

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

INDUSTRY



IATA: New industry statistics confirm 2020 as 'worst year on record' due to COVID-19 shutdown

"IATA's director general, Willie Walsh, said "2020 was a year that we'd all like to forget. But analysing the performance statistics for the year reveals an amazing story of perseverance. At the depth of the crisis in April 2020, 66 percent of the world's commercial air transport fleet was grounded as governments closed borders or imposed strict quarantines. A million jobs disappeared. And industry losses for the year totalled US\$126 billion. Many governments recognised aviation's critical contributions and provided financial lifelines and other forms of support. But it was the rapid actions by airlines and the commitment of our people that saw the airline industry through the most difficult year in its history.""

Source: Asian Aviation

AEROSPACE ENGINEERING



AVIATION



Aviation 4.0 Revolution

"The concept of Industry 4.0 arose in Germany in 2011 and spread to other countries. Industry 4.0 refers to a strategic step that was introduced by the German government seeking ways to change industrial manufacturing through digitalization and the development of new technologies. It introduced the world with new technologies such as cybersecurity, big data, the cloud, simulations, augmented reality, additive manufacturing, etc. The technologies also spread to other fields of business sectors such as aviation, agriculture, health, etc. Thanks to these technologies aviation sector underwent a change named Aviation 4.0. In this chapter, we first discuss the Industry revolution, Industry 4.0, and its technologies. Then, we explain Aviation 4.0 and technologies used in Aviation 4.0. Aviation 4.0 technologies are divided into three categories as follows: Ground services application in Aviation 4.0., Maintenance and production in Aviation 4.0, Unmanned aerial vehicles technology in Aviation 4.0."

Source: Springer Link

Intelligent Systems in Aviation 4.0 Industry

"Aviation 4.0 is related to the design of cyber-physical systems which can

AIR TRAFFIC



Global Air Traffic Control (ATC) Equipment Markets Report 2021

"Global market for Air Traffic Control (ATC) Equipment estimated at US\$5 Billion in the year 2020, is projected to reach a revised size of US\$6.7 Billion by 2026, growing at a CAGR of 5.2% over the analysis period.

Air traffic control (ATC) equipment is used in aviation industry to help in navigation and enable synchronized take-off and landing operations of aircraft. In addition to well-organized operations, ATC Equipment is used to avoid collisions and air-related accidents as well. Increasing traffic of freight and air passengers is resulting in increased aircraft activities and the need to construct new airports."

Source: Business Wire

Air Traffic Movement Outlook – Europe August 2021

"The operational and economic impact of COVID-19 on the aviation industry has been unprecedented. The pandemic caused a disruption across the whole aviation supply chain, affecting not only transportation but also sectors that depend on air transport in their distribution channels. With the global roll out of vaccination campaigns, air travel will resume. Several

Embraer Studying Next Generation Turboprop Concept for Regional Airline Market

"Embraer is studying the development of a next-generation turboprop aircraft with rear-mounted engines and a "jet-like" passenger experience, according to comments made by their top engineering executive during a live webcast hosted by the Brazilian airframe manufacturer results on Aug. 13.

The next-generation turboprop design was one of several concepts and new sustainability goals outlined by Embraer during the webcast, which includes a goal of making their aircraft 100 percent compatible with sustainable aviation fuel by 2030. Other goals include a 50 percent reduction in overall carbon emissions generated by their aircraft by 2040 and net zero emissions by 2050."

Source: Aviation Today

3D printing paves path to orbit with game-changing space applications

"While the scope of 3D printing has grown substantially within multiple industries, none has embraced the technology more innovatively than the aerospace and defence sector. At the forefront of modernisation, defence has seen 3D printing infiltrate the production of multiple platforms, such as the printing of aircraft parts, unmanned aerial vehicles (UAVs), submarine hulls, and components for armoured vehicles. The integration of this technology into production, otherwise known as Additive Manufacturing (AM), has not only resulted in enhanced prototyping but has now, in many cases, become an essential component of manufacturing processes. Although its successes on earth are evident, 3D printing has since launched itself in a stratospheric fashion toward the disruption of a new domain – space."

Source: Aerospace Technology

3D printed spare parts – a market worth US\$400 billion

"For several years, industry analysts have been predicting that 3D printed aircraft spare parts will be the next great technological leap in engineering. With Oliver Wyman – a leading international management consulting firm – predicting that by 2030, 3D printing could represent a US\$400 billion aviation and automotive manufacturing market, the innovative production method is a potential industry disrupter that will affect parts manufacturers, airlines, MROs, and passengers."

Source: Aerofime Hub

support humans by aviation information systems and by helping them to make decisions and to complete tasks autonomously. Within aviation 4.0 context, robotics, augmented reality, radio frequency identification, and internet of things are some components of fundamental concepts and aviation 4.0 employs information technology systems and sensors. These connected systems can interact with each other using standard internet protocols and analyze data to predict failures, configure themselves, and adapt to changes. For this aim, intelligent systems are used to interact with human users in changing and dynamic physical and social environments. An intelligent system is a machine with an embedded, internet-connected computer that can gather and analyze data and communicate with other systems. This chapter presents a literature review on the intelligent systems used in aviation 4.0 through tabular and graphical analyses.

