UTED 1968 INTERNATIONAL

ISSUE 2 • 2024

AIRCRAFT MAINTENANCE MAGAZINE

- UTED INTERNATIONAL TAKES FLIGHT: **A NEW ERA FOR AVIATION MAINTENANCE ON THE GLOBAL STAGE**
- THE AVIATION MRO SECTOR IN 2024: **CURRENT LANDSCAPE AND FUTURE OUTLOOK**
- **ENSURING SAFETY AND PRECISION IN AIRCRAFT MAINTENANCE**

THE BACKBONE OF AIRCRAFT SAFETY:

THE ROLE OF STATIC AND FATIGUE TESTING IN AIRCRAFT DEVELOPMENT


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Esteemed Readers of UTED International,

I am proud and delighted to share with you the second issue of our magazine. I would like to take this opportunity to thank all of my colleagues who have contributed to every word of this publication. One of the most common challenges we face today is the lack of sustainability. Many initiatives start with great enthusiasm, but unfortunately, due to inconsistent efforts, these projects often end in the short or medium term, undermining all the hard work invested at the beginning. Our primary goal is to create a structure that includes everyone in the MRO sector. Thousands of companies, large and small, around the world struggle to access the necessary resources or workforce. With your support, we will build this structure together as a nonprofit organization.

The past three months have been marked by key themes such as sustainability, digitalization, and global political tensions, all of which are shaping the aviation industry. Many of the aviation fairs, conferences, and events held in 2024 have delved deeply into these transformation processes, and together with my team, we closely followed them for you. Events such as the 2024 Farnborough International Airshow, Istanbul Airshow, MRO BEER, and MRO Asia-Pacific provided insights into the future of the aviation industry. Additionally, Türkiye achievements in the defense industry, particularly the Bayraktar TB3 and KAAN aircraft, have emerged as groundbreaking elements that herald a new era in both civil and military aviation.

At the ILA Berlin Air Show, major manufacturers like Airbus and Boeing announced their carbon-neutral flight goals through hydrogen-powered aircraft projects and electric planes. While the economic and environmental impacts of sustainability were widely discussed, the potential of these projects to shape the future of aviation drew significant attention. Similarly, at the 2024 Farnborough International Airshow, Rolls-Royce's carbon-neutral engine projects and Airbus' next-generation aircraft stood out as major steps toward creating a greener aviation sector.

The 2024 Istanbul Airshow once again confirmed Türkiye central role in the aviation industry. Istanbul's strategic location between Asia and Europe increased the significance of the event in the region, while Turkish Airlines' expansion plans and innovations in drone technologies drew attention. In particular, the role of Istanbul Airport as a hub in the region underscored Türkiye growing influence as one of the world's key aviation centers.

Recently, digitalization, AI-powered maintenance solutions, and predictive maintenance technologies have been revolutionizing the aviation industry. At the NBAA Business Aviation Convention & Exhibition (NBAA-BACE), we followed the developments closely, with a focus on reducing costs and improving operational efficiency through digital twin technologies and artificial intelligence. These trends also took center stage at Farnborough, highlighting the rapid progress toward a more digitalized industry.

The MRO services in Eastern Europe and the Baltic region were thoroughly discussed at the MRO BEER conference. The event focused on regional supply chain challenges, the post-pandemic recovery process, and digitalization. Sustainability and environmentally friendly solutions were also among the long-term goals of MRO service providers in the region.
The MRO Asia-Pacific event, held in September, emphasized the increasing demand for MRO services and growth opportunities in the region. The rapid expansion of fleets in China, India, and Southeast Asia demonstrated that the region is poised for substantial growth in the global MRO market.

Türkiye Rise in the Defense Industry:
Bayraktar TB3 and KAAN
Türkiye has made significant strides not only in civil aviation but also in military and defense innovations. The Bayraktar TB3 has elevated Türkiye success in UAV technology to a new level. Its ability to integrate with naval platforms and its long-range operational capacity make the Bayraktar TB3 a promising asset for both military and civil applications. This technology not only strengthens Türkiye military power in the region but also positions the country as a key player in the global UAV market.

Additionally, Türkiye fifth-generation fighter jet, KAAN, has emerged as a project that strengthens the country's independent defense capabilities. KAAN contributes not only to military aviation but also to the development of Türkiye civilian defense industry through technology transfer and the expansion of local production capabilities.

Unfortunately, global political tensions continue to have a significant impact on the aviation sector. The Israel-Palestine and Ukraine-Russia conflicts have forced airlines to reconsider their routes. Flight suspensions in these regions due to safety concerns have led to increased costs and growing operational challenges for the aviation industry. Furthermore, fluctuations in fuel prices and disruptions in the supply chain appear to be pushing airlines toward more flexible business models.

As the aviation industry evolves toward a greener, more digitalized, and strategically flexible structure in 2024 and beyond, it will not be surprising to see innovative solutions from countries like Türkiye at the forefront of this transformation.

Sincerely,

Ömür CANİNSAN
UTED President

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Boeing Company Aims For 2043

Boeing has announced its new targets for 2043. Boeing Company, The USA aircraft manufacturer, said at a meeting on July 17, 2024 that the demand for new commercial aircraft will increase by 3.2 percent annually to 43,975 deliveries by 2043. Increasing its claims in the following days, the company said ahead of the five-day Farnborough International Airshow starting on July 22 that the world's wide-body fleet will more than double to 8,065 at that time, with twin-aisle variants accounting for 44 percent of the Middle Eastern fleet. With the statements made by Boeing, it seems that it will double its existing fleet in the coming years.

Hyundai's Eagerly Awaited Supernal

Hyundai's eagerly awaited SupernalS-A 2 vtol aircraft has made its debut at the Farnborough Airshow, aimed at providing a new urban transportation option. The company is building a technology demonstrator to improve key systems, and the first prototype is expected to fly in 2025. CEO Jaiwon Shin stressed Hyundai's commitment to advanced air mobility and addressing urban traffic and environmental challenges.

With a range of 52 nautical miles and a cruising speed of 104 knots, the SA2 will initially be operated by Supernal and will later be available to third-party operators. Potential Sundays include alternatives to sightseeing, medical evacuation and helicopter services, which Decently require a rapid increase in production to meet demand.

Technical Advisory Issued for Superjet 100 AOA Sensor Replacement Following Moscow Crash

Yakovlev has issued crucial maintenance instructions for replacing angle of attack (AOA) sensors on the Superjet 100 (SSJ100) following a crash near Moscow involving a Gazpromavia aircraft. The guidance emphasizes the importance of precise sensor alignment and the need for overlays to be reinstalled in their original positions. To enhance reliability, Yakovlev recommends increased quality control and advises against having a single technician replace multiple sensors.

Speculation suggests that improper installation of an AOA sensor may have contributed to the crash, with reports indicating a misalignment of about five degrees during maintenance. This could have led to erroneous data affecting the aircraft's stall protection system. The investigation is ongoing, with no further comments from Yakovlev or United Aircraft Corporation (UAC). The Lukhovitsy maintenance center has serviced 25 SSJ100s since its opening in 2020.

FAA Finalizes Rule to Reduce Carbon Particle Emissions from Aircraft Engines

The Federal Aviation Administration (FAA) has announced a final rule aimed at limiting carbon particle emissions from subsonic aircraft engines.

Overview of the Rule: The new regulation establishes maximum allowable levels for non- volatile particulate matter (nvPM) emissions from civil aircraft engines in the U.S. It is in line with recommendations from the Environmental Protection Agency and the standards set by the International Civil Aviation Organization. "This groundbreaking regulation in the United States will help mitigate the environmental impact of civil aviation on both public health and the climate," stated Laurence Wildgoose, assistant administrator for the FAA's Office of Policy, International Affairs, and Environment.

Significance of the Rule: The ultrafine carbon particles emitted by aircraft engines pose inhalation risks to humans. Additionally, nvPM emissions can serve as nuclei for persistent contrails, leading to the formation of extensive cloud cover that may influence global climate patterns. The rule provides engine manufacturers with new emissions standards to adhere to, promoting efforts to minimize health and environmental risks. It offers manufacturers clear criteria on nvPM emissions to guide the development of next-generation aircraft engines. This initiative is part of the U.S. Aviation Climate Action Plan, which aims for net-zero greenhouse gas emissions from the U.S. aviation sector by 2050. For more details about the FAA and its environmental initiatives, visit the FAA's Sustainability Gateway Page.

Boeing's Capable F-15EX Eagle II Is Back On The Topic

Boeing's F-15EX Eagle II is prompting a reevaluation of its mission roles in the U.S. Air Force due to its advanced capabilities. After initial delivery delays, six aircraft are now being tested at Eglin Air Force Base, with the first two delivered to the Air National Guard's 123rd Fighter Squadron in Oregon. Originally designated for homeland defense, the F-15EX will also serve active-duty squadrons, including those in Okinawa, Japan.

Designed for both single-pilot and dual-crew operations, the F-15EX is well-suited for complex long-range missions and could potentially control uncrewed combat aircraft, enhancing its operational flexibility.

SAF (sustainable aviation fuels) Has Created New Competitions in Europe

The European Union (EU) is implementing aggressive climate action through the European Green Deal, targeting climate neutrality by 2050 and a 55% reduction in greenhouse gas emissions by 2030. A key component of this effort is the "Fit for 55" package, which includes the ReFuelEU policy, mandating that sustainable aviation fuels (SAF) account for at least 2% of total aircraft fuel starting next year, with incremental increases every five years—reaching 70% by 2050. Additionally, a specified percentage of the fuel must be synthetic low-carbon aviation fuels, increasing from 1.2% in 2030 to 35% by 2050. These regulations are uniform across the European Economic Area (EEA), prohibiting member states from setting differing targets.

FAA Proposes $239,000 Civil Penalty Against Idaho-based Gem Air

The Federal Aviation Administration (FAA) has proposed a $239,000 civil penalty against Gem Air, a regional airline based in Salmon, Idaho, for allegedly breaching aircraft maintenance and flight-planning regulations. According to the FAA, Gem Air conducted 315 flights with a Cessna Caravan between May 22, 2022, and November 28, 2022, while a required engine overhaul was overdue. Additionally, on August 8, 2022, the airline operated a Cessna T206 on multiple flights without completing a mandatory engine exhaust inspection. The FAA further claims that Gem Air flew a Britten Norman BN-2A from Boise to Salmon, Idaho, without sufficient fuel to complete the journey, leading to an emergency landing after the aircraft's right engine failed mid-flight. The FAA has labeled these actions as careless and reckless, stating that they endangered both lives and property. Gem Air has 30 days from receiving the FAA's enforcement letter to respond to the allegations.

Sigma Air Mobility's Newly Established Test Agreement with VoltAero

Sigma Air Mobility is partnering with VoltAero to test hybrid-electric aircraft, announced during the Farnborough Airshow. Sigma will assess Voltero's advanced air mobility vehicles for a future route demonstration project. Volt Aero is creating a lineup of three models, including the five-seat Cassio 330, with plans to begin flight-testing in 2025 and seek EASA certification by 2026. CEO Christophe Lapierre mentioned potential orders but withheld specific numbers, focusing instead on defining operational networks. The goal is to validate their pilot project by 2026 hile evaluating market needs and fleet size.

Tata Leverages AI and Quantum Computing to Tackle Complex Aerospace Issues

Tata Consultancy Services (TCS) is expanding its partnership with Rolls-Royce to assist in developing a hydrogen fuel system for aircraft propulsion, starting with a Pearl engine demonstrator. TCS has worked with Rolls-Royce since 2010 on various aerospace projects, including supply chain management.

In response to ongoing supply chain challenges, TCS is leveraging its new Supply Chain Navigator platform to analyze data and improve resilience. The company is also using AI and quantum computing to enhance fleet maintenance and customer interactions, as well as its Smart Journeys tool for pilot weather visibility. Additionally, TCS is focused on developing lightweight composite materials to reduce aircraft weight and fuel consumption, collaborating on a proof of concept with an undisclosed aircraft manufacturer.

ITP Aero is not slowing down in growth and 787-10 Models

Since its sale to Bain Capital, ITP Aero has successfully expanded its manufacturing and aftermarket operations by partnering with rivals like Pratt & Whitney and Honeywell. The company reported a significant revenue increase of 25% and earnings up by 50% last year, thanks in part to substantial investments in R&D focused on advanced materials and additive manufacturing.

ITP Aero has made strides in innovation, becoming the first engine manufacturer to receive EASA approval for additive-manufactured structural components. With a new 24 million R&D center underway and an extended MRO contract with Pratt & Whitney Canada, the company is also enhancing its production capabilities in Mexico to address supply chain issues. However, recruiting skilled workers, particularly in the U.S., remains a challenge as President Eva Azoulay emphasizes the importance of training and adaptability for continued growth.

San Diego-Las Vegas Aircraft and the Importance of Landing Gear and Aerial Ladders

On October 5, 2024, Frontier Airlines flight 1326 made an emergency landing at Harry Reid International Airport in Las Vegas due to a fire in the landing gear. After departing from San Diego, the aircraft emitted smoke and flames, prompting the pilots to execute emergency procedures for a safe landing. All 190 passengers and seven crew members were evacuated without injuries, thanks to quick intervention from fire and rescue teams.

The fire, which originated from the right engine, was extinguished promptly. An investigation into the cause of the incident is ongoing, led by the Federal Aviation Administration. In response, the airport implemented a ground stop until 7 p.m. Frontier Airlines, which operates the largest A320neo fleet in North America, confirmed the investigation is underway.

MINI

Light Airplane Pilots Report Successful use of Starlink at a Lower Cost

SpaceX's Starlink division is now offering portable antennas for single-engine planes and light jets, allowing owners to test Starlink Mini for faster in-flight connectivity at a lower cost. The Mini system costs $599, with a Mobile Priority service fee starting at $250 per month for 50 GB, though it's not specifically designed for aviation and has a groundspeed limit of 250 knots. The Starlink network includes over 7,000 satellites, providing global coverage, but some countries have restrictions. For higher speeds, official aviation equipment costs $150,000, with service plans ranging from $2,000 to $10,000. Starlink has FAA-approved installations for various aircraft, but no plans for external mounting of the Mini on light aircraft.

Pilots have successfully used the Mini in sky-facing windows, reporting speeds up to 100 Mbps download and 10 Mbps upload. Cirrus SR22 owner Brad Pierce noted the value of Starlink for real-time weather access while stressing the importance of using in-flight internet responsibly to avoid distractions.

Critical Maintenance Alert: FAA Proposes Airworthiness Directive for Boeing 787-9 and 787-10 Models

The FAA has proposed a critical airworthiness directive (AD) for Boeing 787-9 and 787-10 models due to safety concerns over incorrect materials used in floor beam side-of-body fittings. These fittings, installed between specific stations, were found to be made from weaker commercially pure titanium instead of the required grade 5 Ti-6Al-4V, raising risks of structural failures that could compromise aircraft integrity and passenger safety. The proposed AD mandates replacing all incorrectly manufactured fittings and inspecting the fuselage frame for damage post-replacement. An alternative option allows for X-ray fluorescence spectrometer inspections to verify material compliance, although this may not be as definitive as replacement. Approximately 60 aircraft may be affected, with compliance costs potentially exceeding $263,000 per aircraft for replacement and inspections. The FAA is accepting comments on the proposed AD until July 1, 2024, with a final rule expected thereafter. Operators are urged to review the Boeing Alert Requirements Bulletin and prepare for compliance to ensure aviation safety.

The Launch Of The Gulfstream G300 may be Approaching Soon

Gulfstream Aerospace is reportedly close to unveiling the G300, a derivative of its G280 super-midsize jet, with potential service beginning as early as 2026. According to Hagerty Jet, an aircraft broker, Israel Aircraft Industries (IAI) is set to manufacture an upgraded version of the G280, codenamed P42, though details remain highly confidential. Hagerty Jet hopes the G300 will feature Gulfstream's signature panoramic oval windows, a Symmetry cockpit, and a flat floor design. Deliveries are anticipated to start in 2026, aligning with industry trends for business jet updates every seven to eight years. While there is speculation about a possible reveal at the upcoming NBAA-BACE in Las Vegas, industry analyst Rolland Vincent believes it's unlikely, given Gulfstream's confirmation that they will not be exhibiting at the event.

Turkish Technic Signs Major Agreement with Garuda Indonesia for Component Replacement and Maintenance Services

Turkish Technic has signed a significant agreement with Garuda Indonesia to provide comprehensive component replacement and maintenance support for its Airbus A330 and Boeing 777 fleets. This collaboration between the two companies aims to enhance the operational efficiency of Garuda Indonesia's aircraft and strengthen their long-term partnership. The agreement was signed during the MRO Asia-Pacific (MROAP) event held in Singapore. Through this deal, Turkish Technic will provide technical services to ensure the continuous airworthiness of Garuda Indonesia's aircraft. They will integrate their extensive maintenance and repair expertise into Garuda Indonesia's operational processes. This strategic agreement will enable the two companies to combine their strengths in regional and global operations to provide a more efficient and effective service.

UrbanLink Air Mobility and New Orders

UrbanLink Air Mobility has announced that it has ordered ten Aviation Elite model aircrafts. Thus, it began to complete the third leg of the complete electricity operation plan. "It will enable Urbanlink to provide a unique service while contributing to a greener future," Eviation CEO Andre Stein said about the nine-seat, all-electric Alice, which is estimated to be able to fly up to 250 nautical miles. Urban Link's story did not end with this. Ed Weigel, CEO of UrbanLink, said, "We will be the first airline in the USA to integrate evtol aircraft into its fleet." he explained. UrbanLink, together with its young fleet, is on its way to becoming a leader in zero-emission transportation solutions.

Vertical Finishes Initial Phase of VX4 eVTOL Flight Testing

Vertical Aerospace has successfully completed the initial phase of piloted flight testing for its VX4 eVTOL aircraft, conducting 20 flights at Cotswold Airport and covering 70 test points. The company aims for UK type certification by 2026. Testing included simulating failures in electric propulsion units and gathering extensive data on flight safety. Vertical is collaborating with the UK Civil Aviation Authority for the next testing phases, which will involve thrust-borne and wing-borne flights. They are also building a second prototype to enhance testing capabilities. CEO Stuart Simpson emphasized the rapid progress and safety of the VX4. The company has secured pre-orders for 1,500 aircraft valued at $6 billion, with major airlines among its potential customers. Olsen Actuators and Drives will provide the primary flight control systems for the VX4.

Freebird Airlines Prefers Collins Aerospace for Its Software

Freebird Airlines has chosen Collins Aerospace, a subsidiary of RTX, to implement the Ascentia software solution for enhancing operations across its A320 fleet. This cloud-based data management and analytics platform will provide a comprehensive view of aircraft maintenance, enabling the airline to analyze maintenance data, predict and minimize aircraft-on-ground events, and reduce costs while improving passenger experience. The new agreement complements Freebird's existing solutions, such as OpsCore for flight tracking and Arinc Hermes for communications. Kerem Güngörmez, Freebird's maintenance manager, emphasized that this collaboration will improve maintenance efficiency and service reliability. Nicole White from Collins Aerospace noted that the software will enable data-driven maintenance decisions, enhancing fleet availability.

Boeing and Lufthansa Technik Partner for Expanded 787 Dreamliner Cabin Modifications

In a significant move set to reshape the cabin modification market for the Boeing 787 Dreamliner, Lufthansa Technik and Boeing have signed a landmark license agreement, revealed at the prestigious Farnborough International Airshow. This strategic partnership designates Lufthansa Technik as the first-ever **Boeing Licensed Service Center (BLSC)**, specializing in cabin modifications for the 787 Dreamliner. Under this agreement, Lufthansa Technik is now authorized to perform extensive interior modifications for the 787, adding more options and flexibility for airlines seeking to enhance their fleet. As one of the leading global MRO (maintenance, repair, and overhaul) service providers, Lufthansa Technik will leverage its extensive expertise to offer innovative solutions for Boeing's flagship aircraft. The first cabin modification project under this agreement is set to commence in 2025, signaling a new era of collaboration between these two industry giants, aiming to meet the growing demand for tailored, passenger-centric cabin upgrades. This partnership not only enhances the offerings for 787 operators but also boosts global modification capacity, providing airlines with new possibilities to redefine their onboard passenger experience.

New Developments at AMAC Aerospace

AMAC Aerospace has built a new MRO facility at the JCB Aero subsidiary at Auch-Lamothe Airport, France, which includes a 54,000-square-meter hangar for three Airbus or Boeing narrow-body aircraft. JCB Aero specializes in composite structures and cabin interiors for Mac's VIP completions in Basel. The Auch facility will provide cabin refurbishment and MRO services, with plans to hire between 20 and 30 employees. This expansion complements AMAC's existing operations in Basel, Zurich, Bodrum and Saudi Arabia. Frédéric Dezauzer, chief operating officer, stated that the plant will soon welcome its first aircraft.

