UTED 1968 INTERNATIONAL

ISSUE 01 • 2024

AIRCRAFT MAINTENANCE MAGAZINE

- PARTICIPATING AT THE MRO AMERICAS EXPO: A COMPREHENSIVE OVERVIEW
- PERFORMANCE INDICATORS OF MAINTENANCE ACTIVITIES ON MRO
- WHAT IS MAINTENANCE? WHY DO WE DO MAINTENANCE?

UNSUNG HEROES OF THE SKIES : AIRCRAFT MAINTENANCE TECHNICIAN

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TURKISH TECHNIC

Dear Readers,

Founded on December 5, 1968, in Istanbul, Türkiye, the Aircraft Technicians Association began its journey with 80 dedicated aircraft technicians. Now, celebrating over half a century of dedicated service, our association has evolved into a pivotal non-governmental organization shaping the aviation sector in our country. With a rich heritage of expertise and knowledge, we are embarking on a new endeavor to extend our reach to the international community.

It is with immense excitement that we introduce to you our first issue of UTED International magazine. This publication is crafted to capture the interests of Maintenance, Repair, and Overhaul (MRO) companies and serves as a resource for technicians, engineers, experts, and pilots alike. Through UTED International, we aim to bridge the significant gap in the sharing of knowledge and experiences in aircraft maintenance, a critical area within our industry.

Our commitment to journalism is well-established, evidenced by our longstanding Turkish journal, UTED, which has been published monthly for 47 years. Both UTED and UTED International are accessible through platforms such as Pressreader and Magzter. Recognizing the busy schedules of our readers, we also offer audio versions of our articles on Spotify, ensuring that our technicians stay abreast of industry developments without compromise.

Looking forward, we are committed to enhancing the training, working conditions, and overall quality of life for the anticipated 650,000 aircraft technicians needed in the aviation industry over the next decade. Our efforts are focused on aligning standards across Europe and the Americas, particularly in the adoption of regulatory decisions and practices that benefit the sector.

UTED International aims for a global reach, targeting audiences across six continents—Asia, Europe, Africa, Australia, North America, and South America. Our distribution will include both print and digital formats, ensuring that we meet our readers wherever they may be, possibly at every major fair and event they attend.

As we pursue this journey toward safer skies, we do so with humility, determination, and an unwavering commitment to excellence. Join us in shaping the future of aviation, as we forge pathways in the skies and beyond.

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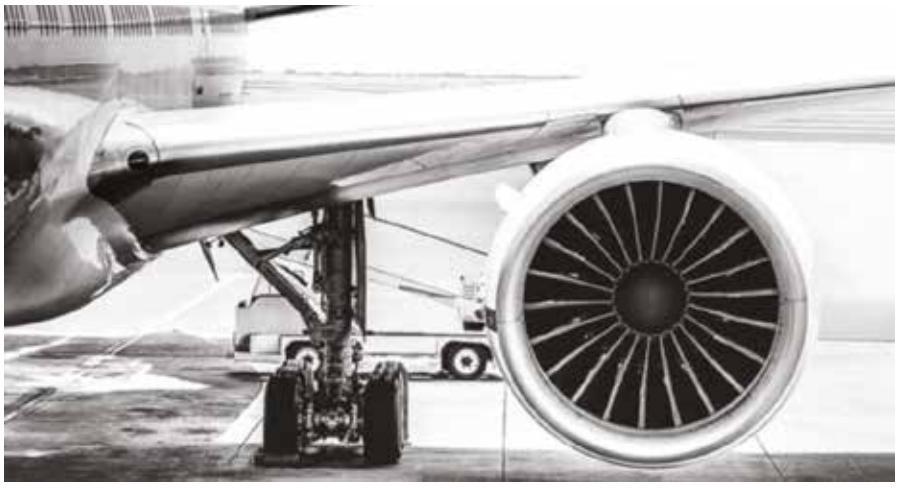
Condor and Lufthansa Technik Forge Strategic Partnership

Lufthansa Technik carries out production and inspection of Condor's A32Xneo fleet with the APIP program. The program covers everything from initial assemblies to aircraft acceptance, including Total Component Support (TCS) agreements. It will come into force in May 2024 and will have a twelve-year term. Christian Schmitt (Condor's Chief Operating Officer and Responsible Manager) said about the work that Condor and Lufthansa Technik will do together: "With Lufthansa Technik, we will continue to rely on a reliable partner who supports our ambitious goals with the most suitable services for us. Based on our previous cooperation, we have decided to further strengthen our partnership in order to benefit from Lufthansa Technik's expertise for our existing fleet and, in future, the new fleet. This puts us in a good position for fleet modernisation."



The Acquisition of Rhinestahl by Hydro Will Enhance Engine Tooling Synergies

Rhinestahl's acquisition of German tooling specialist Hydro Systems aims to capitalize on synergies in narrow-body and wide-body airframe, engine tooling, and ground support equipment. The combined entity, named RH Aero Systems, will operate from Rhinestahl's Ohio headquarters while Hydro will remain in Germany. This strategic move, led by Rhinestahl's CEO Dieter Moeller, leverages the complementary strengths of both companies, particularly in engine programs like CFM Leap, General Electric GE9X, and Rolls-Royce engines. With 15 service center locations worldwide, including North America, Europe, and Asia, RH Aero Systems plans to explore expansion into India. The acquisition, expected to strengthen the supply chain and increase operating scale, will employ over 800 people from its inception, with plans for further workforce growth.

STS Aviation Launches Two New Line Maintenance Stations in the UK

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.

Q1 Engine Market Growth Tempered by Supply Chain Issues

In the first quarter of 2023, the commercial aviation aftermarket experienced a 12% increase in maintenance, repair, and overhaul (MRO) sales, driven by gains in component and heavy maintenance segments, according to an April 18 report by RBC Capital Markets. However, growth in the engine segment was more modest at 9%, hindered by parts shortages and slow service times, particularly affecting engine manufacturers like GE and RTX. The report highlighted high demand for CFM56 and IAE V2500 engines, but noted that supply chains and manufacturers are facing challenges in supporting older engine models due to an increased focus on newer technologies, such as Pratt & Whitney's geared turbofan engines. This shift has resulted in underutilized capacity for some engine MROs, particularly for CFM56 engines, as companies hesitate to sell service slots without assurance of necessary parts availability. Additionally, the industry's pivot towards newer engine technologies has diminished support for older engines, creating potential market opportunities for third-party service providers. The loss of skilled labor during the pandemic has further strained resources, compounding these challenges. Despite these issues, RBC Capital Markets remains optimistic about the MRO sector, especially for older aircraft engines, noting an increase in aircraft over 20 years old since 2019.

StandardAero Achieves CTEM Readiness for LEAP-1A and LEAP-1B Engines

StandardAero's 810,000 sq ft engine overhaul center 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, for both the LEAP-1A, which equips the Airbus A320neo family, and 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.

Supply Chain and Cost Pressures Drive Changes in Warranty Services

Matt Davies from Airinmar highlights current trends in aviation warranty management driven by advancements in aircraft technology and challenges in cost and supply chains. He notes an increase in detailed requirements and scrutiny from manufacturers in handling warranty claims, leading to more rigorous evidence demands and longer adjudication times. This shift complicates and potentially delays the resolution of claims, as OEMs now often require the physical return of parts and prefer providing replacements rather than immediate credits. Additionally, service bulletins now often require airlines to pay upfront for materials and claim credits later, further complicating the warranty process. In a recent agreement with Philippine Airlines, Airinmar aims to reduce costs associated with out-of-scope repair charges, which can significantly inflate operational expenses. Through targeted oversight, Airinmar typically cuts these excess costs by 10-20%, demonstrating effective management and cost savings in warranty handling.

OEM Growth Opportunities Are Eyed by a New Aviation Parts Specialist

Avian Inventory Management, a newcomer in the aftermarket parts industry, specializes in tailored inventory solutions for OEMs. Originally focusing on distributing surplus spares inventory for Embraer, Avian is now seeking similar partnerships with other OEMs. Founder and CEO Ian Gurekian explains that Embraer sought a holistic solution for their surplus parts inventory, leading to Avian's innovative approach. Avian collaborates with OEMs' finance, sales, and spare parts divisions to provide access to buffer stock without using the OEM's capital. They've established a 70,000-ft.2 distribution center in Orlando and currently hold 13 million Embraer parts, along with some Bombardier material. Avian utilizes AvSight software for inventory management and has a network for inspection, repair, and overhaul processes. They've expanded into teardowns and consignments and have partnered with sales channel partners like Aventure Aviation and C&L Aerospace. Gurekian emphasizes adaptability, aiming to pivot quickly to meet different business needs. As Avian's business grows, Gurekian envisions demonstrating their model to other OEMs, showcasing its potential for replication across industries.

Setna iO Experiences Significant Growth in Aircraft Leasing Sector

Setna iO, a Chicago-based aftermarket parts specialist, is considering expanding into aircraft buying and leasing to gain control over its supply chain and increase its assets. The company has already begun leasing engines and components and plans to further expand these efforts. Setna iO's CEO, David Chaimovitz, mentioned that they have the funding to independently purchase aircraft assets and intend to make this a significant part of their business model. By leasing and eventually parting out aircraft, they aim to maximize the value of the components and streamline their supply chain. Chaimovitz notes that, despite fluctuations due to the pandemic, the parts market remains robust, especially for various aircraft models. Setna iO primarily deals in used serviceable material parts, which constitute the majority of their business, with a smaller portion sourced from OEMs.

Moroccan CFM56 Joint Venture Intends to Expand Workforce and Capacity

Safran Aircraft Engine Services Morocco (SAESM), a joint venture between Safran Aircraft Engines and Royal Air Maroc, is expanding its facility near Casablanca's Mohammed V International Airport to accommodate growth in CFM International CFM56 engine services. The recent inauguration marked a 1,500 m expansion, with plans for an additional 21,500 ft expansion to increase annual shop visits from 70 to 100 by 2026. SAESM is also incorporating solar panels to achieve a 30% renewable energy share by 2025. The expansion will necessitate hiring approximately 100 new staff, bringing the total to 350, with a focus on leveraging local academic partnerships to develop MRO expertise in Morocco. Established 25 years ago, SAESM specializes in CFM56 MRO services, with heavy shop visits expected to peak by 2025 according to Aviation Week Network's forecast, which predicts a significant number of overhaul events for CFM56 family engines in the coming years.

Tecnam secures European certification for short take-off P2012

Italian airframer Tecnam has secured European certification for the short take-off and landing (STOL) variant of its P2012 Traveller twin-engined commuter aircraft. The European Union Aviation Safety Agency (EASA) updated the type certificate on 1 March to include the STOL configuration. Tecnam developed the P2012 STOL to accommodate airports with short runways and operational constraints. The certification campaign lasted 18 months, according to the company, and production aircraft are already in the final stage of assembly. Initial customer deliveries are set to begin soon, aiming to fill a previously uncovered gap and serve an underdeveloped and unsupported niche market. The STOL aircraft, powered by geared Continental GTSIO-520-S engines with three-blade propellers, features a 16.6m wingspan—some 2.6m greater than the conventional P2012.

Delta Plans to Expand Third-Party MRO Operations

Delta TechOps, the maintenance division of Delta Air Lines, plans to increase its third-party maintenance work, having primarily focused on its parent company's fleet until now. Due to a mismatch between aircraft supply and surging passenger demand, Delta has kept older aircraft operational for longer periods, thereby increasing the workload for the TechOps team. Despite these challenges, this strategy is viewed as a competitive advantage because it allows Delta to maintain flexibility in its fleet operations. While Delta did not retire any aircraft in 2022 and 2023, they plan to resume normal retirement patterns later this year and recycle materials for efficiency. As supply chain issues and fleet challenges ease, Delta TechOps anticipates an expansion of its external business. CEO Ed Bastian believes that their experiences during the pandemic will enhance their capacity to secure third-party maintenance work, positioning them for growth in the coming years.

