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ASRC News

AVIATION SERVICES RESEARCH CENTRE

QUARTERLY NEWSLETTER OF THE AVIATION SERVICES RESEARCH CENTRE

ASRC Christmas Party 2024

In this big issue

ITC Officials Visit To ASRC

In November the Aviation Services Research Centre (ASRC) welcomed key officials from the Hong Kong Government's Innovation and Technology Commission (ITC). The ITC provides funding to support research and development via several programmes including the Innovation and Technology Support Programme (ITSP), platform and seed funding scheme, and Partnership Research Programme (PRP), as well as for nurturing technology talent via the Research Talent Hub (RTH). Since its establishment the ASRC has successfully secured significant levels of funding from these programmes helping to support many projects in conjunction with it's industrial sponsorship, where several of the projects are showcased on the InnovationHub@HK.

During the visit, ITC's Chief Science Advisor, the Senior Manager for R&D Centres and an Electronics Engineer specializing in AI engaged in discussions with ASRC staff and members, including Boeing, HAECO, and HAESL, with a focus on active ITC-funded projects as well as future initiatives and exploratory research, emphasizing the urgent need for innovation & technology (I&T) in MRO. The officials also toured ASRC's facilities to observe the research projects in action, reinforcing the commitment to advancing aviation I&T.

Zhuhai Aviation Exploration Visit

ASRC staff members MA Yandy and TAO Ziyu participated in a site visit with the Hong Kong Aviation Industry Association (HKAIA) to explore the Zhuhai Aviation Industry Park and Zhuhai Airport on October 29, 2024. The visit was a valuable opportunity to stay updated on the latest developments in the Zhuhai aviation sector and to strengthen connections with industry peers. During the visit, the primary goals were to expand our professional network and engage with aviation experts.

Sustainability Corner

Innovation Summit in Hong Kong

On October 22, 2024, the ASRC was represented at the Innovation Summit in Hong Kong, sponsored by Schneider Electric, where sustainability and decarbonization were prominent themes on the agenda.

Hong Kong was ranked 38th in the 2023 Corporate Knights Sustainable Cities Index with a score similar to Shenzhen and Singapore but far from the leading Scandinavian countries. Preeminent Research & Development organizations in Hong Kong, such as the ASRC, are striving to raise the territory's score in emission reductions, air quality, resilience to climate change and use of renewable energy.

This summit served as an excellent platform for assessing the ASRC position in the ever-evolving sustainability landscape. The event featured thought leaders, innovators, and industry experts who shared their insights on best practices and emerging trends.

The summit emphasized the importance of energy accountability and prioritization of investments for operational efficiency, resilience and sustainability. The panel sessions focused on practical strategies for reducing carbon footprints, enhancing resource efficiency, and promoting sustainable practices valid for various sectors. The keynotes speeches were particularly insightful for us. One session provided a deep dive into the move from Reactive Maintenance to Predictive Maintenance operated by Schneider Electric in the building management sector. This move is very similar to the objective pursued by the aviation MRO sector. Another speech provided insight into the sustainability of data center during the entire lifecycle.

This rich exchange of knowledge stirred enthusiasm among participants, igniting fresh ideas and collaborative potentials. Overall, the summit was a great opportunity to refine our sustainability strategy and to engage with others who share similar goals.

Mr Nicolas Detalle is a PRF in the Data, Materials and Instrumentation Stream of the ASRC

Project Descriptions

ITC-ITF / ASRC Member Funded Open Source Project

Aerostructure Digital Twin (AeDiT)

Recording and displaying the history of maintenance on an aircraft is presently very much a paper legacy process. However there is a push within the MRO industry to implement a platform based software system to record, display and communicate maintenance activities on the airframe. The ASRC have commenced a project to develop a better way to record this data. We will investigate novel methods of damage detection and geolocation of the data using active thermography, ultrasound, enhanced visual methods and hyperspectral scanning with a drone. The data will be recorded and displayed on a 3D model of the aircraft. Once completed, the CAD model will be used to accurately record a maintenance activity with the option of sharing the data with the OEM should stress analysis be required when considering the repair.