Source: Springer Link

Blockchain Applications in UAV-Towards Aviation 4.0

"Aviation 4.0 is one of the most important contexts that started to attract many researchers in recent years. The main element of Aviation 4.0 is to employ and manage unmanned aircraft vehicles (UAVs). Employing UAVs in the Aviation 4.0 era will minimize the human dependency level of the aviation management systems. Embedding UAVs with Blockchain technology (BCT) might become an increasing phenomenon since the UAVs should be operated in an environment with many obstacles and possibilities of cyber-attacks. Therefore, using BCT, regulators in the whole world will be able to track the identities of UAVs flying in their territories. This chapter provides detailed information about the BCT and explains its implementation architecture, and the potential applications of this technology in the UAV in the Aviation 4.0 era are also stated."

Source: Springer Link

Digitalization on Aviation 4.0: Designing a Scikit-Fuzzy Control System for In-Flight Catering Customer Satisfaction

"The fourth industrial revolution is a vision that deeply affects the aviation industry in terms of cloud computing, artificial intelligence, digital transformation, and the internet of things. Although aviation 4.0 is at the beginning of its development, great competition begins to design suitable systems. Airline companies need well-designed software to use these digital

organizations continue to develop scenarios for recovery of traffic based on when international borders will open and how travel restrictions will be eased. However, with the resurgence of new variants in different countries and regions, there remains uncertainty over how soon traffic will recover and whether it will be gradual or if there will be spikes in traffic levels. The exact path (depth, length and shape) of recovery of air travel will depend upon various factors, including the requirements for quarantine at destination."

Source: IATA

AIR TRAVEL



Air Travel Forecast: When Will Airlines Recover from Covid-19?

"Here are the latest developments, as of August 2021.

- Projected global 2021 air traffic continues to drop, as the rapid spread of the Covid-19 Delta variant has dampened the outlook in many parts of Asia. Since our previous forecast, projected global revenue for this year in the "baseline" scenario fell about \$24 billion to \$255 billion, 38% of the industry's total revenue in 2019 (see panel 1 above). That follows a \$24 billion decrease in 2021 "baseline" revenue in the previous projection.
- However, there were some recent positive developments. Flights within Europe are picking up, thanks to increased vaccination rates and more countries opening their borders for travel (see panel 3). Meanwhile, loosening restrictions in the US have improved the country's air travel outlook for this year.
- Looking ahead to July 2022, India, Indonesia, and South Africa had the largest declines in projected airline passenger volume compared with our previous projection (see panel 4). Australia, Brazil, and Mexico saw the largest gains."

Source: Bain & Company

IATA Chart of the Week

"This week, we released air passenger and air cargo market analysis with July data, that reiterate the divergence in air passenger and cargo markets. While industry-wide revenue passenger-kilometres

Pratt & Whitney to develop Dash 8 hybrid-electric demonstrator by 2024

"The Canadian branch of Pratt & Whitney announces the development of the De Havilland Canada Dash 8 demonstrator with hybrid-electric engines that will fly by 2024.

According to the company, the demonstrator is going to feature a 30% reduction in fuel burn and CO2 emissions in comparison with regular turboprop-powered aircraft."

Source: Aerotime Hub

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.

"When landing, aircraft engines are throttled way back, and so they are very quiet. Any other source of noise, like that from the wings, becomes quite noticeable to the people on the ground," said Dr. Darren Hartl, assistant professor in the Department of Aerospace Engineering. "We want to create structures that will not change anything about the flight characteristics of the plane and yet dramatically reduce the noise problem."

Source: Texas A&M Engineering

To de-ice planes on the fly, researchers aim to control rather than combat ice formation

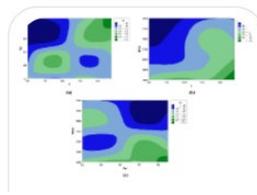
"Ice formation on airplanes can be both an aggravation and a health hazard. Watching an airport departure board for delays because of ice is familiar territory for winter travelers, and the National Transportation Safety Board reports a total of 52 in-flight accidents attributed to ice formation between 2010 and 2014, resulting in 78 fatalities. De-icing a plane at the airport prior to takeoff is possible, but planes also experience plummeting temperatures and rapid ice formation in flight. Once ice forms on the wings, it can greatly inhibit a pilot's ability to safely operate the aircraft. Equipping planes with the ability to remove ice while flying at altitudes between 35,000 and 42,000 feet would provide a better set of tools to maintain safety, the researchers believe."

Source: Virginia Tech

transformation processes for data management and to receive customers' feedback to interpret them in the most suitable way. They should also develop programs that can be adapted to their pre-flight and in-flight systems to measure customer satisfaction and interpret crisp, linguistic, or fuzzy data. In this study, the catering service evaluation system for customers is designed and an interface is developed to be used in the aviation 4.0 industry. The study contributed to the literature by proposing a new fuzzy control system for catering customer evaluation and by designing an interface and coding system with a special SciKit fuzzy logic toolbox on Python environment. The implementation and the design of the system have been simulated several times and the results are evaluated by graphical and visual means."

