

Horizon shift:

In it for the
long haul



Acknowledgements

We would like to thank the following individuals for sharing their time and insight, which was invaluable to the development of this report:

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Introduction

Aerospace has been turned upside down by the coronavirus pandemic, but it is under pressure not to abandon its emissions-reduction efforts.

As the industry pursues lighter materials, cleaner fuels and other innovations, it will need government support, reduced bureaucracy and greater flexibility in the manufacturing process.

Covid-19 has disrupted decades of growth in the aerospace industry, and the entire supply chain now faces structural changes and industry consolidation. But the industry was already facing a challenge: policy change and consumer pressure were pushing it to reduce its carbon emissions.

It is becoming clear now that the industry will continue in this direction. And there is a lot to do. If the aviation sector were a country, it would be the sixth-largest emitter of CO₂, and in 2018 domestic and international flights emitted about 2.4% of global energy-related CO₂ emissions.¹

European governments have already linked their bailout packages to emissions-reduction initiatives, with the aim of protecting jobs and making the aerospace industry competitive well into the future.²

While still in the throes of attempting to mitigate the pandemic, large multinationals are confirming their continued commitment to decarbonisation. Our survey shows that, despite the difficulties caused by Covid-19, senior executives across Europe seek to rebuild with a purpose, taking their cues from policy developments and public opinion.

Dr Cristina Garcia-Duffy, the Head of Technology at the UK's Aerospace Technology Institute, says that the UK's target to achieve net zero emissions by 2050 continues to drive change in the industry. "One [change will be] the pace and how we invest in technology for new aircraft, how aircraft will fly, and how they will be maintained and disposed of," she says. "But there will also be lots of effort put into achieving net zero carbon in the sector's industrial processes and manufacturing activities."

Recover, revamp, reduce

In [Chapter 1](#) of Horizon shift, we explored aerospace's confidence in technology innovation as a catalyst for resilience and competitive advantage during times of disruption. Here, in Chapter 2, we investigate whether there is an opportunity to both revamp the industry post-pandemic and reduce emissions. And we find that it is innovation, operational efficiencies in the production process and government support that will keep up the momentum as the industry seeks to recover from the crisis and prepare itself for the long haul.

In June, we surveyed an additional 80 executives in the European aerospace industry. This allows us to see what has changed since our earlier survey of 325 respondents, which took place at the start of the Covid-19 pandemic in February and March 2020.

Ready for a green recovery?

In this chapter we look at how the industry feels about emissions reductions, the types of innovation that will support a green recovery in the aerospace industry, and implications for the supply chain. We ask four important questions:

1. Is there pressure on the industry to prioritise emissions reductions?
2. Which technologies will lighten the load?
3. How is the industry rethinking its supply chains?
4. Which operational improvements support speed to market?

As a subdued aerospace industry starts to regain its optimism, Protolabs' research suggests that this is the time for it to lay the foundations for a more resilient future. And as Europe's skies reopen for passenger flights and privately built and operated spacecraft launch NASA astronauts into orbit,³ we need to ask what that future might look like – and work out how to get there.

Is there pressure on the industry to prioritise emissions reductions?

Making the case for sustainability could be difficult at a time when activity in the aviation sector has come to an abrupt halt.

When there have been countless job losses, and the slowdown in passenger demand and cancellations of aircraft orders are weighing on the entire production chain.

But other sectors, such as power generation and automotive, are making strides in decarbonisation. So public pressure is on aviation.

Stand apart from the competition

As media coverage and consumer awareness of climate change continue to grow, pressure on the aviation sector will increase. The industry recognises this. In June's survey, 77% of respondents say they expect environmental credibility to become a key differentiator. This compares with 68% in February/March – before the pandemic really took hold (see figure 1).

When demand for passenger and cargo flights picks up again in late 2020 and early 2021, the companies that can continue to invest in emissions reductions may find themselves passengers' and businesses' carriers of choice.

A 2019 study by McKinsey found that 46% of consumers would pay an additional \$20 or more for a carbon-neutral flight.⁴ That increases to 55%

We need to differentiate our business by increasing our environmental credibility

Agree (June) Agree (Feb/March)



Figure 1. Q: To what extent do you agree or disagree with the following statement?

among 18–24-year-olds, who are the next generation of travellers.

