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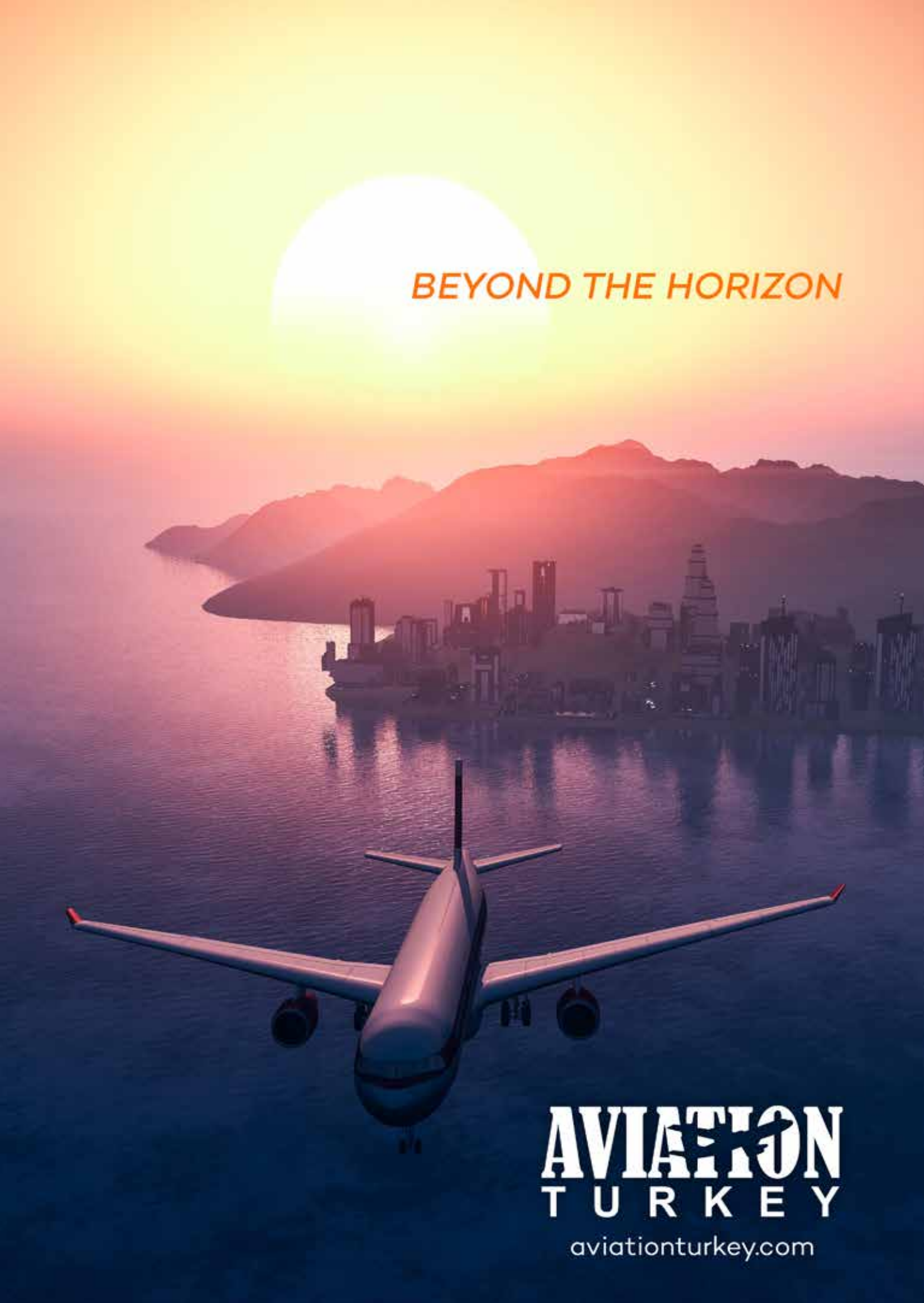
AVIATION TURKEY

ISTANBUL AIRPORT PLEDGES TO ACHIEVE "ZERO CARBON EMISSION" BY 2050

IS IT A DREAM TO FLY FASTER THAN SOUND AGAIN?

DR. MAX KOWNATZKI, SUNEXPRESS CEO, TOLD US ABOUT THE AIRLINE'S CURRENT POSITION AND FUTURE PLANS

TURKISH SPACE AGENCY PRESIDENT YILDIRIM: "THOSE NOT HAVING ANY TRACE IN SPACE HAVE NO SAY IN THE WORLD!"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Basım Tarihi
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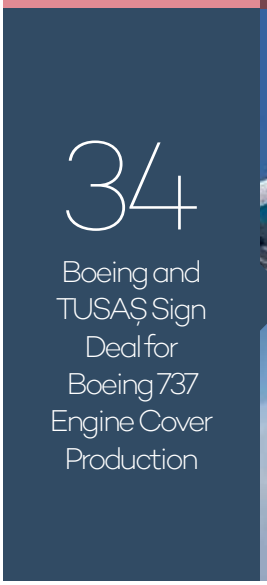


Rolls Royce's All-Electric 'Spirit of Innovation' Takes to the Skies for the First Time

20 years Forecasts on Airtransport by Boeing and Airbus

Lately Boeing released Commercial Market Outlook and Airbus shared a forecast on air transport in next 20 years.

Since the onset of the COVID-19 pandemic in early 2020, airlines have adjusted their networks to meet rapidly changing market needs. In addition to the sharply reduced demand environment, compliance with frequently shifting and varying governmental health guidance and regulatory constraints, such as border closures and travel restrictions, have dramatically increased airlines' requirements for real-time planning and capacity adjustments.

According to Airbus forecast , While having lost nearly two years of growth over the COVID period, passenger traffic has demonstrated its resilience and is set to reconnect to an annual growth of 3.9% per year, driven by expanding economies and commerce around the globe including tourism. The middle classes, who are the likeliest to fly, will grow in number by two billion people to 63% of the world's population. The fastest traffic growth will be in Asia with domestic China becoming the largest market.

While health and regulatory dynamics will continue to shape the near-term Boeing's analysis of market dynamics shows that commercial airplanes and services are showing signs of recovery and resilience. Availability and distribution of COVID-19 vaccines will continue to be critical factors in recovery of passenger air travel. Countries with more widespread vaccination distribution have shown rapid air travel recovery, as governments ease domestic restrictions and open borders to international travel.

In the next 20 years, Airbus forecasts demand for air transport to progressively shift from fleet growth to the accelerated retirement of older, less fuel-efficient aircraft, resulting in a need for some 39,000 new-build passenger and freighter aircraft, 15,250 of these for replacement. As a consequence, by 2040 the vast majority of commercial aircraft in operation will be of the latest generation, up fr om some 13% today, considerably improving the CO2 efficiency of the world's commercial aircraft fleets. The economic benefits of aviation extend beyond the sector, contributing around 4% to annual global GDP and sustaining some 90 million jobs worldwide.

According to the Boeing Commercial Market Outlook, Demand for domestic air travel is leading the recovery, with intra- regional markets expected to follow as health and travel restrictions ease, followed by long-haul travel's return to pre-pandemic levels by 2023 to 2024. Long term, market fundamentals and resilience drive demand through 2040 for more than 43,500 new airplanes valued at $7.2 trillion. Boeing forecasts the global commercial fleet will surpass 49,000 airplanes by 2040. China, Europe, North America and other Asia-Pacific countries each account for about 20% of new airplane deliveries, with the remaining 20% going to other emerging markets.

Prior to the pandemic, nearly 50% of worldwide air cargo was transported via widebody passenger lower cargo holds. This capacity virtually disappeared in March 2020 as passenger widebody service was suspended worldwide. Subsequently, passenger widebody lower hold capacity has recovered to about half of pre-pandemic levels.

According to Airbus forecast, Cargo demand, boosted by e-commerce, is driven by an expected growth in express freight of 4.7% per year and a general cargo (representing about 75% of the market) growth of 2.7%. Overall, over the next 20 years there will be a need for some 2,440 freighters, of which 880 will be new-build.

The Boeing CMO 2021 freighter fleet forecast incorporates near-term cyclical disruptions and long-term structural impacts we anticipate will impact air cargo markets. This assumes the current dynamics of constrained widebody passenger belly capacity will dissipate into the long term, and air cargo will then reflect market dynamics closer to those seen in the years prior to the COVID-19 pandemic. 20-year traffic growth (2021–2040) is forecast to be 4.6%, reflecting low base year effects due to the pandemic-induced traffic reduction estimated at 9% in 2020. The 21-year traffic growth, using

2019 as a baseline, remains at our previous growth forecast of 4.0% (2020–2039). In 2040, the world's freighter fleet will grow from ~2,000 units in 2019 to ~3,400 units, an increase of 70% over the pre-pandemic fleet. This longterm fleet growth will be powered by GDP growth, industrial production and replacement demand. Near-term air cargo market demand has been boosted by increased e-commerce, supply chain disruptions, severe maritime interruptions, economic recovery and the previously mentioned widebody passenger capacity loss. This boost is reflected in total air freighter unit demand that sees somewhat higher demand in the first decade of the forecast.

In accordance with all these reports relased by Boeing and Airbus shows us After years of growth and profitability, the aviation industry kicked off a new decade with a pandemic that resulted in one of the worst shocks our industry has ever faced. . It is obvious that the demand for air transport will continue to grow. The aviation industry has proven resilient time and again as it withstood major external and macroeconomic shocks. This is driven by global commerce, people's desire to travel, visit family and friends, explore the world and build relationships. While difficult in the near-term, operators who emerge from market downturns have historically resumed their growth trajectory through collaboration, adaptation and innovation

Enjoy the issue

Ayşe Akalın
Editor in Chief

Kownatzki; We replaced plastic products on all of our international flights with sustainable alternatives made of wood or paper.

In this exclusive interview, Dr. Max Kownatzki, SunExpress CEO, told us about the airline's current position and future plans.

by Şebnem Akalın

Aviation Turkey: Firstly, thank you for your time. Can you briefly provide some information about SunExpress' history and the way it is structured? Sun Express was established in 1989 as a joint venture company of Turkish Airlines and Lufthansa and has since become one of the top leisure airlines in Europe and indeed the world and has also been awarded prestigious Skytrax awards multiple times. How has SunExpress become so successful?

Indeed, you have already summarized our success story very well. Of course, there is plenty more to add about this subject. As you mentioned, SunExpress was founded in 1989 as a joint venture of Turkish Airlines and Lufthansa. At first, SunExpress focused on touristic services between Antalya and Germany but has now become an integral part of the Turkish tourism industry.

What started with one Boeing 737-300 aircraft and 59 staff, has now evolved into a team of 4000 employees operating 51 aircraft to 52 destinations in 27 countries. In 2019, SunExpress received the award for Turkey's Best Leisure Airline, and the award for World's 5th Best Leisure Airline by SkyTrax, and a SAFA award for Turkey's Safest Airline. It is also worth mentioning that SunExpress is recognized as Turkey's Second Biggest Service Exporter.

SunExpress with its unwavering dedication to Turkish tourism connects Antalya and İzmir to more domestic and international destinations than any other airline and also connects

13 Anatolian cities to 17 European destinations with direct flights. The dedication of our team and our unique company culture which combines Turkish and German elements are the most important factors behind our success; the support and know-how of our shareholders are also crucial.

At SunExpress, we continue to strive for maintaining our position as one of Europe's most innovative and leading leisure airlines.

Aviation Turkey: Since the start of the 2021 summer season, SunExpress has been flying to 52 destinations in 27 countries across Europe directly from Turkey. What are your plans for increasing the number of flights in 2022? Can you tell us more about the activities and developments that SunExpress has planned for the near future?

This summer, despite the industry-wide setbacks due to the pandemic, we are once again proving our commitment to Turkish tourism by utilizing our entire fleet at pre-Covid levels. As the pandemic has constituted the biggest crisis in the aviation industry ever, I am extremely proud of my team members for their substantial achievements such as having the flexibility to increase our offered capacity from 25 percent to 100 percent in just one month.

Given the strong rebound capability of Turkish tourism, we will resume our growth strategy in 2022. Several new destinations, for example in the UK and Eastern Europe, are on our radar as well as frequency increases on existing routes, offering even more options for our customers.

However, the industry still faces multiple uncertainties; the fight against Covid-19 is still ongoing and despite vaccinations being rolled out globally, new virus variants may impact our current progress. There are still many travel restrictions and quarantine requirements in place, partially reducing travel demand.

