UTED 1968 INTERNATIONAL

00. 2024

AIRCRAFT TECHNICIANS ASSOCIATION MAGAZINE

- SINGLE PILOT OPERATIONS IN THE AIRLINE INDUSTRY
- PERFORMANCE INDICATORS OF MAINTENANCE ACTIVITIES ON MRO
- IS 5G AIRCRAFT INTERFERENCE A THREAT? WHAT YOU NEED TO KNOW

AIRCRAFT DELIVERY PROCESS AND TECHNICIAN RESPONSIBILITIES

Dear Readers,

The Aircraft Technicians Association was founded on 5 December 1968 by 80 aircraft technicians in Istanbul, Türkiye. As a 55-year-old association, we have continued our work as a non-governmental organisation that directs our sector in our country. Now, we have started a new journey with the belief that it is necessary to share this knowledge and experience at the international level. We wish to share this experience with you by creating a magazine that will attract the attention and interest of MRO companies, especially for all the building blocks of technicians, engineers, experts and pilots. I would like to express my great pleasure to meet you in our first introductory issue. We are presenting UTED International magazine to you with great effort to eliminate the sharing of information and experience in the field of aircraft maintenance, one of the biggest deficiencies in the sector, and to be a pioneer in this field.

We are not new to journal studies. We already have a Turkish journal, UTED, published every month for 46 years. Both UTED and UTED International magazines are available on Pressreader and Magzter platforms. As a team that knows the value of time, we also publish all articles with audio on Spotify so that busy technicians do not miss any developments.

We are determined to make the necessary efforts to improve the training processes, working conditions and living standards of the 650,000 aircraft technicians who will be needed by aviation in the next 10 years by bringing them to a common denominator both in Europe and the American continent, especially regarding the decisions and implementation methods taken by the authorities on behalf of the sector.

We aim to deliver our Uted International magazine to 6 continents in Asia, Europe, Africa, Australia, North and South America. We will realise some of this as a printed publication and some as a digital publication. Maybe soon you will find us or a part of us in every fair and organisation you attend.

As we embark on this journey towards safer skies, let us do so with humility, determination, and a steadfast commitment to excellence.

Ömür CANİNSAN
Chairman & Managing Director

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Chairman & Managing Director
Ömür Caninsan

Managing Editor
Dercan Demirtepe

Graphic Artist
C. Kaan ÖZKAN

Editors
M. Murat BAŞTÜRK
Mustafa Agaoğlu
Müjgan İrem FİLİZ

Writing Board
Melih Eroğlu
Sühan Göktuğ Aydemir
Özgür Kurt
İltemir Taha Binali
Taha Reşit Kasal

Adress
İstanbul Cad. Üstoğlu Apt. No: 24 Kat: 5 Daire: 8
Bakırköy - İstanbul - Türkiye
Phone: +90 212 542 13 00
Mobile: +90 549 542 13 00
Fax: +90 212 542 13 71

Advertising & Communication
UTEDINTERNATIONAL@uted.org

Website
www.UTEDINTERNATIONAL.com
www.uted.org

Social Media
www.facebook.com/utedmedya
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Uted magazine will be sent to your address every month. Please contact our association for detailed information please contact us.

Past issues of UTED Journal are available on our website.

India's FLY91 Inks Pratt & Whitney Canada Engine MRO Deal

Pratt & Whitney Canada (P&WC) has signed a multi-year engine services agreement with FLY91 for the MRO of the PW127M engines that power its fleet of ATR 72-600 turboprop passenger aircraft. FLY91 is a pure-play regional airline headquartered in Goa, founded by industry veterans and backed by professional funding. The airline says it is committed to enhancing last-mile air connectivity and will connect over 50 cities across India in the next five years. As part of this plan, FLY91 will induct 30 aircraft into its fleet which will be based at multiple hubs across the country.

SAS expects network disruption as batch of A320neos undergoes component checks

Scandinavian carrier SAS is temporarily withdrawing several Airbus A320neo jets from service while it carries out checks on a specific component on the type. The airline says it needs to inspect pressure regulator transmitters on 18 A320neos. SAS states that this "requires pausing operations with these aircraft", and admits that this will lead to "traffic disruptions in parts of our network". The airline has around 84 A320-family aircraft including A320neo models and older-variant jets. SAS says it is "working hard" to minimise the impact of the inspections, but has not stated when the aircraft are likely to return to operation. While it has not detailed the nature of the checks, its reference to pressure regulator transmitters suggests the inspection relates to the components installed on the crew oxygen system in the avionics bay. SAS A320neo-c-Colin Cooke Photo Creative Commons

STS Aviation opens two new UK line maintenance stations

STS Aviation Group has announced the expansion of STS Aviation Services UK, with the opening of two new line maintenance stations. The UK stations are located at East Midlands (EMA) and Norwich (NWI) airports, and will be effective April 1, 2024. Providing a full range of services, including routine maintenance checks, aircraft-on-ground (AOG) support and other line maintenance services, the new stations will ensure enhanced operational efficiency and reliability for airline clients. Ian Bartholomew, executive vice president and managing director of STS Aviation Services Europe, said: "STS set out some time ago to rapidly increase our line maintenance presence in the UK and Europe. Opening these stations is the first part of delivering on this plan. "We have ambitions to be an established provider at a number of key hubs and regional airports, building on the success of our STS Line Maintenance colleagues who dominate the landscape in the USA, and reinforcing our position as a market leader in the aviation MRO sector."

Boeing management overhaul could spark real change – or bring more of the same

The broad management shake up disclosed on 25 March by Boeing might hold a chance of finally setting the embattled company on a real recovery path. But the challenge lies in the fact that many of Boeing's troubles originate not in its corporate suites, but rather on the floors of its factories. For those reasons, unions and aerospace analysts are optimistic but not convinced that a new management team will solve problems that have eluded so many others. "This may be the first real chance, in a long time, Boeing has had to clean house and reset their own narrative," BofA Global Research analyst Ron Epstein said in a 25 March report. "We see the changes as the first right steps of removing the old guard, and making way for a new team which can work from a less-sullied slate." A Boeing 737 Max being assembled at Boeing's Renton facility on 15 June 2022.

Tecnam secures European certification for short take-off P2012

Italian airframer Tecnam has secured European certification for the short take-off and landing variant of its P2012 Traveller twin-engined commuter aircraft. The European Union Aviation Safety Agency lists the type certificate as having been amended from 1 March to add the STOL configuration. Tecnam has developed the P2012 STOL to serve airports with short runways and operational constraints. The certification campaign has lasted 18 months, the company says, and production aircraft are already in the final stage of assembly. Initial customer deliveries, it adds, will start "filling an uncovered gap" and address an "underdeveloped and unsupported" niche market. Powered by geared Continental GTSIO-520-S engines with three-blade propellers, the STOL aircraft has a 16.6m span – some 2.6m greater than the conventional P2012.

Earliest A380s to undergo checks for wing-rib foot cracks linked to storage

Operators of early Airbus A380s are set to be instructed to check internal wing-rib feet for cracking linked to long storage periods. The European Union Aviation Safety Agency is proposing repetitive examination of feet attached to 24 metallic alloy ribs. It refers to a trend of "an increasing number of unexpected finding[s] of damage" to rib feet during airworthiness inspections. Analysis of these findings shows that a "predominant, driving parameter" seems to be significant time spent on the ground – during parking or storage – particularly in certain specific environmental conditions. EASA attributes cracking of the type-7449 alloy to embrittlement from absorption of hydrogen.

StandardAero achieves LEAP-1A and LEAP-1B CTEM readiness

StandardAero's 810,000 sqft engine overhaul centre in San Antonio, TX, is now ready to perform Continued Time Engine Maintenance (CTEM) workscopes for LEAP powerplants. These include high-pressure turbine (HPT) shroud replacements, both for the LEAP-1A, which equips the Airbus A320neo family, and for the LEAP-1B, which powers the Boeing 737 MAX family. StandardAero's achievement of LEAP-1A and LEAP-1B CTEM readiness comes exactly one year after the company signed the first North American non-airline CFM Branded Service Agreement (CBSA) for the LEAP-1A and LEAP-1B.

All-time high shop visits for MTU Maintenance in 2023

MTU Maintenance has announced that 2023 was a bumper year for the company, with over 1,300 shop visits recorded network-wide – the highest number in its history. On-going business expansions and historic milestones within its network also contributed to a strong year for the provider of customised MRO solutions for aero engines. The company says the high volume of shop visits was largely driven by a growing demand in MRO services for CFM International's CFM56-5B/7 (+91%), GE Aerospace's GE90-110/115B (+38%) and Pratt & Whitney's PW1100G-JM (+19%) engines. The latter was helped by the continued ramp-up of EME Aero, a 50/50 joint venture between MTU Aero Engines AG and Lufthansa Technik in Rzeszów, Poland, which focuses on the maintenance of Pratt & Whitney GTF engines and whose shop visits doubled year-on-year.

Haggan Aviation becomes sales and installation partner for SmartSky

Haggan Aviation, an FAA Part 145 repair station, has become a sales and installation partner for SmartSky Networks, provider of advanced inflight air-to-ground (ATG) connectivity for business aviation. Colorado-based Haggan Aviation offers full MRO services including connectivity upgrades for business aircraft, and now with SmartSky next-generation ATG connectivity. Tom Miszewski, vice president/general manager of Haggan Aviation, said: "We are extremely proud to add SmartSky's proven inflight Wi-Fi to our connectivity upgrade offerings. "Together, Haggan's quality customer service and installation expertise, along with SmartSky's performance that customers are raving about, can equip aircraft operators to deliver an elevated inflight experience beyond what they could before.

Vallair completes sale of CFM56-5B engine

Vallair, provider of integrated support for mature aircraft, engines and major components, has completed the sale of a CFM56-5B3/P engine to an undisclosed customer. Vallair says the engine, with serial number 779740, is fresh from performance restoration with full life remaining at -5B3 thrust level, and is a perfect candidate for lease across the A320 family of aircraft. Patrick Leopold, director of asset management at Vallair, said: "The demand for this engine type is strong and steadily increasing due to very high engine shop visit demand, current limited engine shop availability, long turnaround times, and labour shortages among other factors. "This newly overhauled engine, with full operational capability across all thrust levels, will be put on lease."

Sterling and SATS collaborate to expedite airside services for AOG shipments

Aviation logistics firm Sterling, part of Kuehne+Nagel, has partnered with SATS Ltd (SATS) to expedite first- and last-mile airside services for time-critical Aircraft-on-Ground (AOG) shipments The collaboration between the two companies will focus on optimising handling processes to support the urgent needs of the aviation industry and expediting the delivery of aircraft components to resolve AOG situations quickly. Singapore and London Heathrow airports have been identified as locations for a trial phase, with the services anticipated to be rolled out to other airports within Sterling's network in the coming months. The partnership will combine Sterling's critical logistics expertise with the enhanced visibility provided by SATS for express shipments booked with airlines. The services provided include specialised handling at the point of origin and destination to manage AOG shipments and via key time stamps for updates on the shipment's status on the ground.

V2500 engine successfully tested with 100% SAF

Tests on a V2500 engine with 100% sustainable aviation fuel (SAF) have been successfully carried out by IAE International Aero Engines AG (IAE) at the MTU Maintenance Hannover facility. Kim Kinsley, president of IAE AG and vice president of Mature Commercial Engines at Pratt & Whitney, said: "This test with 100% SAF demonstrates that V2500 engines can continue contributing towards making aviation more sustainable in the decades ahead." The V2500 engine test was run on 100% Hydroprocessed Esters and Fatty Acids Synthetic Paraffinic Kerosine (HEFA-SPK) fuel supplied by Neste.HEFA-SPK is produced by hydrotreating renewable raw materials, such as waste oils or fats, into an aviation turbine fuel and is a prominent sustainable alternative to conventional jet fuels. The engine is also approved for operation on SAF blended at up to 50% with conventional Jet A and A-1 fuel.

ExecuJet Haite completes its first Falcon engine change

ExecuJet Haite has completed its first engine change on a Falcon aircraft – a 7X trijet powered by Pratt & Whitney Canada PW307A turbofans. The work was performed at ExecuJet Haite's state-of-the-art Tianjin MRO centre which has a built-in overhead crane for engine changes and other complex work.The MRO facility has carryied out Rolls-Royce and GE engine changes for other aircraft types previously, such as Embraer Legacy and Embraer Lineage aircraft. Paul Desgrosseillers, general manager of ExecuJet Haite, said: "Chinese Falcon operators previously had to send aircraft to Shanghai or more often it went overseas for engine changes. However, after this most recent event we have now demonstrated that it can be successfully performed at our Tianjin facility." Once the engine was changed, ExecuJet Haite then shipped it out for engine repairs.The Falcon 7X and 8X trijets are Dassault Aviation's most popular aircraft types in China.Dassault Aviation recently renewed ExecuJet Haite's authorised service centre (ASC) status for another three-year term.ExecuJet Haite performs line and base maintenance on the 7X and 8X. It is certified by the CAAC as well as by international regulators including the US FAA, the European Aviation Safety Agency (EASA), Bermuda, Cayman Islands, San Marino and others.

Hillsboro Aviation becomes sales and installation partner for SmartSky

Hillsboro Aviation, an FAA-certified Part 145 repair station, has become a sales and installation partner for SmartSky Networks, provider of advanced inflight air-to-ground (ATG) connectivity for business aviation. Oregon-based Hillsboro Aviation will offer full MRO services including upgrading business aircraft with SmartSky's next-generation inflight connectivity. Hillsboro Aviation operates from their state-of-the-art facility at Portland-Hillsboro Airport (KHIO), offering complete helicopter and airplane services since its inception in 1980. Serving domestic and international markets in government, commercial, and private sectors, Hillsboro Aviation also has an experienced team of technicians supporting comprehensive maintenance and avionics needs.

Maintenance of Scoot's Embraer E190-E2s now included in SIAEC agreement

SIA Engineering Company Limited (SIAEC) has announced the expansion of the scope of its Services Agreement with Scoot to include the airline's new Embraer E190-E2 fleet. The expanded scope of services will cover line maintenance and selected fleet management support services and will commence on April, 1 2024. Coverage is for a period of 58 months, with an option to extend that by a further 24 months. The additional scope is estimated to generate revenue of $52 million over the 58 months. The transaction is not expected to have a material impact on the net tangible assets per share or the earnings per share of the SIAEC Group for the financial year ending March 31, 2024. Goh Choon Phong, a director of SIAEC, also sits on the board of Singapore Airlines, the parent company of Scoot. Save as disclosed, none of the directors and controlling shareholders of SIAEC have any interest, direct or indirect, in the transaction, other than through their shareholdings (if any) in SIAEC.

MRO Middle East: Sanad agrees Trent 700 MRO deal with Deucalion arrow_outward

Aerospace engineering and leasing solutions provider, Sanad, has announced a new partnership with Deucalion Aviation, provider of aircraft asset management, financing and investment services, to deliver MRO services for Rolls-Royce Trent 700 engines. Announced during MRO Middle East 2024, the partnership marks a significant milestone, expanding Sanad's services to a new customer and aligning with its strategy of increasing its global customer base. Deucalion Aviation manages more than 160 aircraft with a total asset value in excess of $3 billion. These assets are under management across over 50 countries and leased to more than 80 lessees. Les Walsh, chief technical officer at Deucalion Aviation, said: "Joining forces with a trusted partner with proven expertise like Sanad strengthens our ability to sustain the continued airworthiness of our Rolls-Royce Trent 700 engines within our fleet, enabling us to continue delivering superior value to our customers."

PASSENGER PLANES ARE TRANSFORMING INTO CARGO PLANES: **TURKISH TECHNIC INC. AND CO-OPERATION BETWEEN EFW**

The cargo of passenger aircraft, which has been on the agenda of Turkish Technic Inc. for the last few years aircraft conversion project has attracted the close attention of the senior management in terms of sectoral and financial aspects.

On 07 October 2022, the Chairman of the Board of Directors Prof. Dr. Ahmet Bolat,

General Manager Mikail Akbulut, EFW CEO Jordi Boto and Minister of Transport and Infrastructure a goodwill agreement signed with the participation of Adil Karaismailoğlu

EFW is an organisation based in Dresden, Germany. A company in which AIRBUS is one of the partners and provides maintenance services for military and commercial aircraft as well as offering P2F (passenger to freighter) also provides service. The company's "mode sites" include San Antonio, Mobile, Singapore, Shanghai, Guangzhou, Chengdu, Tianjin and Turkish Technic.

With the start of the project, Turkish Technic accelerated the preparation process by coordinating all departments and prioritising the process. With the most comprehensive OJT study, a 2-month training process was initiated at EFW's facilities. In addition to field teams, engineering and planning teams also participated in the training.

During the training, participants learnt about their areas of specialisation. shared information with EFW staff about the details.

The first project to be realised after the training workshop It will take 8 months. 55 per cent of the transactions in the project are structural, 30 per cent avionics and the remaining 15 per cent will be in charge of the mechanical/in-cabin workshops. First primarily for various components in the cabin and cargo area modifications will be made. Parts dismantled at the end of the project it will be reassembled into the aircraft, these operations must be carried out meticulously.

All of the structural floor parts in the cabin of the aircraft whose dismantling is completed will be replaced with new ones and will be strengthened. However, some frames will be will be replaced with strengthened frames and some frames will be strengthening works will be carried out on it. Inside the cabin

In addition to the operations to be performed, operations will also be carried out on the airframe.

In this context, 2 crown skin panels in section 12 will be replaced with more resistant equivalents, and engineering studies carried out by STC reinforcement doubler installations will be made at certain points determined. After these works, the fuselage strength of our aircraft will be further increased. After the reinforcements are made in the cabin and cargo section, on the left side of the aircraft, where the Main Deck Cargo door will be located, upper frame shell and lower frame shell assemblies will be made. Subsequently, in order to assemble the main deck cargo door, door hinge assemblies will be carried out utilizing tools that are not used in standard maintenance but only in such special projects. and the necessary infrastructure will be prepared for door installation. Simultaneously with these operations, the avionics teams will carry out the necessary mod operations on the 800 VU and remanufacture all the cables that have been removed. will continue.

Within the scope of P2F (passenger to freighter) operations

No reinforcement is made on the wings, engines, vertical and horizontal stabilisers. The reinforcements affecting the design are carried out on the cabin floor and fuselage.

Due to the special nature of the operation to be performed, the relevant It is essential to use special tools in the process. 800 VU disassembly/assembly

apparatus, cargo door before stress-free phase support attached to the cutout and preventing torsion of the body tool is a tool used before cutting the upper frame shell and is used in the cabinet. established support tool and shipping before the stress-free phase tools that support cross beams on the side of this are examples of equipment. It also includes certain major laser alignment of the aircraft position before and after phases, whether there is a change in the balance of the aircraft by measuring with the tool is controlled.

Dismantling and retrofitting of the aircraft cables, components dismantled during the works etc. to the test phase after the reassembly of the and following the successful completion of the tests delivery of the aircraft will be realised.

TERMINAL ISTANBUL:
FROM AN OLD AIRPORT TO INNOVATION CENTER

Atatürk Airport, which was one of the biggest terminals in Türkiye, now hosts an important meeting for Innovation, Technology and Start-ups: Project Terminal Istanbul. The main goal of this event is to announce the opening ceremony of a big change from an old airport to an innovation and start-up center in Istanbul.

With the contribution of more than 50 different national and international technology companies, the event took place with the speeches of the Minister of Industry and Technology and the Minister of Transport and Infrastructure. The first Turkish astronaut, Alper Gezeravcı and BAYKAR CTO Selçuk Bayraktar were also there to support the project. Moreover, global companies like Nokia, Microsoft, Google, Meta, Samsung, Huawei, AWS and more were also at the meeting. But what is this project, Terminal Istanbul?

The airport has been inoperative for commercial use for many years now, and there is a huge potential for future investments. The plan is to transform this huge area into a new Techno-park and Start-up Incubation Center.

