SINGAPORE UNIVERSITY OF TECHNOLOGY AND DESIGN

8 May – 9 July 2021

TOPICAL REPORT

AVIATION

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AIR TRAFFIC MANAGEMENT

The Connected Aircraft: An Agent Of Change

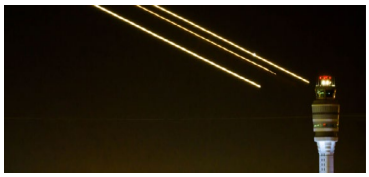
"Soon, drones will deliver packages to our doorsteps. Air taxis will deliver CEOs to meetings across town. And commercially operated rockets will regularly transit the airspace on their way to space. Adding to this complexity, different organizations will be responsible for the flight of different types of airspace users.
Safely enabling this complex array of operations—from the Earth's surface to space—will require a fully interconnected system. MITRE is working with the Federal Aviation Administration (FAA) to make that vision a reality, starting with the "connected aircraft."
Source: Mitre

AVIATION INDUSTRY

What's Trending in Aerospace – July 4, 2021

"Check out the July 4 edition of What's Trending in Aerospace, where editors and contributors for Avionics International bring you some of the latest headlines and updates

AIR TRAFFIC MANAGEMENT



On Jamming Attacks in Crowdsourced Air Traffic Surveillance

"Wireless jamming has been a long-standing issue both in critical infrastructure research and real-world applications, with particular importance in systems that deal with long communication distances and low received signal strength. Air traffic control is one such system, experiencing a rising number of reports of outside interference with the underlying wireless technologies. In this article, we discuss the particular issue of malicious wireless jamming on crowdsourced networks of low-cost ADS–B receivers, which increasingly support modern air traffic management. Using both simulation and laboratory trials, we first show the practical impact of reduced reception and coverage of typical receivers in a crowdsourced sensor network. Following this, we investigate network-wide countermeasures based on redundant coverage, which can defend at most 50.74% of the evaluated real-world network. To improve jamming resilience in nonredundant areas, we analyze and implement a low-cost multichannel receiver and show that it can effectively recover up to 50% of the messages even under heavy jamming conditions."

ANALYSIS

MITRE Air Traffic Update: Future Flight Schedules, Revisited

"Have Published Airline Schedules Stabilized Since Last Year?
In November of 2020, even as the number of travelers remained well below normal levels due to the ongoing pandemic, airlines published planned (and optimistic) departure schedules several months in advance. However, as the departure dates got closer, airlines would revise those schedules downwards, presumably based on actual passenger bookings. Thus, it appears that airline schedules published months in advance were less a projection of future demand, and more of an "opening bid" by the airlines, who knew it was easier to trim flights from their schedule than to add them afterwards. Much has changed in the last 6 to 8 months, however, and more people in the U.S. are starting to fly again."
Source: Mitre

EVALUATING SAFETY MANAGEMENT EFFECTIVENESS

"Today, much attention is given to auditing for compliance to applicable SMS minimum requirements, which is necessary to ensure completeness of implementation. However, subsequent evaluations are also

happening across the global aerospace industry."
Source: Aviation Today

IATA's forecast for recovery in global air travel by 2023 is 'about the right timeframe': Scoot CEO

"The International Air Transport Association's (IATA) forecast for global air travel to return to pre-pandemic levels by around end-2023 is "about the right timeframe", said the chief executive of budget carrier Scoot on Monday (Jun 28).
Mr Campbell Wilson was asked by reporters at a virtual press conference for his prognosis of the hard-hit aviation industry and he replied that he "won't choose to second guess" projections by the global industry body.
In a report last month, IATA said passenger numbers would recover to 88 per cent of pre-pandemic levels next year and surpass pre-pandemic levels by 5 per cent in 2023."
Source: Channel News Asia

AEROSPACE ENGINEERING

Shape-memory alloys might help airplanes land without a peep

"Researchers at Texas A&M University have conducted a computational study that validates using a shape-memory alloy to reduce the unpleasant plane noise produced during landing. They noted that these materials could be inserted as passive, seamless fillers within airplane wings that automatically deploy themselves into the perfect position during descent.
The researchers have described their findings in the Journal of Aircraft."
Source: Texas A&M University

Is the aviation sector ready for another supersonic age?