Boom XB-1 is Ready For Supersonic Flight

Boom Supersonic has successfully completed its fifth test flight of the XB-1 supersonic demonstrator on October 7 at the Mojave Air & Space Port, marking the third flight in three weeks as the company aims to achieve Mach 1 by year-end. The 71-foot-long, two-seat aircraft is powered by three GE J85 engines with a total thrust of 12,300 pounds and first flew on March 22. Before breaking the sound barrier, Boom plans to conduct 10 subsonic test flights. During the latest flight, the team tested the flutter excitation system and reached a speed of Mach 0.69, climbing to an altitude of 17,800 feet. The XB-1 program is crucial for developing technologies for Boom's future 64- to 80-seat supersonic airliner, Overture, which is set for rollout in 2026, first flight in 2027, and certification by the end of the decade.

Electra's EL-2 Goldfinch On New Targets In The Sky

Electra's EL-2 Goldfinch aircraft has successfully demonstrated its short takeoff and landing (STOL) capabilities, achieving takeoffs in under 170 feet and landings in less than 114 feet during recent test flights. Piloted by Cody Allee, the two-seat aircraft reached an altitude of 6,500 feet and maintained speeds as low as 25 knots. Electra's VP, James "JP" Stewart, highlighted the aircraft's exceptional low-speed handling, enhancing confidence in a future nine-passenger eSTOL model planned for 2028. The company is also developing a 'thrust-by-wire' flight control system to improve performance further. With Buddy Sessoms appointed as product chief engineer, the focus will be on various applications, including passenger transport and emergency services, as the team prepares for full-scale prototype testing in 2026 and aims for FAA certification.

Pratt & Whitney and SR Technics Launched New Geared Turbofan (GTF) Engine.

Pratt & Whitney and SR Technics have introduced the first Geared Turbofan (GTF) engine at SR Technics' Zurich facility, enabling full disassembly, assembly, and testing for the PW1100G engine, which powers the Airbus A320neo family. This move is part of Pratt & Whitney's strategy to expand GTF maintenance, repair, and overhaul (MRO) capacity in response to increasing aftermarket demand. The addition of SR Technics, which joined the GTF MRO network in 2022, brings the total to 17 locations, including seven in Europe. SR Technics CEO Owen McClave highlighted that this induction will enhance their capabilities and workforce skills. Pratt & Whitney Engine Wise program also offers operators various aftermarket services for sustainable value.

GKN Aerospace Became the Pioneer of the Hydrogen Powertrain Project

GKN Aerospace has launched H2FlyGHT, a new initiative focused on developing a 2-megawatt cryogenic hydrogen-electric propulsion system aimed at setting new standards for larger sustainable aircraft. Building on the success of the H2Gear project, H2FlyGHT enhances thermal management and simplifies flight testing and certification processes. The project integrates hydrogen fuel cell power generation, cryogenic power distribution, and advanced drive systems, with collaborations involving the University of Manchester, Parker Meggitt, and the University of Nottingham. GKN's CTO, Russ Dunn, emphasized the project as a crucial step toward net-zero aviation, aiming to maximize payload and range for zero-emission flights. The initiative is part of a broader investment of approximately £200 million across multiple projects, including H2Gear and HyFive, to develop a comprehensive hydrogen-electric propulsion system. Gary Elliott, CEO of the Aerospace Technology Institute, noted the project's importance in advancing fuel cell technology toward flight readiness, contributing to the vision of hydrogen-powered aviation.

"Turkish Airlines Secures Major Compensation Deal with IAE Over Airbus Engine Issues"

Turkish Airlines has finalized a significant compensation agreement with International Aero Engines LLC (IAE), addressing challenges related to the engines of its Airbus A320/321NEO fleet. The deal is designed to alleviate the operational disruptions caused by engine availability issues, particularly with the PW1100G-JM engines. As part of this settlement, both the purchase and maintenance contracts between Turkish Airlines and IAE have been thoroughly revised. This agreement is a critical step for Turkish Airlines, ensuring smoother operations and better reliability across its growing A320/321NEO fleet, as the airline continues to expand its presence globally.

APS Expands Its Presence in Asia-Pacific

Aircraft Propeller Service (APS) aims to commence propeller blade maintenance services at its new facility in Kuala Lumpur in the first quarter of 2025. The facility will become operational after receiving certifications from the Civil Aviation Authority of Malaysia and the FAA. Initially, it will service Collins Aerospace 568F propellers, which are used on ATR 42 and ATR 72 turboprop aircraft. Over the first eight months of 2025, additional maintenance capabilities for six other propeller components will also be added.

Corendon Airlines Takes a Major Step Towards Carbon-Free Travel: **New Climate Program**

Known for its mission of sustainable travel, Corendon Airlines has partnered with the cOmmited.app platform to offer passengers the opportunity to offset carbon emissions from their flights. The airline's new climate program aims for a carbon-neutral future, allowing passengers to calculate their carbon footprint and invest in environmental projects such as renewable energy, forest conservation, and sustainable agriculture.

Committed to reducing its environmental impact, Corendon Airlines launched a Sustainable Aviation Fuel (SAF) program in March 2024, which reduces greenhouse gas emissions by up to 80%. The company also demonstrated its leadership in sustainability by ranking 4th globally and 1st in Türkiye in the World's Cleanest Airlines survey, conducted by the German NGO Atmosfair.

Boeing Announces Major Workforce Reductions and Program Terminations Amid Industry Challenges

Boeing has announced plans to cut 17,000 jobs, approximately 10% of its workforce, as part of a broader effort to restructure in response to significant industry challenges. The company has also revealed that the delivery of its 777X aircraft will be delayed until 2026, and the 767 commercial freighter program will be terminated in 2027. In a message to employees, President and CEO Kelly Ortberg highlighted the tough decisions required to restore Boeing's competitiveness. "Our business is in a difficult position, and it is hard to overstate the challenges we face together," Ortberg said, emphasizing the need for structural changes and a focused approach to innovation and performance in core areas. The announcement follows a series of cost-cutting measures implemented after a strike by the International Machinist Association (IAM). Boeing had already reduced its workforce, including the temporary termination of managers and executives, and limited procurement of aircraft parts from suppliers, a move expected to affect smaller aerospace companies in the region.

ADE Plans Further Expansion: **New Hangar Facility in Kuala Lumpur on the Horizon**

Asia Digital Engineering (ADE), the MRO arm of Capital A, is exploring the possibility of constructing an additional hangar facility to complement its newly opened 14-line MRO facility in Kuala Lumpur. This expansion comes in response to an optimistic outlook on future maintenance demand. The company is currently conducting soil testing on a nearby 5-acre site adjacent to its facility at Kuala Lumpur International Airport (KLIA). Additionally, ADE is in discussions with Malaysia Airports Holdings to acquire 20 acres of land to develop a premier MRO center, further solidifying its presence in the region.

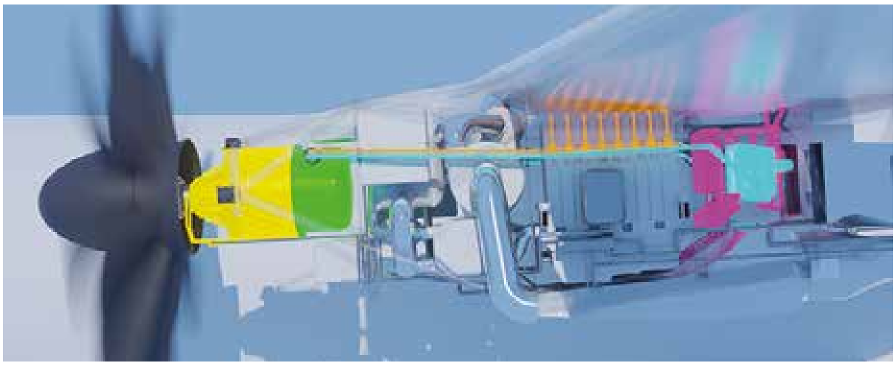
Airbus Racer: **The Future of High-Speed, Eco-Efficient Helicopters**

Airbus Helicopters has launched its cutting-edge Racer helicopter, which successfully completed its maiden flight in Marignane, France. The aircraft flew for 30 minutes, demonstrating its groundbreaking capabilities as part of a two-year testing campaign. Developed under the European Clean Sky 2 initiative, Racer is designed to exceed 400 km/h (250 mph), making it 50% faster than conventional helicopters while reducing fuel consumption by up to 25%.

Racer's hybrid-electric system, featuring two Safran Aneto-1X engines, allows for an innovative "eco-mode" that deactivates one engine during cruise, slashing both CO emissions and fuel costs. This design, which incorporates a combination of a traditional rotor and lateral pusher engines, is set to redefine high-speed helicopter missions with enhanced efficiency and sustainability.

Turkish Technic and Citilink Airlines Forge Stronger Partnership with New Component Maintenance Agreement

Turkish Technic has further strengthened its collaboration with Citilink Airlines, Indonesia's leading low-cost carrier, by signing a multi-year Component Replacement and Maintenance Agreement. This agreement covers Citilink's Airbus A320 fleet, providing access to Turkish Technic's extensive component inventory and specialized maintenance services. Additionally, the partnership now includes the maintenance of landing gears, marking a new chapter in their long-standing cooperation.The agreement underscores Turkish Technic's reputation as a global leader in MRO (Maintenance, Repair, and Overhaul) services, expanding its presence in the Asia-Pacific market while ensuring Citilink operates at peak efficiency with enhanced support for its fleet.



Airbus UpNext Launches New Cryogenic Propulsion Demonstrator for Hydrogen Aircraft

Airbus UpNext has introduced Cryoprop, a new demonstrator aimed at advancing superconducting technologies for hydrogen-powered aircraft. The project focuses on developing a two megawatt-class superconducting electric propulsion system cooled by liquid hydrogen, which promises to enhance performance and enable significant weight and fuel savings. Building on previous advancements, Cryoprop will assess the feasibility of these technologies for future aircraft, focusing on safety, industrialization, and operational factors. This project will also allow Airbus to strengthen its expertise in superconducting systems and foster innovation in cryogenic power electronics and cooling technologies.

New orders from EVA Air to GE Aerospace

EVA Air has placed an order with GE Aerospace for GEnx engines to power the additional four Boeing 787-10s it purchased in May. The Taiwanese airline currently operates 15 GEnx-powered Boeing 787s, and they have demonstrated "outstanding fuel burn, performance, and reliability," said EVA president Clay Sun. "The additional engines will help us further expand our fleet to manage our growing route schedule." The GEnx-1B engine powers two-thirds of all 787 aircraft in operation today. Since its introduction in 2011, the GEnx engine family has accumulated more than 56 million flight hours. It stands as GE Aerospace's fastest-selling, high-thrust engine to date, with nearly 3,000 engines currently in service or on backlog, including spare units. "We're thrilled EVA has selected our high-performance GEnx engine to power its fleet expansion," said Russell Stokes, president and CEO of commercial engines and services at GE Aerospace. "We look forward to ensuring GEnx engines continue providing outstanding economic and operational performance."

UTED 1968
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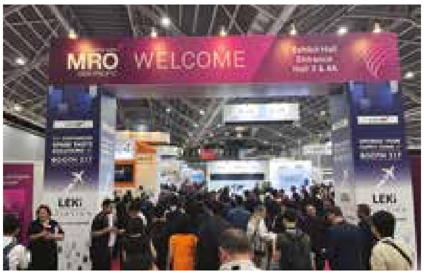
UTED INTERNATIONAL TAKES FLIGHT: **A NEW ERA FOR AVIATION MAINTENANCE ON THE GLOBAL STAGE**

As the Aircraft Technicians Association (UTED), we proudly participated in the IFTE (Istanbul Flight Training Expo) 2024, where we played a significant role in various key events. As the UTED Board of Directors, we delivered a presentation addressing the growing demand for qualified technicians in the aviation industry, offering our proposed solutions to bridge this gap. In our presentation, we emphasized the necessary measures and recommendations for cultivating the skilled technicians that the sector critically needs.

Additionally, we successfully launched our new magazine, UTED International, which aims to make a substantial impact on the global stage. This launch drew significant attention from industry professionals and expo attendees. We would like to extend our sincere thanks to Deputy Director General of Civil Aviation, Mr. Feyzullah ÇINAR, and many other high-level aviation executives who supported us during this special occasion. Our magazine, focused on delivering the latest industry developments, technical insights, and aviation-related news, represents a tremendous source of pride as it positions our country prominently in the international arena.

During the launch, our Chairman, Ömür Caninsan, expressed his enthusiasm by stating:

"Just as our National Combat Aircraft KAAN and globally renowned UAV Bayraktar TB2 have made a name for themselves on the international stage, we are equally thrilled to introduce UTED International, a magazine poised to represent our maintenance and repair sector worldwide. Competing with the best global publications, it is a privilege to introduce this project first to our nation and then to the world. This



achievement is the shared pride of all aircraft maintenance technicians. We have the strength and belief to achieve even greater things. With your support, we will continue to grow and evolve."

Following this monumental launch, we kept our commitment to expanding our presence at international fairs. Our first issue received positive feedback and strong support during MRO Americas. In the past three months, we have attended MRO BEER, Aircraft Interior Expo, MRO Asia-Pacific, and Istanbul Airshow, participating not only as a media outlet but also as an organization introducing a fresh perspective to the industry. Our team engaged with airlines, maintenance organizations, and suppliers, distributing our magazines and establishing new connections that will form the backbone of our growing network.

Turkish Airlines, Turkish Technic, and MyTechnic have all provided essential foundational support to help UTED International establish its presence on the global stage. As we move forward, we aim to bring more international companies into our growing family, working tirelessly and with great dedication to build a stronger future together.

M.Murat BAŞTÜRK
Part -147 Type Training Instructor

THE AVIATION MRO SECTOR IN 2024: **CURRENT LANDSCAPE AND FUTURE OUTLOOK**

The Maintenance, Repair, and Overhaul (MRO) sector plays a pivotal role in ensuring the safety, longevity, and operational efficiency of the global aviation fleet. As of 2024, the MRO market is experiencing robust recovery and growth, driven by rising air travel demand and the need to maintain a growing fleet of aging aircraft.

This article will examine the current state of the MRO industry, key market trends, and forecasts for its future, with particular emphasis on emerging technologies and sustainability efforts. Additionally, we will explore the industry's biggest players and how they are adapting to this fast-evolving landscape.

The Current State of the MRO Sector in 2024

The global commercial aircraft MRO market is projected to reach $104 billion in 2024, with an expected annual growth rate of 1.8% through 2034. Despite challenges such as high inflation, labor shortages, and production delays, the sector has rebounded after the downturn caused by the COVID-19 pandemic. This recovery has been fueled by the return of parked aircraft to service and the maintenance needs of an aging fleet that airlines have been reluctant to retire due to economic uncertainty and supply chain disruptions.

A significant driver of current MRO activities is the introduction of predictive maintenance technologies. Powered by big data and artificial intelligence (AI), these tools allow for more accurate predictions of component failure, optimizing the timing of repairs and minimizing costly unplanned downtime. The potential for AI-driven solutions continues to expand, promising to improve efficiency across the industry.

However, labor shortages remain a persistent challenge for MRO providers, as the retirement of experienced technicians and difficulties in attracting younger talent exacerbate staffing gaps. This has prompted companies to invest in training and upskilling programs, as well as to explore automation in specific maintenance tasks to alleviate workforce pressure.

For 2024, the largest MRO companies continue to dominate the global aviation landscape, offering a wide range of services across airframe, engine, component, and line maintenance. Here's an list of the key global leaders in the MRO industry and their market shares.

Lufthansa Technik: With significant operations in Europe, Lufthansa Technik leads the global MRO

market, maintaining around 9-10% of the total market share. They are known for their comprehensive maintenance services, from engines to components, and airframe maintenance.

Safran SA: Specializing in engine maintenance and nacelle services, Safran holds around 8-9% of the global market share, with a focus on innovation and sustainability.

GE Aviation: GE Aviation is a leader in the engine MRO sector, with an estimated 7-8% share. Their focus on predictive maintenance technologies and strategic partnerships places them at the forefront of the market.

AAR Corp.: A major independent MRO provider, AAR Corp. has approximately 6-7% of the market share, focusing on airframe and component services, particularly in North America.

Delta TechOps: The MRO arm of Delta Airlines holds about 5-6% of the market share, providing services for both Delta's fleet and other airlines globally, with a focus on next-gen engines like the Pratt & Whitney GTF.

HAECO (Hong Kong Aircraft Engineering Company): With strong operations across Asia and the U.S., HAECO has about 5% of the global MRO market share, specializing in airframe and engine services.

SIA Engineering: With an estimated 4-5% of the market share, SIA Engineering is a key player in the Asia-Pacific region, providing airframe, engine, and component services.

AFI KLM E&M: The joint venture between Air France Industries and KLM Engineering & Maintenance commands around 4% of the market, known for its innovation and digital transformation efforts.

SR Technics: Based in Zurich, SR Technics holds around 3-4% of the market share, offering airframe, engine, and component services.

Turkish Technic: With about 3% of the global MRO market, Turkish Technic has grown to be a regional leader in airframe, engine, and component services, particularly in Europe, the Middle East, and Asia.

(StraitsResearch)(Market Research Reports® Inc.)(Visiongain)(markets.businessinsider.com)

Key Trends and Innovations in 2024
The MRO industry is in the midst

of significant technological transformation, particularly with the rise of digital MRO solutions. AI-powered predictive maintenance systems and advanced analytics platforms are reshaping how airlines and MRO providers approach maintenance scheduling, leading to more efficient operations. Additionally, additive manufacturing (3D printing) is gaining traction as a means to produce spare parts on demand, reducing lead times and inventory costs. However, regulatory approval processes for 3D-printed parts continue to be a hurdle.

Sustainability has also become a central focus. Airlines and MRO providers are under increasing pressure to adopt greener practices as part of broader industry efforts to reduce carbon emissions. Innovations such as eco-friendly materials for aircraft interiors and the use of biofuels in maintenance operations are beginning to take hold, though much work remains to be done to fully decarbonize the sector.

Challenges and Opportunities

While the future appears promising, MRO organizations will need to navigate several hurdles. Chief among them is the regulatory landscape, which is becoming increasingly complex as new aircraft technologies emerge. MRO providers will need to stay agile, ensuring that their personnel are trained and certified in line with evolving standards. Another challenge lies in addressing the labor shortage. The industry must find ways to attract and retain talent, particularly younger professionals who may not see traditional aircraft maintenance roles as appealing. Companies are already partnering with technical schools and aviation academies to create more robust pipelines for future technicians.

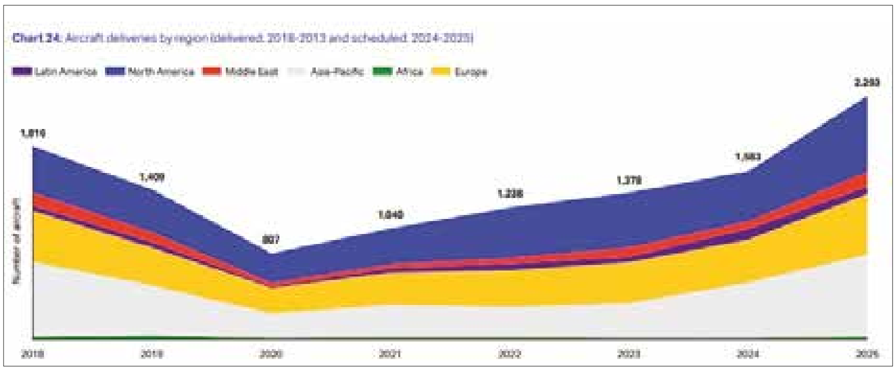
However, opportunities abound. The global fleet of commercial aircraft is expected to grow significantly over the next two decades, with over 38,000 new deliveries projected by 2040. This fleet expansion will fuel demand for MRO services, especially as older aircraft continue to require maintenance.

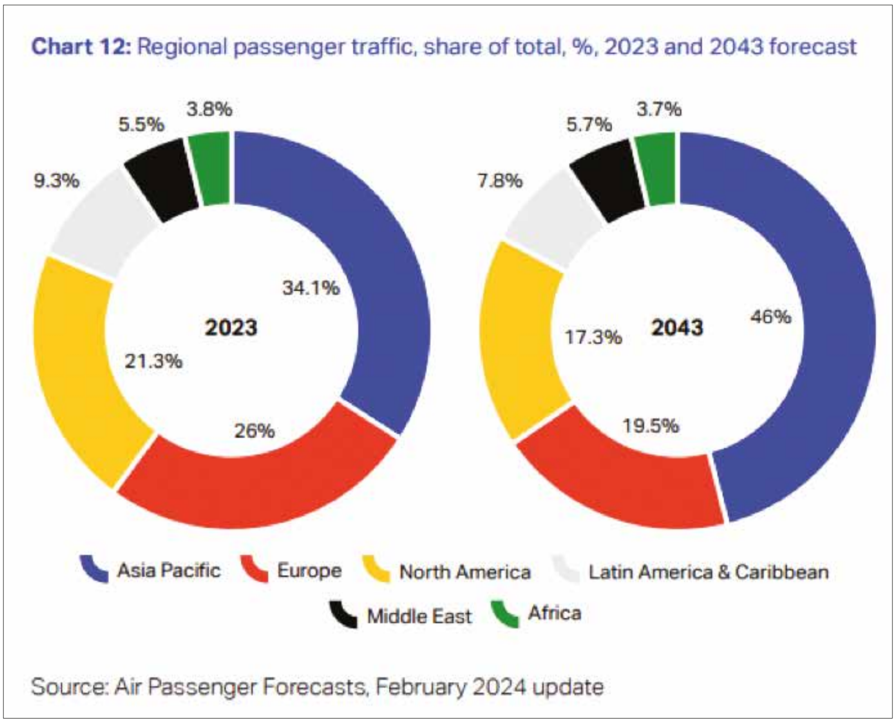
Furthermore, MRO providers who embrace technological innovation will likely enjoy a competitive edge. Early adopters of AI, 3D printing, and blockchain technologies will be better positioned to streamline their operations, reduce costs, and provide superior service to their customers.

