AEROSPACE DIVISION ANNUAL GENERAL MEETING REPORT 2021

Institution of MECHANICAL ENGINEERS

Improving the world through engineering

Chair's Introduction

2020 and 2021 have been marked by a sudden change in the way the Aerospace Division of the IMechE engage with the membership as a result of Covid. These past years have meant that face to face events have been very infrequent and the Division has moved the event offerings to being online. Whilst losing out on the benefits of building relations through face to face contacts we see that we are engaging with greater numbers of the membership. Thus we see the use of online offerings will remain an important aspect of our programmes as easing of Covid restrictions enable us to have more face to face offerings.

From a Technical standpoint we see that aviation's impact on climate change is causing electrical and hydrogen powered solutions to be driven into more focused developments as well as the development of sustainable aviation fuels. Following several events on these themes the Division contributed to a significant forward looking paper and we anticipate that these topics will continue to play a significant role in our offerings.

Improving aviation safety, efficiency and costs will remain core subjects for which we will promote events. We are also seeking to provide events of interest for the membership in the area of space.

We continue to have a limited number of candidate papers that meet the criteria for our prizes. We are in a process of reviewing our prize offerings to enable the goal of encouraging engineering excellence to be achieved.

We are proud of the continuing development of the UAS challenge aimed at giving a learning platform for University students, although the Covid restrictions meant that the 2020 event was limited to review of the designs, in 2021 we had some real flying and for those teams unable to travel, virtual flying of their designs. In excess of 30 teams from around the world have entered into the 2022 competition and review of their concepts has started.

If you are interested in supporting the Aerospace Division, or have questions or comments about this report, please contact Jade Reid (by email: membernetworks@imeche.org).

Andrew Bradley

Chair, Aerospace Division

The Institution's Aerospace Division supports the community of mechanical engineers working in or associated with aerospace.

The past year has seen the Division continue to contribute to the Institution's twelve learned society attributes.

01 A forward-looking technical strategy, more international in outlook

The Division has continued to support the newly started Indian Aerospace Centre, based in Bangalore, India. The Division is actively seeking to promote events that support the evolution of materials and processes used in aviation and a revolution in aircraft power as a result of reducing the impact of aviation on climate change.

02 A full-spectrum matrix covering all major sectors and technologies in mechanical engineering

The Division contributes to the full spectrum coverage of the Institution by providing a focus on the aerospace sector. The Division continues to consider how best to support the increasing number of its members who are interested in the space sector.

03 Comprehensive technical information service

The Division encourages the use of the comprehensive physical and online IMechE library services.

Members of the Board have provided a significant contribution to the Paper "The Transport Hierarchy: A Cross-Modal Stratgey to Deliver a Sustainable Transport System" prepared for the IMechE event "Making COP26 matter: Engineering a net-zero future" to advise members and Government on the potential future direction for Aviation and other transport systems in a world limiting climate change.

04 Links to Government on key issues

Aerospace representatives continue to participate in the Youth in Aviation. Youth in Aviation is a collaboration of the non-profit, charitable and educational organisations involved in enabling young people from all backgrounds to experience aviation and aerospace. This includes showcasing Youth in Aviation to members of Parliament.

Through the paper highlighted in the previous section we aim to provide information to Government on the critical issue of de-carbonising aviation. Further events will enable us to update that information as we proceed during the critical years to address the problem.

05 Member engagement through an event and digital programme of engineering content that also excites non-members

The Division ran the following activities in 2020-2021:

DATE	TITLE	LECTURER	ATTENDEES
28/09/20	Graphene in Aerospace Composites: Unexpected Science from a Pencil Trace	Costas Soutis: Professor, University of Manchester	444 registered (182 listened live)
28/01/21	Automated Fibre Placement Technologies for Aerospace Applications	John Lewalski: Senior Controls Engineer, Electroimpact UK Ltd	174 registered (102 listened live)

30/03/21	Aircraft Electric Propulsion Systems - Opportunities and Challenges	Karim Mokaddem: VP Fast Track Electrification, Airbus	573 registered (331 listened live)
17/05/21	Additive Manufacturing lessons learned and their effect on GKN's approach to certification of higher classification structures	Marko Bosman: Chief Technologist, GKN Aerospace	361 registered (193 listened live)
28/09/21	Structural Health Monitoring of Smart Composite Fuselage: A Building Block Approach	Dr Zahra Sharif Khodaei: Reader in Structural Integrity, Imperial College London	191 registered (121 listened live)
30/11/21	Aerospace Division AGM Lecture: FlyZero: Realising zero-carbon commercial flight	Dave Debney: Chief Engineer – Whole Airframe Integration, FlyZero	259 registered so far