"Somewhere between starting fires and flinging electric cars into space, human beings became disconnected from technology. Progress, long contingent on people doing things, was pushed across some invisible psychic line to become its own force.
Moore's Law is not an industry insider's term – it's a capitalist philosophy. Every year, tech brands release shinier, newer, and nebulously 'better' versions of the dusty, scuffed and concretely 'worse' things we bought last year, because this is what technology does."
Source: IEEE Xplore

Enhanced Controller Working Position for Integrating Spaceflight into Air Traffic Management

"Commercial space transportation is raising the number of space activities and space vehicles are increasingly traversing the civil airspace. During such activities, aircraft need to be protected from possible non-nominal events, particularly from those generating debris. To respond effectively to malfunctions operators and air navigation service provider (ANSP) need to collaborate and exchange operational data. In the data exchange project (DEP) the German Aerospace Center (DLR) cooperates with the Federal Aviation Administration (FAA) to demonstrate such a data exchange. Based on the data exchange, DLR has developed a concept to visualize information at the controller working position (CWP). This enables the controller to initiate appropriate measures to protect aircraft from falling debris. The concept was implemented and evaluated at DLR's Air Traffic Validation Center. The goal was to identify, if the information presented is the information required by controllers to manage the situation."
Source: Springer Link

ENGINEERING

Interior Sound Levels in General Aviation Aircraft

"This study looked at two specific and common general aviation airplanes: the Cessna 172S model, which is a four-passenger, single-engine aircraft, and the Piper Seminole, which is a four-passenger, multi-engine aircraft with wing-mounted engines. Many people across the country utilize these two types of aircraft on a daily basis both for pleasure and to earn a living. The main difference between people who may use the aircraft for pleasure instead of business (such as a flight instructor) is the different duration of exposure to the ambient sounds. The flight instructor may conduct up to five training flights in one day, whereas the average student or recreational aviator will utilize the aircraft at a much lower rate, usually about two to three times per week or less."
Source: Occupational Health & Safety

necessary to ensure that the SMS is performing effectively, is adequately protecting the organization from unacceptable risk, is effective in practice, and that the safety culture it fosters permeates throughout the entire organization as a part of everyday operations. This paper describes the need to evaluate safety management effectiveness, the benefits possible, and the use of best practices for making improvements."
Source: Mitre

ZERO TRUST ARCHITECTURES: ARE WE THERE YET?

"The movement towards Zero Trust Architectures (ZTA) aligns with cybersecurity modernization strategies and practices to deter and defend against dynamic threats both inside and outside traditional enterprise perimeters. The "Executive Order on Improving the Nation's Cybersecurity" released from President Biden on May 12, 2021 directs executive agencies to "develop a plan to implement Zero Trust Architecture." The implementation of ZTA requires the integration of existing and new capabilities, as well as buy-in across the enterprise. Successful implementations will require multi-year planning that includes determination of drivers and use cases, policy development, architecture development, technology readiness assessment, pilots, user training, and phasing of deployments. This ZTA Tech Watcher report provides background, applicability and benefits to organizations, outstanding challenges and issues, and recommendations."
Source: Mitre

Air Passenger Market Analysis

"• Passenger traffic continued to recover in May with the support of domestic travel. However, industry-wide revenue passenger-kilometres (RPKs) were 62.7% lower compared to the pre-pandemic level (May 2019) since tight travel restrictions delayed the revival of international travel.
• Industry-wide seasonally adjusted available seat-kilometres were stable in May while load factors improved with the strength in domestic travel demand.
• The strength of the global economic recovery and rebound in bookings in June raise some optimism for summer recovery. However, increased concerns about new covid waves with the emergence of new variants put the expected rebound in travel in the second half of 2021 at risk."
Source: IATA

POST COVID?

Source: Engineering & Technology

Additive Manufacturing Gains Altitude as Technology Matures

"Additive manufacturing continues to proliferate across the aerospace sector as leading OEMs and their suppliers find new ways of tapping the flexibility—as well as cost and weight savings—that the approach can deliver. Increasingly, the techniques, which in some cases entails 3D printing where objects are made by building layers from either metal powder or composite materials, have become more competitive with castings for smaller parts. As the technology matures, including for both materials and machines, manufacturers will increasingly apply it to making larger components and structures too."
Source: Aviation International News

PRIVATE AVIATION

Private Aviation Boom Likely To Linger

"The current post-Covid surge in private aviation likely will persist, according to the results of a just-released survey conducted by industry buyers guide Private Jet Card Comparisons. According to the findings, 69 percent of private aviation users expect to use private aviation more now than they did pre-Covid, while 28 percent expected the same amount of use."
Source: Aviation International News

An aviation firm is giving travelers a taste of the high life by offering private-jet flights for as low as $450. Meet Set Jet.