The investment in innovation and technology launched over the last few years in Türkiye because of the big events like Teknofest or Take Off. And many people saw this opportunity for a big center of innovation in one of the biggest airports in Türkiye.

The main goal is to collect Start-up and Technology companies to create an innovation environment with the support of many competitions and workshops, such as prototyping, R&D, or DENEYAP ateliers. The plan also consists of many different schools and courses for children inside the Terminal Istanbul to create a huge living ecosystem of technology.

More: https://www.invest.gov.tr/en/news/news-from-turkey/pages/terminal-istanbul-emerges-as-global-hub-for-technology-and-entrepreneurship.aspx

US CRACKS DOWN ON EMISSIONS FROM NEW JETS

In a move aimed at curbing the environmental impact of air travel, the Federal Aviation Administration (FAA) has implemented a new regulation targeting carbon emissions from airplanes. This rule, taking effect in January of 2028, mandates that newly manufactured large airplanes, including subsonic jets, turboprops, and propellers, incorporate advanced fuel-efficient technologies.

This requirement applies not only to airplanes yet to be certified but also to established models with upcoming new builds, such as the Boeing 777-X and the latest iteration of the Boeing 787 Dreamliner. Business jets and larger civilian propeller airplanes, like the Cessna Citation and the ATR 72, will also need to comply. Notably, the regulation won't apply to airplanes currently operational, focusing its impact on the future of U.S. airspace.

"We are taking a large step forward to ensure the manufacture of more fuel-efficient airplanes, reduce carbon pollution, and reach our goal of net-zero emissions by 2050," In the announcement of the rule, FAA Administrator Mike Whitaker stated.

This initiative is a significant step towards achieving the FAA's goal of net-zero emissions by 2050. Civil aircraft currently contribute a substantial portion of the environmental burden within the transportation sector, responsible for roughly 9% of domestic transportation emissions and 2% of total U.S. carbon pollution. By implementing stricter fuel-efficiency standards for new airplanes, the FAA is taking a proactive approach to reducing the industry's environmental footprint and promoting cleaner air travel.

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•FAA finalizes rule to reduce carbon pollution from new jets and turboprops. FAA Finalizes Rule to Reduce Carbon Pollution from New Jets and Turboprops | Federal Aviation Administration. (n.d.). https://www.faa.gov/newsroom/faa-finalizes-rule-reduce-carbon-pollution-new-jets-and-turboprops.

THE TURKISH FLAG IS NOW IN SPACE!

Turkey's first space mission is not only a space mission but also represents a nation's sense of unity and success. The emotional speech of Alper Gezeravcı, who became the first Turk in space, made us all proud, and the words of Mustafa Kemal Atatürk, the founder of the Republic of Turkey, "The Future is in the Skies" became the symbol of Turkey ascending into space.

The Crew Dragon capsule carrying the AX-3 crew reached the International Space Station. After the docking process was completed, the astronauts entered the station. Thus, Ax-3 became the third crewed mission to the International Space Station organised by Houston-based Axiom Space.

Alper Gezeravcı, who reached the International Space Station, made his first speech: "The Future is in the Sky"

"I would like to express our gratitude to Gazi Mustafa Kemal Atatürk and his comrades-in-arms who founded the Republic of Turkey and entrusted it to us, to all our martyrs who gave their lives for this homeland, and to the state that enables us to step here," Gezeravcı said, repeating Atatürk's quote "The Future is in the Skies".

13 scientific experiments in 14 days

He will work on 13 scientific experiments in the ISS, where he will stay for 14 days. These experiments vary

in areas such as microgravity, human health in the space environment, research of the Salt Lake plant in the space environment, and research of solid-fluid mixtures in zero gravity environment.

Michael Lopez-Alegria, Marcus Wandt and Walter Villadei, the other members of the Ax-3 mission, will also carry out scientific studies in many predetermined and different fields.

Upon completing their mission, the team plans to return to Earth on the same spacecraft.

In a statement made by the Ministry of Industry and Technology, information was given about the scientific experiments planned to be carried out in Turkey's first manned space mission. In the statement, the following information was shared regarding the experiments to be carried out by Turkey's first astronaut Gezeravcı:

"With the UYNA experiment developed by TÜBİTAK Marmara Research Center (MAM), the study on the production of high-strength alloys resistant to high temperatures will be carried out using the ELF in the KIBO module. The effects of zero gravity on properties such as thermophysical and crystal growth during the melting and solidification processes will be investigated. This is expected to make a significant contribution to Turkey's ability to develop new generation materials for the space, aerospace and defense industries.

I would like to express our gratitude to Gazi Mustafa Kemal Atatürk and his comrades-in-arms who founded the Republic of Turkey and entrusted it to us, to all our martyrs who gave their lives for this homeland, and to the state that enables us to step here," Gezeravcı said, repeating Atatürk's quote "The Future is in the Skies.

The second project developed by TÜBİTAK MAM, the gMETAL experiment, will investigate the effect of gravity on the creation of a homogeneous mixture between solid particles and a fluid medium under chemical reaction-free conditions. Thus, the propulsion systems of spacecraft will be made more efficient.

With the UzMAn experiment developed by Boğaziçi University, it is aimed to carry out growth and endurance tests of microalgae species adapted to harsh conditions in the world under non-gravity conditions, to examine their metabolic changes, to determine their carbon dioxide (CO_2) capture performance and oxygen (O_2) production capabilities, and to develop a life support system with science mission partner TÜBİTAK MAM.

The EXTREMOPHYTE experiment developed by Ege University, is planned to reveal the transcriptome of A. thaliana and S. parvula plants grown in space and on earth and exposed to salt stress by next-generation sequencing (RNA-seq) and to compare some physiological and molecular responses of glycophytic and halophytic plants to salt stress in microgravity.

METABOLOM research conducted by Ankara University aims to reveal the negative effects of space conditions on human health. To reduce these negative effects, it is envisaged to examine the physiological and biochemical changes in gene expression and metabolism of astronauts participating in space missions under the influence of space environment conditions. The study aims to provide new information to understand the possible risk factors of system-wide changes in the body for the health of space travelers. It is also thought that the study may be useful in developing new treatments and preventive measures for existing diseases in the world.

The MYELOID experiment developed by Hacettepe University, it is aimed to immunologically measure and evaluate the travel and space conditions and cosmic radiation damage that space mission participants will be exposed to at the level of myeloid-derived suppressor cells (MKBH).

The MESSAGE experiment developed by Üsküdar University, is aimed to identify genes whose function has not yet been discovered and to determine which immune cells will be directly affected by gravity during space missions by CRISPR gene engineering methods.

With the ALGALSPACE experiment developed by Yıldız Technical University, the growth data of Antarctic and temperate microalgae in space will be compared, and a study on the use of polar algae in space will be carried out for the first time in the literature. In space, algae will be investigated for use in O_2 regeneration from CO_2, additional food supply, water improvement and life support.

With the CRISPR-GEM experiment carried out by the same university, it is aimed to investigate the effectiveness of CRISPR, one of the modern gene editing techniques of molecular biology, on plants in microgravity environment in order to understand and improve the defense mechanisms of plants, which are the skeleton of bioregenerative life support systems designed to solve the problem of not being able to provide a sustainable system in long-term space missions, which is one of the biggest obstacles to overcome for the future of humanity in space.

With the PRANET experiment prepared by Muş Science and Art Center students, the effect of propolis on bacteria in microgravity environment will be investigated. By forming control and experimental groups, the antibacterial effect of propolis will be tested, and whether the results will give similar results with the gravity environment will be compared.

With the VOCALCORD experiment conducted by Haliç University, it is planned to identify the disturbances caused by the frequency change in the voice with the support of artificial intelligence in the physiology of the respiratory system and to investigate the effects of zero gravity on the human voice.

The OXYGEN SATURATION experiment to be carried out by Nişantaşı University, aims to identify the differences and disorders caused by low gravity by calculating the oxygen level of the air given with the support of artificial intelligence.

With the MIYOKA experiment conducted by TÜBİTAK UZAY, the first Turkish space traveller will assemble lead-free components on the electronic card in the station. The electronic cards to be brought to Earth after the space mission will be subjected to detailed examination by TÜBİTAK UZAY, and the effects of microgravity on the lead-free soldering process will be reported for the use of the scientific world."

METABOLOM research conducted by Ankara University aims to reveal the negative effects of space conditions on human health. To reduce these negative effects, it is envisaged to examine the physiological and biochemical changes in gene expression and metabolism of astronauts participating in space missions under the influence of space environment conditions

Special coat of arms for the first space mission
A special coat of arms was designed for Turkey's first manned space mission. The most striking part of the coat of arms is the glorious Turkish flag of the Republic of Turkey in round form. Just above it is the number 100, symbolizing the 100th anniversary of the Republic. Around it are 16 stars. These stars symbolize the 16 Turkish states. Just below the stars, we see our country. In the world-recognized turquoise colours...

And finally, there is the 8-pointed Seljuk star, which has a very important meaning. With this 8-pointed star, which symbolizes the passage of the connection between the earth and the sky and also represents the 8 basic principles of Islam, our coat of arms ensures its integrity.

Source: https://gdh.digital and https://tua.gov.tr/

TURKISH FIGHTER

Turkish Fighter, the 5+ Generation Multirole Fighter Aircraft is an indigenous product developed using national technologies and inhouse capabilities. In a network centric warfare with secure data sharing between allied forces and using smart weapons, TF provides strategic missions for both air to air and air to surface targets.

Turkish Fighter provides air dominance through:

- Precise and accurate strike capability at a high speed
- High performance of radar, electronic warfare, electro-optic, communication, navigation and identification
- Air superiority with support of Artificial Intelligence and multi sensor data fusion

FEATURES

- High Situational Awareness
- Optimized Pilot Workload
- Battle Damage Assessment
- New Generation Mission Systems
- Interoperability with Other Assets
- Low Observability and IR Signature
- Precision Strike with Sensor and Data Fusion Supported Fire Control System
- **Short Turn-Around Time**
- **Easy Maintenance**
- **Sustainable and Cost Effective Life Cycle Support**
- **Internal Weapon Bay**
- **Supercruise**

KAAN

TECHNICAL DATA

Wing Span	14 m (46 ft)
Length	21 m (69 ft)
Height	6 m (20 ft)
Engine Thrust Class	2 x 29,000 lb
Maximum Speed	1.8 Mach (at 40,000 ft)
Service Ceiling	55,000 ft
Positive / Negative G Limits	+9g / -3.5g

TURKISH AEROSPACE

THE NEW VISION IN WASTE MANAGEMENT "CIRCULAR ECONOMY"

Waste, defined as dangerous, dirty, or unuseful items, is a significant issue in the modern world. The linear economy, which has been driving the world's economy since the 1950s, is responsible for greenhouse gas emissions, water pollution, and biodiversity loss.

PhD. Professor Önder ALTUNTAŞ

Summary

Traditional recycling methods, such as using colored trash cans, contribute to waste. However, a complete system redesign is needed to overcome these limitations and establish a sustainable future. The circular economy, on the other hand, focuses on strengthening and regenerating systems, treating resources as valuable capital, and allowing goods and resources to flow around in cycles to retain economic value or regenerate the biosphere. By adopting a circular economy, we can create safe, compostable materials, cycle valuable metals, polymers, and alloys, and renew natural systems. A Circular Economy aims to preserve value in energy, labor, and materials by utilizing durable, modular, and remanufacturing products, and components. This system requires a combination of firms and governments to achieve. Technological disruption, such as smartphones, AI, and 3D printing, will redefine resource use and create prosperity. We need to propose three pillars to achieve this: abundant clean energy, a cradle-to-cradle material bank, and a high-productivity regenerative system. We should build the economy on three pillars: mobility,

housing, and food, incorporating regenerative farming practices, smarter system-level approaches, and improved urban planning.

Beginning of The Waste-to-Energy
The Back to the Future trilogy, set in 1985, follows Marty McFly, a teenager accidentally sent back in 1955. Doc Brown, Marty's friend, travels to 2015, where he discovers his family. During their voyage, they encounter Mr. Fusion, a home energy reactor that converts household waste into power for the DeLorean's flux capacitor and time circuits, replacing plutonium as the primary power source. Converting waste into energy is possible, as imagined 10 years ago. But not with Mr. Fusion. Although this approach is a bit utopian, it is observed that different studies have been carried out in the past decades.

What are we going to do with our waste?
The question "What is garbage?" might be a better place to start. TDK says this word refers to all the little things that are thrown away because they are dangerous, dirty, or not useful. During the day, we make a lot of trash. Like the boxes that everything we eat, and drink comes in. Can be paper, plastic, or cloth. Another question will be waste. Again, if we define it according to TDK:

Waste: Any substance that is used can no longer be processed or cause harm to the environment.

We should think about what happens when we are working in a hangar (Let us think about the trash we make when we are working). Things we use up all the time during the day are often wasted. Like used or

A Circular Economy aims to preserve value in energy, labor, and materials by utilizing durable, modular, and remanufacturing products, and components. This system requires a combination of firms and governments to achieve. Technological disruption, such as smartphones, AI, and 3D printing, will redefine resource use and create prosperity.

expired parts, parts that we throw away when we take aircraft apart, trash oil, extra fuel, or anti-icing fluids that are used too much in the winter. If we observe it in terms of quantity and number, we produce an amount of waste at work in a year that can equal the weight of a wide-body aircraft.

The operational hub of the aviation industry creates waste streams, such as hazardous materials from oil spills, repair work, and aircraft parking lots. These waste streams need to be handled separately and under strict rules. Repair and maintenance hangars at airports are where ground service equipment is fueled, stored, and refueled. They also make fuel oil, toxic wastes, grease, and car waste, and clean wastewater. Lots of the time, these flats come with built-in offices that add to the waste.

So what happens to waste?
There are traditional ways of recycling that we see around us all the time. Different colored trash cans are used for different types of trash: the red one is for

dangerous trash, the blue one is for recyclables, the green one is for food waste, and the yellow one is for other trash. The first step in collecting trash that has been sorted is to put it in these bins. This change happens to us all the time without us even realizing it. This way of changing things is called a "linear economy."

What is the Linear Economy?
The 'Take-Make-Waste' linear economy is creating greenhouse gas emissions, water pollution, and biodiversity loss.

Toxic spills, greenhouse gas emissions, and pollution from mining, processing, manufacturing, transporting, and operating items are related to the linear economy. For food production, industrial farming has cleared forests and grasslands and used fossil fuels, polluting adjacent waterways. This system degrades soil and pollutes supermarket and table food.

The linear economy has also improved affluence and health, especially in industrialized nations. Alternative solutions are needed to maintain the linear economy's benefits while addressing its drawbacks. Recycling and resource efficiency help, but not completely.

How humans see the world has shaped the linear economy, which has driven much of the world's economy for a long time.

Since the 1950s, complex, non-linear, dynamic adaptive systems have arisen. The human perspective created a limitless supply, driven by fossil fuels, stripping value at every stage, and producing many social and environmental issues.

Long-lasting items can help, but they are not the only solution to the linear economy. A complete systems redesign is needed to overcome linear economic restrictions and establish a sustainable future.

Circular Economy
The transition to a circular economy requires a multifaceted approach that addresses both the negative aspects of the linear economy and the positive aspects of the circular economy.

The circular economy is gaining attention worldwide as companies transition to circular designs and business models, identify product innovations, capture new opportunities, and meet changing customer preferences. City governments are also becoming aware of the circular economy's potential to address urban challenges.

The circle economy is a way of thinking about systems that focuses on making them stronger and more resilient instead of weakening them. Resources, like materials and energy, are seen as important

capital and are either kept in the system or safely returned to make more money, help people, or protect the environment. Renewable energy sources power the system, and energy use is cut down by things like refurbishing and remanufacturing. People can change the way they think and act by adopting a circular economy. They can do this by rethinking and redesigning goods, parts, and packaging to make them safe and compostable. This also lets valuable metals, polymers, and alloys go through a cycle, which protects their quality and lets them be used after the shelf life of individual goods ends. The circular economy is based on three ideas: getting rid of waste and pollution, reusing materials and products, and making natural processes work again.

Focusing on these principles can help us rethink and redesign our future, giving us new ideas and views instead of staying stuck in the problems of the present. The current economic model has worked miracles, lifting billions out of poverty and promoting prosperity. However, there is skepticism around the long-term viability of this model, as evidence shows that we are destroying our planet at a breathtaking speed and scope.

In conclusion, the circular economy is a way to change direction, rethink the economic model, and prosper within the capacity of the planet.

The future of our economy is fueled by technological disruption, advances in smartphones, artificial intelligence, 3D printing, biomaterials, quantum computing, robotics, big data, automation, and new materials. These technologies will fundamentally redefine our ability to use resources and create prosperity. The question remains whether this disruption will be a good or bad one, helping us rehumanize society or dehumanizing it.

To make this a good disruption, three pillars need to be proposed: abundant clean energy, a cradle-to-cradle material bank, and a high-productivity regenerative system. Renewable energy technologies have outperformed expectations in terms of costs and volumes, making clean energy abundantly available to the economy. This would provide massive economic benefits, address environmental and health costs, and enable companies to redesign their products and redefine customer relationships.

A high-productivity regenerative system requires embedding all materials-in-use into high-performing systems that deliver mobility, built environments, and food. Higher utilization of resources through sharing, virtualization of activities, better integration of products into systems, and less wastefulness overall are huge economic opportunities. Technology has made this feasible for the first time, making it possible for the first time in five, seven, or soon, 10 billion years.

The speaker presents a vision of an economy that would be built on three pillars: the mobility system, the housing system, and the food system. These systems collectively account for more than 60% of consumer spending and over 80% of resource use in Europe. The current mobility system is highly wasteful, with the risk of attracting more people into car ownership and clogging up cities and motorways.

The alternative to a mobility system where cars are utilized at 2% is a well-planned, fleet-managed, integrated, shared transport system. This system would monitor traffic, predict demand ahead of time, manage vehicle servicing and charging, and allow predictive maintenance. This would improve the availability of mobility and provide it at a significantly lower cost.

The global food system needs a significant redesign due to challenges such as soil loss, water obstruction, massive nutrient leakage into rivers, lakes, and oceans, and a huge amount of waste. The speaker suggests adopting regenerative farming practices, adopting no-tillage practices, precision-farming practices, rotating crops, and reducing 31% of food waste.

The housing sector offers the potential for adopting smarter system-level approaches, such as building construction more cheaply and at higher performance than currently done. Offices and hospitality locations offer enormous sharing opportunities, as seen in Airbnb's success. Urban planning is back, allowing us to recover space lost to other uses, particularly mobility, which typically takes up 50% of our cities.

A better-planned urban environment would allow us to introduce urban agriculture, garden farming, and better, more healthy materials. System-level changes in mobility, built environment, and food system are starting to dovetail in a way that is creating better economic and social outcomes.

