

**AIRBUS SUMMIT 2021**  
**PIONEERING SUSTAINABLE AEROSPACE**



21-22 September | #AirbusSummit

**AIRBUS**

# Contents

Foreword	3
Making net-zero carbon aviation a reality: A collective challenge	4
The road to net-zero	8
Visions for the future	14
The future is electric: eVTOL & electrification strategy at Airbus	18
The technology challenge: Decarbonisation starts now	22
Space insights for climate action	32
Paving the way to zero-emission	35
Preparing for tomorrow: The people and skills we need	36
Conclusion: Remaining a force for good	39

To view our Airbus Summit video or to find out more, visit [airbus.com](https://www.airbus.com)

## Foreword

### An unparalleled act of collaboration

A sustainable aerospace revolution is underway. Since the COVID-19 pandemic hit nearly two years ago, the aerospace industry has embraced a roadmap to net-zero.

At Airbus, our ambition is to lead the decarbonisation of the sector. On 21 September 2020, we announced our intention to develop the first zero-emission airliner. This triggered enormous interest within the industry and beyond. Exactly a year later, we organised the Airbus Summit in Toulouse, France on 21-22 September 2021 to take stock of how far we and the rest of the sector had since travelled on our sustainability journey.

The Summit was more ambitious than a typical industry gathering. There were speakers from the space industry, the energy sector and civil society organisations; experts in urban air mobility; and representatives from the world's leading airlines and airports, as well as Airbus. The exchanges of views were lively, sometimes frank – and always fascinating. The audience was around 100 journalists in Toulouse and many thousands more people around the world who joined us virtually.

The Summit sought to leverage the current enthusiasm for a specific purpose: driving deeper cooperation and collaboration. In the coming months, our sector has a precious window of opportunity to forge a global approach to tackling CO<sub>2</sub> emissions in what is a global industry. Not only do we have the COP26 climate summit this year but in 2022, there'll be an important meeting of the International Civil Aviation Organisation,



the United Nations body, where the 193 member states are expected to agree on a long-term CO<sub>2</sub> emissions goal, injecting further momentum into the sector's decarbonisation.

Several conclusions emerged from the Airbus Summit. First, decarbonising the aerospace industry will require an unparalleled act of cooperation between industry, governments, airlines, airports, energy companies and civil society. Second, we've entered an era of astonishing technological change, with digitalisation, electrification, renewable energy, new materials and autonomous flight all set to transform aerospace. Finally, a global approach and level playing field will indeed be crucial. It was therefore encouraging to see the representative body for the world's airlines, IATA, commit to reaching net-zero in the days following the summit.

As a record of a stimulating two days, we've summarised the discussions in this booklet. We hope it makes clear our confidence in reaching our ambitious decarbonisation goals, and also gives you insight into the commitment across the aerospace sector to make net-zero a reality.

#### Julie Kitcher

Executive Vice President Communications, Corporate Affairs & Sustainability, Airbus

# Making net-zero carbon aviation a reality

A collective challenge

## Panellists

**Guillaume Faury**, CEO, Airbus (Host) | **John Holland-Kaye**, CEO Heathrow Airport | **Thomas Reynaert**, MD, Airlines for Europe | **Andrew Murphy**, Aviation Director, Transport & Environment | **Timur Guel**, Head of Energy Technology, International Energy Agency

## Moderator

**Jennifer Newlands**, VP Head of Content Creation, Airbus

## Introduction

**The aviation sector is committed to becoming net-zero by 2050 and will achieve it through collaboration. This is a collective goal. Panellists explore how the entire aviation ecosystem can work together with coordinated actions, and with policymakers and regulators around the world to turn ambitions into reality.**

## Tomorrow is coming fast

The challenge is enormous but the industry has embraced a clear roadmap. Airbus itself unveiled, a year ago, three variants of the ZEROe, the world's first zero-emission commercial aircraft, which is expected to enter service by 2035. But how confident is the company in delivering on the goal?

Guillaume Faury, Chief Executive Officer, Airbus, considers the target achievable but noted that it wouldn't be easy: "aircraft entering service in 2035 is just one part of the challenge... there are others that we need to manage." Fuel is one critical factor: "having the right fuels, at the right time, at the right place, in the right quantity, and at the right price," he says, "is essential."

To achieve this requires the participation of not just aircraft manufacturers, but also reg-

“ Aircraft entering service in 2035 is just one part of the challenge... there are others that we need to manage.” Fuel is one critical factor: “having the right fuels, at the right time, at the right place, in the right quantity, and at the right price is essential.”

Guillaume Faury, CEO, Airbus

ulators to help draw up protocols on how fuels will be used and how aircraft will be certified. He commented that: “2035, in the world of aviation, is the equivalent of tomorrow, therefore we have to be fast, and we have to be fast together.”

The matter was recently given more impetus through the Fit for 55 package announced by the European Commission. It mandates the blending of sustainable aviation fuels (SAF), an end to free carbon allowances, and possible border adjustment tariffs.

## Fuel as a priority

Alternative fuels are the largest concern with SAF and hydrogen being the main options under discussion.

Taking SAF first, Reynaert believes that it needs to be available at an affordable price: “and very quickly, in large volumes in order for current aircraft to fly at least until 2035.” And as John Holland-Kaye, Chief Executive Officer, Heathrow Airport, observes, SAF is already a feature at Heathrow. He considers SAF very attractive: “it is a drop-in technology – you can blend it with kerosene – and the faster we can scale up, the faster we can decarbonise.”

Better still, he explains, it doesn't rely on replacing the entire global aviation fleet. But production must be scaled up via a: “mandate and price stability mechanism... to stimulate the hundreds of billions of dollars that will be required.”

Manufacturing capacity is a concern for Timur Guel, Head of Energy Technology, International Energy Agency, who agrees that SAFs, including various types of synthetic kerosene, have a critical role to play. But he warns that while they're expecting more capacity to come online in the next five years: “it will still be well below what

we would need for 2030. We would roughly require almost 20 times the current level.”

In terms of hydrogen, Holland-Kaye says that it requires four times the space compared to kerosene to store: “it needs a big investment in storage... and potentially involves a whole new distribution system for the airport.”

Beyond that there are the issues of availability at small or regional airports.

Guel has concerns over what it would take to manufacture hydrogen-based fuel: “if just 10% of oil-based jet fuel consumption (2019 figures) was immediately replaced by synthetic hydrogen-based fuel, and it was produced via electricity, then the amount of electricity you would need is equivalent to the total electricity generated in France and Spain today.”

On hydrogen, Faury reflected on fly-by-wire 30 years ago: “it always starts with ‘it’s never going to work’, or ‘it’s too challenging’.” Even so, he thinks that hydrogen planes will be in service by 2035.

Electricity is also a viable proposition in some areas of aviation, notably to power short-haul as opposed to wide-body aircraft. Storage, however, is still an issue, as well as the space needed for an aircraft to re-charge. Holland-Kaye certainly questions how airports would cope with the challenge of storage and finding space for recharging facilities.

### Carrots and sticks

Regulation also delivers change. The European Commission’s Fit for 55 is an example of this. Speakers agree that governmental interaction is necessary, especially with regards to getting alternative fuels off the ground.

Holland-Kaye suggests a form of blender’s

tax credit, as is currently planned in the US, making SAF cost neutral to airlines: “I would like to see more of a carrot rather than stick approach from governments in the EU and the UK,” he says, “to make sure that we can all get behind sustainable aviation fuels very quickly.”

The stick, for example fuel taxes, is also dismissed by Reynaert. And Andrew Murphy, Aviation Director, Transport & Environment, feels strongly that making climate policies stricter in Europe in isolation will have little bearing on climate change: “we know Europe can’t do it by itself,” he says, “we need to bring other regions along with us.”

Faury too sees a role for governments as enablers of decarbonisation: “they have stepped up and decided to invest money with the industry on those new technologies to make sure we can stay at the right pace.”

“It always starts with ‘it’s never going to work’, or ‘it’s too challenging’.”

Guillaume Faury, CEO, Airbus

But is there more that governments can do? They control competition policy, which is crucial to ensuring that those who are investing in net-zero technology avoid being undercut by those that aren’t, says Reynaert: “it’s up to us to work with governments and regulators to make sure that we can continue to have a healthy, competitive and affordable market for passengers.” A global level playing field is essential.

