#### CHAPTER 1

# Amadeus in the travel industry



## Travel industry market



## Overall travel volumes

In 2019 the contribution of travel and tourism to the world economy was estimated at USD 8.9 trillion, or more than 10% of the global GDP, supporting 330 million jobs – 1 in 10 globally.<sup>1</sup>

For nine consecutive years, the travel and tourism sector has outpaced global economic growth. The continued rise in the number of middle-class households, sustained low unemployment rates, and visa relaxation in many countries around the world have enabled travel and tourism to grow by 3.5% in 2019 versus overall economy growth of 2.5%.<sup>1</sup>

In 2019 air traffic measured in terms of revenue passenger kilometers (RPKs) was expected to grow at an average of 4.6% per annum over the next 20 years.<sup>2</sup>

The impact of the COVID-19 crisis on travel and tourism has been unprecedented and has caused an existential threat to many players in the industry. As such, the estimated contribution from travel and tourism to the world economy declined by 43% from 2019 to 2020.<sup>3</sup>

Aviation has been even more affected, and the industry has been facing the worst crisis since the beginning of the Jet Age. Several players have gone out of business, while others have survived only due to government bailouts. This is reflected in the decline in air travel of 66%<sup>4</sup> in 2020.

- <sup>1</sup> Source: World Travel & Tourism Council (June 2020). Travel & Tourism Global Economic Impact & trends 2020.
- <sup>2</sup> Source: https://www.boeing.com/resources/boeingdotcom/commercial/market/ commercial-market-outlook/assets/downloads/cmo-sept-2019-report-final.pdf.
- <sup>3</sup> Source: World Travel & Tourism Council (November 2020). Travel & Tourism Recovery Scenarios 2020 & Economic Impact from COVID-19.
- <sup>4</sup> Source: https://www.iata.org/en/pressroom/pr/2021-02-03-02/.

Regarding projections of future air traffic, the pandemic means that there is more near-term uncertainty than at any other moment in aviation history, including after the 9/11 terror attacks in 2001.

However, our industry has consistently overcome downturns throughout its history, and in the long term, air traffic is expected to recover annual growth rates of  $4\%.^5$ 

## Regional development

Developments in the travel sector are expected to be very uneven across different regions of the world. Before the pandemic, growth in the travel industry was expected to be particularly strong in Asia-Pacific and in the Middle East and Africa, with direct travel and tourism GDP projected to grow at compound annual rates in the order of 4–5% per annum. The rest of the world was expected to grow at slower rates, but above 2.5% for any region.<sup>6</sup> Although impacted by the COVID-19 crisis, overall we expect these trends to hold true in the long term.

Looking at air traffic, over the long term, Asia-Pacific, Latin America and Africa are expected to grow faster than other regions. The Middle East is expected to grow moderately, and Europe and North America will grow at a slower pace.<sup>7</sup>

As a consequence of these regional growth differentials, the center of gravity in the travel world will continue to shift from West to East, with Asia-Pacific being the major growth catalyst.

Amadeus is well positioned to capitalize on this Asia-Pacific growth. We have a wide local presence and a workforce of close to 4,000 people in the region, representing 23% of our total workforce. → We also have a strong market position in the Distribution business and many important carriers as customers in our Airline IT business.

- <sup>5</sup> Source: http://www.boeing.com/commercial/market/commercial-market-outlook/#/ long-term.
- <sup>6</sup> Source: World Travel & Tourism Council (February 2019). Travel & Tourism Economic Impact 2019 World. WTTC, London.
- <sup>7</sup> Source: https://www.boeing.com/commercial/market/commercial-market-outlook/#/ long-term.
- ---> See "Amadeus people and culture," p. 79.

## Trends with a potential to impact travel volumes

Some important trends affecting travel volumes include health crises, geopolitical events, economic growth levels, capacity constraints and sustainability issues.

### Health crises

Until the world was hit by the COVID-19 pandemic, health crises like SARS, MERS and Ebola had only regional impacts on travel volumes during a relatively short period of time.<sup>8</sup> COVID-19 is of a completely different order of magnitude, both impacting the whole world and having a much stronger impact on travel.

Restoring travelers' confidence is now the first priority for the industry and for governments. This requires coordinated efforts to implement practical changes in established procedures following the recommendations of public health authorities to ensure passengers' health. Beyond the evolution of the pandemic and the speed at which vaccination takes place, the economic recovery and the international coordination of travel-related measures are essential to restoring traveler confidence.

