market optimism has rebounded sharply in the past two years. Fully 61% of survey participants in 2019 do not expect to see a downturn in the aerospace industry in the next five years. Up from 41% two years ago and 52% in 2018, this figure reflects the most optimistic outlook witnessed in recent years. → **B**

Companies' optimism is largely rooted in the industry's ever-lengthening backlog of orders for single-aisle aircraft in general and derivative products of Airbus' A321 in particular. Virtually no short-term delivery slots are available today and, as things stands, the single-aisle order backlog will take nearly a decade to work off. Accordingly, OEMs are striving to increase the rate of production to 70 or even 80 single-aisle aircraft per month in the years ahead – even though wide-body orders have faltered slightly, with the 787 production rate slipping from 14 to 12 aircraft per month.

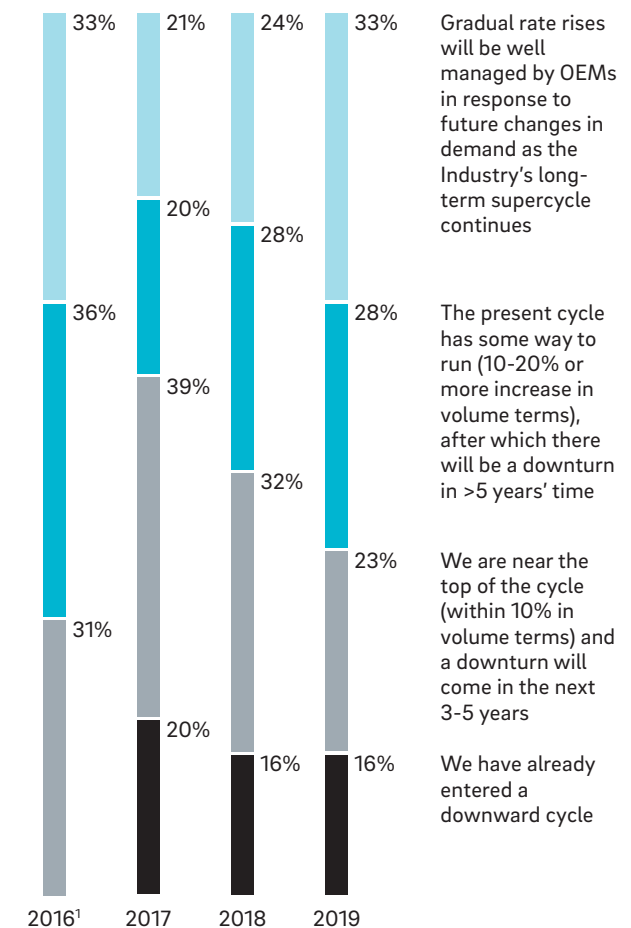
The Asia Pacific region remains the driving force behind strong demand for aircraft. And with three new aircraft – the MRJ, COMAC C919 and MA 700 – due to come off the blocks in the next couple of years, some of the pressure on production may be eased in the future once small initial production numbers can be ramped up.

A word of caution is nevertheless in order: When the study was conducted in July and August, few participants were seriously concerned about the possibility of trade wars arising from putative political changes. Given the current tensions between the USA and China in particular, however, this situation needs to be monitored continuously. At the same time, the full extent of the 737 MAX crisis had not yet been understood or anticipated.

B: Looking up

With the supercycle expected to continue, the mood across the industry is upbeat in 2019

How long do you think that the current buoyant market conditions (in terms of production volumes) will continue in the civil aerospace sector?

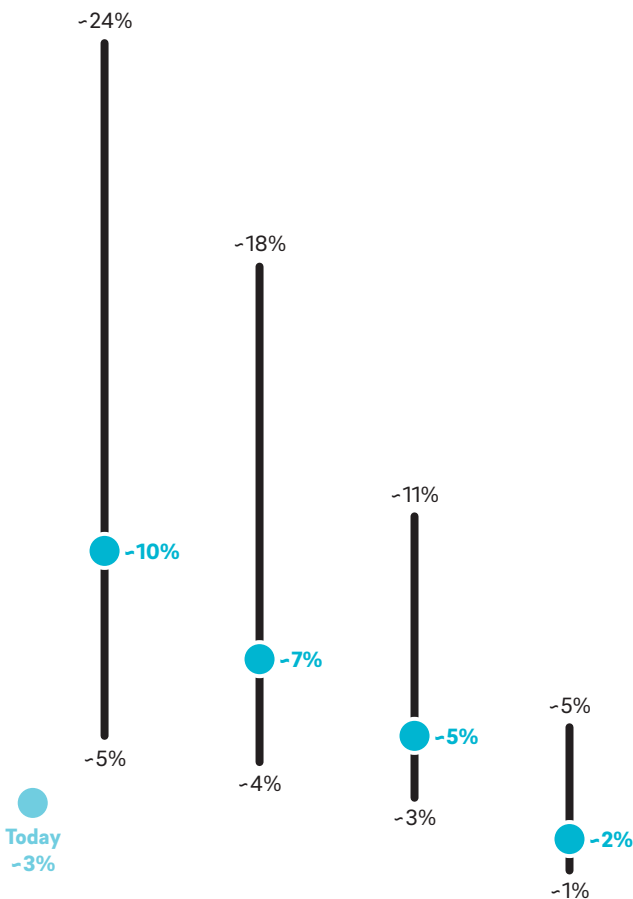


¹ Downward cycle not given as a survey option

Source: Roland Berger "Top Management Issues Radar 2019" Survey

C: More than its fair share?

Aviation's share of global CO₂ emissions could rise sharply by 2050 if no countermeasures are taken



Baseline: Continued evolution at current pace ("business as usual")

Accelerated evolution with system and airframe improvements

Adoption of electric propulsion due to market forces alone

Regulatory push for electric propulsion

Source: Secondary research, Roland Berger

An overwhelming majority believe that the need to reduce carbon emissions will affect the industry.

For the first time, this year's survey also asked participants how they think general pressure to reduce CO₂ emissions will impact aviation. While an overwhelming majority (91%) believe that the need to reduce carbon emissions will certainly affect the industry, only 27% anticipate a strong impact, with almost two thirds (64%) merely pointing to "some" impact. These responses may well be linked to recent stepped-up efforts encouraging urgent action to vastly reduce global carbon emissions in the face of the climate emergency. The "Fridays for Future" demonstrations initiated by Greta Thunberg, for example, were driving widespread and passionate debate at the time of the survey. Also, the UK government had just anchored its commitment to achieve a net zero carbon footprint by 2050 in statutory law. The relevance of this topic to air travel is acute: Aviation currently accounts for 3% of global CO₂ emissions. However, if industries such as automotive hit their emission reduction targets, aviation could see its proportion of global CO₂ emissions jump to 24% (in a worst-case scenario) – setting the industry apart as one of the world's biggest sources of this greenhouse gas. → C

DEFENSE

The needs of users in the defense sector are expected to change in the years ahead in response to two major shifts in the environment within which they operate.

One concerns the **threat environment** that is expected in the future. Tomorrow's state-level adversaries will have access to vastly more data (including real-time data) as well as faster and more accurate weapons (such as hypersonic missiles). Better equipped forces that can make faster and better decisions in combat situations add up to generally more robust and substantial enemies. These developments, coupled with growing geopolitical tensions especially around the South China Sea, are already altering the needs of defense industry customers.