But SAF is more expensive so, as Holland-Kaye points out: “if we want to fly, we will need to pay our way.” But governments could help fund the transition as sustainable aviation fuel scales up.



Guillaume Faury, Airbus; Andrew Murphy, Transport & Environment; Thomas Reynaert, Airlines for Europe; Jennifer Newlands, Airbus.

### Looking to the future

Murphy wants more transparency on investments. He draws an analogy with the automotive sector where manufacturers publicly detail their investments in digital and electric technologies: “we need to see clear timelines and transparency in the amount of money being put into this,” he says.

But as Faury explains, getting the ball rolling isn’t so much about money but about technical issues: “we are limited by resources of engineering... working on technology is very difficult.”

Faury also clarifies that investment timelines are different in the aerospace industry. Manufacturers commit to large-scale financial investments in aircraft programmes when they launch them.

Prior to this, the focus is on a preliminary phase of bringing technology to maturity and ensuring its viability. That is what Airbus is currently doing for the zero-emission aircraft.

No matter the issues, the sector has no choice but to go net-zero – regardless of cost: “We have to get on and make this happen,” says Holland-Kaye, “and if we don’t, then the cost will not be a few pounds on the ticket price, the cost will at best be that we don’t fly, or at worst, that we don’t have humanity.”

Murphy, more directly, says that if solutions cannot be mandated, then old aircraft should be phased out: “I think what would drive innovation is to say that by 2035 we will end the sale of jet aircraft for short-haul flights in Europe.” In response, Faury says that selling new and more fuel-efficient aircraft is the key to solving the problem.

### In summary

The sector has reached a tipping point. There is strong momentum behind sustainable aerospace throughout the aviation ecosystem. Whether through the development of new technologies, the activity of national and international bodies, change is happening.



# The road to net-zero

## Part One: The Perspective from Airline CEOs

### Panellists

**Johan Lundgren**, CEO, easyJet | **Barry L Biffle**, President & CEO, Frontier Airlines

### Moderator

**Julie Kitcher**, Executive Vice President Communications, Corporate Affairs & Sustainability, Airbus

While the worst crisis to ever hit the aviation sector is still posing serious threats, uncertainties and risks, airlines remain key players in making the decarbonisation of air travel a reality. So how committed are the airlines to sustainability? What kind of technologies are being explored for decarbonised aviation? How important is collaboration in achieving shared goals? And what levers need to be pulled and milestones reached on the road to net-zero?

### Introduction

**Two major low-cost carriers – from either side of the Atlantic – discuss the importance of sustainability and the strategies they are applying to drive down their environmental impact.**

### Sustainability as a brand pillar

easyJet's sustainability framework is built around three pillars with the first being the reduction of fuel burn. Johan Lundgren says: "Making sure we reduce our fuel burn means that we also reduce our carbon footprint."

It is the airline's focus on efficiency that makes it one of the most fuel efficient in Europe. Reducing its carbon footprint is complemented by its carbon offsetting programme – its second pillar. The programme was introduced in 2019 and while it is having a positive impact, Lundgren does not believe it is the long-term solution: "The long-term solution we want to get into," he says "is actually zero-emission technologies – the third pillar."

Describing Frontier's commitment to sustainability and the adoption of new technologies, Barry Biffle says the airline started its quest eight years ago, and fundamentally changed the company's business model: "We have higher gauge, higher density aircraft and thanks to the Airbus A320neo and the CFM LEAP engine we've been able to achieve significant efficiencies. But then it comes down to not just the technology but also how you use the technology."

As an example, he references Wi-Fi, which Frontier does not have on board its aircraft: "We don't have Wi-Fi... as we haven't found a solution that wouldn't add at least another 1% more fuel burn."

“ It needs to be an effort by everybody to make sure that there's a plan on how to decarbonise. ”

Johan Lundgren, CEO, easyJet

Today, Frontier claims it is the lowest carbon emitter per passenger due to its fuel efficiency: "We get over 100 miles per gallon per passenger seat," says Biffle, "and that's considerably higher – over 40% higher – than the average airline in the US."

### Customer perceptions

Both airline CEOs agree that prioritising sustainability is not only right for airlines ethically, but it also makes good long-term business sense.

Lundgren sees it as the responsibility of airlines to reduce their impact on the environment. He uses the easyJet offsetting programme as an example: "There wasn't a business case when we set out to do the carbon offsetting programme, but we fundamentally believed it to be the right thing to do."

And today it is proving to be a differentiator. Lundgren says people who are aware of

easyJet's offsetting programme are up to 9% more likely to book with them. In a competitive market such as aviation that is significant, and something which he hopes will be a growing trend as a result of the global pandemic which has elevated the status of the environment in consumer purchasing decisions.

### Level playing field

Lundgren believes achieving a common understanding will be critical to reaching zero-emission aviation: "Individual parts of the ecosystem can sit in their own chambers trying to come up with the plans but it needs to be an effort by everybody – including governments – to make sure that there's a plan on how to decarbonise."

“Hydrogen is key... True zero-emission technology is way more appropriate for the future.”

Johan Lundgren, CEO, easyJet

He voices concerns over taxation which carries with it the potential to strangle demand, and to drive huge inequality by making air travel accessible only to the wealthy. However, he does point out that easyJet was one of the first to show support for a common fuel tax if it would replace other national taxes and the money collected went back into supporting sustainable aviation.

When it comes to taxation Biffle hopes that the US will follow the example set in the automotive sector of incentivising rather than taxing. He echoes Lundgren's concerns for the consumer: "Consumers want these things but they are unwilling to pay for it... so you're just going to see destruction of demand. I think on the tax side we figured out that it's probably a bad idea."



Julie Kitcher, Airbus; Johan Lundgren, easyJet.

### Global problems

Continuing the theme of government support, Biffle says: "We could really use a revamp of the air traffic control as the next big move to save a lot of fuel and a lot of carbon."

On this issue there is also agreement from both sides of the Atlantic. It is a global issue. "I think it's absolutely appalling that we haven't seen progress in this area," Lundgren adds.

easyJet has calculated that a reformation of the airspace traffic management would result in 15% less fuel burn. "That is massive when you're chasing grams or kilos on every flight in order to reduce fuel burn," says Lundgren. He attributes this unnecessary fuel burn to "lack of management" and "outdated technology".

### New energy pathways

On the matter of new energy pathways Lundgren believes that the focus on sustainable aviation fuels could potentially hinder zero-emission technologies: "Sustainable aviation fuels, in the best sense, are an offset mechanism," he says.

While he says that SAF needs to be there, particularly power-to-liquid fuels for long-haul aviation, he is wary of it being seen as a panacea for the whole aviation industry. He doesn't consider SAFs to be a long-term solution for short-haul aviation.

"Unless it actually improves the emissions that are coming off," Biffle says, "just the fact that you have a sustainable source and renewable sources, it is not actually going to help the CO<sub>2</sub>."

Biffle says it is hard to get excited about SAF, instead Frontier is looking for new technologies. "Hydrogen could be that solution – you don't get anywhere near the emissions that you get versus diesel power," he says. "I'm all for sustainable renewable fuels but hopefully we can create one that actually helps the environment," he adds.

For Lundgren "hydrogen is key" – as it is a proven technology: "True zero-emission technology is way more exciting and it's way more appropriate for the future."

### Consumer trends

In terms of the public perception of the aviation sector and the 'flight shaming' movement Lundgren believes that restrictions on the freedom of movement of goods and people would hold back the development of the world.

Biffle doesn't see a flight shaming movement in the US. This is largely because flying from one city to another is more fuel efficient than travelling in an automobile. From a cultural point of view he believes that people are going to continue living their lives in the way they have become accustomed. He believes they will return to flying "both for the economy and for their own personal satisfaction and personal growth... but they're going to do it in a sustainable way that doesn't impact the environment."