Finally, those who prioritize sustainability will find themselves well-aligned with industry trends. As airlines and governments push for greener aviation, MRO companies that can demonstrate eco-friendly practices will be better placed to attract environmentally conscious customers and partners.

The Future Outlook for the MRO Sector

The Maintenance, Repair, and Overhaul (MRO) industry is on the verge of significant transformation, driven by a combination of technological advances, sustainability imperatives, and evolving global market dynamics. As the aviation sector emerges from the pandemic-related disruptions, the MRO market is expected to grow steadily, reaching $124 billion by 2034 .





Technological innovation, sustainability initiatives, and fleet expansion are key drivers shaping the sector's future.

- Technological Advancements: Digital technologies such as predictive maintenance, big data analytics, and 3D printing are transforming MRO operations. Predictive maintenance allows for real-time data analysis, reducing unplanned downtime and increasing component life. 3D printing enables faster production of parts, reducing lead times and costs. Companies like Airbus and GE Aviation are at the forefront of adopting these technologies.
- Sustainability Initiatives: Environmental sustainability is increasingly important, with MRO providers adopting energy-efficient processes, using sustainable materials, and incorporating recycling into operations. The rise of sustainable aviation fuels (SAF) and eco-friendly repairs like Lufthansa Technik's waste-reducing composite repairs exemplify this trend. Regulatory bodies are also pushing for greener practices, increasing the importance of compliance.
- **Fleet Expansion and Aging Aircraft:** The global aircraft fleet is expected to grow by 28% by 2034, driving demand for MRO services. North America and Asia-Pacific will lead this growth, with India experiencing the fastest fleet expansion. Older aircraft will require more frequent maintenance, especially as airlines delay retirements due to economic pressures, making MRO services even more critical.
- **Workforce Challenges:** The MRO sector faces a shortage of skilled technicians due to retirements and difficulty attracting younger workers. Companies are investing in training programs and automation to reduce reliance on labor. AI and automation are being used to enhance efficiency, alleviating some workforce pressures.

- **Globalization and Supply Chain:** The globalization of the MRO industry is driving trends such as outsourcing and nearshoring, with companies seeking to optimize costs. The disruptions caused by the COVID-19 pandemic highlighted the need for resilient supply chains. Airlines and MRO providers are working on diversifying their supplier base to mitigate future disruptions.
- **Regulatory Pressures:** The MRO industry operates in a highly regulated environment, with evolving safety standards requiring constant updates to training, tools, and processes. As newer aircraft with advanced materials and systems come into service, MRO companies must invest in the latest technologies to meet these demands.

The future of the MRO sector is promising, with growth driven by fleet expansion and new technologies. However, the industry must overcome challenges such as labor shortages and sustainability pressures. Companies that invest in digitalization, sustainability, and workforce development will be best positioned to capitalize on the evolving market.

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THE EFFECTS OF SHIFT WORK ON AIRCRAFT MAINTENANCE TECHNICIANS

Aircraft Maintenance Technicians (AMTs) play a critical role in the Aviation industry. Their work ensures the safe operation of aircraft, and any errors or oversights can have serious consequences. Due to the nature of the aviation industry, maintenance operations often require around-the-clock availability, which necessitates shift work. While shift work is essential for the continuous functioning of aviation operations, it brings with it a number of challenges, particularly for those performing high-responsibility tasks like aircraft maintenance. This essay investigates the effects of shift work on AMTs, focusing on fatigue, health impacts, performance issues, work-life balance, and mitigation strategies.

1. Fatigue and Sleep Disruption

One of the most major issues that AMTs encounter as a result of shift work is fatigue, which is mostly caused by sleep disruptions. The circadian rhythm is the body's internal clock that regulates sleep and wakefulness. Shift work, particularly night shifts or irregular hours, breaks this cycle, resulting in sleep deprivation and lower-quality rest. For instance, AMTs who work late-night or rotating shifts may struggle to acquire appropriate daytime sleep, which is less restful than nighttime sleep.

Over time, such sleep disruptions can lead to chronic fatigue, a condition in which people are constantly fatigued regardless of how much they rest. Fatigued technicians are more likely to have impaired cognitive capabilities such as slower reaction times, poor decision-making skills, and poor attention to detail. Given the precision necessary in maintenance of aircraft, these limitations are especially troubling since they can lead to errors that risk safety.

2. Health Impacts

The physical and mental health of AMTs can suffer significantly from prolonged shift work. Studies have shown that those working irregular hours are at a higher risk of developing a range of health problems:

Physical Health

AMTs who work shifts are more likely to develop cardiovascular disease because the stress of insufficient sleep and a heavy workload raises blood pressure and cholesterol. They may also suffer from gastrointestinal issues such as indigestion, ulcers, and acid reflux as a result of the inconsistent food patterns associated with shift rotation. Obesity is another issue, as shift workers may have less time spent exercising and can depend on unhealthy, easy foods during their irregular working hours.

Mental Health
In addition to physical health problems, shift work can contribute to mental health issues. Disrupted sleep cycles and inconsistent schedules can increase stress levels, especially when combined with the high-responsibility environment of aircraft maintenance. Technicians may develop conditions like anxiety or depression due to feelings of isolation and the physical toll shift work can take on the body. In some cases, the combination of physical fatigue and mental stress can lead to burnout, a state of emotional and physical exhaustion that severely impacts job performance and personal well-being.

3. Performance and Safety Concerns
Shift work has a variety of effects on AMTs' performance, often increasing the possibility of errors. When people are tired and stressed, their cognitive functions, such as attention, memory, and problem-solving, suffer. In a situation where precision is essential, these limitations might result in important errors, raising the risk of accidents and malfunctions in the equipment.

Increased Risk of Errors
AMTs working late shifts or after long hours are more vulnerable to human errors due to reduced awareness and lack of judgment. These errors vary from simple errors to serious maintenance faults that risk an aircraft's airworthiness. Aviation is a high-risk sector, and even minor errors can have serious consequences.

Impact on Productivity
In addition to the possibility of errors, AMTs' productivity decreases over time. As fatigue develops in, AMTs' ability to sustain constant productivity could decrease, resulting in slower completion of tasks and decreased overall efficiency. In severe circumstances, this can lead to a delay of maintenance tasks, creating more pressure on the team and increasing the effects of shift work.

4. Work-Life Balance Challenges

Shift work has an important effect on AMT's work-life balance. Different working hours frequently result in technicians missing out on social and family activities, perhaps leading to social isolation. Shift workers may struggle to maintain relationships or participate in activities that occur during regular hours, such as family dinners, holidays, and social events.

Family and Social Life

Shift work can be especially difficult for people with families because the unpredictable hours may interfere with their children's schedules or other family responsibilities. This can cause stress in personal relationships and result in discontent at home and at work. Over time, the gap between work and personal life can lead to sensations of disappointment and isolation, causing the mental and emotional stress impact of shift work.

Burnout and Job Satisfaction

Many technicians may experience burnout as a result of the continuous physical and emotional difficulties that shift work brings. Burnout occurs when people are so consumed by the demands of their jobs that they are unable to sustain their standard level of performance or enthusiasm. Burnout among AMTs can result in decreased job satisfaction, lower performance, and, in extreme circumstances, a desire to quit the industry entirely.

5. Mitigation Strategies

Recognizing the harmful consequences of shift work on AMTs, companies and industry leaders must establish initiatives to mitigate the effects and protect their employees' well-being. Several measures have been useful in reducing the impacts of shift work:

Scheduled Rest Periods

One of the most effective methods to manage fatigue is to schedule periods of rest. Allowing technicians enough time to relax between shifts aids in recovery and minimizes the danger of sleep deprivation. Aviation regulations frequently require minimum rest times to ensure that maintenance personnel are properly rested prior coming to their jobs.

Rotating Shifts

Introducing a well-designed rotating shift schedule can help technicians avoid long-term exposure to night shifts. Ideally, shifts should rotate in a way that allows workers to gradually transition between day and night schedules, minimizing the disruption to their circadian rhythms.

Health and Wellness Programs

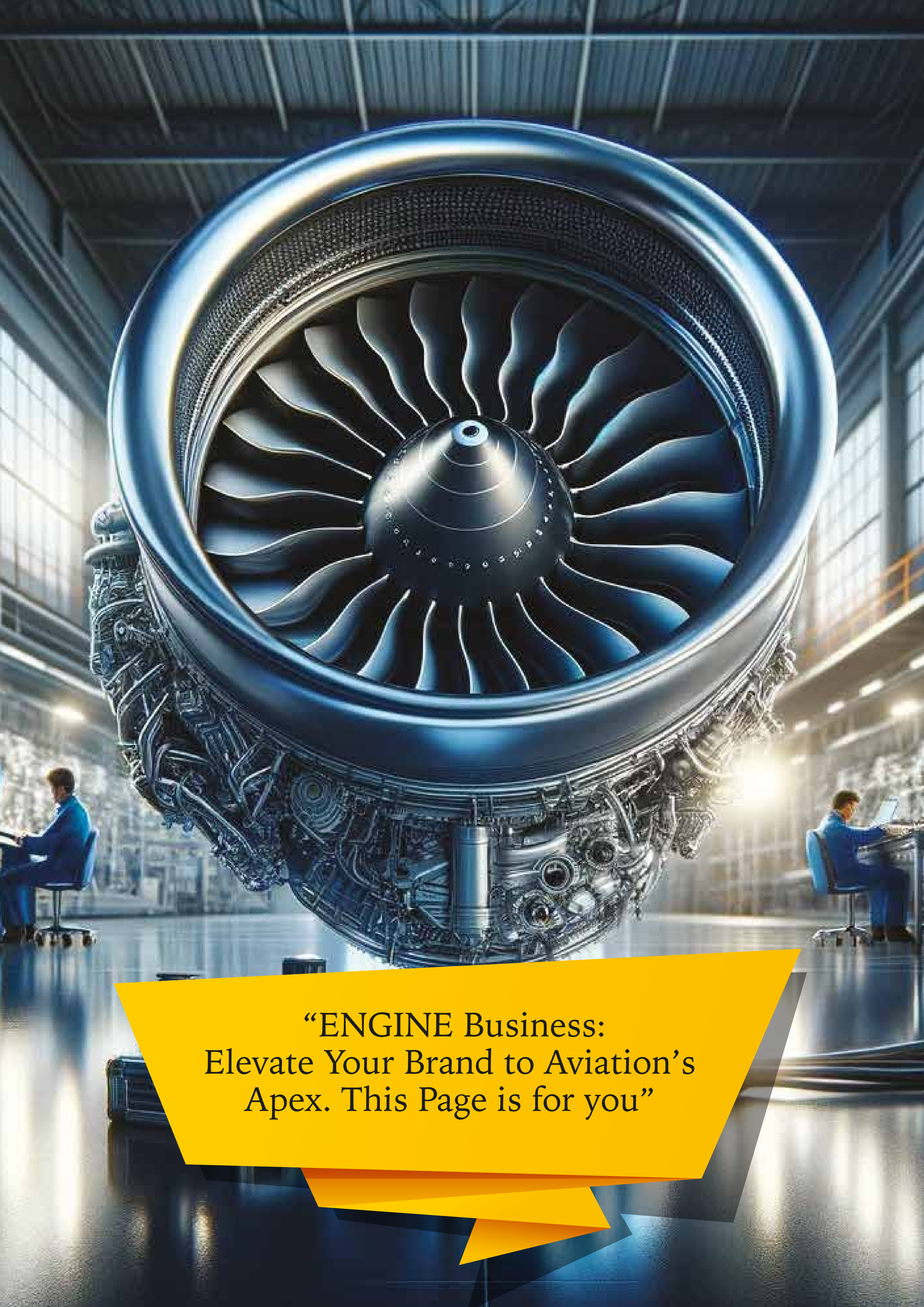
Employers can also help their employees by providing health and wellness programs that focus on the physical and mental demands of shift employment. Providing access to mental health services, fitness facilities, and nutrition programs can assist technicians in managing stress and maintaining a healthy lifestyle despite working unusual hours.

Training for Fatigue Management

Finally, providing fatigue management training programme to technicians can help them recognize signs of fatigue and establish techniques to manage it. Training programs can educate employees the value of good sleeping habits, stress reduction techniques, and time management, allowing them to cope with the challenges of shift work more efficiently.

Conclusion

Shift work is a natural part of the aviation business, particularly for Aircraft Maintenance Technicians who are critical to the safe and ongoing operation of flights. However, the effects of shift work are severe, particularly in terms of fatigue, health consequences, performance concerns, and work-life balance challenges. Managing these effects involves a combination of organizational and individual solutions, including as enough rest breaks, health and wellness programs, and successful shift rotations. By applying these measures, the aviation sector could contribute to the well-being of its personnel while still maintaining the safety and efficiency of its operations.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Dercan DEMİRTEPE
B1/C Aircraft Maintenance Engineer

"ABORTED ENGINE START" ON BOEING 737 SERIES AIRCRAFT

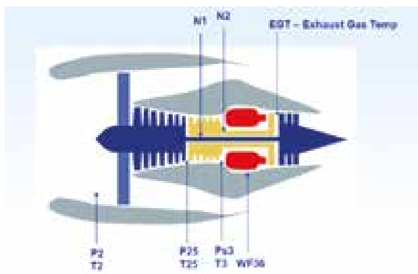
In aircraft maintenance and flight operations, the engine start procedure is a critical operation that requires rigor, knowledge and exceptional decision-making skills. Professionals in this field have a wide range of important responsibilities, from engine start-up to ensuring flight safety and acting with composure in emergency situations. In this article, we will focus on engine starting, which is critical to aircraft maintenance and flight operations, and we will examine the "Aborted Engine Start" process together, where knowledge, experience and emergency response skills will be used.

Before explaining Aborted Engine Start, let's talk about the engine start procedure on a Boeing 737 Series CFM56-7B engine.

Before starting an engine start, we must fully comply with the ground and cockpit checklists. The Fire Brigade must be informed and permission must be obtained from the Airport tower before starting this procedure. Engine start-up is performed by an aircraft maintenance technician who is authorized to start each engine type separately. During the engine start-up procedure, it is important to closely monitor the engine parameters on the upper and lower display unit. First of all, we set the engine start switch to GROUND position. This switch actually uses battery power to open the starter valve which allows high pressure air to come from the APU. This in turn allows the starter motor to rotate. It turns the N2 compressor through the Starter Accessory Gear Box. So we verify the N2 rotation, the oil pressure and expect at least 25%-26% N1 rotation.

From then on we move the engine start lever to the IDLE position. (We always keep our hand on the lever so that we can move it to the CUT OFF position if something goes wrong.) This opens the fuel valves and causes the EEC to supply fuel and ignition to the combustion chamber where the fuel ignites. At the starter motor cut-in speed (about 56% N2), power is removed from the start switch holding solenoid. The engine start switch returns to the OFF position, the engine bleed air valve returns to the selected position and the engine start valve closes. As a result of this process, our motor runs at IDLE speed.

Approximate stabilized IDLE parameters for the CFM56 engine on a standard day at sea level:



- N1 RPM - 20%
- N2 RPM - 59
- EGT - 410°C
- Fuel Flow 272 KGPH

Aborted Engine Start : The unexpected shutdown of the engine of a Boeing 737 aircraft after starting the engine. This can be caused by the airplane failing to start the engine properly, the engine being too hot or some other technical fault. Aborted Engine Start is an important procedure that allows pilots and aircraft maintenance technicians to keep the safety of the airplane and engine under control.

We can perform Aborted Engine Start for one or more of the following situations,

1. If there is no N1 movement before the engine Start Lever is moved to IDLE position.
2. If there is no oil pressure indication when the engine moves stabilized in IDLE position.
3. If there is no increase in EGT within 15 seconds after the engine Start Lever is moved to IDLE.
4. If there is no increase or very slow increase in N1 or N2 after EGT indication.
5. EGT is rapidly approaching or exceeding the initial limit (725°C for initialization) Note: The EGT limit for take-off is 950°C (5 minutes) and the maximum continuous EGT is 925°C.

The most important action in case of Aborted Engine Start is to quickly move the Engine Start Lever (for the affected engine) to the CUT OFF position.

One of the most common reasons for Aborted Engine Start is Engine Hot Start. So what is Engine Hot Start operation?

Engine Hot Start: In any variant of a turbofan engine, "Hot Start" refers to a situation where the limit temperature defined by the manufacturer for Start is exceeded. This temperature limit will be expressed as either turbine inlet temperature (TIT), exhaust gas temperature (EGT) or inter-stage turbine temperature (ITT) as appropriate to the engine. The operating temperature limit varies by manufacturer and engine type and may be less than, equal to, or greater than the normal maximum operating temperature for that engine. For a Boeing 737-800 airplane, this value is between 725 degrees for start and 925-950 degrees for take-off.

The most common causes of a hot start include insufficient airflow from the compressor, improper fuel planning and slow engine acceleration. Other contributing factors include insufficient air from the auxiliary power unit (APU) or ground support unit (GSU) to properly accelerate the engine during start-up, and reverse airflow caused by a wind blowing from the rear of the aircraft.

If a possible Hot Start is detected by the pilot, an aircraft technician authorized to operate the engine or Full Authority Digital Engine Control (FADEC) and the start is aborted before the limiting temperature is reached, a second start can be attempted. Correct intervention is vital, especially in critical situations such as exceeding the limiting temperature values during engine start-up operations. In such cases, special procedures such as "Engine Exceedances Check" are one of the important steps to be followed step by step in aircraft maintenance and operations.

This procedure is meticulously described in the Aircraft Maintenance Manual and must be followed immediately in the event of any temperature exceedance. This is critical for aircraft safety and engine performance. This is done to detect any situation that exceeds the operating limits of the engines and to take the necessary measures. This is an inevitable step to ensure flight safety.

I wish all aircraft professionals have a safe flights and work.

Cpt. Plt. M.Melih BAŞDEMİR
PhD. Airline Management&CRM

IMPORTANCE OF IN-COCKPIT COMMUNICATION IN PROVIDING FLIGHT SAFETY

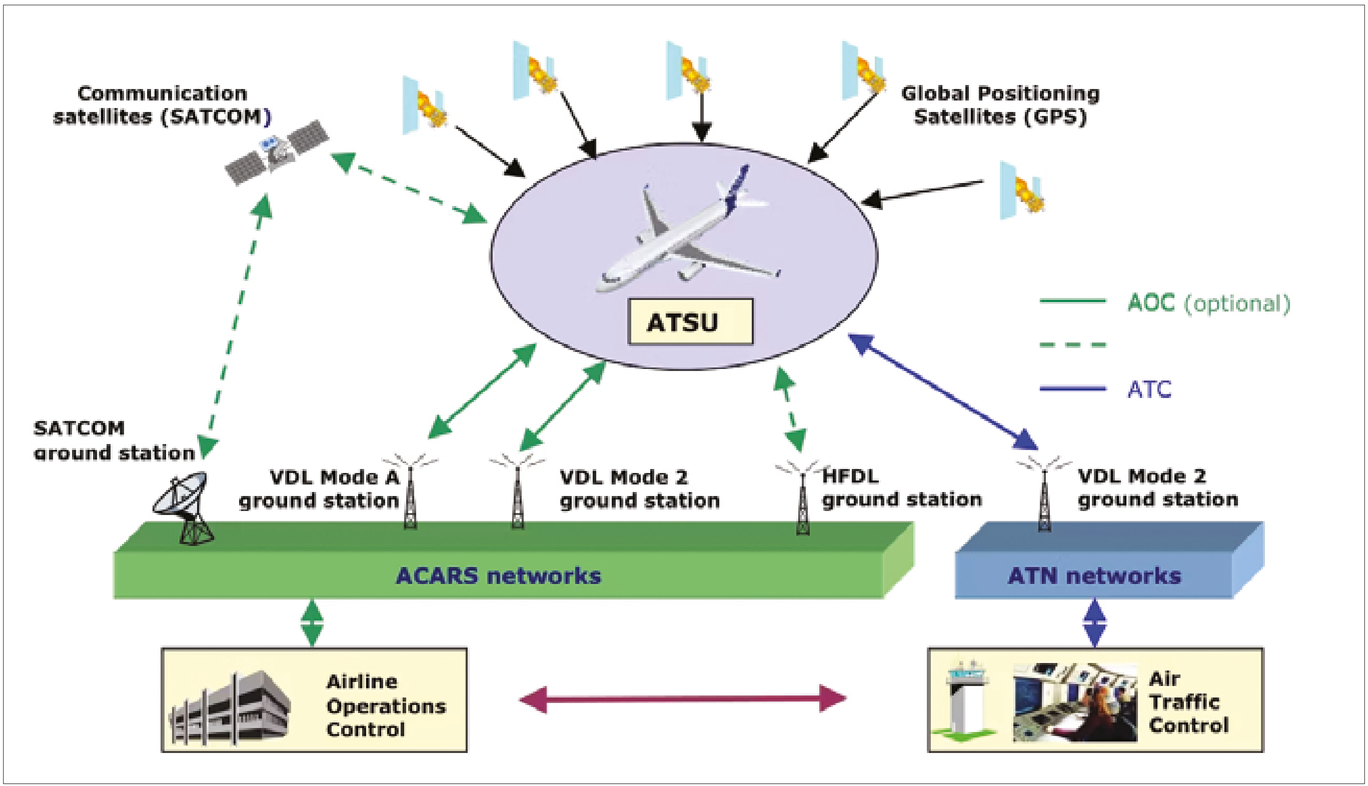
When good communication is established between flight crews in flight operations, it is observed that errors are reduced, threats encountered are eliminated, human performance is increased and a more effective flight operation is carried out.

