SINGAPORE UNIVERSITY OF TECHNOLOGY AND DESIGN

6 March – 7 May 2021

TOPICAL REPORT

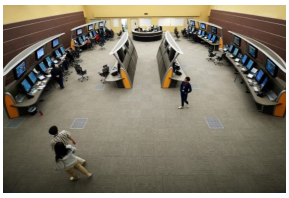
AVIATION

Gain insight and keep up-to-date with the latest publications carefully selected by the library from credible sources in academic publications, industry & market research and scientific & industry news. If you have any sources to suggest for our report please let us know.

view past reports | subscribe to others | unsubscribe

news | academic | reports

AIR TRAFFIC MANAGEMENT



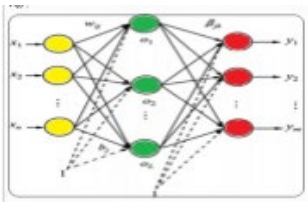
CAAS to expand air traffic control centre; 8 proposals being evaluated

"Singapore will push ahead with plans to upgrade its air traffic management system, amid the current downturn in air travel due to the Covid-19 pandemic.
The Civil Aviation Authority of Singapore (CAAS) is currently evaluating proposals from eight companies to expand the Singapore Air Traffic Control Centre (SATCC) at Biggin Hill Road in Changi, after calling a tender on the project earlier this year."
Source: Straits Times

Accelerating digital transformation in air traffic management through open collaborations

"The adoption of advanced technologies such as Artificial Intelligence (AI), Machine Learning (ML), Big Data, and the Internet of Things (IoT) has accelerated in the past few years across many sectors and organisations … While the rate of advanced technology adoption varies across industry sectors, French tech giant Thales Group and the Civil Aviation Authority of Singapore (CAAS) saw the need to leverage co-

AIR TRAFFIC MANAGEMENT



Optimization of air traffic management efficiency based on deep learning enriched by the long short-term memory (LSTM) and extreme learning machine (ELM)

"In this paper, to increase the air traffic management accuracy and legitimacy we used the bidirectional long short-term memory (Bi-LSTMs) and extreme learning machines (ELM) to design the structure of a deep learning network method. The Kaggle data set and different performance parameters and statistical criteria have been used in MATLAB to validate the proposed method. Using the proposed method has improved the criteria factors of this study. The proposed method has had a % increase in air traffic management in comparison to other papers. Therefore, it can be said that the proposed method has a much higher air traffic management capacity in comparison to the previous methods."
Source: Springer Open

Hierarchical multiagent reinforcement learning

ANALYSIS

Aviation Sustainability and the Environment

"Etihad Airways operates Abu Dhabi-Rome ecoFlight with Greenliner 787. Alaska Airlines sets course for net zero carbon emissions by 2040. All Nippon Airways to introduce biodegradable meal trays. Lufthansa expands Compensaid to include corporate clients. UK Government to include international aviation and shipping emissions in net zero targets."
Source: CAPA Centre for Aviation

Manned Electric Aircraft: Smart City and Regional 2021-2041

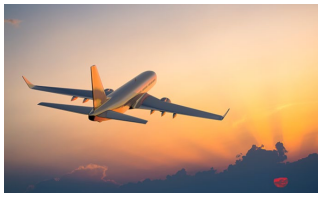
"This report is the first to forecast electric aircraft for 20 years ahead, while reflecting the realities of how the huge new $30 billion market that is identified will be structured. Primarily, it covers aircraft up to 100 passengers and equivalent freighters, touching on how electrification of larger aircraft converges with these to 2050."
Report Statistics

Slides	396
Forecasts to	2041
Published	Apr 2021
ISBN	9781913899431

Source: IDTechEx

innovation to accelerate the adoption of advanced technologies in Air Traffic Management (ATM)."
Source: E27

AVIATION INDUSTRY



Is the aviation landscape set for change?

"The figures are stark. Following the biggest ever fall in demand in 2020, IATA predicts traffic will return to half of 2019 levels in 2021 in a best-case scenario. But if new coronavirus variants force governments to continue with travel restrictions and quarantines then the recovery in 2021 would be limited to just 38% of 2019 levels."
Source: IATA

IATA Welcomes G20 Push to Restart Tourism

""The G20 has the right focus and agenda to restart travel and tourism. The combination of vaccinations and testing are the drivers to make travel broadly and safely accessible. Moreover, Prime Minister Draghi's promise that Italy is ready to welcome back the world and encouragement to book holidays should be an inspiration to other world leaders. It captures the urgency that is needed to move forward quickly and safely in restoring the freedom to travel," said Willie Walsh, IATA's Director General."
Source: Aviation Pros

Dassault Aviation launches Falcon 10X

"Dassault Aviation has unveiled its all-new Falcon jet that will deliver a level of comfort, versatility and technology unmatched by any purpose-built business jet. Featuring a range of 7,500 nautical miles, the Falcon 10X will fly nonstop from New York to Shanghai, Los Angeles to Sydney, Hong Kong to New York or Paris to Santiago. Top speed will be Mach 0.925."
Source: Asian Aviation

The airline industry hasn't collapsed, but that's the only good news for overseas travel

"We thought things would be so much better by now.
A year ago I wrote about the future of the airline industry. Along with many other experts, I expected international air travel by this point would still be below pre-pandemic levels but well on its way to recovery. We are not even close."