ExecuJet Haite Successfully Completes Its First Falcon Engine Change

ExecuJet Haite has completed its first engine change on a Dassault Falcon 7X trijet, which is powered by Pratt & Whitney Canada PW307A turbofans. This work was carried out at ExecuJet Haite's state-of-the-art MRO center in Tianjin, equipped with an overhead crane for engine changes and other complex tasks. Previously, the MRO facility has performed Rolls-Royce and GE engine changes for other aircraft types, including Embraer Legacy and Embraer Lineage. Paul Desgrosseillers, General Manager of ExecuJet Haite, stated: 'Chinese Falcon operators previously had to send aircraft to Shanghai, or more often, overseas for engine changes. However, this most recent event has demonstrated that we can successfully perform such operations at our Tianjin facility.' Following the engine change, ExecuJet Haite shipped the engine out for repairs. The Falcon 7X and 8X trijets are among Dassault Aviation's most popular aircraft types in China. Dassault Aviation recently renewed ExecuJet Haite's Authorized Service Center (ASC) status for another three-year term. ExecuJet Haite performs line and base maintenance on the 7X and 8X and is certified by the CAAC, as well as by international regulators including the US FAA, EASA, and the aviation authorities of Bermuda, Cayman Islands, San Marino, and others

MICHELIN Expands Beyond Tires

Acquired in 2018, Fenner and CDI Products now join Michelin's portfolio, offering coated fabrics, bearings, seals, and injection-molded components. By bundling these brands together, Michelin aims to provide a more comprehensive aerospace solution beyond just tires. Leveraging its well-known brand, Michelin emphasizes that Fenner and CDI uphold the same quality, engineering, and innovation standards. At the event, Michelin showcased its latest aviation tire innovation, the Michelin Air X Sky Light, designed to be lighter and have a longer lifespan than existing tires, catering to the needs of aircraft like the Dassault Falcon 10X. While unable to be retreaded, the tire offers fuel and CO2 savings, aligning with customer interests.

Boeing's Quality Standdowns Continue in the MRO Sector

Boeing's quality standdowns, initially implemented within Boeing Commercial Airplanes (BCA), are now extending to the Boeing Global Services (BGS) segment as well. According to Dan Abraham, BGS VP of Commercial Sales and Marketing, these standdowns involve pausing operations, conducting thorough evaluations, and engaging with employees across the entire enterprise to enhance quality and efficiency. This initiative comes amid scrutiny following the Alaska Airlines 737-9 door plug blowout incident. Boeing's efforts align with an FAA review of all 737 MAX production lines and Spirit AeroSystems' work in Wichita, focusing on manufacturing process control and compliance. Abraham emphasizes an enterprise-wide commitment to safety and continuous improvement, stating that incidents like the Alaska incident serve as reminders of the ongoing need for vigilance. Boeing's approach includes hands-on learning, reflection, and collaboration to identify areas for improvement and ensure compliance.

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 optimizing 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.

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, a 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, now featuring SmartSky's next-generation ATG connectivity. Tom Miszewski, Vice President and 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 was possible before.

The Mantra of Sun Country Automate The Airline

Sun Country Airlines is focusing on improving the efficiency of its maintenance operations to support its expansion plans. Peter Schumann, the airline's director of planning and MRO, highlights the introduction of technologies such as bag tagging and RFID for tracking parts as key elements of their move towards automation. Schumann advocates for a gradual automation strategy, aiming to expand operations while maintaining service levels with the current workforce. Sun Country currently has a fleet of 49 aircraft, predominantly Boeing 737-800s. The recent adoption of RFID for the life vest program has made routine maintenance and security checks more efficient, saving time for technicians. In a similar vein, Endeavor Air is also transitioning technologically to enhance its maintenance operations. Greg Lambert, the regional carrier's director, discusses advances in integrating maintenance manuals and job card systems, which will offer technicians more detailed information. This new integrated system is expected to boost efficiency and streamline maintenance tasks at Endeavor Air.

Airbus Chooses North America's First A220 Repair Station

Station for Airbus A220 aircraft parts. Located near Montreal, M1 Composites will offer repair services for Airbus proprietary parts managed by its Satair subsidiary, focusing on structural components, flight surfaces, rudders, elevators, and winglets. With over 100 employees, M1 Composites provides a range of services including aircraft structural repairs, engineering, manufacturing, and testing. Airbus anticipates a growing number of A220 operators in North America and emphasizes the importance of servicing customers locally. The OEM took full ownership of the A220 program from Bombardier in 2020 and foresees continued expansion in the region. According to the Aviation Week Intelligence Network's forecast, there are 196 A220 aircraft in service in North America in 2024, with MRO spending projected to reach approximately $355.9 million for the year. Notable regional operators of the A220 include Air Canada, Breeze Airways, Delta Air Lines, and JetBlue.

MRO Industry Is Invited to Test Hack-Proof Software by DARPA Chief

During the Military Aircraft Logistics and Maintenance Symposium at the MRO Americas conference in Chicago, DARPA Director Stefanie Tompkins discussed the agency's initiative to enhance cybersecurity in the military. Since 2016, DARPA has been promoting the use of "formal methods," a software coding process that mathematically eliminates vulnerabilities, demonstrated through programs using quadcopters and other UAS like the Boeing Unmanned Little Bird. These methods, which have been proven at hacking conventions, could potentially remove up to 90% of the Pentagon's cyber vulnerabilities by ensuring software performs only its intended functions without loopholes. Tompkins highlighted the necessity of widespread adoption across the defense industry to achieve a kind of "herd immunity" against cyber threats, thus freeing up resources to tackle more complex security challenges.

MRO Americas 2024 Airlink On The Things You May Not Know About Aviation's Global Impact

Airlink, a charity based in Washington, D.C., will host a 15-minute session at the Go LIVE Theater during the MRO Americas event in Chicago on April 9 at 4:30 PM. Sandra Walter, the charity's Director of Development, will discuss the global impact of aviation in humanitarian aid. Airlink connects nonprofit and aviation partners to deliver disaster supplies and assistance worldwide, providing transportation for passengers and cargo at local, national, and international levels. The charity collaborates with over 100 nonprofit organizations and 40 aviation partners, focusing on regions prone to disasters, such as Latin America, the Caribbean, Asia Pacific, Sub-Saharan Africa, and others. Through its Regional Response Framework, Airlink plans collective capacity to respond to emergencies by engaging with partners during non-disaster periods. For instance, Airlink continues to coordinate aid movement to Afghanistan, where vulnerable populations face harsh winter conditions. Attendees of the session at MRO Americas can learn more about Airlink's work and how the aviation sector supports its humanitarian efforts.

VAS and SR Techniques Expand PW4000 Program

SR Technics and VAS Aero Services have extended their contract for Pratt & Whitney PW4000-100-inch engine maintenance for an additional five years. The agreement, valued at at least $50 million annually, aims to provide a lower cost of ownership through the use of used serviceable material and spare engines, according to VAS Aero CEO Tommy Hughes. VAS Aero will supply spare PW4000 engines to SR Technics customers during maintenance, acting as the engine pool provider. VAS Aero has been investing in the Airbus A330, acquiring four A330s from American Airlines and 18 engines over the last 18 months. When PW1000 engines reach the end of their useful life, VAS Aero sends them to SR Technics for dismantling and recertification of used serviceable material. VAS Aero became an independent subsidiary of Satair, an Airbus company, in 2022.

The KLM Group has also started to take part in GE Aerospace's fuel analysis solution

In previous years, KLM utilized GE Aerospace's Event Measurement System (EMS). KLM has now re-registered with the company to adopt its primary fuel efficiency system. GE Aerospace, a software company, has developed a program featuring Fuel Insight to serve the KLM Group. Fuel Insight provides data on fuel consumption and emissions, alerts teams to initiatives with the highest savings potential, and enables them to monitor acceptance rates within their fleets. The scope of this program includes:

- Improving fuel efficiency.
- Reducing CO2 emissions.
- Consolidating around a unified set of tools at the group level.

With this software, KLM will be equipped to identify previously overlooked fuel optimization opportunities, resulting in significant cost savings. Additionally, it will lead to a reduction in environmental impacts and contribute to sustainability efforts.

MRO Middle East: Sanad agrees Trent 700 MRO deal with Deucalion arrow_ outward

Sanad, an aerospace engineering and leasing solutions provider, has announced a new partnership with Deucalion Aviation, a provider of aircraft asset management, financing, and investment services. This collaboration, revealed at MRO Middle East 2024, focuses on delivering MRO services for Rolls-Royce Trent 700 engines. This partnership signifies a major expansion for Sanad as it aims to grow its global customer base. Deucalion Aviation oversees more than 160 aircraft with assets valued over $3 billion, managed across over 50 countries and leased to more than 80 lessees. Les Walsh, Chief Technical Officer at Deucalion Aviation, commented, "Joining forces with a trusted partner with proven expertise like Sanad strengthens our ability to maintain the airworthiness of our Rolls-Royce Trent 700 engines, enabling us to continue delivering superior value to our customers."

India's FLY91 Signs MRO Deal with Pratt & Whitney Canada for Engine Services

Pratt & Whitney Canada (P&WC) has entered into a multi-year engine services agreement with FLY91 for the MRO (Maintenance, Repair, and Overhaul) of the PW127M engines that power its fleet of ATR 72-600 turboprop passenger aircraft. FLY91 is a dedicated regional airline based in Goa, established by industry veterans and supported by professional investors. The airline is committed to enhancing last-mile air connectivity and plans to connect over 50 cities across India within the next five years. As part of this strategy, FLY91 will add 30 aircraft to its fleet, which will be based at multiple hubs throughout the country.

Hillsboro Aviation Joins Forces with SmartSky as Sales and Installation Partner

Hillsboro Aviation, an FAA-certified Part 145 repair station, has partnered with SmartSky Networks, a provider of advanced inflight air-to-ground (ATG) connectivity for business aviation. Based in Oregon, Hillsboro Aviation will provide full MRO services, including upgrading business aircraft with SmartSky's next-generation inflight connectivity. Operating from their state-of-the-art facility at Portland-Hillsboro Airport (KHIO), Hillsboro Aviation has offered complete helicopter and airplane services since 1980. Serving both domestic and international clients in government, commercial, and private sectors, Hillsboro Aviation also boasts an experienced team of technicians who support comprehensive maintenance and avionics needs.

V2500 engine successfully tested with 100% SAF

Tests on a V2500 engine using 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, stated, "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.

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.

PARTICIPATING AT THE MRO AMERICAS EXPO:

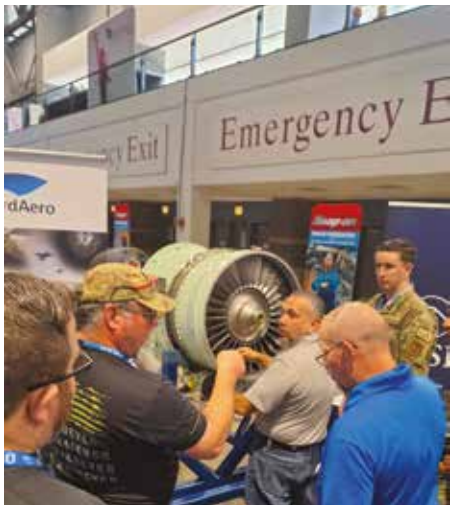
A COMPREHENSIVE OVERVIEW

As the world changes with advancements in unmanned aerial vehicles and artificial intelligence, we too have embarked on a journey to keep up. Initially, we gained experience by participating in the MRO Middle East fair in Dubai and outlined our roadmap, then shifted our focus to the cradle of aviation, America.

The MRO Americas fair, held in Chicago from April 9-11, welcomed nearly 20,000 visitors. Representing UTED were President Ömür Caninsan, former Press Secretary Utku Uzun, THY Technical Revision Technician İsmail Önder Başoğul, and THY Chicago Line Maintenance Technician Tunç Selek. Visiting over 800 stands was barely enough time to promote UTED and Turkish Technicians. The promotional version of our upcoming UTED International magazine was unveiled, attracting significant attention from many companies.

The MRO Americas fair highlighted many new developments and technologies, particularly focusing on digitization and automation technologies. New software solutions that automate maintenance processes and advanced analytics platforms developed to manage aircraft maintenance data were introduced. Drones used to accelerate aircraft maintenance, robots equipped with high-resolution cameras for visual inspections, and Airbus's Future Hangar integrating IoT devices to support maintenance activities with artificial intelligence were showcased. We also observed an increase in eco-friendly practices, particularly innovative fuel systems targeting carbon emission reduction and using recyclable materials to decrease maintenance costs and environmental impact.

