ROYAL AERONAUTICAL SOCIETY

HATFIELD BRANCH NEWSLETTER

FLIGHT LINES

NOVEMBER 2023

November Lecture

Marshall Aerospace C130 Deployable Radar

Ben Jakubowski and Martin Payne

Wednesday 15th November, 7pm, Lindop Building, Room A166
See page 9 for details
(no online option)

From the Chairman

Again, this year, we elected to start our lecture programme with the Sir Geoffrey de Havilland Memorial Lecture. Thanks to continuing support from the University, we were back in the splendid surroundings of the Weston Auditorium.

As our Named Lecture, this event is always about more than just the lecture itself and I was delighted that once again we were able to recognise our student prizewinners. When I talk to these young people, I am filled with confidence for the future of the engineering profession. We were honoured to be joined for the evening by Kerissa Khan the President of the Society.

For the main event, we enjoyed a really excellent lecture from Professor Dame Helen Atkinson, who is a Pro Vice Chancellor at Cranfield University. Dame Helen talked about the challenges for Defence Aviation of achieving Net Zero by 2040.

Such an event does not come together without a lot of people in the background. I am very grateful to the members of the committee, and staff from the University, who worked so hard to make the evening such a success. I must also thank Ray Wilkinson for the excellent photos of the evening.

Our student members of the Branch Committee bring a great deal to the committee. The four members from last year have now all left the university. George Maicaneata is continuing his studies at Cranfield, Alberto Carril is working for Britten-Norman, Pallavi Sharma has completed her masters degree and Mymun is enjoying work experience at Jaguar-Land Rover. However, Joyce Oyewole has returned from her work experience, and she is joined by Daniel Giffin and German Garvan. We hope that they benefit from their time on the committee. If any other students would like to join them, there are still vacancies – particularly from Levels 4 (Year 1) and 5 (Year 2).

For this month's lecture, we will back in the Lindop Building. I am pleased to welcome two former colleagues from Marshall Aerospace who will be talking about future products for the C130, especially an easily deployed radar installation. It would appear that although the RAF have retired their C130Js, there are plenty of other operators that Marshall still supports.

I hope to see you there.

Steve Rogers

Sir Geoffrey de Havilland Memorial Lecture, 25th October 2023

Defence Aviation – Net Zero, Dame Helen Atkinson

On 25th October, we returned to the Weston Auditorium for our annual Sir Geoffrey de Havilland Memorial Lecture with our largest audience for some time.

Photo: Ray Wilkinson

Maurice James opened proceedings by welcoming a number of our distinguished guests, including the Society President, Kerissa Khan. After a welcome from Dr Peter Thomas from the University, we presented our university prizes, which are the subject of a separate article. Then it was on to the main event and we were delighted to welcome Professor Dame Helen Atkinson from Cranfield University to talk on Defence Aviation – Net Zero.

Dame Helen began her talk by telling us about Cranfield University. She outlined its unique range of cutting-edge aerospace research that make up Cranfield's Global Research Airport. These include the National Flying Laboratory Centre, with a SAAB 340B, and the Digital Aviation Research and Technology Centre (DARTEC), which encompasses the Hangar of the Future, including a Boeing 737 donated by British Airways.

Contributing to the UK Government Net Zero 2050 legislation, the RAF has a goal to achieve Net Zero by 2040. It has created a Net Zero Charter, with key signatories including industry partners such as Boeing, Rolls Royce and BAE Systems, the Royal Aeronautical Society and universities including Cranfield. They have identified five key areas which are essential to achieve the target and ensure that the RAF is ready to fly and fight in the fossil-fuel-constrained operating environment post 2040.

The first of the key areas is Rethinking Capability. This includes greater use of synthetic training to replace flying activity. Potentially, this allows trainees to experience activities that would be impossible, and certainly not cost effective, with real-life training, including flying large numbers of aircraft together. It also saves significant cost in weapons fired and reduced aircraft flying hours. Rethinking Capability also considers the use of emerging space technology, such as Zephyr, to remove the need to fly emissions-generating aircraft. Zephyr is an Airbus-developed, unmanned, solar-powered, high-altitude platform with very long endurance.