Source: Springer Link

ENGINEERING



Surface roughness optimization in milling operation for aluminum alloy (Al 6061-T6) in aviation manufacturing elements

"Abstract Purpose

This paper aims that optimization parameters depending on machining processes examine to define for the milling process of AL 6061-T6 aluminum alloy used in the aviation industry.

Design/methodology/approach

The Taguchi method was used to study the optimal parameters. Furthermore, the effects of machining parameters on surface roughness were also evaluated by performing variance analysis. Optimum parameter levels were determined by Signal/Noise analysis."

Source: Emerald

The Application of Disturbance-Observer-Based Control in Breath Pressure Control of Aviation Electronic Oxygen Regulator

"The electronic oxygen regulator (EOR) is a new type of aviation oxygen equipment which uses electronic servo control technology to control breathing gas pressure. In this paper, the control method of EOR was studied, and the dynamic model of the aviation oxygen system was

(RPKs) are still 53.1% lower compared with pre-crisis level (July 2019), industry-wide cargo tonne-kilometres (CTKs) remain robust, hovering above the pre-crisis level for the eighth consecutive month.

Today's chart looks at the details of international air passenger and cargo traffic on different routes."

Source: IATA

Air Passenger Market Analysis

"Rebound in global air travel continued for another month supported by willingness to travel during the northern hemisphere summer. Industry-wide revenue passenger kilometres (RPKs) fell by 53.1% in July 2021 vs. July 2019 compared with a 60.0% contraction in June. In month-on-month terms, RPKs picked up by a robust 8.0%. • Amongst key domestic markets, Russia posted the best outcome for another month, supported by booming domestic tourism. On the other hand, recovery reverted in Australia amidst new travel restrictions imposed to fight new COVID wave. International traffic improved slightly across all regions, but it remained well below 2019 levels. • Bookings for August travel have been falling. The weakness has been largely driven by China domestic market where the latest COVID outbreak resulted in a shutdown of many important routes."

Source: IATA

Global Aviation Satcom Growth Opportunities

"The aviation satcom market is poised for improved flight operations and connectivity that will improve passenger experience, enhance safety, and increase the efficiency of flight operations of airlines. This study covers the global aviation satcom market and provides a 10-year forecast from 2020 to 2030. The total aviation satcom market was worth \$527.2 million in 2020 and, considering the impact of COVID-19, it is expected to expand at a Compound Annual Growth Rate (CAGR) of 3.3% until 2030. This research covers the satcom service used for cockpit, cabin, and IFEC. Cockpit accounts for 80.9% of the market share. The share of cockpit satcom is expected to increase, as the airline will add more next-generation aircraft in the existing fleet, whereas the demand for cabin and IFEC is expected to increase, as airlines want to provide extra services to customers. This will not only increase the passenger experience and process efficiency but also help in making aircraft more connected during the flight to further reduce the chances of losing signals."

Source: Frost & Sullivan

ELECTRIC AIRCRAFT



Airlines Show Growing Interest in Electric and Hydrogen-Powered Aircraft

"Several major commercial airlines made headlines this week regarding new investments, partnerships, and ongoing studies of electric and hydrogen-powered aircraft. United Airlines and Icelandair signed separate agreements for next-generation aircraft and hydrogen, while Delta Air Lines CEO commented on the international carrier's interest in the development of electric vertical takeoff and landing (eVTOL) aircraft. The latest investment in next-generation aircraft from United Airlines came in the form of a July 13 announcement confirming a new investment in electric aircraft startup Heart Aerospace. United Airlines Ventures (UAV), along with Breakthrough Energy Ventures (BEV) and Mesa Airlines made a joint investment of \$35 million toward the development of Heart Aerospace's 19-seater ES-19 aircraft."

Source: Aviation Today

What Challenges Still Exist for Certifying Electric Aircraft

"As the aviation industry shifts towards sustainability, more manufacturers are developing electric engines to move away from jet fuel. However, despite years of developments on the industry side, civil aviation regulatory authorities have yet to actually certify one of these aircraft.

The aircraft manufacturers are at the mercy of regulatory authorities when it comes to certification and some say it is the only thing stopping them from entering into service. During a panel at the Vertical Flight Society's Electric Aircraft Symposium on July 21, industry and regulatory experts explained what challenges still exist for electric aircraft certification."

Source: Aviation Today

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

established. A disturbance-observer-based controller (DOBC) was designed by the backstepping method to achieve the goal of stable and fast breath pressure control. The sensitivity function was proposed to describe the effect of inspiratory flow on breath pressure. Combined with the frequency domain analysis of the input sensitivity function, the parameters of the DOBC were analyzed and designed. Simulation and experiment studies were carried out to examine the control performance of DOBC in respiratory resistance and positive pressurization process under the influence of noise and time delay in the discrete electronic control system, which could meet the aviation physiology requirements. The research results not only verified the rationality of the application of DOBC in the breath control of EOR, but also proved the effectiveness of the control parameters design method according to the frequency domain analysis, which provided an important design basis for the subsequent study of EOR."