"One company is bridging the price gap between flying first class and flying private, opening up the glitzy side of aviation to those who have been traditionally priced out.
Set Jet is a membership-based private airline offering seats on a private jet for as low as $500 one way. Members pay a monthly fee of $100 and are given access to flights on 11 year-round routes throughout the American West."
Source: Yahoo! News

ELECTRIC AIR TAXIS

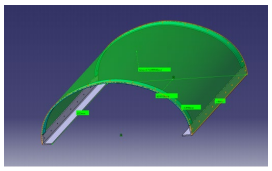
The Construction of Integrated Product Development Framework in Aviation Manufacturing Enterprise

"One of the sustainable competitive advantages of enterprises is to have a superior product development process. Product and Cycle-time Excellence (PACE) is an effective method for product development based on process. Based on PACE and Portfolio Management (PM), the Integrated Product Development (IPD) system of Guidance, Navigation and Control (GNC) products is investigated and implemented, which involves the integration of management elements such as decision, organization, process, strategy, development tools, technology management and pipeline management. The IT environment is also constructed to support each management element. The whole system will consistently identify the best product opportunities, effectively control the product development process, and brings new products to market faster."
Source: Springer Link

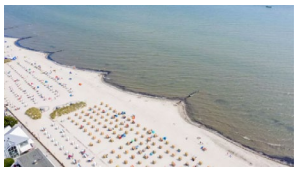
Developing an Approach for Fault Detection and Diagnosis of Angular Velocity Sensors

"Angular velocity sensor detection and diagnosis become increasingly essential for the improvement of reliability, safety, and efficiency of the control system on aircraft. The classical methods for fault detection and diagnosis are limit or trend checking of some measurable output variables. Due to they do not give a deeper insight and usually do not allow a fault diagnosis, model-based methods of fault detection and diagnosis were developed by using input and output signals and applying dynamic process models. These approaches are based on parameter estimation, parity equations, or state observers. This paper presents an improvement method to build algorithm fault diagnosis for angular velocity sensors on aircraft. Based on proposed method, results of paper can be used in designed intelligent systems that can automatically fault detection on aircraft."
Source: International Journal of Aviation Science and Technology

COMPOSITE STRUCTURES



A comparative study evaluating the hybrid



European aviation. International travel restrictions ease; more needed

"The prospects for the third quarter, the most important for European airline revenue, look better in 2021 than in 2020. Forward bookings are up and 3Q2021 seat numbers are planned at 70% of 3Q2019, compared with 3Q2020 at 39%.
Europe's capacity recovery continues in the week commencing 12-Jul-2021, but is not yet at the 70% of 2019 scheduled for 3Q. Seat numbers are 40.7% below the equivalent week of 2019, after -42.7% last week. This is above 50% of pre-pandemic levels for a third successive week.
After eight months as the worst performing region on this measure, Europe has now had three weeks above the Middle East, where seat capacity is down by 45.4% versus 2019. This week (week commencing 12-Jul-2021), Asia Pacific is down by 38.7%, Africa by 38.1%, Latin America by 30.3%, and North America by 23.9%.
The further relaxation of international travel restrictions will determine the pace of the recovery as 3Q2021 unfolds. There has been recent progress, both in the EU and the UK, but more is needed to restore international travel in full."
Source: CAPA

Allianz: 9 trends to watch as aviation readies for post Covid-19 takeoff

"The sudden halt imposed on the aviation industry by the Covid-19 crisis hit the sector hard. In April 2020, two-thirds of the global commercial aviation fleet sat idle on the tarmac, while passenger traffic was down 90% year-on-year. Today, the aviation industry is slowly rebounding, led by domestic travel. As more aircraft return to the skies, a new report from aviation insurer Allianz Global Corporate & Specialty (AGCS) highlights some of the unique challenges airlines and airports face as they restart operations – ranging from "rusty" pilots to insect infestations. It also identifies a number of ways in which Covid-19 is reshaping the sector, driving long-term changes in fleet composition, flight routes and passenger demand."
Source: Allianz Global Corporate & Specialty

SUSTAINABLE AVIATION

Will Electric Air Taxis Fly Themselves?

"As electric air taxi vehicle developers progress towards certification and deployment the industry is starting to ask itself who will pilot these aircraft. Many companies are choosing to design piloted aircraft while others like Wisk and EHang are developing autonomous aircraft.

During a July 1 panel discussion during Revolution.Aero's Global 2021 Virtual Event, industry experts discussed the path to autonomous flight and the obstacles it must still surpass to become a reality."

Source: Aviation Today

Flying Taxi Startup Whisper Aero Aims to Keep Noise Levels Down

"Endless encounters with swarms of bees.

This is the cacophonous scenario that we might be rushing towards as investors pour heroic amounts of money into companies developing ever better drones and their bigger cousins, vertical take-off and landing passenger vehicles. Because, while the underlying technology behind these machines has improved at impressive speed, the simple fact remains that, big or small, these aircraft produce a lot of noise and not much has been done to curb it. If a drone has ruined your peaceful day at the beach, imagine your nerves with 10,000 flying taxis overhead.