Communication is important at every stage of the flight, but when, where and at what quality and effectiveness level the communication is made is more important. It is known that flight safety problems may occur especially in communications made between flight crews without complying with sterile cockpit rules. Therefore, communication established during the flight should be at the optimum level.

Communication is the process of sending the intended message from the sender to the receiver through appropriate transmission channels. It is often thought that the sent message is delivered to the receiver completely, however, the use of incorrect transmission tools and methods in the cockpit, the receiver not being ready to receive the message, the message not being prepared in an understandable manner, and the message being sent not being sent in accordance with its purpose.

The most common method used in the transmission of messages is verbal communication. People first learn the ability to speak during their infancy, and from childhood on, they interact with other people mainly through verbal communication, communicate and socialize through speaking. However, physical obstacles such as noise and crowded environments that prevent verbal communication prevent the message from being delivered, and the recipient not being ready to receive the message prevent effective verbal communication.

Messages can be complicated, more than one message is being given at the same time, messages are longer than necessary, and communication outside of the usual forms can cause problems in receiving the message. This is especially important in flight operations. Flights are conducted in an extremely fast and dynamic environment, which requires the use of dynamic and "standard" communication tools and forms. An example of this is the conversations between air traffic controllers and pilots. Pilots with ground control (ATC) only communicate verbally with each other using aviation terms (standard



phraseology). In addition, this type of communication is used in the cockpit with standard terms and face-to-face verbally. Here, an air traffic controller who tries to direct the planes by making non-standard speeches in flight may create chaos between the planes in his area of responsibility, or may cause irreversible communication problems in the cockpit. This situation also describes an undesirable form of communication.

Language is also an important variable in cockpit communication. As it is known, the most effective language used by a person in communication is his own native language. However, this is not always the case for aviation. Because aviators must definitely know a certain level of English while doing their job. It is a must for an operations officer working on the ground to know English in order to communicate with a foreign flight crew. In addition, a pilot who flies anywhere in the world must receive a passing grade from ICAO's foreign language proficiency exams. Using standard terms and choosing a simple communication language when speaking a foreign language will allow aviators working in international

environments to communicate more easily.

In order for flight operations to be carried out effectively and safely, communication skills must be used appropriately. The message must be understood completely and clearly. Incomprehensible messages must be questioned. The golden rule that should not be forgotten in communication is that there is no place for messages that remain in the air such as "I wonder??? I guess?? It is probably like this" in aviation.

CRM trainings are provided in airline companies in order to ensure better communication among flight crews, especially in the cockpit. Because of these trainings, among pilots following items should be attained;

- During communication, attention should be paid not to sending the message but to ensuring that the message is received healthily and as desired,
- Being a good listener while receiving the message,
- Avoiding all distracting elements and adhering to sterile cockpit rules,
- Emotional feedback and body language of the other party during communication,

- When the message is not understood, clearly stating that the message was not understood,

Repeating the misunderstood expressions,

- Using plain language during communication, making the messages sent clear, short and understandable,
- Establishing face-to-face communication in the cockpit as much as possible during the flight, especially during an operational situation (checklist reading, briefings, announcements, etc.), avoiding non-standard conversations and professional courtesy are emphasized.

In-cockpit communication is a standardized communication. Any communication style that pilots are not accustomed to or that is outside of professional jargon may lead to misunderstandings in the cockpit. In addition, in-cockpit communication is a "peaceful" communication. Here, communication styles that may create conflicts that may even compromise flight safety later on, that may lead to personal resentment should be avoided, the focus should be on understanding the message without leaving any doubt, and personal resentments that may create tension should be avoided.

Cultural Differences in Cockpit Communication

Everyone is different and everyone does his job in a different way and manner than other people. Most of these differences that are unique to individuals arise from people's personal characteristics and cultural backgrounds. In flight environments where cockpit crews operate as multinational and multicultural, cultural problems that may be experienced are an inevitable reality. However, naturally, despite cultural differences, it is a must for a professional aviator to exhibit standard aviator behavior within his/her team. Each culture contains its own traditions, social and political perspectives formed by a certain society, language and beliefs, history, geography and identity values. In other words, culture contains all the values that make a person human and varies from society to society.

Although culture should not affect standard communication styles in the cockpit, it is observed that cockpit members from the same culture are more compatible in terms of CRM and communication during the flight. It should be avoided to create a conflict environment by highlighting cultural differences. In order to stay away from situations that may cause conflict and arise from culture and other issues, flight operations adopt standard communication styles and, in a sense, standard behavioral patterns. However, similarity and harmony in culture and personal characteristics allow the communication process, decision-making styles, and even all flight-related processes to be carried out more comfortably and in more harmony between the teams. Although such similarities are seen as an advantage, standard communication should not be compromised.

In this case, the following recommendations will help with the question of how to behave as a pilot in flight with CRM awareness:

• Behavior breeds behavior, being polite is a desired behavior, being too polite is an undesirable behavior. However, no matter what, a warm meeting in the Flight Briefing Room is always a good start.

• There should be no question marks between people, if there is a situation that is not understood, it would be a good course of action to politely question the situations that are not understood.

• It is necessary to avoid discussing political or private issues that will damage the individual's personality structure or create disagreement.

• It is important to try to be a good team player without trying to dominate anyone.

• It is necessary to understand the situation calmly before taking any action.

• It is important for a flier to always try to display professional aviator behavior.

• It is imperative to be sensitive to cultural differences and act accordingly, if there is a disturbing situation, it is necessary to act in a way that will eliminate this cultural discomfort.

Differences Among Generations in Cockpit Communication

A generation refers to a period of time in which a social settlement is accepted in the same periods, common values and experiences are shared, music, fashion, economic, historical and political events are experienced, a common lifestyle and emotional reactions are formed, and the beginning and end cannot be determined with certainty. In a generally accepted view, generations are classified as;

- Traditionalists: 1945 and before
- Baby Boomers: 1945-1964
- Generation X: 1965-1980
- Generation Y: 1980-2000
- Generation Z: 2000 and after.

Today's cockpit environment is generally formed by generations X, Y, and Z. Although communication in the cockpit environment is shaped by pilots who have the characteristics of the generations mentioned above, it is seen that the differences between generations are tried to be overcome with 'standard' communication methods, and social relations are formed with the harmony of individuals. However, it is evaluated that communication in the cockpit can be established more effectively by knowing the differences between generations.

As a result, the subject of communication in the cockpit, which is included in the Social Skills of EKY subjects, is one of the important points in ensuring flight safety. Effective communication must be provided in the cockpit throughout flight operations. In this way, a good flight climate is created during the flight, efficient communication is established, a good team player is formed, messages are expressed clearly, insistence is determined, conflicts are not experienced, flight discipline is maintained, cultural differences are recognized, efforts are made to ensure harmony between generations, good leadership is made and most importantly, obstacles in ensuring flight safety are eliminated. By removing communication obstacles, threats and errors that may occur during the flight are successfully eliminated, pilot performance increases and flight operations are carried out more safely and effectively.

Zülal ÇELİK
News Editor

AI IN AVIATION:
HOW CHINA IS SHAPING THE FUTURE OF AIR TRAVEL WITH AUTOMATION

In recent years, the aviation industry has witnessed significant advancements in artificial intelligence (AI) and automation technologies, with China emerging as a key player. The country's commitment to integrating AI into its aviation sector is transforming how aircrafts operate, maintain, and communicate, all while enhancing safety and operational efficiency. This article explores China's innovative AI applications in aviation and examines their impact on the global aviation landscape.

AI and automation in Chinese aviation
China's aviation industry has been rapidly evolving, with AI-driven technologies being implemented in various areas, from flight operations to ground services. For example, China Southern Airlines, one of the country's biggest airlines, has adopted AI-powered systems to optimize flight routes and schedules. This system, using real-time weather data and traffic conditions, allows for more efficient flight paths, reducing fuel consumption by as much as 5%.

Additionally, Beijing Capital International Airport has integrated AI in its passenger flow management, using facial recognition technology for faster check-ins and security screening. This has resulted in a 30% reduction in passenger wait times, significantly improving the travel experience.

One of the most groundbreaking AI applications in Chinese aviation is autonomous flight technology. Xpeng AeroHT, a subsidiary of Chinese electric vehicle maker Xpeng Motors, is developing an autonomous flying car prototype equipped with AI-driven navigation. While still in development, these technologies represent the future of both personal and commercial aviation.

Enhancing safety with AI
Safety is the top priority in aviation, and AI plays a crucial role in identifying potential risks before they escalate. For example, COMAC (Commercial Aircraft Corporation of China) uses AI-based predictive maintenance tools for its C919 aircraft. These tools analyze data from sensors embedded in the aircraft to predict component failures before they occur. This not only minimizes the risk of accidents but also improves aircraft availability by reducing unscheduled maintenance.

In addition, AI enhances air traffic management by reducing human error. China's Air Traffic Management

Bureau has implemented AI algorithms to assist in managing the complex airspace over major cities like Shanghai and Beijing. These systems help optimize flight paths, reduce delays, and increase overall safety by providing real-time analysis of traffic congestion and weather conditions.

Efficiency gains through automation
AI-powered automation also plays a vital role in increasing operational efficiency. Shenzhen Bao'an International Airport is using AI-driven baggage handling systems that track and sort thousands of bags per hour with incredible accuracy, reducing mishandled luggage incidents by 15%. Similarly, Shanghai Pudong International Airport employs AI to manage ground services like fueling and cleaning, allowing for faster turnaround times between flights.

Furthermore, AI is aiding in fuel efficiency by optimizing flight routes based on weather patterns, wind speeds, and air traffic conditions. For instance, Hainan Airlines has implemented an AI-based flight management system that saves the airline millions of dollars annually by reducing fuel consumption and CO_2 emissions. These AI systems can calculate the most fuel-efficient paths, saving airlines significant amounts of money while also reducing their environmental impact.

Historical background: China's AI development in aviation
China's journey to integrating AI into aviation can be traced back to the early 2000s when the country first recognized the potential of automation and AI in enhancing its aerospace capabilities. The Chinese government, through its various five-year plans, prioritized technological innovation and infrastructure

development, laying the groundwork for AI's current role in aviation.

Early AI applications in Chinese aviation focused on basic flight data analysis and automated maintenance systems, which have now evolved into more sophisticated applications like autonomous flight control and predictive maintenance. Government-backed institutions, such as the China National Aviation Corporation (CNAC) and research entities, played a crucial role in fostering partnerships between state-owned airlines and tech companies. The gradual incorporation of AI in the form of flight route optimization software and automated air traffic control systems positioned China as a leader in this field.

Global comparisons: China's AI strategies vs. the U.S. and Europe
When comparing China's AI applications in aviation to those of the United States and Europe, a few key differences emerge. While the U.S. and Europe have focused heavily on military applications and safety protocols, China's approach has been more comprehensive, targeting both commercial aviation and airport infrastructure.

For example, the U.S. has invested heavily in AI for defense aviation, such as autonomous drones and AI-driven fighter jets, spearheaded by organizations like DARPA (Defense Advanced Research Projects Agency). In contrast, China has emphasized commercial applications, such as improving passenger experiences and enhancing fuel efficiency through AI. Europe, particularly through organizations like Airbus and Eurocontrol, has been focusing on standardizing AI technologies for air traffic management across different countries, an area where China is also excelling but with its own AI solutions tailored for dense urban airspaces.

China's distinct advantage lies in its centralized decision-making and state-sponsored support for AI development in aviation, allowing for faster implementation compared to the decentralized, more regulated approaches seen in Western countries. This enables China to move swiftly in deploying new technologies, such as facial recognition systems for airport security and autonomous taxiing systems, which are still in experimental stages elsewhere.

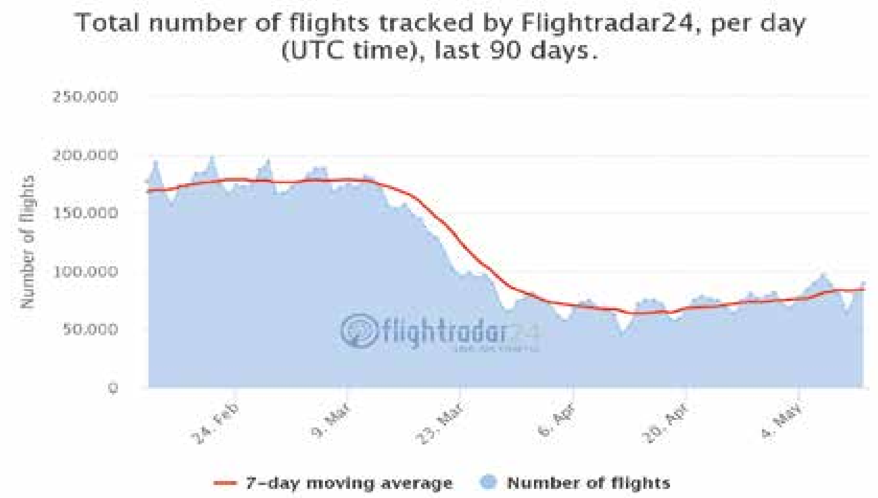
POST COVID19 AVIATION ECONOMIC LANDSCAPE

The aviation industry has seen a rapid global recovery since the pandemic, though the pace of recovery varies by region, and aviation companies' stock performances reflect these regional differences. The economic growth, stock market outcomes, and recovery strategies of airlines in North America, South America, Europe, Asia, and the Middle East serve as significant indicators of the overall recovery in the sector.

In North America, the aviation sector has experienced a robust revival, which is evident in the stock market performances of major airlines. Key players like American Airlines, Delta Air Lines, and Southwest Airlines have significantly improved their profitability, nearing pre-pandemic levels by 2023. For instance, Delta Air Lines achieved a 40% increase in revenue in 2023 and bolstered its operational efficiency. The company's stock rebounded from pandemic-related losses and continued to attract substantial investor interest throughout 2023. Similarly, American Airlines saw a notable rise in its stock prices during the recovery, while United Airlines demonstrated a strong comeback in its stock performance, driven by capacity expansion and a growing flight network. By the second quarter of 2023, United Airlines became the largest airline in the world, operating 121 billion Available Seat Kilometers (ASK) and sustaining its solid performance in the stock market.

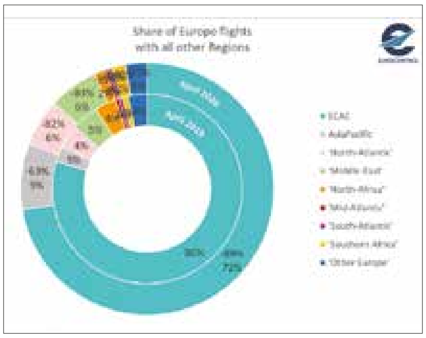
Although South America's recovery has been slower, airlines in the region have entered a growth phase post-pandemic. Major airlines such as LATAM Airlines and Avianca have strengthened their financial standings, aided by government support and restructuring processes. LATAM Airlines, for instance, emerged from bankruptcy protection in 2022 and returned to profitability, with its stock beginning to recover in 2023. Low-cost carriers also saw rapid expansion, and passenger demand in the region showed significant revival. Azul Airlines, in particular, outpaced its regional competitors, enjoying a sharp increase in stock value thanks to a surge in demand, especially for domestic routes and a growing flight network.

In Europe, the recovery was mainly driven by the acceleration of vaccination efforts and the lifting of travel restrictions. Airlines like Lufthansa, Air France-KLM, Turkish Airlines, Pegasus Airlines, and Ryanair saw improvements in their stock market performances, alongside stronger financial outcomes. Turkish Airlines, one of Europe's largest carriers by 2023, capitalized on the increasing demand for long-haul international travel. In the first half of 2023, Turkish Airlines carried 35 million passengers and reported a net profit of $2.7 billion. This financial success positively influenced the company's stock performance, with shares listed on Borsa Istanbul continuing to draw strong investor interest. Turkish Airlines' investment in wide-body aircraft and its expanding global network have also positioned it as a key player both in Europe and globally. Pegasus Airlines, adhering to its low-cost model, swiftly recovered in the post-pandemic era, increasing its passenger count by 29% in 2023 and boosting operational profitability. The airline's net profit surged by 58% compared to 2022, and this success was mirrored in its strong stock market performance.



Ryanair, another major player in Europe, experienced a remarkable rebound in its financial performance due to the growing demand for its low-cost services. By 2023, the airline's stock had returned to pre-pandemic levels, with a 29% increase in ASK. Ryanair became one of the fastest-recovering airlines in Europe, thanks to its expanded routes and an increase in passenger demand. Moreover, the airline's efforts to enhance fleet efficiency and reduce environmental impact have helped cut costs, further boosting its stock market performance. Lufthansa, one of Europe's largest airlines, also took significant steps toward recovery, aided by 9 billion Euros in state support from the German government. The airline focused on fleet and cost optimization, achieving profitability in 2023, and saw a notable rise in its stock value throughout the year.

Meanwhile, Air France-KLM concentrated on debt restructuring and cost controls during the recovery, leading to a steady improvement in stock performance. The group saw an increase in passenger numbers and enhanced its financial stability in the second quarter of 2023, thanks in part to a rise in demand for premium travel.



In Asia, the recovery was slower, but by 2023, significant improvements in stock market performance were evident among major airlines. Chinese airlines such as China Southern and China Eastern Airlines saw their profitability rise due to increased domestic flight demand, with their stocks nearing pre-pandemic levels. China's domestic aviation market stands out as one of the fastest-recovering globally. In Japan, airlines like ANA Holdings and Japan Airlines experienced a stock market resurgence in 2023, largely due to strong domestic flight demand and government support.

Middle Eastern airlines, particularly Emirates and Qatar Airways, led the global recovery with high demand for long-haul international flights. Emirates emerged as a leader in global passenger transportation, operating its A380 fleet and maintaining profitability near pre-pandemic levels. Similarly, Qatar Airways expanded its flight network and capitalized on growing passenger demand, leading to a strong recovery in stock value.

Overall, while the global aviation industry's recovery has been positive, the pace has varied across regions. In North America, Europe, and the Middle East, airlines have strengthened their financial statements and taken strategic actions to boost stock performance. In contrast, Asia and South America are catching up, though challenges remain.

N. Temuçin GÜREL
Instructor/Author

THE HUMAN FACTOR IN AVIATION

"THE CRITICAL ROLE OF TECHNICIANS AND TECHNICAL TEAMS IN EFFECTIVE CREW MANAGEMENT"

"There is no task or job left in the world today that can be accomplished alone." This may seem like a bold statement, but research supports the idea that individual success or the achievements of a single unit within an organization are not possible without effective teamwork. Even the most individual accomplishments are backed by a team working behind the scenes.

When we look closely at even the most individual sports, we can see a group of people, such as coaches, psychologists, masseurs, and equipment managers, who contribute to the athlete's success. Similarly, in a company, success in production, sales, accounting, human resources, and marketing can only be achieved through effective teamwork. In today's world, it takes a strong, coordinated team effort to ensure success and good results in any field.

What is a Holistic Approach and Why is It Necessary?

For centuries, humans have tried to understand the world by breaking it into pieces for analysis. For instance, the human body has been divided into different systems to understand it better. In hospitals, we see departments like cardiology, surgery, otorhinolaryngology, and ophthalmology, each with its specialized doctors. This compartmentalized approach is necessary, but it also presents a risk: the ability to connect the pieces and look at the bigger picture may weaken. If specialists focus only on their area without integrating, communicating, and collaborating with others, the chances of making accurate diagnoses and treatments decrease.