Additionally, pre-Covid industry challenges such as current natural disasters occurring in Turkey and all over Europe are becoming more prominent and are calling for a well-thought sustainability concept.

Aviation Turkey: What is the current status of the SunExpress fleet? Will there be new aircraft joining the fleet in the near future?

We currently have 51 Boeing 737 800 NGs aircraft in our fleet. We are operating 39 of these aircraft for our own SunExpress operations, and 12 aircraft are being operated for AnadoluJet as a part of our wet-lease agreement.

During these challenging times, flexibility is key for limiting negative financial impact and serving available travel demand; this includes reducing the fleet by a couple of aircraft to minimize fixed costs. Nevertheless, our intention to provide strong support to Turkish tourism is at the heart of our crisis strategy.

We have enabled constant access to Turkey's beautiful attractions, and we have provided the Turkish community throughout Europe with considerable opportunities to visit their families in Turkey.

Even during the strict lockdown period, we reduced our capacity less than many other airlines in the Turkish market and we always ensured that we supported Turkish domestic travel as best we could. This allowed us to realize additional business opportunities and, even more importantly we were in a good position to ramp up our activities quickly when demand started to pick up in June 2021.

We currently have 42 737 MAX aircraft ordered, 9 of which will be added by the end of this year, boosting our capacity for the 2022 summer season.

We are deeply aware that the airline industry has an impact on the environment; this is why we need to

grow responsibly and do our utmost to contribute to its conservation. A key component in our strategy is the employment of modern, low Co2 emission aircraft like the 737 MAX. This outstanding model provides the highest efficiency and passenger comfort in the single-aisle market, with a 20% lower fuel consumption than its older Boeing predecessors.

Aviation Turkey: SunExpress is one of the only airlines that have direct flights from Anatolia to Europe; this might be the main reason customers are choosing your airline. What other reasons influence customers' decisions to fly with SunExpress? What other significant services do you provide so your customers can fly safely and comfortably?

As the first and only airline operating direct scheduled flights from 13 Anatolian cities to 17 cities in Europe, we are proud to rejoin Turkish citizens living in Europe with their home country and their loved ones.

We are the first airline to receive the Orange Circle Certificate awarded by the Izmir metropolitan municipality for our safe and hygienic business practices. The Orange Circle Hygiene Certificate has been set up to ensure standards that will give travelers increased peace of mind throughout their journey. This has, once again, proven SunExpress' expertise in providing a healthy and hygienic travel experience to all its passengers.

We are also offering tailor-made solutions by providing our passengers more flexibility during their travel planning; for example, we now provide our passengers with the opportunity to purchase empty middle seats in advance. Thanks to this service, our guests can benefit from extra space between them and other passengers allowing them to have a more comfortable and relaxed flight experience.

SunFlex, launched last November, offers passengers the opportunity to rebook their reservations with no additional fees up until a certain time before departure, depending on the fare selected during booking.

This year, we have launched the Corona Care Guarantee package, which allows our passengers to take advantage of free rebooking and cancellation options if they or their first-degree relatives are infected with Covid-19.

Aviation Turkey: Coronavirus has been affecting the aviation and tourism sector since it first emerged in early 2019. SunExpress has been taking serious actions to protect all their customers and crew. What kind of preventive, safety measures does SunExpress take? And what are your plans for the coming period?

Apart from what I mentioned previously, we are continuing to utilize well thought out, appropriate measures to provide a healthy and care-free travel experience for our passengers, such as continuing our strict face mask policy, disinfecting our aircraft, strict boarding and deboarding procedures, we provide sanitizers, and we use ultra-efficient HEPA filters which are used in surgery theaters in hospitals. Additionally, we have implemented government actions such as the requirement for passengers to declare their HES code on domestic flights: It is mandatory for all passengers booked on domestic flights to provide a HES code during booking; a PCR or rapid antigen-negative test result, a vaccination certificate or proof of recovery from Covid-19 is required for international flights. On top of this, around 80 percent of our crew have been vaccinated. Some may say, flying with SunExpress is safer than staying on the ground.

Aviation Turkey: The summer of 2020 was a bit slow in the tourism sector, but business started to pick up the

following summer with the vaccination rollouts. How would you evaluate the summer of 2021? Did you reach the number of passengers you expected? When do you expect the number of passengers to return to pre-pandemic levels?

Although business in the sector started to build momentum late this summer, the wide rollout of vaccinations in many countries and the easing of travel restrictions have become key drivers for growth in the tourism sector. As of June 2021, we started to see a significant increase in bookings, partly even exceeding 2019 levels in some weeks; this shift allowed us to utilize the entire fleet.

People's overall desire to travel again allowed us to achieve a record on August the 6th with over 36K passengers having flown with SunExpress on one day. By mid-August, we had flown 3 million international and domestic passengers to their dream destinations to see their loved ones. However, given the late start of the season, the strong performance during the peak months, will not be able to make up for the reduced demand before June.

Looking ahead, flexibility will remain a key necessity for airlines. Constantly changing travel regulations will require flexible capacity allocation during the coming periods. I am convinced Turkish tourism will reach pre-pandemic levels before in other tourism markets will.

Aviation Turkey: Currently due to global warming, wildfires are becoming more serious and widespread, not only in Turkey but also in many other countries worldwide. In fact, in recent years, nature has started to sound the alarm and call on humanity for more awareness and sensitivity. Some companies have initiated various positive actions to increase awareness to safeguard the environment. Has SunExpress developed any new projects to improve environmental awareness?

At SunExpress, we take this issue very seriously. As I mentioned before, our fleet development strategy is based on reducing fuel consumption. Soon we will have a younger and more modern fleet which will reduce our carbon footprint. We also replaced plastic products on all of our international flights with sustainable alternatives made of wood or paper.

It is very important for SunExpress as a company to contribute to sustainability. In 2019, we launched our very first forest project in Ankara by planting a large number of saplings. This is a small contribution towards leaving a greener Turkey for future generations. We are currently planning to replicate this sapling initiative in more Turkish cities in the near future. Especially after this year's devastating wildfires, we have decided to speed up our efforts.

Our industry will find solutions to reduce the impact of climate change. In that sense, we are collaborating with "right. based on science", a start-up company specialized in developing science-based metrics and software solutions. They will help us in measuring and managing our carbon footprint. Looking ahead, we will see promising solutions and ideas materializing from this effort.

In addition, such a task requires alignment with all stakeholder beyond the reach of one single company. Two examples for that: Sustainable aviation fuel development, or the creation of a Single European Sky, ensuring more efficient utilization of airspace.

As with many topics, we wish for a level playing field. In an ideal world, these stakeholders pursuing carbon reduction, e.g. through using more costly sustainable kerosene, should not be penalized for going the extra mile by the usual commercial market forces.

At SunExpress, we work as an institution to raise awareness for the environment and contribute as much as we can; our approximately 4000 team members who make up this large family provide immense support and represent the driving force behind the realization of our company's vision to continue to positively contribute towards the protection of nature

Turkish Space Agency President YILDIRIM: "Those not having any trace in space have no say in the world!"

by İbrahim Sünnetçi

In his speech dated May 29 delivered at the 1st Space Economy, Space Law and Space Sciences Symposium held on 29-30 May 2021 with the cooperation of Istanbul University's Faculty of Economics, Faculty of Law and Observatory Application and Research Center, Turkish Space Agency's (TUA) President Serdar Hüseyin YILDIRIM touched upon the economic and legal aspects of space studies. YILDIRIM also stressed the importance of discussing space-related economic and legal developments and stated that the countries that are not active in space would become poorer and have no say in the world. Underlining their wish to have a say in the production activities to be conducted in space, YILDIRIM noted that those not having any trace in the space would fail to have a say in the world.

In the first part of his speech, TUA President YILDIRIM commented on the Space Economy and emphasized the space-related economic activities' impacts over the world and space. Mentioning that they conducted a detailed analysis of the space economy in their activities designed as part of the National Space Program, YILDIRIM said, "According to the latest figures of the pre-pandemic process, the total amount of the countries' space-based expenses is around US$ 80 billion in terms of investment. The total size of the space economy of the same period amounts to approximately US$ 480 billion. Considering the trends, the conservative projections suggest this figure would reach US$ 800 billion by 2030 while the realistic forecasts estimate it as US$ 1 trillion... Surely, one cannot expect Turkey to fall outside such sector."

YILDIRIM mentioned that not long ago, one of the official channels of the Chinese government declared that the Chinese Space Agency's Global Positioning System (GPS) comprising of 30 satellites and titled as BeiDou (the North Star) that was globally launched in

2020 generated revenue of US$ 62.5 billion and underlined that this was a quite remarkable figure. YILDIRIM continued: "There are 4 Global and 2 Regional Positioning Systems in the world. First is the GPS used by the USA, second is the Galileo System utilized by the Europeans. Russia's GLONASS System is the third system and finally, there is the BeiDou Global Positioning System recently completed by the Chinese. BeiDou System reached 30 satellites. Yet, the revenue it accomplished is US$ 62.5 billion. Our National Space Program targets a Regional Positioning and Timing System (BKZS), not a Global one. From a realistic perspective, a Global system is beyond our league at this stage, but why do we refrain from building a Regional one? Are there any similar systems in the world? There are two; one is in Japan and the other is in India. Both countries have already built regional Global Positioning Systems. Why shouldn't Turkey become the 7th country with a Global/ Regional Positioning System? This would bring economic advantages to our country and as you would appreciate to the entire region. This system can be positioned to cover the entire Balkans, Caucasia and the Middle East and it can be rendered as a system that can be utilized by all countries in the neighbor regions. It is not hard at all. Besides, such a system would remarkably contribute to our country. Even when we ignore its contributions regarding the security and independence aspects and tackle the issue from an economic perspective, this BKZS Project will bring crucial advantages to our country. If it is utilized correctly, the system will easily compensate for the investment made with proper technologies and bring much more."

Turkish Space Agency's President YILDIRIM warned that Turkey may lag behind in the space race as it did during the Industrial Revolution if it fails to invest in the space now and said, "Our youngsters would rightfully blame us in the next decades." YILDIRIM underlined the significant advantages of the investments to be made in the space and added that the three main activities are "production in space (made in Space), space mining and space tourism."

Touching upon the hot topics regarding the production activities in space, YILDIRIM stated that particularly the production of crystallized structures (microgravity in other words is developed in gravity-free environments and more valuable products can be achieved compared to the ones produced in the earth) and production in biotechnology areas were planned to be launched in the first stage. According to YILDIRIM's statement, the production activities will be conducted by building seven platforms in the earth's closest axis and the production will be carried out for the utilization in the earth (the products will be brought to earth). YILDIRIM told that these seven platforms were gradually being built by different countries and companies and added, "At least two platform manufacturers contacted our Agency. They asked whether Turkey was interested in these projects or not. Needless to say, we declared our wish to take part in the projects and told them that we aimed to be involved as a shareholder rather than a user, from the very beginning. Before accepting, they will wish to see if we can handle such partnership or shareholder position in terms of technical and budgetary aspects. I believe that we can achieve it...We intend to become a partner of at least one of these platforms in time. We also wish to have a say in the production activities to be performed there."

Reminding that the U.S. aims to found a "Moon Colony" with the Artemis Program, YILDIRIM told that the Moon will become the earth's door to space and so to speak a launcher and added, "Therefore, we will exist on the Moon as Turkey and we will remain there as our Agency!" Relaying information that as Turkey's authority, they have been following the space-related developments quite closely, YILDIRIM continued, "Our country has to benefit from this economic revolution. We should not lag behind the developments. We need to adopt the necessary measures." To underline why Turkey's Moon Program was so critical, YILDIRIM said, "If we fail to exist on the Moon then we will not be able to protect our rights and interests there. Those, who do not have a trace in space, do not have a say in the world!" and continued, "There are major differences between the launch from Moon and the launch from Earth such as the gravity factor, the lack of atmosphere and environmental parameters. More complicated space missions can be executed with the launches from the Moon by using far less power."

TUA President YILDIRIM pointed out that though precious metals were the first things to spring to mind when speaking of mining, the primary product of space mining was water

and stressed that water was the most critical and precious metal on the Moon and in space. YILDIRIM: "For the continuation of life when electrolyzed, water is oxygen (for respiration) and it is fuel as the hydrogen comes out. Therefore it becomes the most valuable product for the existence of human beings in space. Even the possibility of building colonies on the Moon and on Mars is based on the fact that water bodies remain there in the form of ice masses. A severe amount of ice was discovered on the south pole of the Moon. Similarly, such masses exist on Mars."