schemes for air traffic management

"In this work we investigate the use of hierarchical multiagent reinforcement learning methods for the computation of policies to resolve congestion problems in the air traffic management domain. To address cases where the demand of airspace use exceeds capacity, we consider agents representing flights, who need to decide on ground delays at the pre-tactical stage of operations, towards executing their trajectories while adhering to airspace capacity constraints. Hierarchical reinforcement learning manages to handle real-world problems with high complexity, by partitioning the task into hierarchies of states and/or actions."
Source: Springer Link

Air Traffic Controllers' Occupational Stress and Performance in the Future Air Traffic Management

"As demand for unmanned aerial vehicle (UAV) operations increases, it is vital to understand its effects on air traffic controllers and the safety of the national airspace system. This study's primary purpose is to determine how UAVs that operate in controlled airspace would influence air traffic controllers' occupational stress and performance. In a within-subject experimental research design, 24 participants sampled from a university's undergraduate Air Traffic Management (ATM) program completed three different air traffic control (ATC) scenarios on an en route ATC simulation system."
Source: Embry-Riddle Aeronautical University

Support to Design for Air Traffic Management: An Approach with Agent-Based Modelling and Evolutionary Search

"This paper presents a methodology to manage the support to design in ATM operations. We propose a workflow for the design of ATM solutions in a performance-based setting. The methodology includes the evaluation of the impact on human behaviour and exploits a combination of different paradigms, such as Agent-Based Modelling and Simulation, and Agent-Based Evolutionary Search. We prove the soundness of the methodology by carrying out a real case study, which is the transition from Direct Routing to Free Routing in the Italian airspace."
Source: Embry-Riddle Aeronautical University

SINOPTICA: A project of analysis of hail affectation on Air Traffic Management

Growth Opportunities In Autonomous Aircraft Navigation, Telematics Powered E-Bikes, Fast Charging, And Mobility Analytics

"The Mobility Technology Opportunity Engine (TOE) for April 2021 covers innovations in autonomous aircraft navigation, in-vehicle information systems using extended reality, telematics powered E-Bikes, fast charging, mobile analytics, and AI powered solutions for vehicle damage detection, pedestrian safety, and others."
Source: Frost & Sullivan

Outlook for the global airline industry

"1) Financial performance will be worse and more varied this year than we expected in our December forecast, because of difficulties in controlling the virus variants and slower vaccination in some region
2) This net loss forecast implies cash burn in 2021 of $81bn (in between the 2 scenarios we released earlier of $75-95bn)
3) Weaker start to year for passenger business, due to surge in virus cases and travel restrictions, and vaccination delays has lowered our global RPK forecast to 26% in 2021 vs 2020 or -57% vs 2019 (was 50% vs 2020)."
Source: IATA

Commercial Aerospace Insight Report 2021

- "What keeps aerospace executives up at night? Ongoing pandemic and economics- related challenges pose the greatest risks.
- 49% of executives expect airline industry revenues to take 24-36 months to recover to 2019 levels.
- Optimism is on the rise: 68% of executives surveyed expect production capacity to increase over the next 18 months.
- Accenture's latest Commercial Aerospace Insight Report outlines plans to get businesses back on track."

Source: Accenture

Global Airport Traffic Rebounds; Full Recovery Still Years Away

"Airport traffic is rebounding off of pandemic troughs in most countries, though Fitch Ratings' latest quarterly Global Airport Tracker report says the

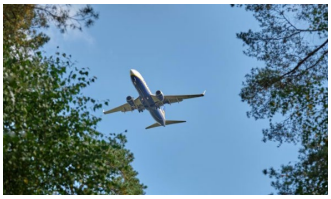
Source: The Conversation

AIRPORT

London City airport switches to remote digital tower operations

"Dedicated controllers at a Swanwick operations room are presented with a 360° panoramic live view of the airport, on 14 screens, transmitted by 16 high-definition cameras and sensors across fibre connections, as well as audio information and radar data."
Source: Flight Global

ENGINEERING



New aircraft efficiency will rely less on propulsion, more on engineering: Boeing CEO

"Boeing has used this model-based systems engineering approach – a common set of digital designs for engineering, manufacturing and maintenance, as well as flight simulations – on its aircraft designs for the defence industry, including the T-7A Red Hawk advanced jet trainer and the Airpower Teaming System loyal wingman unmanned air vehicle."
Source: Flight Global

What Are The Electric-Propulsion Challenges In Commercial Aviation?

"Challenges to the use of electric propulsion in commercial aviation are many and range from the batteries and motors to the wiring and cooling. But from the beginnings in automotive technology, progress is taking place in tailoring electric drive trains to aerospace applications."
Source: Aviation Week

DESIGN

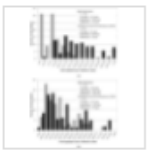
Inside Acumen – Designing Your Favorite Aircraft Seat

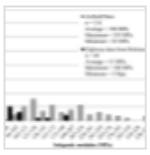
"The H2020 SINOPTICA Project (2020-2022) aims at exploiting the untapped potential of assimilating remote sensing as well as GNSS-derived datasets and in-situ weather stations data. The main goal is getting very high-resolution, very short-range numerical weather forecasts to improve the prediction of extreme weather events to the benefit of Air Traffic Control (ATC) operations. SINOPTICA weather forecast results will be integrated into ATC decision-support tools, visualizing weather information on the controller's display, and generating 4D trajectories to avoid severe weather areas, including hailstorms. Within this context, the preliminary results of the radar analysis on three hail events affecting Italian airports are presented."
Source: DLR Electronic Library