The other major shift concerns the expected **commercial and political environment**. Affordability is increasingly an issue that must be carefully weighed against sovereign capabilities and aspirations to battlefield superiority. The specification of material and its procurement will thus be clearly separated as efforts are made to keep defense spending cost-effective and ensure interoperability with existing systems. Recent security breaches have also sharpened governments' focus on protecting their supply chains, driving a greater trend toward "home-grown" content from smaller suppliers.

As these changes unfold, users need more adaptable solutions that can respond to changing environments. Data management capability must be ramped up and equipment must be both cyber-hardened and made seamlessly compatible across product generations and different allied forces. Intuitive user interfaces will likewise be vital to ensure fast, accurate interpretation and decision-making in the field. Rapid product development must constantly stay abreast of leading-edge technologies – all while delivering cost-effective solutions with secure supply chains.

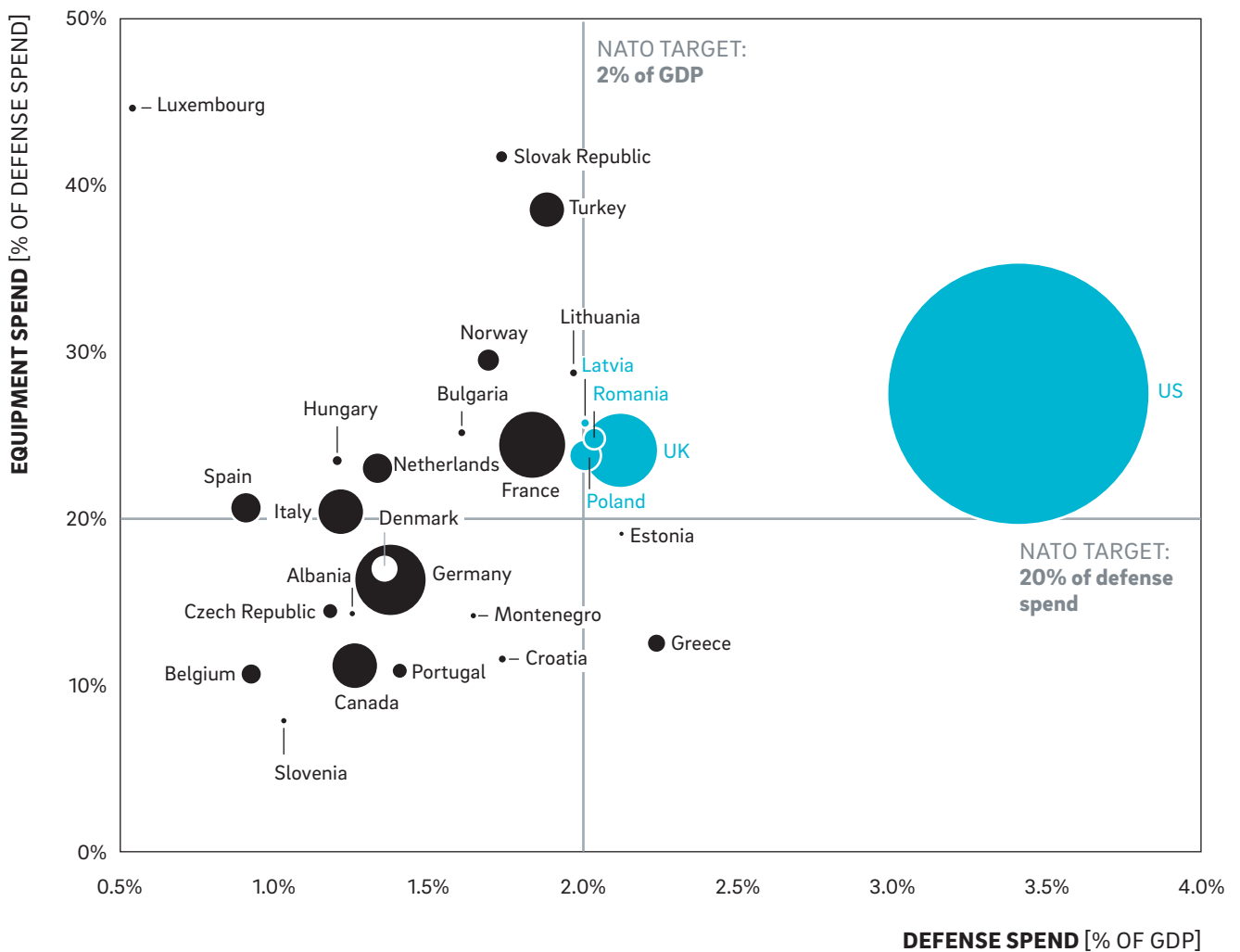
As most countries persist in failing to meet their NATO spending targets, however, our survey respondents are

less optimistic about growing defense budgets, despite all the potential opportunities. Only 84% now anticipate higher defense spending (down from 94% in 2018), and a mere 10% expect to see strong growth of 2 to 5% (down from 26% last year). → [D](#)

Rapid product development must constantly stay abreast of leading-edge technologies – all while delivering cost-effective solutions with secure supply chains.

D: Tight budgets

Most NATO members are still not meeting prescribed defense spending targets



● Bubble size represents total defense spend ● Countries that currently meet their NATO spending targets

Source: NATO, Roland Berger

3 / Fasten your seatbelts

TECHNOLOGICAL DISRUPTION AND NEW SEGMENTS TO BRING TURBULENCE AND CHANGE – THE ONLY CERTAINTY IS CONTINUING CONSOLIDATION

Last year's A&D Radar examined how top executives are facing a wide spectrum of disruptive trends. That has not changed: And as new developments continue to disrupt the status quo across the industry, the business environment is growing ever more complex. Based on the findings of our survey, we break these trends down into three broad categories: **innovation, new frontiers** and **landscape realignment**.

INNOVATION

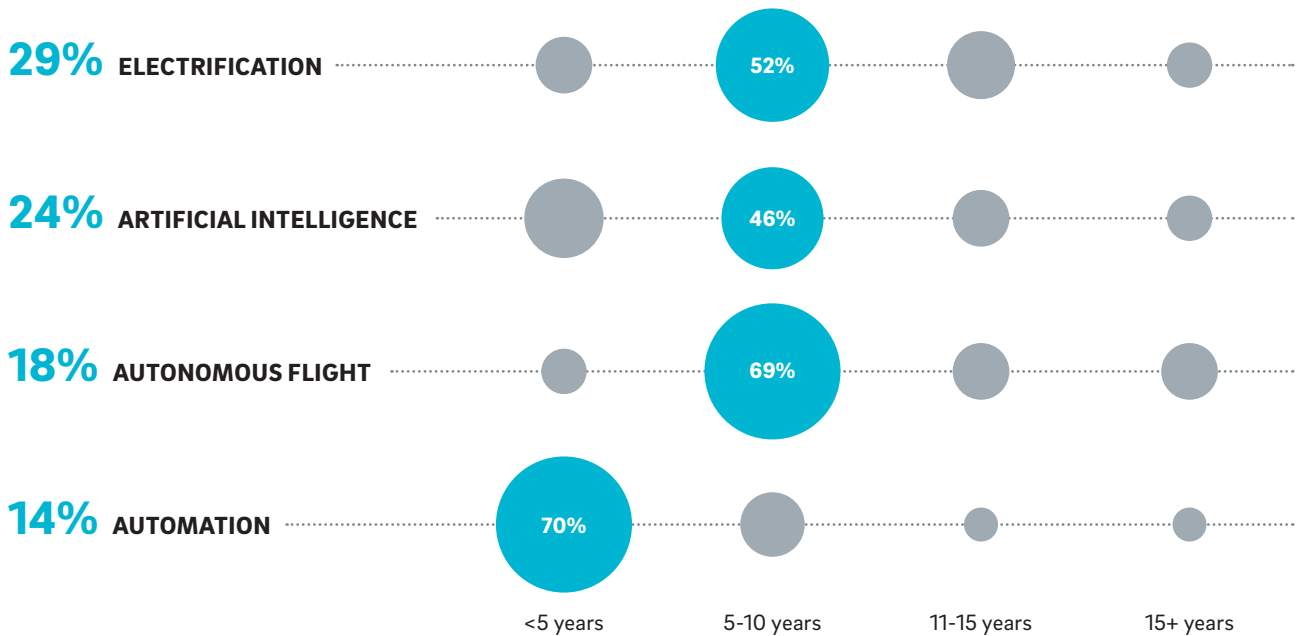
Electrification, artificial intelligence (AI), autonomous flight and automation – all potentially disruptive technologies in their own right – are the key innovation topics that feature high on A&D executive agendas in 2019. → [E](#)