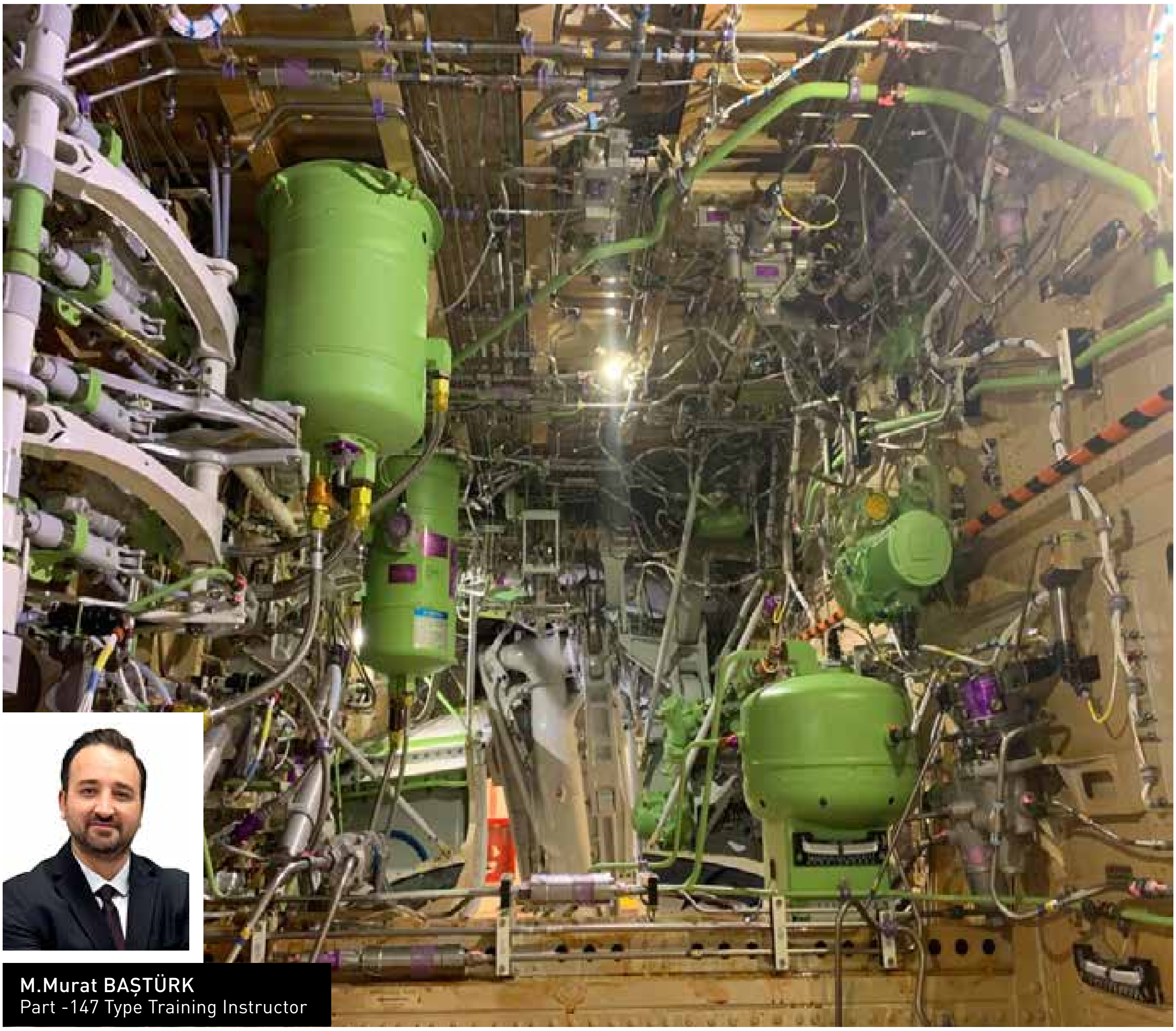
In conclusion, these three systems represent huge positive changes to our lives, economy, and environment. It will be an era of creative destruction, fundamental redesign, testing orthodoxies, experimentation, and redistribution of value between different actors. Leadership, not management, is needed to grasp this opportunity. The speaker concludes by highlighting the problems created by the linear model and proposing solutions.

So what will be in our MROs?
Closed-loop maintenance will be crucial for minimizing aircraft downtime and advancing sustainability in the aviation sector. It reduces costs by curbing unnecessary production and reliance on recycled and secondary parts. MRO procurement within a closed-loop supply chain with centralized inventory management helps minimize inventory costs and optimize spare parts life cycles. Maintenance and refueling operations generate hazardous wastes, including fuel oil, electronic waste, batteries, grease, and oil. MRO units can achieve sustainability by reducing energy consumption and emissions while operating. Airlines will be incorporating circular economy principles (such as bio-based fuels and reducing fleet weight).

PERFORMANCE INDICATORS OF MAINTENANCE ACTIVITIES ON MRO

(MAINTENANCE, REPAIR, AND OVERHAUL) ORGANIZATIONS

Numerous subsystems and components are integrated into commercial aircraft systems. Distinct reliability attributes and probability distributions that dictate their failure rates are present in every one of these systems.



M.Murat BAŞTÜRK
Part -147 Type Training Instructor

The arrangement of each component is determined by the aircraft's structural design and available space. What makes an airplane maintainable depends on its accessibility, dependability, and snag diagnostic capability. The purpose of these performance measurement indices is to assist aviation sector in implementing process enhancements to attain the highest flight and maintenance safety records, enhance aircraft operational availability, and minimize expenses.

An aircraft's flights are all quite expensive. The aircraft and component's residual life decreases with each flight hour recorded. An aircraft's downtime results in lost revenue and decreased readiness for operations. Reduced downtime and enhanced productivity are largely dependent on a strong maintenance, repair, and overhaul (MRO) philosophy. Since maintenance (M), repair (R), and overhaul (O) are three distinct operations, it might not be possible to apply the same performance indicators for all three. As a result,

various strategies must be used to measure M, R, and O's performance

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Maintenance : The purpose of maintenance is prevention. Activities are completed in accordance with the maintenance, repair, and overhaul performance indicators with specified schedules and periodically. Predictive maintenance is occasionally performed in addition, depending on condition monitoring data. It is anticipated that following the planned maintenance, the system will continue to function and be accessible until the interval between the following equivalent scheduled maintenance. If the system breaks down before the next planned maintenance, it is necessary to determine if the malfunction was caused by poor maintenance or was random in nature. The decision-maker would be helped by statistical analysis of the failure rates and the cause(s) of the failure to reassess the maintenance schedule and/or implement reliability enhancement initiatives.

Repair: The nature of repair is remedial. When diagnosing a failure, condition monitoring data, symptoms, and pilot/crew observations are taken into account. Depending on the extent, the defective part is either replaced or fixed. The entire system is put through a serviceability test. The causes of the system's failure must be determined if it malfunctions before the next planned maintenance appointment. In light of this, the restoration/repair process could be examined.

Overhaul: A thorough inspection of all parts and subsystems is known as an overhaul, which combines predictive, corrective, and preventative maintenance. The overhaul is carried out in an industrial setting. A facility of this type could be military, civilian, or both. Aircraft, component, and equipment overhaul, repair, and modification are all included in standard depot-level maintenance. A few elements that affect an overhaul's performance are how long it takes to complete the D level inspection and repairs, how much work is done, how well the systems are restored to their original state, and how long the guaranteed period of failure-free operation lasts.

Maintenance performance indicators, or MPIs, are used to assess how well maintenance is done. A single measurement or the result of multiple measurements (metrics) is an indication. A measure that may produce a quantitative value to represent the degree of performance while accounting for one or more factors is called a performance indicator. Maintenance performance indicators (AMPIs) can be used to track staff performance, customer satisfaction, productivity, financial reports, OEE (overall equipment effectiveness),

RAM (reliability, availability, and maintainability), and more. It's critical to consider the relationship between MPIs and process outputs and inputs when developing them. When done correctly, MPIs can monitor employee performance, offer or point out areas for benchmarking, and support decision-making for improving overall maintenance efficiency.

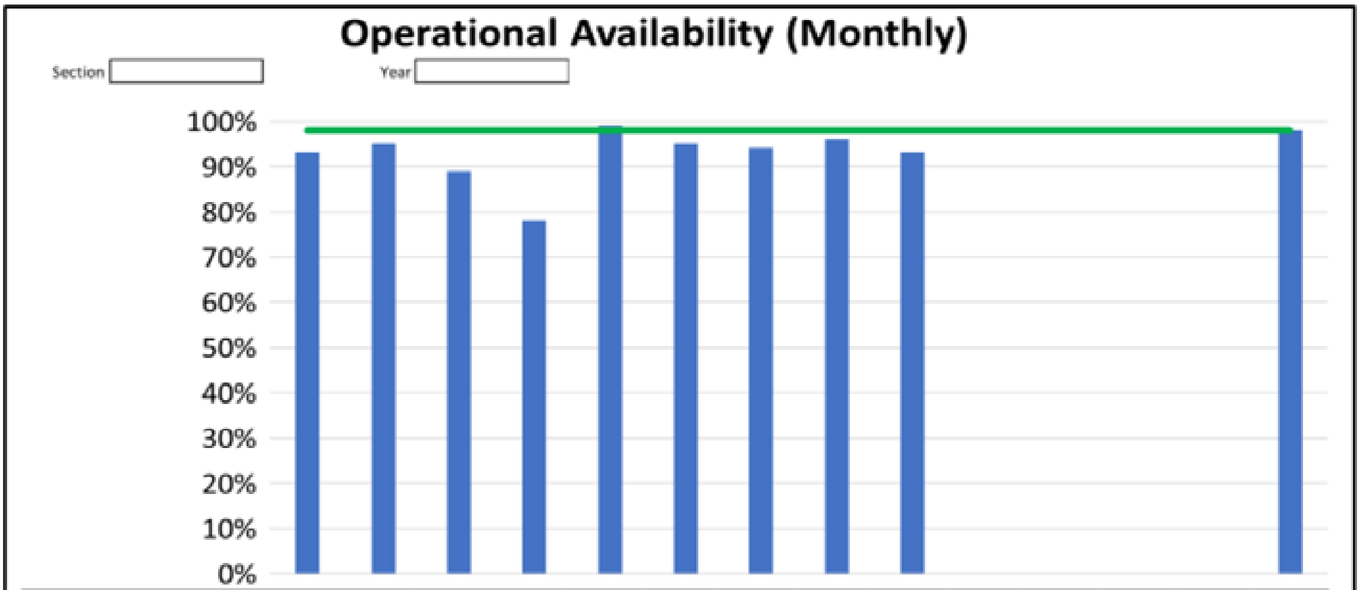
In civil aviation, a variety of MPIs are employed and extensively documented in publications and reference materials related to civil aviation. A commercial airline's financial situation is thought to be a reliable predictor of the health of the aircraft since it takes into account all relevant factors, such as operating, maintenance, and administrative expenditures; losses brought on by subpar maintenance and management; and losses from accidents or incidents, among others. The following indexes can be used for metrics.

Operational Availability Index or Serviceability Index: The percentage derived from the ratio of the total number of days that each aircraft is serviceable to the total number of days that each aircraft should have been serviceable is known as the operational availability index or serviceability index for a given time. Utilizing this index instead of real net serviceability is helpful since it would reflect true operational availability and serve as a gauge for maintenance effectiveness. The serviceability index is unaffected by aircraft that are grounded for lack of spare parts and those that are undergoing routine maintenance.

Aircraft Uptime: Aircraft uptime is the measure of availability of individual aircraft. Before the measurement/assessment period begins, the maintenance managers can be given the goal aircraft uptime. The uptime attained within the limitations and with the resources at hand would be a gauge of the effectiveness of the maintenance.

Index of Failures Occured by Inadequate Preventive Maintenance: Index of Failures Owing to Inadequate Preventive Maintenance The ratio of the total number of breakdowns to the number of breakdowns that should have been prevented is the index for breakdowns brought on by inadequate preventive maintenance. Mechanical component failure is thought to follow a normal or Weibul distribution. Therefore, unless there is an undetected material failure, the likelihood of early failure of well-maintained mechanical components is relatively low. It is anticipated that avionics would fail in an exponential or log-normal fashion. By offering a steady internal and external power supply, safe electrical harnesses, stable conductivity, grounding, and other measures, avionics lifespan can be increased.

Workplace Achievement Index: The ratio of the total number of work packages for the task to the number of work packages that are not completed is known as the work accomplishment index. The endeavor of the maintenance managers should be to minimize the number of WPs not carried out.



Month	Prev. Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Target
Max Operation Time (h)	3375	270	243	283.5	270	270	256.5	283.5	270					3375
Actual Operation Time	3138.75	256.5	216.27	221.13	267.3	256.5	241.11	272.16	251.1	0	0	0	0	3307.5
Stoppage	236.25	13.5	26.73	62.37	2.7	13.5	15.39	11.34	18.9					67.5
Operational Availability (%)	93%	95%	89%	78%	99%	95%	94%	96%	93%					98%

Efficiency of Fault Diagnosis: It is suggested that the effectiveness of fault diagnosis be assessed by contrasting the time required to identify and fix the issue with the typical time required to fix the same or such obstacles in the past. In order to reduce this time as much as possible, a signal to noise ratio analysis is performed for smaller, more important data, and the improvement is determined.

The maintenance managers are in charge of making sure the aircraft is as available as possible. Time-bound completion of the scheduled preventive maintenance tasks and staggered aircraft use can maximize the arising scheduled maintenance. The effectiveness of maintenance would dictate the aircraft system's trouble-free functioning until the subsequent maintenance cycle. The quality requirements during maintenance, the dependability of systems following repair, the efficiency of maintenance, downtime minimization, and the enhancement of aircraft operational availability are all covered by these indicators. In aircraft operating facilities, a well-established maintenance control center (MCC) with integrated planning, direction and control, and data processing cells is in place. These centers keep a close eye on every aircraft's availability, usage, and stagger. The MCCs are able to quantify and analyze the time index, equipment uptime, and serviceability index. Work accomplishment index and the index for breakdowns brought on by inadequate preventive maintenance are to be calculated by independent quality assurance cells equipped with failure modes, effects, and criticality analysis capabilities. Based on statistical and ERP data analysis, the MCC can determine the efficiency of defect diagnosis.

In conclusion, maintaining an aircraft is a challenging task. Even with sophisticated condition monitoring and testing equipment and a well-functioning built-in test (BIT) facility within the aircraft, prognostic and predictive maintenance diagnosis and corrective maintenance diagnosis remain challenging. Aircraft dependability, accessibility, diagnostic capability, and maintenance ease all contribute to maintaining airworthiness and minimizing downtime. Aircraft maintenance managers are supposed to use the performance measurement indices to implement process improvements that will lead to the best flight and maintenance safety records, increase operational availability, and save money. It was believed that all ground and test equipment needed for maintenance was there, as well as that the maintenance crew's credentials and skill levels were sufficient. But in real-world situations, these variables' differences actually matter a lot when it comes to how well maintenance is done.

CHINA'S FIRST INDIGENOUS AIRPLANE: C919

China's first domestic aircraft, the C919, which is considered a sign of China's increasing technological power, is expected to play a significant role in the country's economic development. The C919 stands out for its low carbon emissions and fuel efficiency.

Zülal ÇELİK

In this article, we will explore the significance of fuel efficiency and how the C919 could compete with other narrow-body passenger aircrafts in the category, namely Airbus and Boeing planes.

As you know, airplanes operate with petroleum-based fuels known as 'kerosene' and, of course, this reliance on petroleum-based fuels is a crucial issue for the development and sustainability of aviation because petroleum is a depleting fuel source. Therefore, as it begins to deplete, its price will increase. The second aspect is that when consuming petroleum-based fuels, considering the harmful gas emissions from the aircraft's engine and exhaust, it has a significant impact of emitting dangerous greenhouse gases into the environment. This situation contributes substantially to global warming and has a negative effect on climate change. The aviation industry contribution to the global carbon emissions is around 2.5%. However, if nothing is done about this issue, carbon emissions from the aviation industry are expected to reach around 10% over the next 10 years. Therefore, using aircraft like the C919 in the aviation industry is becoming increasingly important.

A real environmental friend

The C919 is a narrow-body passenger aircraft with a seating capacity of up to 168 passengers. It has a maximum flight range of 5,555 kilometres. The aircraft is powered by two C919A engines developed by the China Commercial Aircraft Engine Company (COMAC), based on the CFM International LEAP-1C engine used in the Boeing 737 MAX.

As for technical specifications, the C919 has a length of 38.9 meters, a wingspan of 35.8 meters, a height of 11.95 meters, an empty weight of 45.7 tons, and a maximum payload capacity of 18.9 tons. It is classified as a Category C aircraft.

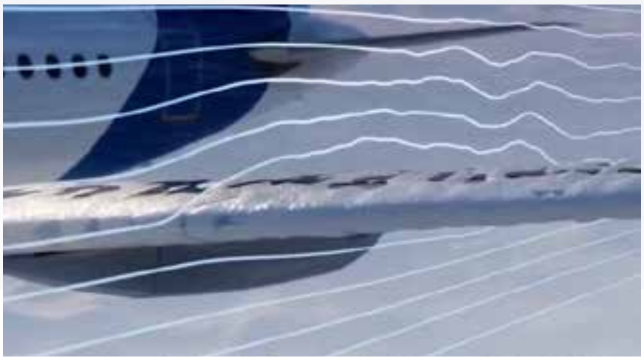
The C919 is equipped with a variety of features designed to enhance its efficiency and performance:

1- A new wing design for improved aerodynamics,

2- A new wing profile designed to reduce friction,

3- New engines for saving fuel,

4- Higher fuel efficiency with lower carbon emissions.



The features of the C919 are not limited to just these; Wu Guanghui, the chief designer of the aircraft, emphasized that they conducted more tests on this plane than all previous aircrafts, solely to ensure safety

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stating that. He stated, "In our aerodynamic design, we use a new system, saving fuel consumption, and making maintenance more affordable." He highlighted their adoption of an 'environmentally friendly' philosophy with their new aircraft.

While the C919 is equipped with cutting edge technology, it is a passenger aircraft. Therefore, ensuring passengers have a comfortable and pleasant journey is crucial for designers. In fact, the common issue of narrow middle seats found in other airplanes has been addressed in the C919. Passengers who typically complain about the narrower middle seat will not encounter such an issue in the C919 because the middle seat of the C919 has been specially expanded to alleviate this concern.

Developed for years to be the best
The project for the C919 was initiated back in 2007, and the first prototype was revealed in 2015. It made its maiden flight in 2017 and has since undergone comprehensive testing.
The aircraft received its certificate from the Civil Aviation Administration of China (CAAC) allowing for commercial operation. Here is a timeline of significant milestones in the development of the C919:

2007: COMAC started developing the C919.

2010: Introduction of the first C919 model.

2015: Launch of the first C919 prototype.

2017: Maiden flight test of the C919.

2020: C919 enters the flight test certification stage.

2022: C919 obtains the type certificate from the CAAC.

2023: C919 completes its first commercial flight.

So, how does the C919 stand out compared to its competitors aircraft in its class?

Since the launch of the C919 aircraft, it has distinguished itself through details such as enhancing passenger comfort in the cabin and extensive use of composite materials. However, the most significant factor is undoubtedly its fuel efficiency compared to other aircrfts in the same market, such as the Airbus A320 Family and Boeing 737 Family. In the narrow-body passenger aircraft market, there has been competition between Airbus and Boeing, and now a

third aircraft has been added to the mix, introducing new competition. COMAC have specifically emphasized fuel efficiency for the C919 to break the dominance of Airbus and Boeing in the market.

Expected orders
COMAC has received significant orders for the C919 from airlines around the globe. The first company to place an order was China Eastern Airlines, ordering 50 aircrafts. Other major company include Air China, China Southern Airlines, and Delta Air Lines. Some of the pending orders from key airlines are as follows:

China Eastern Airlines: 50 aircrafts

Air China: 30 aircrafts

China Southern Airlines: 20 aircrafts

Delta Air Lines: 10 aircrafts

The future of the Chinese aviation industry

The first commercial flight of the C919 is a significant milestone for the Chinese aviation industry. For the first time, China has developed and produced a large passenger jet with the capacity to compete with the world's leading aircraft manufacturers. The aircraft, considered a sign of China's increasing technological power, is expected to play a crucial role in the country's economic development. The entry into service of the C919 will help reduce China's dependence on foreign aircraft manufacturers, contribute to the creation of more job opportunities, and stimulate the Chinese economy. The success of the C919 could assist China in becoming a major player in the global aviation market.

The project to build Chinese planes is being financed by the country's Export-Import Bank, which made available $7.9 billion (7.2 billion euros).

The success of China's aircraft manufacturing program will depend on various factors, including support from non-Chinese carriers, its safety record, the efficiency of its aircrafts, and operational costs. The industry will also closely monitor subjective parameters such as passenger comfort and safety.

I would like to thank Muhammed Yılmaz for his contribution to the article.

PRESSURIZATION AND AIR CONDITIONING SYSTEM IN AIRPLANES

Nowadays, commercial passenger planes fly at very high altitudes. The main reason for this is that the most economical flying conditions are provided at these altitudes. Considering issues such as fuel consumption, engine efficiency, etc., most of the flight takes place at these high altitudes where steady-state rectilinear flight can be achieved. In addition, the highest altitude at which the aircraft can sustain flight is defined as the "flight ceiling" or "service ceiling". This altitude cannot be exceeded, and it is the maximum altitude that a commercial airplane is allowed to reach when flying.