A startup called Whisper Aero, which is disclosing its plans for the first time, thinks it may be well on its way to solving this noise problem."

Source: Bloomberg

DATA SCIENCE

SPURRING GLOBAL AVIATION SAFETY AND EFFICIENCY GAINS THROUGH DATA EXPLORATION

"Data—a lot of it—is the key to unlocking aviation safety and efficiency gains wherever aircraft fly. At MITRE, we've tapped into the power of data with a capability that's delivering decision-support insights to aviation authorities at home and abroad."

Source: Mitre

composite-metal aviation structure

"The main purpose of this paper is to develop some numerical experiences based on mechanical tests performed on a hybrid composite metal aeronautical structure using finite element commercial codes (here NASTRAN). The results of the numerical simulations are consistent with the laboratory tests and encourage us to continue to improve the models using NASTRAN capabilities to obtain a realistic simulation of aeronautical structures made of such composites, taking into account their special properties."

Source: INCAS

Achievement of forging without canning for β-solidifying γ-TiAl alloy containing high content of niobium

"The processes of forging without canning were optimized, such that forging could be successfully performed and forged pancakes without cracks could be obtained. The maximum height reduction could reach 80%. The as-forged microstructure consisted of γ and β/B2 phases. The volume fraction of the β/B2 phase rose slightly compared to the pre-forging state. Near the top or bottom of the pancake, residual lamellae were found, while full dynamic recrystallization was completed at the center and lateral parts. Equiaxed γ grains illustrated that dynamic recrystallization mainly occurred in the γ phase, while the softer β phase coordinated the deformation by adjusting morphology. Two types of Σ3 boundaries, [110] 70° and [111] 60°, were found in the γ phase. At room temperature, the fracture was brittle, and the elongation was 0.07%. With increasing temperature, the yield strength and ultimate strength decreased, while the elongation increased. The brittle–ductile transition temperature was between 800°C and 850°C."

Source: Taylor & Francis

A New Method of Testing the Dynamic Deformation of Metals

"This paper presents the characteristics of a modernized rotary hammer equipped with a new measuring system based on strain gauges for recording short-term signals. The stand makes it possible to carry out dynamic tensile and bending tests in the range of linear speed of the exciting element from 5 to 40 m/s. Initial tests of dynamic deformation and structural studies in

Aviation Environmental Sustainability Case Study 2021 -

"This case study looks at the impact environmental sustainability is having on the aviation industry and assesses the impact across airlines, airports and aerospace players. It then takes an in-depth look consumer attitudes towards environmental sustainability, the industry's impact on the environment, innovations, industry scorecards, and recommendations."

Source: Yahoo! Finance

The New Era of Aviation Safety: Cognitive Science

"The human brain is an impressive and complex sorting machine. It receives 11 million bits of information per second but processes only about 40 bits per second. This means that 99.99 percent of the information we receive, we cannot process consciously.

To catalog incoming data more quickly, part of the brain makes mental models and forms shortcuts, some of which enact cognitive biases. These biases were important for our evolution in moments of time-pressured decision-making: house cat or saber tooth tiger, friend or foe. We'll think about this functionality as our primitive brain."

Source: Aviation International News

SUSTAINABLE AVIATION

The future of flying is closer than ever. Sustainable fuel is the key

"The use of sustainable aviation fuel (SAF) - fuel either made from biogenic feedstocks such as waste cooking oil, agricultural residues and municipal waste, or through next generation SAF technologies such as power-to-liquid from recycled CO2 and carbon-capture technologies - will play an indispensable part in achieving this transition.

SAF is especially relevant for addressing carbon emissions from long-haul flights and has the distinct financial advantage of not requiring any major new equipment or infrastructure investment, since it can be blended with conventional jet fuel. Given the long lead time for new propulsion technologies like hydrogen and electric to come to market, SAF is a way to make substantial progress on net zero immediately, for both long and short haul aviation."

Source: World Economic Forum

Aviation accounts for 2.4% of emissions. Could a different type of fuel help?

"While aviation accounts for 2.4% of all emissions from fossil fuel use globally, two-thirds of the sector's warming effect depends on something other than its CO_2 emissions. And one of the most significant ways aviation contributes to global warming is through the clouds aeroplanes create in the upper atmosphere.