In parallel with public opinion, governments in Europe have made parts of their bailout funding conditional on decarbonisation efforts. In Austria, for instance, Environment Minister Leonore Gewessler says it makes sense to use the situation to support decarbonisation, given the aviation sector's outsized effect on climate change and the taxpayer contribution to the bailouts.⁵

France's €15bn bailout includes €1.5bn for environmentally friendly aviation technology,⁶ and UK Prime Minister Boris Johnson has followed suit, promising government backing for a net zero long-haul passenger plane as part of a post-Covid 'New Deal' designed to support the UK's goal of achieving net zero emissions by 2050.

Our June 2020 survey shows that for the industry these moves are neither unexpected nor unwelcome: 65% of respondents say that investing in innovation that creates energy efficiency and emissions reductions should become a priority despite Covid-19. The same proportion expect the aviation industry to use the post-Covid-19 recovery phase to transition to more sustainable fuels and energy-efficient aircraft (see figure 2).

After Covid-19, sustainability is going to be a more important consideration for aerospace companies

Disagree Neutral Slightly agree Strongly agree

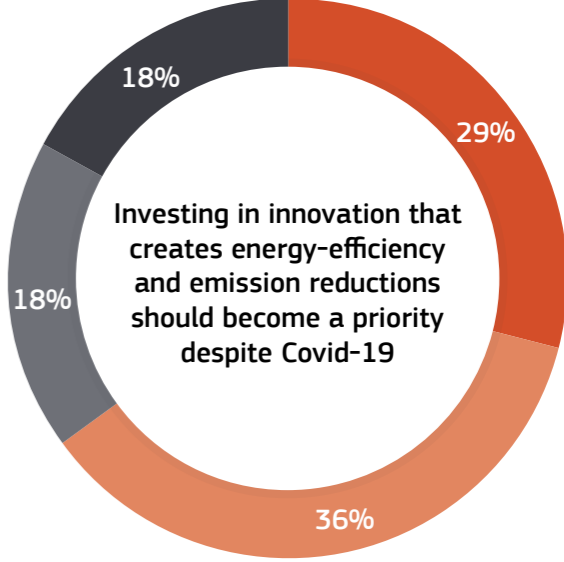
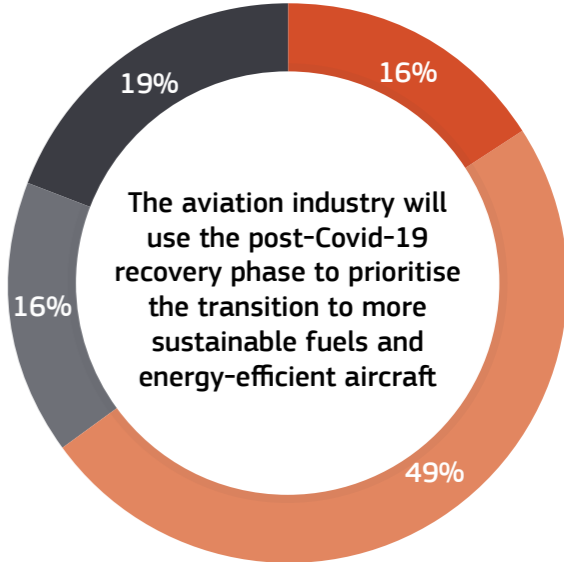


Figure 2. Q: To what extent do you agree or disagree with the following statements?

4 <https://www.mckinsey.com/industries/travel-logistics-and-transport-infrastructure/our-insights/how-airlines-can-chart-a-path-to-zero-carbon-flying>

5 <https://qz.com/1845229/austria-wants-climate-related-conditions-for-its-airline-bailout/>
6 <https://www.cityam.com/french-government-presents-e15bn-aid-package-to-save-aviation-sector/>

Which technologies will lighten the load?

Carbon offsetting, through planting trees or investing in renewable energy, is the most efficient way to neutralise the impact of emissions.

But it is innovation in structures, composite materials and alloys that is expected to attract smart investment and underpin much of the effort to reduce emissions in the next generation of aircraft. France's bailout package, for example, supports structural innovation and propulsion efficiencies, and includes a plan to debut a carbon-neutral plane by 2035.⁷

In the June survey, 72% of respondents say that new materials represent the strongest opportunity for aerospace businesses to reduce their overall environmental impact – up from 68% in February/March (see figure 3).

A lighter aircraft burns less fuel, but it must still feature materials that can endure high stress and extreme thermal exposures. Titanium and aluminium, for example, offer durability at lighter weights, which reduces fuel use.

Weight-loss programme

As well as aerostructures, such as the fuselage and wings, the industry's innovation drive is also targeting propulsion systems.