PhD. Caner ŞENTÜRK
TAI Turkish Aerospace Industries
ITU Ari Teknokent
Structural Design Engineering Manager

The flight/service ceiling is an altitude where the thrust required is equal to the thrust available produced by the engines. Considering that aircraft fly at altitudes of 30,000 ft - 42,000 ft (approximately 9,000 - 12,802 m) during the normal cruise phase, at these altitudes:

- The air temperature is quite low (-56 C to - 60 C).
- The atmospheric pressure is quite low compared to sea level.
- Water at the top of a high mountain begins to boil faster than at sea level. The reason is that due to low atmospheric pressure, water molecules begin to bubble more quickly and easily as the pressure on them is less.
- The amount of oxygen is much less than at sea level.
- It is difficult to breathe in high mountains due to a lack of oxygen. In fact, in some places such as Peru, oxygen masks are distributed to tourists on touristic trips.

For these three reasons, it is not possible for people to live at these altitudes where airplanes fly. In order for passengers and crew to survive and not be affected by external environmental conditions, airplanes must be pressurized, there must be a system that constantly provides air inside the aircraft, and there must be an air conditioning system. The purpose of the air conditioning system is to provide the correct pressurization to

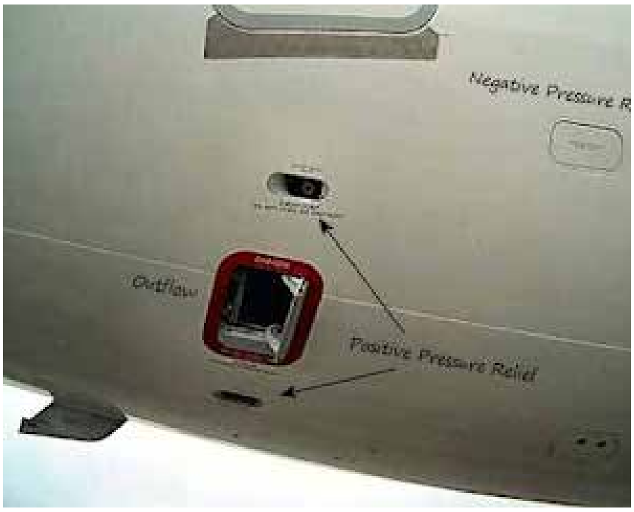
ensure life in the cabin and to ventilate the cabin to keep it within the desired temperature range.

There are two main reasons why air is supplied to the cabin. The first is the pressurization of the fuselage of the aircraft (because the pressure at high altitudes is quite low), and the second is air conditioning. It has been stated that an airplane makes steady-state rectilinear flight at altitudes of approximately 9,000-12,802 m (30-42 thousand feet). At this altitude, the air temperature is extremely low (around -56 to -60 degrees Celsius), the atmospheric pressure is quite low compared to sea level, and the amount of oxygen is also quite low. It is not possible for a person to live in these conditions. Sometimes we hear in the news about the deaths of people who hid in certain unpressurized areas of planes for asylum purposes, etc. The cause of death of a person in these unpressurized areas is the combination of all these negative factors. In other words, they cannot breathe due to a lack of oxygen, they freeze at temperatures as low as -60 degrees Celsius, and they experience internal bleeding because the atmospheric pressure is extremely low. In order to prevent all these undesirable situations, a large part of the aircraft fuselage is constantly pressurized. The passenger compartment, cockpit, cargo compartments, and avionics compartment are among the pressurized areas. There are also non-pressurized areas of the fuselage (landing gear compartment, radome, tail cone, etc.) where people in the example above may hide. We

There are two main reasons why air is supplied to the cabin. The first is the pressurization of the fuselage of the aircraft (because the pressure at high altitudes is quite low), and the second is air conditioning.

separate the pressurized and non-pressurized areas with pressure-resistant structures that we call "pressure bulkheads". We provide the pressurization process by supplying pressurized air to certain parts of the body mentioned above. (Of course, the planes mentioned here include planes used in commercial passenger transportation, small planes that are not pressurized, used for training purposes, etc.)

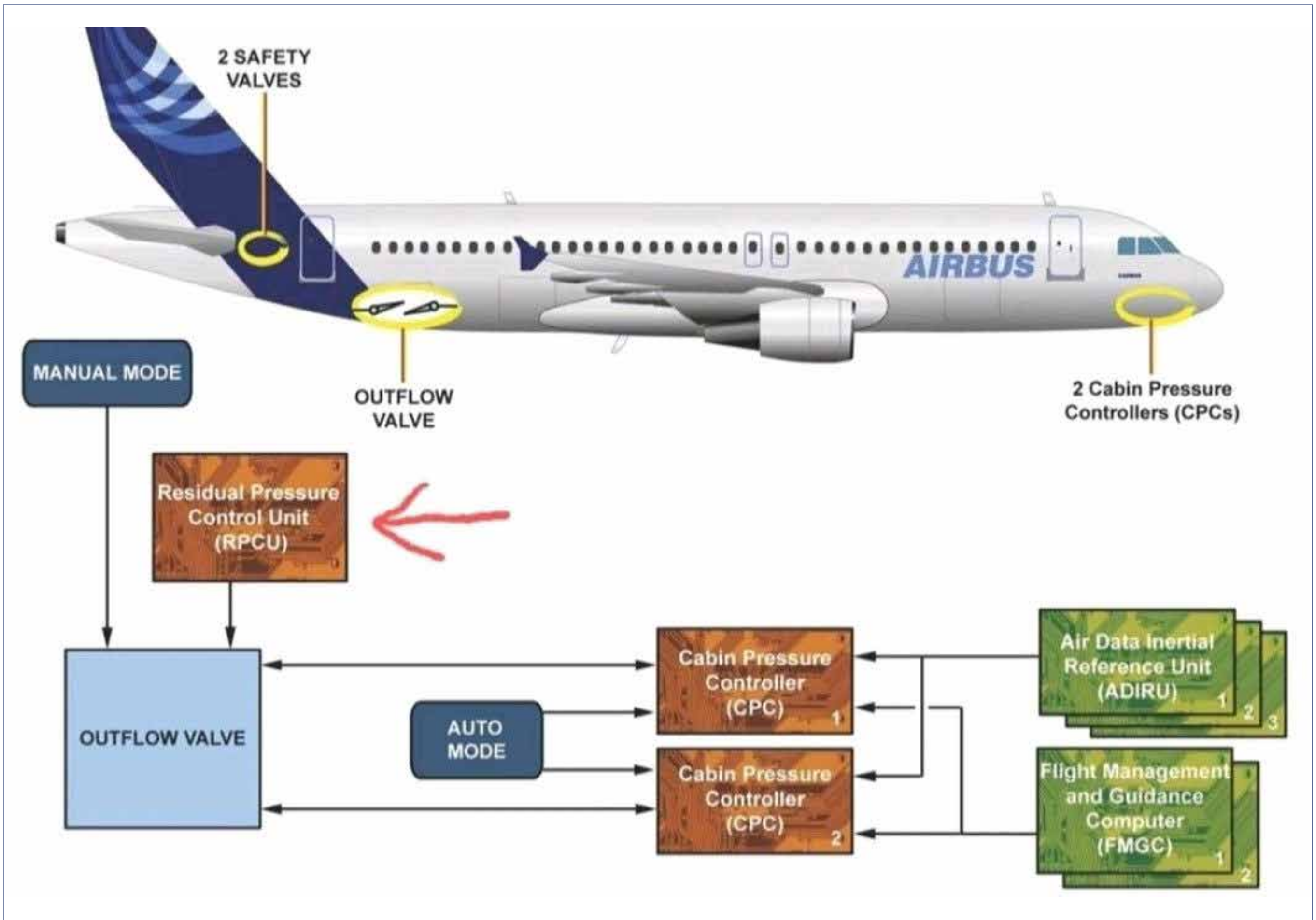
The second reason we provide air is for air conditioning. In other words, we provide conditioned air with the desired temperature, humidity rate, etc. to certain parts of the fuselage under specific conditions for that area. We can cool it when necessary, especially if the plane is parked on the ground on hot days, for the comfort of the passengers, and heat it when necessary. Airplanes are divided into various zones, and it is possible to control each zone separately in terms of temperature. For example, in the B747-400 aircraft, which is an old aircraft model, there are seven separate zones: A, B, C, D, E, U/D, F/D (U/D is the upper deck, and F/D is the flight deck). In an Airbus A320, there are three zones in



the aircraft. The number of zones varies depending on the aircraft model. Meanwhile, the section where the pilots are located, that is, the cockpit or flight compartment, is set to a lower temperature value than other sections. The reason for this is to prevent pilots from feeling complacent due to heat and to eliminate the heat emitted by too many electronic components. Another purpose of the ventilation process is to cool the heated electronic components and thus prevent fire and malfunctions. The majority of these avionic components are located in the avionics compartment of the aircraft, which we refer to as E&E (Electrical and Electronic equipment). This compartment is located just below the pilot's cockpit in most airplanes. Some planes even have access from the cockpit here. So how do we provide air to certain areas and the cabin of an aircraft, pressurize the related areas, and manage the air conditioning process? Where do we get the air from? How do we manage the processes of air supply, circulation, exhaustion, etc.? The fuselage of the aircraft consists of a semi-monocoque structure, which is a combination of reinforced stovepipes. What happens if we constantly send air to a stovepipe with a container at both ends? Let's try to answer these questions.

First of all, let's talk about the source of the air we use for pressurization and air conditioning purposes in the cabin. Where do we get this air from? At an altitude where the outdoor temperature is -56 to -60 degrees Celsius and the atmospheric pressure is extremely low, it is crucial to maintain a certain pressure value and temperature inside the aircraft in order to ensure the comfort, health, and safety of the passengers. While the most appropriate value for passengers is atmospheric pressure at sea level, it is generally not best for the aircraft structure to be pressurized at all, in order to avoid structural stresses. As an optimum solution, the pressure value at an altitude of 8,000 ft-2,450 m is generally suitable, and the cabin altitude is adjusted accordingly. The extremely cold and low-pressure air we obtain from the outside environment must be mixed with warmer, high-pressure air. This means that we provide cold and low-pressure air from outside the aircraft, at the altitude where the aircraft is located (technically, there are systems such as packs in aircraft where we provide this outdoor air). We also obtain hot and pressurized air from the aircraft's engines (specifically, stages 3 to 10 of the engine's compressor). The cold and low-pressure air provided from outside and the hot and high-pressure air provided by the aircraft's engines are mixed to bring them to the desired conditions (in what we call the mix manifold) and sent to the relevant areas of the aircraft. In summary, the process involves providing hot air from the pneumatic system, cooling it with cold air from the packs, adjusting it to the desired temperature, distributing it, and in this way, pressurizing the related areas. If we constantly pressurize a stove pipe that is closed at both ends and constantly send air into it, it will eventually disintegrate and explode, even if it is a durable, reinforced, semi-monocoque structure. The structure cannot withstand this pressure. We may wonder: how can we prevent structural damage in a structure that we constantly pressurize? To prevent structural damage in the aircraft structure and regulate the pressure in the cabin according to the altitude, there are components called outflow valves located under the fuselage of the aircraft, at the rear of the aircraft. These valves act like a valve or tap, opening and closing as necessary (depending on the altitude of the aircraft), transferring the pressure in the fuselage to the outside, regulating the pressure in the cabin, and discharging some of the used air in the cabin.

As I mentioned earlier, some of the conditioned air supplied into the cabin is discharged into the atmosphere after it is used, while the other large amount is returned to be mixed with new hot and pressurized air from the engines and new cold and low-pressure air from the packs (in areas we call mix manifolds). One might ask, "Why don't we throw all of



the used air into the atmosphere and constantly use a new air mixture?" The answer is that the primary function of the engines is to provide the reaction/thrust that moves the aircraft. It is not efficient or effective to use the compressed air needed by the engines for continuous side functions that would weaken this primary function. Therefore, after some of the air used in the cabin is discharged into the atmosphere, the other large portion is sent back to the relevant area (mixing zone) to be mixed with the new source. We call this process "recirculation", which is achieved through fans called recirculation fans. These fans suck the used air in the cabin and send it to the mixing area. It is important to note the structure of the used air at this point. We do not pay much attention to the content of the used air that is discharged into the atmosphere through the outflow valves because we discard this air. What is important to us is the structure of the used air that is sent to the mixing zone to be mixed with new air sources for reuse. This used air, which will be remixed with the fresh, clean mixture provided from outside and from the engines, must undergo a filtering process before it reaches the mixing place. At this point, a filtering process is carried out before the used air in the cabin returns to the mixing place. Let me explain this filtering process in more detail, especially in light of recent virus outbreaks and pandemics. There are filters called HEPA filters that are designed to remove all kinds of viruses and other unwanted structures and particles from the air used in the cabin. Air conditioning and pressurization systems are very complex and enormous systems that involve a lot of detail. In each section, the air sent from the top leaves the cabin through the dado panels on the seat edges within 2-3 minutes.

In summary, we filter the used and returned air to be mixed with the new source and purify it from all kinds of unwanted particles and viruses before mixing it with the new source. These filters are also known as HEPA filters, which is an English abbreviation for "High Efficiency Particulate Air/Arrestors". In the most general sense, HEPA filters are filters that can capture almost 100% of particles with a size of 0.3 microns. Tests have shown that they can even capture viruses in the 0.1 micron range, making these filters highly reliable. Today's aircraft manufacturers use HEPA filters that are certified by both the aircraft and filter manufacturers in their new generation aircraft. The HEPA filters used in aircraft are capable of retaining even viruses as small as 0.01 to 0.2 microns, as specified in the documents provided by the aircraft manufacturer. These HEPA filters are also used in planes operated by airline companies, and their periodic changes are carried out at intervals determined by the aircraft and filter manufacturers.

BOOM'S XB-1 SUPERSONIC DEMONSTRATOR MAKES FIRST FLIGHT

On March 22nd, Boom Supersonic successfully completed the first flight of its XB-1 demonstrator aircraft at the Mojave Air & Space Port in California. This marks a significant milestone for Boom's development of the Overture, a planned Mach 1.7 commercial airliner expected to take flight later this decade. The XB-1 is designed to undergo a short test program with at least three supersonic flights.

The 71-foot-long, delta-winged XB-1 is powered by three afterburning General Electric J85 engines. Piloted by Boom's chief test pilot Bill "Doc" Shoemaker, the aircraft took off around 7:28 AM Pacific Time and reached an altitude of 7,120 feet. The 12-minute flight focused on assessing the aircraft's handling characteristics at various angles of attack, reaching up to 14 degrees. Shoemaker flew a circuit over California City and North Edwards before landing back at Mojave at 7:40 AM.

While the landing gear remained extended throughout the flight, this marked the culmination of months of preparation, including high-speed taxi tests reaching speeds of 140 knots – just below the planned rotation speed for the first flight. Boom founder and CEO Blake Scholl emphasizes that the initial flight's primary objective was to practice a successful landing. He highlights the XB-1's role in pioneering key technologies for the Overture, without the need for full FAA certification standards which could hinder the experimental program.

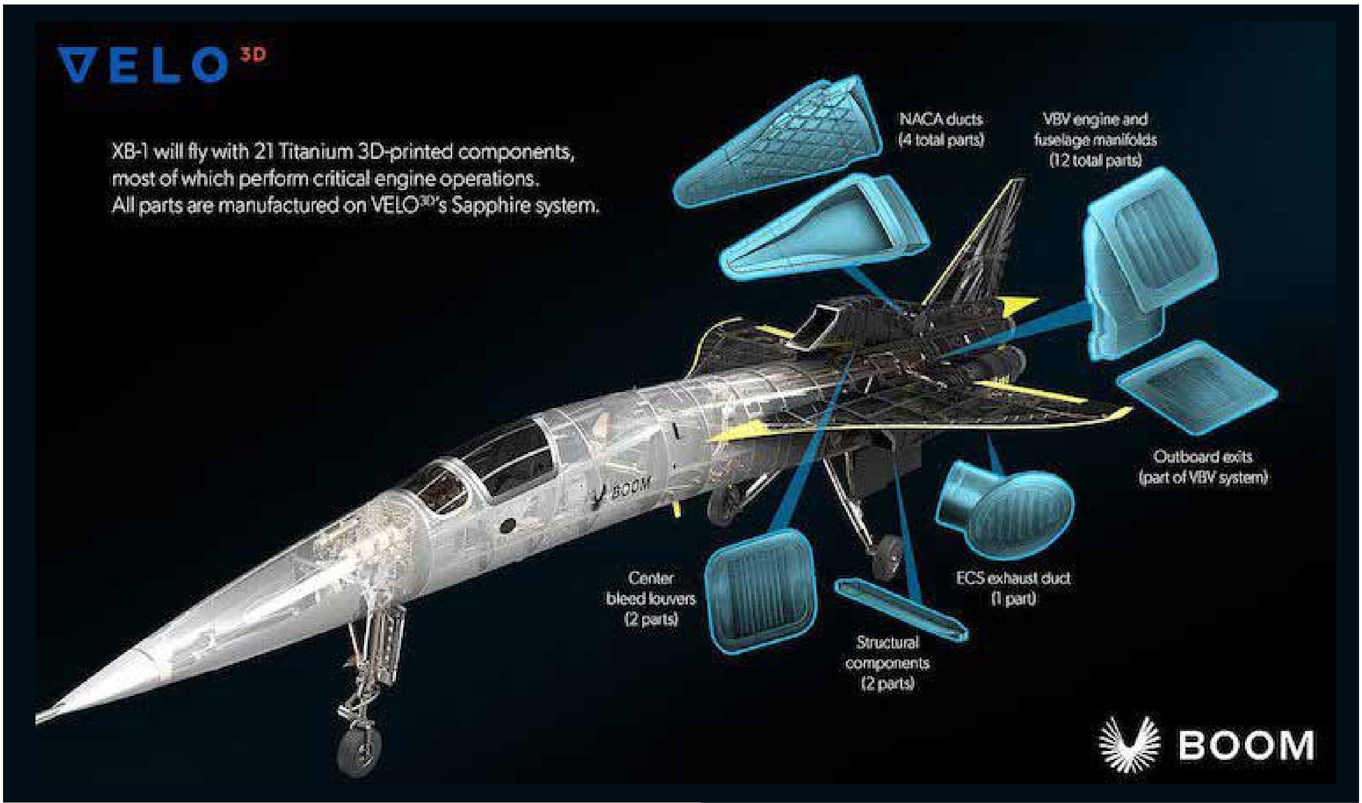
Beyond demonstrating the feasibility of a supersonic test program, the XB-1 serves as a crucial stepping stone for the Overture. It allows Boom to gain valuable experience in aircraft and system design, engineering software, digital modeling, safety management, and production methods. This remains significant despite Boom's 2022 announcement of a complete redesign for the Overture airliner, transitioning from a delta-wing trijet to a four-engine, cranked-arrow configuration.

The XB-1's high angle of attack during approach necessitated guidance from a U.S. Navy-style Landing Signals Officer (LSO) on the ground. Traditionally used on aircraft carriers, the LSO provides visual and radio instructions to ensure safe landings. Boom test pilot Tristan "Geppetto" Brandenburg, slated to fly the first supersonic test mission in the XB-1, explains their training for such scenarios. They practiced landings in F-5 and T-38 jets from the backseat, minimizing visual cues and relying solely on instruments and LSO instructions. Both Shoemaker and Brandenburg, graduates of the U.S. Naval Test Pilot School, possess extensive experience in carrier-based operations, making them well-suited for handling the XB-1's unique landing profile.

Saab, GKN Contracted For Future Swedish Fighter Studies

Saab and GKN Aerospace have secured important contracts to lay the groundwork for a potential new European fighter jet program. These contracts, signed on March 22nd, will see both companies engaged in separate studies over the next two years (until the end of 2025).