But, in a new study, researchers have shown that alternative fuels to the

the form of fractures carried out on a representative group of metallic materials allowed determining the correlation "strain rate–strain structure". The proposed new methodology of dynamic materials testing is an original achievement of the authors and may be an effective tool for assessing the properties of construction materials under conditions of dynamic deformation. In practice, the test results can be used to design the structures of energy-consuming elements of vehicles and aircraft load-bearing elements subjected to dynamic loads. Having an extensive database of results from dynamic tests will allow verifying the correctness of calculations of the structure with the use of the finite element method."

Source: MDPI

Statistical Comparison of the Strength Properties of Titanium Alloys for Aviation Gas Turbine Engines

"The temperature dependences of the strength properties of forgings made of pseudo-α and α + β titanium alloys intended for the production of aviation gas turbine engines are statistically studied. The ultimate tensile strengths of various are compared using cluster analysis, which allowed us to distinguish four groups of alloys with approximately the same strength reduction intensity in the temperature range 20–600°C. The results obtained are used to develop polynomial models to estimate the typical values of ultimate tensile strength of stamped forgings (after standard annealing) as a function of the test temperature. Models are proposed to predict the ultimate tensile strength at various operating temperatures if the room-temperature ultimate tensile strength of an annealed semifinished product is known."

Source: SpringerLink

Exploring the possibilities of FDM filaments comprising natural fiber-reinforced biocomposites for additive manufacturing

"In recent years, with the recent advancements in the field of additive manufacturing, the use of biobased thermoplastic polymers and their natural fiber-reinforced biocomposite filaments have been rapidly emerging. Compared to their oil-based counterparts, they provide several advantages with their low carbon footprints, ease of reusability and recyclability and abundancy, and comparable price ranges. In consideration of their increasing

kerosene that aeroplanes typically burn can help."
Source: World Economic Forum

Draft shows EU to propose aviation fuel tax in green policy push

"The European Commission has drafted plans to set an EU-wide minimum tax rate for polluting aviation fuels, as it seeks to meet more ambitious targets to fight climate change, a document seen by Reuters shows.
The European Commission is drafting an overhaul of EU energy taxation, as part of a package of measures it will propose on July 14, to meet a target to reduce EU greenhouse gas emissions by 55% by 2030, from 1990 levels.
A draft of the Commission's tax proposal takes aim at aviation, which escapes EU fuel taxes."
Source: Reuters

New university institute focused on aviation's sustainable future

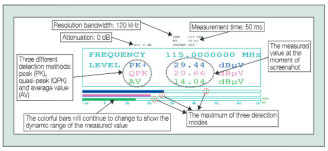
"A brand new institute at the University of Waterloo will harness the power of academia to address social, environmental, and economic challenges threatening the sustainability of aviation and aerospace.
The Waterloo Institute for Sustainable Aeronautics (WISA) – officially approved by the university Senate on June 21 – will serve as a portal for industry stakeholders to access the university's extensive knowledge network. The new organization will be led by Dr. Suzanne Kearns, associate professor of aviation at the University of Waterloo in the Faculty of Environment."
Source: Skies Magagine

How it works: An electric fix for aviation's air pollution problem

"Land vehicles' contribution to degrading air quality and climate change has been the talk of the town. However, a study led by a team at Massachusetts Institute of Technology (MIT) found that "aviation emissions are an increasingly significant contributor to anthropogenic climate change".
Upon reaching cruise altitude, aeroplanes spew out steady streams of oxides into the atmosphere. The suspended oxides, mostly nitrogen, linger long enough to spark new chemical reactions with atmospheric oxygen, producing ozone and fine particulate matter. Such highly reactive and toxic nitrogen oxides (NOx) are known to cause asthma, decreased lung function and cardiovascular disorders."
Source: Engineering & Technology

usage, the present study focused on the
development and analysis of biocomposite material blends and filaments by merging state-of-the-art manufacturing and material technologies. A thorough suitability study for fused deposition modeling (FDM), which is used to manufacture samples by depositing the melt layer-by-layer, was carried out."
Source: AIMS Material Science

AVIATION NAVIGATION



For More Reliable Aviation Navigation: Improving the Existing Assessment of Airport Electromagnetic Environment

"High-speed trains close to airports emit electromagnetic radiation (EMR), which might interfere with the airport communication and navigation signals and create a safety hazard for the aircraft operation. Therefore, it is necessary to measure and evaluate the electromagnetic environment when building high-speed railway near the airport. In this paper, a new influence factor, train speed, is considered in the existing airport electromagnetic environment assessment system to make the evaluation result more reliable and real. We highlight the principles and results of the influence of train speed on the EMR from the high-speed train. Then, we present the corresponding train speed limit to mitigate the electromagnetic interference (EMI) of the nearby navigation station."
Source: IEEE Xplore