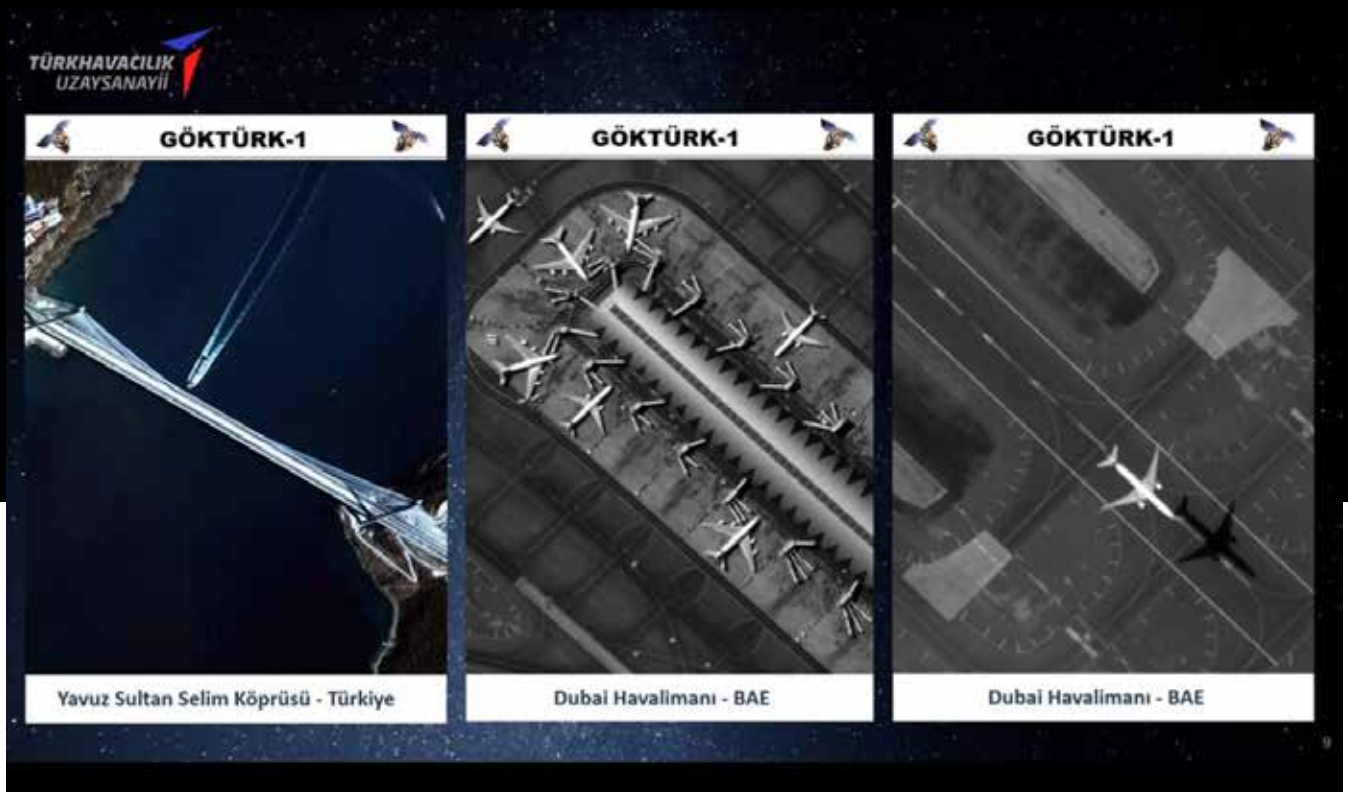
YILDIRIM once again emphasized that the countries failing to be active in space would become poorer and would not have a say in the world and added that they wished to increase the number of Turkey's experts in space to 10.000 in a decade, by the end of 2030.

"Göktürk Satellite System's Renewal Project is at the Signing Stage!"

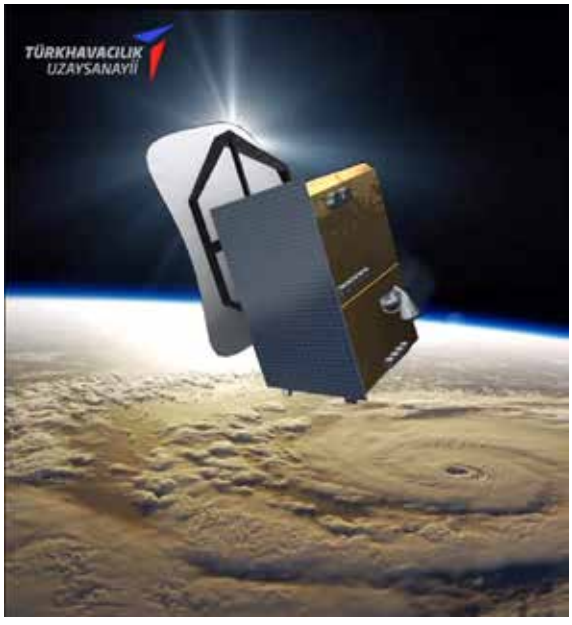
Temel KOTİL, Turkish Aerospace Industries' (TUSAŞ) President & CEO, made a presentation titled "Turkey's Satellite and Space Projects' Past and Present" on May 29, at the first session of the 1st Space Economy, Space Law and Space Sciences Symposium and reminded that Turkey's first communication satellite TürkSat 1B had been launched in 1994, TürkSat 1C in 1996 and TürkSat 2A in 2001. Our other communication satellites, TürkSat 3A was launched in 2008, TürkSat 4A in 2013, TürkSat 4B in 2014 and TürkSat 5A was launched to space in January 2021. TürkSat 5B Communication Satellite is planned to be launched in the last quarter of 2021. Mentioning that the teams TUSAŞ Space with nearly 250 staff and TÜBİTAK Space with nearly 300 people were working on the TürkSat 6A National Communication Satellite, KOTİL added that activities regarding Observation Satellites were being conducted in addition to communication satellites.

KOTİL noted that BİLSAT, the first Observation Satellite was launched into space in 2003, RASAT in 2011 and GökTürk-II developed by TUSAŞ-TÜBİTAK Space cooperation in 2012 and added that developed by Thales, GökTürk-I Earth Observation satellite capable of capturing sub-meter resolution imagery was placed into the orbit in 2016 (final acceptance was accomplished on 4 December 2018) due to the delays caused by license issues. KOTİL said, "GökTürk Satellite Renewal Project is our most critical project in Observation Satellite area. This satellite will be replacing GökTürk-I and TUSAŞ is about to sign this satellite's contract with our government. Hopefully, we will build a better version than the one built by Thales."

KOTİL pointed that after GökTürk-I Renewal Satellite (GökTürk-1Y), they will be developing the



GökTürk-III Satellite with SAR (Synthetic Aperture Radar) disposable load also for observation purposes and that they will be exporting the HTS Communication Satellite technologies with high-output for Argentine's national telecommunication company ARSAT S.A. Within this scope, a joint venture company titled GSATCOM Uzay Teknolojileri A.Ş. has been established at ODTU Teknokent in Ankara by TUSAŞ and Argentine-based INVAP S.E. A Small-GEO type communication satellite, namely ARSAT-SG1, is aimed to be developed in three years and completed in 2024 under GSATCOM license by the engineers of TUSAŞ, GSATCOM and INVAP. Twenty-four transponders will be installed to the Small-GEO type ARSAT Communication Satellite. The satellite will be weighing 1-1.5 tons as it will require fewer fuel thanks to its electrical drive. TürkSat 6A Satellite, on the other hand, is planned to be launched in 2022 and weighs 4.250 kg (nearly 1.800 kg of this figure is the satellite's weight and the rest is the fuel's weight). GökTürk-I Renewal Satellite (GökTürk-1Y) is expected to be launched in 2026 and GökTürk-III Satellite in 2028. İMECE Earth Observation Satellite with EO camera with sub-meter (70 cm) resolution is aimed to be launched in 2022.



BeiDou Global Positioning System Program and QZSS and NavIC Regional Positioning Systems

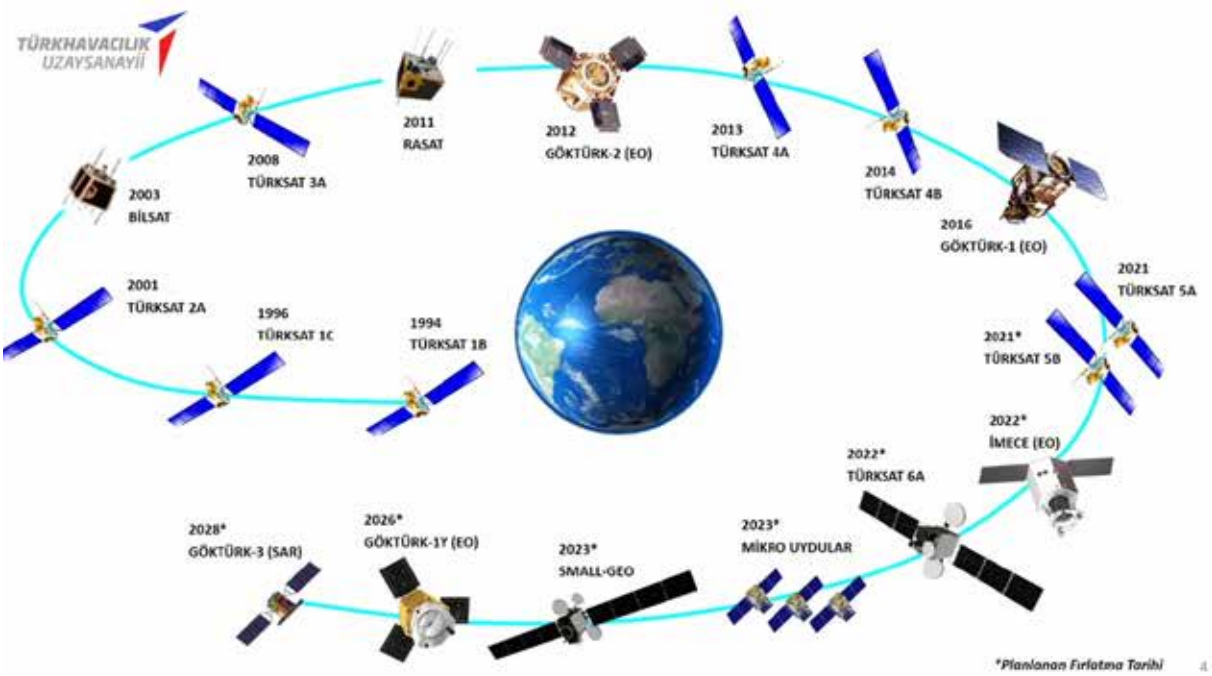
As mentioned by TUA President YILDIRIM, presently there are 4 global (GPS, GLONASS, Galileo, BeiDou) and 2 regional (QZSS [Japan] and NavIC [India]) positioning systems. Some of them are operated in full capacity and some are being installed. These systems comprise three main components that are space, control and user segments. Position identification through satellites is being conducted by measuring the transmission duration of the position signals transmitted by the satellite. For 3D precise positioning, the receiver has to receive signals

from a minimum of 4 signals, simultaneously. MEO satellite is used in global systems and the GEO and IGSO satellites are preferred by regional systems.

The main components of the positioning satellites are the atomic clock and radio navigation payload. L-Band is mostly used in positioning signals. GPS and Galileo's ground stations have a global span while other systems' stations are usually limited with the borders of their countries. All systems provide services for civilian and military users. Satellite-based positioning applications have become quite diversified in time, paving the way to a large commercial market.

BeiDou (North Star) Global Positioning (Navigation) System

BeiDou (North Star) is a Global Positioning (Navigation) System that has been developed by China and activated in three stages. Completed in 2007, BeiDou-1 System presently out of use was composed of 3 main satellites and a backup satellite (BD-1D was launched on 2 February 2007). Upon the launch of the satellite (BD-1A) on 30 October 2000, the BeiDou-1 System started to serve Chinese customers and China's Armed Forces in a limited area. The second stage, also known as BeiDou-2 (COMPASS), was completed in 2021. In the beginning, BeiDou-2 System was planned to contain 10 satellites. Five satellites would be placed to GeoSynchronous Orbit (GEO) and five to Inclined GroundSynchronous Orbit. However, five more satellites were included in the package in time and one of these satellites was placed in GEO orbit while the other four were placed in the Middle Earth Orbit (MEO). BeiDou Navigation System reached a capacity that enables worldwide active utilization upon the completion of the final stage of the program, the BeidDou-3 System, in June 2020. A total of fifty-five launches were accomplished as part of the BeiDou Program and the final launch was conducted on 23 June 2020. The precision of the BeiDou Satellite-Based Navigation System is given as 10 m for commercial utilization and 0.1 m for military utilization (encrypted). Similar to Russia's GLONASS Satellite-Based Navigation System, the main objective of the BeiDou Navigation System developed by China is completely linked with independence as the U.S. uses the GPS Navigation System and this enables the U.S. the option to block the access to the system for its political and military interests.