The Swedish defense procurement agency, FMV, has tasked Saab with exploring technologies and development strategies for a future combat aircraft. This project, named "Vägval stridsflyg" (meaning "choice of path for combat aircraft" in Swedish), aims to determine if Sweden should pursue a next-generation fighter by 2030. This follows Sweden's decision last July to initiate a concept phase for its future combat aircraft needs.



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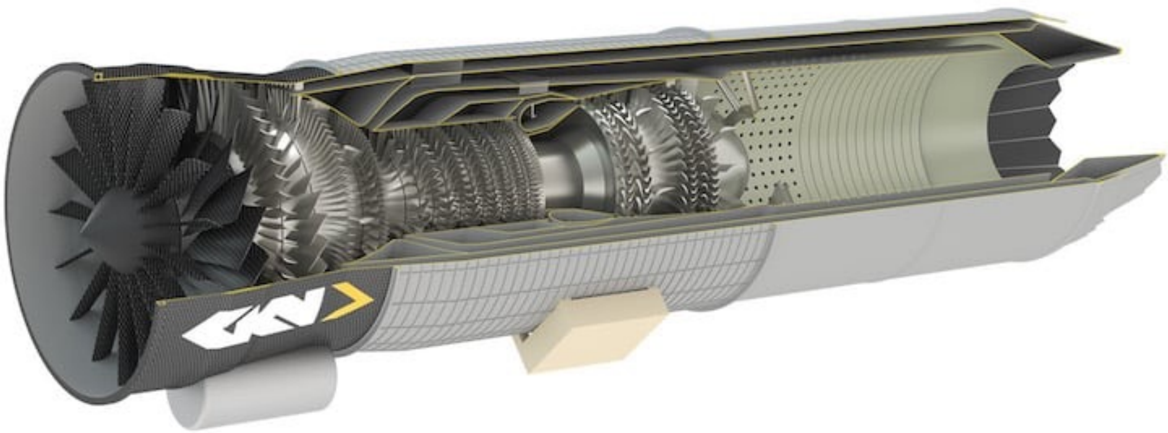
FMV highlights the importance of these studies in making informed decisions about future fighter jet technology and procurement methods. Lars Helmrich, FMV's director of air and space systems, emphasizes the long lead times involved in developing such aircraft and the need for early industry involvement. This project is seen as crucial for Sweden to maintain its capability to design and build advanced fighter jets.

Saab's Gripen aircraft are known for their affordability and ease of use, making them suitable for Sweden's dispersed basing strategy. FMV has already begun laying the groundwork for this program, including initial studies and industry contract negotiations, prior to the official signing of these contracts. Saab intends to explore both manned and unmanned options for this future fighter, while continuing to upgrade existing Gripen models and deliver the Gripen E to Brazil and Sweden.

GKN Aerospace, the engine supplier for the Gripen family, will focus on researching advanced propulsion systems for the potential new fighter. Saab and GKN have signed a new cooperation agreement to facilitate this joint effort.

"This contract will enable us to further strengthen our capability and support our customers with necessary data for future combat air capabilities," says Stefan Oscarsson, vice president of GKN's governmental solutions business.



Bordais even went as far as to suggest that UATM sales might be Eve's initial source of revenue, potentially even preceding sales of their eVTOL aircraft. "Air traffic management is a critical piece of the puzzle," Bordais said. "We need to scale UAM using existing infrastructure as much as possible.

Sweden had previously been linked to the UK-led Tempest Future Combat Air System, which has ultimately evolved into the Global Combat Air Program with Italy and Japan, but those efforts have different timelines than those of Sweden—and will also produce a platform likely too large and complex to fit around Sweden's doctrine of dispersed basing, even with Sweden now a member of NATO.

Eve Names UATM Solution 'Vector'; Deliveries Planned For 2026

Eve Air Mobility, a company spun off from Embraer and specializing in electric vertical takeoff and landing vehicles (eVTOL), has named its urban air traffic management (UATM) solution "Vector." This software is seen as a crucial element for enabling safe and dense operations of eVTOLs and drones in urban environments. Deliveries of Vector are expected to begin in 2026.

Eve is uniquely positioned as the only major air taxi manufacturer also developing a UATM solution. This vehicle-agnostic software, compatible with various eVTOL models, has already garnered 14 customers including fleet operators, vertiports, and air traffic management providers.

The benefits of Vector are twofold. It allows operators and vertiports to streamline their operations and resource allocation, while simultaneously empowering air traffic control and UAM service providers to optimize airspace usage for all participants in the network.

"Eve is committed to addressing air traffic management challenges to foster a safe and harmonized introduction and growth of the UAM market," stated Eve CEO Johann Bordais. "Vector will ensure smooth operation of advanced air mobility (AAM) from the very beginning, facilitating collaboration among all stakeholders to enhance safety, optimize performance, and maximize resource utilization."

Previously, Eve partnered with private jet company Flexjet to conduct a four-day simulation of the Vector solution at Flexjet's Tactical Control Center. The simulation, involving 18 flights across eight airports, highlighted the shortcomings of existing ATM systems in handling UAM operations. These shortcomings included a lack of integration between fleet management systems and vertiport operator systems.

In an interview with AAM Report, Eve CEO Johann Bordais emphasized the importance of designing Vector to be compatible with existing infrastructure. He believes that highly automated UATM systems will be essential for scaling up operations as eVTOLs and drones become more prevalent in urban areas.

Bordais even went as far as to suggest that UATM sales might be Eve's initial source of revenue, potentially even preceding sales of their eVTOL aircraft. "Air traffic management is a critical piece of the puzzle," Bordais said. "We need to scale UAM using existing infrastructure as much as possible. So, we're offering a solution that works within the current system. But as the number of these vehicles grows into the hundreds, a highly automated and comprehensive solution will be necessary, and that's what Vector represents."This news comes alongside Eve's plan to unveil its first full-scale eVTOL prototype in the second quarter of 2024, staying on track for type certification by 2026.

Gulf countries urged to fast-track production of sustainable aviation fuel

A United Arab Emirates official is urging Gulf countries to jump-start production of sustainable aviation fuel (SAF) to avoid dependence on Western suppliers and support their national airlines' environmental efforts.

The global scarcity of SAF makes it significantly more expensive (three to five times the cost) than traditional jet fuel, posing a challenge for securing enough fuel for long-distance flights. Maryam Al Balooshi, the UAE's lead negotiator for aviation climate change, highlights the limitations: "Even if Emirates airline, one of the world's largest, bought all available SAF globally, it wouldn't be enough for their operations."

Balooshi emphasizes the urgency for regional production: "We can't rely on limited SAF production elsewhere. By 2030, the US and Europe are projected to be the top producers, leaving us without a domestic source. We need to ramp up production here to avoid market control by others, which would keep prices high."

The global SAF market is expected to experience significant growth, reaching an estimated $14.8 billion by 2032, up from $617 million in 2023. This growth is attributed to a compound annual growth rate exceeding 42%. North America currently leads the market due to rising air traffic and passenger volumes.

For airlines worldwide, sustainable jet fuel is considered a critical tool to achieve net-zero emissions by 2050. However, progress is hampered by limited supply and high costs, despite strong demand. SAF is typically produced from used cooking oil, animal fats, or other feedstocks. Additionally, synthetic production methods exist that capture carbon directly from the air.

According to the International Air Transport Association (IATA), representing over 80% of global air traffic, SAF has the potential to contribute nearly 65% of the emissions reduction needed for the aviation industry to reach net zero by 2050. While SAF only accounted for 0.02% of aviation fuel needs in 2023, the total cost of acquiring all available quantities amounted to roughly $1 billion, as reported by the airline lobby group.

In a positive development, a UN-led conference held in Dubai last November established a target for the global aviation sector: a 5% reduction in carbon emissions by 2030 through the use of SAF.

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SINGLE PILOT OPERATIONS IN THE AIRLINE INDUSTRY

Global air transport demand is climbing steadily, with global Revenue Passenger Kilometers (RPK) rising at an annual rate of 4% and passenger numbers growing at an average annual rate of 10.6%. By the end of 2016, 1,420 large commercial aircraft had been produced, 40.5% more than five years ago. As a result of this growth, the current global shortage of qualified pilots has increased further.

PhD. Cpt. Plt. M.Melih BAŞDEMİR

Introduction

It is predicted by the authorities that airline companies will have to hire more than 500,000 new commercial pilots by 2034 to meet this unprecedented air transportation demand. Additionally, the high costs associated with training and personnel benefits of pilots have placed a significant economic burden on airline companies and led to active exploration of the Single-Pilot Flight (SPO) concept as an option for the future evolution of commercial aircraft. SPO cockpits have been developed for commercial General Aviation aircraft as well as military aircraft in current aviation operations. Commercial aircraft such as the Cessna Citation I have received approval for SPO from the FAA. At the same time, the aviation industry has shown great interest in the application of SPO in General Aviation in the last decade, and in parallel, NASA has accelerated its SPO studies since the mid-2000s.

In the SPO flight operation concept, as shown in Figure 1, a single pilot performs cockpit duties and flight operations with support from a dedicated Ground Control Flight (GCU) team.

GCU operators take on a role similar to that of the UAV operator, providing strategic and tactical support to the single pilot during flight in cooperation with Air Traffic Controllers (ATC). Figure 1 summarizes crew requirements and interactions in two-pilot, single-pilot, and RPAS operations.

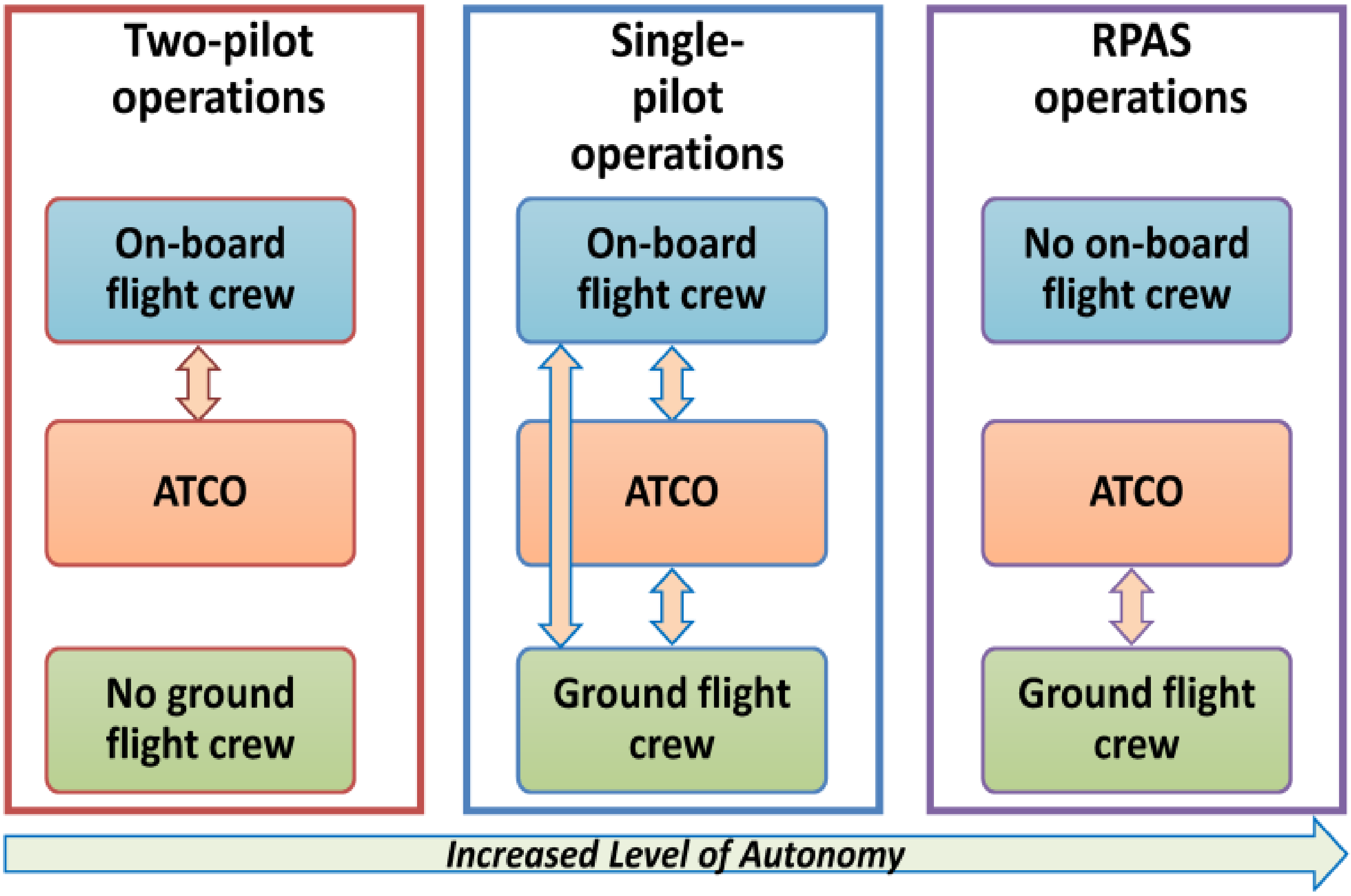

Figure 1: Crew Planning Requirements For 2 Pilot, Single Pilot and RPAS Operations

2. Current Two-Pilot Operations

In the 1950s, any commercial aircraft required a five-person flight crew. However, technological advances have allowed for a gradual reduction of the flight crew in the cockpit. Currently, a two-person cabin crew consisting of the Pilot Flying (PF) and the Pilot Observing (PM) is responsible for all phases of the aircraft from takeoff to landing. These two pilots perform the duties of radio operators, navigators and flight engineers in Figure 2, with automatic systems on the aircraft, today with the "glass cockpit" concept and improved automation.

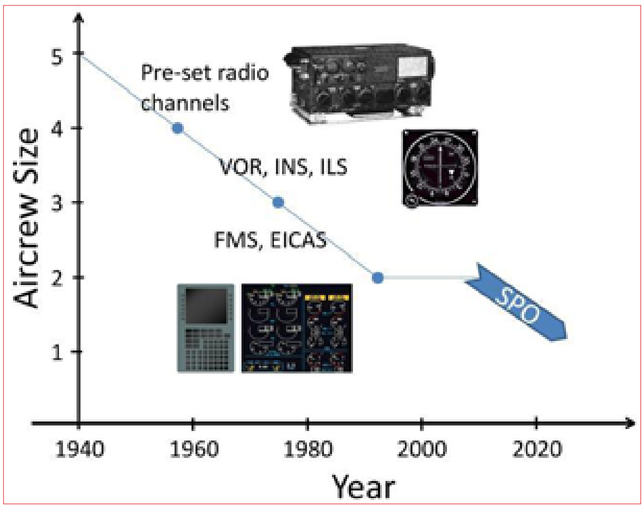

Figure 2: Transition to SPO

It is predicted by the authorities that airline companies will have to hire more than 500,000 new commercial pilots by 2034 to meet this unprecedented air transportation demand. Additionally, the high costs associated with training and personnel benefits of pilots have placed a significant economic burden on airline companies and led to active exploration of the Single-Pilot Flight (SPO) concept as an option for the future evolution of commercial aircraft.

Because of this transition, now almost all the commercial fligths are operated with 2 pilots in the cocpit, however the airline industry and pilot shortage issues demand SPO, immediately. Fort hat reason in the coming 10 years or so we will be witnessing this another transition from 2 pilot to 1 (single) pilot in the cockpit.

3. Single Pilot Flight (SPO):

The Australian Civil Aviation Safety Regulations (CASR) define SPO as the operation of an aircraft by a single pilot in the cockpit (CASR 1998-REG 61.010). In this context, the pilot assumes a supervisory role by monitoring automated systems and coordinating various tasks with

the ground crew. Due to increased autonomy in aircraft, Human-Machine Teaming (HMT) is identified as a critical issue. Aircraft that will be designed in accordance with this definition must also be addressed through human-centered system design. Accordingly, the basic ergonomic elements to be considered in system design should include:

- Ease of learning and remembering basic functions;
- Efficiency and intuitiveness of using automatic functions;
- Preventing/reducing pilot-related errors.
- The main challenges in implementing SPO Operations are:
- Operational: Distribution of workload between the pilot in the cockpit and the ground crew, single pilot resource management, communication procedures and processes, and pilot/crew training requirements.
- Technical: As Datalink;
    - High bandwidth,
    - Low latency communications (line-of-sight and beyond-line-of-sight data links for air-to-air, air-to-ground and ground-to-ground systems),
    - Autonomous navigation (flight planning, management, negotiation and verification), autonomous surveillance (detection and avoidance, monitoring the pilot's level of consciousness),
    - Development of adaptive automation and interfaces for pilot/ground crew.
- Safety: Increasing system integrity and performance, as well as assessing the impact of higher levels of automation on flight safety and determining unconsciousness-incapacitation procedures.
- Human factors: Assessment of pilot workload, handling of single pilot loss of consciousness, maintaining pilot and ground operator situational awareness, developing new Crew Resource Management (CRM) procedures for interactions between pilot and ground operator, establishing automation confidence, as well as design Establishing the appropriate human-machine relationship is among the main human factor topics in SPO operations.

In order to address these problems, projects such as Advanced Cockpit for Reduction of Stress and Workload (ACROSS) and Aircrew Labor In-Cockpit Automation System (ALIAS) have been implemented

by SPO. It has brought together academic, industrial and public organizations to develop solutions for the obstacles to implementation.

Reducing workload in the cockpit – proposed systems include cognitive and adaptive interfaces as well as knowledge-based capabilities to alleviate increased pilot workload. These are relatively new concepts in civil aviation but are necessary for the introduction of SPO. System architecture for a certifiable Virtual Pilot Assistant (VPA) to enable the implementation of SPO for 3 commercial aircraft, taking into account both the SPO operation concept and the evolving regulatory framework for conventional, general aviation and unmanned operations It has been suggested. SPY is an information-based system that reduces the workload of the single pilot in the cockpit through increased system autonomy and closer cooperation with the ground component. An increased operational efficiency and safety with SPY will provide a clear path to certification of single-pilot aircraft for commercial aviation.

4. Conclusion:

In recent years, there has been great interest in the application of SPO for small and medium-sized commercial aircraft. These aircraft, which today make up approximately 80% of the global commercial aircraft fleet, have a lower passenger-to-crew ratio and therefore incur more significant crew costs compared to wide-body aircraft. Cargo aircraft, in particular, may be a suitable testing environment for the initial implementation phase due to public perception of the risks associated with traveling in single-pilot aircraft. The risks and challenges associated with the implementation process in Table 1 in the context of a wide range of airport and air traffic environments should be carefully evaluated.

Risk	Transition	Risk Class
Reliability of non-mature technology	There are already solutions in business jet market (e.g., Embraer Phenom 300)	Medium
Safety issues (physical and cyber)	Automation may provide higher levels of safety (reduced human error)	Medium
Public opinion: acceptance of flying with only one pilot	Progressive implementation	High to medium
Cost and difficulty of airworthiness certification	Moderate compared to RPAS and potentially serving as a transition case	High to Medium
Overload of the pilot	Higher level of automation will contribute to decrease the pilot's workload	Medium
Cost of implementation (training and avionics)	Economic efficiency (same number of pilots can fly more aircraft)	Low

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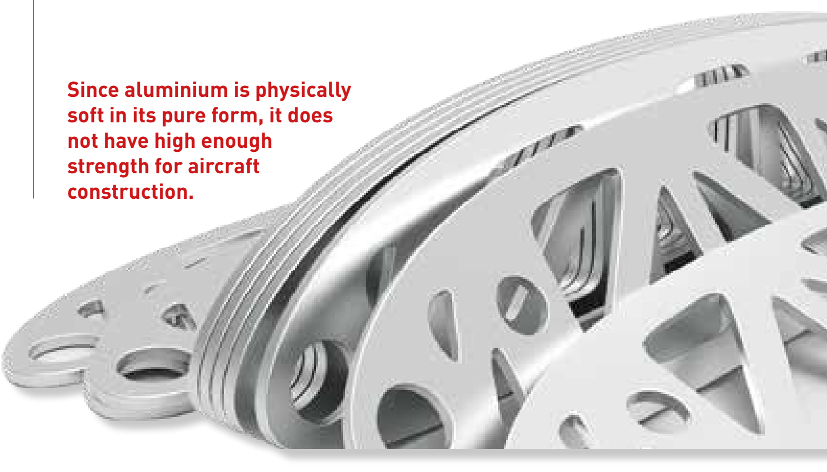
ALUMINIUM ALLOYS USED IN AVIATION

Although the use of composite materials has recently increased in aircraft, 50 - 60 percent aluminium is still used. Aluminium is used extensively in aircraft fuselage, general structural elements, and durable and highly corrosion-resistant compartments.