ELECTRIC AIRCRAFT

Design of a Four-Seat, General Aviation Electric Aircraft

Page 139- 168
"Financial and environmental considerations continue to encourage aircraft manufacturers to consider alternate forms of aircraft propulsion. On the financial end, it is the continued rise in aviation fuel prices, as a result of an increasing demand for air travel, and the depletion of fossil fuel resources; on the environmental end, it is concerns related to air pollution and global warming. New aircraft designs are being proposed using electrical and

Collaboration is key in making aviation truly sustainable

"Within the aviation industry, biofuels, efficiency and sustainability issues are being discussed more and more. Leaders, academics, industry professionals and organisations that are shaping the future of aviation are constantly evaluating these issues and planning various roadmaps. Air transport's commitment is to reduce emissions to 325 million tonnes of CO2 by 2050 – correspondingly to around half of the carbon emissions that were measured in 2005. Of course, this is an approximate calculation based on the average number of passengers. It is estimated that aviation's annual growth will continue at an average of three per cent, if we do not take the impact of COVID-19 as a basis."
Source: International Airport Review

PODCASTS

Top 10 aviation podcasts to tune in to

"Listening to the experiences of others, in any field, is a great way to expand your knowledge. While some of us have more time on our hands as we muscle through this pandemic, a great way to feed the fire and continue to keep ourselves in tune with our greatest passion is by listening to aviation podcasts.
Skies put together a list of aviation podcasts, in no particular order, to keep your pilot brain in check as the aviation industry slowly begins its come back."
Source: Skies Magazine

hybrid propulsion systems, as a way of tackling both the financial and environmental challenges associated with the continued use of fossil fuels. While battery capabilities are evolving rapidly, the current state-of-the-art offers an energy density of ~ 250 Wh/kg. This is sufficient for small, general aviation electric airplanes, with a modest range no more than 200 km. This paper explores the possibility of a medium range (750 km) electric, four-seat, FAR-23 certifiable general aviation aircraft, assuming an energy density of 1500 Wh/kg, projected to be available in 2025. It presents the conceptual and preliminary design of such an aircraft, which includes weight and performance sizing, fuselage design, wing and high-lift system design, empennage design, landing gear design, weight and balance, stability and control analysis, drag polar estimation, environmental impact and final specifications. The results indicate that such an aircraft is indeed feasible, promising greener general aviation fleets around the world."
Source: Athens Journal of Technology and Engineering

Influence of Novel Airframe Technologies on the Feasibility of Fully-Electric Regional Aviation

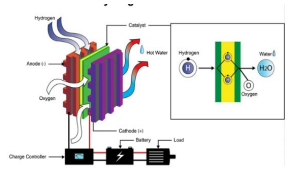
"The feasibility of regional electric aviation to reduce environmental impact highly depends on technological advancements of energy storage techniques, available battery energy density, and high-power electric motor technologies. However, novel airframe technologies also strongly affect the feasibility of a regional electric aircraft. In this paper, the influence of novel technologies on the feasibility of regional electric aviation was investigated. Three game-changing technologies were applied to a novel all-electric regional aircraft: active flow control, active load alleviation, and novel materials and structure concepts. Initial conceptual design and mission analysis of the aircraft was performed using the aircraft design framework SUAVE, and the sensitivity of the most important technologies on the aircraft characteristics and performance were studied. Obtained results were compared against a reference ATR-72 aircraft."
Source: MDPI

Challenges of High Power Machine and Drives for Turbo-Electric Aircraft and a Case Study

"The global aviation industry emitted 781 million tons of CO2 in 2015 [1], a

number which is expected to rise as air travel grows rapidly in emerging markets. Without the intervention of new policies, global aircraft emissions are projected to triple by 2050 [2]. NASA's Advanced Air Transport Technology Project (AATT) has defined ambitious goals for the next three generations of aircraft for commercial aviation to ensure the industry is sustainable [3]. Table 1 outlines the main targets for the different timeframes, with technologies attaining a technology readiness level (TRL) of 4-6"
Source: IEEE Xplore

SUSTAINABLE AVIATION



Analysis of Aviation Pollution in the Selected Regions of the World

"The focus of this paper is to find out the impact made by aircraft on the environment of Europe. In this paper, we will focus on how far aircraft are influencing and contaminating the environment. The paper cover-up the various case studies conducted by different authors to estimate the impact by various universal indicators and to ascertain the level of the impact made by the particular factors on the environment and comparing the EU facts and figures with that of policies put forward by the various governments which are U.S and Australia. Paper evaluates the facts and figures to identify the ascertain the environmental hazards caused by aircraft across the globe. The aviation industry is presently responsible for 12% of worldwide CO2 dis-charges. Aviation could represent up to 24% of worldwide outflows by 2050 except if there is a critical innovative move. Surveys hydrogen's potential as a greener method of impetus and talks about the significant difficulties for its appropriation."
Source: Springer Link