Air Traffic Management Abbreviation Compendium - List of Aviation, Aerospace and Aeronautical Acronyms

"As in all fields of work, an unmanageable number of abbreviations are used today in aviation for terms, definitions, commands, standards and technical descriptions. This applies in general to the areas of aeronautical communication, navigation and surveillance, cockpit and air traffic control working positions, passenger and cargo transport, and all other areas of flight planning, organization and guidance. In addition, many abbreviations are used more than once or have different meanings in different languages. In order to obtain an overview of the most common abbreviations used in air traffic management, organizations like EUROCONTROL, FAA, DWD and DLR have published lists of abbreviations in the past, which have also been included in this document."
Source: DLR Electronic Library

AIRFIELD PAVEMENTS MANAGEMENT





Implications of incorporating geosynthetics in airfield pavements

"A review of the existing DOD design methodology indicated that any improvement from geosynthetic inclusion in thicker pavements was hidden within the variability of the data used to formulate the existing design methodology. An initial cost evaluation suggested that design life proverbial runway to normal will not be in sight for years.
Now reflecting a one- to two-year delay since its last report, Fitch now forecasts recovery estimates ranging anywhere from 4Q'23 to 2025 before airport traffic returns to 2019 levels. The obvious variable is new COVID-19 variants and surges in the number of cases, which caused additional or prolonged lockdown measures and could linger as vaccine roll outs remain slow and uneven on a global basis."
Source: Fitch Ratings

Air Traffic Control Equipment Market Report 2021-2031

"Forecasts by Product (Communications, Navigation, Surveillance), by Airspace (ARTCC, TRACON, ATCT, Remote Tower), by Offerings (Hardware, Software, Services), by Application (Commercial, Defence) AND Regional and Leading National Market Analysis PLUS Analysis of Leading Air Traffic Control Equipment Companies AND COVID-19 Recovery Scenarios."
Source: Intrado Globe News Wire

SMART CITIES

Advanced air mobility could be worth $115B by 2035: report

"AAM, eVTOLs and the like — often referred to under the catch-all term of "flying cars" — have been the subject of much hype in recent years. And representatives of the Federal Aviation Administration (FAA) have said plans for flying cars are more than just hype and are close to reality."
Source: Smart Cities Dive

CYBERSECURITY

Pathways Towards a Cyber Resilient Aviation Industry

"In collaboration with Deloitte
This report aims to define a common language and baseline of practices and encourage collective initiatives for increasing cyber resilience across the Aviation ecosystem."
Source: World Economic Forum

"Innovation has always been at the core of Acumen's DNA. Over the years, Acumen has worked on a diverse range of briefs from powerboats to Action Men. However, appropriately enough, its first major commission was in 1981 to design a range of office seating for Hille International. Hille's 'Shape' range of furniture proved to be a commercial success for many years."
Source: Simply Flying

CYBERSECURITY

Aviation Sector Calls for Unified Cybersecurity Practices to Mitigate Growing Risks

"The aviation industry needs to unify its approach to prevent cybersecurity shocks, according to a new study released today by the World Economic Forum. The increased level of interdependencies can lead to systemic risks and cascading effects as airlines, airports and aircraft manufacturing take different approaches to countering cyber risks."
Source: Modern Diplomacy

Global commercial aviation sector must strengthen its cybersecurity and cyber resilience

"In a report drawn up in cooperation with the global commercial aviation sector, the World Economic Forum (WEF) has highlighted the need for the aviation industry to unify its approach to cybersecurity. The report is entitled 'Pathways to a Cyber Resilient Aviation Industry' and it was published on Wednesday. The WEF also announced that it had launched an initiative called Cyber Resilience in Aviation."
Source: Engineering News

SMART CITIES

Your Kids Won't Learn to Drive, and Here's Why

"Learning to drive is a coming-of-age moment many kids (and parents sick of being taxi services) dream about. But all of this - the tears, the tests, the parallel parking - could become relegated to the realm of nostalgia alongside VHS tapes and flip phones.

extension (if any) could be the preferred means of quantifying geosynthetic improvement and that the reduction in aggregate thickness attributed to geosynthetic inclusion did not seem to provide an initial cost savings for military airfields. Geosynthetic inclusion in airfield damage repair or as a crack mitigation technique may be more beneficial than aggregate base reinforcement in new construction."
Source: Elsevier

Local Calibration of Pavement Mechanistic-Empirical Faulting Reliability using Pavement Management Data

"The Pavement ME transverse joint faulting model incorporates mechanistic theories that predict development of joint faulting in jointed plain concrete pavements (JPCP). The model is calibrated using the Long-Term Pavement Performance database…This paper proposes a calibration of the Pavement ME reliability model using pavement management system (PMS) data. It illustrates the proposed approach using PMS data from Pennsylvania Department of Transportation. Results show an increase in accuracy for faulting predictions using the new reliability model with various design characteristics. Moreover, the new reliability model allows design of JPCP considering higher levels of traffic because of the less conservative predictions."
Source: Sage Journals