The second key area is Improving Efficiency – most of the research and improvements currently apply to Civil Aviation, which has already made huge gains. However, many of these can be read directly across to Defence. This is not just about flying but reducing emissions from all aspects of Operations. Dame Helen went on to describe some of the research work that Cranfield is involved in, including the Hangar of the

Photos: Cranfield University

Image: Airbus

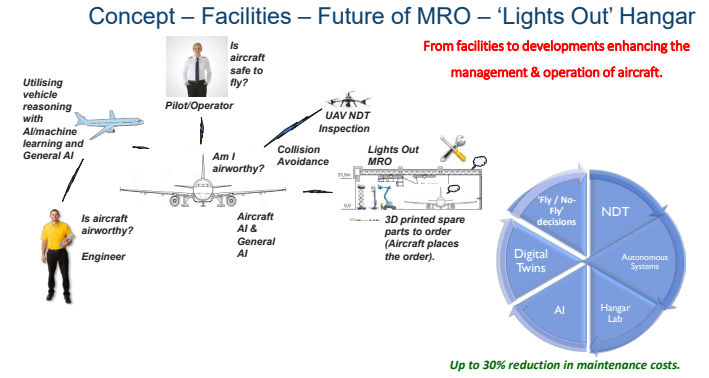

Image: Cranfield University

Future. This is a unique facility to integrate digital, human and physical aspects of aviation for research and technology development. Possibilities include automated aircraft inspection using drones and robots leading to the potential of the 'lights out' hangar, although we are certain to need some human oversight. Traditionally, hangars have been poorly insulated. Improvements in this area can lead to huge reductions in energy required. Relatively simple things like rationalisation of ground handling equipment can result in reduced damage to aircraft and cost and energy savings.

Air Traffic Management and Flight Profile Optimisation can also reduce costs and energy. A 'linear holding strategy', where time is adjusted en route, is aimed at absorbing airborne delays without the penalties associated with traditional 'stacking'.

Whereas electric power and liquid hydrogen will require development of new or significantly modified airframes, sustainable aviation fuel (SAF) offers a 'drop in' alternative to kerosene. SAF is produced using sustainable feedstocks and processes to reduce emission impact by up to 80% compared to existing fossil fuels. Biological feedstocks from crops potentially compete with food supply so synthetic feedstocks are preferred for Defence – Net Zero. These use green electricity, carbon dioxide and green hydrogen (produced from water) to create a synthetic aviation fuel. SAF is available now and the RAF already has clearance to use up to 50% SAF blends in all aircraft. The RAF have also test flown a Voyager Tanker on 100% SAF. Although SAF

Photo: Cranfield University

is already in use for some airline services, the main issue limiting wider use is the need for a significant reductions in production cost, and the huge increases required in production volumes, to meet aviation's total requirements.

Although longer term than SAF, all types of zero-emissions propulsion are being considered as part of the Net Zero strategy. These include the electric trainer, electric vertical take-off and landing (eVTOL), hydrogen fuel cell and liquid hydrogen. A significant number of small eVTOL aircraft are already in flight test and in the UK; Zeroavia, operating from Cotswold Airport have successfully flown a Dornier 228 with a hydrogen-electric power train using a hydrogen fuel cell.

The final element in the strategy is carbon removal. There is no aviation pathway that will reach Absolute Zero – there will always be some residual emissions. Using offsets (e.g. by planting trees in Brazil) or using paid-for offsets are not acceptable to the MoD. Instead, there is a plan to use the existing MoD estate. The plan is to reduce greenhouse-gas (GHG) emissions and to become a sink for carbon, to use as offset.

Dame Helen's talk showed that Defence Aviation has serious challenges if it is to achieve its aim of Net Zero by 2040. However, she also demonstrated that there are a number of innovative solutions which might help.

After an interesting Q & A session, James Allison from the Royal Air Squadron proposed the vote of thanks and presented Dame Helen with an engraved glass vase.

Caroline Betts then gave us an update from the Main Society before we adjourned to the buffet, generously sponsored by the University, where the discussion continued.