Remote-controlled sensor technologies and real-time data monitoring systems were among the solutions enabling instant health monitoring of aircraft and offering proactive maintenance opportunities. The event hosted major aircraft manufacturers like Airbus and Boeing, engine manufacturers such as GE Aviation and Rolls-Royce, and many key maintenance, repair, and overhaul (MRO) firms. Companies from our country like Turkish Technic and MyTechnic set up booths to forge new and significant collaborations. Numerous experts spoke on industry



trends, future aircraft maintenance technologies, and changes in the global aviation market. Many companies announced strategic partnerships focused on increasing the use of artificial intelligence and enhancing data analytics capabilities. New maintenance contracts and technical support agreements were also signed during the fair.

MRO Americas 2024 served as a platform showcasing the latest developments in the aircraft maintenance sector and brought together industry professionals, offering valuable information and collaboration opportunities. The event provided a significant perspective, highlighting differences in approaches between Europe, the Middle East, and America, the main hub of aviation, and the trends we need to catch up with. The organization of the event received high marks from us. From registration to session scheduling, everything was handled flawlessly, making the experience smooth and enjoyable. In the coming years, we might organize similar events ourselves, using these experiences as a guide.

Additionally, this year's MRO Americas coincided with the Aerospace Maintenance Council-organized AMC (Aerospace Maintenance Competition). Teams from companies, universities, and the defense industry competed enjoyably and competitively in 27 different areas ranging from structural repairs to wiring checks. The HERB team from Southwest Airlines won, with the TULSA team from American Airlines coming in second and Chix Fix from United Airlines taking third place.

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

References

• Garcia, M. (2024, February 26). FAA sets new rule to reduce pollution from planes. Forbes. https://www.forbes.com/sites/marisagarcia/2024/02/24/faa-sets-new-rule-to-reduce-pollution-from-planes/?sh=14b4cf182cee

•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.

UNSUNG HEROES OF THE SKIES:

CELEBRATING AIRCRAFT MAINTENANCE TECHNICIANS

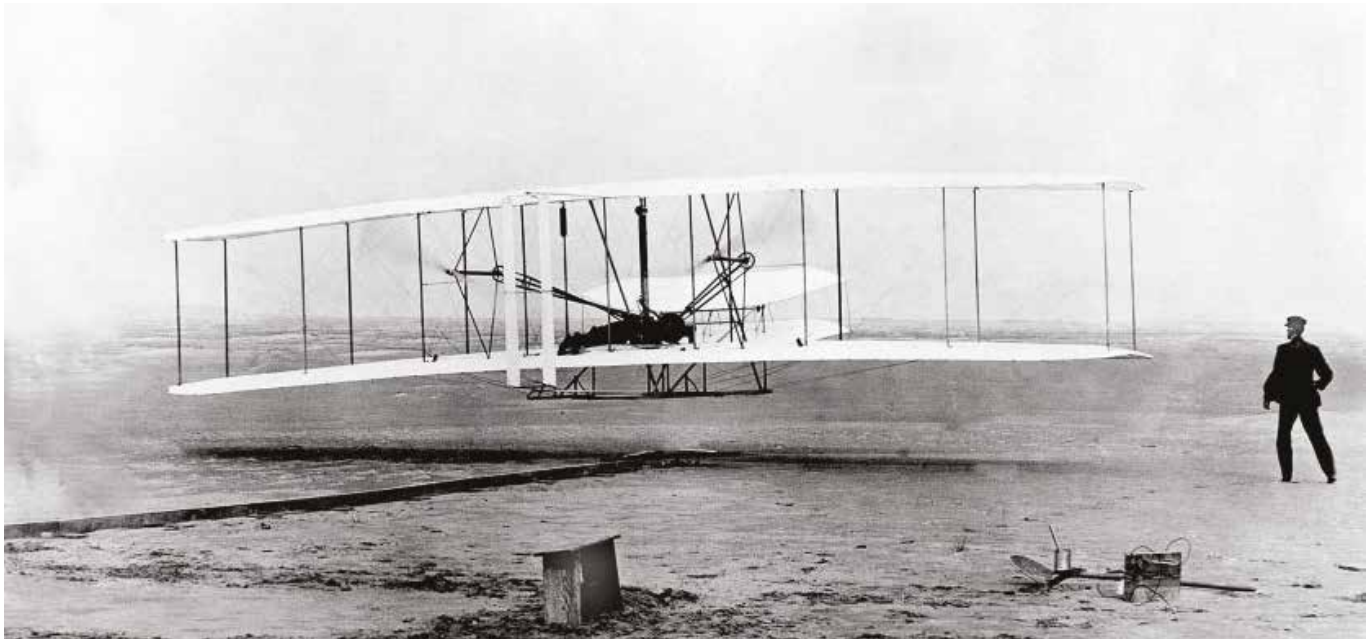
Soaring through the clouds, we often marvel at the engineering marvels that carry us across continents and oceans. While pilots and flight attendants capture our attention, there's an army of dedicated professionals working tirelessly behind the scenes to ensure our safe passage through the skies – aircraft maintenance technicians (AMTs). These unsung heroes are the backbone of aviation, meticulously maintaining and repairing aircraft to keep them airworthy and safe.

Becoming an AMT is no easy feat. It requires years of rigorous training, specialized education, and unwavering dedication to safety. AMTs must possess a deep understanding of aircraft systems, electrical components, mechanical intricacies, and aviation regulations. Their expertise encompasses a wide range of tasks, from routine inspections and minor repairs to complex overhauls and troubleshooting.

A Day in the Life of an AMT

A typical day for an AMT can vary depending on their specialization and the type of aircraft they work on. However, the core mission remains constant: ensuring the airworthiness of their assigned aircraft. Their workday might involve:

Pre-flight inspections: AMTs meticulously examine every inch of the aircraft, checking for any signs



of wear, damage, or potential issues that could compromise flight safety.

Routine maintenance: This includes tasks like changing oil, filters, and tires, lubricating moving parts, and ensuring all systems are functioning within specified parameters.

Troubleshooting and repairs: When technical glitches arise, AMTs employ their diagnostic skills and expertise to identify the root cause of the problem and implement effective repairs.

Overhauls and modifications: For major maintenance or upgrades, AMTs work in teams to disassemble, inspect, repair, and reassemble various aircraft components, ensuring they meet the highest safety standards.

Behind Every Flight, an AMT's Dedication

The next time you board an airplane, take a moment to appreciate the countless AMTs who have meticulously inspected, maintained, and repaired the aircraft to ensure your safe journey. Their dedication, expertise, and unwavering commitment to safety are the invisible forces that keep us soaring through the skies with confidence.

Honoring the Unsung Heroes

While pilots and cabin crew often receive the spotlight, AMTs remain largely unrecognized for their crucial role in aviation safety. May 24th marks International AMTs Day, a day dedicated to honoring these unsung heroes and raising awareness about their invaluable contributions.

As we marvel at the wonders of flight, let us not forget the silent guardians who ensure our safe passage through the skies. Aircraft maintenance technicians are the epitome of professionalism, dedication, and unwavering commitment to safety. Their expertise forms the cornerstone of a reliable and secure air travel experience for all.

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.

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 (CO2) capture performance and oxygen (O2) 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 O2 regeneration from CO2, 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."

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/

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M.Murat BAŞTÜRK
Part -147 Type Training Instructor

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.

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

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.

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.

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%

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.

KAAN

The capabilities and equipment necessary for 5th generation plus fighter jets are designed using domestic and national resources, considering what such advanced aircraft should possess. They are designed to operate in a network-centric environment, allowing secure data sharing with friendly elements and employing smart munitions for strategic attacks against all types of air-to-air and air-to-ground targets.

National Combat Aircraft will dominate the skies with:

- High-performance radar, electronic warfare, electro-optical, communications, navigation, and identification capabilities.
- Precision and accurate firing from internal weapon bays at high/supersonic speeds.
- Automated target recognition and detection, multiple data fusion, and artificial intelligence capabilities enhancing combat power.

SYSTEM FEATURES:

- High Situational Awareness
- Optimized Pilot Workload
- Combat Damage Assessment
- Next Generation Mission Systems
- Interoperability with Other Elements
- Low Visibility and Infrared Signature
- Sensor and Data Fusion Supported Precision Fire Control System
- Short Turnaround Time
- Easy Maintenance
- Sustainable Life Cycle Support
- Cost-Effective Life Cycle Support
- Internal Weapons Bay
- Supercruise Capability
- These advanced specifications and systems are crucial for maintaining an edge in modern aerial combat scenarios.

Deniz GÜNALTAY
Basic Training Instructor

KEY SOLUTION TO LACK OF AIRCRAFT MAINTENANCE TECHNICIANS IN MROs:

147 BASIC TRAINING

According to Boeing's Pilot, Cabin Crew and Technician needs forecast report, between 2023 and 2042 there will be a worldwide shortage of 690,000 aircraft maintenance technicians, 649,000 pilots and 938,000 cabin crew, with nearly 46,000 aircrafts added to the global fleet of all airlines worldwide. To fill such a huge gap, companies will need breakthrough solutions; training strategies enriched with innovative technologies, tools and teaching methods to train the next generation of pilots, technicians and cabin crew.

"Necessity is the mother of invention" is a guiding motto. With the projects carried out for the realization of strategic plans, it becomes flesh and bones. For aviation companies, training technicians equipped with up-to-date knowledge is one of the most long-term human investment projects in the aviation sector.

At this point, 147 Basic Training comes into play; 147 Basic Training creates the basis of the project in terms of technician training, licensing and updating information with special trainings. It shapes in the future of aviation maintenance technicians. It serves as the cornerstone of aircraft maintenance technician education and certification in producing competent and qualified aviation professionals who can effectively contribute to the safety and airworthiness of the aircraft all over the world.

147 Basic Training can be considered as a school where both education and training are provided to the individual, professional and vital experiences are transferred, the individual realizes himself/herself in socio-economic and socio-cultural terms by internalizing the training received, and the first step is taken into business life. They are increasingly important centers where trained manpower can be readily employed by the human resources departments of aviation companies.

The most important function of basic training is to mentally prepare the technician candidate student for the real maintenance environment and to acquire specific habits. Working in accordance with aircraft maintenance documents such as AMM, IPC, TS, MEL, SRM, WDM, etc., instilling the awareness of complying with the rules set forth in terms of occupational health and safety, developing the student with hand skills, enabling him/her to visualize and implement the solution steps from simple to complex when faced with a problem in the working environment, showing the ability to take a definite stance without leaving any open doors based on knowledge and experience in situations where decisions need to be made while working in the maintenance environment, are permanent behavioral changes that must be gained.

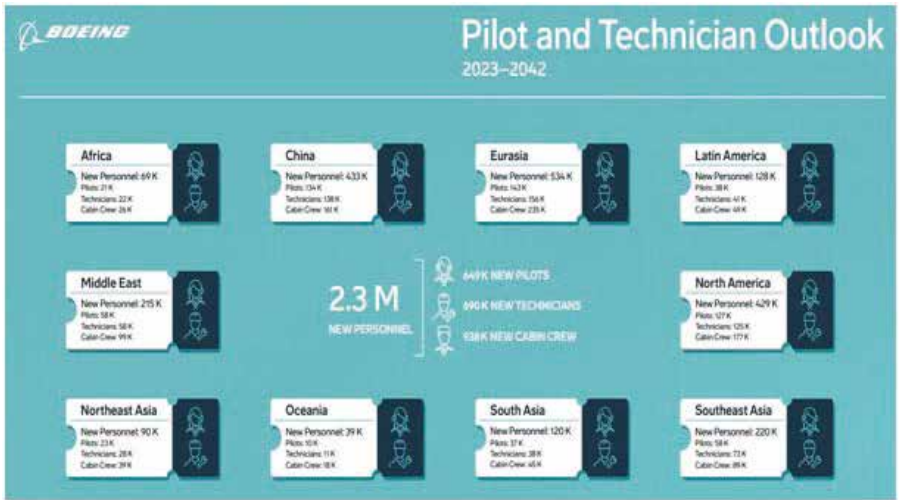
Man is a social being and is in communication-interaction with the creatures and objects around him. In addition to classical learning methods, computer-based learning methods are a perfect fit for the digital new generation who want to become aircraft maintenance technicians. Thanks to digitalized teaching methods, direct interaction between the student and the aircraft is established. As the young

generation grows up in a technological environment in the digital age, the preference in terms of education should be for computer-based training as well as traditional methods.