QZSS Regional Positioning System

Due to the country's intense utilization of GPS, Japan has been carrying out activities to build a Regional Positioning System named as Quasi-Zenith Satellite System (QZSS) to overcome the problems experienced during the GNSS (Global Navigation Satellite System) usage and to create its satellite-based positioning capability. Japan's primary objective in launching the QZSS Project is to reduce the errors caused by signal shadows and bounces faced during the utilization of GPS, particularly in the cities. Naming the system, the Quasi-Zenith orbit set ensures that a minimum of one satellite is (elevation 60° or more) over Japan at all times.

Japan's regional satellite navigation system QZSS currently features a total of four satellites (3 satellites with Quasi-Zenith orbit [QZO/IGSO, inclined semi-synchronous orbit] satellite and one Geostationary Orbit/GroundSynchronous [GEO] satellite) and delivers GPS integration, GNSS support and message services. QZSS Regional Positioning System's first satellite (QZS-1 "Michibiki-1") was launched on 11 September 2010. The tests started as of 12 January 2018 with the four satellites and the system was officially launched to service on 1 November 2018. The second satellite of the QZSS satellite set was launched in June 2017, the third in August 2017 and the fourth satellite was launched in October 2017. Mitsubishi Electric Corporation (MELCO) is in charge of QZSS satellites' production. Developed by Japan, QZSS is the sole positioning system that can operate integrated into the GPS developed by the U.S. This characteristic renders QZSS superior to other positioning systems. Since they are able to transmit GPS signals, QZSS and GPS can be utilized as a single satellite group.

In line with a decision adopted in 2015, the Japanese government planned to increase the number of QZSS systems comprising four satellites to seven satellites around 2023. Increasing the number of satellites to seven will enable continuous and sustainable delivery of positioning services. One of the satellites to be added to the satellite set is planned to be placed in the quasi-zenith orbit and the remaining two satellites will have geostationary orbits. When completed, the QZSS Satellite Set will feature 2 GEO (QZS-3 and 6), 4 QZO/IGSO (QZS-1, QZS-2/4/5) and 1 QGEO (QZS-7) Satellites. The QXS-1R Satellite to replace the QZS-1 "Michibiki-1" Satellite was planned to be launched in 2021.

NavIC (IRNSS) Regional Positioning System

Formerly named as the IRNSS (Indian Regional Navigation Satellite System), NavIC is India's satellite-based regional positioning system. The seventh and final satellite of the system developed by ISRO was launched into space in 2016. During the launch of the final satellite, the IRNSS-1G, India's former President Narendra Modi changed the system's name to NavIC. NavIC is the abbreviation for "Navigation with Indian Constellation" and means sailor/navigator in Sanskrit.

NavIC is an independent system designed to provide accurate position data services to the users of its primary service area. The primary service area covers India and the zone extending to 1.500 km out of India's borders. NavIC Satellite Set features seven satellites; three satellites orbit at the geostationary orbits and four orbits around a semi-simultaneous inclined orbit

Pioneering Turkish Airspace in 1924: Swiss pilot Walter Mittelholzer's amazing journey from Zurich to Tehran

by Dr. Emir Öngüner
Freelance Researcher in Aviation History

In the fall of 1924, Swiss pilot and photographer Walter Mittelholzer received an invitation from the Persian government. Reza Shah Pahlavi wanted to modernize Persia (Iran) and open up the still undeveloped country to air traffic. He therefore negotiated with Junkers Luftverkehr AG, among others, about the establishment of possible air routes.

Junkers had already begun in 1923 to establish an air route from Sweden to Persia with its F 13 commercial aircraft, but soon had to discontinue the first test route from Moscow to Tehran due to a lack of demand. In 1924, an attempt was now to be made to link Iraq via Turkey, Greece and Italy to the southern European air traffic network of Junkers - the Trans-Europe Union.

On December 18, 1924, Mittelholzer took off from Zurich in the Junkers A 20 "Switzerland" accompanied by the mechanic Bisseger for the flight to Tehran. The

Walter Mittelholzer

"Junkers-Luftverkehr Nachrichtenblatt" of January 14, 1925, carried his diary-like reports, which we reprint in this chapter.[1]

After arriving to Pisa, Naples, Brindisi and Athens, the next destination was İzmir. The unauthorized landing took place after 2.30 hours of flight despite the stormy weather at the Turkish military seaplane station of Smyrna (İzmir). A surprise awaited Mittelholzer here. Mittelholzer and his mechanic Bisseger were held in custody for 26 days in Turkey until the negotiations of the Swiss embassy with Turkish government came to a final conclusion. According to the statements of Turkish officials, he had to fly over İstanbul first and head back to the south. Unfortunately there is no clear written explanation for this indirection:[2]

Across the Aegean Sea (Athens - Smyrna in 2h 30min)

"I was told that the plane was confiscated; because Smyrna and its hinterland was a war zone. I was the only airman who had dared to come here since the end of the war, and that the two Turkish airmen had been instructed not to let me enter the Gulf of Smyrna. How this should have been prevented has not become clear to me to this day; for I could not suppose that they would have made use of their weapons on a civilian airplane manned by Swiss. Until the arrival of a new instruction from Angora (Ankara), we were not allowed to enter our plane, not even minor repairs let alone conversion from water to land were allowed. I protested strongly against this discourtesy, reminding the Turks of

[1] *For Mittelholzer's entire report about his flight see: https://www.junkers.de/blog/zuerich-smyrna-in-20-stunden-mittelholzer-startete-mit-einer-junkers-a-20-zum-persienflug/, last access: 03.07.2021; https://www.junkers.de/blog/mittelholzers-persienflug-smyrna-konstantinopel-bagdad-in-17-stunden/, last access: 03.07.2021. Detailed explanations can be found in Mittelholzer's own book as well: Mittelholzer, W., Persienflug, Verlag Orell Füssli, 1926, Zürich.*

[2] *Zulliger, H., Mittelholzer's Persienflug, Die Berner Woche in Wort und Bild, Nr. 10, XVI. Jahrgang, 06.03.1926, Bern, s. 148-151*

the hospitality enjoyed by their peace delegation to the Swiss Military Aviation.

For the success of my Persian flight it is of vital importance that I reach Baghdad as soon as possible, before the long rainy season sets in, in order to get from there in one stage over the snowy mountains of Persia to Tehran. We already believed that we would reach our destination by New Year's Day, thanks to our excellent machine, which was proving itself better and better, and thanks also to the splendid weather, which appeared to be stable for some time to come. Unfortunately, I was thoroughly mistaken, not in my ability and willingness, but in the mentality of the Orientals...

Central European who has never been to the Orient, you do not know the secrets of Turkish diplomats! I am convinced that the permission to continue the flight will come when the big rain starts! Then the unwanted stranger shall seek his way through the fog-covered mountains of Anatolia!"

Over the Bosphorus (Smyrna-Constantinople in 4h 30min)

"To the east, as far as the eye could see, the view was clear, while to the north lay a suspicious,

Mittelholzer and Bisseger in Junkers A 20 before their flight to Persia

ever-widening cloud cover. What should I do? - Head east anyway, or fly north into the fog and probably rain against the fierce headwind? Longingly I looked to the distant snow mountains in the east, there, yes there my way went towards freedom of thought and action.

Above Manissa (Manisa) I turned around to the north. Soon I was above a fine cloud cover, from which in the northeast long high snow mountains looked out. From time to time I saw a river in the dark depths, then isolated villages; I could no longer orient myself exactly, but only knew, calculated from the two-hour flight time and the compass course, my approximate position; so I had to decide to go down through a cloud hole. Steeply we whistled from our altitude of 2500 m in narrow spirals into the depths; suddenly dark night enveloped us, as we came out of the blinding abundance of light above the sea of fog below the cloud edge. Wildly, our bird rears up, shaken by violent gusts, and then falls down again headlong, that sometimes I hung in the air for seconds despite my seatbelt. It smelled like rain in the gloomy depths. I was forced to fly at an altitude of 200 meters. Now I recognized in the eerie gray to my right a large lake with an inflowing river; according to my little map it must be Lake Abulliona (Ulubat Gölü)[3], in front of which the higher mountains were covered with fog. So only the way to the northwest to Panderma (Bandırma) at the Sea of Marmara remained open to me, which I reached flying only 100 m high, at 2:40 p.m., thus after 2 hours 35 minutes of flight from Smyrna. I flew around the mountainous Peranio peninsula (most possibly Erdek / Kapıdağ Yarımadası) on its southern side, reached the bare Marmara Island over the open sea at 3:5 p.m. and now, flying only about 80 m high above the stormy sea, headed northwest over the 20 km wide Marmara Sea. Bissegger and I counted the seconds and minutes until we finally reached the European shore south of Podosto (Tekirdağ), fighting against the fierce headwind. In the event of an engine breakdown, we would have disappeared without a trace with our now no longer floating land machine, because as far as the limited visibility reached, no ship was to be seen."

[3] Supposed to be the Manyas Lake. According to the map given by Mittelholzer, he did not fly near Abulliona Lake & Ulubat Gölü.

Mittelholzer's route from Switzerland to Turkey

The overflight of the Taurus (Constantinople-Aleppo in 7h 25min)

"The takeoff from St. Stefano (Yeşilköy), the airfield in Constantinople (İstanbul), could not take place until 10 o'clock. Despite the shortness of the day, the enormous distance of 1100 km to Aleppo was almost completely covered. The landing took place only 25 km from the city after a difficult flight.

I immediately flew from St. Stefano over the Bosporus to the Asian shore, leaving Constantinople somewhat to the left. Nevertheless, we overlooked the city, which presented itself today gray in gray unfriendly. Flying low under the wet clouds, we followed the Anatolian Railway to Daridje (Darıca), on the Gulf of Ismid (İzmit Körfezi). There I had to dodge the rain in front of me over the sea, and reached the other shore at Kara (most likely Karamürsel).

In front of me about 800 m high mountains blocked the way, which were up to 400 m in the fog. But a narrow pass was free of fog, and I was able to slip through its gap, still flying about 20 m high. Soon the wide valley opened up, in which the Isnik Lake (İznik Gölü) is located, which we passed at 10:50 minutes.

I was pleased to note that today, in contrast to yesterday, we were making good progress, with the north wind at our backs. Gradually I was able to climb a bit higher, the clouds cleared and after an hour 40 minutes, approximately in the area of Eskischehir (Eskişehir), I left the gusty airspace and quickly climbed to 2500 m above the clouds. To the southeast, the elongated bluish range of the Taurus (Toros) gradually grew out of the vast sea of fog. At 3 p.m. I saw the sea behind the high gigantic snow mountains in the southwest, at first judging it as a sea of fog, but soon after the reflection of the sun recognizing it as the Gulf of Adalia (Antalya Körfezi). So my hope that there was still good weather in the Mediterranean had not


A photograph taken by Mittelholzer over the skies of Eskişehir-Turkey

Blick auf die anatolische Hochebene in der Gegend von Eskischehir.

deceived me - the venture of flying over the clouds had been successful.

My way to the south was now given, I had left Konia (Konya) a little to the left and now followed the long, wild Geuktal surrounded by mighty sediment terraces down to the sea. A huge delta of at least 20 km in diameter had been washed up here by the stream from Anatolia.

From Selefke (Silifke), a small village above the confluence with the sea, I now traversed the Gulf of Mersina (Mersin Körfezi), leaving the town on the left! I look backward; and state with something uneasiness that the sun soon turns to the horizon. Thereupon I measure again on the map the distance to Aleppo (Halep). There are still about 110 km, so full throttle and press the machine, so that it gives its utmost speed. But as if in a race, the dark purple shadows on the steep mountain slopes in front of me rush upwards - a last glow of the snow-covered mountain ridges and dusk approaches with uncanny speed.