Diagnosis and prognosis of ASR in an airfield pavement

"A concrete runway at an international airport began to exhibit multiple modes of distress several years after construction, including popouts, paste pop-offs, spalls, and cracking, prompting a root cause failure investigation. Both coarse aggregates used in construction were considered potentially reactive per the accelerated mortar bar test, and one of the three primary mixture designs did not use an SCM for mitigation. Based on petrographic findings of ASR in all three mixtures, a residual expansion testing program was initiated to investigate future expansion potential from ASR. This program included cores immersed in 1N NaOH at 38 °C and cores stored over water at 38 °C, monitored for up to fifteen months. The data indicate minimal risk of future expansion from ASR and the surface distresses were ultimately not attributed to ASR. This information will be valuable in designing an effective rehabilitation and repair strategy to extend the service life of the pavement."

Commercial Aerospace Insight Report 2021

- "What keeps aerospace executives up at night? Ongoing pandemic and economics- related challenges pose the greatest risks.
- 49% of executives expect airline industry revenues to take 24-36 months to recover to 2019 levels.
- Optimism is on the rise: 68% of executives surveyed expect production capacity to increase over the next 18 months.
- Accenture's latest Commercial Aerospace Insight Report outlines plans to get businesses back on track."

Source: Accenture

DRONES

5 lessons from Africa on how drones could transform medical supply chains

- "Drones provide a potential avenue for ensuring that everyone, no matter where they live, has access to high quality healthcare.
- The challenge is to move from pilot projects to larger scale operations that are financially sustainable.
- Africa offers lessons: the technology is ready, but the regulation and the sharing of data needs to catch up."

Source: World Economic Forum

This is due to the massive focus on automation sweeping the personal transport industry."
Source: IDTechEx

Perth Airport improves performance and agility

"The Veovo Intelligent Airport platform connects and analyses data spanning flights, airside and landside activities – to provide clarity in real-time for the airport, its aviation partners and its passengers.
Decision support and optimisation tools enable the airport to build robust resourcing plans and proactively flex to handle irregular operations. This agility leads to improved resilience, more efficient gate allocations and a more predictable experience for customers, Veovo claims."
Source: Smart Cities World

Why Airlines Should Use Technology To Stay Ahead With Distribution

"In a movement that was well under way before 2020 but is accelerating as air travel demand recovers, airlines and distribution technologies companies are turning more to digitalization. The way airlines are selling their products and services continues to change."
Source: Aviation Week

SUSTAINABLE AVIATION

Realizing the potential of sustainable aviation fuel

"US university researchers are looking at whether waste products from craft brewing can power low emissions flight. Scientists have just published research on carbon negative aviation fuel, and Shell is investing in LanzaJet to scale up production of sustainable aviation fuel (SAF)."
Source: IATA

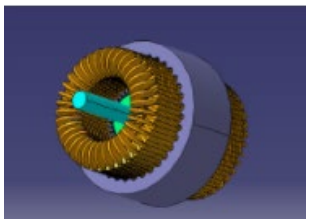
The Case For Hydrogen Powered Aircraft Gains Momentum

"While much of the discussion about how to reduce aviation's carbon footprint has focused on the availability of sustainable aviation fuel (SAF) and when and how electric aircraft may be unshackled from the limits of battery technology, hydrogen has been quietly moving up the future propulsion agenda."
Source: AINOnline

Electric Vs Hydrogen – Which Is Best For The Future Of Aviation?

Source: INEC

AIRCRAFT SYSTEMS



Development of a Turbo Electric Distribution System for Remotely Piloted Aircraft Systems

"This paper investigates a turboelectric propulsion system that can be considered an initial step in the production of TeDP in a remotely piloted aircraft system with the use of existing technology. This is achieved by replacing the gear and the starter motor of a turboprop with a high-speed permanent magnet electric machine to generate electrical power and propelling the aircraft through a distributed electric propulsion system. In this theoretical study, an augmentation to Breguet's range and endurance equation is developed. This study confirmed that the new system is 31% lighter than the turboprop engine. Then the effect of the weight savings is used in the distributed electric propulsion (DEP) aerodynamic studies and found that there is a drastic increase in the range for a TeDP developed with the high-speed machine."
Source: Scielo

System Identification Guidance for Multirotor Aircraft: Dynamic Scaling and Test Techniques

"State-space system identification was performed to extract flight dynamic models for hovering flight of a 55 cm, 1.56 kg hexacopter unmanned aerial vehicle. Different input excitation techniques were tested to determine which maneuvers provided high-quality system identification results for small-scale multirotor vehicles. These input excitation techniques included automated frequency sweeps, varying in amplitude, and multisine sweeps. Coherence, Cramer–Rao bounds, and insensitivities were used as metrics for comparing the system identification results. A parametric variation of frequency sweep amplitudes were performed in all axes (roll, yaw, pitch, and heave) to provide guidance on frequency sweep amplitude for small-scale multirotor unmanned aerial systems."
Source: Ingenta Connect

RISK ANALYSIS IN AVIATION

"That commercial aviation needs to do everything it can to mitigate its contribution to greenhouse gas emissions is no longer up for debate. Airlines are investing in everything from carbon capture to sustainable aviation fuels, along with hydrogen-powered and electric aircraft. But which of the latter two is the better option?"
Source: Simply Flying