Source: MDPI

Buckling under the action of loading by aerodynamic and inertial forces during ground track tests of aviation equipment.

"The article analyses the choice of a rational layout of the test object with a propulsion system (PS). One of the design examples of calculating the longitudinal stability and strength of the structure is given. The purpose of the article is to solve the problem of bending the elastic line of a cantilever tubular rod with a hinged termination during tests of a propulsion system for various aircrafts. On the example, the estimates of the approximate test object, accelerated on the track to a speed of 1200 m/s, are carried out. The aerodynamic loading of the structure of the mobile track installation is considered using the methods of mathematical modelling and the development of an algorithm for the numerical solution of the problem of bending the elastic line of a cantilever tubular rod. The deflection from the forces of external and internal loads of the outer shell of a movable track installation is considered, provided that the diameter of the outer contour is equal to the minimum and it is constant along the entire length."

Source: Ebsco Host

Evaluation of CFD for Simulation of High-Supersonic Control-Surface Effectiveness

Global Airport Digitalization Growth Opportunities

"The airport digitalization market is a growth market estimated to generate more than \$8.52 billion in revenue by 2030. A highly fragmented market, the top five companies contributed approximately 55% to the global revenue market in 2020. This figure is not expected to change significantly over the forecast period (2021–2030). The top companies in this market by estimated revenue include SITA, ADB Safegate, and Amadeus.

The aviation industry was severely affected by the COVID-19 pandemic, with overall 50% reduced capacity, 60% drop in passenger numbers, and \$125 billion loss in airport revenues in 2020. Domestic traffic, however, is expected to show greater resilience than international traffic in the short and medium term. How quickly airports and airlines can recover from the pandemic is critical to the market growth. The increasing pace of vaccination globally will also have a positive effect on the market, but passenger traffic is expected to achieve pre-pandemic levels only by 2024."

Source: Frost & Sullivan

path to autonomous flight and the obstacles it must still surpass to become a reality."

Source: Aviation Today

SUSTAINABLE AVIATION



Technology is Available That Could Lower Aircraft Emissions Today, Not Ten Years from Now

"Airlines and aircraft makers have all committed to zero emissions pledges that pump funding and research into cleaner technologies like electric and hydrogen-powered aircraft and sustainable aviation fuels. The problem is that none of these solutions can be implemented on a wide scale today.

While this means that some of the emission reduction estimates tied to these technologies are still decades away, there are technologies available right now that can contribute to emissions reductions."

Source: Aviation Today

AIR SPACE INFRASTRUCTURE



Is the biggest invisible infrastructure project on course for arrival?

"Modernisation improvements can employ the latest technology, reduce emissions, result in more direct routes and, potentially, mean an end to stacking - a phenomenon familiar to many travelers when circling above a city before coming into land (an annoying delay, no matter how good the view).

The importance of these projects is undeniable. The Airspace Change Organising Group estimates that modernisation in the UK could reduce future CO2 emissions by up to 20% by 2050. This makes it a vital component in the industry's plans to decarbonise and reach net zero.

But in the face of a global pandemic and aircraft largely grounded for the significant part of a year, what are the prospects for getting modernisation off the ground?"

Source: Aerotime Hub

ELECTRIC AIRCRAFT

"As part of studying the ability of Computational Fluid Dynamics (CFD) to accurately model important flow physics in the high-supersonic Mach number range, control-surface effectiveness on an entry vehicle for Mars exploration was examined. As with several other important flow regimes studied under the CFD as Surrogate for Wind Tunnel Testing at High Supersonic Speeds Project, a combined CFD and wind-tunnel study of a proposed Mars landing configuration was undertaken. The testing was performed in high-speed test section of the NASA Langley Research Center's Unitary Plan Wind Tunnel. The CFD team was an integral part of the overall evaluation team throughout the model development and test planning process and performed pre-test computations predicting the results of the testing. For the CFD predictions of the model in the wind tunnel, the flow into the test section was imposed as a boundary condition. The imposed inflow was based on a previous flow characterization study and companion CFD simulating the flow from the settling chamber through the test section. This paper presents a description of the control-surface effectiveness testing and the resulting aerodynamic data."

Source: Aerospace Research Central

Scaling of an Aviation Hydrogen Micromix Injector Design for Industrial GT Combustion Applications

"Decarbonising the energy grid through renewable energy requires a grid firming technology to harmonize supply and demand. Hydrogen-fired gas turbine power plants offer a closed loop by burning green hydrogen produced with excess power from renewable energy. Conventional dry low NOx (DLN) combustors have been optimized for strict emission limits. A higher flame temperature of hydrogen drives higher NOx emissions and faster flame speed alters the combustion behavior significantly. Micromix combustion offers potential for low NOx emissions and optimized conditions for hydrogen combustion. Many small channels, so-called airgates, accelerate the airflow followed by a jet-in-crossflow injection of hydrogen. This leads to short-diffusion flames following the principle of maximized mixing intensity and minimized mixing scales. This paper shows the challenges and the potential of an economical micromix application for an aero-derivative industrial gas turbine with a high-pressure ratio. A technology transfer based on the micromix combustion research in the ENABLEH2 project is carried out. The



Electric Eel demonstrates hybrid electric flight

"Ampaire's Electric EEL technology demonstrator, a modified six-seat Cessna 337, runs on battery power and a conventional combustion engine. The company is developing a line of hybrid electric powertrain upgrades that it said will reduce emissions and operating costs by as much as 25 percent initially.