Aluminium, a ductile metal, is located in group 3A of the periodic table and its atomic number is 13. Aluminium, a +3 valence element with an atomic weight of 26.89, has a density of 2.7 g/cm at 20°C, a melting point of 659.8°C, a boiling point of 2450°C, a heating temperature of 0.224 Cal/gr (at 1000C), a melting temperature of 400 Cal/gr, an electrical conductivity of 65 percent of copper at 20°C, a thermal conductivity of 0.5, a light reflectivity of 90 percent, and these properties can be changed to a great extent by adding alloying elements.

It is generally found in nature as bauxite ore (Al2O3) and has superior oxidation resistance. Aluminium, one of the youngest members of the global metal world, which is classified as light metal due to its technical properties and the development of technology, is widely used in many fields of industry. The ratio of aluminium's strength to its weight (specific strength property) is very large, soft and weighs one-third of steel. As a result of alloying by adding alloying elements and increasing its mechanical properties comparable to steel, aluminium alloys have increased its usage area. Due to their low density and high mechanical properties, their use is rapidly increasing in many important production areas such as medicine, construction, food, automotive, aerospace and defence industries.

Since aluminium is physically soft in its pure form, it does not have high enough strength for aircraft construction.



Aluminium alloys are numbered with a 4-digit system. The first number symbolises the main alloying element. The second number indicates the number of modifications of the alloy. If the second digit is 0, this means that there are no modifications. The last two digits indicate the alloy designer.

In industrial applications, the mechanical properties of aluminium alloys are increased by heat treatment processes and their usage area is expanding. Heat treatment generally includes heating and cooling processes applied to metallic materials to change their mechanical properties. For this purpose, heat treatments such as annealing, solution treatment and ageing are applied to aluminium alloys.

1XXX, 3XXX, 4XXX and 5XXX series wrought Aluminium alloys are non-heat treatable alloys. These alloys can only be hardened by strain hardening.

2XXX, 6XXX, 7XXX and 8XXX series alloys can be hardened by heat treatment.

Alloys formed by combining aluminium with different materials are used in a wide range of aircraft main structures and many parts. There are many reasons why Aluminium is preferred in aircraft structural parts. Aluminium's light weight, corrosion resistance in the atmosphere, heat and electrical conductivity and easy production are the most important reasons for its preference.

Aluminium alloys have increased the area of use. Due to their low density and high mechanical properties, their use is rapidly increasing in many important production areas such as medicine, construction, food, automotive, aviation, space and defense industries.

Since Aluminium is physically soft in its pure form, it does not have high enough strength for aircraft construction. Through the impurities remaining in the aluminium obtained for commercial purposes, this material gains some hardness strength as a result of mechanical processing.

These simple alloys are suitable for the construction of second-order aircraft components, but higher-strength Aluminium alloys are used for the construction of load-bearing first-order components, the breakage of which could endanger the aircraft.

Use of aluminium in aviation

Aluminium has been used in the aviation industry since the 1915s instead of the heavier steel. During this period, copper alloyed 2xxx series aluminium was used as a building material in wings and fuselages.

After the Second World War and afterwards, the use of aluminium became widespread. While 2014 - 2017

- 2024 alloys were used in these periods, the need for high tensile strength paved the way for the use of 7000 series aluminium. Currently, 2xxx, 5xxx, 6xxx, 7xxx series aluminium alloys are used. In addition, 3xxx and 4xxx series aluminium are also used on a limited basis. The lithium alloyed 8xxx series aluminium, which provides advantages in terms of lightness and elasticity, is currently used only in military aircraft/helicopters and spacecraft due to its very expensive price, and cannot be used in civil passenger/transport aircraft.

Aluminium standards used in the aerospace industry are recognised by AMS (Aerospace Materials Specifications).

Although the use of composite materials has recently increased in aircraft, 50 - 60 percent aluminium is still used. Aluminium is used extensively in aircraft fuselage, general structural elements, and compartments that are required to be durable and have high corrosion resistance. The rate of aluminium used in military aircraft reaches 75 percent to 80 percent. aluminium is used in aircraft wings, flaps, landing gear, main body arches and beams, hydraulic systems, main body, connection rivets, and engine outlet sections.

Aluminium alloys used in aircraft wings

The wings are evaluated in two separate structures. Since the upper wing is exposed to load, 7075 T6 / T651 alloy is used. In some aircraft, 7050 T7451 produced in aluminium sheet form is also used. Since the lower wing is subjected to amplitude and tensile load, it is made of 2024 T3 / T351 material with high fatigue resistance and high damage tolerance due to its flexibility.

There are many reasons why aluminium is preferred in aircraft structural parts. The most important reasons why aluminium is preferred are its lightness, corrosion resistance in the atmosphere, heat and electrical conductivity and easy production.

However, recently, 2324 T39 (Boeing) and 2124 T3/T351 (Airbus) alloys, which provide more advantages in fatigue and damage tolerances, have been used.

Aluminium alloys used in airframe

Alloy 7050 T7451 and 7050 T7651 (AMS 4201) are used in the arches and stringers forming the main fuselage structure of the aircraft. Alloy 7075 T6/T651 is used in the fuselage connection beams, alloy 2024 T3/T351 Alclad (both surface coated) is used in the fuselage cladding and alloy 7075 T6/T651 plates and sheets are used in the load-bearing areas.

Component	Material	Alloy	Properties
Front legs of seat	Al 2017, Al 2024	Copper, Magnesium	Good machining, high strength, high fatigue strength, corrosion resistance
Wing leading edge	Al 2024		
Seat ejectors	Al 2024		
Backrests and armrests	Al 6xxx	Magnesium, Silicon	High strength, good formability and weldability, corrosion resistance
Fuselage skins, stringers and bulkheads	Al 6013, Al 6050, Al 7050, Al 7079		
Wing skins, panels and covers	Al 7075	Zinc, Magnesium, Copper	Highest strength, high toughness, good formability
Rear legs of seat and seat spreaders	Al 7075		
Wing spars, ribs	7055-T77		
Wheels and loading gear links	7055-T77		
Horizontal and vertical stabilisers	Al 7xxx		
Upper and lower wing skins	8090-T86, 2055-T8, 2199-T8E80	Lithium, Copper, Magnesium	Low density, excellent fatigue and toughness, crack growth resistance
Floor sections of the aircraft	2090-T83, 2090-T62		
Sear structure	2090-T83		
Supporting members of fuselage structure	8090-T651, 2090-T651		

Table: Application of Aluminium alloys in Aircraft Components (adapted from.

Aluminium alloys used in wheels

In this section, Alloy 7075 T6/T651, 7050 T7451 and 2024 T3/T351 are used in the main carrying part of the aircraft landing gear to meet the strength and flexibility encountered especially during landing, and alloy 2014 T4/T351 and 2017 T4, which have high strength and durability, are used as fasteners.

Aluminium Alloys Used in Other Regions

Alloy 5052 H32/H34 Plate: Used in applications where high fatigue and corrosion resistance are required and good operability is desired. The most intensively used place is fuel tanks.

Alloy 5052 - Temper T0 Drawn Seamless Pipe and Bar: Used for fuel and oil pipes and their fittings. Alloy 6061 - Temper T4 / T6 Plate / Sheet: It is used in areas and systems where high strength, good workability, weldability and corrosion resistance are required. The most commonly used places are aircraft landing stairs, service systems, and electronic device boxes.

Alloy 6061 - Temper T0 / T4 / T4511 / T6 / T6511 Extrusion: It is used as various extrusions (profiles) in interconnection parts. It is used in fuselage panels, edge coverings of escape (emergency exit) places on the wings, and engine bonnets. Recently, 6013 T6 and 6063 T6 materials are also used instead of 6061 due to their better formability and higher corrosion resistance.

Use of Aluminium in Joining Parts in Aircraft Manufacturing

If the connection is desired to be permanent and sealed against air, welding should be used. 4xxx series aluminium is used in this process.

In other joints, mechanical joining (rivets, pins, threaded fasteners, ring fasteners, special fittings) is used.

5056 H34 / H32, 2017 T3/T351, 2117 T3/T351, 2024 T351/T3 are used in the manufacture of materials used in mechanical joining.

THE WORLD BEHIND THE TERMINAL: WORKING AT AN AIRPORT

Airports are bustling hubs of activity where passengers embark on journeys, reunions are celebrated and dreams fly. But beyond the hustle and bustle is a world of dedicated professionals who work tirelessly to keep these transportation giants running smoothly. Working at an airport is an intriguing mix of excitement, responsibility and challenges as employees navigate a diverse and dynamic environment to keep the wheels of air travel turning smoothly.

Airports are like small cities, with countless departments and teams working together like the gears of a well-oiled machine. From the moment passengers step inside the terminal, they encounter a wide variety of airport staff, each with very important roles. The first point of contact is usually the customer service agents who assist with check-in, boarding passes and flight information. These individuals have excellent communication skills when dealing with a myriad of situations and passengers from all walks of life.

Behind the scenes, the operations team organizes a symphony of events. Air traffic controllers work in the towers, monitoring aircraft movement and ensuring safe take-offs and landings. They are adept at managing high-stress situations and have an unwavering focus. On the ground, ground staff and ramp attendants handle baggage, refuel aircraft and guide planes across the tarmac. Their physical stamina and coordination are crucial to maintaining efficient aircraft turnaround times.

Security personnel play a critical role in protecting passengers and airport property. Constant vigilance and adherence to strict protocols are required to prevent potential threats and maintain a safe environment. Scanners help ensure the safety of all travellers by using advanced technology to scan baggage and identify prohibited items.

Working at an airport requires adaptability due to the 24/7 nature of air travel. Employees often work shifts, including nights, weekends and holidays. This schedule can be challenging, but it also fosters a unique camaraderie among staff who come to rely on each other during unusual hours.

In addition, retail and dining facilities within the airport thrive with the help of retail managers, chefs, servers and salespeople. These individuals are responsible for providing passengers with a pleasant and comfortable experience, offering a variety of products and services to meet the needs of various customers. Working at an airport requires adaptability due to the 24/7 nature of air travel. Employees often work in shifts, including nights, weekends and holidays. This schedule can be challenging, but it also fosters a unique camaraderie among staff who come to rely on each other during unusual hours. In addition, the multicultural environment of an airport provides the opportunity to interact with people from different backgrounds, enriching employees' cultural understanding and communication skills.

While airports may look glamorous, the work is not without its challenges. Dealing with angry passengers facing flight delays or cancellations requires extraordinary patience and diplomacy. Employees must adhere to strict regulations, policies and security measures to maintain the integrity of the airport, which often faces the pressure of deadlines and crowded terminals. Amidst these challenges, working at an airport is also inherently rewarding. The sense of accomplishment in facilitating smooth travel experiences for passengers is immeasurable. Watching families reunite after long separations, witnessing first-time travellers embark on adventures and helping people through difficult times creates a deep sense of fulfilment.

For those passionate about aviation, an airport can be a place of constant wonder and fascination. The opportunity to witness the arrival and departure of numerous aircraft, from small propeller planes to large jumbo jets, is an experience that few other workplaces can offer. Employees often deeply appreciate the intricacies of aviation and the dedicated teamwork required to ensure safe and efficient air travel.

All in all, working at an airport is an enriching and multifaceted experience, encompassing diverse roles, dynamic challenges and rewarding moments. This is a world where the dedication of employees keeps the wheels of air travel turning, allowing passengers to embark on adventures, reunite with loved ones and connect with the world. Despite the occasional turbulence, airport workers thrive in the adrenaline-fueled environment, determined to make every traveller's journey memorable.

AIRCRAFT DELIVERY PROCESS AND TECHNICIAN RESPONSIBILITIES

From yesterday to today, many aircraft have been added to the Turkish Airlines fleet, while many others have been removed from the fleet. We will talk about the inclusion of the MSN 11446 A320-271N TC-LUZ aircraft, which was added to our fleet last month from Airbus Toulouse Facilities, and the responsibilities of the technician in this regard.

Established on May 20, 1933, with the law numbered 2186, Turkish Airlines, whose first name was "Airways State Management Administration", started its flights in August 1933 with 5 aircraft and 23 seat capacity. Today, Turkish Airlines is the proud flag carrier of our country with a huge fleet of 413 aircraft and the target is to reach a fleet of 810 aircraft in the next 10 years. Many aircraft have been included in or removed from the fleet from past to present. In this article, we will talk about the MSN 11446 A320-271N TC-LUZ aircraft, which was added to the fleet from Airbus Toulouse facilities this month, and the responsibilities of the technician during this period.

First of all, aircraft ordering, assembly and ground tests vary according to the model of the aircraft. At the end of this process, the delivery process is initiated by Airbus. Invitation to Airbus facilities and controls begins within a certain checklist. At this point, the responsibilities of the technicians begin. Even though the technician is buying a new airplane, so to speak, he/she has to catch many errors caused by the production.

The process after the test flight is now TAC (Technical Acceptance Completion), that is, the closure of defects. The Airbus team shows the corrective action to each personnel who found the defect, and upon the technician's approval, the process of closing all defects is completed.

The delivery time given to us for MSN 11446 TC-LUZ aircraft was 4 days. The process started with a meeting between the Airbus team and the Turkish Airlines team. In this meeting, the aircraft delivery process was explained step by step. Ground checks started on the first day. While I was performing my checks as a mechanical technician, an avionics technician and 2 engineers started their checks. Airbus team was accompanying us during the checks and they provided all the access.

Although at first glance, the airplane looked flawless and sparkling, during the detailed checks, we encountered some manufacturing defects. To mention some of these defects; waste pop-out in the engine, untightened clamps, hydraulic pipes in contact with the structure, forgotten safeties... All these and similar defects are reported by the experienced technicians present there. Airbus assigns a defect to each of these defects and they start corrective actions themselves. At this stage, we only make determinations and the corrective actions are carried out by the Airbus team.

After the first day of checks, we continue the checks on the second day. All flight control surfaces, engines, landing gear, cargo, hydraulic compartments, cabin, galley and lavatories are thoroughly inspected. Any defects found are reported to the Airbus team. The Airbus team then applies the corrective actions and shows the personnel who found the defect that the corrective action has been taken for approval. If the technician confirms that the corrective action has been taken at that stage, the defect is closed; otherwise, the corrective action is applied again.

The next stage is the test flight. A captain pilot from THY is participating in the test flight as the captain pilot, while the co-pilot is from the Airbus team. In addition, an engineer from the Airbus team and the THY team also participated in this flight and made observations. During the test flight, the capability of the aircraft is tested, while diving and bank movements at certain altitudes are checked. APU tests and some system tests are also carried out during this test flight. If the aircraft successfully completes all these tests during the test flight, the test flight is completed; otherwise, a test flight is carried out again the following day after system errors are corrected.

The next process is TOT (Transfer of Title), the process of transferring the aircraft from Airbus to THY. At this stage, purchase or lease transactions are realized. Mutual signatures are signed and all certificates and documents of the aircraft are delivered to the THY team. At the end of this period, the documents are sent to the DGCA and the DGCA issues a temporary airworthiness certificate for Ferry Flight.

After the certificate is issued, the final stage is the Ferry Flight. I participated in this flight as a captain pilot, a co-pilot and a mechanic technician from the Turkish Airlines team who participated in the test flight. The flight took place after all permits were obtained from the DGCA. When we landed in Istanbul, we were welcomed by the THY fleet team and the line maintenance team. As a mechanic technician, I signed all the documents, certificates, aircraft delivery report and certificate delivery report of the aircraft and handed them over to the THY team who welcomed us. And thus, I completed my duty as a technician in the aircraft delivery process.

We, as technicians, work devotedly at every stage of the operation process with the awareness of this duty and responsibility, and we continue our work with the awareness of how important the responsibilities of the technician in the delivery process are.

BOEING 747 WITH 5 ENGINES

Hello dear readers. Today I am going to tell you the story of a Boeing 747 that saved the company a huge cost by using a genius idea in aviation.

Plt. Mehmet Berk GÜNEŞ

The Boeing 747 is a very large airplane type used today, especially in cargo. Boeing 747 has 4 engines, has a maximum take-off weight of 440 tons and can carry 140 tons of cargo. It can be difficult to deal with the malfunctions of such a large aircraft in any situation.

Let's come to the subject of our article. In 2016, a Boeing 747 of Australia's flag carrier airline Qantas, registered VH-OJU, suffered an engine failure in Johannesburg, South Africa. After the failure, the engine had to be replaced. The General Electric GEnx engine was approximately 3.6 meters wide and 3.5 meters long.

Discussing the delivery of the engine, Qantas officials started to come up with solutions. It was possible to transport the engine by airplane, but the only airplane that could carry the engine was the Boeing 747's older brother, the Antonov AN-225.

Since there is only one Antonov AN-225 in the world, renting this aircraft was very expensive in terms of cost. Another transfer method was to take the engine by sea. This was a little more convenient than the airplane transfer, but very time-consuming. It took about 55 days to sail from Sydney to Johannesburg. Qantas officials decided that this method of transportation was not good either. Another method was to attach the engine to the wing of a Boeing 747. Qantas had previously used this method on Boeing 707s, and now it was going to try it on a Boeing 747.

The Boeing 747 had attachment points on the underside of its wings. A spare engine could be mounted on these attachment points. The mounted engine would seriously affect the airplane aerodynamically. The engine, which was not connected to the aircraft systems, would have disrupted the balance of the aircraft and at the same time would have caused extra fuel consumption due to the friction it created. However, mounting the engine on the airplane was more feasible than other methods, both in terms of time and cost.

After making the decision to mount it, officials removed the engine's fan blades and installed an anti-friction component to reduce friction. The motor was to be installed on the left wing next to the inboard motor. Due to the extra weight of the engine and the friction it created, the pilots had to make stops en route. Perth Airport, which was en route, was a suitable place for this fuel transfer.

The passengers were informed about this prior to the flight, and a Qantas Airlines Boeing 747, flight number QF63, registration VH-OJS, took off from Sydney Airport and landed at Perth Airport in western Australia on January 6, 2016. After receiving the necessary fuel from here, the plane set off for Johannesburg and landed successfully. The fifth engine, which is the subject of this article, was replaced with the engine of the plane that failed. The faulty engine that caused this transportation was sent to Sydney with a ship.

Qantas Airlines' Boeing 747 took off from Sydney Airport on January 6, 2016 and landed at Perth Airport in the west of Australia. After getting the necessary fuel from here, the plane set out for Johannesburg and landed successfully.

After the flight, Qantas Airlines shared a photo from this flight with a fun explanation on Instagram. "We know that three engines are crowded, but not on yesterday's QF63 Johannesburg flight," the caption was liked by thousands of people.

