Summer 2009

Royal Aeronautical Society
Yeovil Branch Newsletter

Reggie Brie Lecture Competition 2009

The Young Members' lecture competition is now firmly established in the Yeovil branch diary, held annually on the third Thursday in April. This year a well attended and knowledgeable audience heard three speakers give excellent presentations on a wide range of subjects. Again we had the pleasure of welcoming Miss Elizabeth Brie, daughter of Reggie Brie, as our guest of honour.

The speakers and their topics were, in alphabetical order:

Lucy Hipkins:
Wind Turbines - The Future?

Louise Iveson:
Educating Engineers for Industry

Alex Perham:
Helicopter Tail Driveshaft Design

Louise Iverson, Miss Brie, Lucy Hipkins and Alex Perham

The presentations lasted for 20 minutes each, allowing time for a few questions before the panel of judges retired to deliberate. The oral and visual standards and level of preparation were excellent and all of the contestants performed very well, giving the panel a difficult challenge to pick a winner. All three presentations were based on university final year projects, subjects the contestants were intimately familiar and passionate about. After some debate it was concluded that Lucy Hipkins had given the best overall presentation. Lucy was presented with the Reggie Brie trophy by Miss Brie and a cheque for £200. The runners up all received cheques for £25.

Miss Brie presenting the 2009 winner Lucy Hipkins with the Reggie Brie Trophy

Again the evening was a great success and next year's competition has been planned for 15th April 2010. Posters will be displayed in the Autumn, looking for young people who are keen to develop an essential professional skill. Each contestant is provided with tuition before the competition, including advice on slide preparation and a rehearsal in the lecture room. After the competition individual feedback is provided on the strengths of the presentation and areas for future improvement. The competition is open for all people under 30 years in the Yeovil area, the only criteria is the topic has to aerospace related.

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WESTLAND WHIRLWIND FIGHTER
TALK BY GROUP CAPTAIN TOM EELES

Report on the very well received October 9th 2008 talk by Group Captain Tom Eeles on the Westland Whirlwind fighter and it's entry into operational service.

Tom Eeles retired from the RAF some 8 years ago having attained the rank of Group Captain. Amongst the aircraft he had flown in the service was the Buccaneer on which he had achieved considerable operational experience.

His talk began with an outline of the F37/35 requirement which gave birth to the Whirlwind design into which Chief Designer WEW "Teddy" Petter introduced a number of innovations. It was the first four cannon fighter for the RAF and for the first time magnesium alloys were used both as sheet material and castings to produce a light but very strong airframe. The rear fuselage in particular consisted of thick magnesium rolled sheet metal with very little internal structure which was bolted to the rear of the fuselage centre section with the T-tail unit bolted on to the rear. The engines were new and untried Rolls-Royce Peregrines in very close cowlings with carburettor air intakes and radiators in ducts within the wing between the fuselage and engine nacelles making a very sleek low drag installation. Leading edge automatic slats were fitted as were large one piece area increasing Fowler flaps right across the wing centre section. The exit air from the radiators was controlled by upper surface flaps which were operated by cam arrangements on the top of the inboard portion of the Fowler flap.

Development was rather protracted largely by early engine problems with the result that it took from the first flight on October 11th 1938 until mid 1940 before there were enough production aeroplanes to form the first squadron.

Tom's father Squadron Leader Harry Eeles collected one of the first aircraft, P6969, from the Yeovil factory on July 6th 1940 and flew it to Drem, near Stirling, where 263 Squadron was formed and temporarily based, eventually having just 8 aircraft rather than the planned complement of 16. They soon moved south from Drem to Exeter arriving on November 28th, training intensively for their first operation in mid-January when they intercepted and destroyed a single Ju88 over the channel. A new CO, Squadron Leader John Munro, took over the squadron in March and the unit soon switched to low level attacks on airfields and transport in northern France and on small shipping in the Channel.

In 1942 the aircraft were modified to each carry two of either 250lb or 500lb bombs to make their low level attacks more productive. Photographs of the Exeter based aircraft were shown together with squadron personnel.

A number of models and other artefacts were on display including a silver tray engraved with an outline of the Whirlwind on it's lower surface because at the time it was presented by Westland the aeroplane was still on the Secret List!

The talk was attended by over 70 members with John and Jim Munro, sons of the second CO, in attendance. Jim was accompanied by his son James.

Report by Fred Ballam FRAeS

ENGINEERING IN SCHOOLS

Buckler's Mead Community School, 12th March 2009

A team of young engineers from AgustaWestland spent the morning with thirty Year 8 pupils from Buckler's Mead School Yeovil, introducing them to the world of engineering as part of their celebrations of National Science and Engineering week. The objective was to give the pupils an appreciation and understanding of engineering as a profession, and the activities were planned to give them an indication of the variety of skills, such as team working and designing, that are used by engineers.