Each student can be given a tablet or portable computer at the beginning of the theoretical or practical training course for an engaging, motivational learning. The blending of old and new methods, the increasing use of new technologies is not to replace the trainer, but to adapt the trainer to the technological world and to increase the quality and impact of education for students. Different, remarkable and impressive training methods leave a positive impression on the student and permanent learning takes place.

When the practices in the world are examined, it is seen that basic training departments are generally independent from the real maintenance environment, with their own hangars, classrooms, workshops, equipped with today's technology, infrastructure, superstructure and documents, books, presentations, questions, training management software that can be used for basic training, computer-based training programs, interactive online training platforms and simulation systems; they are not a structure that is separated piece by piece, but an integrated installation that meets every need.

The content of the tasks performed during practical training is based on the documents published by the manufacturer of the aircraft you are working on. For example, the sequence of work, tools and equipment used, chemical materials used in the hydraulic systems are included in the aircraft maintenance documents. In practical trainings on a workshop basis, task cards designed in addition to the list published by the authorities are created according to the training to be given, but include flexibility. A unique task card, which is suitable for the sectoral requirement and which is called a must-have in practice, can be designed and added



to the list of existing approved task cards. For instance, in the avionics workshop, in addition to general voltage, current, resistance, frequency measurements, the student can set up an electrical circuit suitable for his/her level and make measurements on it, and observe the signal outputs on an oscilloscope.

Synchronous and asynchronous distance education, off-line and on-line training, web-based training, multimedia-based training, computer-based training, simulation-based digital training (MTD&MSTD), practical training on real aircraft, mock-up structures designed specifically for needs, virtual reality training based on task cards or chapters, training needs analysis-TNA and approaches aimed at bringing an innovative approach to the process, needs should be addressed and implemented within the scope of the vision based on the future harmonized with approved Part-66 and Part-147 Regulations.

In conclusion, Part 147 Basic Training plays a crucial role in shaping the competence and professionalism of aviation maintenance technicians. By providing a well-structured syllabus, theoretical - practical training and compliance with regulatory standards, it educates candidates of aircraft maintenance technicians with the contemporary knowledge and skills necessary to ensure the safety and airworthiness of aircraft. As the aviation industry continues to evolve, ongoing efforts to develop and improve basic training programs will be essential to meet the demands of an ever-changing environment while maintaining the highest standards of safety and reliability.

DIGITAL DATA TRANSMISSION STANDARDS USED ON AIRCRAFT

In the aviation sector, there are various digital data transmission standards developed for different types of aircraft and applications. It is necessary to adhere to certain standards for the effective transmission of analog and digital signals between transmitter and receiver systems. In other words, computer systems need to share the same language. The type of language used in aircraft data lines is defined as a protocol.

Civil aircraft data line protocols are defined by ARINC (Aeronautical Radio Incorporated), while military aircraft protocols are defined by MIL-STD (Military Standard). For digital data transmission on aircraft, standards like ARINC 429, ARINC 629, CSDB (Commercial Serial Digital Bus), ASCB (Avionics Serial Communication Bus), and MIL-STD 1553 have been developed.

CSDB

This standard was developed by Collins Avionics in the early 1980s for regional aircraft and business jets and has been certified for use in numerous aircraft, including SAAB regional aircraft and Hawker business jets. Data transmission occurs over shielded and twisted pair cables from a single transmitting system to one or multiple receivers (up to a maximum of 10) in a unidirectional manner, using the RS-422 A standard, asynchronous, NRZ (Non Return to Zero unipolar) format at two different speeds (50 Kb/s and 12.5 Kb/s).

ASCB

This standard was developed by Sperry, a division of Honeywell, in 1986 and revised in 1987. It has been certified for use in a variety of aircraft, including the ATR 42/72 regional aircraft and the Hawker 1000, Gulfstream IV business jets. Unlike the CSDB standard, data transmission over the same cable pair is semi-duplex and not simultaneous, based on the EIA (Electronic Industries Alliance) standard HLDLC (High Level Data Link Control) industry protocol, with an independent line controller, at two different speeds (2/3 Mb/s).

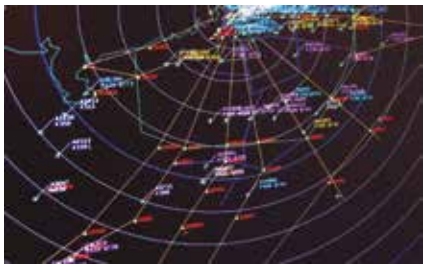
MIL-STD Data Transmission Standards

MIL-STD-1553 was specifically developed for military aircraft in 1973 and includes many types of military aircraft such as F-15, F-16, F-22, and C-17, as well as limited

applications in civil aircraft. This standard, which is a LAN (Local Area Network) description with a multiple transmitter-receiver structure, was first updated and released as MIL-STD 1553A in 1975 and MIL-STD 1553B in 1978. Data transmission is carried out at a speed of 1 Mb/s with maximum 20-bit words. Up to 31 terminals can be connected to the data line. To prevent electromagnetic interference caused by composite materials used in aircraft structures, the MIL-STD 1773 standard has been developed for data transmission using fiber optic cables. This standard retains similar characteristics to MIL-STD 1553 but has been utilized in advanced fighter jets such as the F-22 and Eurofighter 2000, where data transmission speeds are 20 Mb/s using optical or electrical cables. The first HSDB (High Speed Data Bus) used in the F-22 aircraft, NATO STANAG 3910 using optical cables, and MACAIR data transmission standards with similar characteristics to MIL-STD-1553 are also used in naval aircraft.

ARINC Data Transmission Standards

ARINC is an organization that develops and operates systems and services to enhance the efficiency, operation, and performance of aviation, defense, and transportation enterprises. It was established in 1929 by four major airline companies to provide a single license and coordination for radio communications outside of government management and has been authorized by the unified radio board. ARINC has developed various specifications and standards (such as the 400, 500, 600, 700, and 800 series) for avionic equipment. These standards are used in different systems and equipment across various aircraft types. For example, ARINC 573 is the standard format for parameters related to data recorded by flight data recorders, while ARINC 661 CDS (Cockpit Display System) is used for communication between this system and others. ARINC 429 is generally the most widely used data transmission standard in commercial air transport aircraft, defining data exchange between avionic equipment and systems. With rapid technological advancements, there is an increasing need for more information on aircraft. Advanced avionic data lines with higher transmission speeds and the significant impact of electromagnetic interference on system performance have led to the use of additional optical data transmission standards.



REFERENCES

[1] TTS Integrated Training System Module 5, Digital Techniques
Electronic Instrument Systems for EASA Part-66 Licence Category B1 and B2,Vol1,9 362008

[2] Davies, A., "IR Part-66 Aircraft Maintenance Licence, Distance Learning Modules, Module5-Digital Techniques/ Electronic Instrument Systems", Barry College,67-90, 2002 2005

[3] Tooley M., "Aircraft Digital Electronic and Computer Systems:Principles, Operation and Maintenance", Elseiver, U.SA.,33-44, 2007

[4] Kayton M., Fried W. R., "Avionics Navigation Systems", J. Wiley., New York, 691 694,1997.

[5] Helfrick A. D., "Principles of Avionics, Avionics Communications", Leesburg, Bt, 258-288, 2002

[6] Moir, I., Seabridge, A., "Civil Avionics Systems", AIAA,U.S.A,11-29, 2003

[7] Spitzer. C .R., Digital Avionics Systems : principles and practices", McGraw-Hill, New York, 19-47, 1993.

[8] Collinson R.P.G., "Introduction to Avionics", Chapman & Hall, London,406-427,1996

[9] http://www.ecrin.com/downloads/ ARINC-429-tutorial.pdf (Ağustos 2009)

THE REALITY OF THE BANDIRMA MISSILE CLUB

Bandırma Missile Club was founded in 1957 by high school students as 'Bandırma High School Feza Research Branch'. in 1960, when the students finished high school, it became an association as the 'Missile Culture Club'. in 1964, it became 'Bandırma Aviation Astronomy Rocket Club'. in 1966, it took the name of 'Aviation and Space Research Association'. However, it is known as the 'Bandirma Missile Club'.

Everywhere it is called Bandırma Missile Club was founded in 1957, but there is also a pre-dating to 1955. Güngör Gezer, one of the founders of Bandırma Missile Club, describes his foundation as follows; "In 1955, Halit Kıvanç's serial interviews published in Milliyet Newspaper on space encouraged me and a few friends in middle school to work on missiles. We started aviation studies with Artuğ Sayıner, Ali Osman Caran and Adnan Zambak. We've read everything we've found about it. We have brought books and magazines from abroad. We were spending all our allowance on these.

We made a 30cm long rocket in a small hut in the garden of Ali Osman Caran's house. His rocket reached an altitude of 50 meters when it was mounted on top of the mavzer bullet and fired. We made the second experiment with a larger rocket in which we used gasoline vapor and oxygen as fuel. In those years, we attracted attention and gained appreciation with the conferences we gave in middle school on Space, Missiles, Rockets.

When young students move to high school, they are very impressed by the fact that the USSR made history as the first country to send a rocket called Sputnik 1 into space on October 4, 1957 and set up a 'Feza Research Arm' at the school. The high school's Mathematics Teacher Tahsin Çizenel and Physics Teacher Selahattin Örgen also help young students.

by 1959, the missile made by the students was ready to be launched. On October 10, 1959, a 100 cm tall, 10 cm diameter, 3 kilogram weight missile was launched from a launcher by means of an electronic control vehicle. The missile, which is launched with a mixture of naphthalene, gunpowder and nitroglycerin fuel, falls into the sea after reaching a height of 40 meters. At these dates, there is no other organization or person interested in missiles and rockets in Turkey.

On February 9, 1960, they held a new trial. This time they will deploy the missile in the direction of the Moon. Using an automatic firing system and a control device, they manage to launch a 150 cm tall, 10 cm diameter, two-stage missile to a height of 750 meters. After the missile reaches this altitude, it falls into the sea.

After this experiment, these works of the association will cause great repercussions in the foreign press. He appears in magazines related to space studies and rocketry in America, the Netherlands and Italy. It'll be a story in the Washington Post.

Young students organize amateur activities among themselves in high school. They discuss the topics of space, the universe and aliens. Participation in events is increasing every day. They give lectures on atomic energy, the outside world, rockets and missiles at the school and at the Bandırma Municipality Building.

Young students graduate from high school. On September 17, 1960, Ali Osman Caran, Adnan Zambak, Artuğ Sayiner, Güngör Gezer founded the association as 'Missile Culture Club' in accordance with the Associations Law. Atilla Yedikardashlar also participates in this formation.

in 1961, they launched the 'B-T-47' rocket. The rocket rises 40 meters and lands by parachute. Also in the same year, the Soorpian type 'GK 30' missile they fired also becomes entangled with a parachute at 300 meters and falls to the ground. Thursday August 30, 1962 at 16:05, young people launch the Sergeant type 'Marmara 1' rocket, 87 cm tall, 6 cm diameter, 3.8 kg weight, ignited with solid fuel consisting of 750 g of nitroglycerin mixture, in the Küçük Livatya locality 5 kilometers from the city. Watched by a crowded crowd of people, the rocket was ignited by applying electricity to one end of a 25-meter-long wire, and then launched at 800 meters, where it managed to reach an altitude of. At this altitude, the second part of the

BANDIRMA'DAN
aya roket atıldı

Lise talebe ve öğretmenlerinin kurdukları "Roket Kulübü,,nün fuzesi 750 metre yükselip denize düştü

FEZA KONFERANSI

missile explodes, rocket fragments falling 200 meters away, causing a 5-acre area with grass and bushes to burn. However, the farmer whose field was burned did not complain and said to the young people; "You are doing something for this country, we will replant those trees, you go ahead. The important thing is that young people do these experiments, " he supports.

Sunday September 2, 1962 at 10:05 club members successfully launched the 'Marmara 2' rocket 113 cm tall, 6 cm diameter and 5.5 kg weight as the sixth attempt in the Plain of Sailkaya, where 3 soldiers took security measures at the Obelisk

Plain at an altitude of 100 kilometers to Bandırma. more than 50 curious. The rocket is launched by electronic ignition by remote traction via a 50 meters cable. The Marmara 2 rocket, which uses a liquid fuel with a mixture of glycerin and asphalt ballistite, ignites a fire five meters in diameter, shoots into the sky through a large layer of smoke and disappears among the clouds within five seconds. he parachute landing of the rocket head on Fener Island was observed by those who were on Fener Island. Observers present at the launch found that the rocket was 823 m. they find that it reaches an altitude of (2700 feet). This successful launch gives the club the third place in the world after America and Germany in the amateur inter-missile competition.