At 16:48 I fly in 2000 m height over the small town Alexandrette (İskenderun), which is wonderfully in a protected bay of the eastern gulf of the Mediterranean, at the foot of steep, up to 1800 m high mountains. At 17:10 I passed the El Bahra Lake..."

Mittelholzer's route from Turkey to Iran

After passing the highlands in Syria and Iraq, Mittelholzer and his mechanic Bisseger arrived in Persia. But the journey via Baghdad to Persia was varied and adventurous; they had to stop over and over again. Mittelholzer's expedition flights and films were media events of the first order, as untouched regions were explored and captured photographically. Such pioneering flights also attracted a great deal of attention abroad and made the pilot known in wide circles at the time.

Without doubt, the most intriguing detail during his flight over Turkey is the confiscation of his plane. After nearly 10 years later, British pilots Jim Mollison and Charles Kingsford Smith shared the same experience. Due the their landings on Turkish soil without permission they were taken into custudy as well. Smith had to even apologize to the Turkish President Mustafa Kemal Atatürk for his unintentional mistake.[4] Mittelholzer's forced stay in Turkey is a direct evidence that the Turkish authorities were extremely strict with any kind of unauthorized flights over their airspace.

Mittelholzer's and other early aviators detailed reports give phantastic insight into what it was like to engage in a new way of exploration and break new ground, throwing caution literally to the wind tempted by new technology, a passion for adventure, break boundaries and to catch a glimpse of the unknown

[4] Öngüner, E., Australian Pilot Apologizes to Turkey: Charles Kingsford Smith - Turkish-British Diplomacy before the MacRobertson Air Race (1934), Aviation Turkey, Issue:4, 2020, pp. 94-98

Exploring Mars Inch By Inch With An Autonomous Helicopter!

National Aeronautics and Space Administration (NASA) takes pride in embracing an accomplishment beyond its expectations. NASA has been dreaming about reaching this achievement for a long time. The autonomous helicopter Ingenuity has been exploring every inch of the red planet Mars. Ingenuity's production lasted for six years and to date, nine successful flights have been conducted as part of the project that originally aimed to execute five flights in the beginning. Each new success has been taking the targets to a higher level. Thanks to this project, a remarkable amount of know-how on a place other than our planet has been acquired. Live sound recording from Mars was achieved as well. Any news from the excursion will enhance this success and advance exploration of the remaining planets.

Why the flight by Ingenuity is a big deal

Ingenuity's flight on Mars was recorded as the first successful flight of an air vehicle manufactured on the Earth, at an extraneous planet. This accomplishment clearly reveals the threshold achieved.

Ingenuity is a solar-powered rotorcraft air vehicle with twin propellers and a metal fuselage and four landing legs. It weighs slightly less than two kilograms. It was launched to fulfil a single mission in February with NASA's Perseverance Mars exploration vehicle: Proving that it can fly at the Martian atmosphere that is very different from Earth's atmosphere!

Mars' gravity is much lower than Earth's gravity though density of the Martian atmosphere is equal to merely 1% of the density of our planet's atmosphere. Due to such low levels of density, it is much harder for an air vehicle to generate lift. Therefore, the engineers who designed Ingenuity installed 122 cm long rotor blades that can spin at a speed higher than the speed enabling an aircraft to fly on Earth. Many helicopters and unmanned air vehicles on earth feature rotors with nearly 400-500 rpm; Ingenuity's rotor on the other hand features 2.400 rpm.

by Muhammed Yılmaz

What Happened in the First Five Mars Flights?

Prior to its launch to Mars, Ingenuity has been tested on Earth with various simulations where it can generate lifts under the challenging conditions of Martian atmosphere. During Ingenuity's first flight dated April 19, 2021,

the aircraft rose nearly 3 m, hovered for 30 seconds, there it rotated for 96 degrees, then returned and landed. Transmission of the signal to initiate the flight caused delays due to the distance between the Earth and Mars. The signals reached a satellite dish via the computer on Earth, then to the Mars Explorer and to Perseverance and finally to the helicopter. Optimizing this system has not been easy at all.

The first data received from Mars included black and white images captured by the cameras installed over Ingenuity and the images confirmed the realization of a successful flight. In the initial flight, Ingenuity was airborne for 39 seconds. NASA and the International Civil Aviation Organization (ICAO) officially identified Ingenuity's first flight site as Mars' first runway and named it as the Wright Brothers Field after the founders of modern aviation.

The second flight with more challenging missions lasted approximately 52 seconds. Climbing 5 meters up in the flight, Ingenuity managed to fly 2 meters laterally before landing and rotated around its own axis to capture a panoramic view with its camera.

During its third flight, Ingenuity once again climbed up 5 meters and managed to fly at a total range of 50 meters. In this 80-second flight, the air vehicle reached a top speed of 2 meters per second. NASA strived to enhance Ingenuity's capabilities by adding new instructions for capturing more photos through its internal color camera.

The first attempt for Ingenuity's fourth flight failed due to a technical problem. The helicopter could not properly switch to the "flight mode" required for the take-off. The problem was linked with a technical fault with a 15% probability.

The second trial took place a few days later and the flight was conducted smoothly as planned. Ingenuity climbed to five meters again. Flying to nearly 133 meters south, the air vehicle returned to its take-off position and realized a successful landing. During the fourth flight test, total endurance of Ingenuity was 117 seconds – the longest flight to that date. In this flight, Ingenuity managed to transmit a series of color images with black and white photos captured via the navigation camera under the helicopter.

Compared to the previous flights, the helicopter recorded much more images in the fourth flight and took nearly 60 photos, mostly at the last 50 meters before landing. Capturing such images constitute a "technical challenge" for Ingenuity as the Red Planet's images that have never been seen before were achieved from the air. These images were used for examining the surface characteristics of the field and they enabled the capacity to build 3D images of the surface and examining the height of the different zones beneath the helicopter.

Live Sound Recording from Mars

Ingenuity shared the first sound recording from the skies of Mars in its fifth test flight. The sound recording by the SuperCam microphone was registered as the first sound recording achieved while flying on another planet.

NASA officials were not sure whether the microphone placed 80 meters away from the Ingenuity's take-off and landing spot could save the sound of the rotorcraft rotating at 2.537 revolutions per minute under the stormy Martian atmosphere. However, the scientists did not only manage to record the sound

but also isolated the sounds from the noise of the wind.

The helicopter took-off from the Jezero Crater, also known as the Wright Brothers Field, and flew 129 meters south. Then it ascended to a new record of 10 meters to examine and take the photos of its surrounding and the field beneath it. Ingenuity was airborne for a total of 108 seconds during the fifth test flight.

Thanks to the data collected by Ingenuity, NASA generated digital elevation maps. These maps seem to suggest a completely flat terrain with almost no obstructions. According to NASA, the fifth test flight signals that Ingenuity has passed a critical milestone for its new operations.

Ingenuity's Flights Surprised NASA

NASA did not expect Ingenuity to remain healthy after the fifth test flight, upon observing the successful operations NASA decided to carry out testing the top limits of the helicopter's capabilities. Therefore, with its accomplishments, Ingenuity managed to surprise even the team in charge of its operations.

The eighth flight conducted on June 21 lasted 7,4 seconds in total. Mars helicopter vertically climbed to 10 meters and laterally flew for 160 meters before

successfully landing at a brand new landing spot named "Airfield E" by NASA. Ingenuity landed 135 meters away from Perseverance that is critical for sending the helicopter programming data and commands and achieved another milestone.

The ninth flight at the Red Planet on July 5, 2021 has been regarded as the "most challenging" flight so far. However, Ingenuity also completed this test successfully. The helicopter had to struggle against the tough field conditions and sand storms as it flew over the eastern part of Mars' Séítah region and accomplished this high risk flight. Ingenuity skillfully reassured the concerns regarding its reach at the targeted landing field and its landing at the accurate spot.

Flying for a total of 166,4 seconds during this flight, Ingenuity reached its longest endurance. The helicopter also achieved a maximum speed of 5 meters per second, which is regarded as an impressive success for an air vehicle travelling in the thin Martian atmosphere. Ingenuity was instructed to fly for a total of 625 meters over a more textured terrain that the helicopter was quite unfamiliar with. Thanks to this successful flight, close-up images of the Séítah field (which could not have been captured otherwise) have been received and some of the mysteries about Mars have been uncovered.

What will Ingenuity's New Missions Be?

After each successful flight, Ingenuity expects new instructions and assignments via the Perseverance Rover from the command center at NASA. Rover carries Ingenuity's communication base station. That's why the proximity of Perseverance and Ingenuity was of critical importance in the beginning. Thanks to this rotorcraft active in Mars, NASA will focus on identifying which of the capabilities among reconnaissance, surveillance, access to areas out of access and stereo imaging from atmospheric altitudes could be achieved. Such operations and the lessons-learnt from them are considered to provide remarkable advantages in the future in the aerial reconnaissance of Mars and other planets.

In conclusion, the autonomous helicopter Ingenuity will continue to explore the red planet as it carries out breaking its own records in the range, endurance and ground speed areas while we follow its explorations...

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Is It A Dream To Fly Faster Than Sound Again?

by Muhammed Yılmaz

Since the last commercial flight with Concorde on October 24, 2003, almost all aviation enthusiasts have dreamed of the launch of Concorde 2.0 and its relaunch of supersonic flights.

During the race that has been going on for 18 years to start a new era of supersonic jet, many projects have been initiated. But somehow they all failed. The bad news recently from the Aerion AS2 made us think that reaching the target of supersonic flights was impossible. Is that really so?

AS2 Would Open the Door to the New Era!

One of the companies believed to be the closest to the relaunch of supersonic travels was Aerion Supersonic Corporation. The model the company was working on, the AS2, was a business jet, not a commercial aircraft, and it was getting prepared for becoming a revolutionary that would make people fly faster than sound again!

Being the first supersonic aircraft put into commercial service after 51 years, the Aerion AS2 was the world's first supersonic business jet candidate as well. It intended to cut travel times down by around 50 percent. Aerion had previously announced that around US$ 4 billion would need to be raised to initiate the production of the AS2, and US$ 1 billion would be spent only for engine development.

Boeing and Spirit Aerosystems, the investors of AS2, the first production of which was planned to be made in 2023 and the first flight in 2024, with a speed of 1.4 Mach and to be sold for US$ 120 million, were planning to make an investment worth $300 million to establish the final assembly line in Melbourne, Florida, for the business jet that had been developed for ten years. But it didn't happen!

Boeing-backed supersonic jet start-up Aerion has officially ceased all activities of the supersonic business jet program, which it has been developing for years, after struggling to secure the necessary financial investment. Those who were waiting for the next generation version of the legendary Concorde were greatly disappointed with this latest development.

Things appeared to be going well...

Founded by billionaire businessman Robert Bass in 2004, Aerion managed to attract significant investments from major investors and partners, including Lockheed Martin. It also secured a contract with General Electric for the supply of the supersonic jet's engine.

Last March, Aeron received an order from NetJets for 20 AS2s. In addition, it started to work with NetJets and professional aviation training provider FlightSafety International to develop a supersonic flight training academy to train pilots for civil, commercial and military supersonic aircraft. In 2015, Flexjet had placed an order for 20 AS2s worth US$ 2.4 billion.

Designed to fly at supersonic speeds over water, the AS2 was configured for high subsonic or ultrasonic flight over land, at around Mach 0.96, in most countries where sonic booms are banned. The original design was morphed from twinjet to trijet in 2014.

Aerion Also Announced its AS3!

Last March, Aerion released the first image of the concept design of the AS3 model, which is designed to enter service at the end of the 2020s. The company announced that AS3 will cruise at speeds closer to the hypersonic region (5 Mach+).

As it is considered impossible to raise the capital needed for the production of AS2, the project has been surprisingly put on ice, though AS2 was planned to be the pioneer of the supersonic market -a new segment of general aviation, met all market, technical, regulatory and sustainability requirements, and it already received orders worth US$ 11.2 billion. As a result of this development, the same question has been in everyone's mind. Is it a dream for humans to fly faster than sound again?

The Only Hope Left: Boom!

Aerion, despite its high-profile supporters, was lagging behind its biggest rival in the race to pave the way for supersonic travels. Denver-based Boom made a big hit with the supersonic aircraft model Overture, by producing the one-third scale model XB-1 as the "Baby Boom".