Recycling Metal Chips into AM Feedstock (RecAM)

During the manufacture of aerostructure or aeroengine monolithic parts a large amount of machined chips is produced, with as much as 95% of the raw material being removed to create the final part. The chips are typically recycled to produce other components of lower value and specification. The RecAM project aims to develop alternative methods of recycling chips into fine precision powders consisting of Aluminium Alloy, Titanium Alloy, and Inconel to be used in additive manufacturing processes such as SLM, DED and Cold Spray. Powder will be produced from recycled chips using Atomisation, Induction Melting, and a Hydrogenation — Dehydrogenation ball milling processes. With powder analysis and conducted prior to the additive manufacturing of test specimens for further analysis, comparison, and destructive testing.

Advanced Masking Techniques on Aero Components (AMTAC)

The goal of this project is to develop some advanced masking techniques for aerospace components. A study on the reliability of various maskants against chemical attack from those treatments will be undertaken. Alternative maskants and masking techniques will be explored, new maskant should be more resilient to chemical attack and require shorter application time. Automatic masking system will be developed and tested to ensure consistent quality, especially when the masking is applied on irregular surfaces. NDIs will identify any masking flaws and verify the thickness of maskants. It aims to reduce the chemical attack to the component surfaces and hence to eliminate any rework required. The project could be applied in adhesive and sealant dispensing.

Aircraft Coating and Paint Analysis (ACPA)

This project will use various sensors to assess the integrity and quality of the paint and coating on the airframe such as multispectral, terahertz and ultrasound imaging in addition to thermal and optical cameras. It will also use machine learning to assess the level of degradation and even the likely causes of the coating degradation. In addition, AI will also be used to determine a generic formulation for the mixing of paint for repairing aesthetic damage to the exterior and interior of the aircraft.

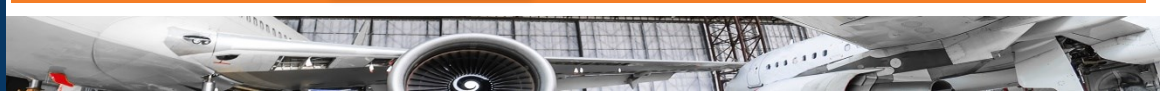
Laser Paint Removal EcoSocialSustainability (L-PRESS)

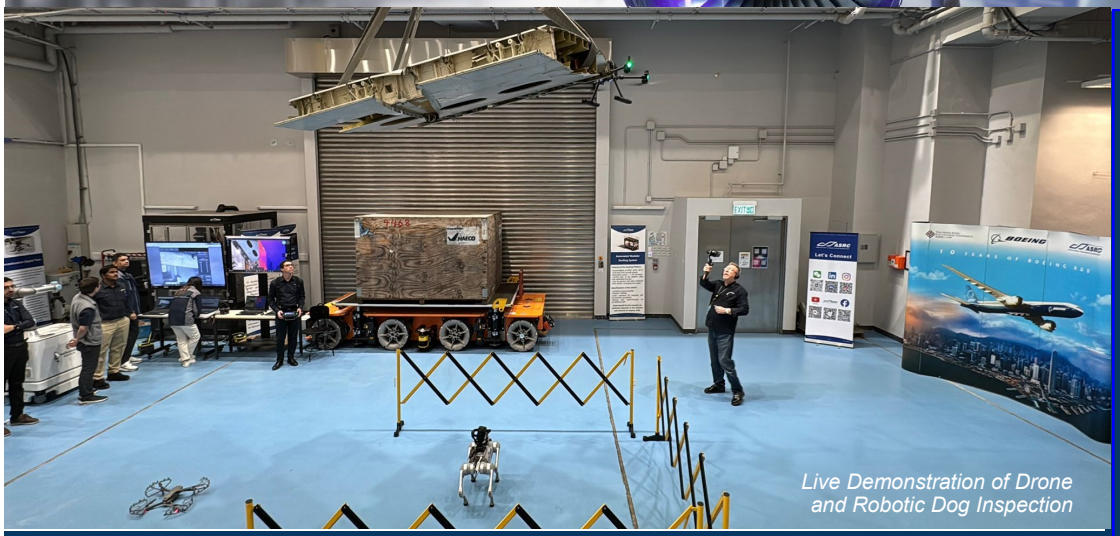
Laser paint removal emits gases, smells and fumes, which can be reduced if we understand the chemical mechanisms. This project aims to identify the nature of the volatile elements so that the laser is tuned exactly for the paints which need to be removed. For this, the ASRC uses a LIBS (Laser Induced Breakdown Spectroscope), a multi-gas monitor sensor and an X-Ray spectrometer. Our research has identified that there is an optimal value of the fluence (i.e. laser energy) at which pyrolysis is avoided, which means that less gases are emitted. This value is different for every couple of coating and substrate material, and depends on the heat conduction, the coating thickness and the chemical composition of the elements. Our current tasks focus on establishing the correct methodology to have all appropriate parameters considered for the fluence value.