Aerospace North West

DATE	TITLE	LECTURER	Registered Attendees	Actual Attendees	Video Views
24/02/21	Dassault Systems CATIA Composer	Jochem Baehr, CATIA Mechanical Industry Process Expert Senior Specialist	67	38	144
23/03/21	Inertial+, the Once and Future Navigation System	Michael Braasch, Thomas Professor of Electrical Engineering, Ohio University	102	71	40
22/06/21	Demining in Cambodia	Dr Darren Ansell, Aerospace Engineering Lead, UCLAN	66	32	239
13/07/21	Aircraft Fuel Systems	Manuel Donald-Lopez, Fuel System Design Lead, US Programmes, BAE Systems	264	133	243
29/09/21	Human Factors Taster	Marcus Madden, Senior Consultant, Baines Simmons	NA	NA	NA

Aerospace India

DATE	TITLE	LECTURER	ATTENDEES
08/02/20	Artificial Intelligence	Professor. Asim Tewari, IIT Bombay,	n/a
08/02/20	AI Applications	Professor SN Omkar IISc	n/a

08/02/20	AI in Air Traffic Control at Changi Airport	Dr Suresh Sundaram, IISc	n/a
24/05/20	Aircraft Modification and Repair	Mir Moazam Ali IEng, MIMechE Member AED India Committee	n/a
06/06/20	The Covid-19 virus, a portable UV Sanitiser & COVID-19 research at IIT-Bombay	Dr. Ambarish Kunwar, Associate Professor, Biosciences and Bio engineering IIT Bombay.	n/a
16/12/20	Covid-19 and flying – Thoughts of an engineer	Andrew Bradley FIMechE FRAeS CEng MEng, Chair Aerospace Division Board IMechE	n/a
27/03/21	Mental Health & Wellbeing for Engineers, Talking Together	Rafsan Chowdhury, Chair IMechE Derby & Nottingham YM Panel & Joshua Thomson-Smith Rolls Royce	n/a
29/03/21	Supporting the Royal Air Force: Current and Future Challenges	Air Vice-Marshal Paul Lloyd CBE MSc MA MDA BEng CEng FIMechE, Chief of Staff for RAF Support	n/a
07/04/21	The Covid-19 Pandemic	Dr Gagandeep Kang FRS, Professor CMC Vellore.	n/a
19/06/21	Covid-19 Infection Control	IMechE Pandemic Infection Control Group, Professor Cath Noakes, Professor of Environmental Engineering for Buildings, University of Leeds, Frank Mills, Chair, Building Services Division IMechE, Andrew Bradley, Chair, Aerospace Division Board IMechE.	n/a
15/09/21	“Use of FEM in Design” & “Digitization in Manufacturing, Data acquisition and manufacturing technology”	Ravi Kochak, Member AeD India Committee & Valentino Barbosa. Organised by India YM Panel & Mohammad Ameen Shaikh, AeD India Committee YM	n/a

06 A business plan and be business-like

Financial Planning

In 2021AeD was allocated £2310 in funds and ran approximately 15 meetings. Due to COVID-19 majority of these meetings remained virtual and the committee budget remained. The only expense of 2021 will be the AGM meeting, with funds used to cover light refreshments and member expenses.

The two AeD Centres have also delivered their programmes of events all within budget

07 A public agenda of themes and campaigns

Representatives contributed to the reports and position statements published, see the list of consultations in which IMechE has been involved.

08 A proactive and reactive voice on current affairs

The Division has continued to support Institution contributions to discussions on current engineering matters.

09 Links with partners to increase impact

The IMechE, RAeS and IET work together under the banner of the Aerospace Partnership. This includes ensuring lecture and event programmes between the organisations are complimentary and seeking opportunities for joint events. Events such as the EV battery conference are supported through this partnership.

10 Links to industry and employers to ensure the business relevance of the Learned Society programme

The four Technical Activity Committees (TACs) and one community of Interest cover the full range of mechanical engineering in aerospace but concentrate on core mechanical engineering activities. The TACs organise seminars, conferences, and other events. Through these events they provide a mechanism for knowledge sharing among practitioner and expert communities.

- Aerospace Materials and Structures Technical Activity Committee (AMSTAC) monitors and promotes, primarily through the development of seminars and conferences, the application of materials in aerospace structures.
- Airworthiness Committee (AIRTAC) provides a focus for discussion of military and civil airworthiness issues, contributing to the purpose of IMechE.
- Combined Propulsion Technical Activity Committee (CPTAC) operates under the authorities of the Aerospace Division of the Institution of Mechanical Engineers (IMechE) and the Royal Aeronautical Society (RAeS).
- Transmissions and Associated Systems Committee (TASTAC) covers mechanical power transfer technology for aerospace applications.
- The Combined Propulsion TAC (CPTAC) is a joint activity with the RAeS. CPTAC covers all aspects of propulsion systems but focuses on whole engine and propulsion system aspects.