This idea applies to the aviation industry as well. Like many other sectors, aviation is divided into specialized areas like sales, marketing, human resources, flight operations, technical services, finance, and cargo. Specialization is necessary, but if these departments do not coordinate and collaborate, achieving the common goal of flight safety becomes difficult.

Holism and Teamwork in Aviation

Research into preventing and managing incidents in aviation began in the 1950s, and accelerated in the 1970s with an increase in accidents and incidents. A discipline that aims to manage resources effectively to ensure flight safety began to spread widely: Crew Resource Management (CRM). Initially called "Cockpit Resource Management," it focused on pilots in the cockpit. Over time, the discipline expanded and became known as "Crew Resource Management," encompassing the entire crew. It became evident that preventing accidents and incidents requires the collective awareness and effort of everyone involved in aviation—not just the pilots.

The Place of Technicians and Technical Teams in the Big Picture

Every area and individual in aviation is essential. However, CRM includes a limited number of roles such as pilots, cabin crew, dispatchers, loadmasters, and technical staff, including technicians. Technical personnel play a crucial role in CRM because their errors can have severe consequences. Examples of incorrect control linkages or overlooked issues during maintenance leading to accidents remind us of the importance of technicians in ensuring flight safety.

Technicians' roles extend beyond routine maintenance. Their ability

to identify and resolve technical issues before flights begins is vital, as even minor oversights can lead to significant problems during flight. History shows that improperly fastened rivets or undetected wiring issues have caused accidents. Conversely, technical teams have also prevented serious incidents by identifying and resolving problems before they escalate. Therefore, technicians are an integral part of the aviation safety chain.

Steps for Improvement

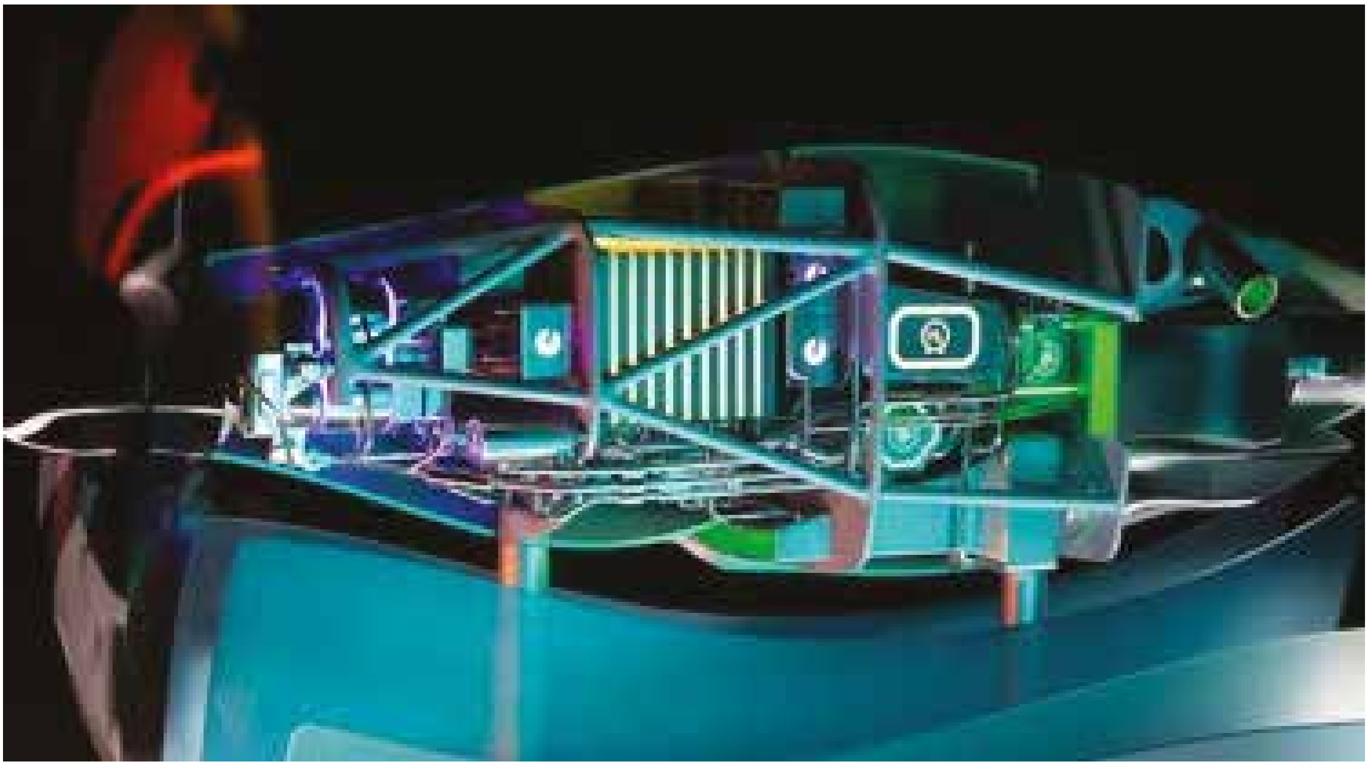
To enhance CRM, it is essential to implement it organization-wide as Company Resource Management. This would involve all departments, including human resources, finance, technical services, flight operations, and ground services. Shared training sessions and collaborative projects can help foster communication and empathy among different teams, ensuring everyone understands how their work impacts others.

Creating digital platforms for continuous information sharing and problem-solving can also help maintain communication and knowledge exchange beyond formal training sessions. By encouraging collaboration between departments like pilots, dispatchers, and technicians, organizations can build stronger, more cohesive teams that contribute to overall safety and efficiency.

Conclusion

As mentioned earlier, we live in a world where individual success is no longer possible without effective teamwork. In aviation, every unit and person is crucial. Technical staff, in particular, play a significant role in ensuring flight safety. As Ken Blanchard said, "None of us is as smart as all of us." Through teamwork, we can harness the collective potential of individuals and elevate the organizations we belong to.

Wishing you safe and efficient operations.



“AIRBUS’ HYDROGEN-POWERED FUTURE

A DEEP DIVE INTO THE LARGEST HYDROGEN ENGINE AND THE PATH TOWARDS DECARBONIZED AVIATION

As the world faces growing concerns about climate change, the aviation sector is under immense pressure to decarbonize. Airbus, one of the largest aircraft manufacturers in the world, has taken a pioneering role in developing hydrogen propulsion systems, which are seen as a key technology to achieving zero-emission flights.

The company’s ambitious ZEROe program, which aims to introduce the first hydrogen-powered commercial aircraft by 2035, is a testament to this commitment. Central to this effort is the development of the largest hydrogen engine ever built—a two-megawatt-class propulsion system that promises to revolutionize air travel.

Airbus’ Hydrogen Engine: The Core of Zero-Emission Aviation

A Revolutionary Design

Airbus’ hydrogen engine, which represents the backbone of its ZEROe initiative, is designed to use liquid hydrogen as fuel. Stored in cryogenic tanks, the hydrogen is converted into electricity through hydrogen fuel cells, which then power electric motors to drive the aircraft’s propellers. This process is entirely emission-free, producing only water as a byproduct

The Iron Pod, an innovative component housing the hydrogen fuel cell system and electric motors, was successfully tested in late 2023, marking a significant milestone in the development of this groundbreaking propulsion system

The engine is capable of generating two megawatts of power, which is the highest level of energy ever achieved in a hydrogen propulsion system for aviation. This system is crucial for scaling up hydrogen-powered aircraft to accommodate commercial flights, which require more energy and range than smaller electric aircraft.

Key Features and Technologies

1. **Hydrogen Fuel Cells:** These cells convert hydrogen into electricity through a chemical process involving oxygen, emitting only water as a byproduct. Airbus’ focus on fuel cells is driven by their potential to power larger aircraft with zero emissions.

2. **Cryogenic Hydrogen Storage:** Airbus is utilizing liquid hydrogen stored at cryogenic temperatures to fuel its aircraft. This storage method is critical for ensuring that enough hydrogen can be carried onboard to meet the energy needs of long-haul flights

3. **Scalability:** Airbus’ engine is designed to be scalable, allowing it to be used in various aircraft configurations, from small commuter planes to large commercial jets.

A Step Towards ZEROe
The hydrogen engine is central to Airbus' vision of launching its ZEROe demonstrator aircraft by 2035. This aircraft will serve as a testing platform for hydrogen propulsion systems and will play a pivotal role in reducing the aviation industry's reliance on fossil fuels

Challenges in Hydrogen Propulsion
While hydrogen offers immense potential for decarbonizing aviation, there are several challenges that Airbus and the broader industry must overcome.

Infrastructure
One of the key hurdles is the lack of hydrogen infrastructure at airports. Hydrogen requires specialized handling and storage facilities, which most airports currently lack. Airbus is working with airports and governments to develop the necessary infrastructure to support hydrogen-powered flights. This includes investigating the feasibility of on-site hydrogen production at airports and the potential for using existing natural gas pipelines to transport hydrogen

Safety Concerns
Although hydrogen has been safely used in industries such as space exploration for decades, there are still public perception issues regarding its safety. Airbus is investing in research and public education to address these concerns and demonstrate that hydrogen can be safely used in commercial aviation.

Energy Density
Hydrogen, while offering zero emissions, has a lower energy density compared to traditional jet fuels like kerosene. This means that larger storage tanks are needed, which can impact aircraft design and performance. Airbus has been working on developing lightweight cryogenic tanks that can safely store hydrogen while minimizing the impact on aircraft weight

Competitors in the Hydrogen Race: Airbus vs. Boeing
While Airbus is leading the charge in hydrogen aviation, it is not alone in its efforts. Boeing, Airbus' main

competitor, has also been exploring hydrogen technologies, but with a different approach.

Boeing's Approach to Sustainable Aviation
Boeing has historically been more focused on the development of Sustainable Aviation Fuels (SAF) rather than hydrogen. SAF is produced from renewable resources such as biomass and can be used in existing aircraft engines with minimal modifications. While SAF offers a short-term solution to reducing emissions, it does not offer the same zero-emission potential as hydrogen

However, Boeing has acknowledged the potential of hydrogen and is reportedly conducting research into hydrogen combustion engines, which would use hydrogen in a similar manner to traditional jet fuel. These engines could serve as an interim solution as the industry transitions to fully electric hydrogen propulsion

Comparing Hydrogen and SAF
The main difference between Airbus and Boeing's strategies lies in their focus on long-term vs. short-term solutions. Airbus is betting on hydrogen as the ultimate solution for zero-emission aviation, while Boeing is focusing on SAF as a more immediate way to reduce carbon emissions. Hydrogen offers greater environmental benefits, but SAF is easier to implement in the near term, as it can be used in existing aircraft without requiring new infrastructure

The Road Ahead: The Future of Hydrogen Aviation
Airbus' ambitious goal of launching the first hydrogen-powered commercial aircraft by 2035 has the potential to transform the aviation industry. The development of the largest hydrogen engine in history is a major step toward achieving this goal. However, the company faces significant challenges, including infrastructure development, safety concerns, and public perception.

In comparison, Boeing's approach to Sustainable Aviation Fuel may offer a more immediate path to reducing aviation emissions, but it falls short of the long-term benefits that hydrogen offers. The race between these two aviation giants highlights the broader debate within the industry: whether to focus on incremental improvements or pursue radical innovation.

In the coming years, the success of Airbus' ZEROe program and its hydrogen engine will be crucial in determining the future of aviation. If successful, it could pave the way for a new era of zero-emission air travel, positioning Airbus as a leader in sustainable aviation.

Yüksel BOZKURT
Business Excellence Consultant

CONFIGURATION MANAGEMENT IN AVIATION:
A KEY TO STREAMLINING COMPLEXITY MANAGEMENT

Configuration Management (CM) is a management discipline that applies both technical and administrative direction to the development, production, and support lifecycle of a configuration item. This discipline applies to hardware, software, processed materials, services, and related technical documentation.

In simple terms, configuration management is a management tool that identifies a product and then controls changes to that definition.

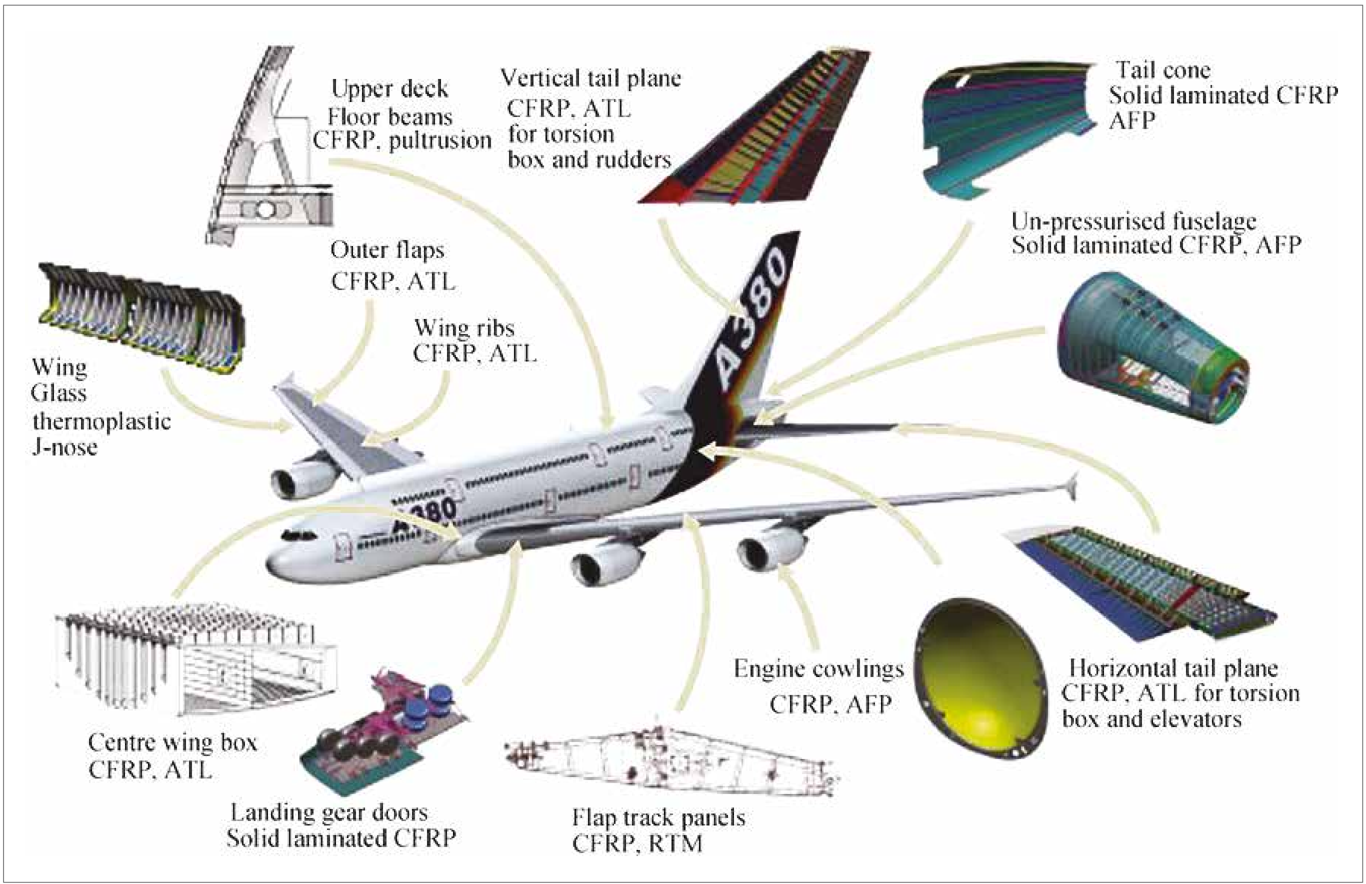
In the key areas of the military and aviation, the demand for improvement often comes from governments or their customers with CM authority, usually large companies dealing with defense contracts. To ensure better control, relevant parties have established CM standards that dictate how projects should be managed. Standards such as EIA649 (EIA, 1998) state that configuration management covers the entire product lifecycle, from conception to decommissioning.

In Europe, it was decided to first conduct research on the purposes and methodology of configuration management. The research question was: "How is the CM discipline applied in the European aerospace industry?"

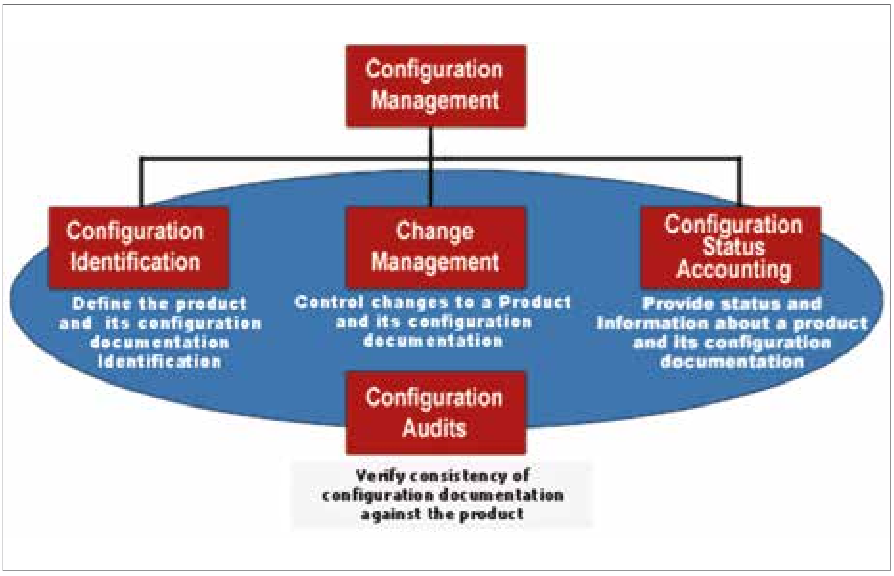
The research sought to address the following:

- How do industry players define CM?
- How do they evaluate the CM process?
- How do they implement the CM process?
- How is CM addressed within the organization's structure?
- How does CM fall under the scope of IT?
- Is CM an independent process, or is it covered by other separate processes?
- Does CM add any value to the business?

The research strategy adopted in this study is based on a survey initially conducted via mail, supported by in-depth interviews with a focused number of participants. The survey was designed to gather data from the sampled companies on the previously mentioned topics through questions in the following areas:



1. Background Information: Information on the number of employees, main business activity, key customers and suppliers, and the respondent's role within the company.
2. Corporate Information: Reporting structures and the position of Configuration Management (CM) within the management hierarchy.
3. Product Structure: The number of levels, types of information, and product processing.
4. Standards: Key standards followed and those used by contractors/suppliers.
5. Process Information: Processes used within the company and connections to other functions.



The results show significant differences between the two tiers of sampled companies; second-tier companies only addressed CM processes for part of the product lifecycle and were less accepting of CM. However, while high-level standards define the process quite uniformly, at lower levels, factors such as the company's IT setup and data requirements lead to differences in processes.

Although CM processes are fragmented and not sufficiently integrated end-to-end, aerospace defense companies appear to have the potential to achieve this with IT support. Companies view CM as a compliance issue, which is not a good sign, especially considering that suppliers have shifted the responsibility for self-monitoring to reflect the general trend toward greater collaboration and partnership within the industry.

CM is seen as a "Cinderella discipline"; this lack of recognition reveals shortcomings in upper management's responsibility for the discipline and the lack of training and career paths for CM-related personnel.

For example, the aircraft industry is one with a high content of technical research and development. Various complex processes take place for each new aircraft project.

Many disciplines are involved in these processes, such as aerodynamics, structural calculations, production, etc.:

- CM (Configuration Management) is a discipline born out of the necessity to maintain control in complex process relationships.
- The product structure is a hierarchical breakdown of a product (aircraft) used to represent product information in a database.
- CM is well-suited to solving complex problems and allows for the reduction of integration and design timelines, thus shortening the delivery time to customers. This discipline is essential for complex projects like aircraft design, but it is also recommended for integrating many activities or processes in other projects or programs that manage products created by components.
- One of the challenges in the aircraft industry is the long design periods (approximately seven years). This can lead to the product (aircraft) losing its competitive advantage.