The pupils were initially given a presentation by Lucy Hipkins. The aim was to explain what engineering is and how it affects their lives. She introduced them to the key areas of engineering like aerospace and construction, and then highlighted the different roles of engineers within these areas and how they interact together.

Robin Mills then took over to introduce the first of two team projects – a competition to design and build a drag car. He gave them an overview of vehicle design and how to reduce the drag force acting on their vehicles. He also gave some examples of how to power the cars. Armed with the same amount of materials, the teams set about designing and testing their vehicles. They then had two attempts to get their vehicle to travel the furthest.

After a break, Louise Iveson introduced the pupils to the second team project – a competition to modify the drag cars for a series of crashworthiness tests. She explained to the pupils the importance of safety within a vehicle and how industry tests their vehicle to ensure it meets the safety regulations. The teams were then sent away with ideas on how to improve their vehicles. The tests involved sending the vehicles down ramps of varying steepness so they crashed into a wall at the base. Each vehicle had an egg inside and if the egg survived, the team could then move on to the next ramp.

Each team was given a prize for winning the individual competitions. A trophy was then awarded to the team that show the best team working attitude. Overall the pupils thoroughly enjoyed the day's event and went away with a better understanding of what engineering involves.

If anyone is interested in getting involved with future events, please contact RAeS (Yeovil) Young Member representative Rebecca Brodie on 01935 386256 or email rebecca.brodie@agustawestland.com.

RAeS Events - Women in Aerospace and Aviation 2008

Part of the 100 Years of Aviation in Britain Celebration

The conference was held at Hamilton place in London and was free to attend for both women and men, although the subject of the conference attracted a predominantly female audience of about 50 people. Six women who work in a variety of engineering and business roles at AW were supported by AW to attend the conference.

The day was well organised with an interesting and varied programme that covered a wide area of the aerospace and aviation industry, aimed at both those thinking of entering the world of aerospace, and those already working within the industry.

Session 1 Aeronautical and space perspective saw a presentation on 'A Career in Engineering - One Woman's View' from Mary Frost, Head of Fuel Control and Gauging Department, Airbus UK, and a talk about current research in the Space sector given by a recent graduate Jessica Housden, EADS Astrium who stood in for a college at late notice.

Clare Walker, Director of Clare Walker Associates then gave a presentation on 'Key British Women in Aviation' which took the audience on a trip back through time to the early achievements and records broken by pioneering women in aviation. Throughout the morning session, the challenges faced by women entering the industry 40 years ago were presented with good humour, and the evolution in attitudes towards encouraging women in the industry today was described.

A workshop followed which introduced a scheme piloted by UKRC. The scheme aims to both encourage women back into industry after a break, and to benefit companies which are able to gain value from the resource of highly skilled women who may have had a career break while having children.

The day was very well organised. Interesting, inspiring and informative presentations from all speakers, in particular Jessica Housden (who's 'last minute' presentation was remarkable).
The breakout sessions were a good idea, however lack of time potentially limited their usefulness.
I personally came away feeling inspired, motivated and ready to encourage – Chrissy Smith

The afternoon session, *Hands-on: in the air and on the ground* included presentations from Ellen Burridge, a British Airways Captain, and Flt Lt Charlotte Fenn the Junior Engineering Officer for the Red Arrows display team. Both described how they had entered their respective careers and gave an account of their experience within the industry. Both were really positive about their experiences and it's fair to say we all came away feeling inspired.

Jane Neal-Smith gave the final presentation on her research work at London Metropolitan University concerning the attitudes to women in aviation. The highlight of this presentation was an account of some of the responses received from passengers to the first women airline pilots. It seems that some passengers were genuinely concerned for their safety when they discovered they were being flown by a woman!

Some very enthusiastic and motivating speakers who gave a useful insight into the Aerospace industry from a female perspective and how men treated them. I liked the mix of older and younger speakers and range of topics. I did feel that it was a bit engineering orientated and there wasn't much on the managerial side what it's like to be working in programmes for example and having engineers reporting to you. – Rebecca Brodie

The final activity of the conference was a break out session where parallel discussions were held on 'Supporting Women's Retention and Progression; what can the RAeS do?' And a discussion aimed at people just starting out in the aviation industry, entitled 'Getting there …career preparation and advice for new entrants'.