Intelligent Wire Arc Welding Additive Manufacture (iWAAM)

Welding is used as additive manufacturing (AM) process in MRO and its subsequent machining process depends on component damage's geometry. This project's objective is to design and develop an intelligent arc-welding additive manufacturing system for engine components. AM techniques and advanced automated nondestructive inspection (NDI) techniques will be applied to ensure consistent welding quality, so that damaged components can be rescued, and scrap reduced. The advantages of the Wire Arc Additive Manufacturing (WAAM) processes include high material utilization and deposition efficiency, low production cost, and versatile equipment.

The ASRC has career opportunities for Postdoctoral Fellows, Research Associates, and Research Assistants on several projects. The appointment period is twelve to twenty-four months, with a highly competitive remuneration package. For more information regarding the duties, programme acceptance criteria and application requirements, please visit the ASRC Careers Page.





Live Demonstration of Drone and Robotic Dog Inspection

Aviation Classics - JU-52

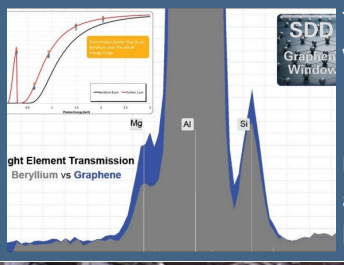
Designed and produced in the 1930s, the Iconic JU-52 remains a classic piece of design with a number of examples still flying today. Post WW2 the aircraft was produced in both France and Spain up to 1952. As a passenger or troop carrying aircraft, it was a great success and several variants were constructed with the three distinctive radial engines. It was of steel tubular construction with corrugated Duralumin skin for greater strength and stiffness (Duralumin being an age hardened Aluminium-copper alloy).

During the war, Hugo Junkers objected to any use in a military context but was unsurprisingly over-ruled. The aircraft first flew in 1930 and served with many airlines and militaries. It was used in Europe, North Africa and Indo-China. It was one of the first aircraft to be equipped with a rudimentary auto-pilot.

There are three examples of this classic aircraft that are airworthy today and a large number on static display.

ASRC Equipment Update - The XRF Spectrometer

The ASRC recently added the Bruker Titan X-ray Fluorescence Spectrometer to it's Capabilities. This is a hand-held device that produces an X-ray beam to stimulate the surface of the material under test and produces a fluorescence from within the atoms of the material. The fluorescence enables lighter elements to be identified as the X-rays activate innermost electron shells that are most relevant for the lighter elements. This enables the classification of steel alloy types and even paint types. It will have a wide range of applications across several projects within the ASRC and is currently being deployed on the L-PRESS Project. There are very stringent regulations in Hong Kong in the use and controls governing X-ray apparatus, where the HSE Team have been diligently ensuring all regulatory requirements are met ensuring safe operation by project staff.