In a statement, Ampaire test pilot Justin Gillen commented: "Today's flight to Wick went without a hitch, flying at 3,500 feet and 120mph. The Electric EEL is easy to fly and we've achieved a total five hours here so far."

Source: The Engineer

RESEARCH FACILITY



Purdue to build \$41m hypersonic research facility

"The planned \$41m Hypersonic Applied Research Facility (HARF) will house two wind tunnels, including the only Mach 8 quiet wind tunnel in the world as well as a hypersonic pulse (HYPULSE) shock tunnel. According to Purdue, the tunnels recreate different scenarios such as spacecraft re-entry or missile flight through the atmosphere as well as replicating engine conditions for extremely high-speed propulsion."

Source: The Engineer

eVTOL



Overair Releases New Details About its eVTOL Aircraft

"The electric air taxi company Overair is breaking its silence on its electric vertical takeoff and landing (eVTOL) aircraft and debuting the design of Butterfly.

Butterfly will be an all-electric aircraft with a range of over 100 miles and 200 mph top speed. It will have zero carbon emissions and has a robust design made to withstand challenging weather conditions. Its payload will be able to

driving parameter for ground use adaption is an increased fuel orifice diameter from 0.3 mm to 1.0 mm to reduce cost and complexity. Increasing the fuel supply mass flow leads to larger flames and higher emissions. The impact was studied through RANS simulation and trends for key design parameters were shown."

Source: Springer Link

Simultaneous use of Ground Reflection and Lateral Attenuation Noise Models

"Ground reflections and lateral attenuation due to refraction and scattering are two effects of acoustic propagation that can strongly influence noise received by an observer. Software that predicts community aviation noise can be reliant on ground reflection models to predict noise at receivers. However, empirical lateral attenuation models often include the influence of ground reflections implicitly, so a double-bookkeeping error can exist if one is used together with a reflection model. An accounting method that reconciles this bookkeeping issue for the Chien and Soroka reflection model and a Society of Automotive Engineers lateral attenuation model is presented. Importance to emerging supersonic civil aircraft is discussed."

Source: Aerospace Research Central

COMPOSITION AND STRUCTURE



Influence of solder and flux composition on thermal stability of brazed PDC cutters

"The process of induction brazing of diamond-carbide cutters with various silver solders and fluxes with different proportions of active substances is considered in this paper. The influence of heating during brazing on the thermal stability of polycrystalline diamond is also investigated. A methodology for testing brazed cutters is developed and the results of the wear dependence from the applied solders and the soldering mode are obtained. It is established that at hold-up time at temperature over 800°C for more than 1 min takes place destruction of the diamond plate. Due to the significant alloying of silver solders with manganese and nickel, a dependence of the solder wetting of the diamond-hard alloy cutters (DHAC) carbide substrate surface from the composition of the

accommodate five passengers, a pilot, and cargo topping out at 1,100 pounds."

Source: Aviation Today

Joby Completes Longest eVTOL Test Flight to Date

"The electric air taxi company Joby Aero completed its longest test flight to date of its full-scale prototype aircraft flying over 150 miles on a single charge of the company's lithium-ion batteries, the company announced on July 27.

"We've achieved something that many thought impossible with today's battery technology," JoeBen Bevirt, founder and CEO of Joby, said in a statement. "By doing so we've taken the first step towards making convenient, emissions-free air travel between places like San Francisco and Lake Tahoe, Houston and Austin, or Los Angeles and San Diego an everyday reality."

Source: Aviation Today

UAV



Drone project could lead to microwave propulsion

"Previous analyses of this kind were carried out decades ago and mostly considered microwaves of a low frequency of a few gigahertz. Power transmission efficiency increases as the operating frequency is raised, so the team behind this latest research used microwaves with a relatively high frequency (28GHz). The team's drone weighed roughly 0.4kg and hovered for 30 seconds at a height of 0.8m above the source of a microwave beam.

"We used a sophisticated beam-tracking system to ensure that the drone received as much of the microwave power as possible," lead author Kohei Shimamura said in a statement. "Moreover, to further increase the transmission efficiency, we carefully tuned the phase of the microwaves using an analogue phase shifter that was synchronised with GPS units."

Source: The Engineer

Iris Automation and UAV Navigation Partner for Drone DAA and Autopilot System

"Iris Automation and UAV Navigation are integrating their autopilot and detect and avoid (DAA) system to allow unmanned aircraft to find uncooperative aircraft in their airspace and autonomously take

fluoroborate flux is found. The best results are obtained when using PV209 or PV209X flux, which have a minimum F/B ratio, i.e. with lower fluorine content. When choosing solders, preference should be given to alloys based on silver with a melting point no higher than 700°C, alloyed with manganese and nickel."