As of December 2021, the division now has 11,211 members.

By membership type this breaks down as:

Affiliates	1,312
Associates	2,645
Member	6,053
Fellows	1,197
Honorary Fellows	2
Companions	2

By field this breaks down as:

Airworthiness	5749
Propulsion	6145
Transmissions	4982
Systems and airborne equipment	5785
Ground support equipment	4903
Aerospace materials and structures	6551
Space	4612

The composition of the present AeD Board is included as Appendix 1. of this report

11 A system to recognise personal achievement and raise the profile of Engineering

Derek George Astridge Safety in Aerospace Award

The Derek George Astridge Safety in Aerospace Award is awarded annually for the best paper or to a person or persons who is/are considered to have made a useful contribution to technology relating to safety in aerospace including the widening of professional and public awareness of such technology.

No paper was selected as winner of this award in 2021

The Kenneth Harris James Prize

The Kenneth Harris James Prize is awarded for the best paper on an aerospace subject published by the Institution in the previous year or for a contribution or for achievement in that field.

No paper was selected as winner of this award in 2021.

The Whittle Reactionaries Prize

The objective of the prize is to stimulate and encourage those in the early stages of their engineering career to continue to apply innovative and forward-looking thinking to aerospace propulsion problems that demonstrates technical excellence, originality and independent thinking, and high-quality presentation and effective communication.
The author shall be either an undergraduate or postgraduate studying at a university, or a recent graduate working in industry.

No paper was selected as winner of this award in 2021.

The Board are currently reviewing the criteria and media coverage of these prizes to encourage a greater range of work to be considered for the prizes.

12 Promote professional development of members

UAS Challenge:

Despite the challenges of covid the UAS challenge took place in 2021 with a live fly-off; the first time since 2019. This year university teams took part in a two-day, in-person event to test the effectiveness of their UAS (unmanned aircraft system) at a closed airfield at BMFA Buckminster, located on the Lincolnshire/Leicestershire border.

While restrictions relating to COVID this year meant that some teams were unable to join an in-person event, the first half of the 2021 UAS Challenge took place virtually in order to give all teams the chance to benchmark and get feedback on their work, no matter where they are located and how much of their UAS they were practically able to build.

This year 32 teams entered the UAS challenge, with 12 of these teams being internationally based. In the end 15 teams took part virtually, 6 teams attended the virtual event. The winners of the 2021 UAS Challenge Live Fly Off Event are as follows:

AWARD	TEAM
Grand Champion	University of Surrey
Runner Up	Loughborough University
3rd Place	Heriot Watt University
Highest Placed New Entrant	Heriot Watt University
Innovation	Loughborough University
Design	Loughborough University
Safety	Loughborough University
Business Proposition	Ghulam Ishaq Khan Institute of Engineering Sciences and Technology
Media and Engagement	Islamic University of Technology
Scrutineering	Imperial College
Airworthiness	Imperial College
Operational Supportability	Loughborough University
Most Promise	Imperial College

The winners of the 2021 UAS Challenge Virtual Events are as follows:

AWARD	TEAM
First Place	University of Petroleum and Energy studies – Wrise
Runner Up	National University of Sciences and Technology - NUST Airworks
3rd Place	University of Moratuwa - Mora Avions
Highest Placed New Entrant	Democritus University of Thrace - Democritus Aeronautical Rescue Team (DART)
Innovation	Swansea University - blueswan
Design	Islamic University of Technology – ANTS
Safety	National University of Sciences and Technology - NUST Airworks
Environment	University of Moratuwa - Mora Avions
Most Promise	University of Twente - DronteTeam Twente

Surrey University (Winners of the 2021 UAS Challenge Live Fly Off)

Appendix 1: Aerospace Division Members: Session 2020-2021

Chair	
Mr A Bradley (RAeS)	
Immediate Past Chair	
Air Cdre P Lloyd (MOD)	
Vice Chair	
Mr S Phillips	
TAC Chairs	
Dr C Pinna (AMSTAC) (Prof P Fromme until Nov 2021) Mr T Harris (AIRTAC) Mr D Cook (CPTAC) Dr K Hart (TASTAC)	Mr D Entwistle (North West Centre) Mr A Baweja (Indan Centre)
Ordinary Members	
Mr J Turton, (IET) Mr R Williams Mr N Barnett	Mr V Raman Ms B Robinson Mr C Elliott Mr K Fletcher
Young Members	
Mr S McLaughlin	