Steve Rogers

Photo: Ray Wilkinson

University Prizes 2023

The university prizes were presented at the Sir Geoffrey de Havilland Memorial Lecture. Once again, we were able to showcase the fine trophies carved by Stan Kimm and I was delighted that Stan was in the audience for the presentations.

The first award was the John Cunningham Flying Scholarship, sponsored by the Royal Air Squadron Charity. The Scholarship is for demonstrating outstanding flying skills on the flying module of any engineering course which involves pilot studies. The winner was Elliott Irons, who was the first student in his cohort to go solo, and the trophy was presented by James Allison representing the Royal Air Squadron [1].


1

The RE Bishop Trophy [2] was presented to Alberto Qintana Carril by Kerissa Khan, the Society President, for his project on ***The Design of a Solar Powered High Altitude Pseudo Satellite***. Alberto also won the Student Lecture Competition [3] for his talk on ***Flight Tracking***.

The Blue Streak prize, for the most innovative final year project, was awarded to Ana Maria Del Cid Velez [4] for her project entitled ***Drag Investigation in Different Rocket Configurations***.


2


3

Maurice James presented the Robert Pooley Prize to Chigozirim Ede [5]. This prize is sponsored by Pooleys Flight Equipment and is awarded for the best performing student in level 5 (second year) pilot studies.


4

The Tony Fairbrother Award, which is for the best masters level assignment, was presented to Safwan Ahmed by Dr Peter Thomas [6]. Safwan's project was entitled


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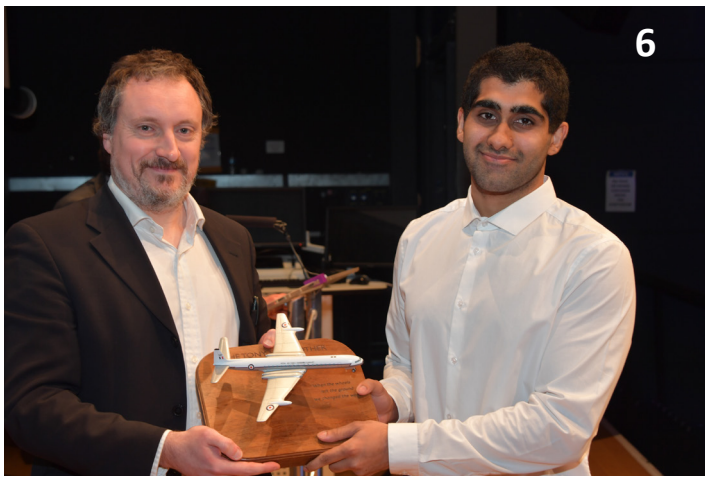


Aerodynamic Analysis and Optimisation of a Small-Scale UAV Using Computational Fluid Dynamics.

The final award was the Hatfield Branch Aerospace Bursary, which is for the best performing first year student on any Aerospace Degree Course. It was presented to Shishir Bhusal by Phil Birtles, President of the de Havilland Aircraft Museum [7].

The picture at the bottom of the page shows the Society President, Kerissa Khan, the speaker, Dame Helen Atkinson, and some of the prize winners with James Allison, Maurice James and Steve Rogers.

After the prizegiving, we made one final presentation. Following the death of our former president, Mike Ramsden, his widow Angela generously donated the remaining copies of Mike's book on Sir Geoffrey de Havilland to the Branch to use as prizes and speakers' gifts. To acknowledge this generous gift the branch donated to Angela's chosen charity, the de Havilland Aircraft Museum, where Mike had been a Board Member and Vice President. Maurice James handed over the cheque to Phil Birtles, the President of the Museum [8].

Congratulations to all our prizewinners.

Steve Rogers

Torr Scientific Industrial Placement

I spent my last year on an Industrial Placement with Torr Scientific. Torr Scientific is a company at the forefront of vacuum and gas analysis technologies. They offer a range of specialized instruments and services designed for precision measurement and analysis in the field of vacuum science and related areas. Their products cater to researchers, scientists, and industries that rely on precise vacuum and gas measurements. This includes tools for monitoring gas compositions, pressure, and leak detection in vacuum systems, as well as custom solutions for specific research and industrial applications. Torr Scientific plays a crucial role in advancing scientific research and enabling high-precision processes by providing essential tools for understanding and controlling vacuum environments.