Nearly 30% of survey respondents see **electrification** as the number one technological disruptor. While more

[E](#): Electrifying future

Challenges remain, but electrification and other technological disruptors are coming soon

Technological disruptors and time horizon [% of answers]¹ *What is the biggest technology disruptor currently facing the A&D industry? If these challenges are overcome, when do you expect the technology you selected to be applied in the commercial sector?*



¹ Other responses included predictive maintenance (10%), blockchain (2%) and other (2%)

Source: Roland Berger "Top Management Issues Radar 2019" Survey

electric aircraft (MEA) is essentially a longer-term trend, its impact seems already to have reached a tipping point that is affecting the entire A&D supply chain.

Each new generation of aircraft has added more capacity to generate electricity than its predecessors: The Boeing 787 and Lockheed Martin's F-35, for example, constitute significant step changes in this direction. Traditional hydraulic and pneumatic systems are very robust. But they face reliability issues, and maintaining the miles of complex, heavy piping and ducts that crisscross every aircraft is very expensive. By contrast, well-designed electric systems take up much less space and can significantly reduce maintenance costs. On the downside, advances in power electronics are needed to cope with ever-increasing power loads. Also, excess heat generated by electrical losses must be dissipated in some way and/or put to good use in the aircraft.

As the industry strives to completely change the game by leveraging electrification technology on a broad front, certification – and the immaturity of some segments of the technology itself – are seen as the two biggest challenges. Still, more than half of our survey respondents are confident that, if these challenges are overcome, aircraft with more electrical systems (replacing today's hydraulic/mechanical/pneumatic systems) will take wing in the commercial sector within five to ten years from today, while electrically propelled aircraft will follow (see "Emergence of electrically propelled aircraft" on page 14).

A quarter of our respondents rate **artificial intelligence (AI)** as another major disruptive trend. AI is already being deployed in the A&D sector – to make supply chain management more efficient, improve quality control and optimize flight operation performance, for instance. It has the potential to help aerospace and defense companies cut costs, slash design cycle times and streamline the manufacture and maintenance of aircraft. Actual hands-on applications are, however, still

in their infancy. Executives who took part in our survey cited regulation, public acceptance and the immaturity of the technology as key challenges to wider adoption of AI. Unlike the electrification trend, more than a third of respondents expect that AI could be applied in the industry on a growing scale in the next five years.

Nearly 20% of respondents also see **autonomous flight** as an important trend. Although autonomous flight technology is unlikely to find its way into commercial intercity aviation in the short-term future, it is nevertheless seen as a core enabler of urban air mobility, especially in the air taxi and airport shuttle segments.

Electric vertical take-off and landing (eVTOL) technology is expected to progress rapidly and expand its geographical reach. Commercial passenger drone operators might still keep a pilot on board for safety (and psychological) reasons to begin with, gradually increasing the number of autonomous flights as public acceptance grows. EHang, for example, has already conducted more than 2,000 manned flights in Guangzhou, its first UAM "pilot city" in China.

In spite of the many barriers this technology is yet to surmount – in terms of regulation, certification, immature technology and public acceptance – the vast majority of survey respondents believe we could see initial autonomous flight operations in the skies in less than ten years.

Automation is no newcomer to the A&D industry, as key players have long been implementing advanced automation solutions. But for the reasons already discussed, the pressure to continue raising production rates while cutting costs and improving quality is forcing OEMs to explore further automation options. One of the key next steps in this discipline is the greater use of industrial robots, for example to handle hazardous tasks, fit parts into hard-to-reach places and – most importantly – automate manual tasks while also increasing high precision, repeatability and, hence, consistent quality.

Aircraft parts are bulky by nature, so robots and tools must be brought to the aircraft rather than vice versa. The resultant need for mobile robots that can move around the factory floor itself creates the huge challenge of completely redesigning plant operations while still upholding safety standards, as human interaction will still be needed in many cases.

More than 70% of our survey respondents believe that automation technology will be ramped up and rolled out in these ways in the next five years if the specified challenges can be overcome.

NEW FRONTIERS

Beyond the impact of the technological disruptors described above and the advances that digital transformation can bring, three wider developments have the potential to push the A&D industry into completely new territory, bringing massive disruption in their own right. These developments are the emergence of aircraft with electric propulsion systems, the use of alternative and/or synthetic fuels and the nascent trend toward urban air mobility.

Emergence of electrically propelled aircraft

The number of development projects in this field had already surpassed 190 when our survey was conducted in July/August and was well over 200 by year-end 2019.

→ E

As with most ground-breaking technological advances, starting small seems the sensible thing to do. Electric pilot trainer aircraft such as Pipstrel's Alpha Electro are already available for purchase. Yet development is increasingly turning its attention to larger aircraft, too: Purely in terms of power levels under development, projects tracked in the RB database increased by 30% in 2019 alone.

Casual observers are often quick to dismiss the possibility that large commercial aircraft (LCA) might

use electric propulsion. And while that may be true for fully electric LCAs, which are unlikely to take off before mid-century, hybrid electric propulsion is becoming a serious contender for the next generation of large commercial aircraft. The distributed propulsion facilitated by hybrid systems in general, and series-hybrid powertrain layouts in particular, allow the airframe and propulsion system to be optimized in a way that is simply not feasible with existing turbojet architectures. Hybrid electric propulsion coupled with novel aircraft architectures has the potential to reduce fuel consumption significantly.