Ensuring a Sustainable Future for Aviation from Global Aerospace

"The building blocks are in place to enable the next phase of aerospace development to achieve much greater levels of sustainability in the aviation industry while lessening its carbon footprint."
Source: GlobeNewswire

Airlines must reduce emissions instead of offsetting, say experts

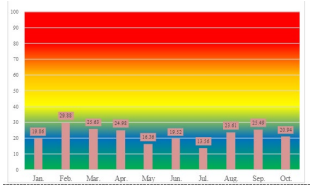
"On Tuesday, an investigation by the Guardian and Unearthed, Greenpeace's investigative arm into the forest protection carbon offsetting market used by airlines found it had a significant credibility problem, with experts warning the system is flawed and can produce credits with no climate benefit. Environmental campaigners said the airline industry must focus on reducing emissions from aviation and the use of offsets distracts from rising emissions from flights."
Source: The Guardian

Building A Bridge To Accelerate The Transition To Sustainable Aviation

"In September, Deloitte globally pledged to reach net zero emissions by 2030 as part of our WorldClimate commitment. For professional services firms like ours, weekly travel—by our partners and professionals before the pandemic—accounted for the largest source of our emissions. And while shifting to renewable electricity in our offices or to electric and hybrid vehicles in our small fleet is straightforward, at least technologically, the emissions from our air travel are "harder-to-abate" with few low-carbon options available at scale."
Source: Forbes

Airlines get lift from corporate allies in shift to sustainable fuels

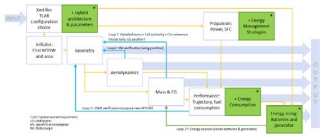
"Some of the world's biggest corporations are signing on to help decarbonize the aviation industry just as business travel is expected to rebound this year and send greenhouse gas emissions soaring.



Identifying Safety Performance Indicators for Risk Assessment in Civil Aviation

"A novel risk assessment model of a department is proposed based on four types of safety performance indicators identified by system and job analysis, event tree analysis, fault tree analysis, bow-tie, and so on. A case study of risk assessment using the proposed model is presented for two departments in an airport which implements safety performance management. The results illustrate the operation risk of different departments can be assessed based on safety performance indicator system."
Source: IOP Science

AIRCRAFT DESIGN



Hybrid electric distributed propulsion overall aircraft design process and models for general aviation

"In the frame of the European objectives in terms of CO2 emissions, the aeronautics is looking for a technological rupture to achieve them, in particular, the aircraft design domain pursuits this through the research of innovative architectures. One of these innovative configurations currently being explored includes the hybrid electric energy source (thermal/electric) for Distributed Electric Propulsion (DEP) architecture. This Paper details a code developed to size a general aviation aircraft at concept level, by only defining its top level requirements and the main architecture parameters."
Source: IOP Science

Multidisciplinary Modelling, Analysis and Optimisation for Aircraft and System Level Design and Validation

"Against the background of the big environmental and societal challenges as formulated for example in Flightpath 2050, current developments in aircraft design are aiming at further emission reduction through integrated, unconventional propulsion, systems and airframe innovations. This requires the further integration of methods for

Microsoft, Siemens and Deloitte are among at least 14 companies that pledged last month alone to purchase sustainable aviation fuel, one of the few promising climate solutions airlines have to directly reduce their pollution. They have a long way to go."
Source: Politico

INSIGHT

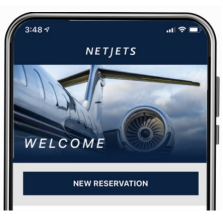
Why Does The Airbus A380 Have Such A Good Safety Record?

"In commercial terms, the Airbus A380 has not proven to be as commercially successful as the European manufacturer would have hoped. The airline industry is increasingly moving away from the high-capacity, hub-to-hub model that the 'superjumbo' demands. This trend has only increased as coronavirus has caused passenger numbers to plummet over the last 12 months. However, one area in which the A380 has excelled is in its safety record. But why is it so good?"
Source: Simply Flying

What Is The Difference Between An Incident And Accident In Aviation?

"The aviation industry is bound by countless stringent safety regulations designed to keep passengers and crew safe at all times. However, it is impossible to fully mitigate against what can be quite random occurrences, and, subsequently, things can and do sometimes go wrong. In such instances, one often hears the terms 'accident' and 'incident' used to describe what has happened to the aircraft or its occupants. But what exactly do these terms mean?"
Source: Simply Flying

PRIVATE JETS



Everything You Need To Know About Booking Private Jet Charters

"Let me start with the spoiler: Despite what you read, the notion of buying private jet charter flights online in real-

multidisciplinary modelling, analysis and optimization for aircraft design, but also for propulsion and system level designs... This paper presents some key technologies for computationally efficient collaborative MDO (multidisciplinary design and optimization) frameworks for multidisciplinary design and validation of advanced aeronautic products like aircraft and propulsion systems."
Source: Scipedia

Economically driven requirements for a hybrid-electric 19-passenger commuter aircraft