38mm Fused Silica 0400

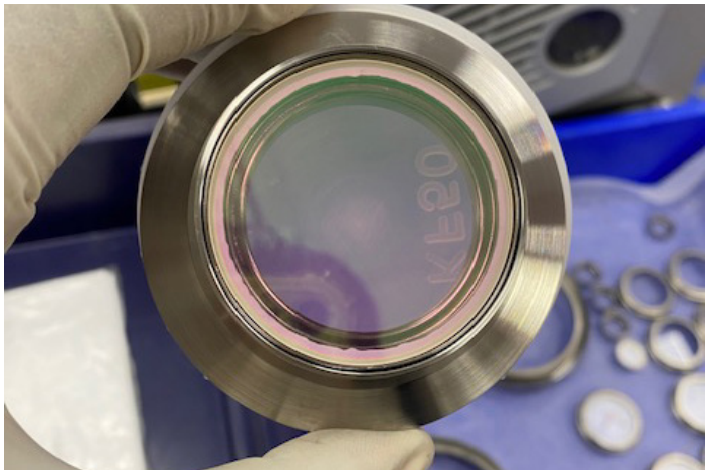
The transition from the academic realm to the professional world can be a daunting experience for any student. The first year in the industry is often filled with challenges and opportunities to learn, grow, and make significant contributions. During my time at Torr Scientific, I was involved in various technical and development projects, including induction brazing, glass-to-metal seals, thin-film coatings, and non-magnetic alternatives for sapphire view ports. Also exploring an array of equipment for testing, building, and analysing, which significantly enhanced my technical analysis capabilities.

My first year in industry was very interesting. There were a lot of things I wasn't used to, including work culture and a sudden change in how I should schedule in my life so I can perform to the best of my abilities during the placement. Working with a wide range of materials, exploring their suitability for glass-to-metal seals. I actively contributed to the improvement of product design and material selection. By collaborating with a diverse team of experienced engineers, I learned to evaluate the unique properties and challenges of different materials. This project broadened my horizons, not only in terms of materials but also in my ability to think critically about design and its real-world applications.

Torr Scientific ships out product worldwide for varying companies and institutions. Though it is a small company everyone really put their head down and work collaboratively which made me feel comfortable enough to ask questions and get more insight into the company and my co-workers. One of the most significant milestones in my placement was learning about the development of glass-to-metal seals. These seals are crucial in various industries, including aerospace and electronics. Learning about such a niche manufacturing process allowed me to see how crucial it is for a product to go through so many quality checks.

The first year in the industry is often a transformative journey, characterized by growth, learning and valuable contributions to technical and development projects.

Overall, my time at Torr Scientific was marked by challenges, but it was also defined by the immense potential for personal and professional growth. The discovered the significance of precision, critical thinking, and meticulous attention to detail. Furthermore, my involvement in a diverse range of projects broadened my horizons and deepened my understanding of materials science and design. As I move forward in my career, the experiences of my first year in the industry will continue to shape my perspective and abilities, setting the stage for a promising and impactful future. I would definitely encourage any student especially within the aerospace field to seek out placements, not just with big named companies but the various ones all over the UK.



KVPZ 50 chrome coated optical lens

Joyce Oyewole

From the Cockpit – What could *possibly* go wrong?

As has been said before, flying an aeroplane is not like driving a car, in many ways. One major difference is the amount of preparation that goes into each flight. I'm sometimes asked whether we're allowed to fly just anywhere, or whether we need some sort of flight plan or permission. The answer to that, as I'm sure most readers will know, is that we don't need to file a flight plan, or get permission, for most flights. The exception is where we are flying through controlled airspace or across a state boundary. Quite often I will take off without any clear idea of where I'm going to go, and make it up as I go along. This assumes, of course, that I'm not planning to fly somewhere in particular.

However, that doesn't mean we don't need to prepare before every flight. On a day that I'm going to fly, I'll be checking the weather and any NOTAMs (Notices to Air Missions). NOTAMs cover a wide range of events or conditions that may affect a flight, from tall obstacles such as cranes to gliding competitions to airfield equipment that isn't working. If I'm flying for significant distances over water, then I'll need a lifejacket, at least. I also carry a personal locator beacon, which will send out a distress signal and my GPS location if I ditch. For longer flights, an immersion suit (to avoid hypothermia) or a life raft would increase my survival chances.