Evaluating the climate impact of aviation emission scenarios towards the Paris agreement including COVID-19 effects

"Aviation is an important contributor to the global economy, satisfying society's mobility needs. It contributes to climate change through CO2 and non-CO2 effects, including contrail-cirrus and ozone formation. There is currently significant interest in policies, regulations and research aiming to reduce aviation's climate impact. Here we model the effect of these

measures on global warming and perform a bottom-up analysis of potential technical improvements, challenging the assumptions of the targets for the sector with a number of scenarios up to 2100. We show that although the emissions targets for aviation are in line with the overall goals of the Paris Agreement, there is a high likelihood that the climate impact of aviation will not meet these goals. Our assessment includes feasible technological advancements and the availability of sustainable aviation fuels. This conclusion is robust for several COVID-19 recovery scenarios, including changes in travel behaviour."
Source: Nature Communications

Analysis of the Relationship of the Degree of Aviation Sector Development with Greenhouse Gas Emissions and Measures of Economic Development in the European Union Countries

"The rapid growth of aviation over the past fifty years has resulted in numerous negative environmental impacts due to the combustion of fossil fuels in aircraft engines. This paper presents the relationship between air transport and GHG emissions. Based on data on the development of aviation, the level of GHG emissions from transport, environmental tax revenues and the amount of GDP per capita in the countries of the European Union, an attempt was made to create a typification that would illustrate the interaction of GHG emissions with air transport, environmental taxes and GDP in the years 2009–2018. The next step to confirm the obtained results was the application of statistical methods: the TOPSIS (Technique for Order of Preference by Similarity to Ideal Solution) method of linear ordering and the Perkal index. Based on the study findings, the analyzed countries were divided into three groups: the group of innovators, the stable group and the group of students. The analysis revealed the relationship of all three analyzed variables with air transport. The development of the aviation sector leads to a significant increase in GHG emissions from transport, increased revenues from environmental taxes and acceleration of the rate of economic growth of a country."
Source: MDPI

Spatially Explicit Assessment of Suitable Conditions for the Sustainable Production of Aviation Fuels in Brazil

"International civil aviation strives to significantly reduce its greenhouse gas (GHG) emissions, and the use of Sustainable Aviation Fuels (SAF) is an alternative for such purpose. However, for an alternative fuel to be considered SAF, some conditions must be met, and production must be certified for sustainability. This paper presents an assessment of the necessary conditions for the sustainable production of these biofuels in Brazil. It is based on a geospatial publicly available database (SAFmaps) that was built with the aim of providing information to stakeholders who would be interested in the production of SAF. The geographic scope corresponds to an area that is about half of the country. The case studies reported in this paper are related to four crop-based feedstocks (eucalyptus, soybean, sugarcane, and corn), which could be used for SAF production, according to three certified routes (FT, HEFA, and ATJ) (Fischer–Tropsch, Hydroprocessed Esters and Fatty Acids and Alcohol to Jet); in total, six potential production sites were assessed."
Source: MDPI

PEDAGOGY

A Hands-on Project for Avionics Systems Course in Aviation Engineering Technology Program

"This paper introduces a hands-on project for avionics systems course to better enhance a practical education for AET students. This hands-on project proposes assembling an Automatic Dependent Surveillance – Broadcast (ADS-B) flight tracking system as a real-world aeronautical example. ADS-B is one of the major technology components of next generation air transportation system. Students are expected to apply electrical and avionic knowledge to build up an entry-level ADS-B receiver, and deploy the receiving system to collect and decode flight data. This project requires students to have knowledge of basic electronics and avionics, basic computer programing, and basic mathematics. As a part of the AET program, this project would be in the second electronics course. The connections to the first and third courses will be detailed in the paper. To accomplish this project, students will need to assemble an ADS-B receiver using provided hardware,

program the desired code, load code into hardware, deploy system to collect and decode data, and analyze the results. Therefore, the project engages students with many skills, such as circuit analysis and design, soldering, programing, and system field testing. The project helps students develop the ability of integrating skills from different courses to solve real aviation problems."
Source: ASEE

Development and Assessment of a Summer Program to Introduce High School Students to STEM Through Aviation and Transportation Engineering