"The appeal of reduced travel and transport times and electrification of aircraft drive the development of new aircraft for short distances. The goal of the CleanSky2 project ELICA (ELectric Innovative Commuter Aircraft) is to provide a preliminary design of a hybrid-electric 19-passenger commuter aircraft, whereby the passenger limit is defined by certification. This paper describes the initial set of Top Level Aircraft Requirements (TLARs) based on both a benchmark with existing 19-passenger commuter aircraft and the analysis of requirements derived from potential future markets Regional Air Mobility (RAM) and thin-haul air cargo services."
Source: IOP Science

Obtaining the 3D geometry of the blade in a training aircraft

"The aim of this paper is to present a technique of 3D scanning applied to the training aircraft blade so as to copy its precise geometry after a specified period of operation. Scanning enables the use of a created geometry for numerical analyses, in particular of icing during aircraft operation. The Nikon Maker MMDx scanner and the GeoMagic Design X Software were used to create the 3D model and scan the blade of the PZL 130 Orlik training aircraft."
Source: IOP Science

From FAST to FAST-OAD: An open source framework for rapid Overall Aircraft Design

"To face the increasing environmental footprint of commercial aviation, industrial and research efforts have been focusing on exploring unconventional configurations and new propulsion paradigms, mostly based on electric technology. Such explorations require Overall Aircraft Design that has to be performed in an integrated multidisciplinary design environment. Such design environments are often

time is mostly fake news. Aside from that, it's easy to make mistakes if you don't know what you're doing. Still, if you really need to tap your way into the private skies, out of dozens, I found only a few apps and digital interfaces worth looking at."
Source: Forbes

eVTOL

Wisk To Operate Autonomous eVTOL Air Taxis for Blade

"Wisk Aero will supply and operate up to 30 of its eVTOLs for Blade Urban Air Mobility's passenger transportation network, the companies announced today. According to Wisk, the aircraft will be what it called its sixth-generation design rather than the two-seat, all-electric Cora currently undergoing flight testing."
Source: AINOnline

eVTOL: What They Are, When They'll Be Here, And How They'll Change How You Get round

"THE BACKGROUND — eVTOL (pronounced eee-vee-toll) is short for electric vertical takeoff and landing, and it's not an entirely new concept.
Some might call eVTOL aircraft "flying cars," but they're more accurately called electric helicopters. A regular helicopter is a VTOL (as in it takes off up-and-down vertically, rather than rolling down a runway like an airplane), and if you make it electric, then it's an eVTOL.
Basically, every modern consumer drone from DJI or Skydio is a miniature eVTOL. Those small drones are good at carrying small cargo like cameras or vaccines, but now eVTOLs are getting bigger. Much bigger."
Source: Inverse

UPS agrees to buy electric vertical aircraft to speed up package delivery in small markets

- "United Parcel Service announced it has agreed to purchase of 10 electric vertical takeoff and landing aircraft from Beta Technologies.
- The package delivery giant will test the eVTOLs for use in its Express Air delivery network, focusing on small and medium markets.
- "You can see a future where it's carrying, let's say 1,000

limited to multidisciplinary analysis, adapted for a single aircraft configuration or require an important effort to be mastered. FAST-OAD is a software program developed by ONERA and ISAE-SUPAERO for aircraft sizing analysis and optimization that aims at user friendliness and modularity."
Source: IOP Science

Minimum weight design of curvilinearly grid-stiffened variable-stiffness composite fuselage panels considering buckling and manufacturing constraints

"In this paper, optimum designs of a tow-steered composite fuselage skin stiffened by a grid of curvilinear composite stiffeners are obtained for minimum weight subject to buckling and manufacturing constraints. A simply supported cylindrically curved panel loaded by either uniaxial compression or combined uniaxial compression and shear is addressed. Using Python-Abaqus interface for modelling the panels and genetic algorithm implemented in MATLAB as an optimization platform, an integrated design framework is developed for obtaining the designs…It is also observed that the shallow fuselage panels designed using the circular arc path satisfy the manufacturing constraints represented by the minimum turning radius of both the fiber and stiffener paths and have favourable buckling patterns to aircraft structures."
Source: Elsevier

AIRCRAFT MATERIALS

A review on different hybrid composites for aircraft structures

"Composites have been used in motorsports, aviation and many industrial machines for decades. In this paper, the recent research works on composites are reviewed. This work explores the possibility of using carbon fiber in different sequences of an inter-ply hybrid composite. This review also concentrates on various tests conducted on a select few composites to test their strength in different areas."
Source: Materials Today

Effects of connecting materials on the static and fatigue behavior of pultruded basalt

pounds, 1,500 pounds to rural hospitals," and landing on a helipad instead of an airport, UPS' Bala Ganesh said."
Source: CNBC

eVTOL Air Taxis – Everything You Need To Know

"eVTOL (electric vertical takeoff and landing) air taxis have been touted as the future of urban transportation. Many companies, both emerging start-ups and established manufacturers, are developing eVTOL vehicles which are expected to hit the market in just a matter of years. What does the future hold for eVTOL?"
Source: Simply Flying

AUTONOMOUS AIRCRAFT

NASA Tests 'Moral Compass' For Autonomous Aircraft

"NASA is conducting final simulator tests of an unmanned air vehicle configured with programmed rules of behavior and an internalized set of values, which could pave the way for a new generation of safer autonomous and piloted aircraft."
Source: Aviation Week