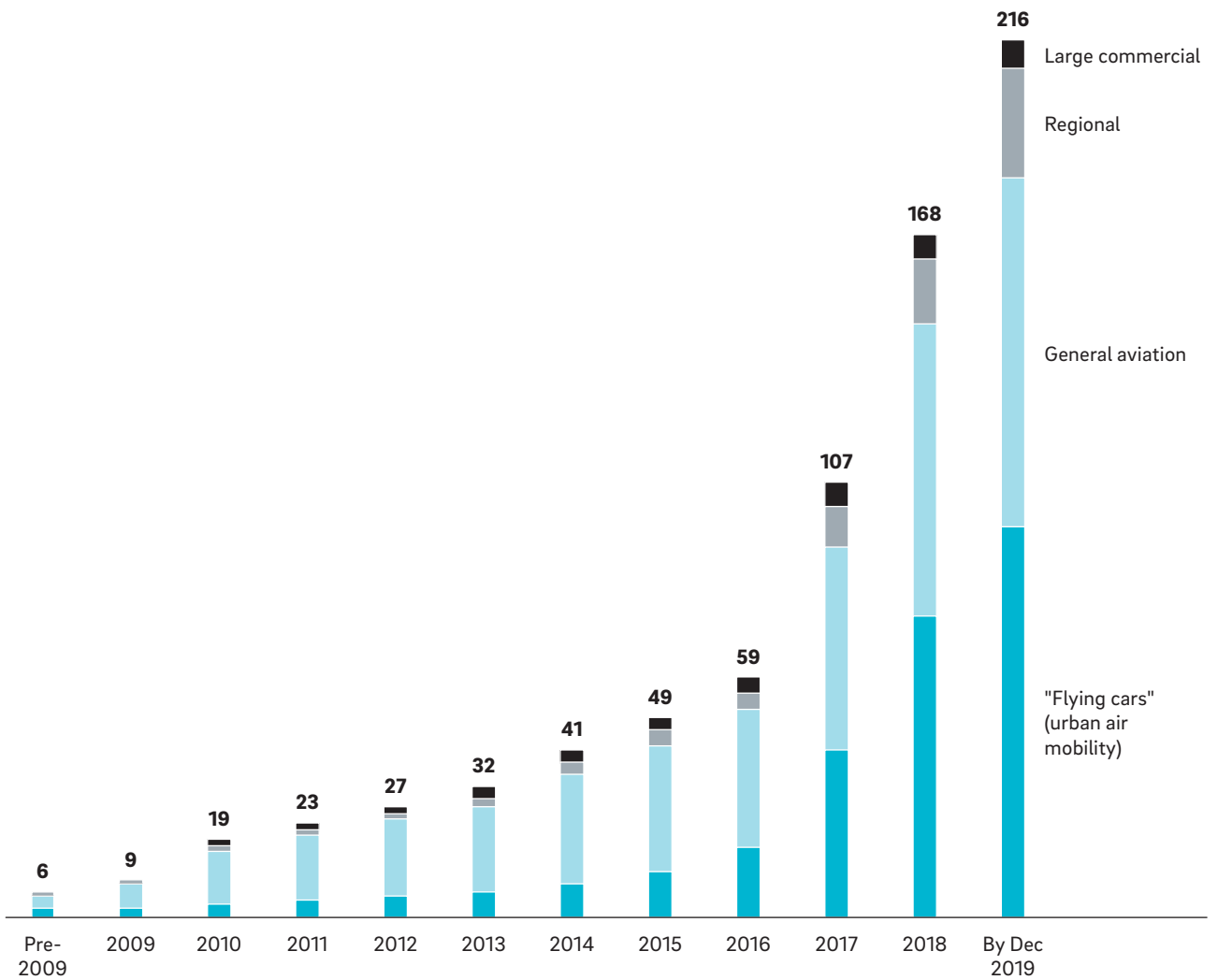
Substantial barriers surrounding technology, regulation and infrastructure must be overcome before this vision becomes reality. Notwithstanding, 70% of our survey respondents believe hybrid electric flights will be generating revenue from airline service within 15 years, while battery-electric flights are expected to take a further decade or more.

Alternative jet fuels (AJF)

As we saw in figure C on page 9, aviation currently accounts for roughly 3% of global anthropogenic CO₂ emissions. And while the percentage has so far been growing in line with overall global emissions, aviation's share of emissions may now be poised to increase dramatically. Ongoing growth in revenue passenger miles and a slowdown in the rate of reduction in fuel burn as gas turbine technology matures – coupled with sharp reductions in CO₂ emissions in other sectors – are the key factors driving aviation's proportion of greenhouse gas emissions upward. Even if fuel consumption were to continue to improve at 1-2% p.a., worst-case scenarios still suggest that aviation could account for as much as 25% of total CO₂ emissions by 2050. If the A&D industry is to meet its self-imposed target of cutting carbon emissions in half by 2050 (relative to 2005 levels), it may have no choice but to incorporate synthetic fuels.

F: Ready for take-off

Increase in known electrically propelled aircraft developments through December 2019
[#, cumulative]¹



¹ Only including those with first flights after 2010; by date of announcement

Source: Roland Berger Electric Aircraft Database

A number of technological hurdles still stand in the way of this development, however. Five aviation biofuel production pathways have so far been approved for blending with fossil-based kerosene. But of these, only hydroprocessed esters and fatty acids/synthetic paraffinic kerosene (HEFA-SPK) is already technically mature and commercialized. Further research and development is therefore needed before new aviation fuels can become a viable commercial proposition. At the same time, the alternative jet fuels currently in focus do not fully address the issue of other harmful emissions besides CO₂ – one example being nitrogen oxide (NO_x).

Cost issues, too, require attention. Producing AJFs currently costs between two and eight times as much as it does to prepare conventional jet fuel, raising a very high barrier to wider adoption. Politically motivated taxes on existing aviation fuel could, of course, change the economic equation at a stroke.

Yet despite these as-yet unresolved issues, several large airline groups are already taking action to promote or, in some cases, even commit to the use of alternative jet fuels for a small proportion of their fuel needs. As they do so, additional government policy measures will be vital to build on what has already been impressive progress toward more climate-friendly fuel alternatives.

One other "alternative fuel" that appears to be under serious study again is hydrogen – see [Roland Berger's publication on hydrogen](#) for more details on this option.

Urban air mobility

Driven by the ongoing spread of urbanization, the worsening bane of road congestion and new advances in aircraft technology and electric propulsion, the time is now ripe for the emergence of urban air mobility (UAM). Urban air mobility constitutes an attractive solution in areas where merely increasing two-dimensional (ground-based) capacity would in no

way ease the existing traffic situation. It also creates new opportunities for travelers for whom personal comfort and speed are at a premium, as well as for rescue services and para-public applications.

UAM is not a silver bullet that will single-handedly resolve the current overload of traditional transportation networks. Physical constraints such as the limited availability of landing sites and limited options for creating new ones place inherent restrictions on possible UAM routing. Both noise and visual pollution concerns will likewise place a cap on the number of "urban air taxis" and/or drones per city. Public safety too must be addressed: Here, a robust regulatory framework must be put in place in order to ensure this new mode of transportation is safe and reliable. That said, urban air mobility can certainly provide a degree of relief for traditional transportation networks by opening up the third dimension.

More than 80% of our survey respondents expect air taxis and airport shuttles to be the main applications. In this form, urban air mobility will gradually be integrated in the existing mobility landscape, bringing a time-efficient mode of travel and a safe, enjoyable flight experience to more and more passengers at increasingly low cost. With flagship pilot projects scheduled to go live in cities such as Dubai, Singapore, Los Angeles and Dallas in the early 2020s, better batteries, new aircraft designs and – later in the coming decade – autonomous flight technology will bring prices down and spread services to major metropolitan areas around the globe.