"On the propulsion side, we need to continue development for the next generation of ultra-high bypass ratio engines for large commercial aircraft," says Garcia-Duffy of the Aerospace Technology Institute.

"There is a lot of investment in more energy-efficient aircraft technologies – increased energy efficiency can be gained through aircraft light-weighting, improved aerodynamic efficiency, and improved propulsion system efficiency," she says. "And there is a lot of investment in aircraft weight-reduction technologies – mainly for structures and propulsion systems." She adds that weight reduction can be gained through improved use of materials such as composite materials and taking advantage of new manufacturing processes such as additive manufacturing.

In this context, additive manufacturing offers the chance to process materials at greater speed and with less waste, and to compress multiple components into a single piece. Defence contractor Lockheed Martin is an example of a business that is making these kinds of innovative investments: it has turned to additive manufacturing in order to create propellant tanks from titanium.⁸

Additive manufacturing is no longer just restricted to prototyping – it is increasingly used for production, says Hannes Hecher, CEO of Austrian UAV manufacturer Schiebel Group. "The advantages are increased design freedom as well as valuable weight savings," he says. "Every future gram we save on the aircraft allows us to further increase endurance or payload capacity. We see the technology mainly for production rather than prototyping."

New materials represent the strongest opportunity for businesses in the sector to reduce their overall environmental impact

■ Agree (June) ■ Agree (Feb/March)



Figure 3. Q: To what extent do you agree or disagree with the following statements?

How is the industry rethinking its supply chains?

Aerospace is facing significant economic and environmental transformation, which will reverberate along the entire supply chain.

Environmental compliance is already high on the agenda of aircraft manufacturers, and 71% of survey respondents expect regulatory compliance obstacles, including CO₂ targets, to have an increasing impact on their supply chain (see figure 4).

What will have a negative impact on the supply chain over the next two years?