While rocket firings and exhibitions were being held in Bandırma, at the same time, a primary school graduate named Kirkor Divarcı in Istanbul was conducting shooting trials one after the other on the Umraniye ridges with rockets he developed alone. Sunday September 19, 1962 Kirkor Divarci's rocket fire in Istanbul Umraniye is featured on the first page of the Hurriyet Newspaper. Kirkor Divarcı explains that he wants to launch the next rocket he will launch in Bandırma. Meanwhile, the activities of the Bandırma Missile Club in Bandırma also attract the attention of Hürriyet Newspaper in. A proposal is coming from Hürriyet Newspaper to Bandırma Missile Club that Kirkor Divarcı and Bandırma Missile Club should hold a missile race in Bandırma. The Bandırma Missile Club consents to the firing of the rocket that Kirkor Divarcı wants to fire in Bandırma together with his own

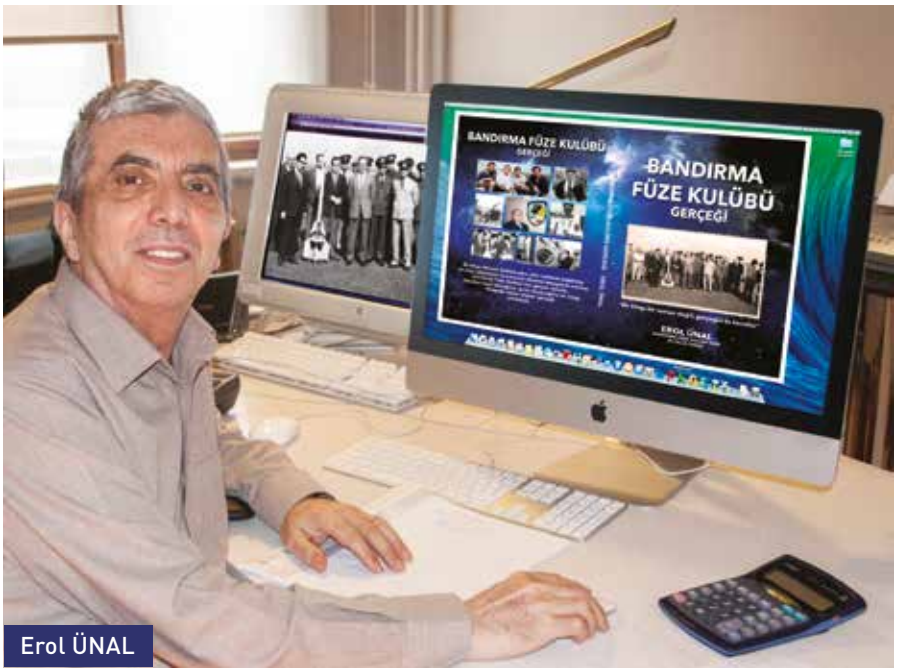
Ali Osman Caran | Adnan Zambak | Artuğ Sayıner | Güngör Gezer | Atilla Yedikardaşlar

rockets. The areas where Bandırma Missile Club has been conducting trials until then are not suitable for such a race. 6. The Main Jet Base Command will be contacted. 6. The Main Jet Base Command allows rocket firing at the Kiziksa Military Firing Range, 43 kilometers from Bandırma, owned by the Air Force.

Saturday October 13, 1962 Bandırmalarlar who want to watch this special day are brought to the Kızıksa military shooting range by military shuttle buses allocated by the 6 Main Jet Base for transportation. Hundreds of invited guests watched Kirkor Divarcı's 2.1 meter race. its tall, 15 cm diameter, 32 kg weight missile named 'Hürriyet 2' is fired at 11:20, but the missile explodes before it can take off. As the head of the rocket separates from the fuselage and launches into the air, the fuselage topples to the side like a tree cut with an axe and explodes.

Then, the Bandırma Missile Club's 'Marmara 4' missile, which is 115 cm tall, 7 cm in diameter and weighs 5 kg, is launched and raised to 5,415 meters. The rocket lands on the ground with a parachute 200 meters ahead of the firing ramp. Bandirma Missile Club, because of these achievements, 6. He is congratulated by the commander of the main jet base.

The Ankara Branch of the Bandırma Missile Club sends the latest project they are working on to the Head of the Research and Development Department of the General Staff in Ankara. In the Arcturus rocket project, which was considered larger than the Vega rocket, a mouse that would be taken from Ankara Hifzissiha and trained in a special way would be placed in the header part of the rocket and the movements of the mouse would be detected with a microfilm machine. Although there was a mouse in the capsule of the rocket, it would separate from the rocket and land with a parachute. If the project is approved, the Air Force Command and the R & D directorate will cover these



Erol ÜNAL

expenses as materials and projects, and the rocket's fuel will be made at the Research and Development Laboratory in Ankara, and the fuselage part will be made at the Etimesgut Aircraft Factory.

Tuesday April 26, 1966, members of the Ankara Branch of the Bandirma Missile Club visited President Cevdet Sunay, on July 25, 1966 Chief of the General Staff General Cemal Tural and gave information about their work. Cemal Tural appreciates the young people and orders financial assistance to be given to the club and two military barracks to be sent to Bandırma. A large rocket project is being prepared from these aids. after 1.5 months, technical drawings of the liquid fuel project prepared at the request of Chief of General Staff Cemal Tural are drawn and prepared in accordance with scientific 'MSB Research and Development' methods and presented to the General Staff.

On July 19, 1966, the number of members of the association reached 300.

The ATA 1 Rocket, launched by the Bandirma Missile Club in September 1967, is located 25 km away. by reaching the altitude, he increased Turkey's altitude record in this area. This successful launch had earned the club a world Decider in the amateur inter-club missile competition.

At this time, young people opened an exhibition in Bandırma.Various model and model airplanes related to space studies, plenty of photos, banners and banners were exhibited at the exhibition.

in the 1970s, rocket construction work was stopped and Model Aircraft, Parachute, Glider work gained momentum. Thursday July 15, 1971 the association won the right to represent Balıkesir province in the Turkish Model Aircraft Championship. in 1972, the Aviation and Space Research Association took third place in the Turkish Model Aircraft Championship held in Etimesgut. The contestants were given a B certificate and a "National License" by the General Directorate of THK Türkkuşu. the team won the Turkish National Model Aircraft Championship 4th in 1974. he finished next.'NC' was obtained. 6 out of 19 teams in the Model Aircraft Championship held in 1975. Dec. took place.

Bandırma Missile Club, which has written its name in golden letters in the history of our country and has left its mark on the space studies period, is a development that we can be proud of.

BAYRAKTAR TB2UAS

The Bayraktar Tactical Unmanned Aerial System is a medium-altitude, long-endurance class UAS for reconnaissance operations. With its triple-redundant avionics system and sensor fusion architecture, it has the capability of fully autonomous taxi, take off, cruise and landing.

The Bayraktar Armed UAV has a standalone precise see, designate and hit capability with its tv1Atv1-L or tv1Atv1-C guided bombs and onboard designator. The system offers an all-in-one solution with an easy to operate and maintain airframe which reduces operational necessities and cost.

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FOR TURKISH AVIATION

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

WHAT IS MAINTENANCE? WHY DO WE DO MAINTENANCE?

When we use any product, our satisfaction with this product is proportional to whether it meets our expectations. We can also consider "meeting expectations" as one of the definitions of quality. Our expectations may vary depending on the type of product. If this product is a technological product, our most basic expectation is that this product fulfills the "expected function" without malfunctioning.

The purpose of use of some products is to obtain the desired output as a result of reliably fulfilling the functions determined for this product at the design stage. We define "reliability" in technical terms as "the probability that a product will be able to perform the expected task / function within a specified time period, within specified conditions, without malfunctioning". To give an example, the function expected from a gun is that it fires without jamming when we pull the trigger. If we pull the trigger a hundred times for trial purposes and it fires ninety-seven times and jams three of them, we can define the reliability level of this gun as 97%. In summary, it is important that the products we use should be reliable. Reliability is also established during the design phase of the products. What we need to understand from "a product's ability to perform its expected function without malfunction" is that the product not only works, but also operates at the performance values established in the design. For this reason, "operational test" and "functional test" are different types of tests, and in the functional test, reaching the performance values determined in the design is also evaluated.

Regardless of the product, we can actually say that there are three life stages in a product's life cycle (PL). The first of these phases is the design and production of a product that did not exist before. The second is the support processes provided to this product during the use, and the operation of this product. And the last phase of the life cycle is the end-of-product process.

When the product is designed and produced, the product manufacturer confirms and certifies that this product can fully perform the functions expected from it (operates and meets the perdetermined performance values).

In case of the aircraft as a product, the airframe manufacturer of the aircraft confirms that they designed and produced this aircraft type under airworthy conditions. An "Airworthiness Certificate" is issued for each aircraft following the completion of the necessary technical evaluations before delivery to the aircraft operator. This is an

indication of this: "as the aircraft manufacturer, we have designed the aircraft delivered for your use to ensure that, at any time during its life, the aircraft complies with applicable airworthiness requirements and is in safe operating conditions."
In more technical terms, we can divide airworthiness into two parts: "initial airworthiness" and "continuing airworthiness". The aircraft manufacturer is responsible for initial airworthiness. However, the aircraft manufacturer's responsibility does not end with establishing initial airworthiness. It is mandatory under the rules to establish a maintenance program that will support continuing airworthiness to be easily achieved by aircraft operators. The purpose of this maintenance program is to ensure that the aircraft is operated in airworthy conditions at any time and that the aircraft, its parts and components continuously reach the reliability values established at the initial design stage. The sustainability of the issue of "our satisfaction with the product and meeting our expectations", which we mentioned at the beginning of our article, is possible by continuously providing some support tools to that product throughout its lifetime. As a matter of fact, the second phase of the product's life cycle is entirely related to this issue. This is the phase of support processes provided to this product during the use, and the operation of the produced product. The most important of these supports is "maintenance". When an aircraft is delivered to an operator, it has been designed and certified to meet basic airworthiness and safety rules and requirements. The main purpose of maintenance is to keep the performance and reliability of the aircraft within the specified design limits after delivery. Based on this, we can define maintenance regarding the aircraft as follows: "The general name given to the set of activities consisting of services, repair, modification, revision, inspection and due diligence in order to repair and restore the parts, components, systems or whole of the aircraft, to completely renew it or to keep it in operable condition".
In summary, our aim is to return the product to its original state when we first received it, and to carry out some activities to bring it back to the performance values established in the design. Nowadays, we actually perform maintenance in many places in our daily lives. Many operations such as cleaning and painting a shoe, changing a worn lace can be given as examples of activities carried out within the scope of maintenance.

Reliability is established in the design of aircraft systems, components and engines. It deteriorates over time due to wear and damage caused by the environment and operation.

This is where "maintenance" comes in. It is carried out with the aim of bringing the decreasing reliability level back to its original value through the activities carried out. Since the aircraft manufacturer designs and manufactures the aircraft, it is the one who initially knows the aircraft best. Therefore, in accordance with the rules, it is the aircraft manufacturer's responsibility to prepare a maintenance program for this aircraft that will be used throughout the life of the aircraft. Preparation of the maintenance program and maintainability issues are issues that are carried out simultaneously with the design processes. Limited maintainability issues may also require design changes.

When an airplane passenger boards the plane, he/she is faced with a technological product. However the passenger has the opportunity to evaluate this product only in terms of issues that visually appeal to him, such as cabin comfort and IFE systems. These are just the part of the iceberg that remains above water. Apart from this, there is a much larger mass at the bottom that keeps that iceberg above water. This mass is the maintenance elements that cover the safety, reliability and airworthiness issues of this aircraft. The purpose of the maintenance and maintenance program is to balance the airworthiness, reliability and safety of the aircraft and all its components with minimum maintenance cost in accordance with the rules, in addition to the comfort and quality expected by the passengers.

Based on this, it is important to feel the importance of maintenance personnel and the issue of maintenance. It has an importance that can be considered as the heart of the aviation industry.

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.