When autonomous (unmanned) flight technology goes into passenger service, the number of passenger drones flying urban routes is forecast to grow rapidly. Close to 100,000 such drones could indeed be in service by 2050. As this exciting new market takes shape, the winners will be those companies that address its complex, interdisciplinary needs in close collaboration with manufacturers, infrastructure and service providers

During the next economic downturn, some observers see potential for consolidation in the business jet and rotorcraft segments as competition grows ever fiercer.

and the relevant regulatory and urban authorities. The pivotal success factor will be choosing the right use case from the broad array of possible aircraft/drone concepts. Each has its own benefits and limitations, and not all technologies suit all applications (see our recent [urban air mobility study](#)).

Growing climate awareness is also helping all three of these new frontiers – electric propulsion, alternative jet fuels and urban air mobility – to gain greater traction. Several countries have announced increases in ecology-focused travel taxes that will push up the price of air tickets, thereby potentially reducing demand for air travel. There is also a growing consumer-driven trend to reduce air travel, again rooted in environmental concerns. Some observers speculate that if the status

quo remains unchanged, the climate change awareness phenomenon could result in a significant slowdown in air passenger growth in the long term.

LANDSCAPE REALIGNMENT

There is a strong consensus among top A&D executives that further horizontal and vertical consolidation is expected in the next three to five years. More than 90% of survey participants anticipate more mergers and acquisitions at the tier-1 level, alongside vertical integration across the whole value chain.

Consolidation

After Airbus acquired Bombardier's C-Series program (now the A220) in 2018, and following Boeing's tie-up with Brazil's Embraer, further consolidation in the large commercial aircraft segment is highly unlikely: Between them, these two players now control the vast majority of the LCA airframe market. During the next economic downturn, some nevertheless still see potential for consolidation in the business jet and rotorcraft segments as competition grows ever fiercer.

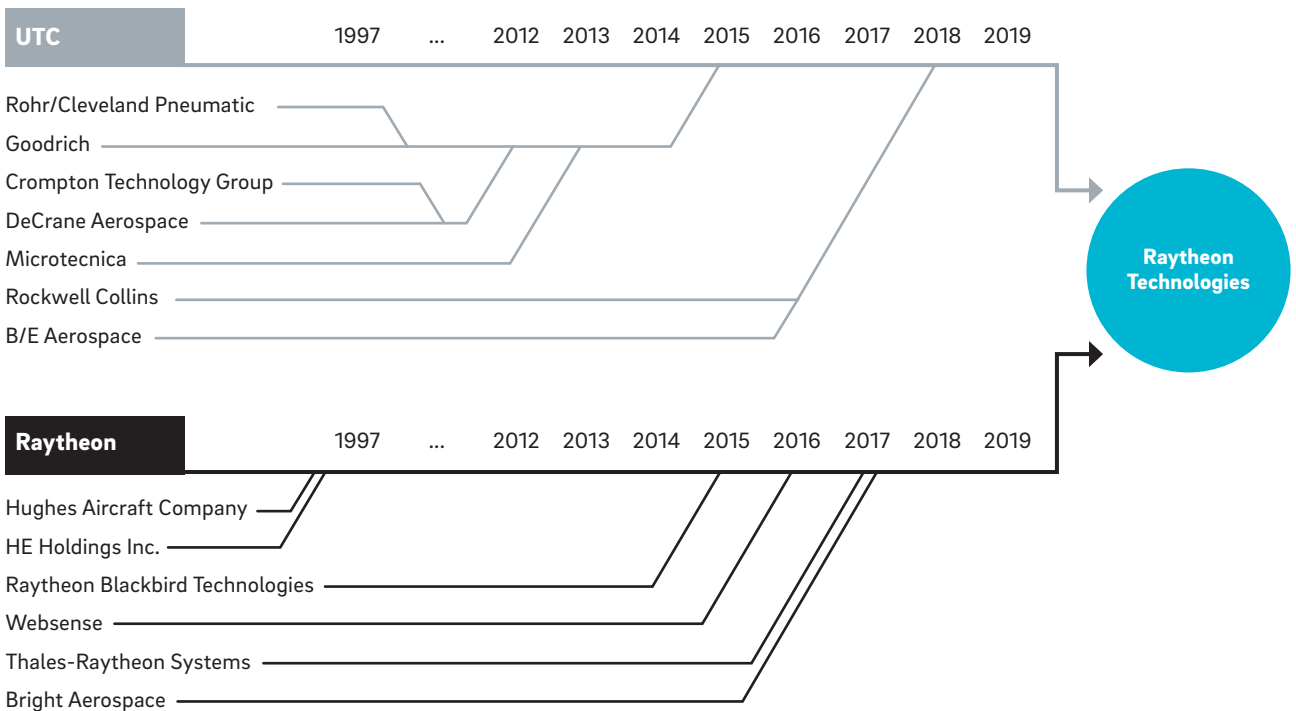
Speculation also surrounds a potential "airframe to engine" move – a scenario in which Airbus and/or Boeing could acquire one of the engine OEMs. If this does happen, existing alignment constellations suggest that Airbus would be most likely to target Rolls-Royce, with Boeing presumably setting its sights on GE.

At tier-1 level, there is no sign of an end to consolidation between suppliers. Creating a USD 74 billion giant in its own right, the UTC-Raytheon merger is indicative of the trend in question. → [G](#)

Although the rationale behind this deal was evidently not clear to some market players, potential benefits could arise from a more balanced and diversified portfolio combining exposure to both the civil and defense markets. A stronger negotiating position to counter OEM-imposed price squeezes would also doubtless be

G: The consolidation game

UTC-Raytheon as an example of horizontal consolidation



Source: Secondary research, Roland Berger

welcome. Be that as it may, more than 95% of our survey participants expect further M&A activities between tier-1 suppliers to materialize in the next three to five years. Aerostructures, interiors and avionics are viewed as primary areas for ongoing consolidation. → [H](#)

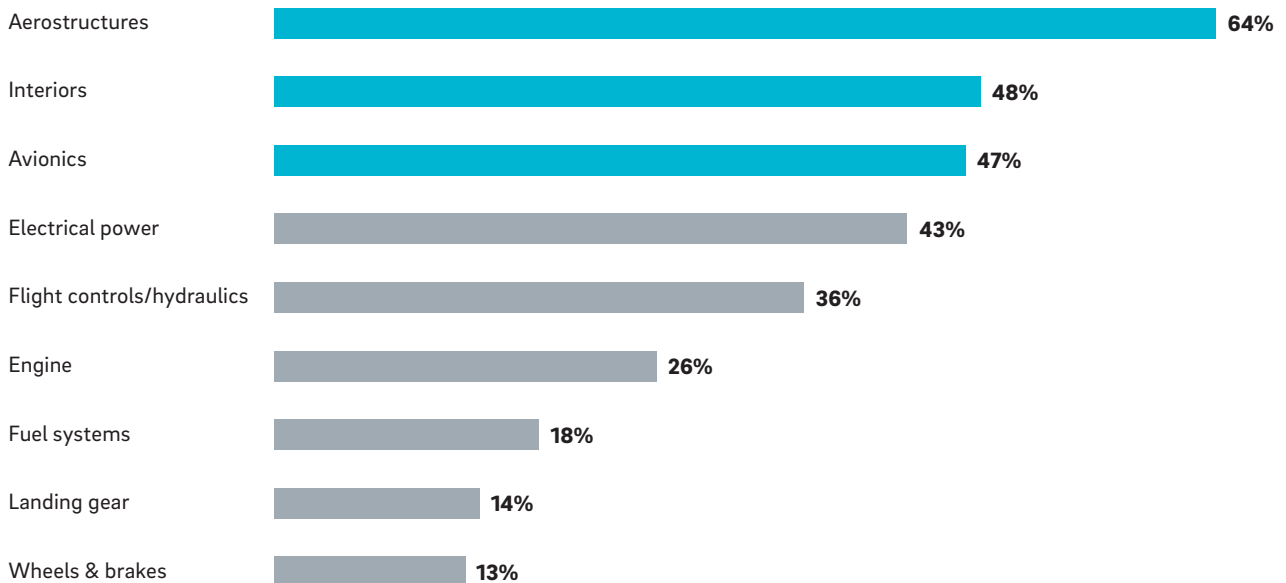
Four key factors are driving the trend toward greater consolidation at this level of the market: As always, one is the search for economies of scale and the assorted synergies that can be gleaned from combining similar businesses. Another is that aircraft OEMs