## Part Two: The Perspective from Airline Sustainability Leaders

### Panellists

**Grace Cheung**, Head of Public Engagement & Sustainability, Cathay Pacific | **Amelia DeLuca**, Managing Director of Sustainability, Delta Air Lines | **Annette Mann**, Senior Vice President for Corporate Responsibility, Lufthansa Group | **Juan José Tohá**, Director of Corporate Affairs and Sustainability, LATAM Group

### Moderator

**Julie Kitcher**, Executive Vice President Communications, Corporate Affairs & Sustainability, Airbus

### Introduction

**In the second Road to Net-zero panel discussion, four major full-service carriers, representing four continents, discuss what sustainability means for them and their roadmaps.**

### Commitments to carbon neutrality

Delta Air Lines claims to have been the first

and only airline to voluntarily cap its emissions at 2012 levels, but in March 2020 it went further by committing to carbon neutrality. "We are the world's first carbon-neutral airline on a global basis," says Amelia DeLuca. "We recently took it a step further with a commitment to set carbon-based, science-based targets in line with the Paris agreement, something that we're really proud of."

DeLuca knows that to achieve its commitments, partnerships will be key: “Partnering with people like Airbus will help us with our fleet efficiencies... In addition, we can achieve operational efficiencies – flying smarter, flying lighter – and then of course look at sustainable aviation fuel (SAF) which is a really big part of our portfolio going forward. We’re working to achieve our goal of 10% SAF as part of our fuel consumption by 2030.”

Grace Cheung says that Cathay Pacific recently conducted a survey amongst stakeholders revealing that climate change and a reduction in the use of plastics remain the two biggest issues for airlines to address. It’s why in 2019, the airline committed to halving its single use plastic footprint by 2022 and reaching net-zero carbon emissions by 2050. In 2021, Cathay Pacific was also among the first airlines in Asia that committed to use 10% sustainable aviation fuel by 2030. “Even in the midst of the pandemic, we have put the focus on long-term sustainable development for the aviation industry,” she says.

LATAM Group sees sustainability not as a target, but as a responsibility to nature and society. “Although we [South America] only have 6% of the of the world’s population, we have a third of all freshwater reserves and 40% of all the species on the planet,” says Juan José Tohá.

“We have been pushing the transformation agenda because we understand that sustainability has to be at the centre of our company’s strategy. There is no more time to wait for the right moment. We have used the pandemic as an opportunity to test ourselves, to move out of our comfort zone, and re-energise our relationship with society and the environment.”

Lufthansa Group says it has been working on environmental projects since 1955. More

“ We want to become net-zero by 2050. SAF is also a huge priority... we are the biggest SAF user in Europe and we will continue to drive this agenda. ”

Annette Mann, Senior Vice President for Corporate Responsibility, Lufthansa Group

recently, it became the first airline in the world to submit a sustainability report. What is new, however, is that sustainability is now one of its three strategic pillars, and a pillar around which specific targets have been set: “We want to become net-zero by 2050,” Annette Mann says, adding that, “SAF is also a huge priority. Currently we are the biggest SAF user in Europe and we will continue to drive this agenda.”

### Consumer demands

“Sustainability is the number one issue that our consumers want us to address,” Amelia DeLuca of Delta says, “and that’s why we set our science-based targets.”

Sustainable aviation fuel, she believes, is essential, and a ‘win-win’ opportunity for all, but education and information is key: “I think consumers, as they become more educated about SAF, will become more willing to pay.”

The panellists are cautious about grouping all consumers into one, and note differences in attitudes and opinions between the US, Europe and Asia.

With respect to Asia, Cheung is pleased to report on the commitment from President Xi Jinping that China is committed to carbon neutrality by 2060: “I think that’s an important milestone, not only for the country, not only for an airline based in Asia, but also for global sustainability,” she says.



Julie Kitcher, Airbus; Annette Mann, Lufthansa Group.

### Incentives versus taxation

Lufthansa’s Annette Mann is concerned about talk of additional taxes in relation to sustainability, as it will simply make flying more expensive and less democratic: “People talk about flying being more sustainable but in the end many still decide on price. There has to be a level playing field across all regions if we are to achieve the transformation that is needed.”

Incentivisation is more attractive than taxation and in this respect, the US seems to be leading the way.

DeLuca is pleased with the Biden administration’s support for sustainable aviation fuel: “They have a very crystal-clear understanding that sustainable aviation fuel is really the key to helping us unlock our ability to reduce our carbon footprints in the medium as well as the long-term,” she says. “Incentives over mandates is really what is going to help us.”

Supply and demand for SAF is a challenge. Demand has to be of sufficient volume to make investment in the production and distribution of the fuels worthwhile and competitive. This is again where incentives are critical, and a proposed SAF blenders tax credit in the US could be a potential game changer. “We’re optimistic that that will be implemented soon,” DeLuca adds.

Airport infrastructure is also crucial on the road to a net-zero future, and in South America, Tohá believes governments have a crucial role to play to achieve the transformation required.

Cheung agrees. Like Tohá and Mann, she says SAF production needs to scale up: “A supportive long-term policy for SAF development is very important for scaling up its production and usage in this part of the world [Asia],” she says. “It needs a targeted approach like in the US with specific incentives and targets.”

With around 26,000 aircraft in the skies today, only 10% are flying using the latest technology. The potential for reducing emissions with existing technology is considerable. Mann thinks this is overlooked. Every aircraft Lufthansa replaces in its fleet brings 15% to 20% improved fuel efficiency.

In the longer term, the focus will be on more ambitious solutions. The panellists are excited by the work Airbus is doing towards its ZEROe aircraft.

Direct air capture is also a possibility: “Somewhere along the way direct air capture will become part of the journey so we’re looking... to make sure that we have the right partner,” DeLuca says.

# Visions for the future

At the Summit we also heard about the current actions being taken by many of the aerospace industry players who are key to supporting sustainable aviation and decarbonisation.

## Day 1



“The airline industry has been through the most significant crisis of history but in the future we will be stronger, more resilient and more agile. There has been a great deal of communication about climate change and airlines have to be part of the solution. We will look to our partners including Airbus to build a sustainable future together.”

**Christine Ourmières-Widener, Chief Executive Officer, TAP Air Portugal**



“Restless innovation has made our industry much, much better with every technological breakthrough bringing quieter, lighter and more energy efficient aircraft. Today our main challenge is to fly greener. The pursuit of sustainability is the new frontier and the cornerstone of the future of aviation. Together with our partners we at Air France-KLM are determined to be a part of the solution, to make sure to offer our future generations opportunities to responsibly discover the world.”

**Benjamin Smith, Chief Executive Officer, Air France-KLM**



“One of the major factors in choosing an airline in the future will be whether or not companies operate environmentally-friendly aircraft. Japan Airlines has a goal to reduce its CO<sub>2</sub> emissions to practically zero by 2050, and some of that will be achieved by upgrading to more efficient aircraft. We are also excited by the future aircraft such as ZEROe from Airbus.”

**Yuji Saito, Executive Officer, Japan Airlines**



“The importance of biofuel is of extreme relevance for ADAC Luftrettung. We want to achieve our social responsibility not only by saving lives but also by taking a socially responsible approach to the environment. The goal at the moment is to save approximately one third of the CO<sub>2</sub> emissions we have. If we achieve this across our entire fleet, within a period of 12 months we could save approximately 6,000 tonnes of CO<sub>2</sub>.”

**Frédéric Bruder, Managing Director, ADAC Luftrettung**



“Zero-emission aircraft is the target for the aviation sector and needs to be achieved as soon as possible. To make it possible there are two solutions: sustainable aviation fuel and improved aircraft technology. Pegasus is investing in fuel-efficient aircraft, which helps in cutting emissions. We are also closely following developments in central improvements for sustainable aviation fuel.”

**Mehmet Tevfik Nane, Chief Executive Officer, Pegasus Airlines**



“For Spirit, sustainability really comes down to a very simple thing: how can we take existing technology and be more efficient with it on a fuel burn basis? And then what can we do between today’s technology and the future technology to make things better? We are excited about what the future will bring with regards to new technology and our partnership with Airbus and other providers. I think it’s going to be a bright future for all of us.”

**Ted Christie, President and Chief Executive Officer, Spirit Airlines**



# Visions for the future

What the world's airlines have to say about the current action being taken to support sustainable aviation and decarbonisation.

Day 2



“COVID-19 has not slowed our commitment to reducing our carbon emissions. It's a key pillar in our strategy. Our customers are passionate about protecting the environment, they expect us to minimise the environmental impact of their travel. Our ambition is to have an electric hybrid or green hydrogen aircraft flying on our domestic network with the help of Airbus through our recently announced memorandum of understanding.”