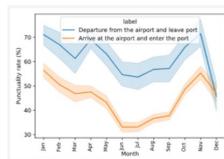
Source: Taylor & Francis

Investigation of the Thermal Hardening Impact by the T1 Mode on the Structure and Properties of Pressed Shapes from a Promising Super-Strength Alloy of the Al-Zn-Mg-Cu System

"We have carried out complex studies of the structure and properties after thermal hardening by the T1 mode of pressed shapes 20–40 mm thick from a new promising high aluminum alloy V-1977 based on the Al-Zn-Mg-Cu system with the addition of Zr. It has been found that, after aging according to the T1 mode, in the pressed shapes of alloy V-1977, a homogeneous structure and a uniform distribution of finely dispersed nanocrystalline particles of the η' phase and dispersoids of the β' phase ($ZrAl_3$) with spherical shape are observed. Owing to this, the required level of mechanical, corrosion, and resource characteristics for parts of modern aviation and missile technology is achieved. Thus, the V-1977 alloy is shown to be competitive in comparison with the widespread serial alloy V95och and a domestic analog of alloy V96ts-3pch."

Source: Springer Link

ARTIFICIAL INTELLIGENCE



Identification of Weather Influences on Flight Punctuality Using Machine Learning Approach

"One of the top long-term threats to airport resilience is extreme climate-induced conditions, which negatively affect the airport and flight operations. Recent examples, including hurricanes, storms, extreme temperatures (cold/hot), and heavy rains, have damaged airport facilities, interrupted air traffic, and caused higher operational costs. With the development of civil aviation and the pre-COVID-19 surging demand for flights, the passengers' complaints of flight delay increased, according to FoxBusiness. This study aims to discover the weather factors

action to avoid them, according to an Aug. 16 press release.

UAV Navigation will use Iris Automation's Casia DAA software in its VECTOR autopilot systems to enable these operations, according to the release."

Source: Aviation Today

System trains drones to fly around obstacles at high speeds

"The World Robotics report shows that Europe is the region with the highest robot density globally, with an average value of 114 units per 10,000 employees in the manufacturing industry. For more facts about robots watch IFR's video news about Europe in one minute."

Source: MIT

Algorithm trains high-speed drones to avoid obstacles

"The algorithm was tested in the context of autonomous drone racing, where crashes are a common occurrence due to unpredictable aerodynamics at high speeds, but the team believes the algorithm could be used to improve drones' performance in time-critical operations and complex environments beyond the race course such as searching for survivors in a natural disaster.

Researchers said the new algorithm did not always keep drones ahead of competitors, in some cases choosing to slow a drone down to handle curves or to save energy in order to speed up and overtake its rival."

Source: The Engineer

TRAVEL AFTER PANDEMIC



Working together to make travel safe and easy

"The agreement incorporates SYNLAB's extensive lab network into IATA Travel Pass. This will enable airline passengers to access SYNLAB's broad and secure COVID-19 testing services, benefiting from its international capabilities.

IATA Travel Pass allows passengers to locate authorized laboratories at departure locations to get tested for SARS-CoV-2 as required by border and health authorities. After testing, SYNLAB will provide passengers with their certified test results directly through the IATA Travel Pass. The app checks the result against the IATA Travel Pass registry of national entry requirements to produce an "OK to Travel" status."

Source: IATA

affecting flight punctuality and determine a high-dimensional scale of consequences stemming from weather conditions and flight operational aspects. Machine learning has been developed in correlation with the weather and statistical data for operations at Birmingham Airport as a case study. The cross-correlated datasets have been kindly provided by Birmingham Airport and the Meteorological Office. The scope and emphasis of this study is placed on the machine learning application to practical flight punctuality prediction in relation to climate conditions. Random forest, artificial neural network, support vector machine, and linear regression are used to develop predictive models. Grid-search and cross-validation are used to select the best parameters."

Source: MDPI

Deep Spatio-Temporal Neural Networks for Risk Prediction and Decision Support in Aviation Operations

"The maintenance and improvement of safety are among the most critical concerns in civil aviation operations. Due to the increased availability of data and improvements in computing power, applying artificial intelligence technologies to reduce risk in aviation safety has gained momentum. In this paper, a framework is developed to build a predictive model of future aircraft trajectory that can be utilized online to assist air crews in their decision-making during approach. Flight data parameters from the approach phase between certain approach altitudes (also called gates) are utilized for training an offline model that predicts the aircraft's ground speed at future points. This model is developed by combining convolutional neural networks (CNNs) and long short-term memory (LSTM) layers. Due to the myriad of model combinations possible, hyperband algorithm is used to automate the hyperparameter tuning process to choose the best possible model. The validated offline model can then be used to predict the aircraft's future states and provide decision-support to air crews. The method is demonstrated using publicly available Flight Operations Quality Assurance (FOQA) data from the National Aeronautics and Space Administration (NASA)."