Governments, trade industry associations, travel players and IT companies have launched a wide range of initiatives to address the impact of COVID-19 on travel demand – such as "travel bubbles," contactless solutions for use at check-in, rapid testing, health pass solutions or insurance against COVID-19-related events. However, these initiatives are still fragmented, and an increased degree of coordination is required.

With the use of rapid COVID-19 tests and related protocols, the industry is pushing for safe alternatives to blanket quarantines imposed by governments. The industry is also promoting the use of updated, easily available and standardized information on national restrictions and conditions for travel, in order to facilitate decisions about traveling, improve the consumer journey experience and help companies servicing trips.

We believe that these initiatives will also mature beyond COVID-19, with technology companies like Amadeus playing an important role in this evolution, preparing the industry to better deal with future health crises.

<sup>&</sup>lt;sup>8</sup> Source: https://wttc.org/Initiatives/Crisis-Preparedness-Management-Recovery/ moduleId/1154/itemId/41/controller/DownloadRequest/action/QuickDownload.

The dedicated COVID-19 chapter in this report covers the general impact of COVID-19 on the industry as well as the measures Amadeus has taken to address the situation.

## Geopolitics

Geopolitical and security events in certain parts of the world are affecting travel significantly.

Political tensions and an increased level of protectionism are affecting travel negatively. Indeed, in 2018 the International Air Transport Association (IATA) projected significant differences in the growth of air travel over the next 20 years under a base case scenario ("Constant Policy": 3.5% growth p.a.) and two extreme scenarios ("Reverse Globalization": 2.4% p.a.; "Maximum Liberalization": 5.5% p.a.).<sup>9</sup> In terms of number of passengers in 2037, this shows a difference of a factor of almost two between the best- and worst-case scenarios.

At the same time, threats of terrorism are leading to restrictions on travel, increased security and border control, and an increased administrative burden on the traveler. This, coupled with a reduced appetite for travel, can have a dampening effect on travel demand. But experience has shown that security issues tend to only affect specific countries or regions and are generally short-lived. In addition, Amadeus' high geographical diversification helps to limit the impact of such issues on our business. Technology has provided solutions for security issues in the past, and this is likely to continue, presenting a further opportunity for large travel IT providers with the required scale and reach such as Amadeus.

## Economic growth

Economic growth levels correlate closely with travel industry growth on the long term,<sup>10</sup> although this general correlation varies substantially over time and from one region to another.

However, in the short to mid-term, as the COVID-19 pandemic has had an unbalanced economic impact on countries and citizens, and as

the recovery out of the crisis is likely to be uneven,<sup>11</sup> the relationship between GDP and travel industry growth may be different from what has been observed historically.

## Capacity constraints

Growth in travel is leading to strains on travel infrastructure, and in particular on airports. In 2019, 204 airports were designated Level 3 slot-coordinated facilities, meaning that they did not have the runway, ramp or gate capacity to handle all of the flights that carriers would like to operate.<sup>12</sup> At the time, it was also expected that there could be another 100 slot-constrained airports declared in the next 10 years because airport infrastructure development wasn't keeping up with traffic growth.<sup>13</sup>

While the COVID-19 pandemic has reduced passenger numbers massively, with the recovery in travel, capacity constraint issues might be exacerbated by the need for airports to safeguard passengers and comply with new national and global health standards, which in turn increases the chance of crowded terminals, queues and bottlenecks.

Social distancing measures alone will slash airport capacity, and airports already congested before the COVID-19 crisis can expect to reach their maximum saturation capacity at just 60–75% of their peak 2019 traffic.<sup>14</sup>

As technology can facilitate more efficient use of these scarce resources, the industry will need to invest in IT systems. For example, while in traditional check-in passengers are directed to the check-in hall, where they interact with agents to obtain a boarding pass or drop off their luggage, with technology from companies like Amadeus, airports can position fixed or portable check-in and bag drop stations at multiple locations inside or outside the terminal, minimizing congestion at the terminal.