**Greg Foran, Chief Executive Officer, Air New Zealand**



“We are putting sustainability right at the heart of our business and calling it our most important journey yet. Our customers are telling us that they really want to understand the emissions associated with their travel. That's why we're giving our customers the opportunity to offset their emissions using quality carbon reduction projects. We also recently introduced a new offer which allows our customers to choose to also purchase sustainable aviation fuels so that they can reduce their emissions in that way too.”

**Carrie Harris, Head of Sustainability, British Airways**



“Singapore Airlines is very focused on our sustainability goals. For airlines, operating a young fleet of new generation aircraft which are up to 30% more fuel efficient than older models is the most effective way to immediately reduce carbon emissions. As a group we are committed to achieve net-zero carbon emission by 2050. To achieve this we will work closely with our partners to support a greater adoption of sustainable aviation fuels.”

**Goh Choon Phong, Chief Executive Officer, Singapore Airlines**



“Climate change is undoubtedly the most pressing challenge of our time. It's a global challenge, one we can only master together. We must overcome the idea that there is a contradiction between a green agenda and the aviation industry. Both complement each other, both need each other. Meeting these targets will be a long journey. We are however convinced we can get there by investing in technology, improving the global infrastructure, and fostering carbon compensation and storage.”

**Carsten Spohr, Chairman and Chief Executive Officer, Lufthansa**



“We've recognised the impact that the pandemic has had on all of us, particularly our inability to be with each other, to connect with each other, to collaborate together, to share experiences together and as a result of what we've been through, we realise that the purpose of travel has never had a more important role in reuniting the world and bringing the world back together.”

**Ed Bastian, Chief Executive Officer, Delta Air Lines**

[View our contributors' videos](#)

# The future is electric

## eVTOL & electrification strategy at Airbus



### Panellists

**Bruno Even**, CEO, Airbus Helicopters | **Tomasz Krysinski**, Vice President Research and Innovation, Airbus Helicopters | **Karim Mokaddem**, Head of Electrification, Airbus | **Jörg Mueller**, Head of Urban Air Mobility, Airbus | **Balkiz Sarihan**, Head of UAM Strategy Execution & Partnerships, Airbus

### Moderator

**Chris Bockman**, Journalist

### Introduction

**What is Airbus doing to help decarbonise the aviation industry and be a true pioneer in sustainable aerospace and how is it becoming a key player in the Urban Air Mobility (UAM) market?**

### Making zero-emission flight a reality

Zero-emission flight will be a reality, and within Airbus there is a clear path to achieving sustainability through continued innovation.

Bruno Even says that while Airbus is already playing its part in reducing CO<sub>2</sub> emissions, there is much more that can be done: “It’s one of the biggest challenges of our generation, and one we have worked on in recent years, but thanks to our innovation and our pioneering spirit we can do more with a clear ambition to become carbon neutral.”

“ It’s about achieving a dream. It’s about innovation... technology... certification ... regulation, it’s about what is socially acceptable, and it’s about building a global ecosystem. ”

**Bruno Even, CEO, Airbus Helicopters**

Even says that by working on helicopter design and optimising its engines, Airbus has already shown that significant reductions in CO<sub>2</sub> are possible, halving emissions over the last 30 years. It believes it can do more thanks to the introduction of SAF: “All of our helicopters are already certified with a 50% blend but we clearly want to do more, especially with electric hybrid solutions, and innovation will be key to opening new frontiers and business opportunities.”

Tomasz Krysinski agrees and says that it is a combination of factors which results in

significant fuel burn reduction: one relates to the design of the vehicle itself, and in using lighter materials that reduce fuel burn by as much as 15%; another relates to the design of the engine, and the introduction of electrification. The first significant ‘technology brick’ for Airbus Helicopters is EcoMode, which enables the helicopter to switch off one engine via an innovative ‘start stop’ system at 190 knots and fly on one turbine, reducing fuel burn by 25% compared to a conventional helicopter.

The second is hybridisation: “We included hybridisation in our Flightlab,” he says, “and by continuing to push this new source of energy, and harnessing all of these technological breakthroughs, zero-emission flight will come. It is not one component that will get us there – you need all of the techno bricks coming together to achieve this ambition.”

### Group synergy

Group synergy has been essential to realising many of the remarkable innovations around electrification and hybrid-powered helicopters. A future step will be making it possible to re-charge the battery while in flight, and not just on the ground. Hybrid helicopters, Krysinski says, also lose nothing in handling, performance and speed: “I advise you to talk to the pilot,” he says.

But he also believes that pragmatism is key: “First we have to demonstrate we can do it, then we have to look at the application. We have a big appetite.” The company’s belief in electric propulsion is not just about driving CO<sub>2</sub> reductions, neither is it a ‘fashion’. Karim Mokaddem says it is more deeply rooted: “Electricity is an enabler of all the technology we have today within Airbus in terms of connectivity, digitalisation, autonomy and even preventative maintenance, and we are convinced that electricity in flight is the next future.”



Balkiz Sarihan, Airbus; Bruno Even, Airbus; Chris Bockman, Journalist; Tomasz Krysinski, Airbus; Karim Mokaddem, Airbus.

The evolution of electric-powered flight has been rapid over the last 10 years, with significant innovations in battery management and energy management and pushing the boundaries of electrification and hybridisation. The Airbus Vahana and CityAirbus demonstrators are evidence of the company's drive towards a net-zero target.

But hybridisation in aviation is not the same as hybridisation in the automotive industry, where such thinking is now standard. In aviation terms, it means a clever way of combining a thermal engine with electric power but doing so in such a way that the additional weight – and specifically from the batteries – does not cancel out the benefits that a hybrid solution delivers in reducing emissions.

Airbus therefore strongly believes in the concept of 'micro-hybridisation' as the starting point. "For us it's frugal energy management on board by which the electrical power is sized to fulfil the needs of the non-propulsive requests of the aircraft," Mokaddem explains. "This approach will allow us to reduce the fuel consumption by 5%."

Crucially, Mokaddem says this is only the first step. There are others, including how

battery technology will evolve – a key area of focus for Airbus Defence and Space – and to help new innovations come to life. Electrifying different parts of an aircraft will help with the operability of the engine, which in turn will help in reducing its fuel consumption and extending its range and supporting the journey towards low and even zero-emissions: "It's not a question of if or how but a matter of when, and that could be a reality within the next 15 years."

### Urban Air Mobility

Bruno Even says Urban Air Mobility is the ideal illustration of what being a pioneer in sustainable aerospace is all about: "It's about achieving a dream," he says. There are, however, many challenges: "It's about innovation, it's about technology, it's about certification, it's about regulation, it's about what is socially acceptable, and it's about building a global ecosystem. It's also about safety – and that is the kind of challenge we like at Airbus."

Even believes the need will evolve as the technology evolves; transporting people in the urban environment is key, but range and capability will determine its future role.

Jörg Mueller says partnerships across Airbus and the wider business community will be key to making UAM a reality: "There are so many possibilities when it comes to electrical propulsion vehicles and Urban Air Mobility that no single company can explore all of these ideas."

“ When we think of sustainability, it is absolutely about the environment... It has to be socially accepted, but also economically viable. ”

Balkiz Sarihan, Head of UAM Strategy Execution & Partnerships

He is excited, however, by the progress Airbus has already made with earlier designs, and how this experience has converged into creating CityAirbus NextGen: "We have spent hundreds of thousands of engineering hours on this on all aspects of the eVTOL design. This is a rotorcraft so we are using our rotorcraft capabilities but it also has a wing and a battery so we are using the capabilities of the group."

### Social acceptance

Noise reduction has also been a critical area of research; millions of computational hours have been put into bench tests, wind tunnel tests and simulations to optimise the vehicle design, alongside research and analysis of current consumer behaviours, habits and expectations in relation to urban travel. It has also meant working closely with urban design specialists and architects as regards how any new mode of transport will integrate with the existing infrastructure and environment.

Mueller sees how this new mode of transport could be used to deliver essential medical

supplies, or simply to connect remote areas where there's a current lack of transport infrastructure.

Autonomous flight is also possible given time: "This will be introduced step-by-step so that at a certain point these vehicles will be able to fly fully autonomously."