Source: ASME

Annihilate Unsighted Dots in Operating and Aviation Using Artificial Intelligence

"With the new trends in technology, artificial intelligence is playing a major

Passengers confident in onboard health safety

"IATA's latest passenger survey conducted in June 2021, reported that most air travelers are confident about the safety of air travel and support mask-wearing in the near-term."

Source: IATA

Follow WHO guidance on cross-border travel

"IATA called on states to follow new guidance on travel from the World Health Organization (WHO). The guidance recommends a risk-based approach to implementing measures related to COVID-19 and international travel."

Source: IATA

CONNECTIVITY



CAAC Validates JetWave Connectivity System for Airbus A320s in China

"The Civil Aviation Administration of China (CAAC) has approved a validation of Honeywell's MCS-8420 JetWave satellite connectivity system for Airbus A320 aircraft.

A320s using the MCS-8420 system in the CAAC-controlled flight information region (FIR) will connect to China's Ka-band satellite network, according to an Aug. 9 press release. The validation was one of the first issued by CAAC on a European Union Aviation Safety Agency (EASA) Supplemental Type Certificate (STC) for commercial aviation connectivity."

Source: Aviation Today

role in the advancement of machines and software's. Remote sensing, robot control, medical diagnosis, and electronic trading are the various activities that are performed with the use of structured algorithms using this technology. One such main demand in today's world is its use in the field of automated driving and aviation. In automated driving, we need to cover a lot of aspects and evaluate each situation to improve the performance if we are completely depending on this innovation. In the long term, automated driving has the potential to improve traffic safety and follow rules and regulations to the extent, thus, minimizing accident deaths and loss of public property. In the aviation scenario, a number of tasks are initiated using this technology such as customer queries, facial recognition of passengers, baggage check-in, autopilot mode, and aircraft fuel optimization. Also, a huge amount of data is collected and carefully examined so that certain steps in the future can be taken to ensure safe journey and quality travel. The flight's scheduling on various routes is also determined, and our idea here is to perform end-to-end passenger identification such as biometric impression is made essential after booking of the flight, and during check-in, it is again checked. Proper techniques and filtered data will be used to enhance this process, and sorted information will be provided to the pilots regarding the present condition of the aircraft and the weather conditions at certain heights or regions. AI demonstrates many unwitting consequences for the foreseeable future in the context of driving."

Source: Springer Link

Recent trends and challenges in predictive maintenance of aircraft's engine and hydraulic system

"Predictive maintenance (PM) strategies are based on real-time data for diagnosis of impending failure and prognosis of machine health. It is a proactive process, which needs predictive modeling to trigger an alarm for maintenance activities and anticipate a failure before it occurs. Various industries have adopted PM techniques because of its advantage in increasing reliability and safety. But in the aviation industry, expectations for safety are increased due to its high cost and danger to human life when an aircraft fails or becomes out of service. Flight data monitoring systems are regularly implemented in commercial operations using artificial intelligence (AI) algorithms, but there is limited work specific to safety critical systems

such as engine and hydraulic system. This paper provides a survey of recent work on PM of aircraft's hydraulic system and engine, identifying new trends and challenges. This work also highlights the importance of PM and state-of-the-art data pre-processing techniques for large datasets."

Source: Springer Link

AIRCRAFT MAINTENANCE



The Prognostics Approaches and Applications in Aircraft Maintenance Optimization: Review

"Aircraft servicing or Maintenance is a critical environment that must be given due consideration because it is directly related to passenger safety. As a consequence, maintenance operations are crucial in assessing the aircraft's fitness. Since any aircraft's structural failure can result in fatalities, vehicle health management is critical in the aviation industry to prevent and detect structural damage at an early stage. This study examines the literature on how prognostics have been used to improve the Maintenance of aircraft and discusses the study limitations for improving aircraft maintenance in the commercial aviation industry. Moreover, it highlights the state of the art in the application of prognostics to enhance maintenance of aircraft is then double-checked, possible opportunities and issues are explained and investigated. Additionally, it shed alight on the big prospect of the Methodologies and Techniques for Predicting Remaining Useful Life and future directions for further research."

Source: IEEE Xplore

DATA ANALYTICS



Framework for Mid-Air Traffic Collision Detection Using Data Analytics

"Flight safety is a wide area ranging from human life to aircraft. One of the biggest risks is lack of communication or communication failure between the pilot and air traffic control tower can lead to flight delays and catastrophic accidents not just destroying the aircraft but also losing

hundreds of human lives. The purpose of this study is the betterment of aircraft safety. We developed a system using data analytics, which creates an environment in the aircraft's cockpit by providing the pilot with a visual system. It allows identifying the neighboring aircraft that lies in the proximity of one aircraft. Generating the alert and warning that other aircraft comes in that radius. This system tries to ensure the maximum possible safety of the aircraft in a mid-air collision."