The final session of the conference gave an opportunity to discuss how the shortage of skilled people in the industry could be at least partly addressed by encouraging more women into aerospace. The conclusion was mainly that children should be given more exposure to the opportunities within the aerospace industry at a young age, so that by the time it comes to making career choices they haven't moved away from aviation because of viewing it as an unobtainable career.

Report by H. Nobbs

Wind Turbines…The Future?

Lucy Hipkins, AgustaWestland

Executive Summary

The aim of the presentation is to give an insight into the current developments in the wind turbine industry, particularly the High Altitude Wind Turbine sector. The feasibility of the three most developed models was also debated based on my two year dissertation carried out at The University of Liverpool entitled "The Feasibility of High Altitude Wind Turbines"

Presentation Review

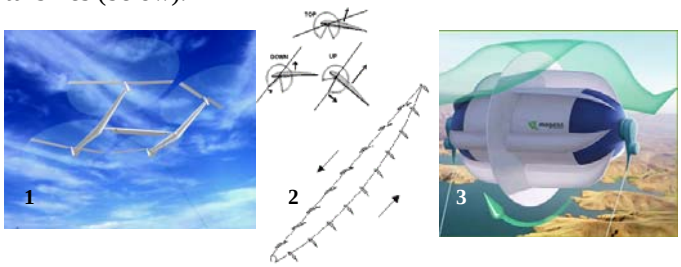
At the moment the UK produces 2.6% of the global emissions of CO_2 despite only having 0.9% of the global population. The majority of this is emitted during electricity production. The two main methods of producing electricity in the UK are gas and oil. However, it is predicted that these resources have only 60 and 40 years left respectively before exhaustion. Something must be done to find an alternative source of energy or the UK will face a severe energy deficiency soon.

The obvious answer would be to convert to nuclear power and renewable energy sources. The problem with investing heavily in nuclear power is that it is not itself a renewable resource so the same problem would be faced further down the line. There is also the pressing problem of how to dispose of the vast quantities of nuclear waste produced.

The question then is which renewable energy system will reward the time and effort needed to develop it? Wind power has been chosen due to its high availability, especially the UK, and its ready accessibility. Pits don't need to be dug to reach it or plants grown to capture it.

The main issues with the current models of wind turbines (shown above) are that they have to work near the ground where the wind direction is variable and its velocity is low and inconsistent. They are very difficult to transport during construction. Blades can be over 100m long and must be made in one section. They create a large amount of noise and vibration which can cause vibroacoustic disease in some people. They can also cause interference with aircraft radar systems.

One way to overcome these problems is to move the turbine further from the ground, to higher altitudes. There are three distinct designs for high-altitude wind turbines (below).



1. The Sky WindPower turbine; it consists of four rotors, two rotating clockwise, two anti-clockwise to counteract the torque. This turbine would reach the desired height using electricity to power the rotors. Once at the desired height, the motors turning the rotors would become generators producing power as the blades auto-gyrate.
2. The Laddermill; this is basically a giant loop of wire with a number of aerofoils attached at set distances. The pitch of the aerofoils is controlled by a computer and altered depending on their position on the loop. The loop of wire then rotates around a generator fixed to the ground.
3. The Magenn wind turbine; this is basically a helium balloon that rotates about its horizontal axis with two generators, one at each end of the horizontal axis.

The Magenn turbine was found to be the most practical turbine after an initial feasibility study, and chosen for further study for my dissertation. After a number of experiments and wind tunnel tests it was found that the Magenn model was capable of producing electricity efficiently. However, a large amount of power was not produced The Magenn turbine would not be able to make a large contribution to the UK's energy production market.
On the other hand, due to the turbine's compactness (it can fit into a rucksack), light weight material and speed of deployment, it makes the turbine an ideal candidate for the production of emergency energy for disaster relief or in remote communities.

In summary, the U.K. is producing a large amount of CO_2 which must be reduced by altering the way electricity is produced. However, if renewable energies are to replace the current depleting methods, improvements need to be made. High-altitude wind turbine technology is still in its infancy and is not yet advanced enough to attempt to take on this challenge. Nonetheless, they are potentially ideal for supplying power in remote sites and disaster areas. High altitude wind turbines will save lives in the future.

Supercritical Drive Shafts for the AW159, 'Wildcat'

Alex Perham, AgustaWestland

My presentation detailed the concept of incorporating Supercritical drive shafts, (Flexible Drive Shafts), onto the Future Lynx Helicopter which has recently been re-named the AW159. The project that I presented was the work I carried out for my dissertation for my part time BEng (Hons) degree in Mechanical Engineering at UWE. I was asked to undertake the project by the Transmission Design Lead for Lynx and concentrated on the design of the Drive Shafts. The information and design work presented will be the basis of the critical design review of this concept in a few months time. If accepted, this concept will be introduced as a modification for the new variant.