Featuring a 26-metre-long carbon composite body and three GE-designed J85-15 engines, the XB-1 aroused high level of excitement for Overture. This prototype, which has a wingspan of 5.2 meters, has received critical acclaim for its "ergonomically designed" cockpit, which gives particular importance to the comfort of the pilots. While the XB-1 only has a range of around 1,000 nautical miles, it will be used as a testbed for supersonic technologies to be used in Overture.

The target for Overture, which has a passenger capacity of 65-88 people, is to complete the certification process by 2029 and make the first commercial flight in 2030.

United's announcement to purchase 15 Overtures at the beginning of June has gotten all hopes up that supersonic travel would one day be realized again.

Is Concorde 2.0 Possible?

It is for sure that if the next generation supersonic jets are launched, the problems that caused the withdrawal of Concorde from service must be fixed! Elimination of sonic booms over the territory of countries at a sound speed (Mach 1.0 or 767 mph) that impedes supersonic flight. Tolerance for excessive fuel consumption, which is the natural consequence of flying faster than sound, and its economic and environmental consequences. As weight is almost everything for an airplane, setting ticket prices and creating demand to make flights commercially profitable due to limited passenger carrying capacity and reduced cabin interior design. Finally, reaching a consensus by hundreds of countries on setting the standards for supersonic flights. Designers, engineers and companies have an answer to all such barriers to supersonic aircraft.

Boom plans to develop a 40-50-seat passenger aircraft and fly it with sustainable aviation fuel and biofuel. California-based Exosonic is trying something similar for its 70-seat airplane. Boston-based Spike Aerospace is focusing on an 18-passenger business jet with proprietary technology that it claims will keep sonic boom at the level of vacuum cleaner. Recently, it even received FAA approval for limited testing of its design.

What every manufacturer aspiring to deal with noise, fuel inefficiency, and many other major technical issues needs most is unquestionably the cash. The most concrete example of this is the Aerion and AS2 project. In other words, if we could fly faster than sound one day, cash would definitely be the key.

Speed or Comfort?

Another group approaches the launch of supersonic flights cautiously. They believe that passengers traveling on airplanes with huge improvements in premium cabins, large seats and privacy compartments would not compromise on travel comfort just to cut the flight time by half. If supersonic jets are launched, travelers will have to give up the pleasant travel experience they have by sitting on a wide seat that can be converted into a full, flat bed and watching the content on a big screen.

So let's see how the ongoing battle for supersonic flights will end...


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How Did Lukashenko Risk the National Airline?

On May 23, 2021, we witnessed one of the most bizarre incidents in aviation history. A passenger aircraft was hijacked by a jet fighter!

When Ryanair's Boeing 737 destined to Lithuania's capital Vilnius from Greece's capital Athens with 170 passengers from 12 countries was diverted to Belarus' capital accompanied by a MiG-29 fighter from the Soviet era, it was only a few minutes away from the Lithuanian air space.

The reports regarding the incident reveal that Belarus' officials deliberately diverted the airplane (which was headed to Lithuania) to Minsk to arrest an opposition journalist, stating that they received a bomb threat. When the pilots contacted the tower, they noted that they were closer to Vilnius than Minsk and that they wished to continue their flight, Belarus officials launched the fighter and forced the airplane to land.

Following the landing, the officials detained journalist Roman Protasevich and his girlfriend Sofia Sapega who were among the passengers. It was reported that Protasevich got frustrated upon the pilots' announcement notifying the crash-landing to Minsk and he yelled as he was escorted out of the airplane by the Belarus officials, "I will get the death penalty here."

The 26-year-old journalist was wanted as per the accusations of extremism after the news he wrote last year for the Polish-based news agency NEXTA that published the footage of mass protests against Belarus President Alexander Lukashenko. Though Protasevich denies the accusations, he is accused of organizing mass protests and inciting social hatred.

This incident was condemned strongly by nations, politicians, organizations and airline companies across the world. Some of the world leaders denounced the incident as a "plane hijack."

Initial Reactions: In Violation of the International Regulations!

United Nation's agency, the International Civil Aviation Organization (ICAO) claimed that Ryanair's forced landing may have contravened the Chicago Convention, which is the core aviation treaty, designed after WWII.

The International Air Transport Association (IATA), on the other hand, reacted to the incident by declaring, "We condemn any intervention or forced landing that violates the international law to the aviation operations. A full investigation should be conducted by the international authorities in charge."

Belarus Points to Hamas!

More than 24 hours after the incident, the Belarus government stated that all the developments discussed in the world were nothing but misunderstanding and that the government played no part in any of the incidents!

Hamas was accused of the incident. It was claimed that an e-mail with a protonmail.com extension was sent to Minsk Airport's official e-mail account and the e-mail read:

"We, the soldiers of Hamas, demand that Israel cease the fire to the Gaza Strip. We demand that the European Union withdraw its support for Israel in this war. We are aware that the participants of the Delphi Economic Forum are returning home with the Foxtrot-Romeo 4978 numbered flight. There is a bomb on this plane. Unless our demands are fulfilled, the bomb will explode near Vilnius on May 23rd."

The world public opinion was amused by the Belarus Government's statement that claimed the reason behind the incident as the time of the e-mail claimed to be sent was an hour later than the diversion of the aircraft.

Why is this Claim False?

Belarus authorities' claim seems quite suspicious as there are doubts on why the informer chose the Belarus officials instead of the officials of Greece or Lithuania. Besides, since the aircraft was closer to Vilnius than Minsk when it was instructed to divert, shouldn't the Belarus authorities' primary concern be the airplane's rapid landing to Vilnius for maintaining the safety of the passengers?

A Bomb Threat Also to a Lufthansa Aircraft!

Curiously, a day after the incident, on May 24th, it was claimed that another tip was received regarding a Lufthansa flight (flight number LH1487) from Minsk to Frankfurt. The government declared that an anonymous e-mail revealing a terrorist action plan was sent to the airport and that a search was carried out on the airplane. The airplane headed towards Frankfurt after a two-hour delay.

After this incident, it was thought that an attempt was made to make the Ryanair incident look more convincing by claiming that there was another potential problem on a plane without any opposition journalists.

What Does the Legislation Suggest?

According to the experts, there are two main points regarding whether or not Ryanair's forced landing initiated by Belarus is legal.

The first point is whether Belarus authorities had the power to divert the airplane to Minsk. Though it may not be convincing, the grounds for landing an airplane escorted by fighter jet is the existence of a bomb in the airplane, thus security. In this respect, the decision adopted may be legally justified.

The 1944 Chicago Convention allows Belarus to order a crash landing to a civilian aircraft flying over its land. However, to exercise this right, Belarus has to have "reasonable grounds." Moreover, such calls should be notified to the pilots in line with the regulations.

At this point, the Belarus authorities are obliged to prove that both conditions were met. Within the scope of the investigation initiated by the International Civil Aviation Organization (ICAO), Belarus authorities will strive to persuade the committee that their action was legal by revealing the evidence.

Even though the Belarus authorities manage to justify the forced landing of the aircraft, Protasevich and his girlfriend Sapega's arrest is a completely different

subject. According to the ICAO regulations, the flight numbered FR4978 is under the jurisdiction of Poland, the country where the aircraft was registered. When the aircraft was diverted to Minsk, the flight was on course. Therefore, no country has the right to escort a passenger out of a civilian airplane and detain him by accusing him of the offences or suspicious cases other than the ones committed during that flight. Belarus has almost no ground to defend its actions.

When Belarus authorities' detention of Protasevich and Sapega due to an offence that has no connection with the flight was finalized, Poland where the aircraft is registered may have a right to make legal demands against Belarus for violating the rights originating in ICAO agreements. Furthermore, other countries may have a right of litigation against Belarus at the International Court of Justice as the incident threatened the global civil aviation system.

Even though Poland has denounced Belarus' actions as "state terror" and issued a condemnation message, the country can still do more. The lawyers claim that Poland has the right to initiate talks via diplomatic representations for the release of the detainees.

Under normal circumstances, Belarus should make an official application to the Polish government which owns the aircraft or to Lithuania's government as the airplane was scheduled to land on Vilnius to request the extradition of the persons who would be detained.

Sanctions Against Belarus

The international reaction to the incident suggested that Belarus should be communicated openly about the political and economic prices of such universal violations of law.

Global airlines and international organizations one by one started to impose severe sanctions against Belarus after the incident ended with the arrest of a journalist who was a passenger of the airplane...

The United Kingdom has been one of the first countries to take firm steps against Belarus. The country suspended all permits of the Belarus airlines, including both the scheduled and chartered flights until further notice. Also, all aircraft registered in the United Kingdom were instructed to avoid the Belarus air space.

Following the United Kingdom, the U.S. and the European Union rapidly decided to impose flight bans to Belarus Airlines in their air space. Likewise, the EU countries' airlines were banned from entering Belarus' air space. The airlines updated their flight routes.

At the beginning of July, a more surprising decision was declared by the U.S. The Secretary of Transportation issued a new order that restricted the travels between the U.S. and Belarus. Washington D.C. underlined the concerns regarding the implementation of a forced landing to arrest an opposition journalist and banned the ticket sales of the airlines between two countries excluding the flights to be conducted merely for humanitarian or national security purposes. Presently, there are no non-stop scheduled flights between the U.S. and Belarus.

Belavia is Most Affected!

The European Union's and the United Kingdom's decision to close their air spaces to Belarus airlines affected the country's national airline Belavia the most. The company had to revise its flight network severely to keep up with the restrictions.

Belavia's executives condemned the European leaders' sanction decisions and implementations regarding the air space as they found the sanctions' impacts over Belavia unjust since Belavia had no connection with the initiators of the incident.

On the other hand, the EU and UK airlines' decision to avoid Belarus air space in their flights triggered a deep economic and political crisis in the country. In this way, in office since 1994, 66-year-old Lukashenko's adopting such political decision caused the greatest damage to his country's national airline and ultimately to his own country

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Boeing and TUSAŞ Sign Deal for Boeing 737 Engine Cover Production

Boeing and Turkish Aerospace (TUSAŞ) signed a contract to manufacture and supply the engine cover of Boeing's single-aisle family of Boeing 737s. With this contract, TUSAŞ is expected to meet half of the monthly engine cover production for all Boeing 737 aircraft to be produced as from 2025.

The contract signed between Boeing and TUSAŞ also expands TUSAŞ's Boeing Commercial Aircraft portfolio. The close industry cooperation of the two companies not only uplifts the performance and financing capacity of the 737 program, but also furthers the long-standing relationship between Boeing and the Turkish aviation industry.

The role of engine covers in aircraft is to protect engine-mounted components and equipment by creating an aerodynamic surface on the engine fan frame between the air inlet and the reverse thrust system. There are two engine covers surrounding each engine which can be opened for repair and maintenance of engine parts and equipment on the engine fan frame.

Commenting on the contract, TUSAŞ President and CEO Prof. Temel KOTİL said, "TUSAŞ continues to take place among the manufacturers that have proven themselves in the field of aero structures with its half-century experience. While we develop and implement

projects in the field of aviation in our country, we also perform high-quality critical productions for the world's leading air platform manufacturers. We are excited about the engine cover production that we will carry out for Boeing within the scope of the contract. We will gain a new capability in our company. I congratulate all my colleagues and Boeing executives who contributed to this cooperation."

Boeing Turkey Managing Director and Country Representative Ayşem SARGIN said, "We are confident that Turkey, which is among Boeing's strategic growth countries and an important industry and technology partner, has the potential to make great contributions to the global aviation industry. Boeing expanded its presence, investments and supply chain in Turkey with the National Aviation Plan implemented with Turkey a few years ago. The selection of TUSAŞ for the 737 engine cover production reflects Boeing's strategic partnership with Turkey and the world-class capability of the Turkish aviation industry."

The production of the 737 engine covers will be conducted at TUSAŞ facilities in Ankara, where TUSAŞ is currently producing the 787 Dreamliner elevator, cargo panel, horizontal tail leading edge and 737 elevator for Boeing and has delivered thousands of parts and components for Boeing aircraft that have been flying for years

Rolls Royce's All-Electric 'Spirit of Innovation' Takes to the Skies for the First Time

Rolls-Royce's all-electric "Spirit of Innovation" aircraft completed its first flight. On July 15th, at 14:56 the plane took to the skies propelled by its powerful 400kW (500+hp) electric powertrain with the most power-dense battery pack ever assembled for an aircraft. This is an important step towards the plane's world-record attempt, with a target speed of 300+ MPH (480+ KMH), and another significant milestone on the aviation industry's journey towards decarbonisation.