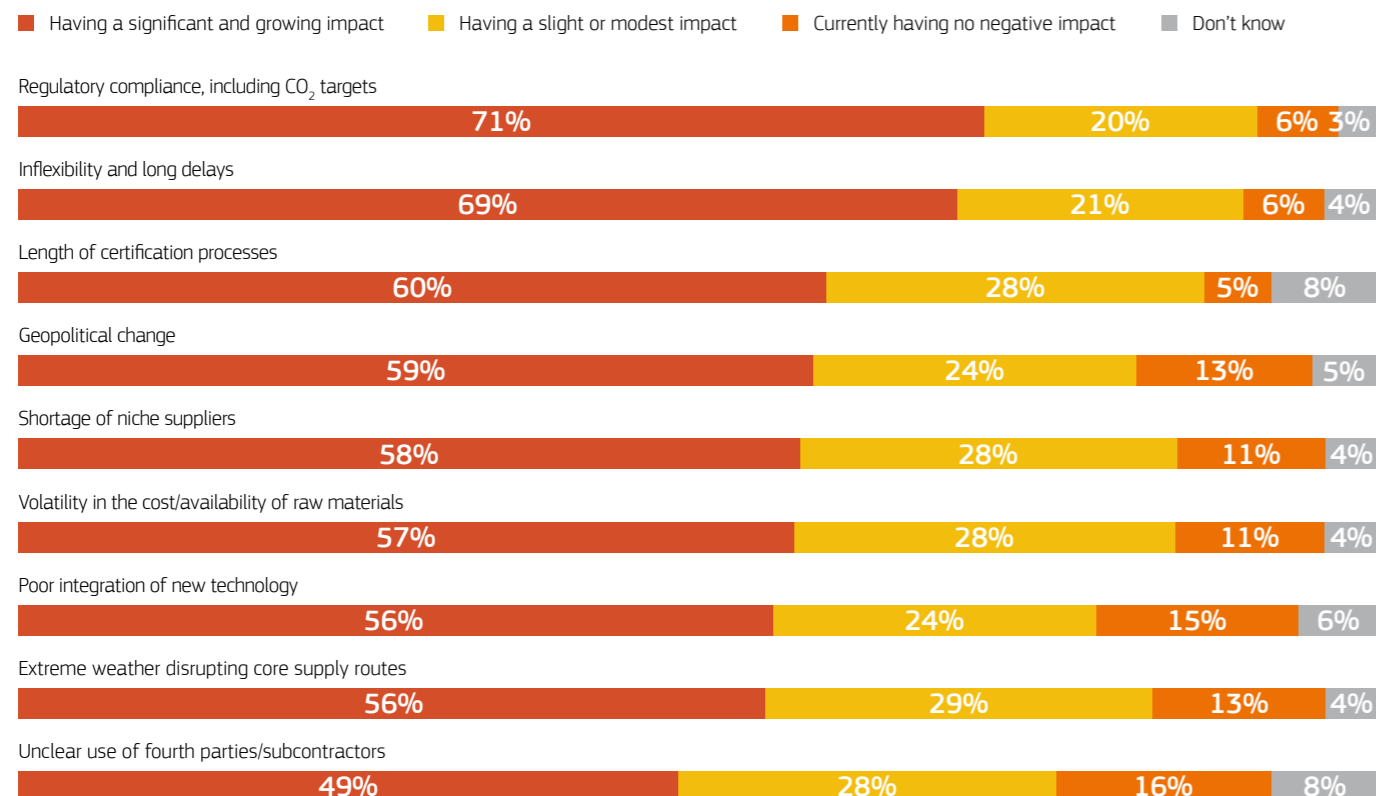


Figure 4. Q: To what extent, if at all, are the following challenges having a negative impact on the efficiency and reliability of your supply chain?

For about four in 10 respondents to both of our surveys, reducing CO₂ emissions is the top reason to innovate the supply chain (see figure 5a). Looking more closely at the survey dates, this concern diminished slightly at the height of the pandemic in March, but bounced back in June (see figure 5b).

Circular supply chains

In April, Airbus reconfirmed its commitment to decarbonisation and leading the development of a more sustainable global aerospace industry.⁹ That is a commitment that also has to filter through its supply chain.

Composite Technology Center (CTC) in Stade, Germany, is one company that illustrates the efforts to tackle the issue of waste and emissions in every part of the business. "I guess the most important challenge is to manage the complexity of getting innovation or increasing eco-efficiency in the aviation sector," says Marc Fette, CTC's COO. "This creates a lot of opportunities, especially for innovation and technology, and these are the most important things influencing all our business at the moment – and also the business of OEMs such as Airbus.

"For commercial aviation, we look for clean technologies, linked to biofuels, electrification and hydrogen," he adds. "And we also apply a 'green' thinking to the entire lifecycle – from the raw materials to the end-of-life and including the required production and infrastructure."

Another of CTC Stade's aims is to design and manufacture lightweight aircraft components that can be recycled. "We consider what we can do to reduce our production waste – especially for carbon fibres – in terms of reuse and recycling at the end of life," says Fette. "For that we have several approaches, and now is a good time to scale up their application."

The Aerospace Technology Institute's Garcia-Duffy backs this approach, and says that recyclable materials have gained in importance since the onset of the crisis. "We have European targets on CO₂, but also for nitrous oxide emissions, on noise pollution and recyclability," she says. "A lot of aircraft are grounded, and they need either repurposing or recycling. Aircraft recycling has suddenly become much more of a priority right now, because of the amount of [stranded] aircraft and the high-value materials and components that are available as a result."

What is driving businesses to rethink or innovate their supply chains?

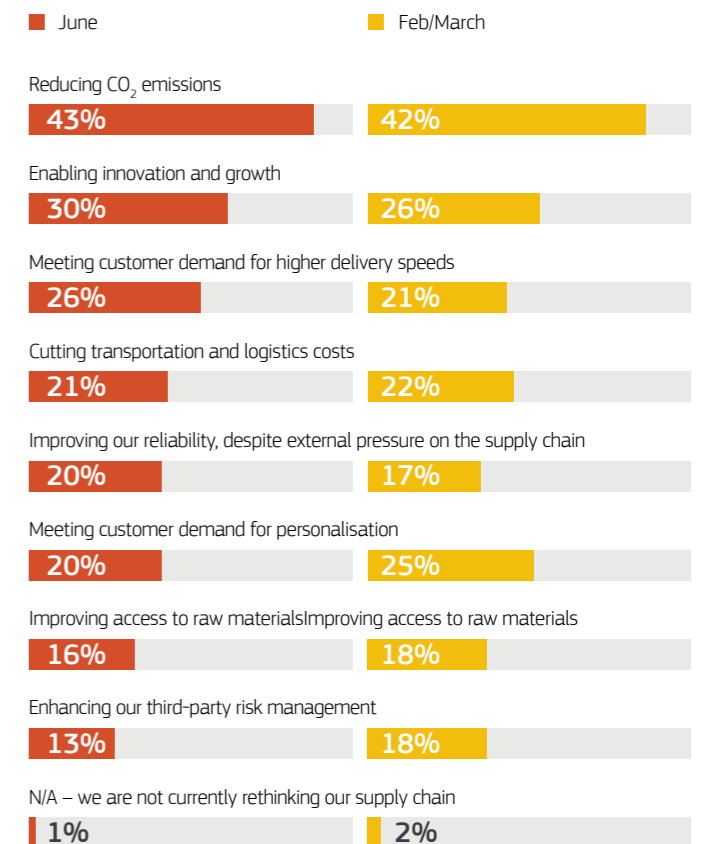


Figure 5a. Q: Which of the following ambitions/opportunities, if any, are driving your business to rethink or innovate its supply chain?