are running fewer new programs and reducing the number of suppliers they work with on those programs. Coupled to this point is suppliers' desire to avoid being bound to one OEM only. Boeing's recent move to halt production of its 737 MAX aircraft has created huge problems for relevant suppliers and highlights the wisdom of such diversification. Lastly, OEMs' desire to pass development costs and risks down the chain to suppliers is creating a need for more sizable suppliers with deeper pockets.

H: More to come

Respondents believe ongoing consolidation will most likely affect the aerostructures segment

In which segments do you expect further consolidation between tier-1 suppliers? [multiple answers possible]



Source: Roland Berger "Top Management Issues Radar 2019" Survey

Vertical integration

For strategic and financial reasons, prime A&D OEMs have recently been pushing hard and aggressively to in-source design and production work (for wings, nacelles, pylons and actuators, for example). Their strategic motivation is to improve these products, control key technologies and be able to monitor both production and ramp-up activities. They are also keen to benefit from service revenue and achieve greater customer intimacy. On a financial level, the OEMs want to cut costs and tap

into aftermarket sales to boost operating margins. As things stand, airframe OEMs' margins are half of what their key tier-1 suppliers earn.

It is therefore no surprise that 94% of our survey respondents expect vertical integration to deepen in the near future. Aerostructures are viewed as the primary candidate for vertical integration, likely because of the relatively fragmented nature of the current market. Other target segments may include electrical power (following the cue given by developments in electric propulsion)

and avionics. OEMs see considerable value to be added in the latter segment in particular: Boeing, for example, has set up a unit to develop avionics technology that could focus on flight management systems and the common core system. → [I](#)

NEW MARKET LANDSCAPE, NEW BUSINESS MODELS

If mergers, acquisitions, collaborative ventures, alliances and the like continue along the lines anticipated, the outcome could be a completely reconfigured end market landscape. → [J](#)

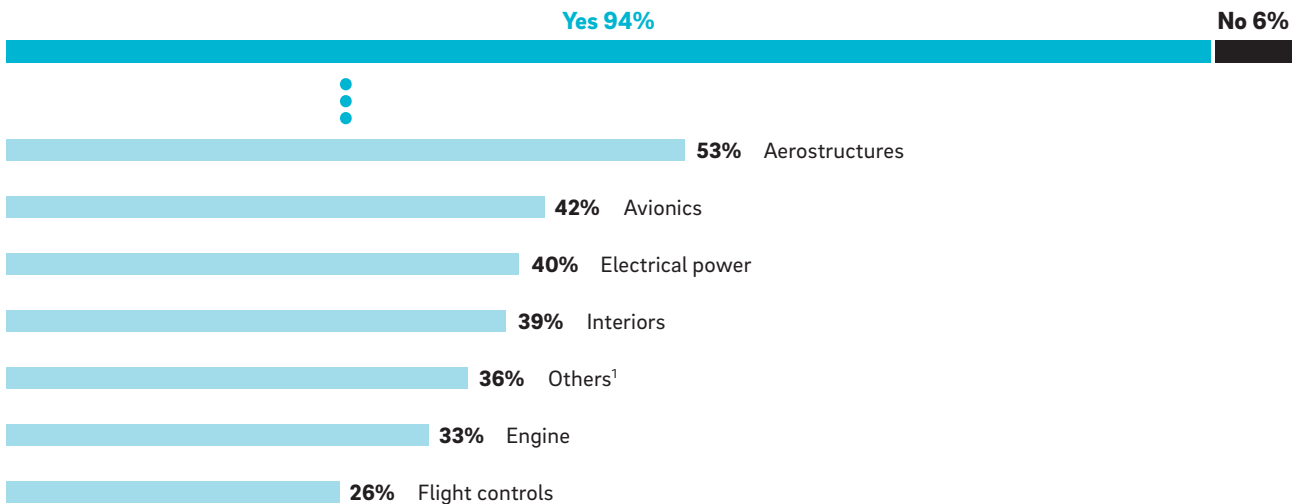
Engine OEMs were the first to introduce fully integrated "power by the hour" engine maintenance contracts. And they were so successful in doing so that nearly 90% of all new aircraft engines are today sold with end-to-end maintenance "built in". In all probability, the next – and highly logical – step will see new aircraft marketed with similar integrated maintenance contracts.

The market could also end up with just a handful of "super-tier-1" suppliers delivering aircraft systems to the OEMs. Supplier consolidation to date has placed entire work packages in the hands of these super-players, which now handle everything from initial detailed

I: Vertical integration heading north

Likelihood and impact of vertical integration in different areas

*Do you expect to see a rise in vertical integration over the next 3-5 years?
[multiple answers possible]*



¹"Others" includes landing gear, fuel systems, wheels and brakes
Source: Roland Berger "Top Management Issues Radar 2019" Survey

system and component design to manufacturing across airframes, systems and engines.

At the same time, vertical integration will see airframe OEMs capture a bigger chunk of the margins currently earned by suppliers on tiers 1 and 2. Insourcing is the key tool via which the OEMs are aggressively targeting two thirds of total industry profits – profits that are currently shared among engine companies and system and