Balkiz Sarihan believes the ultimate objective is to provide a service to society: "it's something that we must all want – not we as aviation experts and professionals and enthusiasts but we as citizens and members of our community." Sarihan believes social acceptance is vitally important, and this feeds through into every aspect of future design: "When we think of sustainability, it is absolutely about the environment, absolutely about zero-emission flight, and absolutely about minimal sound emissions. It has to be socially accepted, but also economically viable."

### The CityAirbus NextGen

Airbus has announced plans for a new generation CityAirbus, a fully electric vehicle equipped with fixed wings, a V-shaped tail, and eight electrically powered propellers as part of its uniquely designed distributed propulsion system. It is designed to carry up to four passengers in a zero-emission flight in multiple applications. CityAirbus will have a range of 80 km and a cruise speed of 120 km/h, making it perfectly suited for operations in major cities for a variety of missions. It will also be very quiet with sound levels below 65 dB(A) during fly-over and below 70 dB(A) during landing. It is optimised for hover and cruise efficiency, while not requiring moving surfaces or tilting parts during transition. The CityAirbus NextGen meets the highest certification standards (EASA SC-VTOL Enhanced Category). The first prototype is scheduled to fly in 2023.

# The technology challenge

Decarbonisation starts now

## Panellists

**Thierry Harquin**, Engineering Senior Manager, ATM International Cooperation, Airbus | **Laurent Lafontan**, Flight Operations Technical Development Senior Vice President, Air France | **Florian Guillermet**, Director, DSNA | **Philippe Lenne**, Aviation Sustainability Programme Manager, SESAR JU | **Mattia Nurisso**, Engineering ATM Programme Manager, Airbus

## Moderator

**Chris Bockman**, Journalist

## Introduction

**Reforms and improvement to air traffic management (ATM) could accelerate the journey towards sustainability and significantly reduce CO<sub>2</sub> emissions.**

Much has been said about the need to reduce carbon emissions from air travel. New aircraft designs and fuels will play a role in the decarbonisation process. But there is another consideration: improved air traffic management (ATM).

Thierry Harquin says that with a gradual return to flying post-COVID, modernisation of ATM is essential: “ATM is one of the four pillars identified by aviation stakeholders in the Destination 2050 roadmap to decarbonise aviation.”

“Europe has to move first.”

Laurent Lafontan, Flight Operations Technical Development Senior Vice President, Air France

He acknowledges past achievements in ATM reformation but believes that there’s much more that can be done: “We can still optimise the ATM system... [and] optimisation could contribute to a reduction of 6% to 10% of CO<sub>2</sub> emissions generated by aviation in Europe.”

Harquin says that this is an ambitious target but believes it is possible with the collaboration of airlines, air navigation service providers, airports, industry, and research institutes. And he points to work being carried out by the SESAR – the Single European Sky ATM Research programme.

Laurent Lafontan also thinks better ATM could reduce fuel consumption and emissions, citing the flight he took to the summit in Toulouse from Paris, which Air France had made as fuel-efficient as possible: “I was in

the cockpit, and I can say that... we saved around 5% of CO<sub>2</sub> emissions. How? Through collaboration between air navigation services providers.”

He explains that dynamic management of air space, work on the ground, single engine taxiing, and the optimisation of vertical flight paths meant that the aircraft could climb to an efficient flight level – and this cooperation continued into the flight’s descent.

Put into context, Lafontan says the savings from this flight alone equate to around 100 kilogrammes out of a two-tonne fuel load. He also refers to SESAR’s Albatross project. This is a two-year project comprising around 1,000 demonstration flights to showcase the potential fuel and CO<sub>2</sub> emissions savings that various operational solutions can deliver. And with the importance of efficient ATM, the project, as Lafontan says, isn’t waiting for others: “Europe has to move first.”

Florian Guillermet is responsible for the French air navigation service and has firm views on decarbonisation. “For the French ministry, the environment is a clear priority for aviation. It’s part of building the future and building it back better,” he says. He believes that together it is possible to meet the EU’s goal of net-zero CO<sub>2</sub> emissions for European airspace by 2050.

While he acknowledges that his primary duty is to manage air traffic safely, his secondary duty is now to provide “the best service in terms of environmental performance.”

As a result, the DSNA, the French air traffic control authority, has made the reduction of the environmental impact of air navigation its first strategic goal, after flight safety. It is giving priority to limit the noise disturbance/pollution below 2,000 metres (FL60) around airports and reduce gaseous emissions above 3,000 metres (FL100). The two

have to connect, he says, and to do this, he wants a continental approach.

### Efficient trajectories

While there's the matter of aircraft using the most efficient trajectories, Philippe Lenne says that this is more than flying the shortest distance between two destinations. It is all about determining what is the most efficient trajectory per flight, every day, in all conditions, and then building the necessary ATM network that will let the flight happen as planned.

"SESAR works," he says, "because there are multiple actors with a lot of different interests, and that's where we kick in – with a joint undertaking... we address the key focus areas which are non-CO<sub>2</sub> and contrail mitigation, CO<sub>2</sub>, and noise."

“Albatross is really helping us progress. It's showcasing that we can make this happen, that we can as well work with our operational staff... and is helping to really create the momentum we need to progress.”

Florian Guillermet, Director, DSNA

Mattia Nurisso, Engineering ATM Programme Manager, Airbus continues the theme. He says that Albatross follows a holistic approach by covering all flight phases, directly involving all relevant stakeholder groups (such as airlines, Air Navigation Service Providers (ANSPs), Network Managers, airports and industries) and addressing both operational and technological aspects of aviation and ATM. The project will demonstrate the complementary nature of some solutions, from

alternative aircraft fuel to enhanced ATM and Airspace Users operations on the ground, the Terminal Manoeuvring Area (TMA) and en-route.

Nurisso details how the project is “pushing a little bit further continuous climb, continuous descent, and exploring a little bit more how we can help sustainable air fuel to be deployed.”

But the project is also putting in place tools for pilots, for example to optimise flight trajectories that consume less fuel. “It's also,” he says, “looking at drastically decreasing the uncertainty around aircraft trajectory prediction... to better control aircraft in a more efficient way.” And on the ground, Albatross has a hybrid, semi-robotic towing vehicle, that allows taxiing without engines running. Interestingly, Nurisso says that the project isn't aiming to be revolutionary: “It is seeking out quick win improvements that will deliver a global benefit.”

### Building momentum

Guillermet admits that ATM will not be quick to change: “Even so, Albatross is really helping us progress. It's showcasing that we can make this happen, that we can as well work with our operational staff... and is helping to really create the momentum we need to progress.”

In his view change must come: “Systems... are quite outdated and have to be modernised,” he says, if they are to take advantage of new components and capabilities found on modern aircraft. Here he talks of a “massive renewal of the fleets across our skies” and that it would be a pity if supporting systems didn't capitalise on the technology in new aircraft.

And from an airline's perspective, Lafontan tells how Air France has committed to halve



Philippe Lenne, SESAR JU; Thierry Harquin, Airbus; Chris Bockman, Journalist; Laurent Lafontan, Air France; Mattia Nurisso, Airbus.

its CO<sub>2</sub> emissions by 2030 compared to 2005 levels. He says that to do this requires a two-pronged approach – short- and long-term. He explains that Air France is investing heavily in new aircraft from Airbus. He says that based on aircraft that have been bought so far Air France will be able to make a 20% to 25% reduction in CO<sub>2</sub> emissions.

On quick wins, however, Lafontan picks out single engine taxiing, continuous descent, and a European – if not a global – approach. He thinks the potential for savings are great and he gives an example using Paris Charles De Gaulle as a point of reference. With all flights using continuous descent, he says that Air France could save 10,000 tonnes of fuel and 3,400 flying hours per year.

On what's happening now, Lenne says that SESAR is about to publish its fourth catalogue of more than 100 deployable solutions. Further, the project will use Digital Sky

Demonstrators: “This,” he says, “will bring everyone together and demonstrate that... these solutions can contribute directly to the mitigation of the environmental footprint of aviation.”

So is the current level of investment in ATM reform sufficient? Guillermet says that airlines are already investing, but there's further to go: “It's clearly a joint ambition with the airline industry to be able to scale this up in the future so that it becomes the norm and that we don't have to manage this kind of flight independently from the rest of our operations.”