Source: Springer Link

AVIATION PARKING



Fuzzy Logic Controller for Aviation Parking with 5G Communication Technology

"The fourth industrial revolution is the current trend of automation. Devices that are connected with multiple networks are still unable to connect fastly, and the world is looking for the application of the massive lot, whereas the 5G network is enabled to meet the demand. It is a dire need to automate the aviation industry with this technology. So, in this research, a Fuzzy Logic Controller (FLC) for the parking of aircrafts is proposed and all the calculations are done using the fuzzy logic controller toolbox of MATLAB. An aircraft can be parked without human interference by seeking the information of flights and the availability of parking space in the garage along with the clearance of the runway. Membership values of FLC are taken in the form of a neutrosophic number and then converted into a fuzzy number using the accuracy function. Results evaluate that 5G will automate the Aviation automation industry with precision and efficiency in operation. 5G also has an ability of flexibility support to the upcoming technologies which are unknown to us."

Source: Springer Link

SUSTAINABLE AVIATION



Sustainable Supply Chain of Aviation Fuel Based on Analytical Hierarchy Process

(AHP) Under Uncertainty of q-ROFSs

"Nowadays, sustainable supply chain (SSC) selection of aviation fuels is one of the hot topics around world aviation industries. Existing of diverse intuitive and interrelated criteria that should be considered during the decision-making process turned it into one of the complex decision-making problems. Also, there exists tremendous uncertainty around all parameters and alternatives in the problem. The q-Rung Orthopair Fuzzy Sets (q-ROFSs), which is a generalization of Intuitionistic Fuzzy Sets (IFSs), provide a more proper space for decision-makers. q-ROFSs capable of expressing uncertain information with more flexibility. In this article it is tried to show the reliability of applying the analytical hierarchy process (AHP) in q-ROFSs environment for SSC of aviation fuel. First, properties of q-ROFSs are evaluated then the AHP method is discussed in detail based on q-ROFSs. Afterward, by considering the hardness of the SSC in aviation fuel problem, it is proposed a MAGDM method based on AHP in q-ROFSs environment. Finally, an application of AHP based on q-ROFSs to solve the SSC of the aviation fuel problem is presented to test the effectiveness of the proposed method."

Source: Springer Link

Evaluating refinery configurations for deriving sustainable aviation fuel from ethanol or syncrude

"This study presents novel comprehensive comparisons of alternative refinery configurations for sustainable aviation fuels (SAF) from bio-ethanol or Fischer-Tropsch bio-syncrude through techno-economic evaluations. Simulations were conducted in Aspen Plus, followed by evaluating the minimum aviation-fuel selling price (MINAFSP) at specific feedstock price, and the maximum tolerable prices of ethanol or syncrude at incentivised SAF prices. FT-syncrude refining scenarios considered (i) a basic refinery, (ii) incorporating synthetic aromatics, (iii) incorporating synthetic alkanes, and (iv) combined technology. Scenarios for refining bio-ethanol to higher alkanes considered (i) the base Heveling Process, (ii) Hybrid Process, (iii) the patented PNNL process, and (iv) the pre-upgrading of ethanol to butanol."

Source: Elsevier



Application Of Munich Agile Concepts For Mbse As A Holistic And Systematic Design Of Urban Air Mobility In Case Of Design Of Vertiports And Vertistops

"This paper will adopt the Munich Agile Concepts (MAGIC) on the design of Vertistops and Vertiports (Verti-X) for Urban Air Mobility (UAM) Systems. Vertiports and Vertistops are single or multi-landing spaces for air taxis, which are electric-powered vertical take-off and landing (eVTOLs) aircraft. The target of this paper is to apply a holistic approach how to design so called Verti-X in a holistic and system of system method from the Requirement-, Function-, Architecture- and the Implementation phase. The MAGIC approach contains all of the required phases which are necessary to build up such a complex design of Verti-X. Therefore, based on the literature survey, we have determined the key components of the Verti-X design with a thorough requirement analysis. Then, we have followed the existed criteria and regulations to design a valid and verified Verti-X which fulfills all the requirement. Furthermore, the focus of this paper is to apply the first four phases of MAGIC regarding the requirement, function, architecture and the implementation of such Verti-X Design."

Source: Cambridge Core

ENGINEERING CONTROL SYSTEMS



Review on Engineering Control Systems in Aircraft and Unmanned Satellites

"Engineering control systems for satellites and drones, as drones are complex technical systems in which no pilot sits. But the name of these planes does not fully indicate the way in which these planes operate. In fact, it does not direct itself completely, but also needs a pilot who sits in the guidance station on the ground, and controls it remotely in a wireless way by means of engineering control,

engineering robots, engineering electronic devices and remote control. In fact "Drones" require that they have a pilot at a ground station. This ground pilot is responsible for driving it, ensuring that it does not occur in any accidents, and intervenes in emergency situations. But he does not do this with a joystick like a toy plane's, but rather he has to determine the plane's trajectory points, and then the plane directs itself according to these coordinates using its automatic system, that is under the guidance of its automated flight system. "This system is not very different from that of large, modern passenger transport aircraft, which fly long distances completely automatically using autopilot," says Schmidt, an aviation expert.."

Source: Journal of Control System and Control Instrumentation

For more articles or in-depth research, contact us at library@sutd.edu.sg
An SUTD Library Service©2021