A Story for Axel: Small Drones, Big Ideas for Better Air Mobility

"This is the final part of a three-part series in which NASA Aeronautics' senior writer Jim Banke tells his newborn grandson, Axel, the story about how two recently concluded research projects will help achieve a long-held vision for the future of aviation. In part one and part two, Axel heard about the goals and achievements of the UAS in the NAS project."
Source: NASA

fiber-reinforced polymer bolted joints

"Owing to the heavy weight and poor durability of the bolted joints with traditional connecting materials composed of steel cover plates and steel bolts in the fiber-reinforced polymer (FRP) profiles, a novel homogenous joint consisted of basalt FRP (BFRP) cover plates and BFRP bolts was developed in this study. An experimental investigation on the static behavior of the double-lap shear bolted joints was carried out using different connecting materials to be compared, i.e. four types of combinations composed of steel/BFRP cover plates and steel/BFRP bolts, and different numbers of bolts. Fatigue experiments of the bolted joints with selected combinations were performed to further compare the behavior of the homogenous joints using S-N curve and fatigue strength."
Source: Elsevier

Dynamic aeroelastic optimization of composite wings including fatigue considerations

"In the traditional design process, knowledge about the design increases, while the design freedom decreases as one goes from conceptual to preliminary and finally to the detailed design. For conventional designs, the lack of knowledge during the initial stages is compensated through empirical knowledge. However, the lack of such empirical knowledge for novel design and advanced technology, results in the need for increased physics-based knowledge during the initial design process. In the research presented in this dissertation, the focus was on increasing knowledge in the early stages of the aeroelastic design process of a composite wing. As current state of art in aeroelastic tailoring does not include critical gust and fatigue loads, this thesis is focused on including critical gust loads and fatigue loading requirements in the preliminary aeroelastic optimization framework."
Source: TUDelft

High-cycle bending fatigue behavior of TC6 titanium alloy subjected to laser shock peening assisted by cryogenic temperature

"Aiming at the problem of high-cycle bending fatigue (HCBF) of aeroengine blades, the coupling strengthening process of laser shock peening assisted by cryogenic temperature was proposed. Transmission electron microscopy (TEM) and electron backscattered

diffraction (EBSD) was employed to characterize the microstructures, while the in-deep residual stress was tested by the XRD technique. Moreover, the HCBF behavior of fatigue specimens were also compared. The experimental results showed that cryogenic laser shock peening (CLSP) induced a higher-density of dislocation and deformation twins. The surface compressive residual stress (CRS) of the CLSP specimen was increased by 13.3% than that of the room temperature laser shock peening (RT-LSP) specimen."
Source: Elsevier

Fatigue Life of a Structurally Like Sample of a Fuselage Panel with an Aluminum–Glass-Reinforced Plastic Shell

"Comparative tests are performed during repeated tension of structurally similar samples of fuselage panels with a SIAL-3-1R laminated aluminum–glass-reinforced plastic (GRP) shell and a shell made of aluminum alloy 1163 sheets, and their fatigue life until cracking and complete failure is determined. Instrumental methods of monitoring the integrity of the structure with the registration of cracks up to 5 mm long and monitoring their growth have been tested."
Source: Springer Link

Perspectives for use of composite and polymer materials in aircraft construction

"It is one of the modern trends in the development of aviation at this stage of development of aircraft construction. This article discusses the technological aspects of the development of the use of composite materials in aircraft construction at the present stage of society development. The aircraft industry is one of the high-tech industries where modern polymer and composite materials play a decisive role. In this regard, the development of composite and polymer materials is the future of all the world aviation."
Source: IOP Science

An Integrated Computational Materials Engineering Predictive Platform for Fatigue Prediction and Qualification of Metallic Parts Built With Additive Manufacturing

"Described here is the development of a modeling tool enabling prediction of the performance of parts built with AM, with rigorous consideration of the microstructural properties governing the nucleation

and propagation of fatigue cracks. This tool, called DigitalClone® for additive manufacturing (DCAM), is an Integrated Computational Materials Engineering (ICME) tool that includes models of crack initiation and damage progression with the high-fidelity process and microstructure modeling approaches. The predictive model has three main modules: process modeling, microstructure modeling, and fatigue modeling. In this paper, a detailed description and theoretical basis of each module is provided. Experimental validations (microstructure, porosity, and fatigue) of the tool using multiple material characterization and experimental coupon testing for five different AM materials are discussed."
Source: ASME Digital

A Preliminary Study of Laser Directional Solidification for Potential Use in the Repair of Damaged Aviation Turbine Blades

"To achieve directional solidification repair of damaged aviation turbine blades, the directional growth repair layer was prepared using a Nd:YAG laser on the surface of superalloy DZ-22. A scanning electron microscope (SEM) was used to observe the microstructure. The element distribution was analyzed and the microhardness of the sample was measured. The results showed that primary dendrite size was proportional to the current and the pulse-width, and inversely proportional to the scanning speed. No obvious macrosegregation of the repair zone was evident."
Source: Kaunas University of Technology

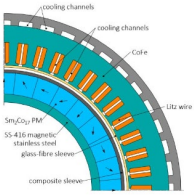
AIRCRAFT MANUFACTURING

Towards Information Management Framework for Digital Twin in Aircraft Manufacturing