What is perfectly clear from the debate is that Airbus' innovations and changes to ATM have the potential to save thousands of tonnes of aviation fuel which, in turn, could radically alter the volume of CO<sub>2</sub> emitted by aircraft. And that's a serious win for aviation – and the environment.

# The technology challenge: The journey to 2035

## Hydrogen Ecosystem Roundtable

### Panellists

**Glenn Llewellyn**, VP Zero-Emission Aircraft, Airbus | **Cecilia Fouvry-Renzi**, Director of Hydrogen Energy, South West Europe, Air Liquide | **Eric Delobel**, Chief Technical Officer, VINCI Airports, and H2 coordinator for VINCI Concessions | **David Morgan**, Director of Flight Operations, easyJet | **Lars Andersen Resare**, Head of Sustainability, SAS

### Moderator

**Chris Bockman**, Journalist

### Introduction

**Cross-industry investment and partnerships are crucial to the future of a sustainable aviation industry, and the successful introduction of disruptive technologies such as hydrogen.**

### Collaboration is key

Decarbonising aerospace is an enormous task. But Airbus knows there are a number of challenges to achieving net-zero carbon emissions by 2050. Disruptive technologies and aircraft designs, as well as new fuels will all play a key role in this respect.

What is clear is that Airbus cannot move forward on its own – it requires cross-industry investment and partnership.

Glenn Llewellyn says Airbus went public with

its plans precisely to generate the awareness and support needed to get hydrogen on the radar across the aviation industry: “I’m very energised by the amount of teamwork that’s going on,” he says. “We’re at the beginning [of the process] and from what I’ve seen so far, I believe that we can do this.”

“ Without hydrogen we will not be able to reach our ambition for decarbonisation. ”

*Cecilia Fouvry-Renzi, Director of Hydrogen Energy, South West Europe, Air Liquide*

Others share his view. Eric Delobel says airports are very committed to reducing their emissions. VINCI Airports plans to halve its CO<sub>2</sub> emissions by 2030 and achieve car-

### ZEROe in the Spotlight

Sabine Klauke, Chief Technical Officer for Airbus, says that Airbus has achieved much since the company outlined its plans for a zero-emission aircraft in September 2020. She says progress has been “remarkable,” considering the initiative was announced mid-pandemic.

Klauke is particularly optimistic regarding the potential for hydrogen-powered aircraft by 2035 given her experience with the Cryoplane study some 25 years ago: “The study ended saying that ‘yes, hydrogen could be possible – but we’re not quite mature enough in the technology... maybe in 20 years’ time.”

Referring to the ZEROe project, Klauke is keen to emphasise that technology development is accelerating: “There are three main options for using hydrogen – you can directly combust it; you can use it to create energy to power fuel cells; or you could

combine the two technologies in a hybrid-hydrogen configuration,” she explains.

“Airbus is working to understand how to integrate a cryogenic liquid hydrogen tank in an aircraft and the whole system which goes along with it, how hydrogen would be distributed, and how engines must be adapted – a lot has been learned and we’re going in the right direction.”

Part of the journey saw the creation of two new Zero-Emission Development Centres – one in Nantes and the other in Bremen. Bremen was specifically chosen as Airbus Defence and Space is on the same site and ArianeGroup is close by: “We’re taking advantage of proximity to an entire ecosystem that knows how to work with hydrogen,” she adds.

Klauke says that some ground testing will start as early as next year (2022).



bon neutrality by 2050: “We strongly believe that hydrogen has to play a key role to achieve these goals.”

His reasoning is based on two simple truths: “Hydrogen is a universal energy carrier and

doesn’t create any CO<sub>2</sub> emissions. And hydrogen needs only water and electricity.”

Cecilia Fouvry-Renzi agrees, noting that hydrogen could solve the emissions problem on its own but she warns against com-

placency: “Without hydrogen we will not be able to reach our ambition for decarbonisation,” she says.

Fouvry-Renzi says her company has invested large sums to scale up hydrogen production at a plant in Canada. Air Liquide is also planning to develop a hydrogen refuelling station at Lyon airport; it will then introduce liquid hydrogen to test the refuelling process. Overall, the company will invest more than €8bn before 2035 to develop hydrogen further.

David Morgan is keenly aware that there is no opportunity to press the pause button on climate change: “We cannot sit back until 2035 and then get our cheque book out and expect this thing to happen.”

“ We cannot sit back until 2035 and then get our cheque book out and expect this thing to happen. ”

David Morgan, Director of Flight Operations, easyJet

While he recognises the challenges of developing new aircraft, there is also the need to create new infrastructure: “Organisations are going to have to work together collaboratively at a scale we’ve never seen before, and it’s really exciting.

“Collaboration is important because we need to share knowledge that we have as an airline – such as how to turn around aircraft at airports and the trade-offs between payload and range. Likewise, airlines need to understand the limitations from a manufacturer’s perspective too,” he adds.

Similarly, Lars Andersen Resare says that despite his airline’s mitigation activities, more could be done to transition to a new

form of energy. Being the biggest player in the Nordic aviation market, SAS has placed climate change at the top of its agenda: “The discussion with Airbus was very interesting... to accelerate the development and to put all stakeholders together.”

### Consumer agenda

So what was COVID’s impact on the drive towards increased sustainability and, importantly, could airlines delay future spend? Both Morgan and Andersen felt this was not an option. Morgan says his airline’s passengers expect change “and sustainability is right at the top of people’s agendas.” Andersen agrees, adding that “SAS stakeholders want us to do even more.”

Airlines have been hit hard by the pandemic, but airports have also been affected. Delobel says this is why VINCI Airports’ partnership with Airbus and Air Liquide is so valuable. VINCI Airports will run a pilot at Lyon airport. Getting hydrogen into daily use will, in his view, take time: “It will require discussion and exchanges with public authorities to develop and support the relevant regulation,” he says.

Crucially, hydrogen has to be affordable, cost-effective and, eventually, profitable: “It needs a relevant market price and lower capital expenditure to make it work,” Delobel concludes, “but it also needs to demonstrate an environmental return on investment.”

### In summary

Hydrogen is one of multiple decarbonisation levers for an aviation sector working towards a more sustainable future. As a fuel, it has a bright future. The real questions seem to be how production can be ramped up, how the price can be made affordable, and just how quickly the industry can collaborate to develop the technology.

## Innovating with Purpose

### Panellists

Sabine Klauke, Chief Technical Officer, Airbus | Stefan Thomé, EVP Engineering and Chief Technical Officer, Airbus Helicopters | Francisco Sánchez Segura, EVP Engineering, Airbus Defence and Space

### Moderator

Chris Bockman, Journalist

### Introduction

**Innovations for the future require thought leadership and collaboration, whether in reducing CO<sub>2</sub> emissions or noise.**

### Collaborative culture

Stefan Thomé says Airbus has a collaborative culture and cites CityAirbus, which originated with help from the company’s commercial, helicopters and defence and space divisions: “We see the skill, passion, energy, and enthusiasm in how we strive to provide solutions to all challenges,” he says.

Artificial intelligence (AI), quantum computing, digital design and manufacturing are all key areas of technical development but Thomé says change does not happen overnight: “We’re quite pragmatic,” he says.

Sabine Klauke agrees and says it is about evolution rather than revolution: “We’re continuously improving [our products]. If you look at propulsion systems, we have the NEO engines, but tomorrow we will be talking about ultra-high bypass ratio, open rotor and other concepts.”

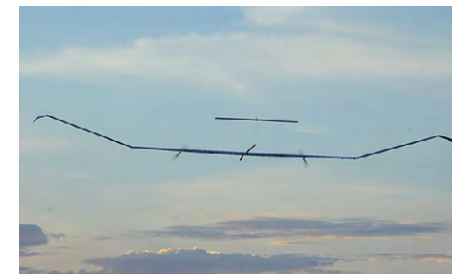
She also mentions developments in ATM and airframe materials: “Today, the A350 is

made of 53% composites, but tomorrow it might be completely different.”

### Creating viable solutions

Airbus is not just a leader in commercial aviation. Francisco Sánchez Segura makes the point with the company’s Zephyr programme – an aircraft that flies at 70,000 feet running on solar power by day and batteries by night. And what has made Zephyr and other space systems possible are technologies such as electrical propulsion, advanced optic techniques, laser communication and batteries.

But does sustainability result in extra cost?