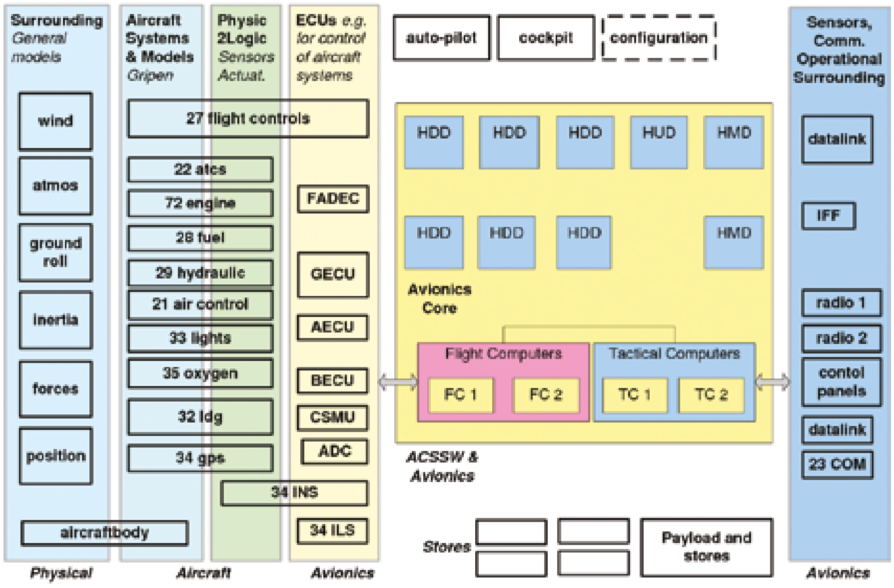


Fig. 5. The model map shows a simplified model overview of the application example.

- Reducing and integrating aircraft design times result in several processes occurring simultaneously. This is referred to as concurrent engineering. CM processes are defined to manage these relationships and outputs.
- CM solves issues during the lifecycle, reducing the time to make changes in releases and preventing management errors.

Recent failures in the development processes of aircraft manufacturers have led to significant delays in deliveries to customers. This can be attributed to the improper use of CM.

CM consists of four elements: the configuration baseline and the definition of configuration items as content, change management and the tracking of changes, configuration status accounting to track the status of configurations, and ensuring that configuration items are physically and functionally controlled while bringing the associated documentation to the appropriate level. Configuration management ensures traceability of the product throughout its lifecycle.


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

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A PROPOSAL FOR NON-TECHNICAL KNOWLEDGE AND SKILLS **IN AVIATION MAINTENANCE MANAGEMENT**

To maintain aircraft in a continuous airworthy condition, managers and employees within both the Continuing Airworthiness Management Organization and the Maintenance, Repair and Overhaul (MRO) organization must have a long list of technical knowledge and skills that can be performed. In addition to all this, these individuals must also have a knowledge base on non-technical matters.

In the following lines, basic information on Project Management, Quality Management and Information Systems Management will be presented.

In this context, although there are knowledge and skills that emerge as some explicit knowledge and some implicit knowledge with a pragmatic approach, it would be useful to talk about their definitions and certain characteristics.

First of all, base maintenance activities should be considered as a project within the scope of preparation and execution of maintenance packages. Therefore, it would be useful for managers and employees to have knowledge and skills about a modern project management methodology. The internationally recognized Project Management Institute / Project Management Bodly of Knowledge (PMI / PMBOK) may be the right choice.

The figures given below show the core process of Project management and process groups separetely.

PMBOK recommends managing projects with 48 main processes belonging to ten basic knowledge areas within five separate process groups. For these processes, around 100 different "tools and techniques" and around "250 inputs and/or outputs" used in the processes are suggested. The use of tools such as "Gantt chart", "Critical Path Method" (CPM) and "Program Evaluation and Review Technique" (PERT), which are indispensable for project management, are the issues that can be suggested as a first step.

Currently, Quality Management in the aviation sector is documented

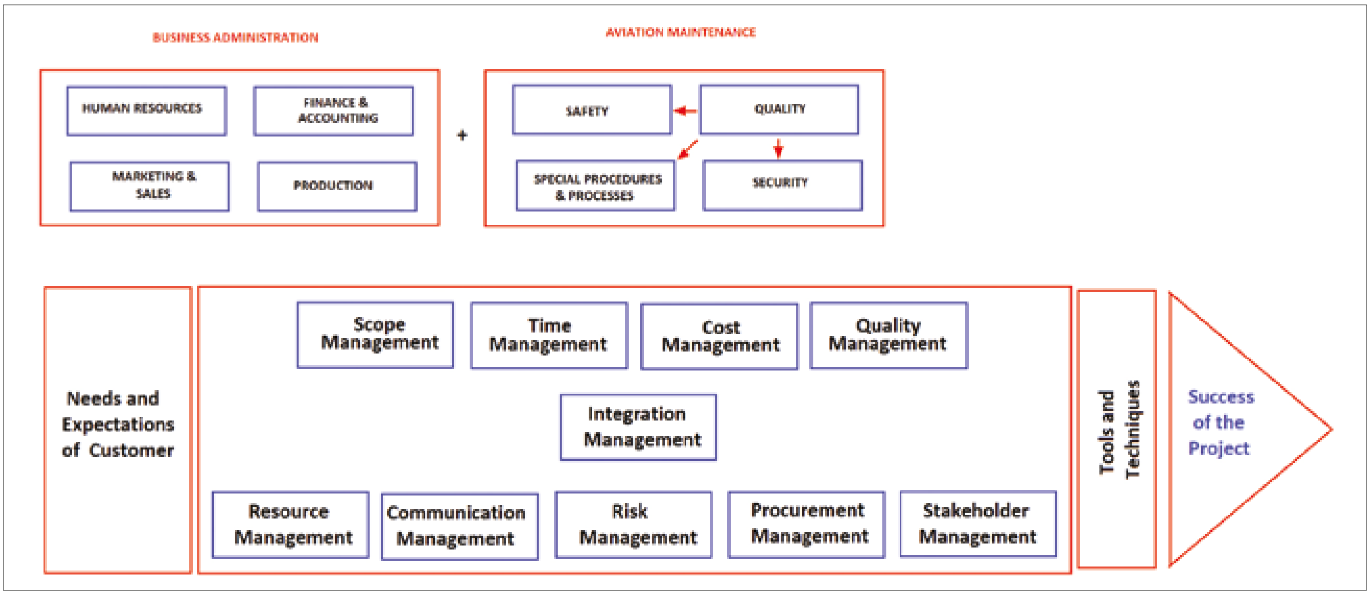

Figure 1. Core process of Project Management

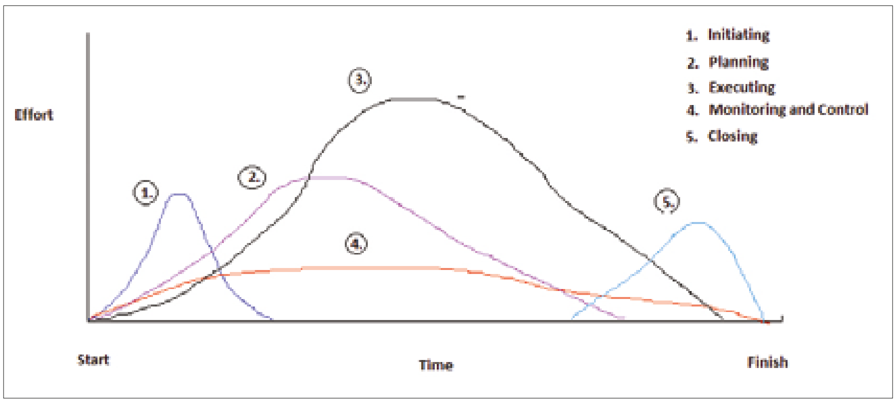

Figure 2. Process Groups and their Effort Change in a Project or Project Phase Duration

through handbooks created within the framework of templates specified in ICAO Annexes, EASA PART documents or national regulations and instructions. However, it is thought that it would be useful to develop a separate learning program to understand the intellectual framework of principles such as "Continuous Improvement", "Teamwork", "Management by Processes" and "Zero Defect" that form the basis of this documentation and to understand the reasons for the transition from general quality standards such as ISO 9001:2015 for quality management standards to standards such as AS9100 specific to aviation.

Last but not least, a lot of data is needed for aircraft maintenance management. The regular assets that are transformed into information that answers the questions of "what/where/when/how/why and by whom" created by the authority, manufacturer and operator, are updated with the answers of "what/where/when/how/why and by whom" are done, constitute a significant workload. This entire complex process should also be carried out administratively and managerially at the tactical and strategic management level. In order to transform this mass of data into information, information into knowledge and even wisdom and disseminate it to the relevant stakeholders in a timely and complete manner, computer-aided information systems and business processes designed in accordance with these systems are needed. This requires conscious and professional "information system management" knowledge and skills within corporate management.

The figures given below show the four frames of information systems, managerial roles and their information systems with their interactions and change approachs that can be used in information systems design regarding to change amount and possibility of gain and loss respectively.

As a result, it can be thought that the development and implementation of more efficient and effective approaches for Project Management, Quality Management and Information Systems management by the management on both CAMO and MRO sides can create great gains for the aviation sector.

We hope that all aviators will always ensure "continuous airworthiness" with safe and reliable systems.

Sincerely

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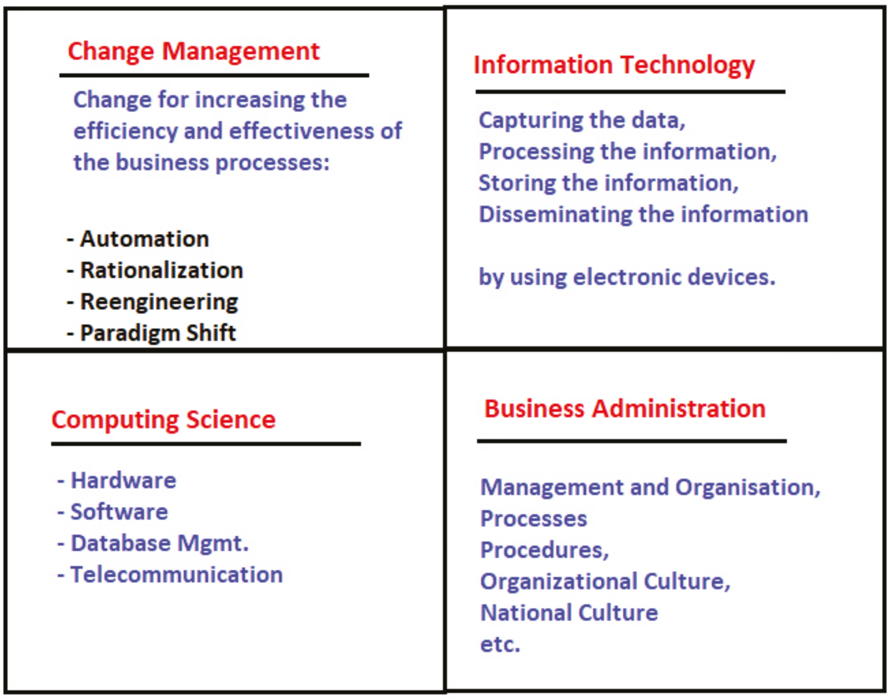


Figure 3. Conceptual frames of information systems

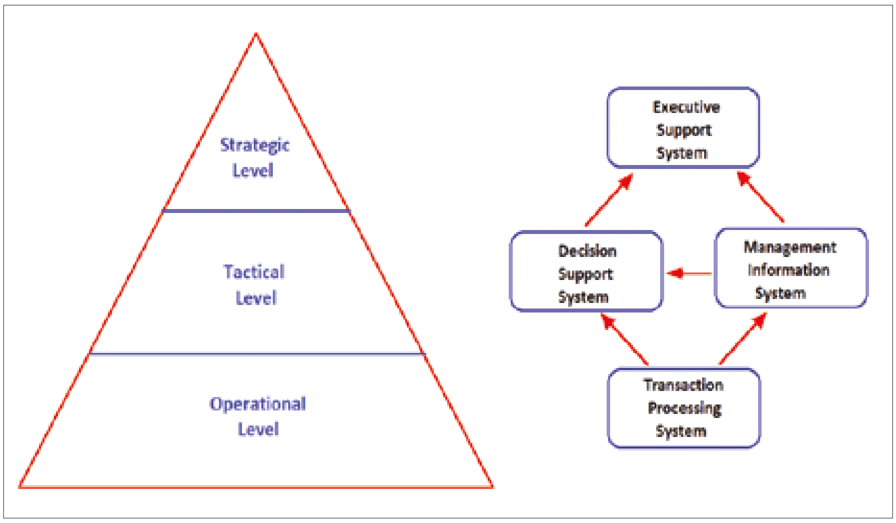


Figure 4. Management levels and their generic information systems

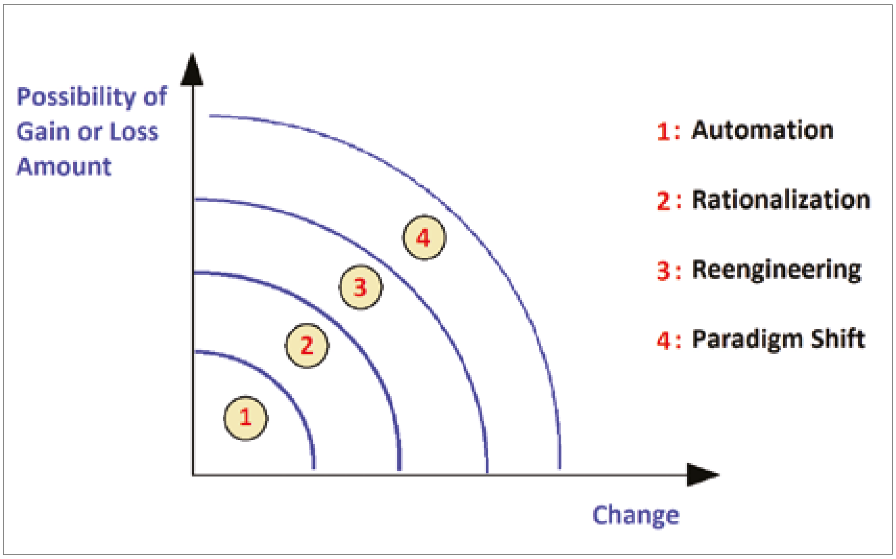


Figure 5. Change types and related change quantity and risk levels


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

ENSURING SAFETY AND PRECISION IN AIRCRAFT MAINTENANCE

Aircraft maintenance is crucial to ensuring both safety and operational reliability. In this high-stakes field, maintenance tasks cannot be delayed or postponed, as they are tied directly to flight safety. All maintenance must be carried out by highly skilled technicians at EASA Part 145-approved maintenance centers, following stringent protocols and using proper tools and equipment.

Key Principles and Safety Measures in Aircraft Maintenance:

1. **Safety First**: No task in aircraft maintenance is more critical than ensuring the safety of both personnel and passengers. Before starting any task, technicians must be well-rested, focused, and free of stress. Fatigue can lead to serious mistakes, which may endanger lives. Additionally, using personal protective equipment (PPE) is essential for tasks involving hazardous chemicals, high-voltage systems, or heavy machinery. Face coverings, gloves, and hearing protection must be used when dealing with harmful substances or working in noisy environments

2. **Tool Safety and Usage:** Technicians must always use the correct tools for specific tasks. Improvising or using worn-out tools increases the risk of injury and can lead to mechanical failures in the aircraft. It is also vital to maintain a rigorous tool control program to prevent any tools from being left in or around the aircraft, which could cause serious accidents. All tools must be inspected regularly to ensure they are in good condition

3. **Clear Communication and Signage:** In the fast-paced environment of aircraft maintenance, communication is key. Technicians must regularly update each other about potential hazards, changes in procedures, or the use of new equipment. Warning signs, particularly in areas near engines or hazardous chemicals, should always be visible and respected. Color-coded safety labels help technicians quickly identify dangers and act accordingly.

4. **Handling Hazardous Materials:** Many aircraft maintenance tasks involve working with chemicals such as cleaning agents, lubricants, and fuel. These substances pose significant risks if not handled properly. Technicians should follow manufacturer guidelines and use appropriate PPE to avoid exposure to dangerous chemicals. Proper disposal of hazardous waste is

also critical to maintaining a safe work environment.

5. **Preventing Foreign Object Debris (FOD):** FOD, such as loose tools or debris on the tarmac, can cause catastrophic damage to engines and aircraft components. An effective FOD prevention program involves strict tool control and maintaining a clean work environment. Ensuring that no foreign objects are left around the aircraft, particularly near engine intakes, is essential to avoiding accidents

Detailed Maintenance Process:

1. **Initial Inspections and Preparations:** Before starting any major maintenance tasks, initial checks for leaks in systems such as air conditioning, APU, and hydraulics are performed. Identifying issues early makes the subsequent maintenance process smoother. Additionally, Incoming Inspections are carried out for external clients, ensuring that all systems are checked in detail.

2. **Pre-Maintenance Cleaning and Safety Precautions:** Before taking the aircraft into the hangar, essential areas like landing gears and flap tracks must be cleaned thoroughly. Special attention must be paid to electrical connectors and sensitive components to prevent water damage. All cleaning must be conducted according to AMM (Aircraft Maintenance Manual) standards.

3. **Access Panels and Preparations:** Opening access hatches and panels is a crucial step in aircraft maintenance. Technicians must use proper tools to avoid damaging components. Removed parts must be labeled and stored properly. Any damaged components should be repaired or replaced immediately

4. **Executing the Maintenance Package:** The maintenance process follows a predefined package, and each task must be completed in accordance with AMM regulations. Any issues encountered during the process must be addressed and recorded immediately. Components such as engines, landing gears, and control surfaces are carefully inspected and serviced

5. **Engine Testing and Final Checks:** After completing all major tasks, engine testing is conducted under controlled conditions. Technicians ensure that all systems, including fuel, oil, and hydraulics, are functioning correctly. Any anomalies must be addressed before the aircraft is cleared for operation

6. **Post-Maintenance Certification and Documentation:** Upon completing all tasks, the aircraft undergoes a final inspection. The C Category team checks all maintenance cards to ensure that nothing is missed. Once confirmed, the aircraft is issued a Certificate of Release to Service (CRS), confirming that it is safe and ready for flight.

Advanced Safety and Risk Management:

Maintaining a safe work environment in aircraft maintenance requires constant vigilance. Technicians should stay updated on the latest industry standards, including advancements in tools and safety procedures. Additionally, performing regular risk assessments and identifying hazards in advance can help reduce the risk of accidentsBy following these detailed processes and prioritizing safety, aviation maintenance teams ensure that aircraft remain reliable and safe for passengers and crew.

THE BACKBONE OF AIRCRAFT SAFETY:

THE ROLE OF STATIC AND FATIGUE TESTING IN AIRCRAFT DEVELOPMENT

Developing a new aircraft is one of the most complex and time-intensive challenges in the aviation industry. From design to production, every step is meticulously planned and executed to ensure both the safety and performance of the aircraft. At the heart of this process are static and fatigue tests, two essential testing phases that guarantee the reliability and longevity of an aircraft's structural integrity. These tests simulate the challenges an aircraft will face during its operational life, ensuring that it can perform safely under both short-term and long-term stress conditions.

The Importance of Static and Fatigue Testing

Aircraft undergo a series of rigorous tests before they can be cleared for commercial use. Static testing evaluates the aircraft's ability to withstand maximum loads, while fatigue testing simulates the long-term stress the aircraft will encounter over its operational life. These tests are critical in determining whether the aircraft can safely handle both extreme and repetitive conditions.

Static Testing: Evaluating Structural Durability

In static testing, an aircraft's components are subjected to maximum loads that exceed what they would experience in normal operations. These loads can reach up to 150% of the design limit, simulating extreme situations such as emergency landings or severe turbulence. For example, in 2006, Airbus subjected the wings of the A380 to extreme static loads, causing significant bending that helped engineers assess the aircraft's ability to withstand such forces. Similarly, Boeing conducted static tests on its 777X, focusing on the aircraft's fuselage and how it reacts under intense pressure.These tests not only help identify potential weaknesses but also provide valuable data on the aircraft's safety margins. This information is crucial for ensuring that even in extreme scenarios, the aircraft's structural integrity remains intact.

Fatigue Testing: Simulating Long-Term Operational Stress

Fatigue testing is designed to replicate the long-term stress that an aircraft will endure over its service life. Aircraft structures are exposed to repeated loads during takeoff, landing, and turbulence, which can lead to the formation of microcracks that, if left unchecked, can compromise structural integrity. This testing compresses the aircraft's entire lifecycle into a shorter timeframe, allowing engineers to observe how materials degrade over time. The testing process often involves millions of load cycles over several months, simulating years of operational stress.Fatigue tests are particularly important for detecting early signs of wear and tear, enabling manufacturers to implement necessary design improvements before the aircraft enters service. These tests also help determine maintenance intervals and identify which components may need to be replaced or repaired during the aircraft's life.

Advances in Testing Technology

Modern testing technologies have significantly enhanced the accuracy and efficiency of both static and fatigue tests. Advanced sensor systems, such as strain gauges and data acquisition software, allow engineers to monitor load distribution and crack growth in real-time. These systems can detect even the smallest deformations in the aircraft structure, providing precise data that helps engineers make informed

decisions about the aircraft's design and safetyFor instance, electron microscopy is now commonly used in post-test analyses to examine microcracks that form during fatigue testing. This technology allows engineers to track crack growth and identify potential points of failure before they become critical. Additionally, innovations in finite element modeling (FEM) and digital twin technology have allowed for more extensive virtual testing before physical tests begin. These digital simulations can replicate real-world conditions and identify potential vulnerabilities in the aircraft's structure, reducing the need for expensive and time-consuming.