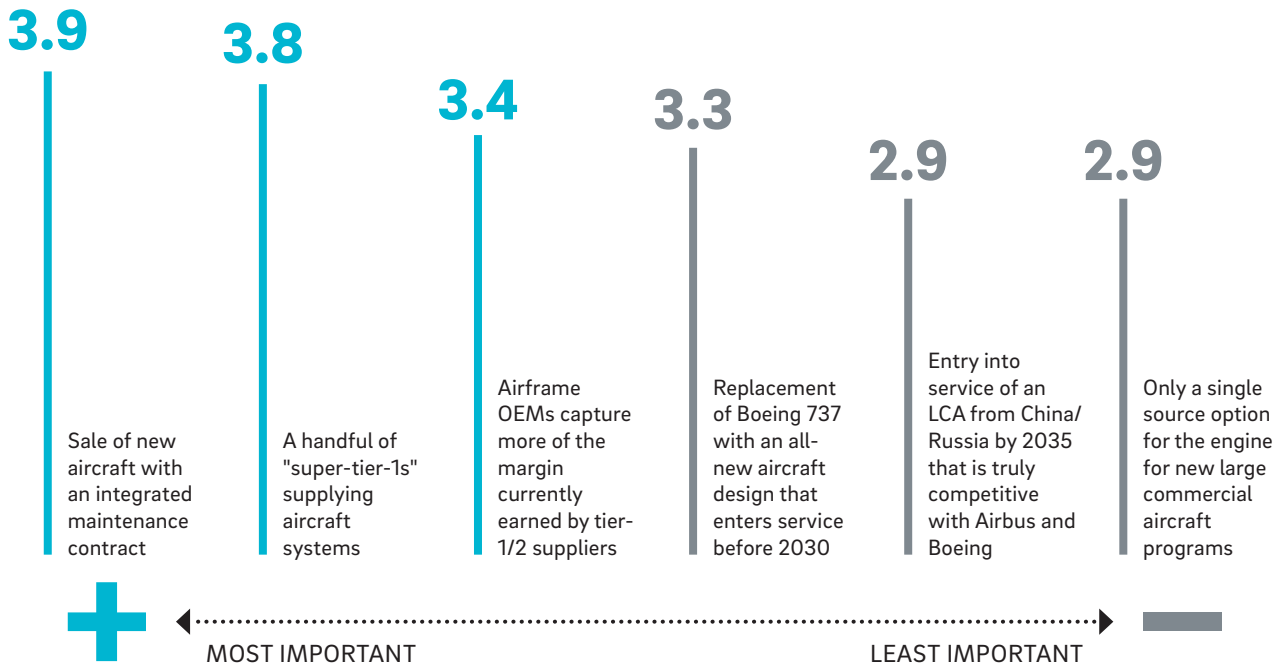
structure suppliers. If OEMs succeed in implementing this strategy and leveling up margins, their own operating margins could improve by as much as 50%. For their part, tier-1 suppliers too are looking to cream higher profits off the supply chain by integrating with tier-2 and tier-3 suppliers, as the latter’s margins are typically even fatter than those of tier-1 players.

J: All change

The A&D landscape could look very different in the future

Characteristics of future landscape [1 = very unlikely to occur, 5 = very likely to occur]

If M&A, collaboration, alliances and other changes in the industry landscape continue, what could the end market look like?



Source: Roland Berger "Top Management Issues Radar 2019" Survey

4 / Strategy revisited?

AS PRODUCT STRATEGIES MOVE BACK CENTER STAGE, COMPANIES ALSO NEED OPERATING MODELS THAT DELIVER EXCELLENCE IN IMPLEMENTATION


There are good reasons why product strategy once again figures prominently on top A&D executives' agendas this year. Although more than 80% of our survey respondents have already changed their strategy in the past five years, nearly two thirds (64%) indicate that their companies need to go further in this area. This conclusion is consistent with the wider findings of our survey: The powerful forces of ever greater complexity and volatility, ongoing consolidation, the battle for the aftermarket, the rise of electrification and other technological disruptors are pulling market players in different directions – even as they struggle to meet the demands of an unprecedented "supercycle". Gone


K: Never-ending story


Even companies that have updated their strategy see the need to continue doing so

Changes and suitability of strategy [% of answers]
Has your company changed its strategy in the last five years (to capitalize on/adapt to the changes in the market landscape)?

Yes, but it needs further change  57%

No, it has not changed but needs to change  9%

Yes, it is now fit for purpose  30%

No, it has not changed but is fit for purpose  4%

Source: Roland Berger "Top Management Issues Radar 2019" Survey

are the days when a strategy could be "cast in stone" for five or even ten years. OEMs, tier-1 suppliers and tier-2 suppliers all agree that strategies must today be revisited – and made as agile as possible – with ever-greater frequency. → [K](#)

FROM STRATEGY TO OPERATING MODEL

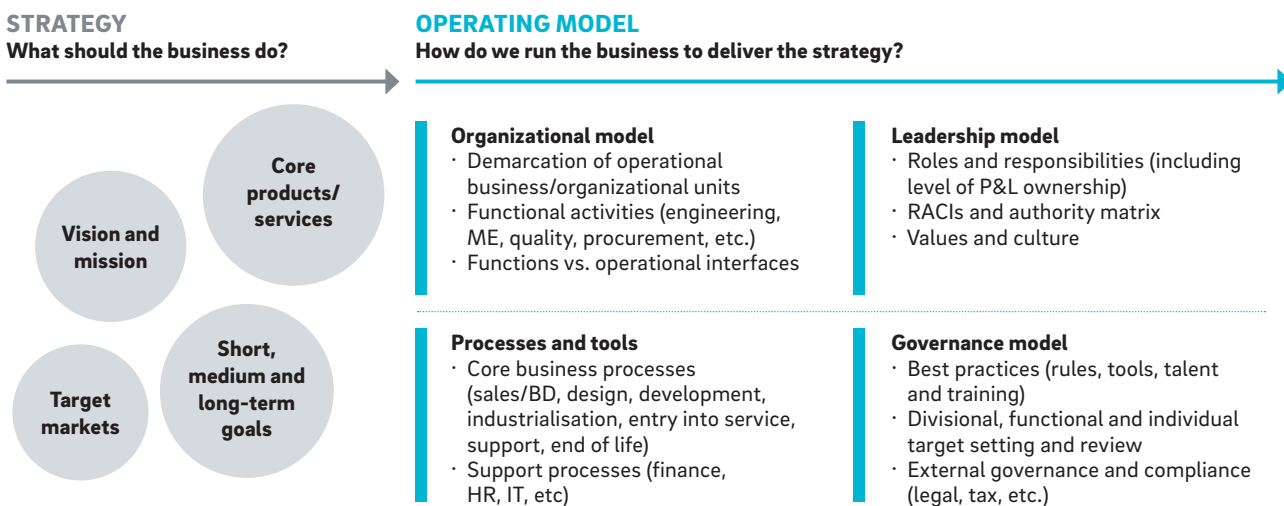
Even the best strategy still has to be implemented correctly, though. Which is why strategic considerations in the A&D industry must also devote some headspace to the operating model: the mechanism that breathes life into a strategy. An operating model describes a company's processes (how it does its business), its structures (the organizational framework within which it operates), its approach to leadership (how it is managed) and its governance model (how it ensures appropriate oversight for its operations). In such a complex environment, finding the right operating model that suits your company's needs is not easy. But it is essential if companies are to fully achieve their strategic objectives. → [L](#)

It follows that changes to any company's strategy should necessarily lead to a redesign of its operating model. Despite being satisfied that their strategy is generally fit for purpose, many organizations still fail to reach their full potential, with organic revenue growth, profitability and customer satisfaction tending to fall short of expectations.

In our experience, these typical challenges are symptomatic of an operating model that has plenty of room for improvement. Such sub-optimal models often stem from underlying issues such as multiple customer interfaces, fragmented product portfolios, a scattered footprint, local process ownership and ineffective performance measurement. These issues in turn may be rooted in unstructured (organic or inorganic) growth histories and failures to properly complete post-merger integration somewhere along the line. What should

L: From strategy to operating model

Strategies show the way forward, operating models get the job done



Source: Roland Berger

have become streamlined, synergistic organizations thus degenerate into complex, disparate entities that are difficult to manage and nullify the intended benefits of scale.