Warren East, CEO, Rolls-Royce, said: "The successful first flight of the 'Spirit of Innovation' is a fantastic achievement for the ACCEL team and Rolls-Royce. We are focused on producing the technology breakthroughs society needs to decarbonise transport across air, land and sea, and capture the economic opportunity of the transition to net zero. The advanced battery and propulsion technology developed for this programme has exciting applications for the Urban Air Mobility market and can help make 'jet zero' a reality."

Business Secretary Kwasi Kwarteng said: "The first flight of Rolls-Royce's revolutionary Spirit of Innovation aircraft signals a huge step forward in the global transition to cleaner forms of flight. This achievement, and the records we hope will follow, shows the UK remains right at the forefront of aerospace innovation."

"By backing projects like this one, the Government is helping to drive forward

the boundary pushing technologies that will leverage investment and unlock the cleaner, greener aircraft required to end our contribution to climate change."

The aircraft took off from the UK Ministry of Defence's Boscombe Down site, which has a long heritage of experimental flights and is managed by QinetiQ, and flew for 15 minutes. The first flight marks the beginning of an intense flight-testing phase in which Rolls-Royce will be collecting valuable performance data on the aircraft's electrical power and propulsion system. The ACCEL programme, short for 'Accelerating the Electrification of Flight' includes key partners YASA, the electric motor and controller manufacturer, and aviation start-up Electroflight. The ACCEL team have continued to innovate while adhering to the UK Government's social distancing and other health guidelines.

Half of the project's funding is provided by the Aerospace Technology Institute (ATI), in partnership with the Department for Business, Energy & Industrial Strategy and Innovate UK. In the run up to COP26, the ACCEL programme is further evidence of the UK's position at the forefront of the zero-emission aircraft revolution.

"The first flight of the Spirit of Innovation demonstrates how innovative technology can provide solutions to some of the world's biggest challenges," said Gary Elliott, CEO, Aerospace Technology Institute. "The ATI is funding projects like ACCEL to help UK develop new capabilities and secure a lead in the technologies that will decarbonise aviation. We congratulate everyone who has worked on the ACCEL project to make the first flight a reality and look forward to the world speed record attempt which will capture the imagination of the public in the year that the UK hosts COP26."

Rolls-Royce continues to offer its customers a complete electric propulsion system for their platform, whether that is an eVTOL or a commuter aircraft. Rolls-Royce also plans to use the technology from the ACCEL project and apply it to products for these exciting new markets. The characteristics that 'air-taxis' require from batteries are very similar to what is being developed for the 'Spirit of Innovation' so that it can reach record-breaking speeds. In addition, Rolls-Royce and airframer Tecnam are currently working with Widerøe – the largest regional airline in Scandinavia – to deliver an all-electric passenger aircraft for the commuter market, which is planned to be ready for revenue service in 2026.

In June, Rolls-Royce announced its pathway to net zero carbon emissions – a year on from joining the UN Race to Zero campaign – and the 'Spirit of Innovation' is one way in which Rolls-Royce is helping decarbonize the critical parts of the global economy. Rolls-Royce is also committed to ensuring its new products will be compatible with net zero operation by 2030 and all its products will be compatible with net zero by 2050.

Columbia Helicopters Wins Turkey Firefighting Contract

Columbia Helicopters last month signed a contract partnering with CMC Savunma Sanayi A.S. to provide two (2) Columbia 234 Multi-Mission Chinooks for firefighting and external load operations in Turkey on August 17,2021 Aurora,Oregon. The contract encompasses the fire season and marks Columbia's first operation in the country.

CMC Savunma Sanayi A.S. is the original awardee of the contract with the Turkey General Directorate of Forestry and is subcontracting with Columbia to provide the aircraft, crew, and maintenance support.

"This contract marks a significant milestone for Columbia Helicopters – our first time operating in Turkey and hopefully the beginning of a long-term partnership," says Olivia Wolfgram-Rubio, business development and marketing manager at Columbia Helicopters. "The 234 Multi-Mission Chinook delivers significant support in protecting life and property. We know it will be extremely successful in helping battle wildfires and protecting Turkish citizens now, and we hope, well into the future."

While the 234 can operate with Columbia's 2,800-gallon Fire Attack System (FAS) internal tank, the aircraft on this contract utilize the 2,600-gallon Bambi Bucket for precision water and retardant drops.

Columbia's 234 Multi-Mission Chinook helicopter is fully certified to civilian transport category standards, allowing it to transport internal cargo and passengers. Originally certified by Boeing, the aircraft certificate is now owned and supported by Columbia. Today, as the aircraft's OEM, Columbia provides all sustainment, training, and MRO capabilities to support the aircraft around the globe.

Thales Has Begun the Flight Test Campaign for the FlytX Avionics Suite

The latest generation FlytX avionics suite made its first test flight on board a Cabri helicopter this summer. The test campaign will continue until 2022 to test and optimise the suite's functionality.

Adaptable to all segments of the helicopter market for both new programs (linefit) and retrofit projects, FlytX is available in a cockpit equipped with one to four screens. The Thales avionics suite has already been selected by Airbus Helicopters and the French Defence Procurement Agency (DGA) to equip the Guépard, the future light joint helicopter, as well as by VR-Technologies for the future single-turbine light helicopter, VRT500.

Thales pilots and engineers are capitalising on the flight tests of the single-screen version of FlytX in order to make short-loop adjustments to improve the performance and maturity of the system before its integration on these first customer programmes. The VRT500 flight tests scheduled for early 2022 will benefit from the progress made following these flights on Cabri.

The result of more than ten years of research, FlytX has been designed to improve the operational efficiency of the crew by reducing their workload and facilitating their understanding of the environment and the situation. It features a crew-centric design, is natively connected and cyber-secure, and promotes cooperation with other actors in the aviation ecosystem. It is compact and offers a 40% reduction in weight, size and energy consumption compared to current avionics suites.


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Collins Aerospace Unveils Lilac-UV, a New Sanitizing Light Solution for Aircraft interiors

Collins Aerospace, a Raytheon Technologies (NYSE: RTX) business, today unveiled Lilac-UV, an ultraviolet (UV) lighting solution to sanitize aircraft interiors nearly anywhere a light is installed inside an aircraft.

Lilac-UV emits a slight violet light that disinfects surfaces in seconds to minutes, depending on lamp configuration and specific pathogen. Lilac-UV can be applied in lavatories, galleys, flight decks, cargo bays and throughout the cabin, and can be set for scheduled cleanings or manual applications during or between flights. The sanitizing light, combined with other hygienic measures taken onboard aircraft, gives added peace of mind and protection to passengers while also reducing aircraft downtime for manual cleaning.

Lilac-UV uses technology developed by The Boeing Company (NYSE: BA) as part of a licensing agreement granting Collins the ability to build on Boeing's UV technology for in-flight operation.

"At the heart of this project is the desire to continue to build the public's trust and confidence in air travel as passengers return to the skies," said Cynthia Muklevicz, vice president of business development for Collins Aerospace. "Collins and Boeing share the common goal to redefine air travel, a commitment to collaboration and the technical research and development expertise to bring this game-changing, hygienic technology to market for the benefit of air-travelers around the world."

The new Collins-developed sanitizing lighting system operates with an intelligent dosage controller – for scheduled cleanings and manual treatments – and an occupancy detector for enclosed spaces, like an airplane lavatory.

"Our design allows for installation anywhere in the cabin with minimal or no hardware design changes, enabling users to switch to a higher power lamp or change the number of lamps based on application," said Bridget Sheriff, vice president of engineering at Collins Aerospace. "The intelligent controller automatically adjusts to manage power consumption and offers scientifically proven disinfection of spaces during and between flights."

A finalist for the 2021 Crystal Cabin Award in the "Clean & Safe Air Travel" category, the Lilac-UV sanitizing system will be available for new cabins or retrofittable to existing interior spaces.


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Airbus and Partners Target More Energy Eficient Flights

Airbus, Air France and DSNA, the French Air Navigation Service Provider (ANSP), have begun working towards the development of "most energy efficient flights", following their inaugural demonstration flight from Paris to Toulouse Blagnac on the day of the Airbus Summit event. The aircraft flew an optimised trajectory, marking the first of a series of trials planned during 2021 and 2022 within the framework of the Single European Sky ATM Research Joint Undertaking (SESAR JU) "ALBATROSS" project.

Launched in February 2021, ALBATROSS is a large-scale initiative of major European aviation stakeholder groups led by Airbus. It aims to demonstrate, through a series of gate-to-gate live demonstration flights across Europe, the feasibility of implementing most energy efficient flights in the short term, by combining several R&D technical and operational innovations.

"ALBATROSS" follows an holistic approach by covering all flight phases, directly involving all relevant stakeholder groups (such as airlines, ANSPs, network managers, airports and industry) and addressing both operational and technological aspects of aviation and Air Traffic Management (ATM). Many solutions will be put into practice during the flight demonstrations, from new precision approach procedures to continuous climb and descent, a more dynamic management of necessary airspace constraints, sustainable taxiing and sustainable aviation fuel (SAF) usage.

Thanks to the transmission of four-dimensional trajectory data, ATM will be able to optimise and better predict an aircraft's trajectory, thereby enabling it to immediately and concretely reduce a flight's environmental footprint.

Starting from September 2021, these live trials will involve around 1,000 demonstration flights, showcasing mature operational solutions with potential fuel and CO2 emission savings. First results are expected to be available in 2022.

The Transportation Vehicle of the Future, Cezeri

Flying car Cezeri, developped by Baykar Defence, showcased for the first time at Teknofest 2021. Flying Car Cezeri is being designed to take an active role in passenger and cargo transportation and also to give a new face to logistics support activities in the health sector and military.

Having a cruise speed of 100km and a maximum flight altitude of 2000m, Cezeri can stay in the air for 1 hour.

The flying car, which has an artificial intelligence computer-assisted flight system among its technical features, has a maximum take-off weight of 241 kg.

The flying vehicle Cezeri, is powered by rechargeable batteries and works with electricity, in this case it is planned to help reducing air pollution in transportation and is expected to reduce traffic congestion in urban transportation which will help the ecosystem positively.

Cezeri is also expected to help health institutions being a fast and effective means of transportation in emergencies.

Airbus' new Single-Aisle Airspace Cabin Enters into Service with Lufthansa Group

Lufthansa is the first airline in Europe to feature Airbus' new Airspace cabin on Single-Aisle aircraft

Lufthansa has started operations with its first A320 Family aircraft – an A321neo – featuring Airbus' new Single-Aisle Airspace cabin. In doing so, the airline becomes the first operator in Europe to introduce the new Airspace cabin features for passengers on board A320 Family aircraft. In 2018 Lufthansa Group, a long-time A320 Family customer, chose to equip more than 80 of its new A320 Family aircraft on order from Airbus with Airspace cabins.

The new Airspace features include: slimmer sidewall panels for extra personal space at shoulder level; better views through the windows with their redesigned bezels and completely integrated window shades; the largest overhead bins for 60% more bags; the latest full LED lighting technologies; LED-lit 'entrance area'; and new lavatories with hygienic touchless features and antimicrobial surfaces.

"Lufthansa has once again made a choice of innovation and passenger appeal, raising the bar for the flying public at large to experience next-level, Airbus leading cabin innovations", said Christian Scherer, Airbus Chief Commercial Officer and Head of International. "I am delighted to welcome one of our long term partners, Lufthansa, to become the first European operator for the A320neo Family Airspace cabin. I can't wait to fly on one of these aircraft."

"Regardless of the crisis, we continue to focus emphatically on a premium product for our guests," emphasizes Heike Birlenbach, Head of Customer Experience, Lufthansa Group. "For us, premium means providing high-quality, individualized and relevant offers for all our passengers at all times. With the new Airspace Cabin, we are significantly improving the travel experience on short-haul routes and setting a new industry benchmark."

Lufthansa has been operating the A320-family since the 1980s and has been the very first operator of the A321 and the A320neo. The airline group is one of the biggest Airbus operators worldwide.