What is driving businesses to rethink or innovate their supply chains? (Top choice by survey date)

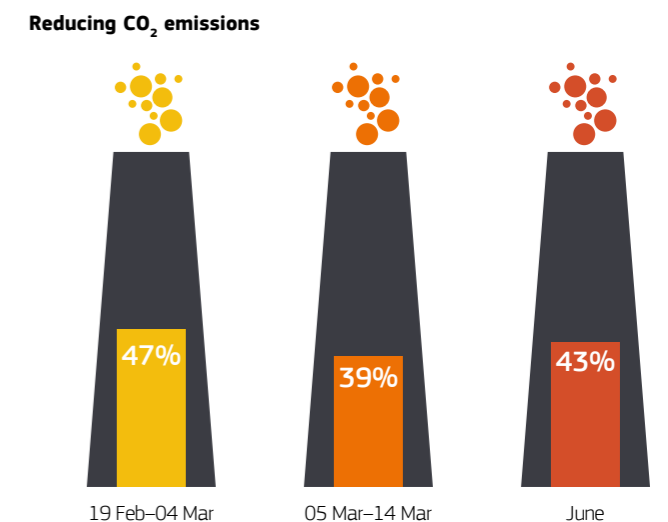


Figure 5b. Q: Which of the following ambitions/opportunities, if any, are driving your business to rethink or innovate its supply chain?

Which operational improvements support speed to market?

Over the next two years, companies we surveyed in June expect to move from using advanced manufacturing techniques in order to enhance productivity and output, to using them to create a more flexible product range, deliver parts and/or aircraft at greater speed, and improve their ability to innovate (see figure 6).

Accelerated consolidation in the supply chain as a result of the Covid-19 induced crisis may compel OEMs and manufacturers to bring suppliers in house or to seek new ways to secure parts and components from approved vendors. In July, British multinational aerospace company BAE Systems announced it expected to onboard new suppliers for the manufacturing of its Tempest fighter jets as a result of “innovative manufacturing processes.”¹⁰ BAE said it had already reduced the production of certain parts from two years to two months through additive manufacturing.

Additive manufacturing delivers

As we have seen, one advanced manufacturing technique that complements traditional processes is additive manufacturing. It can have the added benefit of decentralised on-demand production of components that are difficult to procure, and can also contribute to emissions savings by reducing transport in the supply chain. Before the pandemic, this was already seen as an efficient way to compress production time in the supply chain, but now Covid-19 has increased manufacturers’ need to be prepared for disruptions.

According to Marc Fette, CTC is exploring innovation in the additive manufacturing of composites, which is one of the company’s technical innovation fundamentals. “We have a new approach to digitalisation and the industrial IoT,” he says. “For this, additive manufacturing is really good because we can build up the process chain digitally. We want to use it to create new business models and to transfer this knowledge to other technologies for bigger lightweight components, such as load-bearing carbon-fibre-reinforced aircraft structures.”

Additive manufacturing is also an important innovation for the satellite market. “We’re trying to see how additive manufacturing could work for us in terms of faster access to market,” says Dr Kolja auf der Heide, Director of Group Supply Chain Management at German satellite technology company OHB. “Because many things in

satellites are specifically designed, and for that you need specifically manufactured parts – as cost efficient and quick as possible.”

That desire for speed is reflected in our June survey. Respondents expect inflexibility and long delays (69%) and lengthy certification processes (60%) to have a significant and growing impact on the efficiency and reliability of their supply chains over the next two years (see figure 4 on page 10).

Flexible product ranges and faster delivery times are becoming more achievable

■ Next two years ■ Past two years

Wider flexibility of product range (e.g. personalisation)



Faster delivery times



Enhanced ability to innovate



Reduced costs



Enhanced employee experience



Improved client retention



Enhanced productivity/output



Figure 6. Q: Which of the following outcomes have you achieved to a meaningful extent during the last two years, as a result of using advanced manufacturing techniques? And which do you expect to achieve over the next two years?