Zephyr is a High Altitude Pseudo-Satellite (HAPS) UAS/UAV which runs on solar power. This unmanned aircraft provides local satellite-like services. It endures like a satellite, manoeuvres like an aircraft and is more cost-effective than both.



Stefan Thomé, Sabine Klauke, Francisco Sánchez Segura, Airbus



The Flight Test Bed 2 (FTB#2) is an in-flight demonstrator of the Clean Sky 2 programme to test mature technologies applicable to future Regional Multi-mission aircraft configurations.

Klauke says that “we cannot choose between economic profitability and sustainability; if we’re making zero-emission aircraft then it has to be economically viable.”

But she says that costs can be brought under control by governments, financial institutions, and industrial businesses such as Airbus acting in concert.

On the same subject, Thomé explains that helicopter operators are just as concerned about the planet: “They’re all asking for solutions for a sustainable future,” he says.

This, he says, explains the level of interest in the use of sustainable aviation fuel (SAF): “While helicopter operators are cost-sensitive, that’s not an excuse to delay the drive towards a sustainable future.”

From a military perspective, Sánchez Segura agrees. “Airbus can offer different design solutions that minimise impact and take care of environmental sustainability [through] end-of-life management, material waste and manufacturing,” he adds.

On SAF, Klauke says that all Airbus commercial aircraft are certified to fly with an up

“ We have the ambition to achieve certification for 100% SAF in our fleets by 2030. ”

Sabine Klauke, Chief Technical Officer, Airbus

to 50% SAF blend: “We have the ambition to achieve certification for 100% SAF in our fleets by 2030,” she says. “However, SAF currently represents around 0.03% of the fuel used in civil aviation and so there’s room for improvement.”

Airbus is currently testing 100% SAF on an A350 test aircraft and is planning to do the same with an A320neo by the end of 2021. The company is also using a SAF blend in its Beluga transporters, while also using bio-gas trucks in its supply chain.

Thomé also sees the benefit of SAF. He points to the June launch of a worldwide user group as a global exchange platform for all stakeholders who are required to make SAF a reality, and says that by November 2021, helicopters will also be testing 100% SAF.

The same applies for defence. Sánchez Segura

references the C295 and its use of 50% SAF as well as a project testing 100% SAF. Beyond that is Airbus’ participation in other clean aviation projects that include hybrid technologies.

Much talk is about CO<sub>2</sub> emissions. However, noise emissions can be just as problematic.

Klauke explains how the current generation of aircraft have reduced noise emissions by 75% compared to the first generation: “Airbus has committed to reduce by 2050 perceived noise by 65% compared to 2005,” she adds.

Thomé says that Airbus Helicopters’ product lines have become the benchmark for noise reduction, and this is evidenced by the development of its H160 blue edge rotor blade shape which reduces sound emissions. But he says improvement will come with variable rotor speed settings and new blade shapes: “The company is also looking to optimise the flight paths helicopters take – the target is for 65-70 decibels which is comparable to buses.”

### Proven technologies

Projects often lead to multiple benefits – a

fact expressed by Sánchez Segura when he talks of the Clean Sky project. It features a semi-morphing wing, a new flight control system, new materials, and new production methods. And the results, he says, are plain to see: “A 43% reduction in CO<sub>2</sub> emissions, 70% in NO<sub>x</sub> emissions, and a 45% reduction in noise during take-off.”

Klauke points to *Wing of Tomorrow* as a project that seeks the best materials, best manufacturing processes, and the best assembly techniques for a wing. She also speaks of the extra-performance wing demonstrator, a project that “thinks about birds and how they adapt to different parts of flight in terms of span, shape, and aerodynamics.” The project, she says, uses technologies such as wingtips, pop-up spoilers, and gust sensors to adapt wings during flight.

### In summary

Airbus recognises that change is constant, and progress requires detailed conversations between all stakeholders – both inside and outside the company. But given time and the right resources, Airbus will be front and centre in a more sustainable world.



# Space insights for climate action

## Panellists

**Josef Aschbacher**, Director General, European Space Agency | **Mike Schoellhorn**, CEO, Airbus Defence and Space | **Jean-Marc Nasr**, Head of Space Systems, Airbus Defence and Space | **Evert Dudok**, Head of Connected Intelligence, Airbus Defence and Space | **Drew Shindell**, Nicholas Professor of Earth Science, Duke University

## Moderator

**Chris Bockman**, Journalist

## Introduction

**Space-based systems offer a unique viewpoint of the Earth and help us to understand our planet as a whole.**

## The ultimate diagnostic tool

Space-based systems have become an undisputed diagnostic tool for detecting climatic and environmental changes on a planetary scale. They can also measure changes on Earth reliably, accurately and consistently. Indeed, more than half of the essential climate variables defined by the heads of UN Framework Convention on Climate Change (UNFCCC) are measured from space.

But Europe should be doing even more. Politicians need to be engaged. Countries need to play their part. Josef Aschbacher says private industry also needs to be invested: "I look at Airbus as a key partner in Europe, capable of delivering big change," he says.

Mike Schoellhorn sees Airbus as helping to address the UN's Sustainable Development Goals: "These include protecting democracies and protecting what I call a free world, which is not a given," he says. Space-based systems offer a unique viewpoint of the Earth and as such have become unparalleled in enabling us to understand our planet as a whole.

From space, scientists are able to measure the essential physical parameters including the temperature of the Earth's surface, its oceans and the surrounding atmosphere. They can measure the concentration of potentially harmful gases and aerosols and help analyse the consequences of global warming by looking at the rise in sea levels and melting ice. And they can help distinguish between natural and anthropogenic effects, including the effects of deforestation.

Satellites make all of these things possible: "I think we have a lot of assets to bring to the table," Mike Schoellhorn adds.

When it comes to protecting the environment, the satellites Airbus is building and the programmes with which it is involved are making a real difference.

## History of innovation

Airbus has a proud history of innovation in the space and defence industry. It has been involved with the European Copernicus global environment monitoring programme of the European Space Agency since the beginning, and a fleet of optical and radar satellites are now in operation. It is also playing a key role in the development of the new Sentinel satellites to provide radar-based earth observation imagery to a much higher level than previously possible. It has been chosen to develop and build the two satellites that will comprise the Copernicus Polar Ice and Snow Topography Altimeter mission known as CRISTAL.

“ I look at Airbus as a key partner in Europe, capable of delivering big change ”

Josef Aschbacher, Director General, European Space Agency

This is of course not the full extent of Airbus' commitment to space. It is also the prime contractor for the new Land Surface Temperature Monitoring (LSTM) Mission and will also build the advanced radar instrument for the Radar Observatory System for Europe in L-band (ROSE-L).

While many of the projects mentioned are for the future, several satellites have been in space a decade or more – a testament to



Mike Schoellhorn, Airbus; Chris Bockman, Journalist; Jean-Marc Nasr, Airbus.

Airbus' engineering skill – and sending back essential data.

Jean-Marc Nasr says that Airbus' ice monitoring satellite CryoSat, which has been in orbit since 2010, revealed the damage being done to Antarctica: "The data showed that ice losses from Antarctica have increased global sea levels by 7.6mm since 1992 but two-fifths of it has been happening in the last five years. If all of Antarctica melted, the sea level would increase by 58 metres. Nobody can accept that."

Evert Dudok says that the real advantage a satellite delivers is that the data it gathers can be trusted: "Satellites don't see borders," he says.

### Collaboration benefits

Dudok is proud at how other organisations use the data from Airbus satellites to improve the environment: "One small not-for-profit organisation used our pictures to help clean up the ocean and remove ghost nets and plastics. Larger companies like Nestlé use them to monitor what their suppliers say about deforestation and ensure they are honouring their statements."

Josef Aschbacher is keen to give tangible proof of how satellites are benefiting society. He refers to the measurement of the ozone layer and the discovery of the famous ozone 'hole' which ultimately led to the Montreal protocol and the reduction in the use of halocarbons.

The data the world gleans from space is providing "wonderful opportunities" according to Drew Shindell. He says the data over the last 12 months has been particularly interesting: "Because of COVID, space-based measurements have shown the air getting cleaner, and a drop in almost every pollutant emission.

"This means we can take this information to countries like India, who are yet to engage fully with climate change, and show them that the benefits are not just for their children or grandchildren but can be realised right now if they transition to clean energy."