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 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

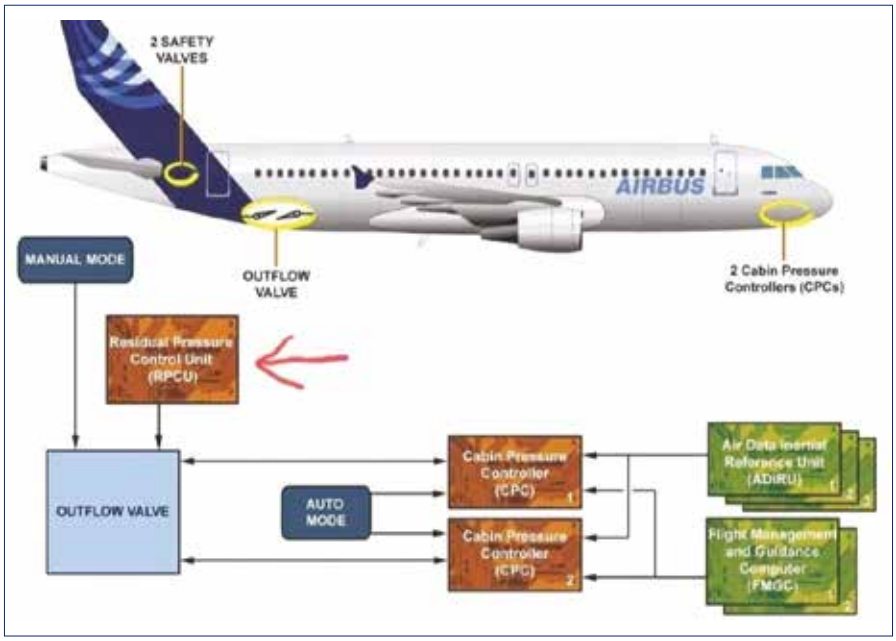
or flight compartment, is set to a lower temperature value than other sections. The reason for this is to prevent pilots from feeling complacent due to heat and to eliminate the heat emitted by too many electronic components. Another purpose of the ventilation process is to cool the heated electronic 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.

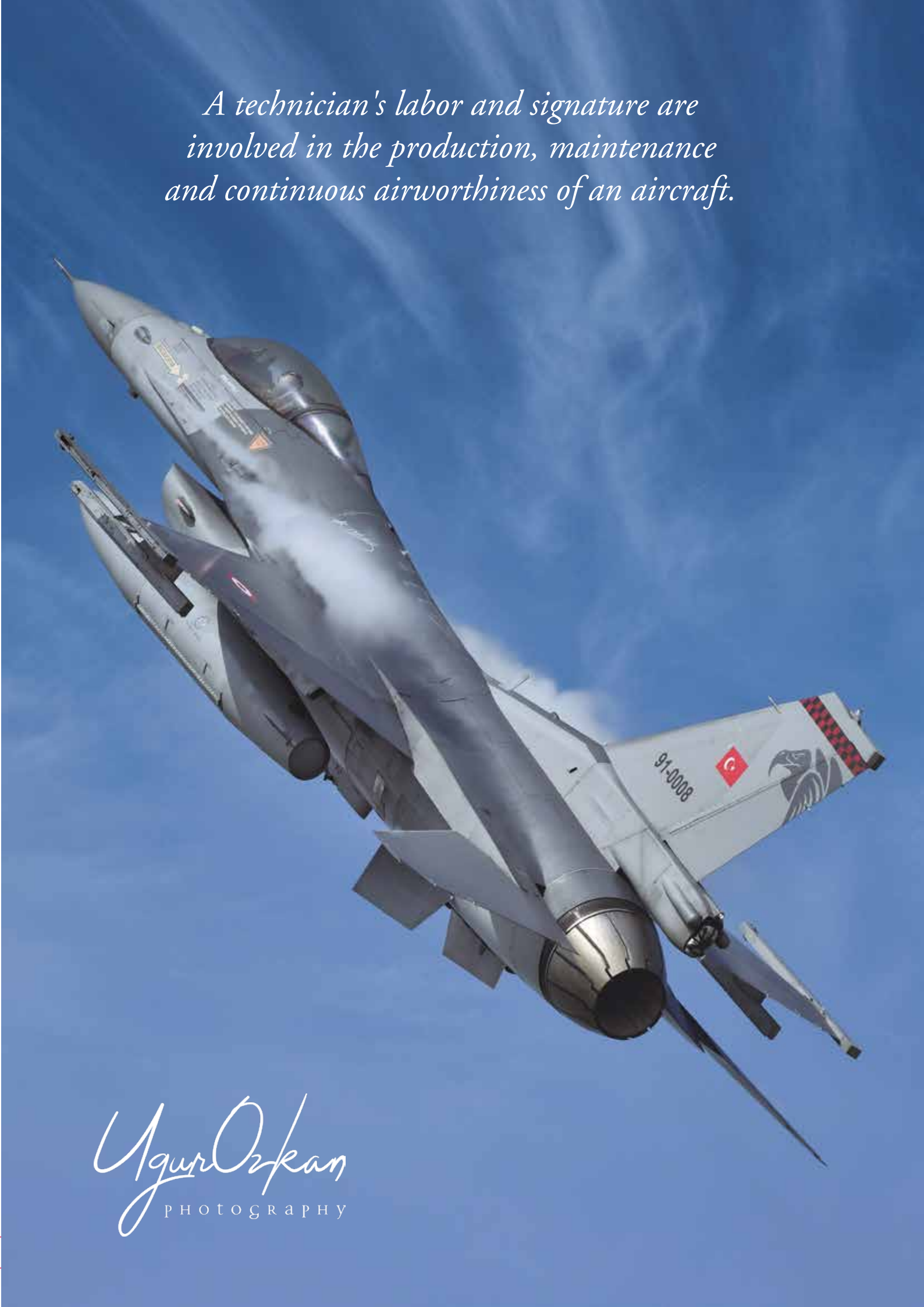
As I mentioned earlier, some of the conditioned air supplied into the cabin is discharged into the atmosphere after it is used, while the other large amount is returned to be mixed with new hot and pressurized air from the engines and new cold and low-pressure air from the packs (in areas we call mix 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.

A technician's labor and signature are involved in the production, maintenance and continuous airworthiness of an aircraft.



UgurOzkan
PHOTOGRAPHY

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).

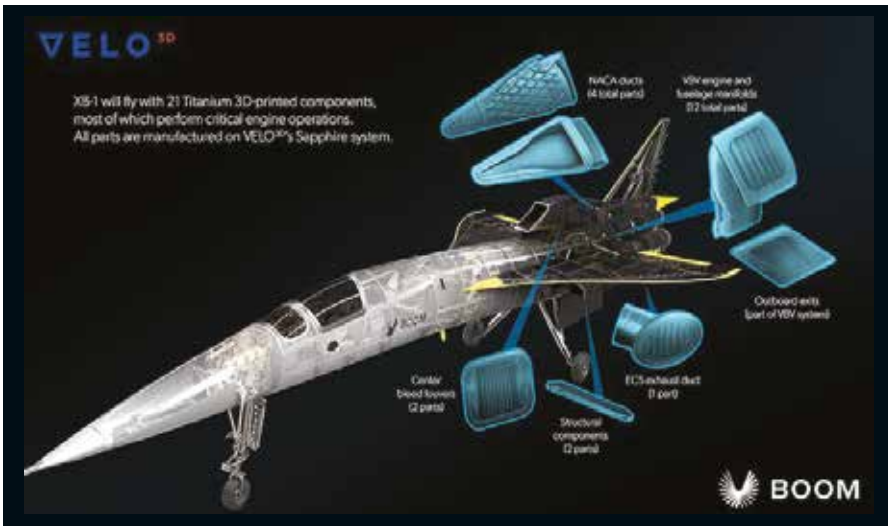
The Swedish defense procurement agency, FMV, has tasked Saab with exploring technologies and development strategies for a future combat aircraft. This project, named "Vägval stridsflyg" (meaning "choice of path for combat aircraft" in Swedish), aims to determine if Sweden should pursue a next-generation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

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. 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.

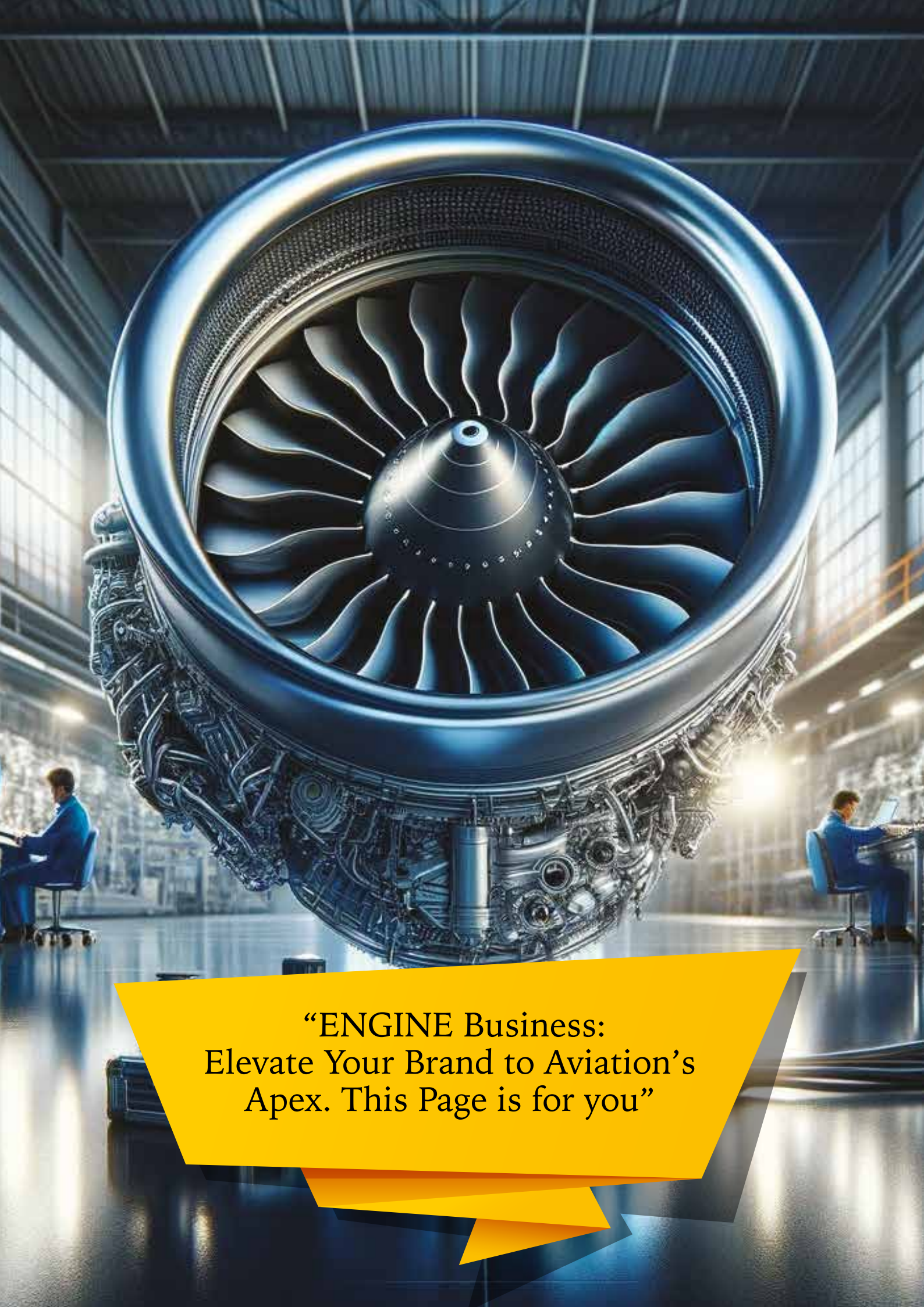
References:

Guy Norris Guy is a Senior Editor for Aviation Week, Norris, G., & Guy is a Senior Editor for Aviation Week. (2024, March 22). Boom's XB-1 supersonic demonstrator makes First Flight. Aviation Week Network. https://aviationweek.com/aerospace/emerging-technologies/booms-xb-1-supersonic-demonstrator-makes-first-flight

London, T. O. B. in, Osborne, T., & London, B. in. (2024, March 22). Saab, GKN contracted for future Swedish fighter studies. Aviation Week Network. https://aviationweek.com/defense-space/aircraft-propulsion/saab-gkn-contracted-future-swedish-fighter-studies

Boston, B. G. B. in, Goldstein, B., & Boston, B. in. (2024, March 20). Eve names UATM solution "vector"; deliveries planned for 2026. Aviation Week Network. https://aviationweek.com/aerospace/advanced-air-mobility/eve-names-uatm-solution-vector-deliveries-planned-2026

Kamel, D. (n.d.). Gulf countries urged to fast-track production of Sustainable Aviation Fuel. The National. https://www.thenationalnews.com/business/aviation/2024/02/14/gulf-countries-urged-to-fast-track-production-of-sustainable-aviation-fuel/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PhD. Cpt. Plt. M.Melih BAŞDEMİR

SINGLE PILOT OPERATIONS IN THE AIRLINE INDUSTRY FIRST FLIGHT

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.