Gulfstream G500 Interior Earns International Yacht & Aviation Award For Design Excellence

Gulfstream Aerospace Corp. and the Gulfstream G500 have been awarded the 2021 International Yacht & Aviation Award (IY&AA) for excellence in cabin design. The "Performance and Polish" G500 entry gained the top honors in the Interior Design/VIP Completions category."This is the fifth year in a row we have earned an International Yacht & Aviation Award, and I am proud of our amazing Gulfstream team of designers and artisans that brings creativity and imagination to our ultramodern aircraft," said Mark Burns, president, Gulfstream. "Every Gulfstream cabin is the product of collaboration among our interior and industrial design teams and the craftsmanship of the men and women who build the custom cabin elements by hand. Our combined focus on performance, innovation, quality and artistry sets Gulfstream interiors apart."The Gulfstream G500 Performance and Polish interior design conveys the aircraft's high-speed capabilities and mimics the smooth flight passengers enjoy while flying in the aircraft's stylish, comfortable cabin. The award-winning design was achieved through a play on contrasts in color, content and composition: linear patterns juxtaposed with sweeping movement; plush upholstery balanced with smooth, sleek lines; ebony furniture contrasting with ivory upholstery; and a carpet that blends the two. The combination of Gulfstream innovation and artistry is also evident in the award-winning seat design, advanced ergonomics, handcrafted furnishings and hand-tailored finishes.

The award-winning tal and wide G500 cabin offers interior designers great flexibility. In addition to the bespoke interior, passengers flying aboard the G500 benefit from 100% fresh, never recirculated air, industry-leading low cabin altitudes, whisper-quiet sound levels and 14 Gulfstream Panoramic Oval Windows.

Rolls-Royce UltraFan Power Gearbox Tops World Aerospace Record

Rolls-Royce announced that its UltraFan® power gearbox has set a new world aerospace record

It was reported that the gearbox has reached 87,000 horsepower or 64 megawatts – enough to power a city with the population of 89,000 - on test at Dahlewitz, near Berlin. The power milestone was achieved as build continues on the power gearbox that will be delivered for the actual UltraFan demonstrator engine, UF001, later this year.

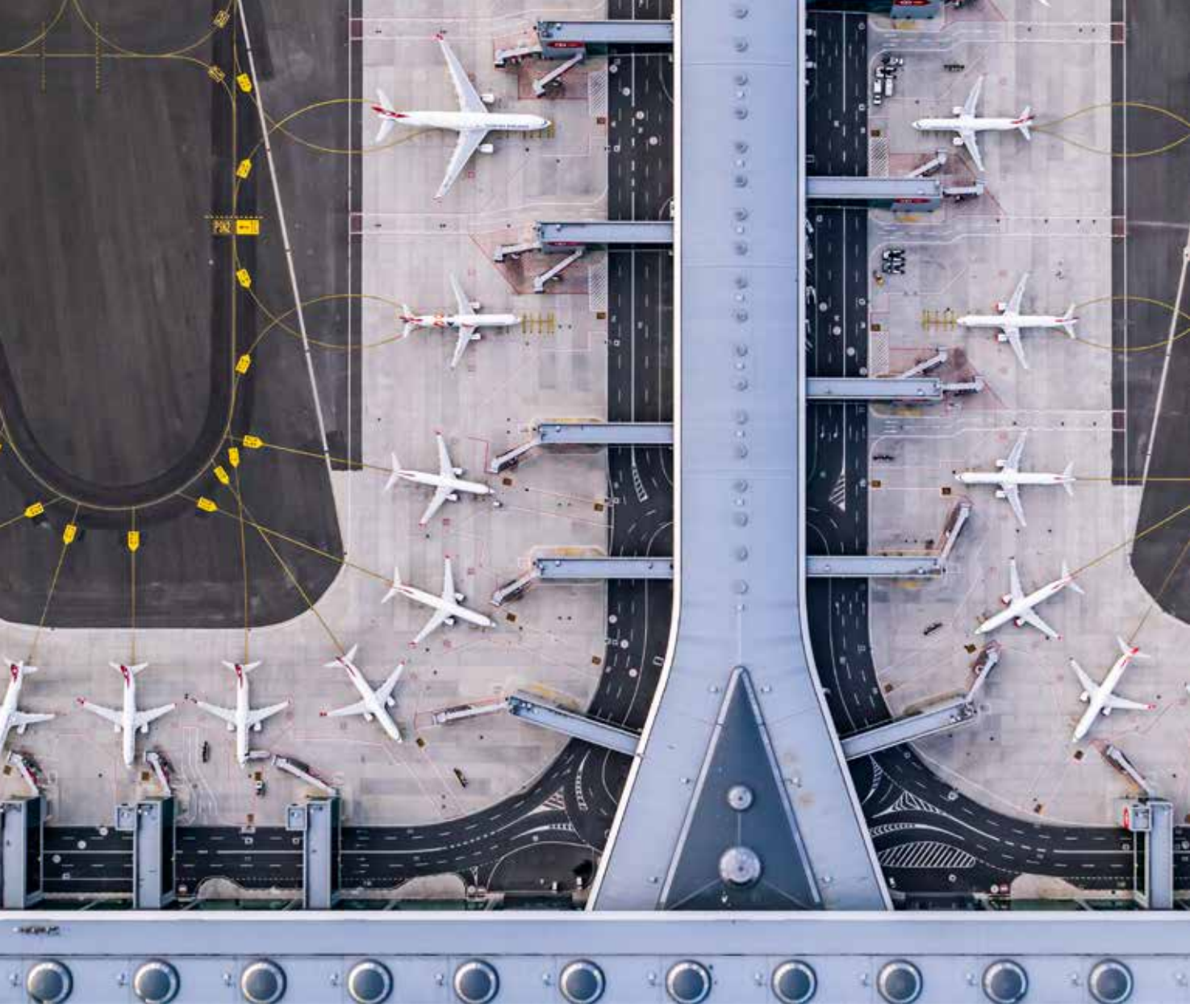
UltraFan, which is scalable for narrowbody or widebody aircraft, is a key element of Rolls-Royce's commitment to making travel more sustainable. Gas turbines will continue to be the bedrock of longhaul aviation for many years. UltraFan's efficiency will help improve the economics of an industry transition to more sustainable fuels, which are likely to be more expensive in the short-term than traditional jet fuel. The first test run of the engine will be conducted on 100% Sustainable Aviation Fuel.

Dr Holger Klinger, Sub-System Executive Power Gearbox, Rolls-Royce, said: "Reaching this record is another great achievement that showcases the performance and durability of this key component for our UltraFan program. The power gearbox technology is central to the success of the next generation of Rolls-Royce jet engines and I'm proud to see us pushing the engineering boundaries again."

The PGB is playing a central role for the UltraFan engine, helping to deliver excellent efficiency levels over a wide range of thrusts. It has a planetary design, with each 'planet' capable of holding the force of a Trent XWB engine at full throttle. It is designed to allow the turbine at the rear of the engine to run at a very high speed while the fan at the front runs at a lower speed. This makes the engine very efficient, making the UltraFan engine 25% more fuel efficient than the first generation of Rolls-Royce Trent engines.

Development testing of the first prototype gearbox, focused on validation, endurance and reliability, began in 2017 at the dedicated PGB test facility in Dahlewitz. During a rigorous test regime, the power gearbox has since accumulated more than 650 testing hours and proven its capability of managing the equivalent power of 20 Formula 1 cars.

As well as high power testing, the PGB has been undergoing test on the facility's Attitude Rig, which simulates the effect of the gearbox being on the wing of an aircraft in flight, through phases such as take-off, climb, banking and descent.

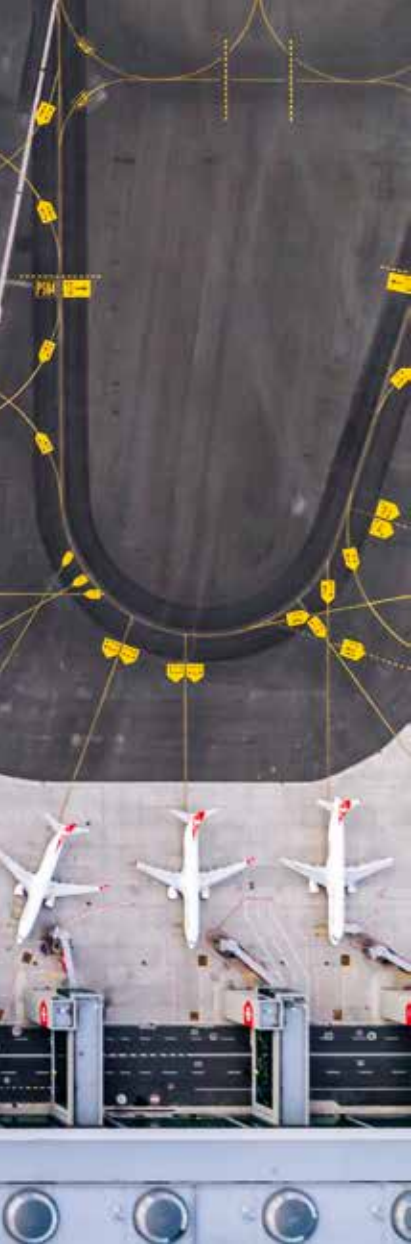


Istanbul Airport pledges to achieve **“Zero Carbon Emission”** by 2050

Istanbul Airport has joined the "Net Zero Carbon Emissions by 2050" commitment launched by the Airports Council International (ACI) and undersigned by 238 airports.

İGA continues to work in line with the principles of sustainable development. Taking action in advance to leave a cleaner world to the next generations, İGA has announced that Istanbul Airport has committed to achieving net zero emissions by 2050 at the latest. Launched by Airports Council International (ACI) in June 2019, "ACI Net Zero 2050" was set in line with the goal of taking action and decarbonizing airports against the climate problem.

As a result of its efforts to manage and reduce its carbon footprints within the scope of the environment and sustainability program, Istanbul Airport has joined 238 airports that have committed to achieving "Net Zero Carbon Emission". Within the scope of activities to reduce carbon emissions at Istanbul Airport, significant efforts such as the establishment of ISO 50001 Energy Management System, Energy Efficiency Activities, System Improvements with Energy Surveys, the establishment of ISO 14064 Greenhouse Gas Management System,



and Greenhouse Gas Calculations, Afforestation Activities, the Use of Electric Vehicles, and Vehicle Charging Station Installations have been conducted.

Istanbul Airport will continue its efforts towards achieving net zero emissions by 2050 and it has announced its commitment to the Use of Hydrogen Fuel for Heating and Transportation Purposes, and Carbon Capture Technologies from Fuel Gas in line with technological developments and efforts for Solar Power Plant Installations, Purchase of Renewable Energy from the Electricity Network, Electric Vehicle Conversions, Vehicle Charging Station Installations, Use of Bio-Diesel in Heavy Vehicles, Energy Efficiency Activities, and Afforestation Projects.

İGA Airport Chief Executive Officer Kadri Samsunlu: "As İGA, we are aware that we have a critical responsibility towards future generations. Acting with this sense of responsibility, we have taken relevant action for a cleaner world. At Istanbul Airport, Turkey's gateway to the world, we have prepared our roadmap for 'Net Zero Carbon Emission' by 2050 and set our carbon emission reduction strategy by making quite assertive planning to this end. Thus, we have involved in a process where both technological and operational requirements are constantly monitored and evaluated. By implementing many of our projects in advance, we will have achieved our zero-emission targets even before the year 2050. Recently, we have realized Energy Efficiency Activities, Energy Surveys, and System Improvements, the use of Electric Vehicle and Vehicle Charging Station Installations and we will continue to do so in the next two to three years. In the long term, we will supply the majority of our electrical energy needs from renewable sources through the installation of Solar Power Plants and by Green Energy purchases. We believe our afforestation activities will also become a sink of substantial amounts of carbon. We will also evaluate opportunities for reducing emissions by following the developing technologies such as the Use of Bio-Diesel in Heavy Vehicles, Use of Hydrogen Fuel for Heating and Transportation, and Carbon Capture Technologies from Fuel Gas. As İGA, our greatest goal is to set the bar even higher in line with our objectives."

Olivier Jankovec, Director General of the European Region of the Airports Council International (ACI EUROPE): "I sincerely congratulate Istanbul Airport for its participation in the collective agreement we have formed with airports across Europe and the world to achieve 'Net Zero Carbon Emission' by 2050. Despite the critical challenges our industry has been encountering due to the COVID-19 pandemic, airports continue to prioritize climate related activities, and this statement is a proof of this issue. Carrying the climate issue a step forward by aligning decarbonization efforts with global targets will not be easy for any industry, as well as the industries that have significantly suffered from this crisis, the recovery process of which may take years. We still have considerable work to do. I would like to thank the Istanbul Airport team, who are always willing to do their best by focusing on the ambitious net zero target."

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