- <sup>11</sup> Source: https://blogs.imf.org/2020/10/13/a-long-uneven-and-uncertainascent/#:~:text=We%20are%20upgrading%20our%20forecast,to%205%20 percent%20in%202021.
- <sup>12</sup> Source: https://blog.aci.aero/the-majority-of-passengers-this-summer-will-travelthrough-airports-with-capacity-constraints-the-importance-of-a-robust-slot-allocationprocess/.
- <sup>13</sup> Source: https://www.airlineratings.com/news/iata-capacity-crunch-hit-another-100airports/.
- <sup>14</sup> Source: https://www.internationalairportreview.com/news/127043/study-impact-covid-19-measures-airport-performance/.

<sup>&</sup>lt;sup>9</sup> Source: https://www.iata.org/en/pressroom/pr/2018-10-24-02/.

<sup>&</sup>lt;sup>10</sup> Source: https://www.iata.org/en/iata-repository/publications/economic-reports/air-travelgdp-multiplier-falls-sharply-back-to-its-20-year-median/.

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## Sustainability

The travel and tourism sector faces issues such as overcrowded destinations, income inequalities and human-induced climate variability. The climate issue in particular has received much more attention over recent years. In 2019 air traffic accounted for 2% of all human-induced carbon dioxide emissions,<sup>15</sup> and social movements like "flight-shaming" have attracted unprecedented attention. The industry therefore needs to respond with facts and action. We expect a more specific and stricter legal framework to emerge on these and other issues, which could have a negative impact on travel volumes in the short term.

In regard to aviation, however, the industry is determined to grow sustainably, committing to cutting net emissions to half the 2005 levels by 2050.<sup>16</sup> As such, many airlines have taken an active role in addressing this issue. For example, back in 2019 EasyJet announced that it will offset the emissions of all of its flights,<sup>17</sup> and more recently JetBlue announced that it had gone carbon neutral on all domestic flights.<sup>18</sup> Also, the Oneworld alliance member airlines have committed to net zero carbon emissions by 2050, via various initiatives such as efficiency measures; investments in sustainable aviation fuels and more fuel-efficient aircraft; reduction of waste and single-use plastics; and carbon offsets, among other measures.<sup>19</sup>

In the journey toward the industry becoming more sustainable, technology from IT companies such as Amadeus can contribute to the more efficient use of infrastructure and energy.  $\rightarrow$ 

## The need for technology to support the evolution of the travel industry

The evolution and growth of the travel industry is highly dependent on technology.

For travel providers to succeed in today's world, a strong focus is required not only on cost efficiencies but also on revenue maximization, as well as brand and customer loyalty. In this context, technology also plays an important role in enhancing a wide variety of core operations for travel providers. Amadeus has IT offerings for a wide range of travel providers, including airlines, hotels and airports.

The travel ecosystem consists of countless providers – airlines, hotels, railways, car rental companies, destination services providers, etc. – as well as countless travel sellers. Technology is powering the ecosystem by connecting all these different travel providers, allowing travelers to search for and book the optimal journey, consisting perhaps of several travel services (e.g. air, hotel and car). Amadeus plays an important role in powering this ecosystem via our distribution business, which connects travel providers with travel sellers all over the world. →

## Cloud

A significant change in the technology arena is cloud. Cloud is a disruptive technological change that will bring significant benefits in terms of innovation, agility, flexibility and efficiency.

Companies have generally accelerated the move to the cloud. It's predicted that the cloud will represent 14.2% of global enterprise IT spending by 2024, up from 9.1% in 2020.<sup>20</sup>

Cloud is a key enabler for the future evolution of the travel industry. The cloud is the right systems architecture to deliver on the needs of the industry in today's "new normal." Some of the key benefits of the cloud include:

- <sup>15</sup> Source: https://www.atag.org/facts-figures.html.
- <sup>16</sup> Source: https://www.iata.org/en/programs/environment/climate-change/.
- <sup>17</sup> Source: https://www.easyjet.com/en/sustainability.
- <sup>18</sup> Source: http://mediaroom.jetblue.com/investor-relations/press-releas es/2020/08-13-2020-152953291.
- <sup>19</sup> Source: https://www.oneworld.com/news/2020-09-11-oneworld-member-airlinescommit-to-net-zero-carbon-emissions-by-2050.
- ---> See "Environmental sustainability," p. 114.

- → See "Business lines," p. 26.
- → See "Distribution," p. 29.
- <sup>20</sup> Source: https://www.computerweekly.com/news/252492189/Covid-19-Pandemicinduced-surge-in-public-cloud-spend-predicted-to-run-until-2024.