"In this paper, an IM framework for DT in the aircraft manufacturing sector is proposed. The key phases and elements of IM are discussed on which the framework is constructed. The potential application of the framework along aircraft lifecycle is further discussed. The framework not only provides an effective approach to managing information but also

opens new research prospects in DT domain."
Source: Elservier

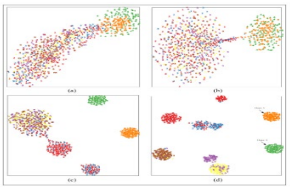
HYBRID-ELECTRIC AIRCRAFT



4MW Class High Power Density Generator for Future Hybrid-Electric Aircraft

"This paper describes the underpinning research, development, construction and testing of a 4MW multi-three phase generator designed for a hybrid-electric aircraft propulsion system demonstrator. The aim of the work is to demonstrate gravimetric power densities around 20 kW/kg, as required for multi-MW aircraft propulsion systems. The key design choices, development procedures and trade-offs, together with the experimental testing of this electrical machine connected to an active rectifier are presented. A time-efficient analytical approach to the down-selection of various machine configurations, geometrical variables, different active and passive materials and different thermal management options is first presented."
Source: IEEE Xplore

AIRCRAFT ACTUATORS



Novel topology convolutional neural network fault diagnosis for aircraft actuators and their sensors

"The variable working conditions and frequent turns make the aircraft actuator system prone to failure, seriously threatening flight safety. The identification of the airplane actuator system is critical for flight decisions and safety. Most fault diagnosis methods of actuators only focus on the actuators themselves, ignoring the disturbance caused by the fault of the actuator position sensor, which may easily lead to wrong decisions. In order to distinguish the actuator fault from its position sensor fault and identify the fault type accurately, an offline diagnosis method of convolutional neural network (CNN) with novel topology for processing time series is proposed."

Source: Sage Journals

SUSTAINABLE AVIATION

Sustainable aviation fuel prescreening tools and procedures

"This paper outlines the benefits and procedures for prescreening Sustainable Aviation Fuel (SAF) candidates before entering the official ASTM D4054 evaluation process. Specific properties are identified, that if not met, may result in extensive and costly efforts to correct if not recognized until later in the fuel development process. Hence, an approach with specific techniques that use low fuel volumes is suggested that enable (1) early estimates of critical properties and subsequently (2) direct measurement of these properties to guide fuel processing development prior to formally entering the ASTM evaluation process."
Source: Elsevier

Synergistic Technology Combinations for Future Commercial Aircraft Using Liquid Hydrogen

"Liquid hydrogen (LH2) has long been seen as a technically feasible fuel for a fully sustainable greener aviation future. The low density of the cryogenic fuel would dictate the redesign of commercial aircraft to accommodate the large tanks, which are unlikely to be integrated within the whole internal volume of the wing. In the ENABLEH2 project, the morphological aspects of a LH2 aircraft design are discussed and a methodology for rapid concept comparative assessment is proposed."
Source: ASME Digital

Toward net-zero sustainable aviation fuel with wet waste–derived volatile fatty acids

"With the increasing demand for net-zero sustainable aviation fuels (SAF), new conversion technologies are needed to process waste feedstocks and meet carbon reduction and cost targets. Wet waste is a low-cost, prevalent feedstock with the energy potential to displace over 20% of US jet fuel consumption; however, its complexity and high moisture typically relegates its use to methane production from anaerobic digestion. To overcome this, methanogenesis can be arrested during fermentation

to instead produce C2 to C8 volatile fatty acids (VFA) for catalytic upgrading to SAF."
Source: PNAS

Emotions and caring mediate the relationship between knowledge of sustainability and willingness to pay for greener aviation

"Sustainable initiatives continue to be a major focus of worldwide industries, and this has also become relevant within the aviation industry. As the move to incorporate and switch to sustainable practices increases, the question becomes whether passengers will be willing to pay more for sustainable aviation. Building upon prior research, the purpose of the current study was to identify which factors act as significant mediators between a participant's general knowledge of sustainability, their aviation-specific knowledge of sustainability, and their willingness to pay for greener aviation."
Source: Elsevier

SAFETY MANAGEMENT

Holistic view of safety culture in aircraft ground handling: Integrating qualitative and quantitative methods with data triangulation

"The complexity in aircraft ground handling operations has led this study to conduct a holistic assessment on the ground handling safety culture, with the purpose of preventing accidents at the workplace. This study adopts the multiple perspective assessment model that allows the integration of two mixed methods designed with data triangulation. The qualitative results generated seven themes and eight themes respectively, in which were later generalized and developed for quantitative instrument. The quantitative results showed the industry's safety culture performance and its influence on the safety performance outcome constructs."
Source: Elsevier

PASSENGER AIRCRAFT

Informational Support for the Sale of Passenger Aircraft

"Market analysis at aircraft plants permits improvement in product competitiveness. Informational support for marketing is necessary not only to create promising aircraft but also for sales purposes and as a service to airlines from aircraft manufacturers."

Source: Springer Link

eVTOL

A computational fluid dynamic acoustic investigation of a tiltwing eVTOL concept aircraft

"This investigation aims to develop an understanding of the aeroacoustic emissions associated with the non-linear interaction resulting from multi-rotor integrated propellers and a tiltwing eVTOL airframe. Acoustics is one of the key requirements of any future eVTOL aircraft certification, hence, an investigation was conducted into the baseline design, followed by an optimisation study aiming to reduce the amount of noise generated."

Source: Elsevier