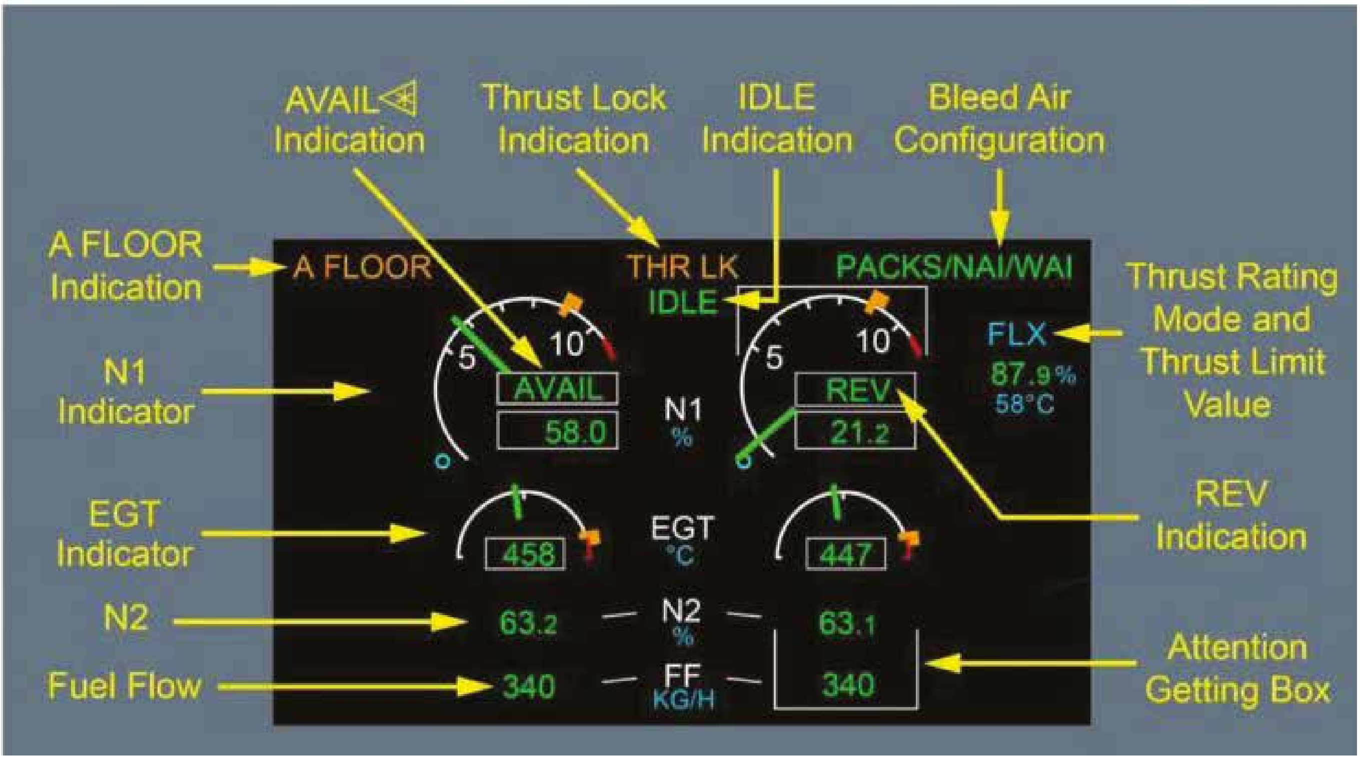
I wish everyone a safe flight.

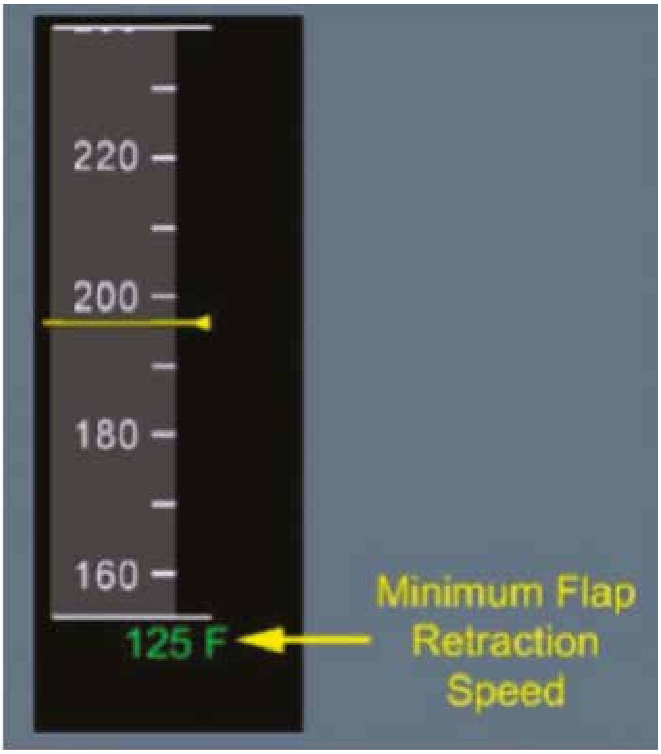
NEW ELECTRONIC DISPLAY SYSTEM ON AIRBUS A320-NEO AIRCRAFT

The new electronic display system used in Airbus' new A320-NEO aircraft brings several changes. Let's take a look at what is included in the new electronic display system.

The latest A320 family aircraft now features a new electronic display system with various modifications. One of these changes is that a new system page has been added to the Engine and Warning Display (EIS) and System Display Engine page. This system will help increase flight crew awareness in the event of engine failure or engine start-up. During an engine start, whether on the ground or in flight, the "Attention Getting Box" is displayed in white to draw the flight crew's attention to the engine concerned.

Engine/Warning Display





In addition, if there is a significant malfunction affecting the engine, the box will appear in yellow. To visually highlight the affected engine, the "Attention Getting Box" surrounds the engine as shown in the picture. This modification is intended to enable the flight crew to recognise any problems with the engine immediately.

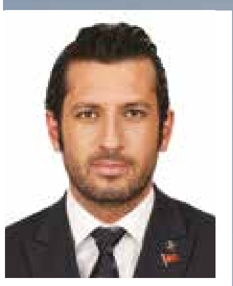
In addition, another modification to the Engine and Warning Display (EIS) applies specifically to the A321.

For aircraft flying with heavy loads, the speeds at which the slats and flaps retract (Vslat/Vflap) may exceed the speed scale. To address this, an "F" with the associated speed value for Vflap or an "S" with the associated speed value for Vslat is displayed as above or below the speed scale.

This modification is intended to increase flight crew awareness of the aircraft speed parameters.

THE FOLDABLE WING TIP OF THE BOEING 777X

Boeing 777, which was introduced to the market in the mid-90s, is a modern passenger aircraft model that is in active use today and in our country. We will examine the folding wingtip design (Folding Wingtip), which is the most obvious difference seen from the outside of the Boeing 777X aircraft, the new generation version of the aircraft, which is the favourite of airlines.



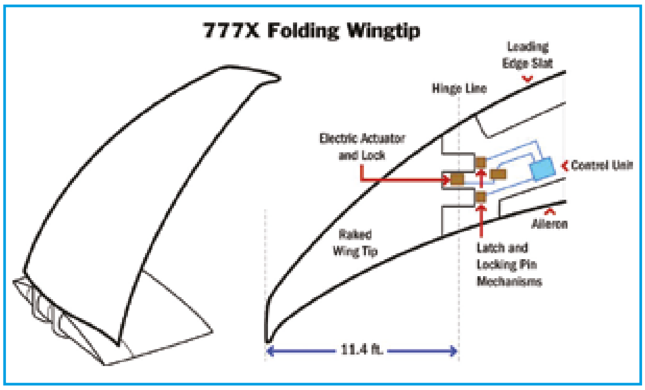
Dercan DEMİRTEPE
B1/C Aircraft Maintenance Engineer


777X

The Boeing 777X features folding wingtips to allow the aircraft to fit into the same airport bellow doors and taxiways as existing 777 models. The folding wingtips give the 777X the ability to have a larger wingspan than the current 777 models and at the same time operate at airports designed for smaller wingspans. In this way, airlines benefit from the increased efficiency and performance of the larger wingspan without requiring infrastructure changes at airports. When the aircraft is on the ground, the wingtips can be folded up to reduce the wingspan to a narrower width. This feature enables airlines using the Boeing 777X to access existing infrastructure without the need for costly changes to airports.

This aircraft type has a significantly wider wingspan compared to previous 777-200/300 models. The 777X has a wingspan of approximately 71,8 metres (235,5 feet), making it the widest wingspan of any Boeing aircraft. The added wingspan provides several advantages, including improved aerodynamics, increased lift and reduced fuel consumption.

These wingtips are designed to flex and move in flight, adapting to different flight conditions. This flexibility helps optimise aerodynamic performance by reducing



drag and improving fuel efficiency. The wing tips also provide increased stability during take-off and landing.

The folding wingtips are controlled by a sophisticated system that ensures they operate safely and accurately. The system includes sensors, actuators and control mechanisms that allow the wingtips to extend or retract according to specific flight phases and conditions. The wingtip controls are integrated with the aircraft's overall fly-by-wire system.

The folding wing tips on the Boeing 777X have undergone extensive testing and certification processes to ensure their safety and reliability. Boeing engineers conducted rigorous evaluations to assess the structural integrity, aerodynamic performance and operational stability of the folding mechanism. The design and functionality of the wingtips comply with stringent regulatory requirements.

The foldable wingtips on the Boeing 777X are an innovative solution that allows the aircraft to take advantage of a larger wingspan while maintaining compatibility with existing airport infrastructure. This feature contributes to increasing the efficiency, reducing fuel consumption and increasing the overall performance of the Boeing 777X.

In addition, the folding wingtips on the Boeing 777X are an innovative solution that allows the aircraft to benefit from a larger wingspan while maintaining compatibility with existing airport infrastructure. This feature contributes to increased efficiency, reduced fuel consumption and improved overall performance of the Boeing 777X.

Perhaps soon, we may see a Boeing 777X flying under the Turkish registration at our airports.

IS 5G AIRCRAFT INTERFERENCE A THREAT? WHAT YOU NEED TO KNOW

Once the doors close on a commercial flight, passengers are asked to put their devices in airplane mode. Flight attendants give personal reminders to stragglers trying to sneak in last minute calls or messages. But why is this such a big deal? We'll answer that in this article. Let's begin!

Airplane Mode Please
The reason behind the no cellular functions mandate on commercial flights is that the FAA is concerned 3G and 4G cell carrier signals could interfere with aircraft navigational and landing systems.

Now the rollout of new 5G cellular networks from major carriers like AT&T, T-Mobile, and Verizon has pilots, airlines, and the FAA facing questions about what impact 5G interference can have on aircraft.

If you're not sure what the deal is with the 5G controversy and whether you as a pilot should be concerned, keep reading.

We will explain what 5G is, how it works, what potential problems it could cause for pilots, and how the Federal Aviation Administration (FAA) is responding to the 5G rollout.

What is 5G?
For starters, let's talk about what the term "5G" actually means. Those who aren't tech-savvy or overly interested in tech news will be forgiven for having only a vague understanding of what 5G is and why it matters to pilots.

In simple terms, 5G is the name given to the most recent iteration of cellular network technology. The "G" in 5G stands for "generation," meaning that 5G is simply the 5th generation of wireless cellular networks.

The purpose of the 5G upgrade is to provide enhanced services at speeds that are 10 times as fast as those of 4G networks.

5G Explained
If you recall the box phones from the 1990s, you will remember using 1G technology.

- 1G: Original 1G signals were analog and supported voice only calls, often with poor quality.
- 2G: Starting with 2G, mobile broadband signals became digital and introduced text and media messaging data services in addition to voice.
- 3G: The 3G rollout supported basic mobile internet access.
- 4G: 4G allowed video streaming, gaming, and video conferencing.
- 5G: The new 5G deployment started in 2019 and is designed to support even faster data rates with decreased latency (or delay).

It will also offer larger scale uses for industry and government purposes. Users will be able to connect their 5G-enabled devices to any other device with a 5G-compatible chip for an interconnected "internet of things."

Each generation of cellular network has operated on different frequency bandwidths and has provided improved speed and capabilities compared to previous generations.

Current 5G networks include two different frequency ranges. The first, a high-frequency millimeter wave (mmWave) operates between 28-39 Gz and is of no consequence for pilots.

Now the rollout of new 5G cellular networks from major carriers like AT&T, T-Mobile, and Verizon has pilots, airlines, and the FAA facing questions about what impact 5G interference can have on aircraft.

The second 5G frequency range is known as the C-band. It operates between 3.7-3.98 GHz and is the focus of current conversations about 5G interference with aircraft.

Does 5G Interfere with Planes?
As the FAA reviews the implications of widespread 5G implementation, one major area of concern has been 5G aircraft interference.

Since the C-band radio frequencies used for some 5G spectrum services are close to those used by aircraft radio altimeters, there is a potential for hazardous interference.

It depends on the equipment, frequencies, proximities, and other variables, but the short answer is: yes, in certain cases, 5G may interfere with airplanes.

Why Does 5G Interfere with Airplanes?
When aircraft are within 2,500 feet of ground level, an instrument called an aircraft radio altimeter is used to determine the aircraft's height above ground level (AGL).

The radio altimeter transmits a radio signal from the aircraft, then measures the change of phase between the original signal and the reflected signal.

The phase change denotes aircraft height relative to the ground. Radio altimeters are most crucial for flights landing in low visibility conditions.

The signals sent out by radio altimeters are supposed to be within the 4.2-4.4 GHz band range designated by the Federal Communications Commission (FCC).

In theory, that means that the new 5G mobile telecommunications signals sent out in the C-band spectrum at frequencies between 3.7 and 3.98 GHz should be no problem.

The gap of 0.22 GHz creates a "guard band" which should be sufficient to prevent overlap between 5G signals and radio altimeter signals. Unfortunately, that may not always be the case, depending on the sensitivity level of the individual altimeters used onboard aircraft.

How Can 5G Interfere with Planes?
Some pilots have already reported radio altimeter interference when flying near 5G signal transmitters and receivers. The problems for these aircraft systems are caused by signal overlap.

Signal overlap occurs when an aircraft's radio altimeter is not sensitive enough to receive only signals within its dedicated 4.2-4.4 GHz band.

Since the 5G band is only 0.22 GHz away, a low-sensitivity radio altimeter can pick up 5G cellular signals and mistake them for the reflected radio wave.

If a 5G signal overlaps and interferes with the signal emitted by or reflected to an aircraft's radio altimeter, the measured phase change will be inaccurate.

The altimeter will either tell the pilot that the plane is closer to or further from the ground than it truly is. The instrument can also fail completely due to interference.

In practice, most reports of potential 5G signal interference have involved pilots receiving ground proximity warnings when they are not close to the ground.

In theory, 5G interference could also affect navigation instruments, Traffic Collision Avoidance System (TCAS), and terrain awareness systems since they too receive data from the radio altimeter.

The good news is that a high-quality, sensitive altimeter should not pick up 5G signals at all, and if it does, it can register the signals as noise and filter them out.

What is the FAA's Position on the 5G Rollout?
As the agency responsible for aviation policies and safety in the United States, it is important for the Federal Aviation Administration (FAA) to play a role in the 5G rollout process.

In December of 2021, the FAA released an official statement saying the agency "believes the expansion of 5G and aviation will safely co-exist."

Two airworthiness directives, one for fixed wing aircraft and one for helicopters, were also simultaneously released to further explain the FAA's initial concerns about interference potential and to advise pilots of upcoming NOTAMs that would "prohibit certain operations requiring radio altimeter data" at designated 5G-impacted locations.

The FAA has created a 5G and Aviation Safety information page to address the potential for 5G interfering with airplanes and share what is being done to minimize risk.

The FAA's goal is "to ensure that radio signals from newly active wireless telecommunications systems can coexist safely with flight operations in the United States, with input from the aviation sector and telecommunications industry."

The FAA is testing current aircraft altimeters and clearing those that are sensitive enough not to be affected by 5G signals. Aircraft with altimeters that are deemed unaffected by 5G are issued an AMOC (approval of an alternative method of compliance).

The agency has also worked with cell service providers to set up temporary 5G deployment exclusion zones around fifty of the busiest US airports while altimeter testing continues.

Which Altimeters Has the FAA Cleared for Use Near 5G?
Upgrading altimeters or adjusting existing altimeters is pricy, leaving both airlines and pilots hoping their current equipment makes the cut and is deemed 5G safe.

The good news is that following altimeter testing, most aircraft are being approved for low-visibility landings in 5G deployment zone airports.

You can also view which aircraft have gone through the AMOC process and received approval to carry out altimeter-supported operations within that airspace. If your aircraft has received a relevant AMOC, the restrictions of the 5G NOTAM to do not apply to you.

Takeaways
Although there have been implementation concerns and challenges in the United States regarding 5G, the FAA is working with cellular service providers to mitigate any potential hazards that the network rollout could pose to aircraft.

Some radio altimeters are less sensitive than others and could have difficulty filtering out or disregarding 5G cell signals they pick up, therefore the FAA is testing all altimeters.

As a pilot, you should review the relevant NOTAMs and AMOCs to confirm what types of operations your aircraft is currently cleared to conduct at any 5G impacted airports.

If your aircraft's altimeter hasn't been cleared yet, you won't be able to perform low-visibility landings in these airports.

HOW DO YOU PAINT AN AIRCRAFT?

Painting an aircraft is a very complex process that requires up to two weeks of work and, sometimes, over one thousand litres of paint. Coatings are certainly important to improve aesthetics, but their main role is actually to protect the aeroplane against corrosion while improving its aerodynamic properties.

How do you paint an aircraft?
Painting an aircraft is a very complex process that requires up to two weeks of work and, sometimes, over one thousand litres of paint. Coatings are certainly important to improve aesthetics, but their main role is actually to protect the aeroplane against corrosion while improving its aerodynamic properties.

Approximately every five to seven years, an airliner has to undergo a new coating phase in order to be able to continue flying safely in the sky. Painting an aircraft is a complex, precise, multi-step process that must be carried out to perfection in order to achieve optimum results in terms of both aesthetics and, above all, efficiency and safety.

The coating process
Before painting, a masking phase is carried out to protect any areas that do not need to be coated, such as windows, engines, and electrical equipment. Given the size of an average commercial aircraft, this takes about two days to complete.

The next step is that of surface preparation. Since in most cases the plane to be painted is not new, but an aircraft to be re-painted as a maintenance operation, the previous layer of paint must be removed before a new coating is applied. There are two ways of removing the existing layer of paint: mechanical and chemical stripping. In the former case, the surface is sanded; however, this is a very demanding and time-consuming process. In the latter case, i.e. chemical paint stripping, the coating layers are eliminated by using special chemicals to dissolve and remove all paint residues. A surface control phase follows paint stripping. A certified aircraft mechanic must inspect the plane before proceeding with the coating phase, as any cracks or surface defects must be repaired before proceeding to the next step.

This is followed by a surface preparation and coating phase consisting in the application of a primer that fosters the adhesion of subsequent layers and of a base coat (often white, as explained later on). The plane is then decorated with the airline's livery and the colours, logos, and further details are added using stencils. Finally, a transparent top coat is applied, which seals the previous layers of paint and provides protection against erosion by airflow, all types of fluids, and UV radiation. A layer of protective paint is also applied to safeguard the aircraft against corrosion.

Two main types of paint can be used on aircraft, enamel and epoxy. Epoxy is a polyurethane paint that adheres well to surfaces, has a high resistance to chemicals, and does not fade, oxidise, or break easily. Enamel, on the other hand, is cheaper and less dangerous because it does not release certain gases when sprayed. These two products are also often used in combination with each other.

The coating must be applied evenly, paying attention to the amount of paint applied to each side: every layer adds significant weight to the aircraft and any weight difference between the two sides could make the plane unstable. This is checked with a precision laser, which measures the amount of paint deposited on the fuselage.

At the end of the whole process, the aeroplane has to pass a test phase consisting of a series of test flights without passengers in order to check the correct functioning of all its elements.

An aircraft coating process can take from a few days to some weeks depending on the size of the plane and the colour scheme's complexity.

Why are most aircraft painted white?
Most of the aeroplanes in our skies are white, and this is no coincidence. Of course, each brand has its own livery, with its own logo, various decorations, and coloured stripes, but the main hue of the body of the aircraft is usually white. There are several reasons for this:

1. It reflects sunlight
The main reason why aircraft are painted white is because white is the colour that best reflects sunlight, unlike other tints that absorb it. Planes are constantly exposed to sunlight both while flying and when parked on airport aprons. Therefore, white minimises heating of the interior and prevents potential damage caused by sunlight.