Is government support the answer?

Some companies in aerospace are looking to government support as they try to explore new markets and achieve faster certification for new products that could support their revenue streams.

“It’s the government’s responsibility to promote high-level disruptive technology and to act as an industry partner – especially in situations like the one we’re facing now,” says Fabio Russo, Head of Research and Development at Italian aircraft manufacturer Tecnam, which recently unveiled, among other new products, an EU-funded hybrid electric propulsion aircraft, the H3PS Tecnam P2010 four-seater.¹¹

To encourage growth, more than three in 10 respondents in June’s survey say they would welcome: industry-wide initiatives such as increased government investment – in infrastructure, for example (39%); improved international regulation and collaboration (36%); continued investment in STEM skills and aeronautical engineering education programmes (35%); and supportive fiscal policies (33%) (see figure 7).

“It’s most important have a smooth process of aircraft certification at every stage by further increasing companies’ involvement,” says Russo. “This enables companies to better schedule and plan their efforts, objectives and resources.

“As a private company, we need to limit as much as possible the timeframe between the first concept of a new product and the time from which it can be sold on the market,” he says. “Disruptive technology, often not supported by certification requirements, usually takes years to bring in revenue.”

Initiatives that could improve organisations’ potential for growth

■ June ■ Feb/March

Increased government investment (e.g. in infrastructure)

39%

34%

Improved international regulation and collaboration

36%

36%

Investment in STEM skills and aeronautical engineering education programmes

35%

32%

More supportive fiscal policy (e.g. tax breaks, R&D grants)

33%

34%

Development of a ‘fail fast and fail safe’ industry culture

29%

25%

Easier licensing of commercial operations

26%

25%

Public awareness campaigns (around safe use of drones, etc.)

21%

32%

Regional space clusters

21%

20%

Figure 7. Q: Which, if any, of these sector-wide initiatives would most improve your organisation’s potential for growth?

Conclusion: Two crises, one way forward

Covid-19 is stalling ambitions and holding up financing for the next moon-shot – literal and metaphorical. But the goal of protecting Earth’s climate by reducing emissions is still within the grasp of the aerospace industry.

That industry has gone from being a high-growth sector to one that faces radical structural changes. How, then, does it make it through the crisis and press onward to the energy transition to remain competitive for the long haul?

With innovation and ingenuity.

“We need to look at the portfolio of technologies and continue to push on with big game-changing technologies,” says Garcia-Duffy of the Aerospace Technology Institute. “But we also need to identify some shorter-term priorities that will help us shift the current fleet.”