If that sounds familiar, it is hardly surprising: Over the past two decades, a raft of acquisitions at major aerospace and defense companies have never been fully integrated. Perhaps that is why some 70% of respondents in our survey agree that their current operating model may be holding them back. Among OEMs the figure is even higher, with nearly 80% asserting that further changes to their operating model are necessary. Respondents also pointed to one main root cause: a silo mentality that keeps functions and divisions from working smoothly and efficiently together. In the current climate, and with further consolidation in the pipeline,

it is therefore high time to revisit strategy, "sort out the mess" and bring operating models up to par in line with new strategic goals. → [M](#)

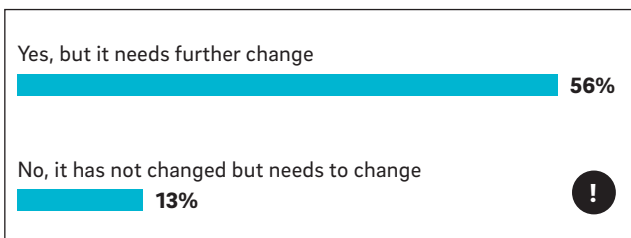
Five questions can help you identify whether your company's operating model needs a redesign:

- Do you have multiple interfaces to your customers?
- Do you operate as a unified organization (across different functions, sites and divisions)?
- Do you have too many hierarchical layers hindering decision-making?
- Is operational performance consistent and fully in line with customer requirements?
- Have you fully captured the economies of scale and operating leverage across the entirety of your business?

M: Once more, with feeling...

In a changing market environment, and as companies discover that their existing operating models may still be holding them back, this aspect is a constant work in progress

Changes and suitability of operating model [% of answers]
Has your company changed its operating model in the last five years?



Yes, it is now fit for purpose
24%

No, it has not changed but is fit for purpose
7%

Source: Roland Berger "Top Management Issues Radar 2019" Survey

Essentially, if you are not happy with the answers you get to these questions, it may indeed be time for a closer look at your operating model. The decision to implement a new operating model should not be taken lightly, of course. As important as it is to every company, getting the operating model right will involve fundamental changes across the entire organization. In the current context, however, failure to make such changes ultimately exposes players to the real risk of being taken out of the market. → [N](#)

CASE STUDY

Revisiting your operating model

The following recent case study can be a useful point of departure for other companies looking to realign their operating model to meet changing strategic requirements.

A company that provides highly engineered products to numerous markets worldwide recently approached Roland Berger for help in developing and implementing a new operating model. Its operating units were product-centric, which came as no surprise given the client's strong engineering heritage. The company was also suffering from low organic growth rates, complex customer interfaces and high SG&A costs. And its footprint, supplier landscape and base of expertise were scattered and fragmented. This was the legacy of a policy of growth through acquisitions, where inadequate integration had left decision-making power spread across different locations. Management was understandably having trouble driving company-wide change of any kind – be it operational or strategic – across such a piecemeal organization.

We set about the task of reviewing the operating model by first benchmarking the company's performance against its peer group. The result was a robust case for change that all internal stakeholders could buy into. On this basis, we worked with the client's management to stake out the design principles for the new operating model, detailing processes, structures, leadership and governance from the ground up. A series of war gaming exercises stress-tested the modified design to prepare for the implementation phase.

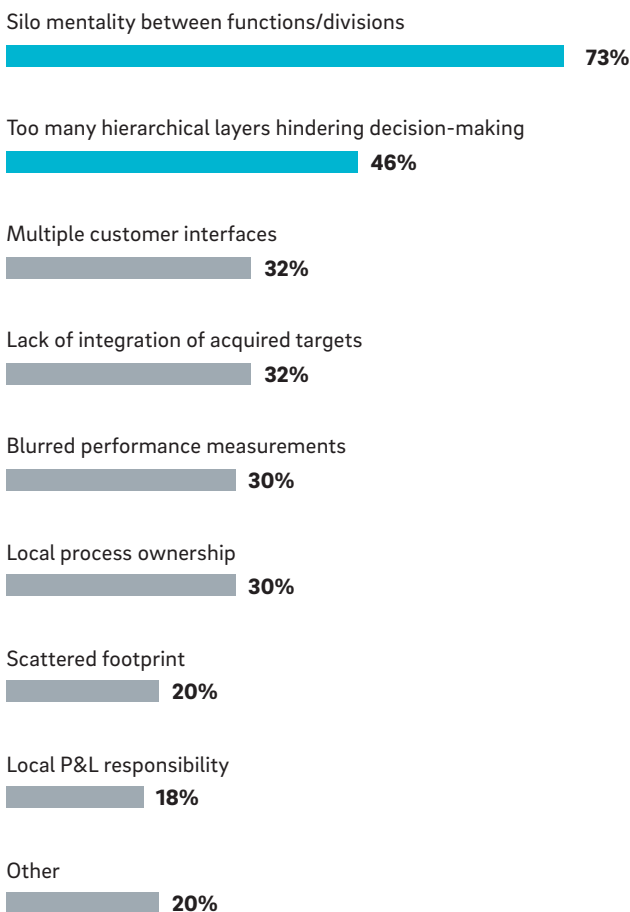
Following implementation, the company has generated faster organic growth, reduced overhead costs, simplified the organization and improved its customer responsiveness.

N: Back to the roots

Silo mentalities and legacy inefficiencies are holding companies back

Root causes of operating model issues [% of answers]

What were the root causes that led to the operating model not being fit for purpose?



BENEFITS OF A FULLY ALIGNED OPERATING MODEL

Redesigning your operating model can give you a single, empowered interface to the customer, a fully leveraged supply chain, a footprint that is truly fit for purpose, effective and efficient processes and superior performance measurement capabilities. It instills clarity and simplicity in the way your organization works.

Global account management can replace multiple customer interfaces to drive commercial excellence and pricing discipline, for example. Managerial complexity can be eased by streamlining a scattered footprint and investing intelligently – which will also slash SG&A costs and boost efficiency. Similarly, a healthy balance between local and global relationships and sourcing decisions can enable direct and indirect savings on procurement costs.

Further details of how to improve your operating model are provided in Roland Berger's Focus publication on this topic ("Is your operating model fit for purpose?").

Conclusion

The pressure of urgent, day-to-day operational demands can easily crowd out the need to map out strategies for what the future may bring. Yet as we have seen, the future of the A&D industry is already bringing change in the present: disruptive technologies, new fuels and propulsion systems, new and unfamiliar markets, as well as consolidation that could conceivably transform the landscape beyond recognition.

Strict safety standards are one reason why the A&D industry has, to date, been slow to adopt new technologies. Yet as technological disruption gathers momentum, executives must be ready (and more agile in their responses) if they want to stay ahead of the game.

For those technologies – such as electrification and automation – that will increasingly come into play very soon, companies need a clear strategy. They need to know exactly which technologies to focus on and how they plan to do so: organically, or via mergers and acquisitions.

At the same time, for technologies expected to take wing a little later, players in this industry must keep a very close watch on the market landscape, monitoring developments to identify the most promising aspects. That will help them invest confidently in their own R&D, which will in turn enable them to develop their own intellectual property for the economy of the future.

Successful companies are the ones that never rest on their laurels. So, even as the current "supercycle" looks set to continue, the time is ripe for companies to ask themselves whether they genuinely have the right strategy – and the right operating model to deliver on that strategy. Mergers and acquisitions pieced together like so many building blocks over several decades have left more than a few companies with organizational structures that look increasingly out of date and out of place. Maybe the one missing piece of the puzzle – the one factor really holding your organization back – is an operating model that once worked well but is now in danger of being bypassed by disruptive developments and daily demands?

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