Other colours, on the other hand, would absorb most of the light, causing the body temperature of the aircraft to rise and increasing the risk of serious damage from solar radiation.

2. It fades more slowly than other colours
Travelling at high altitude, aeroplanes are exposed to various atmospheric and weather conditions, including ice, wind, rain, and temperature changes, which quickly deteriorate the paint layer. Coloured paints tend to fade faster than white does and they require more frequent maintenance to preserve their aesthetics.

As it deteriorates less quickly than other colours, therefore, white saves costs associated with painting and grounding the aircraft.

3. It is cheaper and lighter
Aircraft paints are special coatings that contain polyurethane substances and various hardeners and activators and whose cost is much higher when compared to products used in other industries. Among all the colours available, white paint is the cheapest on the market. In fact, the economic factor plays a major role in the selection of a tint, since the surface area of an airliner is so large that it requires 250 to 1100 kg of paint. Specifically, painting a Boeing 737 requires at least 240 litres of paint, whereas the Airbus A380, the largest commercial aircraft ever, calls for up to 3,600 litres.

The colour chosen also has an impact on the plane's weight: the heavier the aircraft, the higher the fuel consumption and the lower the profit for the airline. Although the applied paint layer is generally thin, given the extent of the surfaces, it can increase the weight of an aircraft by up to 550 kg. Among the products on the market, white paints are the thinnest and therefore the lightest ones. For this reason, too, white remains the preferred colour for aircraft paintwork.

4. It reduces the risk of bird strikes
In aviation, the term bird strike indicates the impact between an aircraft and a bird. Bird strikes occur in most cases during take-off, landing, or low flying, whereas it rarely occurs at higher altitudes. Any impact with birds is a significant threat in terms of aircraft safety, although its severity depends on the weight of the animal, the difference in speed, and the direction of the collision.

Using white improves the visibility of the aircraft and it increases its detection by birds, thus avoiding impact. Using colours other than white may reduce the visual contrast between the plane and the atmosphere, limiting the ability of birds to detect the aircraft in time.

5. It makes it easier to detect damage
Aeroplanes are regularly checked to ensure they are safe. A white livery makes it easier and faster to identify surface damage such as cracks, dents, and other defects.

Coloured liveries
Although white is the colour favoured by airlines, it is obviously not the only one. For example, in order to differentiate themselves from other companies or to give their fleet a tint that is in line with their national identity, airlines may opt for other colours.

PAINT ISSUE ON BOEING 787

A recent video that has been going on social media shows that patches on the wings of Boeing 787- Dreamliner aircraft have gotten some attention among people who are interested in aircraft. However, Boeing says that this paint issue does not affect the safety of the aircraft. This time the problem comes back to the attention center from one of the B787 operators which is UZBEKISTAN Airways.

According to the reports, the patches were attributed to paint peeling on composite parts of the B787. Boeing admits that this issue has been around in recent years and it is a known issue. For this problem, Boeing is trying to find a temporary solution regarding this issue. They have applied to the US Aviation Administration for permission to use special tapes on moving parts of the wing and the areas where paint has peeled off.

The composite materials used in the construction of the wing and some parts of the fuselage of Boeing 787 are new to aviation. Seeing these kinds of problems on relatively recent aircraft is normal. This challenge arises from ultraviolet radiation and the wing's flexibility during flight operations. Paint layers start to peel off from the skin of the wing in sizable fragments.

The challenge with maintaining paint on composite wings comes from the unique properties of these materials. Unlike traditional metallic wings, composites are more susceptible to the effects of ultraviolet radiation and the constant flexing experienced during flight. This combination of factors makes it difficult for conventional paint layers to adhere effectively, leading to the observed peeling issues. Manufacturers like Boeing and Airbus are continually exploring innovative solutions to overcome such challenges and ensure the reliability of paint coatings on composite aircraft components.

Despite the visual concern, Boeing asserts that their analysis confirms the detached paint does not affect flight safety. This assurance is echoed by several major operators such as Nippon Airways, Japan Airlines, United Airlines, American Airlines, and Air New Zealand. Due to this issue arising, Boeing plans to implement a solution involving an additional top coat to reduce ultraviolet radiation which prevents further paint from being peeled off.

Among the operators taking proactive measures is Uzbekistan Airways JSC, which has announced plans for the repainting of three Boeing 787- Dreamliners soon.

Source :

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WHY ARE THE B787 LEADING EDGES MADE FROM ALUMINUM?

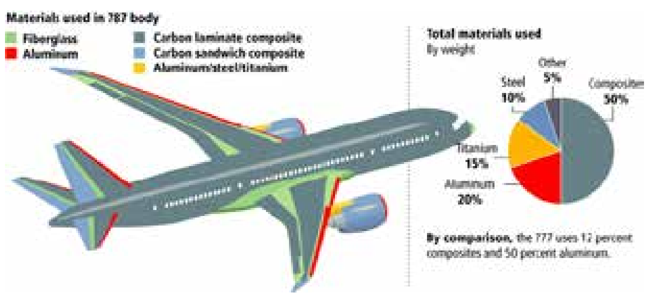
As you know, there is a risk of bird strikes for airplanes in all flight operations. Metal parts tend to be more resistant to impact, while composite materials tend to be weak and delaminate. In addition, metal parts can protect their strength against impacts. Similar features can be said for hail as well as bird strikes. When you look at bird strike examples, you will see that composite materials are damaged more than metal.

So why isn't metal used in the nose? There is a weather radar in the nose of modern passenger planes. At this point, the use of metal material can block the radar waves. Therefore, composite material was preferred for radome production.

Another reason for using aluminium is to prevent icing on the leading edge. Disruption of air flow at the edge of attack and engine inlet adversely affects flight safety and performance. For this reason, there are ice anti icing systems in critical areas of the aircraft.

The leading edges of the wings and the engine inlets are heated by the bleed air taken from the engine (or, for the 787, electrical elements). As you can imagine, metal materials conduct heat better than composites.

In addition to all these, shaping metal is much easier and more economical than shaping composite. With the development of composite materials, we can say that the use of composites in all parts will increase over time.



ARTIFICIAL FEEL UNIT IN AN AIRCRAFT

Abstract - Traditionally pilot's efforts were directly applied on control surfaces like aileron, elevator and rudder by system of cables, cranks, pulleys, etc. However the power required for surface control in high speed, military aircraft far exceeds the pilot's capabilities. Hydraulically powered control surfaces help to overcome limitations of mechanical system like complexity and weight of mechanical systems . In hydraulic flight control systems the aircraft's size and performance are limited by economics rather than a pilot's muscular strength. Modern high speed and performance piloted aircrafts uses electrical flight control systems (Fly-by-wire) to control the forces on control surfaces of flight. Since fly by wire system gives no feel to the pilot on control stick , an artificial feel unit is to be designed to give feel force to the pilot. Feel unit is an important part of control stick which provides force field to pilot proportional to the loads of the control surfaces.

1. Introduction:
Modern high speed and high performance piloted aircraft uses Electrical Flight Control Systems (fly-by-wire) to control the forces on control surfaces of flight and the aircraft's direction and altitude. Traditionally pilot's efforts were directly applied on control surfaces like aileron, elevator and rudder by system of cables, cranks, pulleys, etc. However, the power required for surface control in high speed, military aircraft far exceeds the pilot's capabilities. Flight control systems installed in these aircraft are fully powered that is, none of the force required to overcome the aerodynamic moment on the control surface comes from the pilot's control stick. Since fly-by-wire system gives no feel to the pilot on control stick, an artificial feel unit is to be design to give feel force to the pilot. They regard stick-feel as a particularly valuable because it is always available without distracting the pilot's attention from his target. A pilot upon whom is placed the tasks of navigation, communication and aerology, in addition to flight and combat, approaches the limit of his abilities. For such a man, a stick with feel is equivalent to a host of flight instruments. Movement of any of the three primary flight control surfaces (ailerons, elevator, or rudder), changes the airflow and pressure distribution over and around the airfoil. These changes affect the lift and drag produced by the airfoil or control surface combination and allows a pilot to control the aircraft about its three axes of rotation. Hence even small mistakes in moving control stick will be dangerous. Hence artificial feel unit of control stick plays important roll. Depending

on components used in artificial feel unit of control stick the control stick is of two types- active stick and passive stick. Artificial feel produces an opposition to the pilot movement of controls that is proportional to the aerodynamic loads acting on the control surfaces. For larger aircrafts where PCUs (Power Control Unit) are used, the pilot has no direct feedback 'feel'. Therefore the designer has to use artificial feel to ensure that the pilot senses the magnitude of the effect of the control movements. Conventional control linkages permit the pilot to perceive some of the airplane's flight characteristics through position and pressure effects on stick and elevator controls. Stick feel depends on the forces arising from the feed-back of some fraction of the aerodynamic forces developed with displacement of the control surfaces. Artificial feel force can be generated by using various combination of components like spring, damper, Q bellow, electric motor, advance fluids like MR fluid, ER fluid. In this paper, we will be concentrating mainly on two feel systems i.e.

1)Spring-Damper feel system and

2)Q feel system.

2. Fly By Wire System:
A fly-by-wire (FBW) system replaces manual flight control of an aircraft with an electronic interface. The movements of flight controls are converted to electronic signals transmitted by wires (hence the fly-by-wire term), and flight control computers determine how to move the actuators at each control surface to provide the expected response. Commands from the computers are also input without the pilot's knowledge to stabilize the aircraft and perform other tasks. Electronics for aircraft flight control systems are part of the field known as avionics. Fly-by-optics, also known as fly-bylight, is a further development using fiber optic cables. Improved fully fly-by-wire systems recognize pilot's input as the required aircraft action, acting in different situations with different rudder elevations or even combining several rudders, flaps and engine controls at once using a closed loop (feedback). Even without the pilot's input, automatic signals can be sent by the aircraft's computers to stabilize aircraft or partially unstable aircraft, or prevent unsafe operation of the aircraft outside its performance envelope. Operation of fly by wire system:

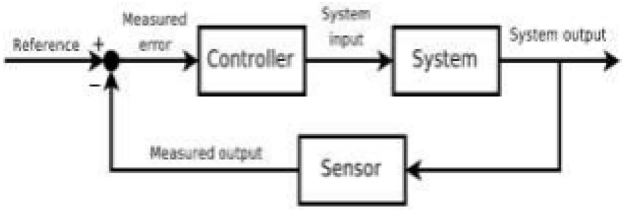


Figure 1: Closed loop control unit of fly-by-wire

An above fig shows the closed loop system of an aircraft. A pilot commands the flight control computer to make the aircraft perform a certain action, such as pitch the aircraft up, or roll to one side, by moving the control column or sidestick. The flight control computer then calculates what control surface movements will cause the plane to perform that action and issues those commands to the electronic controllers for each surface. The controllers at each surface receive these commands and then move actuators attached to the control surface until it has moved to where the flight control computer commanded it to. The controllers measure the position of the flight control surface with sensors such as LVDTs.

3. Spring Feel System: The most elementary force producer which can be used in artificial feel system is the simple mechanical spring. Its purpose is to create a stick force proportional to control surface deflection. An artificial feel system using a spring only system would probably exhibit very poor longitudinal and lateral control feel characteristics for a typical fighter plane however directional control feel for such an airplane is acceptable. Preloaded spring is used to improve the stick centering characteristics of simple spring artificial feel system. The purpose of damper is to provide stick force proportional to stick deflection mechanically this device consist of a small piston moving within a cylinder of oil the motion of piston being restricted by oil which must be forced through tiny orifices in piston when pilot deflects the stick he experiences a force proportional to velocity on elevator. The damper is used in longitudinal control feel systems to improve the transient feel if an airplane exhibit unsatisfactory transient feel characteristics. Spring damper system used in feel unit of control stick is nothing but a system of mechanical forced vibration model. In feel unit of control stick spring-mass damper are used.

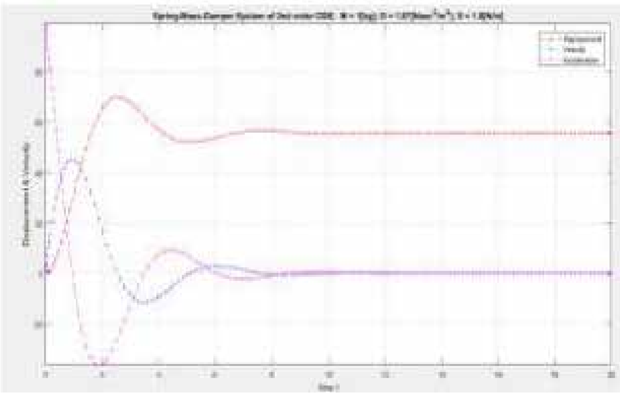


Figure 2: Curve for under damped condition Vs time

The energy dissipated out of the dynamic system is modeled through a one-dimensional damper in the MSD system. The viscous damper, for instance, is able to dissipate energy as heat outside the dynamic system. These three components, mass, spring and the damper can model any dynamic response situation in a general sense.

4. Q Bellow Feel System:
One method of improving the control feel characteristics with a rather simple mechanical feel system is to use a Q-bellows. Instead of spring

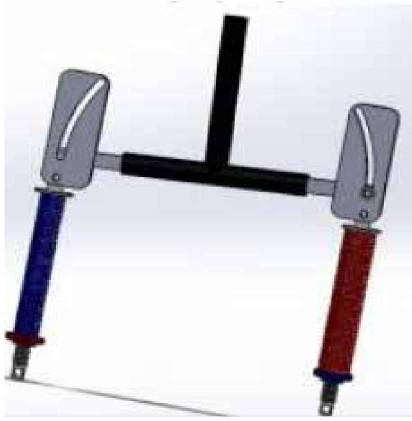


Figure 3: 3D model of spring damper system

gradient that is constant throughout the flight region of the airplane, the Q-bellows provide a variable spring gradient that is a function of mach number and altitude. Thus the Q-bellows can be thought of a mechanical gain changer or a gain compensator. A typical Q-bellow system produces a stick force proportional to the product of pressure differential across the diaphragm of the bellows, ptp, and then control surface deflection.

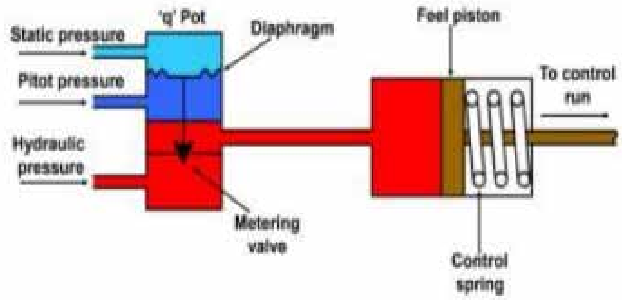


Figure 4: Basic Model of Q-fee

Q is referred to as dynamic pressure found by subtracting static pressure from pitot pressure. Pitot pressure directed at one inlet and static pressure in other resulting in differential dynamic pressure, which acts to bias the system. Linear movement of piston leads to feel resistance to pilot i.e. greater the movement greater the feel. Increase in speed increases the value of Q which acts against the pilot although requiring only small deflections. A requirement for flight control systems is that the faster you fly, the heavier it should appear to operate that control, be it elevator, aileron or rudder, the three primary flight controls. This is called "feel". So, the Q bellows intake is just another type of pitot tube, a device that measures or uses pressure created by increasing airspeed.

Equations in q bellow feel unit:- Pd = Pt - Ps Where, Pd = Dynamic Pressure. Pt = Total Pressure. Ps= Static Pressure.

In the design and operation of aircraft, static pressure is the air pressure in the aircraft's static pressure system. An aircraft's altimeter is operated by static

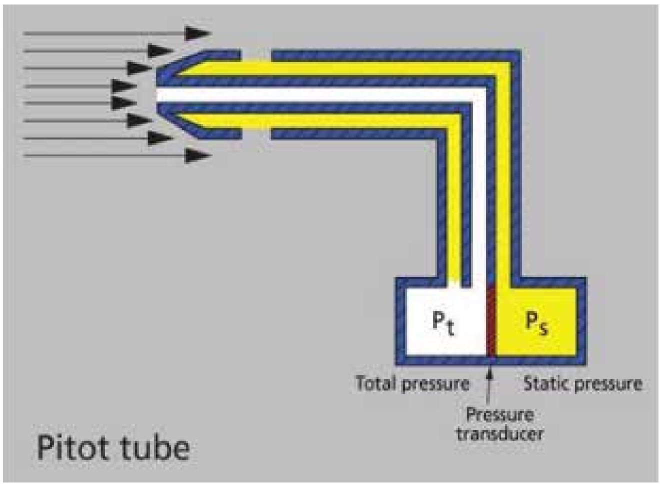
pressure system.. An aircraft's airspeed indicator is operated by the static pressure system. The basic pitot tube consists of a tube pointing directly into the fluid flow. As this tube contains fluid, a pressure can be measured; the moving fluid is brought to rest (stagnates) as there is no outlet to allow flow to continue. This pressure is the stagnation pressure of the fluid, also known as the total pressure or (particularly in aviation) the pitot pressure. The dynamic pressure, then, is the difference between the stagnation pressure and the static pressure. The dynamic pressure is then determined using a diaphragm inside an enclosed container. If the air on one side of the diaphragm is at the static pressure, and the other at the stagnation pressure, then the deflection of the diaphragm is proportional to the dynamic pressure.

(F/ (k (Pt - Ps))) Where, = Control surface deflection F = Stick Force K= spring stiffness Pt= Total pressure Ps= Static pressure

In Q bellow feel system, stick force is directly proportional to pressure differential across the bellows.

5. Pitot Static Tube

Pitot tubes are used on aircraft as speedometers. The actual tube on the aircraft is around 10 inches (25 centimeters) long with a 1/2 inch (1 centimeter) diameter. Several small holes are drilled around the outside of the tube and a center hole is drilled down the axis of the tube. The outside holes are connected to one side of a device called a pressure transducer. The center hole in the tube is kept separate from the outside holes and is connected to the other side of the transducer. The transducer measures the difference in pressure in the two groups of tubes by measuring the strain in a thin element using an electronic strain gauge. The pitot tube is mounted on the aircraft so that the center tube is always pointed in the direction of travel and the outside holes are perpendicular to the center tube. (On some airplanes the pitot tube is put on a longer boom sticking out of the nose of the plane or the wing.)



Difference in Static and Total Pressure:

Since the outside holes are perpendicular to the direction of travel, these tubes are pressurized by the local random component of the air velocity. The pressure in these tubes is the static pressure (ps) discussed in Bernoulli's equation. The center tube, however, is pointed in the direction of travel and is pressurized by both the random and the ordered air velocity. The pressure in this tube is the total pressure (pt) discussed in Bernoulli's equation. The pressure transducer measures the difference in total and static pressure measurement = pt – ps

DANGEROUS LASER STRIKES INCREASE TO HIGHEST NUMBERS

According to the FAA, there were 13,304 reports of laser strikes from pilots last year, indicating a 41 percent surge from the 9,457 incidents reported in 2022, thus establishing a record for the escalating danger.

Directing a laser at an aircraft poses a significant safety risk. Various high-powered lasers have the potential to incapacitate pilots, particularly those operating airplanes carrying hundreds of passengers. Since the FAA commenced recording data on laser strikes in 2010, pilots have reported 313 injuries.

"The FAA is committed to maintaining the safest air transportation system in the world. Aiming a laser at an aircraft is a serious safety hazard that puts everyone on the plane and on the ground at risk," said FAA Administrator Michael Whitaker.

The FAA has the authority to levy civil fines of up to $11,000 for each violation and up to $30,800 for multiple violations involving lasers. Additionally, criminal penalties for laser infractions can be enforced by federal, state, and local law enforcement agencies.

"Like many crimes, there's a need for education, outreach, and cooperation from the public to address this safety risk. We encourage you to report laser strikes to the FAA via our website or to your local law enforcement agency," said Whitaker.

The FAA created a visualization tool that presents laser-strike data spanning from 2010 to 2023, along with associated trends, including geographic distribution, per capita statistics, and time patterns by day and year.

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