Since my primary method of navigation is GPS, I need to consider that it may fail, so I routinely carry a spare tablet, and have the navigation software on my phone as well. In the event it really isn't my day, I have a paper chart as a final backup.

A lifejacket is essential for flying over stretches of water

We don't normally wear parachutes, but some aircraft are fitted with ballistic parachutes for the whole airframe. Image: Ballistic Recovery Systems

Some people may wonder if we wear parachutes, but the answer to that is no, except for aerobatic pilots. Structural failures are extremely rare, so the cost, weight and bulk mean that it doesn't justify having them. They also can make escape from an emergency on the ground more difficult. However, some aircraft are fitted with ballistic parachutes, which can be deployed to bring the entire aircraft, and its occupants, to earth. The same penalties apply as to personal parachutes, with the obvious benefit if saving a broken airframe as well. However, some argue that the knowledge that this is available may make pilots take more risks in the first place, negating the safety argument. One place they really offer a benefit is over water, where a parachute will always land the aircraft the right way up. Of course, coming down softly isn't the end of the story – landing on a house roof, for instance, is likely to end badly as the canopy will then collapse, and the aircraft will then fall to the ground from roof height, which may still be serious or fatal.

I once asked well-known test pilot John Farley, of Harrier fame, whether he had ever ejected from an aircraft. His reply was that there had always been enough still working to get back down. He then added that ejecting from an aircraft started a chain of events over which he had no control at all.

Aside from landing accidents, by far the most likely problem (or *least unlikely*, for the optimist) is that the engine fails. This is one event that we train for extensively whilst qualifying, and are tested on to get our license. Having a check flight for a syndicate aircraft, or to hire an aircraft, will almost certainly include a PFL – practice forced landing – to cover engine failures. Most pilots also practice PFLs from time to time to keep their skills up.

The other mitigation for engine failures is where we fly. The rules of the air state that we must maintain a certain height above urban areas and be able to 'glide clear' in the event of an engine failure. For single-engine aircraft, that means to have sufficient height, and to maintain a suitable course, that we can always glide to a suitable landing site at all times. Some people seem to think if the engine stops the aircraft will fall out of the sky, and don't appreciate that a glider is just an aircraft without an engine. For sure, they glide much better than most powered aircraft, but that's to be expected. Flying over central London, even with the appropriate clearance, is not on the menu for a single-engined aircraft (or a glider).

There are many other problems we need to avoid – flying into cloud (unless suitably qualified), mid-air collisions, thunderstorms all come to mind. However, most of these are predictable as long as we check before flying and keep a good lookout. Probably the most scary is a fire in flight. Most are electrical in origin, and switching everything off often solves the problem. Here, another major difference between aircraft and cars comes to the fore. Most aircraft have dual ignition systems (for reliability) and are independent of the rest of the electrical system. The engines fitted to many larger aircraft, from the Continental or Lycoming series, have twin magnetos that each have a lot of fail-safety built in. Smaller aircraft often have Rotax engines, which have electronic ignition rather than magnetos, but appear identical to the pilot, and again this is duplicated for safety. There are no lay-bys at 2000 feet. With either system, even if the main fuse or circuit breaker shuts off all the electrics, the engine will keep running.

During a check flight with an instructor in a Piper Cherokee out of Elstree, my instructor suddenly said he could smell smoke and perhaps it was an electrical problem. After a moment of concern, I realised he was setting up a drill. He asked me what I should do, to which I replied that we should start switching off the circuit breakers, and perhaps make a ***Mayday*** call. He responded by simply switching off the master electrical switch. 'There we go,' he said (much quieter with the intercom not working!), 'now all the electrics are off so the problem is solved.'

'Wouldn't we start turning things back on one at a time so we could use the radio?' I suggested, once we had restored the electrics.

'No, we would just turn back to Elstree and land without using the radio – they'll cope,' was his reply. Given we were only 20 minutes away, that made sense, as did the decision not to switch anything back on and risk the problem returning. Exercises like that are useful follow-on training – we shouldn't stop learning after getting our license. (In fact, that's when the learning really starts.)