- \_ Increased flexibility to scale up or down operational capacity to adjust to market conditions
- \_ Better performance and lower latency thanks to proximity to customer locations
- Better resiliency thanks to improved business continuity, higher availability and improved disaster-recovery capabilities
- Leveraging innovation and economies of scale of the public cloud providers
- \_ More flexible and competitive cost structure
- Higher security standards thanks to the enhanced controls and functionality available

To take full advantage of the possibilities of cloud technology, Amadeus has decided to accelerate its move to the cloud and to transfer all its systems and services to the public cloud.  $\rightarrow$ 

## Recent and emerging technologies that could reduce the friction of travel

The inconveniences and friction sometimes linked to travel can be a significant impediment in the evolution of the travel industry. However, recent and emerging technologies could help all actors deliver a frictionless experience, either by reducing the friction for the traveler directly (e.g. by allowing check-in for a flight at the hotel, or removing the need to present physical IDs), or indirectly (e.g. by reducing the impact from a disruption). With the friction now exacerbated by the COVID-19 crisis, the pandemic will accelerate the use of these technologies.

Key technologies in this arena include digital identity and biometrics, artificial intelligence (AI) and the Internet of Things (IoT).

#### Digital identity and biometrics

A digital traveler identity is a fully digital form of a traveler's identity, with embedded biometric information. These enabling technologies are coming together at the right moment to change the nature of our journeys. The most crucial concept that they enable is perhaps contactless travel, a trend further fueled by the pandemic. Contactless travel has the potential to help deliver a greatly improved travel experience. Contactless technologies can be applied even before the air traveler reaches the terminal. Both baggage and travelers can now be checked in from home, hotel or workplace. And as social distancing remains in place, "off-airport check-in" will be crucial to maintaining a smooth flow of passengers through the terminal. Technology exists today that enables a passenger, via digital traveler identity, simply to walk through security, the boarding gate and the lounge without the need to interact with physical interfaces or present identification documents

Even upon arrival at a destination, the contactless concept can still be applied. We're likely to see homestays, hotels and attractions such as museums and theme parks adopt low-touch solutions. Digital room keys, pre-arrival emails and facial recognition at the concierge desk are all being explored by the hospitality industry.

At Amadeus we provide solutions that allow remote and contactless check-in and baggage handling as well as biometric technologies for identification at boarding. We've also launched a major innovation program, Traveler ID, that aims to enable an end-to-end experience by offering a seamless ID verification process throughout the traveler journey.

#### Artificial intelligence

AI has the potential to be applied across all steps of the journey. At Amadeus we have research teams of AI specialists and data scientists exploring these various use cases.

When considering future travel, thinking specifically about the complexity of choices and uncertainties that travelers face, AI can be used to enhance recommendations based on a detailed understanding of travelers' needs and requirements. At Amadeus, we've tested AI in flight searches to segment off travelers and deliver the most relevant results to them.

Once the traveler has booked a flight, our dynamic pricing prototype for ancillary services, another AI-powered component, is able to provide even more personalized offer recommendations – what products to offer (e.g. extra bags and extra legroom), to which traveler, at which price.

Airlines and ground-handling companies need to forecast the total weight of the aircraft to be able to assess the precise quantity of fuel required. In this regard, as an enhancement to the Amadeus Altéa Departure Control – Flight Management solution we use AI to predict the amount and weight of passenger luggage based on historical passenger (e.g. leisure/business or number of travelers traveling together) and flight (e.g. day of week or origin/destination) data.

When traveling, AI can also be applied to reduce the impact of disruptions. Managing changes and disruptions dynamically will be aided by the application of AI. By providing fast and high-quality decision support for reallocation of flights and passengers, AI can help smooth operations for the airlines and ground handlers while removing anxiety for the traveler.

We've also developed a travel demand monitoring prototype that uses AI to detect changes in search and booking data, which can be used by airlines to better plan their schedules as they recover from the COVID-19 crisis.

For the traveler, flight delays and cancellations are two of the most common headaches. Using machine learning, we can predict which flights and itineraries have the highest probability of delays, providing valuable input when booking a trip. At Amadeus we have created a flight delay predictor for this purpose.