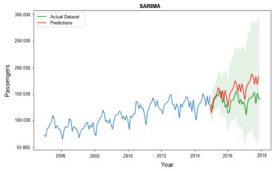
"This paper describes the curriculum developed for a summer outreach program that used the transportation system as a vehicle to introduce high school students to STEM. The curriculum included modules to introduce participants to the topics of aviation and air transportation, infrastructure design and traffic engineering, inland waterways, transit, and rail transportation. The relationship between safety, design, and operations was elaborated on in each module, and the multimodal nature of the transportation system was emphasized. The curriculum included subject-based learning, experiential learning, and out-of-classroom experience. First, students were provided with background and basic knowledge about each mode of transportation through lectures. A lecture was followed with a hands-on laboratory or a computer-based activity to allow students to apply the basic principles of transportation engineering to solve a problem related to each mode of transportation. Finally, field trips were arranged to help students connect the theory and hands-on activities to real-world engineering and aviation applications. Likert scale questionnaire was utilized to inquire about participants' opinions about STEM and assess the effectiveness of the program in introducing students to STEM."
Source: ASEE

Individual Resilience as a Competency for Aviation Professionals: A Review of the Literature

"Graduates from aviation education programs emerge with requisite technical certification and academic coursework to fulfill the respective degree requirements, but may still lack fluency in key non-technical competencies to fully leverage their professional credentials and academic coursework. Individual resilience is one example of a non-

technical competency sought by employers across several industries including aviation. Due to the applied nature of the aviation discipline, problem-based learning approaches often implicitly seek to develop individual resilience within many educational programs/experiences; however, the shift from a traditional lecture/lab course to a learner-centric, problem-based approach may cause some learners to retreat from learning due to early failures or insufficiently developed recovery techniques. The purpose of this paper is to identify a list of attributes of resilience and develop a theoretical model of individual resilience. A cross-domain review from seminal and modern research on resilience theory from aviation/aerospace, education, medical and psychology literature was conducted."
Source: ASEE

DEEP LEARNING



Deep learning models for forecasting aviation demand time series

"The analysis along with the modeling of passenger demand dynamic, which deem to have vital implications on the management and the operation within the entire aviation industry, are regarded to be an extreme challenge. However, air passenger demand introduces reliably complex non-linearity and non-stationarity. In this paper, we have tried to forecast aviation demand with the use of time series and deep learning techniques. We have developed air travel demand estimation and forecasting models, using classical Autoregressive Integrated Moving Average methods (ARIMA), Seasonal approaches (SARIMA) and Deep Learning Neural Networks (DLNN)."
Source: Springer Link

AVIATION COMMUNICATIONS

Examining pragmatic failure and other language-related risks in global aviation

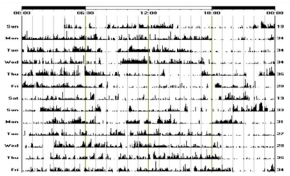
"The purpose of this research is to investigate the pragmatic failure and

other language-related risks between pilots and air traffic controllers in intercultural aviation communication. The paper attempts to provide recommendations for the minimization of these risks, thereby improving aviation safety by reducing the rate of aviation incidents and accidents. Pragmatic failure refers to the miscomprehension of intended pragmatic meaning. As opposed to semantic meaning, it depends on the context and is highly influenced by culture."
Source: Emerald

Application of Air Traffic Control Communication, Navigation and Surveillance Equipment in the Aviation Field Based on Data Analysis

"Communication, navigation and surveillance equipment is the core of airspace management and command aircraft. Whether its management is efficient and reasonable has a direct impact on aviation safety and passenger safety. Any error in any link may have disastrous consequences. In recent years, China's civil aviation industry has developed rapidly, and the pressure of air traffic management has continued to increase with the increase in the number of flights. Problems such as incomplete implementation can no longer meet the needs of the current development of air traffic control equipment management. Based on this, combined with the current status of civil aviation control equipment operation, this paper proposes the application research of air traffic control communication navigation surveillance equipment based on data analysis."
Source: Springer Link

FATIGUE RISK MANAGEMENT



FATIGUE RISK MANAGEMENT IN AVIATION

"Over the years, the aviation sector, like other transportation sectors, has shown great development and change. Depending on this development, the need for the number of people working in the aviation industry has also increased. Although the number of employees has increased, the growth experienced in the sector has increased the burden on individuals during working hours. Increasing

working hours also revealed the importance of the concept of fatigue. Intensive working hours and insufficient rest hours greatly affect aviation sector employees, especially pilots, and create a great risk in aviation. When considering the accidents in aviation, it is seen that most of them are caused by pilot error and one of the main reasons that cause the pilot to make wrong decisions is fatigue. Fatigue is a factor that causes a decrease in awareness, a decrease in mental and physical activities, and therefore negatively affects performance. Increased reaction time, reduced situational awareness, and attention delays may be observed due to fatigue. In this study, first chapter includes general short information about aviation industry and some sources which are used in this study are given."
Source: Istanbul Technical University