Membership Benefits of the ASRC

Organisations that join the ASRC as members have a primary involvement in Aviation MRO or Aerospace Manufacture, or whom could benefit from the application of the technologies developed from fields of research in support of these areas where they may be commonality, such as energy, marine, and other forms of transportation.

If you feel you are in one of these categories and would like more information on the benefits and details on how to join or cooperate with the ASRC, please contact us via
Mr Robert Voyle, CEO
robert.voyle@polyu.edu.hk, or take a look at our website www.asrc.hk.

There are different levels of membership and working relationships that have varying levels of access to research at the ASRC. Almost certainly there is a membership level or collaborative opportunity that is a good match for your organisation.

Asian Airline Profile

AIR CHINA 中国国际航空公司

Air China Limited is the major airline of the People's Republic of China and serves as the exclusive national flag carrier. The headquarters of Air China is located in Beijing, and it has expanded its network of branch offices.

This airline not only provides domestic and international flights to various destinations worldwide but also offers specialized services for Chinese government leaders.

As of 2023, Air China (including its subsidiaries) had a total of 902 aircrafts of all types, mainly Boeing and Airbus, with an average age of 9.05 years. Its service was further extended to more than 1,200 destinations in 186 countries (regions) through cooperation with airlines such as Star Alliance Members.

Racer LAM

Runsheng LI

Staff Profiles:

Dr LAM and Dr LI

Racer Lam and RS Li are both Postdoctoral Fellows and of course very talented engineers. Racer initially supported the research project on "Cold Spraying Material Deposition" at the ASRC in 2019 before moving on to other projects. During his time at ASRC, he successfully obtained a PhD degree in 2022. He has expanded his capabilities in additive manufacturing further through one of our ITC projects, "Recycling Metal Chips into AM Feedstock."

Runsheng Li graduated from his PhD program in Wuhan. He published several articles and participated in various research projects on welding during his studies. In 2024 he joined the ASRC team, where he is investigating one of our ITC projects, "Intelligent Wire Arc-Welding Additive Manufacturing," where he is sharing his previous research professional knowledge of welding with the team.

Activities/ Visits

OCT

- ✈ Attend Schneider Electric Innovation Summit
- ✈ Visit to SANAD Abu Dhabi
- ✈ Visit by Inner Mongolia University of Science & Technology
- ✈ Visit by COMAC
- ✈ Visit by Hetao Shenzhen Hong Kong Science and Technology Innovation Cooperation Zone
- ✈ Visit by Cathay Pacific Pilot Cadets
- ✈ Visit to Zhuhai Aviation Industry Park

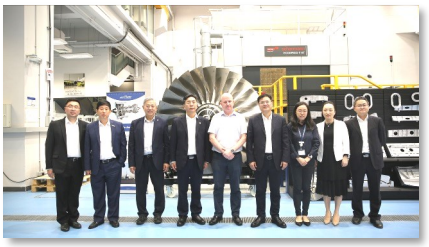
NOV

- ✈ Visit by National Natural Science Foundation of China
- ✈ Visit by ITC Officials
- ✈ Visit by National Committee of the Chinese People's Political Consultative Conference member
- ✈ Visit by Chongqing Youth Federation
- ✈ Visit by THE Global AI Forum Lab Tour
- ✈ Visit by United Front Work Department of Taizhou Municipal Committee

DEC

- ✈ Visit by Civil Aviation University of China
- ✈ Visit by Hefei City Government Officials

Civil Aviation University of China



COMAC

Cathay Pacific Pilot Cadets

ITC Officials

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ASRC
INNOVATIVE MRO & MANUFACTURING TECHNOLOGIES

The ASRC on Social Media

ASRC maintains six active social media accounts, namely 'Facebook', 'LinkedIn', 'Website', 'WeChat', 'YouTube' and 'Instagram'. These are updated regularly with project status, visits to the centre, as well as special events. These sites enable increased engagement with our clients, industry and our local community, and allow followers to keep up with our activities.

Check it out!