Boeing vs. Airbus: Different Approaches to Testing

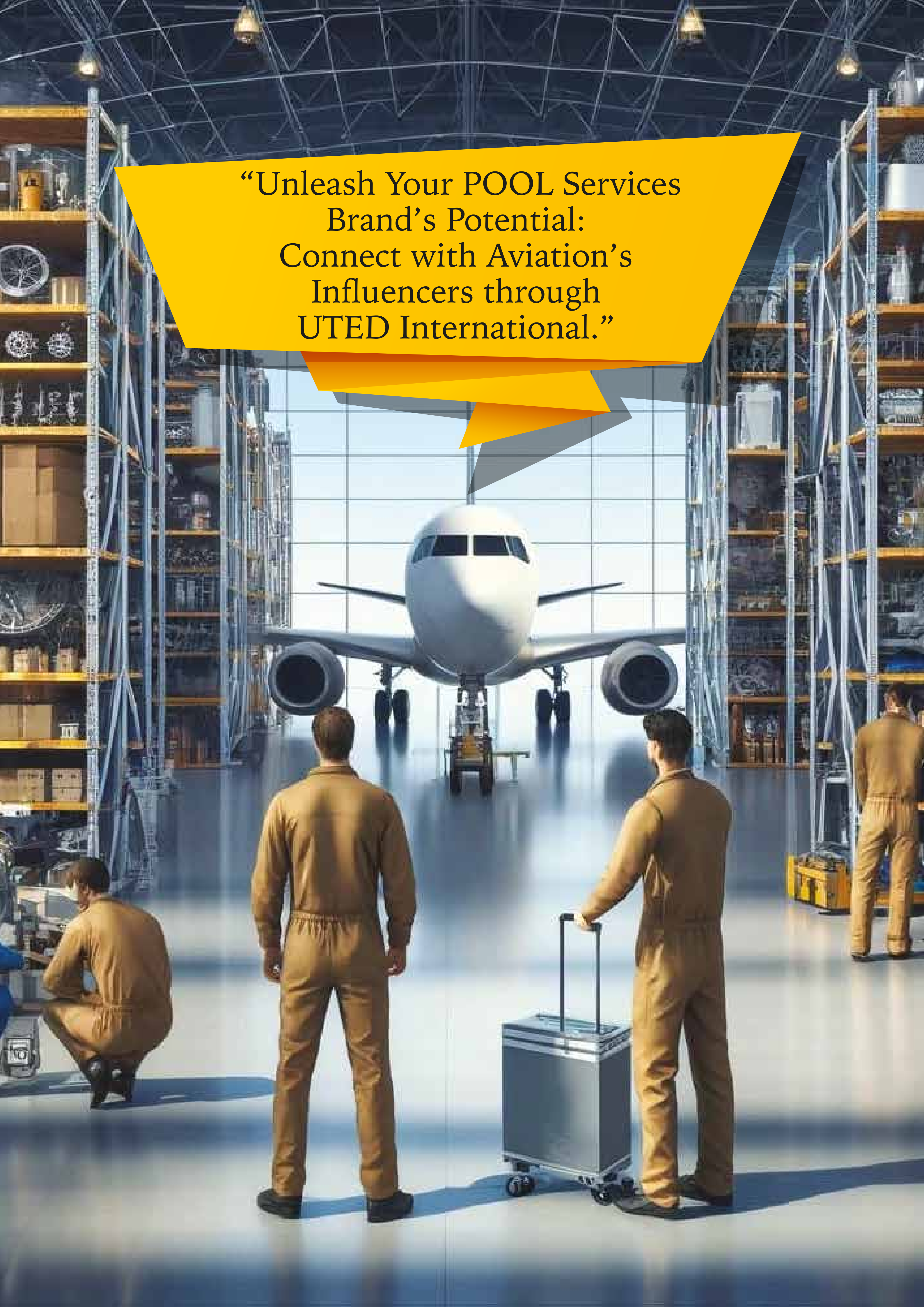
While both Boeing and Airbus use static and fatigue testing in their development processes, they often take different approaches in their broader strategies. Boeing, for example, has focused more on Sustainable Aviation Fuel (SAF) and digital testing technologies, integrating advanced simulations into their testing processes to reduce costs and time. On the other hand, Airbus has taken a more forward-looking approach, investing heavily in the development of hydrogen-powered aircraft as part of its zero-emissions goals.

Aircraft like the Boeing 787 Dreamliner, made with carbon fiber composites, have different fatigue behaviors compared to traditional aluminum structures. This requires unique testing approaches to account for the composite materials used. Similarly, Airbus A350 utilizes composite materials that are lighter and more durable, which can reduce maintenance needs but require specific fatigue testing tailored to these materials.

The Future of Aircraft Testing

As testing technologies continue to advance, the time and cost associated with testing new aircraft designs are expected to decrease. Innovations in simulation technology and the increasing use of digital twins will allow manufacturers to test more efficiently while maintaining high standards of safety and reliability. However, while virtual testing is becoming more prevalent, physical testing will remain an essential part of the aircraft certification process, as real-world conditions can often reveal issues that simulations might miss.

In conclusion, static and fatigue testing are indispensable components of aircraft development, ensuring that new designs meet the rigorous safety and performance standards required in the aviation industry. These tests not only protect passengers and crew but also contribute to the long-term sustainability of the aviation industry by improving aircraft durability and reducing maintenance costs. As technology continues to evolve, these testing methods will become even more integral to the future of aviation.


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

M.Berk GÜNEŞ
Pilot

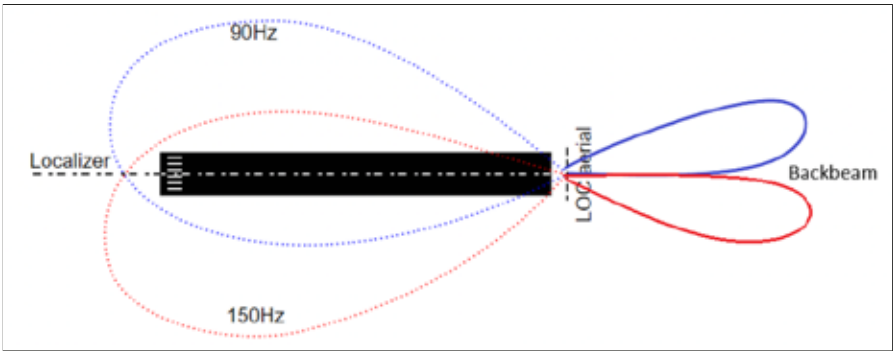
INSTRUMENT LANDING SYSTEM (ILS)

How can pilots safely land their aircraft on the runway behind the clouds or in the darkness of night? This is where the Instrument Landing System (ILS) comes into play. So, what is ILS, how does it work, and why is it so important in aviation? In this article, we will take a detailed look at the history and components of the ILS system.

The Instrument Landing System (ILS) is a precise navigation aid system that uses radio waves to provide vertical and horizontal guidance to pilots during the approach for landing. ILS testing began in 1929 in the United States, and Jimmy Doolittle became the first pilot to take off, fly, and land an aircraft using only instruments, without external visual references from the cockpit. In 1941, the United States Civil Aeronautics Board authorized the installation of the system at six locations. The first landing of a scheduled U.S. passenger aircraft using ILS occurred on January 26, 1938, when a Pennsylvania-Central Airlines Boeing 247-D flew from Washington D.C. to Pittsburgh during a snowstorm, relying solely on the ILS system. After World War II, with the establishment of the International Civil Aviation Organization (ICAO), ILS was accepted as a standard radio navigation system, compared to alternatives.

Now, let's talk about how this system works. The ILS consists of four main components. The first is the localizer (LOC), which provides azimuth guidance, while the glideslope (GS) indicates the correct vertical descent profile. The other systems are the marker beacons and the approach lighting system.

Localizer (LOC)
Localizer signals come from transmitter systems placed at the



end of the runway in the approach direction, operating within the frequency range of 108.10-111.95 MHz. It provides horizontal guidance to the aircraft, allowing pilots to align themselves with the runway.

Glideslope (GS)
The Glideslope is the part of the ILS that provides vertical guidance to the pilot. This signal is transmitted at a frequency between 329 and 335 MHz to ensure that the aircraft descends at the correct angle to the runway's threshold point. The Glideslope frequencies are paired with the localizer, meaning the pilot only needs to set a single frequency.

Marker Beacons
The Marker system is a radio navigation system used to determine the distance between the aircraft and the runway threshold. If the aircraft passes over a marker, this system provides the flight crew with audible signals in Morse code and colored visual alerts. These visual alerts are as follows:

- Outer Marker - Blue
- Middle Marker - Yellow
- Inner Marker - White signals.

Approach Lightning System
The approach lighting system allows the pilot to visually identify the runway environment for a safe transition from instrument flight to visual flight. It helps the pilot align the aircraft with the runway upon reaching a specified point during the approach.

Additionally, ILS systems are divided into different categories, each associated with different minimums:

CAT I
a. A decision height not lower than 60 meters (200 feet); and

b. A visibility of not less than 800 meters or a runway visual range of not less than 550 meters.

CAT II
a. A decision height lower than 60 meters (200 feet) but not lower than 30 meters (100 feet); and

b. A runway visual range of not less than 300 meters.

CAT IIIA
a. A decision height lower than 30 meters (100 feet) or no decision height; and

b. A runway visual range of not less than 175 meters.

CAT IIIB
a. a) A decision height lower than 15 meters (50 feet) or no decision height; and

b. b) A runway visual range lower than 175 meters but not less than 50 meters.

CAT IIIC
No decision height or runway visual range limitation.

In conclusion, ILS plays a critical role in all aspects of aviation, enhancing flight safety, optimizing airport operations, and providing accurate guidance to pilots. The ILS technology is an area open to innovation along with the ever-evolving aviation industry. The integration of advanced digital and satellite-based systems will further enhance the precision and reliability of ILS. When used in conjunction with alternative systems such as GNSS (Global Navigation Satellite System), the flexibility and efficiency of flight operations will increase.

Ersan YÜKSEL
Senior Avionics Engineer
Istinye University

A LEGENDARY MULTI- AIRCRAFT AVIATION ENGINE:
PRATT & WHITNEY R-4360 WASP MAJOR

Is the engine built to fit the aircraft or is the aircraft built to fit the existing engine? The high cost of engine design and manufacture means that aircraft are usually built to use commercially available aviation engines. The use of an engine type in a "wide variety and large number of aircraft" means that the engine type will be produced in large numbers. In turn, a large number of engines produced results in positive economies of scale, which means that the cost of the engine is lower than similar engines produced in small numbers.

Convair B-36 Peacemaker Strategic Heavy Bomber with six engines

Pratt & Whitney's R-4360 piston (internal combustion) engines were marvels of aeronautical engineering. They are considered the masterpieces of the piston engine era.

Called the Wasp Major, these engines had 28 cylinders, 71.5 litres of displacement and could produce max. 4300 horsepower each. The most powerful engine of its time, it was used on numerous aircraft platforms before being dethroned by turboprop and turbojet engines.

It is interesting to note that there were not only aircraft with a single R-4360 engine, but also aircraft with two R-4360 engines, four R-4360 engines, six R-4360 engines and even eight R-4360 engines.

Aircraft powered by the R-4360 engine included single-engine fighters, two- or four-engine bombers, passenger aircraft, transport aircraft, flying boats, four- or six-engine heavy bombers, and the record-breaking eight-engine Hughes H4 Hercules, also known as the Spruce Goose, built by the famous US tycoon Howard Hughes.

The first working example of the R-4360 engine, a marvel of engineering, was not completed until 1944, so it could not be used on aircraft used in the Second World War. On the other hand, this engine, which represented the pinnacle of piston engine technology, was produced in a total of 18697 units and became the power source of many aircraft used in the Cold War period following the Second World War.

I think it is a unique feeling to be the pilot of a single-engine, propeller-driven fighter with thousands of horsepower.

Boeing XF8B Fighter- Bomber

Developed by Boeing during the Second World War, the XF8B (Model 400) propeller plane used a newly developed R-4360 piston engine. It was designed as a multi-role fighter and bomber, capable of taking off and landing from US Navy aircraft carriers and operating over the Japanese islands, beyond the range of aircraft taking off from Japan's main air bases. The war in Japan ended much earlier than expected with the dropping of the atomic bombs, which prevented the XF8B, which could fly at 310 kilometres per hour over a distance of 4,500 kilometres, from going into mass production.

Boeing described the XF8B as a "five-in-one fighter" (fighter, interceptor, dive bomber, dive bomber, torpedo bomber or level bomber) and three prototypes were produced as demand for the aircraft disappeared with the end of the war.

Among the twin-engined aircraft using Pratt & Whitney's R-4360 Wasp Major giant piston engines, the Fairchild C-119 Flying Boxcar stands out with 1183 units produced.

In the US Armed Forces, the letter F in aircraft types generally indicates a fighter, the letter B indicates a bomber, and the letter C indicates a cargo transport. The C-119 Flying Boxcar was designed to carry cargo, personnel, wounded on stretchers and mechanical equipment, and to land cargo and troops by parachute. The C-119 made its maiden flight in November 1947 and more than 1,100 were built before production was discontinued in 1955.

The C-119 Flying Boxcar cargo aircraft

The C-119 Flying Boxcar was used by many countries. It took part in major operations, particularly during the Korean War. Even during the Vietnam War, this aircraft, modified with special equipment, was retired from the US Army in 1974, but remained in service with the Taiwanese Army until 1995.

A photograph taken in 1942 of the production lines of the Fort Worth, Texas plant of Consolidated, one of the largest aircraft manufacturers in the United States.

Instrument panel of the C-119 Flying Boxcar aircraft.

A very interesting twin-engined aircraft using the R-4360 engine was the Fairchild XC-120 Packplane Military Cargo aircraft. Instead of an internal cargo hold, this aircraft carried removable cargo pods that were mounted under the fuselage.

XC-120 Packplane Military Cargo aircraft shown with cargo capsule

It made its maiden flight in 1950, and although only one was built, it is unique in that it eliminated the need to load cargo onto the aircraft. In a sense, like today's ships or trailers carrying containers, this aircraft was designed to carry cargo capsules. The aircraft did not have to wait to unload its cargo. At the airport, the capsule was removed from the aircraft and replaced by a capsule loaded with cargo.

View of the XC-120 Packplane without the Cargo Capsule attached.

With a crew of five, including two pilots, a flight engineer and two loadmasters, the XC-120 Packplane transport aircraft had a take-off weight of 29 tonnes and could fly 3700 kilometres at a speed of 400 kilometres per hour.

Four-engine aircraft are among those in which the R-4360 engine is widely used. The Boeing C-97 Stratofreighter (Stratosphere Transport Aircraft) cargo platform, which first flew in 1944, has been used in various military applications as well as a civilian airliner for passenger transport.

Boeing C-97 Stratofreighter Cargo Aircraft

The Boeing C-97 Stratofreighter cargo aircraft gave rise to the KC-97 strategic tanker, the Boeing 377 Stratocruiser passenger aircraft and the Aero Spacelines Pregnant Guppy, Aero Spacelines Super Guppy and Aero Spacelines Mini Guppy bulky transport aircraft.

811 of KC-97 Strategic Tanker Aircraft were produced to refuel aircraft in the US Air Force fleet.

The Boeing 377 Stratocruiser passenger airliner could fly at an altitude of 32,000 feet at a speed of 500 kilometres per hour for a distance of 6800 kilometres. The aircraft was double-decker and could carry 114 passengers plus flight and cabin crew. The 4-person crew consisted of 2 pilots, 1 flight engineer and 1 navigator.

Boeing B377 Airliner in United Airlines livery.

Aero Spacelines Super Guppy in Airbus Skylink livery

The first airline to receive the aircraft was Pan Am, also known as Pan American. The B377, which offered comfortable long-haul flights for large numbers of passengers, was not in sufficient demand due to its high maintenance and operating costs and frequent breakdowns.

Aero Spacelines purchased Boeing 377 Stratocruiser airliners that had been decommissioned by airlines, made structural modifications to them and developed the Pregnant Guppy, Aero Spacelines Super Guppy and Aero Spacelines Mini Guppy Large Transport Aircraft, which are used to transport airframes and other bulky parts.

Airbus also used the Super Guppy Large Transport Aircraft, developed from the Boeing B377, when it started production.They had four of them in their cargo fleet. Airbus then produced a Large Volume Transport Aircraft from its own A300 model and named it the Beluga.

Airbus A300-600ST Beluga

One of the military aircraft using four R-4360 piston engines is the B-50 Super Fortress strategic bomber produced by Boeing.

Boeing B-50 Super Fortress strategic bomber

The B-50 Super Fortress aircraft, which made its first flight in 1947, was one of the favourite aircraft of the Cold War period. 370 of these aircraft, which were produced and remained in service with different versions until 1965, were also capable of carrying and launching atomic bombs.

The Douglas C-124 Globemaster 2 military heavy transport aircraft, powered by four R-4360 engines, was a major commercial success with 448 units produced. In service until 1974, the aircraft was used in many US military operations.

Douglas C-124 Globemaster 2 military heavy transport aircraft

Weighing 88 tonnes, the Douglas C-124 Globemaster 2 could take off at a speed of 370 kilometres per hour and fly 6500 kilometres. The 6-7 person crew consisted of a captain, pilot, navigator, flight engineer, radio operator and 2 or more loadmasters.

Another transport aircraft produced by Douglas with four R-4360 engines is the C-74 Globemaster military heavy transport aircraft, which made its first flight in 1945.

C-74 Globemaster military heavy transport aircraft

Although 14 of C-74 aircraft were produced, the last aircraft served until 1969. Douglas developed the C-124 heavy transport aircraft from the C-74 Globemaster aircraft.

There are also unusual aircraft that use four R-4360 piston engines. One is the YB-35 Flying Wing, built by Northrop, and the other is the JRM Mars Flying Boat, built by Martin.

Northrop YB-35 Flying Wing

The YB-35 Flying Wing was a heavy bomber that first flew in 1946. Although 14 of the aircraft were produced with a take-off weight of 95 tonnes, with the development of jet engines, the YB-49 jet-powered Flying Wing was developed from this aircraft type. Although 3 of the YB-49s were built and did not go into mass production, Northrop would use the experience gained from these aircraft years later to build the B-2 stealth bomber.

Martin JRM Mars aircraf Martin JRM Mars aircraft

The JRM Mars Flying Boat, manufactured by Martin, is another aircraft that uses four R-4360 piston engines.

Although not widely known in Türkiye, Flying Boats have played a major role in the current state of aviation. These aircraft, which can land on and take off from the sea and carry a large number of passengers or a large amount of cargo at a time, have operated for a long time, especially on overseas routes. With the Second World War, the construction of a large number of runways made the ability of these aircraft to land and take off from the sea no longer an advantage.

Seven Martin JRM Mars Flying Boats were produced, including the prototype, and although two of them crashed at an early age, they had a very long operational life.

The aircraft manufactured by Martin on order of the US Navy carried the names of the overseas territories of the USA. The aircraft, named Marianas Mars, Philippines Mars, Marshall Mars, Caroline Mars and Hawaii Mars, started to carry cargo to Hawaii and the Pacific islands at the beginning of 1944.

The Martin JRM Mars Flying Boats, powered by 4 Wasp Major engines of 3000 hp each, had a wingspan of 61 metres despite being 35 metres long. With a take-off weight of 75 tonnes, the aircraft could travel 8000 kilometres at a speed of 310 kilometres per hour.

On 4 March 1949, the Caroline Mars plane carried 269 people from San Diego to San Francisco, breaking the record for the largest number of passengers on a single flight. On 5 April 1950, the Marshall Mars plane was destroyed in a fire. The remaining four planes continued to carry record amounts of Navy cargo on the San Francisco-Honolulu route until 1956.

Martin JRM Mars aircraft

In 1959, when the planes were about to be scrapped, a Canadian company bought all four and converted them into firefighting aircraft. This was the beginning of the aircraft's second life.

After modifications, the planes were able to carry 27 tonnes of water in 22 seconds into the tanks in their fuselage and undertook very important missions in responding to large forest fires in Canada. Although two aircraft were lost over time, the Philippines Mars and Hawaii Mars

Martin JRM Hawaiian Mars Last Flight

aircraft were still actively involved in firefighting missions until 2015.

At the end of their long lives, the two legendary aircraft were given to aviation museums for display. It is interesting to note that in August 2024, the Hawaiian Mars aircraft flew under its own wings to the British Columbia Aviation Museum. The plane was eighty years old when it made its last flight in the company of the Canadian Air Force's Snowbird.

The R-4360 Major Wasp 28-cylinder piston engines were not only used by US aircraft manufacturers. The French SNCASE (Sud- Est) S.E.2010 Armagnac passenger plane, which made its maiden flight in 1949, also used four R-4360 piston engines.

French SNCASE (Sud- Est) S.E.2010 Armagnac passenger plane

With a cruising speed of 450 kilometres per hour, the S.E.2010 Armagnac aircraft had a capacity of 160 passengers and could fly a distance of 5120 kilometres. Nine were built.