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.

2. Current Two-Pilot Operations

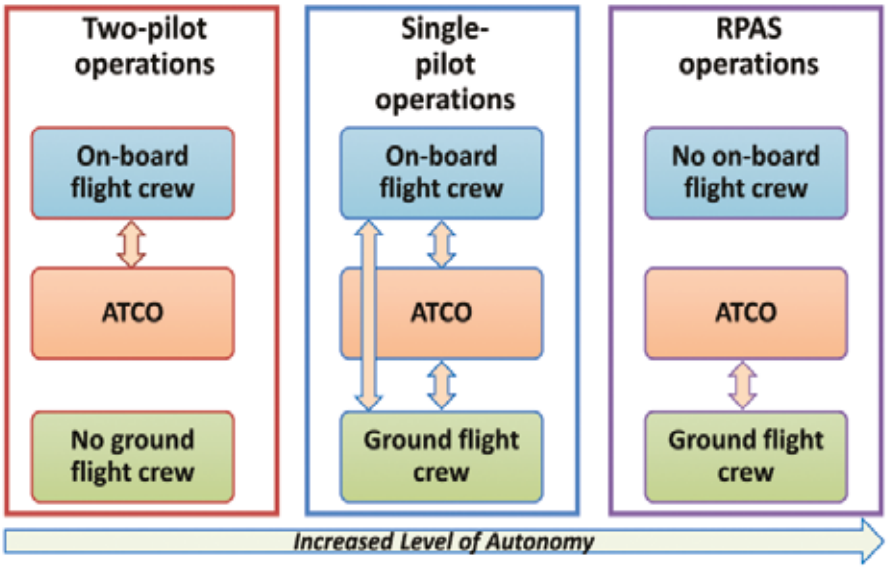
In the 1950s, any commercial aircraft required a five-person flight crew. However, technological advances have allowed for a gradual reduction of the flight crew in the cockpit. Currently, a two-person cabin crew consisting of the Pilot Flying (PF) and the Pilot Observing (PM) is responsible for all

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.

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.

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

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.

References

Commercial Airline Single-Pilot Operations: System Design and Pathways to Certification
September 2017
IEEE Aerospace and Electronic Systems Magazine 32(7):4-21
DOI:10.1109/MAES.2017.160175


“If you are in MRO Business
Elevate Your Brand to New Heights
with Our Aviation Audience!
This page is for you.”

THE WORLD'S LARGEST CARGO AIRCRAFT

Some of the world's largest cargo aircraft can carry multiple helicopters, a space shuttle, or enough consumables for an entire country. If you think all of these giant aircraft were recently developed and built, you're mistaken. The largest cargo aircraft were actually built during the Cold War era, and some of them are still in operation.

The colossal cargo aircraft, the Antonov An-225, which holds 242 world records, had planned to remain in service until at least 2033 but became a target in attacks carried out by Russia.

Antonov An-225

Despite sustaining significant damage and becoming inoperable during the early days of Russia's invasion of Ukraine, the Antonov AN-225 Mriya, the world's largest aircraft, continues to maintain its position on our list of the top 10 largest cargo aircraft. Having set 242 world records related to weight, distance, and altitude, the Antonov retains its status as the only aircraft in the world powered by six turbofan engines and boasting the widest wingspan. Initially, plans were made to repair and restore the aircraft for flight again; however, after it was determined to be infeasible, Microsoft Flight Simulator simulated the flight of the Antonov An-225 Mriya one year after its destruction. Currently, discussions have begun about constructing another Mriya using salvageable components from the wreckage and combining them with those designed for the construction of a second aircraft in the 1980s.

Boeing 747-8

The Boeing 747-8 Freighter, or 747-8F, which is the cargo variant of the 747-8 aircraft, was launched by Boeing in November 2005 and was first delivered to Cargolux in October 2011. The cargo hold of the 747-8F offers a volume of 853 m^3, capable of accommodating a maximum payload of 137 tons. Powered by four GEnx-2B67 engines, the aircraft has a maximum range of 7,630 km (4,120 nautical miles). With the more efficient General Electric GEnx turbofan engine, also used on the 787 Dreamliner, the maximum takeoff weight (MTOW) of the 747-8 has increased to 975,000 pounds (442 tonnes), making it Boeing's heaviest aircraft. The 747-8 is designed to safely operate at all airports where the 747-400 is currently in service. It builds upon the worldwide capabilities of the existing 747 by utilizing the same pilot type rating, services, and most of the ground support equipment.

Boeing 747-400ERF

The Boeing 747-400ERF (Extended Range Freighter), which is the fully cargo version of the 747-400ER jet aircraft, entered service with Air France in the second half of 2002. This aircraft is capable of carrying a maximum payload of 113 tons. It is powered by four Pratt & Whitney PW4062A engines, providing a maximum range of 9,200 km. It boasts a maximum range of 9,200 km, approximately 525 km farther than other 747-400 cargo aircraft, and features new, larger tires along with a reinforced fuselage, landing gear, and wing components.

An-124-100M-150

The Antonov An-124-100M-150 is an enhanced version of the AN-124 Ruslan heavy military transport aircraft, adapted for commercial cargo transport. Its fuselage has been strengthened to accommodate

a single cargo weighing up to 150 tons. The aircraft is powered by four Ivchenko-Progress D-18T III-series turbofan engines, each capable of producing a takeoff thrust of 229.7 kN. Most of the approximately 60 aircraft produced are still in operation today. The An-124-100 serves with Antonov Airlines, Volga-Dnepr, Polet, and other airlines, transporting various cargoes worldwide. Some of the massive cargoes it has carried include 90-ton hydraulic turbines, large Liebherr mobile cranes, American Euclid dump trucks, the fuselage of a Tu-204 passenger aircraft, a 109-ton railway locomotive, and even sea yachts over 25 meters in length.

Boeing 747-400F

The Boeing 747-400F, which is the fully cargo version of the Boeing 747-400 aircraft, can carry a maximum payload of 113 tons. It entered service with Cargolux in November 1993. The 747-400F features a main deck nose door and a mechanized cargo handling system. The nose door opens upward to allow for the direct loading of pallets or containers onto motorized rollers, accommodating items up to 40 feet (12 meters) in length. An optional main deck side cargo door (similar to the 747-400M (Combi)) allows for the loading of larger cargo modules in terms of size. The lower deck (belly) side door allows for the loading of unit load devices (ULDs) up to 163 cm in height.

Boeing 747-400BCF

The Boeing 747-400BCF (Boeing Converted Freighter), previously known as the 747-400SF (Special Freighter), is a result of the 747-400 passenger-to-freighter conversion program initiated in January 2004. The first 747-400BCF resulting from the conversion program was delivered to Cathay Pacific Airways in December 2005. The aircraft is capable of carrying a payload of 108 tons and has a range of 7,576 km (4,091 nautical miles).

C-5M Super Galaxy

The C-5M Super Galaxy, an enhanced variant of Lockheed Martin's C-5

Galaxy military transport aircraft, can carry a maximum payload of 129 tons, comprising six MRAP vehicles or five helicopters. The aircraft, which entered service with the United States Air Force in 2009, holds the distinction of being the largest military cargo aircraft in the USAF fleet. Equipped with five sets of landing gear, 28 wheels, four General Electric CF6-80C2-L1F (F-138) commercial engines, and a state-of-the-art maintenance diagnostic system, the C-5M Super Galaxy is designed for optimal performance. Without aerial refueling, the C-5M can fly up to 2,150 nautical miles with a cargo load of 127,460 kilograms, unload its cargo, and fly to a second base up to 500 nautical miles away from the original destination.

Boeing 747-200

The Boeing 747-200F, which is the all-cargo version of the 747-200 passenger aircraft, can carry a maximum payload of 110 tons. Boeing also developed a similar variant, the 747-200SF, which is a specialized cargo aircraft with comparable features. The first 747-200F took to the skies in November 1971. The initial 747-200F was delivered to Lufthansa in April 1972, and the final aircraft was delivered to Nippon Cargo in November 1991.

Boeing 747-300SF

The Boeing 747-300SF (Special Freighter), developed under the 747-300 modification program, can carry a revenue payload of 106 tons. The first 747-300SF was delivered to Atlas Air in October 2000. The aircraft offers a cargo volume of 26,600 ft , equivalent to the 747-200F. It can be powered by either four PW JT9D-7R4G2 engines or four GE CF6-80C2B1 engines or RR RB211-524D4 engines.

Boeing 747 Dreamlifter / 747-400

The Boeing 747 Dreamlifter, also known as the 747-400LCF (Large Cargo Freighter), is designed to transport large fuselage sections and wings of the 787 Dreamliner from partner facilities around the world to Boeing's assembly facility in Everett, Washington. It is a extensively modified version of the Boeing 747-400, and it made its first flight in September 2006. The 747 Dreamlifter can carry more cargo volume than any other cargo aircraft in the world. Its fuselage design allows the aircraft to transport especially large or oddly shaped objects.

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 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.

ALUMINUM ALLOYS USED IN AVIATION'S FIRST FLIGHT

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.

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.

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.

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.

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.

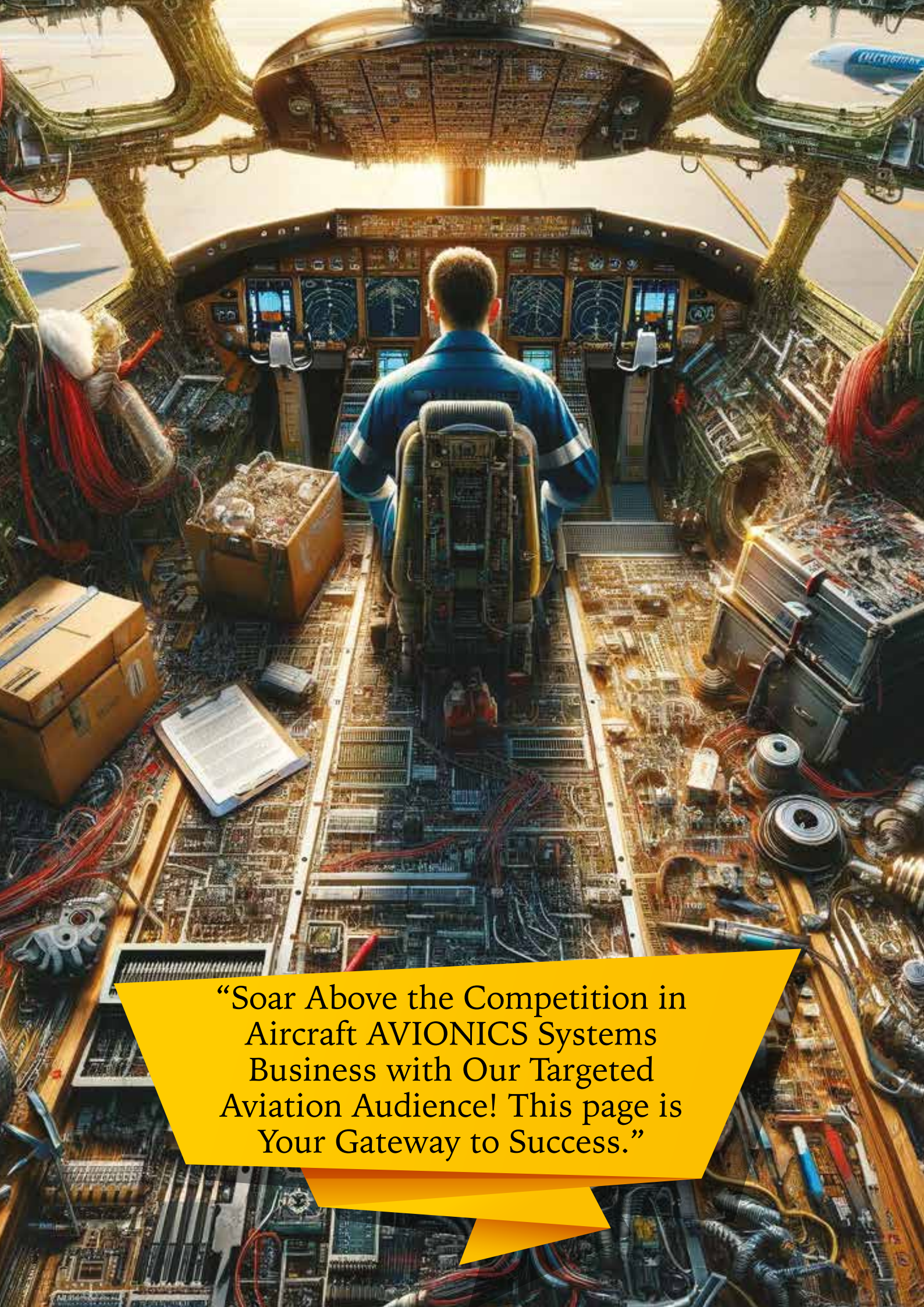
Use of Aluminium in Joining Parts in Aircraft Manufacturing

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.