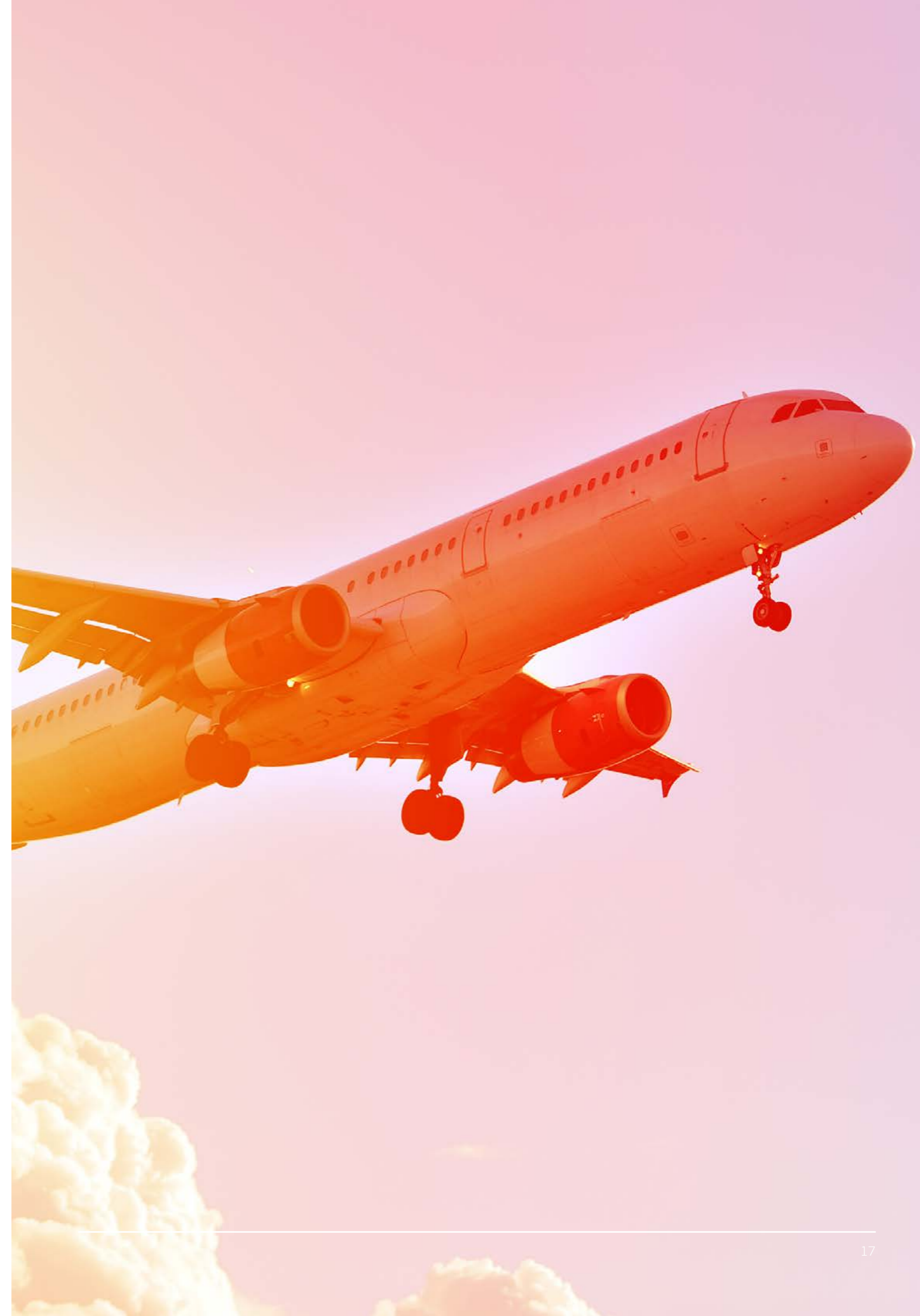
She acknowledges a short-term hit on the supply chain: “The government helping the health of the industry is going to be key in maintaining capability.”

Companies that are pressed for cash in the aftermath of Covid-19 are now focusing on quick wins and speed to market. One way to plan ahead is to create new revenue streams, embed innovation in the supply chain and have the flexibility to develop new products quickly.

In the longer term, as organisations revamp their operations following the pandemic, our survey shows that they will look to hire talent, implement new technology, use new materials and expand their manufacturing capabilities. They might see some unexpected positive outcomes from the crisis: flexibility from upgraded manufacturing supply chains and processes, and the ability to cater to consumer and social pressures with more environmentally friendly aircraft.

As in other sectors, government support is crucial to enable aerospace to plan ahead. Public and private investments are now geared towards creating and securing jobs – many of which are linked to retraining and research and development for green jobs – and developing competitive industries. This will lay the foundations for a more resilient future for the European aerospace industry and prepare it for the long-haul.

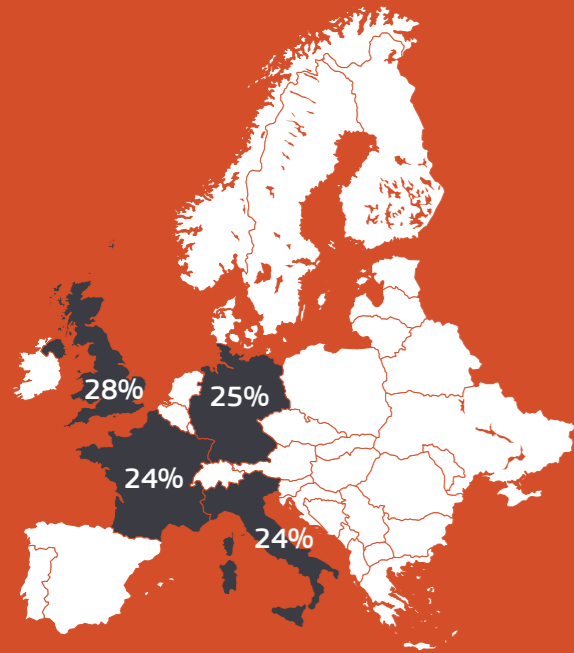
The two crises of climate change and the Covid-19 lockdowns are changing the face of the aerospace industry. New types of aircraft, business models and supply chains will emerge. Survival is not going to be about a fast transition, but about building up resilience for the long term – and part of that is producing the next generation of aircraft: improved aerodynamics, lighter, more fuel-efficient and less polluting.