The Convair B-36 Peacemaker was a giant strategic bomber using six R-4360 piston engines. Used to deliver nuclear weapons during the Cold War, 384 of these aircraft were produced.

Convair B-36 Peacemaker Strategic Heavy Bomber with six engines

With a wingspan of 70 metres, the Convair B-36 Peacemaker could fly up to 16000 kilometres unloaded and 6500 kilometres fully loaded. The threat of the Soviet Union motivated the production of large numbers of this giant aircraft.

The first and only aircraft to use eight of the R-4360 Major Wasp 28-cylinder piston engines was the huge H-4 Hercules Spruce Goose military transport flying boat, designed by the famous aviator and businessman Howard Hughes. Due to the difficulty in obtaining metal during the war, a composite material called Duramold,

Hughes H-4 Hercules Spruce Goose military transport flying boat

made by treating birch wood with epoxy, was used in the fuselage of the aircraft in the form of a flying boat.

The need for a huge Strategic Transport Flying Boat, capable of carrying 60 tonnes of cargo or a unit of 750 soldiers or 2 M4 Sherman tanks from the USA to Europe at a time, arose from German submarines attacking and sinking ships in the Atlantic.

The aircraft was nicknamed the Spruce Goose. In November 1947, only 1 prototype of the aircraft was produced, which made a very short flight. Due to the end of the 2nd World War, production could not go beyond the prototype stage as the need for the aircraft had disappeared.

This aircraft, which for many years held the record for widest wingspan, is currently on display at the Evergreen Aviation & Space Museum in McMinnville, Oregon, USA.

Cockpit of Hughes H-4 Hercules Spruce Goose military transport flying boat

FUTURE AVIATION EXPOS

Nusret ERCEYLAN, PhD
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Technical Training Manager

MANAGING SAFETY IN AVIATION ORGANIZATIONS

Ensuring flight safety is the top priority of all kinds of aviation organizations including operators, manufacturers, and maintenance organizations. Managing safety requires an organization-wide comprehensive systematic approach which includes identifying hazards, mitigating risks, and creating a positive safe culture adopted by the whole organization. As an effective decision-making tool, Safety Management System (SMS) provides this systematic, explicit, and comprehensive approach needed to maintain and sustain the highest level of safety in aviation organizations.

Traditional safety approach of aviation industry had been built upon the reactive analysis of past accidents and the introduction of corrective actions to prevent the recurrence of those events. With today's higher safety objectives and low accident rate, it is not possible to make further improvements to the level of safety by using this approach. Establishing the highest possible safety level in the most efficient manner requires the adoption of a management approach with every segment and level of an organization is part of a safety culture that promotes and practices risk reduction. Safety managing principles also need to be implemented that proactively addressing current hazards by using consistent and systematic approaches to make smarter, risk-based decisions.

International Civil Aviation Organization (ICAO) has significant role on safety enhancement efforts. ICAO manages over 12,000 global Standards and Recommended Practices (SARPs) across the 19 Annexes to the Chicago Convention. Annex 19 contains safety managing functions at the State level across multiple aviation domains. ICAO defines safety as "the state in which the possibility of harm to persons or property damage is reduced to, and maintained at or below, an acceptable level" and safety management as "to proactively mitigate safety risks before they result in aviation accidents and incidents". In Annex 19, ICAO provides a detailed guidance to establish a Safety Management System (SMS) which is an organization-wide comprehensive and preventive approach to managing safety. Basic SMS structure comprises of creating a safety policy, application of systematic methods for hazards identification and risk mitigation and encouraging organization to have a positive safety culture.

Safety Culture

Creating a positive safety culture within the organization is one of the first goals in safety management. Within the general organizational environment, the term 'culture' regard as the collection of beliefs,

attitudes, roles, norms and practices of a given group or the whole organization. The existing culture of an organization provides a corporate framework that provides guidance on issues like how work is done, specific ways to communicate to each other, how to use of technology and facilities that organization has, how they interact and how they behave and feel about new things. An ideal positive safety culture is an effective tool towards the goal of sustaining the maximum resistance towards its operational hazards, regardless of the leadership's personality or current commercial concerns. While culture in organizations refers to the array of systems of meaning through which given groups of people understand the organization's distinctive 'world', safety culture should be regarded as the specific set of beliefs, norms, attitudes, roles and technical aspects in the organization. While Safety culture is handled as a multi-dimensional construct in aviation, the main characteristics of safety culture are commitment, behavior, awareness, adaptability, information and justness.

Commitment: Aviation organization should totally have a positive attitude towards safety and be aware of the importance of it. Top management should absolutely commit to keeping desired level of safety and motivate all organization members to do so.

Behavior: Indicates safety commitment's realization on all levels of the organization. Top management recognizes the importance of safety and organization members do whatever needed to maintain desired safety level.

Awareness: Indicates whole organization is aware of the risks for its own for others implied by the organization's operations. All levels of the organization should always maintain a high degree of attention to safety issues.

Adaptability: It is very important for the aviation organizations that they have ability to adapting changes in safety issues. Both management and other members should be willing to learn from past experiences and are able to take whatever action is necessary to improve the safety level.

Information: Safety information should be distributed to all levels in the organization timely and effectively. All members should be encouraged to report safety issues and concerns. Safety information must be transmitted to the right personnel to avoid misconception that could lead to unsafe situations.

Justness: Indicates a safety culture that individuals are not blamed for their unintentional faults. A trust-based atmosphere is present and all individuals in organization are encouraged and rewarded for providing essential safety-related

information. Justness is indeed an indispensable component of safety culture.

Safety management focuses on a proactive approach and results in a safety culture that is so entrenched that there is a perception that safety is simply the best, most effective and profitable way to do business. ICAO notes that a good safety culture is made up of the following attributes:

- Senior management places a strong emphasis on safety
- All staff understands hazards within the workplace
- Senior management fosters a climate that encourages feedback
- Senior management's willingness to accept criticism and an openness to opposing views
- Emphasizing the importance of communicating relevant safety information
- Promotion of realistic and workable safety rules
- Ensuring staff are well educated and trained so that the consequences of unsafe acts are understood.

Managing Safety Risks
In organizational terminology, risks are basically defined as the possibility that the occurrence of an event will adversely affect the achievement of the organization's objectives. The risks can be seen as disruptions resulting from the unpredictability of the future caused by accidental derogation possibilities of planned targets. In terms of aviation sector, specific and constantly changing environmental conditions, high level technical information and skill need, and working with the high-cost equipment puts the risk management into the heart of the safety management activities. In this context, it is possible to identify the term "safety risk" as the continuance of a hazard in terms of a scenario that follows due to accepting the hazard. In this context, risk management can be seen a systematic process of identifying, analyzing and responding to projected risks. It includes maximizing the probability and consequences of positive events and minimizing the probability and consequences of adverse events to project objectives. ICAO defines the aviation safety risk management concept as "convey the notion that the management of safety does not aim directly at the management of financial risk, legal risk, economic risk and so forth, but restricts itself primarily to the management of safety risks". Aviation safety risk management is generally shaped in a five-step management process as follows.

Step 1-Identify the Risks: The most important stage in safety risk management since it effects the rest of the process. It includes determine the possible risks and deciding which of them effect the aviation safety.

Step 2-Analyze the Identified Risks: After risk identification process, a risk analysis should be done to minimizing the expected loss in case of risk realization. It involves estimating the likelihood and the consequences of each identified risk. Risk analysis is made either qualitative or quantitative methods.

Step 3-Risk Planning: It includes developing strategies and methods on how to deal with the assessed risks. Includes different mitigation scenarios, determining different risk levels, and sequencing of the risks.

Step 4-Track the Risks: Risk tracking consist of collecting, updating, compiling, organizing and analyzing risk data and reporting risk trends. Tracking process enables measuring to progress of the risk managing process.

Step 5-Risk Control/Mitigation: It includes the overall assessment of the process, results of the risk mitigation efforts and documentation for the future risk evaluations in lessons learned approach. This step reverts the safety risk management cycle.

Safety Management System
As indicated in the beginning, SMS is basically designed to take a systematic approach to aviation safety management, including shaping organizational structures, establishing management accountability, creating policies and procedures to reduce aviation accident rates to a tolerable level. SMS includes identifying hazards, collecting and analyzing information, estimating safety risk, and implementing mitigation strategies, on an ongoing and daily basis. In this respect, it is a continuous, never-ending process that aims to maintain and, if possible, improve safety levels that are in line with the strategic goals of the organization and that support key operational functions.

Safety management activities should follow a predetermined plan and are implemented consistently within the organization. To control the safety risks of the consequences of hazards, long termed plans should be developed and operated on a continuous basis. As a result of their systematic and strategic nature, SMS activities aim at gradual but continuous improvement. The systematic nature of the SMS also allows it to focus on processes rather than results. SMS should be designed and operated as an objective system and all safety management activities should be well documented. Safety management activities and, accordingly, the organization's safety management knowledge should be recorded in official documents that are accessible to everyone.

ICAO has divided the safety management system into four functional to ensure global standardization and applicability. However, countries have the freedom to make changes in the system specific to their needs. ICAO's key SMS components ("Four Pillars") can be summarized as follows.

Safety Policy: The first step in establishing an effective safety management system is to create the environment in which safety management can operate effectively, and this can only be possible by determining and implementing appropriate policies. The management commitment to safety, the creation of targets and supportive organizational structure, and the follow-up of the activities carried out are covered within the scope of this component. The created safety policy is designed in such a way as to ensure that the system and the safety phenomenon are clearly understood by all organizational members. Necessary documents, instructions and control forms are prepared in detail at each level, ensuring that the requirements are fully implemented.

Safety Promotion: Promotion of safety policy is needed to enable the whole organization fully understands and adopts the SMS policies, procedures, and structure. This pillar is achieved by establishing a culture of safety, training employees in safety principles and allowing open communication of safety issues. Creating a safety culture is at the center of the safety promotion. To achieve this objective, all employees should be trained in organization's safety principles, and their roles and responsibilities within the safety management framework. The trainings should be structured to enable two-way communication process that helps ensure that employees benefit from safety lessons learned, see the results of their actions, and continue to improve their understanding of the organization's SMS. Additionally, recurrent trainings should be implemented to keep employees up to date on any changes to SMS framework.

Key Elements of SMS

Safety Risk Management: Risk assessment within the SMS should be organized with a technical and scientific approach. Possible hazards should be identified according to the data from the past events, experiences, and predictions by using the data obtained. Therefore, today's modern hazard identification methods are usually structured on a combination base of reactive, proactive and predictive approaches. Possible sources of danger may be aircraft and system designs, human errors or organizational processes. Risk mitigating actions should be analyzed carefully to ensure that they address the root cause of the hazard. It may be beneficial to explore a range of mitigating strategies before choosing the preferred option, basing the decision upon factors such as timeliness, cost, organizational capabilities, and overall effectiveness.

Safety Assurance: The final component of SMS consists of the process and activities performed to determine whether the SMS is operating in accordance with expectations and requirements. Internal and external audits and following-up the corrective actions are the key elements of safety assurance pillar. An independent internal audit mechanism that directly reports to top (accountable) manager should be established that constantly monitors the activities of the organization, checks whether the existing policies, processes and procedures are followed and measures the effectiveness of the SMS. For oversighting organization, state aviation authorities may conduct external audits. All audits can be scheduled or unscheduled and they provide a means for ensuring compliance with SMS standards, policies, and processes.

As a conclusion, one should be underlined that besides the basic business processes such as financing, budgeting, communicating, allocating resources, managing safety has become one of the key managing tools for today's aviation organizations. SMS presents the aviation organizations with a systematic, data-driven approach to determining priorities and allocating the resources required to address safety concerns that hold the greatest risk potential. SMS also provides the means to address safety systemically and proactively through hazard analysis and risk assessment and mitigation. Although its function is extremely important for both human and organizations lives, SMS does not need to be a structured as a complicated system. Adopting and implementing the four key elements, top management's determination on safety processes, and creating a shared sense of safety responsibility within the overall organization will be enough to have an effective SMS that helps top management making the best possible safety related decisions. It should always be considered that no system is ever risk-free. There have been and is going to be certain risks inherent in every system and especially in aviation. Aviation organizations' managers should understand the importance of safety managing tools and use it effectively to achieve their safety goals.

TURKIYE'S FIRST FEMALE AVIATOR: BEDRİYE TAHİR GÖKMEN'S PLACE IN AVIATION HISTORY

Aviation history is filled with bold and innovative figures who have pushed the boundaries of what was thought possible. However, this history becomes even richer when it includes women who defied societal norms and paved the way for others. One such figure is Bedriye Tahir Gökmen, who became Türkiye's first female pilot and an aviation pioneer. Known as "Gökmen Bacı" (Sister Gökmen), Bedriye Tahir not only achieved remarkable success as a pilot but also became a symbol of Turkish women's fight for a more prominent role in society.

In the 1930s, Türkiye was undergoing significant transformations under Atatürk's reforms, with women gaining more opportunities in education and the workforce. However, the idea of a woman pursuing a career in aviation was considered radical at the time. Bedriye Tahir's determination to become a pilot and her achievements in this male-dominated field were both groundbreaking and inspirational. This article delves into Bedriye Tahir Gökmen's life, her achievements, the challenges she faced, and her lasting legacy in aviation history.

Early Life and Interest in Aviation

Bedriye Tahir was born in 1912 in Istanbul and grew up in an environment that valued education. Despite the limited educational opportunities for women in Türkiye at the time, she excelled academically, particularly in mathematics and the sciences. However, her real passion was aviation, a field that was just beginning to take flight in Türkiye.

She first became interested in aviation through the work of the Turkish Aeronautical Association (Türk Hava Kurumu), which was actively promoting civil aviation in Türkiye. The association was offering aviation courses to encourage interest in flying, and Bedriye Tahir was determined to be a part of it. Her ambition to become a pilot was a bold move, as aviation was seen as a dangerous and physically demanding profession, typically reserved for men.

In 1932, she enrolled in the Turkish Aeronautical Association's Civil Aviation School, marking the beginning of her journey into aviation. Despite the societal expectations of the time, Bedriye Tahir was resolute in her goal. Over the course of her education, she completed both theoretical and practical training, eventually earning her pilot's license in 1933. With this, she became Türkiye's first female civil aviator, a monumental achievement not just for herself, but for women across the nation.

Challenges and Obstacles in Her Aviation Career

Despite her successful completion of pilot training, Bedriye Tahir Gökmen faced numerous obstacles in her career. The 1930s in Türkiye were marked by significant societal resistance to women entering the workforce, particularly in fields like aviation, which were considered unsuitable for women. The deeply patriarchal structure of society placed immense barriers in her path.

One of the greatest challenges she faced was the inability to officially practice as a pilot despite her qualifications. Although she had completed her training and earned the title of pilot, there were no opportunities for women to fly professionally. The male-dominated aviation industry was reluctant to accept a woman in such a physically demanding and high-risk role.

Yet, despite these challenges, Bedriye Tahir remained committed to her passion for aviation. She never gave up on her dream and continued to advocate for women's involvement in the field. Her determination in the face of adversity made her a symbol of resilience, inspiring future generations of Turkish women to pursue their goals, regardless of societal limitations.

Defying Societal Norms and Advocating for Women's Rights

In a time when women were often confined to traditional roles, Bedriye Tahir Gökmen defied expectations and blazed a trail for others. Aviation was considered a dangerous and

demanding career, but she was undeterred. Her success in completing her pilot training and obtaining her license was a bold statement: women were just as capable as men in any profession.

Her pioneering work in aviation went beyond her personal accomplishments. She became a role model for women who wanted to break free from societal constraints and prove that they could succeed in male-dominated fields. Gökmen Bacı's determination to pursue her passion for flying was not just about becoming a pilot—it was about challenging the broader societal expectations of women and expanding their role in public life.

Her legacy is deeply intertwined with the progress of women's rights in Türkiye. By refusing to conform to the limitations placed on her, Bedriye Tahir opened the door for other women to dream big and pursue careers that were previously thought to be off-limits. In this sense, her contribution to Turkish society transcended aviation.

Contributions to Aviation and Legacy

Bedriye Tahir Gökmen's significance in Turkish aviation history goes beyond her title as the first female pilot.

Although her official flying career was brief due to societal constraints, her influence on Turkish aviation is undeniable. Through her involvement in the Turkish Aeronautical Association, she played a vital role in encouraging women to participate in aviation. Her efforts helped lay the groundwork for future generations of female aviators in Türkiye.

Her legacy lives on in the many Turkish women who have followed in her footsteps, carving out successful careers in both civil and military aviation. Today, numerous women in Türkiye hold positions as pilots, flight engineers, and air traffic controllers—roles that would have been unthinkable without the trail blazed by Gökmen Bacı.

Bedriye Tahir Gökmen's name is also honored in various ways, including aviation schools, events, and awards that commemorate her pioneering spirit. The Turkish Aeronautical Association regularly hosts ceremonies to remember her contributions, keeping her memory alive for future generations of aviators and reminding them of her courage and resilience.

Her story is not only one of personal triumph but also a testament to the broader struggle for gender equality in Türkiye. By refusing to let societal norms dictate her path, Bedriye Tahir Gökmen left an indelible mark on both Turkish aviation and women's rights.

Bedriye Tahir Gökmen's life and career were groundbreaking in many ways. She not only became Türkiye's first female pilot but also broke down barriers for women in aviation and beyond. Her courage and determination helped pave the way for future generations of women to pursue careers in fields previously considered off-limits. Today, her legacy continues to inspire women in Türkiye and around the world to follow their dreams, no matter the obstacles. In Turkish aviation history, her name will always stand as a symbol of resilience, courage, and pioneering spirit.

AVIATION HISTORY JULY, AUGUST, AND SEPTEMBER.

July 2, 1900: First flight of the Zeppelin LZ 1 in Germany by Ferdinand von Zeppelin.

July 9, 1951: The first jet-powered commercial passenger service was inaugurated by BOAC, flying a de Havilland Comet.

August 1, 1946: The U.S. Air Force (USAF) was officially established as a separate military branch.

July 25, 1909: Louis Blériot made the first flight across the English Channel.

July 20, 1969: Apollo 11's lunar landing, with Neil Armstrong and Buzz Aldrin walking on the moon.

August 8, 1910: Walter Brookins set a new altitude record flying a Wright airplane.

July 28, 1924: First successful around-the-world flight began by the U.S. Army Air Service.

July 17, 1989: First flight of the Northrop B-2 Spirit stealth bomber.

August 27, 1939: First flight of the Heinkel He 178, the world's first jet-powered aircraft.

July 6, 1936: Howard Hughes set a transcontinental speed record from Los Angeles to New York.

July 17, 1996: TWA Flight 800 exploded over the Atlantic, killing all 230 aboard.

August 6, 1945: The Boeing B-29 Enola Gay dropped the atomic bomb on Hiroshima.

July 14, 1938: Howard Hughes completed a record-breaking around-the-world flight in 91 hours.

July 17, 2014: Malaysia Airlines Flight 17 was shot down over Ukraine.

August 23, 1979: The Double Eagle II completed the first non-stop balloon flight across the Atlantic.

August 1, 1981: Launch of MTV by an aircraft-inspired video, "Video Killed the Radio Star," reflecting pop culture's aviation influence.

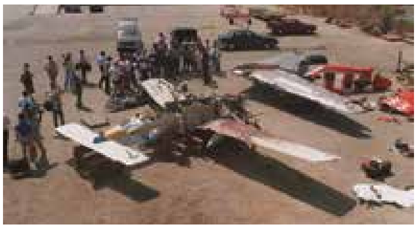
September 4, 1957: The Boeing B-52 Stratofortress made its first operational flight.

September 11, 2001: Four planes were hijacked in the 9/11 terrorist attacks, reshaping aviation security worldwide.

August 12, 1985: Japan Airlines Flight 123 crashed, resulting in the deadliest single-aircraft accident in history.

September 9, 1944: First V-2 rocket launched at London, marking the start of long-range missile warfare.

September 28, 1994: Airbus A330 entered service with Air Inter.



August 31, 1986: Aeroméxico Flight 498 collided mid-air with a small aircraft over Los Angeles, killing 82.

September 24, 1929: Jimmy Doolittle performed the first instrument-only flight (blind flying).

August 31, 1986: Aeroméxico Flight 498 collided mid-air with a small aircraft over Los Angeles, killing 82

August 10, 1990: The first flight of the McDonnell Douglas C-17 Globemaster III, a large military transport aircraft.

September 1, 1939: The start of World War II, heavily impacting military aviation developments.

August 10, 1990: The first flight of the McDonnell Douglas C-17 Globemaster III, a large military transport aircraft.

August 22, 1995: Atlantic Southeast Airlines Flight 529 crashed after an engine failure, killing 9 people.

September 9, 1967: The Boeing 737 made its first commercial flight, becoming a highly successful aircraft model.

September 5, 1918: The first scheduled air mail service in the United States began between New York and Chicago.

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