So when someone asks what could go wrong, the answer should be: 'nothing I haven't already thought of.'

Ray Wilkinson

GPS – check. Spare GPS – check. Phone with GPS – check. Map – check. Shouldn't get lost, then.

2023-24 Lecture Programme Confirmed lectures (Wednesdays):

25th Oct: ***Geoffrey de Havilland Lecture: Defence Aviation – Net Zero,*** Dame Helen Atkinson, Cranfield University, Weston Auditorium

15th Nov: ***Deployable Radar,*** Ben Jakubowski and Martin Payne, Marshalls of Cambridge (A166)

13th Dec: ***RAF Engineer Officer,*** Cameron Stewart (A166)

24th Jan ***2024: MBDA Missiles,*** Speaker to be announced, MBDA (A166)

21st Feb: ***Student Lecture Competition*** (A166)

20th Mar: ***Electric Powertrains,*** Speaker to be announced, Safran Group (A166)

17th Apr: ***How an Aeroplane Really Flies***, Ray Wilkinson (A166)

17th May: ***2024 AGM + Lecture to be announced*** (A166)

All lectures are in A166, except as indicated. Lectures start at 19:00, except the Geoffrey de Havilland Lecture, which begins at 18:30.

Royal Aeronautical Society Hatfield Branch

Branch President: ***Maurice James***

Branch Vice-President: ***Professor Dan McCluskey***

Branch Chairman: ***Steve Rogers***

Newsletter Editor: ***Ray Wilkinson***

HATFIELD BRANCH LECTURE

ROYAL AERONAUTICAL SOCIETY
HATFIELD BRANCH

Marshall Aerospace C130 Deployable Radar

Wednesday 15th Nov 2023 19:00 Room A166 Lindop Building, UH Hatfield, AL10 9AB

Marshall Aerospace (MA) have a long history with the C-130 starting in 1966 with the first C130K for the RAF. They have supported not only the RAF with their C-130K and J fleets but other nations including Austria, Qatar and the USMC totalling 18 different operators in 2023. MA have also provided significant modifications to many C-130's notably full avionic upgrades for the South African and Dutch Airforces as well as converting the "Snoopy" weathership into a flying test bed for the A400M TP-400 engine development program. Now MA is developing a range of products that allow operators to do more with their C-130's, further enhancing the versatility of the platform. Ben Jakubowski, Head of Future Products, and Martin Payne, ARC Radar Product Lead, will discuss the development of the ARC Radar product launched in March this year as well as other exciting products in the pipeline.

Ben Jakubowski – Head of Future Products MA

Graduating in 2000 with a B.Eng in Electronics & Computing, Ben joined MA as an avionics engineer before moving into the Test Department where, he spent 16 years developing instrumentation for both ground and flight tests ranging from Auxiliary Fuel tanks to Full ISR aircraft conversions. In 2018 Ben joined the newly formed Systems Engineering department and was instrumental in revamping the companies engineering process as well as becoming an INCOSE Associate Systems Engineering Professional (ASEP). Ben joined the Future Project groups at its inception in 2021, initially as the lead systems engineer and then Head of Future Products, who with a team of talented engineers are responsible for the conceptual design of the products.

Martin Payne - Principal Engineer MA

Martin has a degree in Aeronautical Engineering from Loughborough University and joined MA as a graduate engineer in 2000. He has worked in a variety of Engineering roles, currently acting as a package team leader. He specialises in mechanical analysis, advanced composite materials and conceptual product design and has worked on many aircraft projects across a range of different aircraft. Martin is a Chartered Engineer and gained Eur Ing registration in 2011.

VENUE:
Room A166
Lindop Building
University of Hertfordshire
Hatfield AL10 9AB
There is no online option

PROGRAMME:

19:00 – Introductions
19:05 - Lecture
20:15 – Close

CPD

CPD certificates of attendance will be endorsed for CEng, IEng or EngTech registration

Members & non-members are welcome

For any queries, please contact the Branch Secretary on:
Email: hatfield@aerosociety.com

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