#### **Internet of Things**

IoT refers to everyday physical devices that are connected to the internet, making them capable of sending and receiving data. The technology holds big potential, both for the traveler and the travel provider, and can be used for example at hotels (e.g. smart rooms and seamless check-in), airlines (e.g. efficient aircraft fueling and aircraft repairs) and airports (e.g. flight status, luggage tracking and directions to gates).

The pandemic and the new health and safety protocols will foster new uses of this technology. With the use of smartphones that connect with the various devices around, new IoT applications could be deployed such as smart contactless solutions, asset tracking at airports (e.g. tracking of luggage and ULDs<sup>21</sup>) or keeping track of travelers throughout the whole trip. At the same time, applications could send alerts to users when social distancing is not being maintained in crowded places like airports.

Regarding air travel, Amadeus has already explored the technology in the form of real-time luggage and ULD tracking solutions for airlines and airports,

and we are also exploring other B2B use cases within the airport environment.

Amadeus supports travel industry growth with significant investment in technology. We've invested €876 million in R&D in 2020, we remain leaders in R&D investment in the travel industry and rank third largest R&D investor in the software industry in Europe.<sup>22</sup>

## Amadeus profile



## At the heart of travel

Travel fulfills our need to explore the world – to see new places, meet new people and be near to what's important to us. Travel also powers progress – it builds economies, broadens cultures and creates connections between societies. The travel industry is dynamic, powerful and fast-moving. And it is one of the world's largest business sectors.

Technology has always been critical to developing global travel. Travelers today expect to be continuously connected. Mobile devices, artificial intelligence and data analytics are giving people more ideas, options and control over their journeys, and they expect personalized experiences. To keep up with these changes, the industry must continue to innovate in a way that is sustainable and responsible.

Amadeus sits at the crossroads of travel and technology. We're passionate in our pursuit of better technology to make better journeys. We connect travelers to the journeys they want, and we power the solutions that keep the world of travel moving.

## Who we are

Amadeus is a technology company dedicated to the travel industry. Amadeus corporate headquarters are in Madrid. We have a truly global

<sup>&</sup>lt;sup>21</sup> A unit load device (ULD) is a pallet or a container used to load luggage, freight and mail on aircraft.

<sup>&</sup>lt;sup>22</sup> Source: http://iri.jrc.ec.europa.eu/sites/default/files/contentype/scoreboard/2020-12/ SB2020\_EU%2BUK1000.xlsx.

team of more than 16,000 professionals serving customers in more than 190 countries. We've built a commercial and operational network all over the globe, which is key for our value proposition, and we're committed to helping global travel make a positive impact on communities around the world.

We operate under a transaction-based business model linked to global travel volumes. We are a publicly listed company and part of the Spanish IBEX 35 Index, which includes the biggest, most liquid companies in the Spanish stock market, and the EURO STOXX 50 Index, comprising 50 of the largest and most liquid stocks in the eurozone.

## What we do

Amadeus offers cutting-edge technology solutions that help travel industry stakeholders succeed. We connect travel players and make personalized journeys happen.

#### Sales & marketing

- \_ Direct & indirect distribution
- \_ Traffic acquisition & conversion
- \_ Point of sale & payment
- \_ Revenue management
- \_ Digital retail & merchandising

#### Analytics & intelligence

- Personalization
- \_ Market insight
- \_ Data integration
- \_ Consulting services

#### Business management

- Process automation
- Expenses
- \_ Finance & accounting
- Mid- & back-office

#### Customer, guest & traveler management

- \_ Customer experience
- Passenger processing Corporate booking & duty of care
- Loyalty & awards

#### Operations

- Flight operations
- Airport operations
- \_ Hospitality operations
- Property & resource management

We invest hundreds of millions of euros each year in research and development. We design our solutions around our customers' needs as well as their customers' – the travelers – needs. At all stages of the travel experience – from inspiration to shopping, booking, on-trip and post-trip – our solutions help deliver better service to travelers.

We help travel providers package and deliver their content across both direct and indirect (travel agency) channels. Our customer management solutions help them manage and enhance the customer experience, from first contact to check-out and beyond.

For example, for airlines, this means improving passenger processing capabilities. We've developed solutions to make sure that flights take off on time, every bag is tracked, and every disruption is dealt with as effectively as possible.