Satellites, the experts agree, may not hold all of the answers and the general public still don't fully appreciate the full importance of space, but as Shindell concludes: "It is always helpful to bring really hard data to the conversation."

## Paving the way to zero-emission

Decarbonising is a journey that has already started and the Static Display at the Airbus Summit gathered together some of the company's most emblematic products and solutions, which are already contributing to sustainable aerospace – namely the BelugaXL, A350, A320neo, A321XLR, ATR 72, CityAirbus and H130 Flight Lab, Copernicus Sentinel-2, but also Tarmac Aerosave, TaxiBot and our Biomass Truck.



# Preparing for tomorrow:

The people and skills we need

## Panellists

**Thierry Baril**, Chief Human Resources Officer, Airbus | **Jumoke Fagbemi**, Head of Develop, Airbus | **Sam Hyams**, Founder and CEO, Springpod | **Laura Montironi**, Loads and Aerolastics engineer, Airbus Upnext | **Professor Pablo Fajardo Peña**, Deputy director of the school of engineering, UC3M

## Moderator

**Chris Bockman**, Journalist

## Introduction

**The transformation facing the aerospace industry is also a huge challenge from an HR perspective. How do we attract the talent we need for tomorrow? How do we retain and develop our future innovators and which skills and competences will be key for the industry's future?**

## Attracting the smartest minds

The journey to decarbonising aerospace will be transformative for the industry and an exciting challenge for those involved in rethinking the way the industry designs, sources, builds, finances, sells, markets, and maintains its products, as well as how it manages those products' 'end of life'.

Developing all-electric or hybrid vehicles, hydrogen and other zero-emission technologies will require the smartest, most diverse and forward-thinking talents. "We have a big ambition and purpose in pioneering sustainable aerospace, and that means having the right people with us," says Thierry Baril, "including the new Generation Y&Z who, within the next 10 years, will account for 70% of our employees."

"This new generation will have expectations regarding our ethical and sustainable values, and it is up to us to deliver on those values," he adds.

Baril says that it is not only about bringing in new talent, but also upskilling the team Airbus already employs, especially in digital areas such as data science and artificial intelligence.

He summarises the Airbus proposition by using three 'i's' that stand for innovation, international and inclusivity. Airbus is very much international with a team comprising some 135 different nationalities with European roots and an international footprint. And it

is inclusive with a variety of diversity programmes that support an individual's performance and appetite for innovation.

## Closing the skills gap

Jumoke Fagbemi likens joining the aerospace industry to falling in love: first comes the initial attraction; then falling in love; and then building on that love over the longer term. She believes that an encounter at the earliest stage is important, giving children a love for STEM subjects and nurturing a passion for the aviation industry.

She points to the work that Airbus is doing with primary schools in China, reaching more than 10,000 pupils in the past six years through its 'Future by Airbus' campaign, as well as her work with the Airbus Foundation and its 'Future to the Skies' initiative across 17 countries.

Fagbemi also places considerable emphasis on the "relentless" work Airbus is doing to retain existing employees, continuing to deliver fulfilling careers, and working towards ambitious targets, especially in relation to inclusivity.

Laura Montironi is a good case study of how new talent is being attracted to a career in aviation, sometimes by chance. An internship at Airbus opened her eyes to a new world of possibilities and a way of employing her creative talents: "We have big environmental challenges and this is where young people today can use their creativity," she says, "and really 'shake things up'."

## Academic choices

Creating opportunities for young people in the world of aviation is a challenge faced by all of the major players. One of Airbus' long-standing partners in capturing talent at an early stage is Springpod, a UK online

# Preparing for tomorrow



Thierry Baril, Airbus; Jennifer Newlands, Airbus; Jumoke Fagbemi, Airbus; Laura Montironi, Airbus.

early careers platform that seeks to democratise access to opportunity.

Sam Hyams says that a 'virtual' work experience programme devised during the lockdown resulted in more than 800 young people applying for an apprenticeship at Airbus: "It's a really powerful talent pipeline generator," he says, "and really helps to support diversity, inclusion, and social mobility."

Professor Pablo Fajardo Peña says that in consultation with Airbus, he has developed courses that also provide some of the "softer" skills that students will need to thrive in the world of aviation such as the art of negotiation, and interacting with customers and colleagues at work.

Attractive packages and flexible working conditions are standard requirements for

recruiting and retaining employees, but arguably more important is a business that is driven by a real sense of social purpose: "We are a business committed to investing in our people, where diversity and inclusion are key," Baril concludes, "and where our purpose speaks to their own desires."

“ We are building the right partnerships and taking concrete steps to prepare the next generation to drive transformational change. ”

Thierry Baril, Chief Human Resources Officer, Airbus

“We are building the right partnerships and taking concrete steps to prepare the next generation to drive transformational change.”

## Conclusion

# Remaining a force for good

Everyone agrees the time for action on sustainable aerospace is now. We are at a tipping point. Things are different today than they were just two or even three years ago and there is a new confidence in our industry that we can rise to the challenge ahead.

New partnerships are emerging alongside new levels of cooperation and collaboration among airlines, engine makers, energy companies, governments, space agencies and many more.

We are confident that with our partners we will develop the new technologies and energy sources required to decarbonise aerospace. But as the CEO of Airbus says, 2035 is tomorrow and we need to move fast. The more progress we make the more we understand the collective challenge, and we must never forget that reliability, safety, quality, integrity and compliance remain at the very foundation of what we do.

It is going to take a global effort. Europe is taking the lead, but there are also promising signs from our colleagues in the US and Asia too. This is important because a global level playing field is what is required.

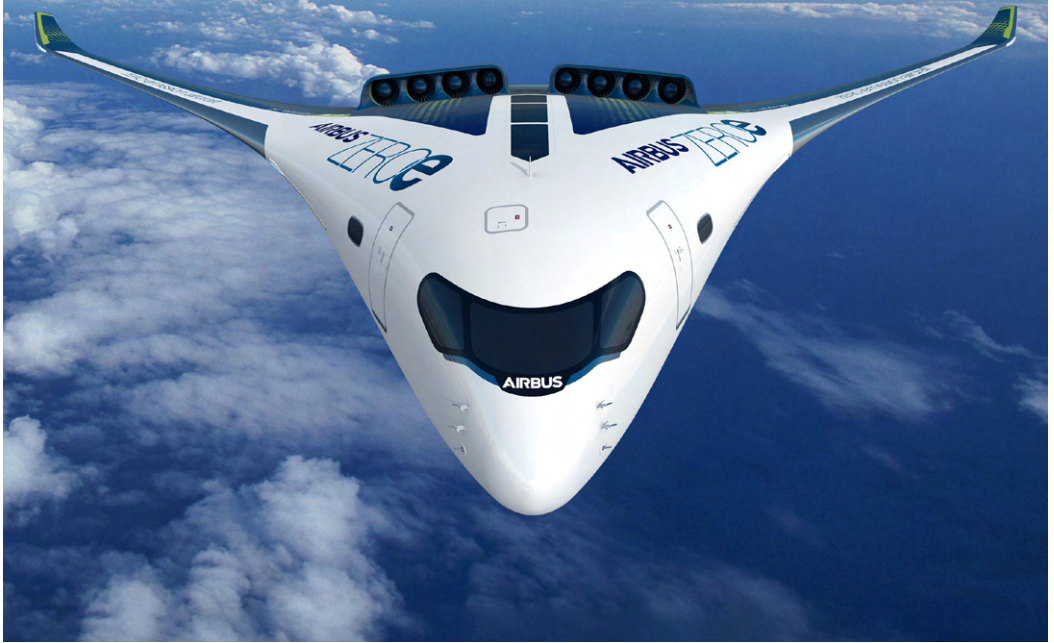
This is an incredibly exciting time to be working in the aerospace industry and we can look forward to the future with cautious optimism. Aviation is on the path to recovery – people are flying again, and borders are gradually opening across the world.

By pioneering sustainable aerospace together, aerospace can remain a force for good. We need to keep the energy alive, and accelerate the actions required towards achieving net-zero.

### Julie Kitcher

Executive Vice President Communications, Corporate Affairs & Sustainability, Airbus

THE WORLD IS  
A  
BEAUTIFUL PLACE



[airbus.com](http://airbus.com)

**AIRBUS**