About the research

The data in this report is based on an online survey of 80 senior executives in the European aerospace industry, which was carried out with Longitude in June 2020, and an earlier survey of 325 executives in February and March 2020. We also conducted in-depth interviews with thought leaders and senior executives.

Respondents' countries

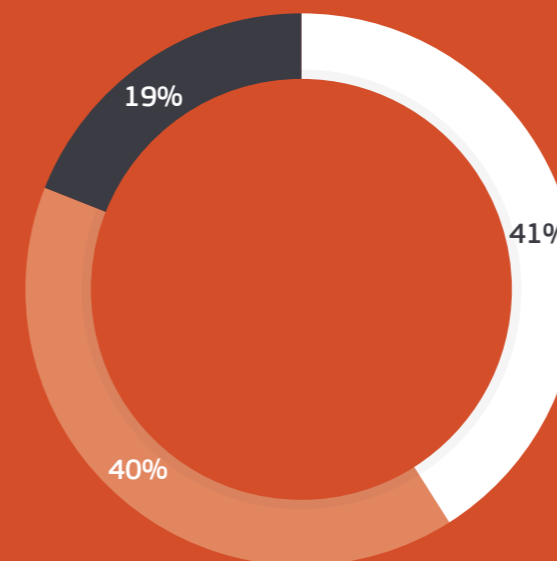


Job titles

- Chief Executive Officer
- Chief Operating Officer
- Head of Operations
- Director/VP of Operations
- Senior Operations Manager
- Chief Information Officer
- Chief Technology Officer
- Chief Digital Officer
- Chief Innovation Officer
- Chief Strategy Officer
- Senior Strategy Manager
- Head of Design
- Senior Designer
- Head of Innovation
- Head of IT/Technology
- Director/VP of IT/Technology
- Technical Director
- Senior Technology Manager
- Chief Engineer
- Head of Supply Chain
- Senior Supply Chain Manager
- Head of Project Management
- Senior Project Manager
- Head of Research
- Senior Research Engineer
- Head of Manufacturing
- Senior Manufacturing Manager

Organisation types

■ High space ■ Middle space ■ Low space

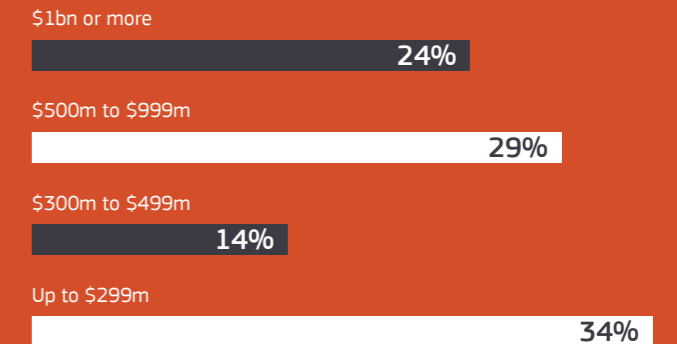


High space = government organisations and not-for-profit organisations involved in aerospace; satellite manufacturers

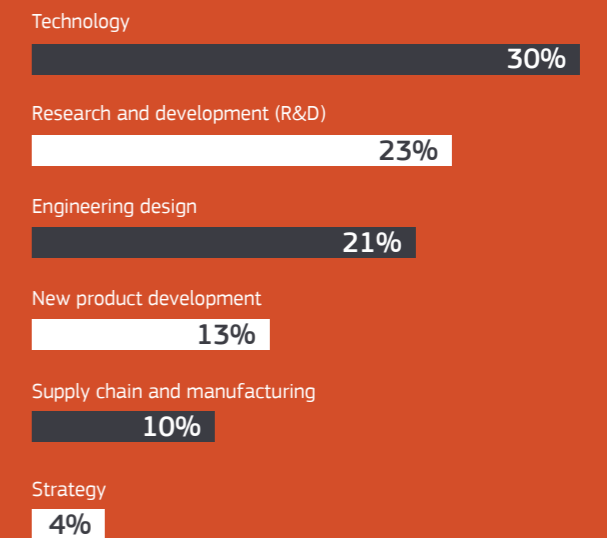
Middle space = aerospace manufacturers; components manufacturers; helicopter manufacturers; defence contractors

Low space = drone manufacturers; automotive with a focus on urban air mobility

Total annual revenue



Job functions





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