For corporations, this means providing staff with improved self-booking and duty of care solutions. We offer solutions built to automate processes and handle all essential mid- and back-office tasks – hassle-free. These give corporate travel and finance managers greater control across all travel programs. Our dedicated finance and accounting tools can also help our corporate customers with managing travel information and making strategic travel decisions.

We also provide solutions to help the hospitality sector manage properties and resources more efficiently. Our technology and insight help our customers develop tailored content and promotions that enhance the guest experience. We also help optimize the delivery of that experience so that guests' loyalty increases. We offer analytics and intelligence solutions built to help anticipate trends, adapt to market shifts and monitor performance. This means travelers get more than just a great travel experience – they get one designed to meet their individual preferences, needs and expectations.

We also offer industry-leading consultancy services to help transform travel businesses for the better.

#### Amadeus' presence in the world Headquarters Madrid **9**



Sites marked only with a dot on the map represent smaller Amadeus sites, branches, companies non-wholly owned by Amadeus and distributors.

## The customers we serve

We build technology solutions that serve every part of the global travel ecosystem: airlines and airports, hotels and railways, search engines, travel agencies, tour operators, and other travel players. We help them run their business and improve the travel experience all over the world. And we continue to innovate, bringing more products and services to market as quickly as possible, so we can deliver on customer expectations and respond to industry challenges.

Amadeus sits at the heart of every journey, connecting travel providers, buyers and sellers.

# Where we've come from – our history and key milestones

Amadeus was founded in 1987 by four airlines: Air France, Iberia, Lufthansa and SAS. From our origins supporting airline distribution and then IT, we gradually expanded our capabilities to serve customers across the entire travel industry. Fast-forward three decades, and Amadeus has become one of the world's largest technology providers for travel and tourism.

Over the years, we've broadened our scope, launching our Airline IT business in 2000 and building on that with the acquisition of Navitaire in 2016 to expand our portfolio for low-cost carriers.

## Our history and key milestones





Business operations



We accelerated our move into the hotel IT sector with the acquisition of Newmarket in 2014 and TravelClick in 2018, confirming our strong commitment to the hospitality industry and broadening our product portfolio, know-how and global presence. In a highly fragmented market, Amadeus now has the people and the technology to help all hoteliers rise to the challenge of delivering a great experience for their guests.

We've also expanded our portfolio to include merchandizing, revenue management, travel intelligence and travel expense management, harnessing the potential of cloud computing, mobile applications and big data for our customers.

We have also diversified our activity into other businesses linked to the travel industry like airport IT or payments, and we are exploring new opportunities through our innovation teams. Throughout our history, investment in research and development has been integral to our company culture.

## Where we're going

Since 1987, we've been a leader in the evolution of the travel industry. And we're always looking for ways to keep our customers and partners at the forefront of the latest trends, so they can provide travelers with a consistent, personalized experience throughout their journey. We retain our unique vision, determination and commitment to working more closely than ever with our customers, existing and new, to shape the future of travel together.

Today's travelers want a more personalized way to travel. They want to search for experiences that are unique to them. They also expect their journeys to be one single, smooth experience – from thinking of where to go, to getting to their destination, to arriving back home. At Amadeus, we believe that this desire for connectivity will continue to grow – across all modes of transport, experiences and devices. And travelers will also want their travel providers to make a positive impact on society and the environment, both locally and globally.

We're investing in these opportunities and exploring new models that will drive our own and our customers' growth, experimenting with technologies that'll make travel more rewarding for all of us. We're working in a more agile way. We're making processes leaner. We're building new and better ways to collaborate. And we're using new structures and systems to catalyze cooperation across teams, functions and geographies – within Amadeus and with our customers.

#### Recognition and awards

We are committed to investing in innovation and collaboration, promoting sustainable business practices, advancing the travel industry and giving back to society. In 2020 respected organizations all over the globe recognized our efforts and achievements in these areas.



GLOBE

WINNER



Innovation

DJSI Europe and World indices

> IRISH TRAVEL INDUSTRY WARDS 2020 WINNER BEST TECHNOLOGY

Globe Travel AwardsIrBest technology providerW

Irish Travel Industry Winner

Vakantie Award



CDP



FTSE4Good



Amadeus' Executive Committee

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## Tomas López Fernebrand

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Christophe Bousquet Chief Technology Officer, Senior Vice President, Airlines R&D



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