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		


“Soar Above the Competition in Aircraft AVIONICS Systems Business with Our Targeted Aviation Audience! This page is Your Gateway to Success.”

Dercan DEMİRTEPE
B1/C Aircraft Maintenance Engineer

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.

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.

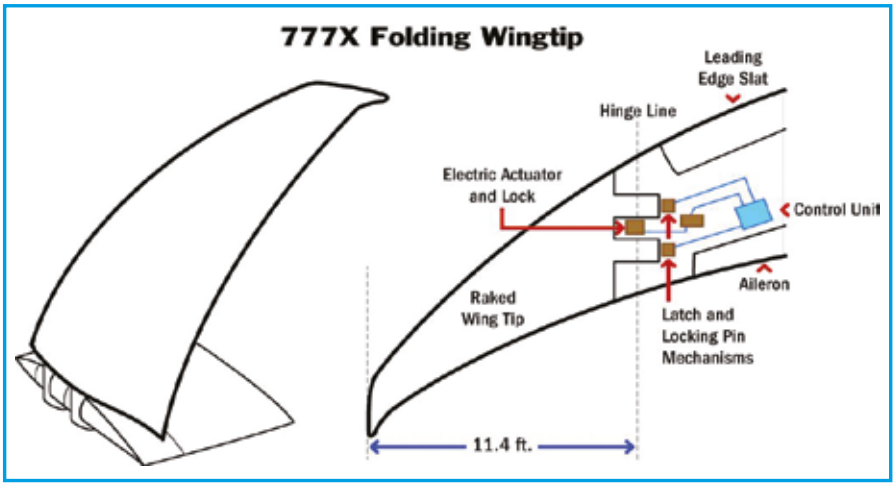
This aircraft type has a significantly wider wingspan compared to previous 777-200/300 models. The 777X has a wingspan of approximately 71,8 metres (235,5 feet), making it the widest wingspan of any Boeing aircraft. The added wingspan provides several advantages, including improved aerodynamics, increased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

777X

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.



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.

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.

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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.

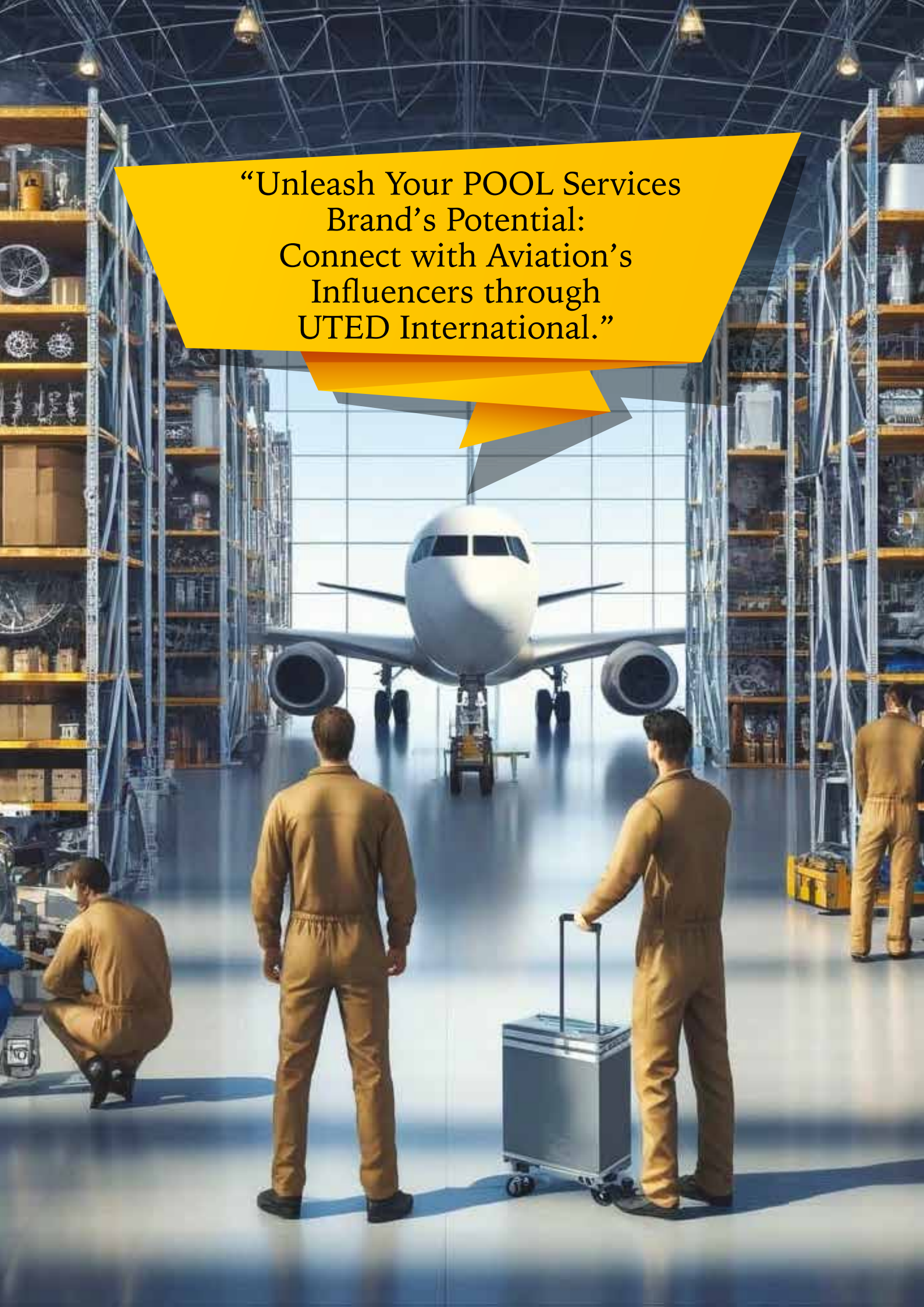
Takeaways

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.


"Unleash Your POOL Services
Brand's Potential:
Connect with Aviation's
Influencers through
UTED International."

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 :

https://www.paintsquare.com/news/view/?27542#:~:text=The%20report%20adds%20that%20in,speed%20tape"%20over%20affected%20areas.

https://simpleflying.com/boeing-asks-faa-approve-plan-fix-787-peeling-paint-issues/

https://www.uzairways.com/en/press-center/news/paint-peeling-wing-boeing-787-dreamliner

https://www.aviationweekly.org/news/boeing-applies-for-faa-certification-to-fix-787-paint-peeling-issues

NEW ELECTRONIC DISPLAY SYSTEM ON AIRBUS A320-NEO AIRCRAFT

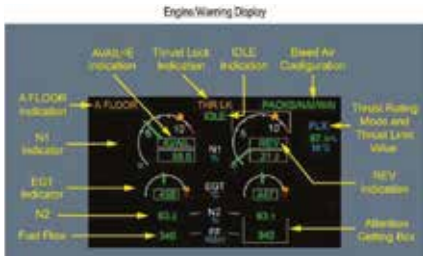
The new electronic display system used in Airbus' new A320-NEO aircraft brings several changes. Let's take a look at what is included in the new electronic display system.

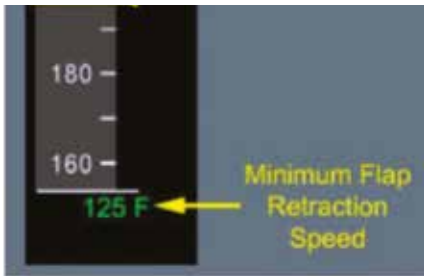
The latest A320 family aircraft now features a new electronic display system with various modifications. One of these changes is that a new system page has been added to the Engine and Warning Display (EIS) and System Display Engine page. This system will help increase flight crew awareness in the event 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.

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.





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

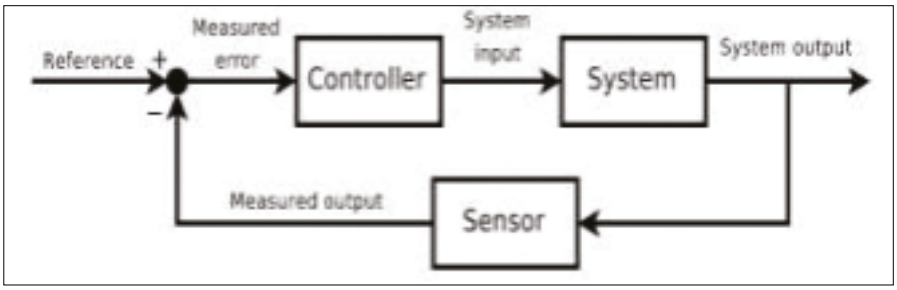


Figure 1: Closed loop control unit of fly-by-wire

aircraft outside its performance envelope. Operation of fly by wire system:

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.

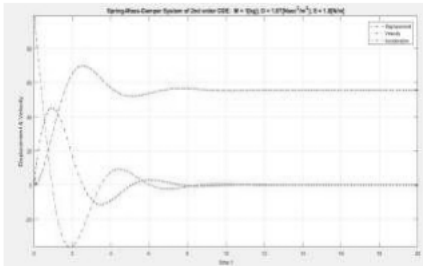


Figure 2: Curve for under damped condition Vs time

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 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.

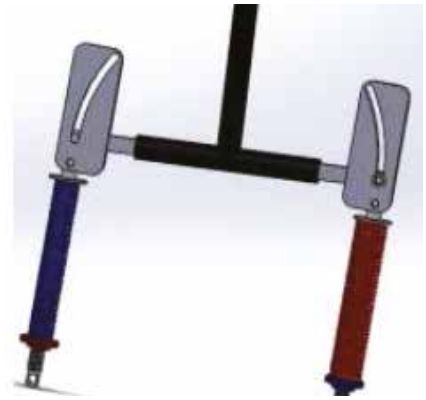


Figure 3: 3D model of spring damper system

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.

Q is referred to as dynamic pressure found by subtracting static

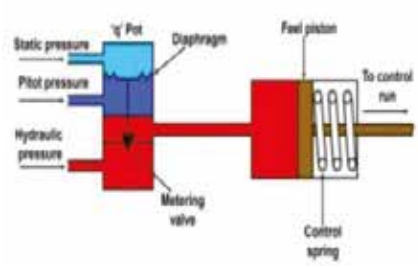


Figure 4: Basic Model of Q-fee

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

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.

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.

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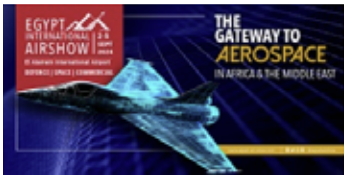

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- May 28, 2024 / European Business Aviation Convention & Exhibition / Geneva
- May 28, 2024 / Aircraft Interiors Expo / Hamburg, Germany
- June 11, 2024 / WAA Annual Safety Day / White Plains, New York
- June 12, 2024 / NBAA White Plains Regional Forum / White Plains, New York
- June 18, 2024 / CBAA Convention 2024 / Montreal, Canada
- June 21, 2024 / FlightSimExpo 2024 / Las Vegas, Nevada
- July 15, 2024 / Corporate Aviation Leadership Summit (CALS), East / New York
- July 22, 2024 / Farnborough International Airshow / Farnborough / UK
- July 22, 2024 / EAA AirVenture / Oshkosh, Wisconsin
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