The Lynx Helicopter has been in operation around the world for the last 35 years and its popularity with customers has lead to the sale of some 300 aircraft. The current variant of the Lynx is about to be superseded by the AW159.

As part of the modification process, the Tail Rotor Drive Shaft (TRDS) System has been identified as a maintenance burden to the operator, with reports of bearing and coupling failures, cracked bearing hangers, the need to re-grease bearings and a complex shaft alignment procedure. The development of the Lynx project gives AgustaWestland the chance to address these issues.

Currently, the Lynx has four drive shafts between the Main Gearbox and the Intermediate Gearbox, with a fifth shaft between the Intermediate Gearbox and Tail Gearbox. The initial design for this variant uses legacy TRDS technology. However, the ideal concept for the AW159 is to have a total of 3 drive shafts, 2 between the Main Gearbox and the Intermediate Gearbox, with the third shaft between the Intermediate Gearbox and Tail Gearbox. This concept is hoped to be achieved by the use of 2 Flexible Drive Shafts.

A Flexible or Supercritical Drive Shaft is designed to run above its 1st or 2nd whirl mode. The whirl mode or critical speed of a shaft is the theoretical angular velocity which excites its natural frequency. As the speed of rotation approaches the natural frequency of the shaft, it will begin to resonate dramatically, increasing vibration. Whirl of a shaft is affected by many different variables, three of which are speed of rotation, length and diameter. Typically flexible drive shafts are 2 - 3.5 meters long and unsupported. Balance of a shaft is achieved by the addition of mass in three places and if placed in the centre of the shaft, large whirl deflections are prevented.

The introduction of the Flexible Drive Shafts will reduce the vital part count of shafts, bearings, bolted and bonded joints throughout the TRDS system. There will also be a reduction in cost of ownership with improved reliability and system quality. Other civil and military helicopters that use Flexible Drive Shafts are AW139, Apache, A129, AMD 500, A119 and NH90.

Whirl analysis and stress calculations helped to confirm the final design of the shaft that would best suit the requirements of the 'Wildcat' variant. It was calculated that each shaft would have a length of over 2.5 M and manufactured from Aluminium.

The end fittings have been redesigned to have a 5 point fixing method to improve joint safety and will be welded on, thus helping to reduce the part count.

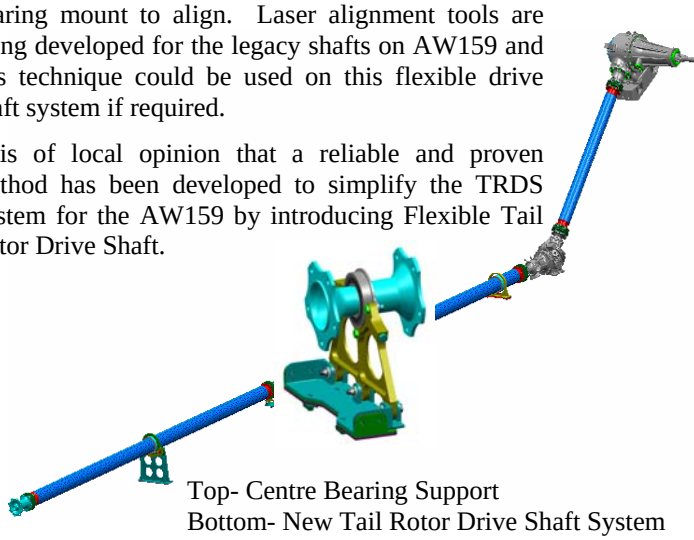
The introduction of Flexible Couplings, placed at the end of each shaft will allow up to 1° of angular movement and 1 mm of axial deflection therefore, the system is not solely relying on the Centre Support Bearing to take up movement created during flight.

The design of the Centre Bearing Support incorporates easy alignment features such as shims for left and right movement and spherical bearings for fore and aft movement. The bearing in this new design is self lubricating and sealed for a life of 10,000 hours.

Dampers will be added to the system to reduce excessive defections as the shafts pass through the first whirl mode. The Centre Bearing Support and Dampers have been designed to locate in the same place as the exiting Bearing Hangers. This will allow for easy interchangeability between the legacy TRDS system and this new system. To certify the new system, rig testing and evaluation of the shafts, including flight tests will be carried out.

Shaft alignment time will be reduced as Couplings have greater deflection capacity and there is only one bearing mount to align. Laser alignment tools are being developed for the legacy shafts on AW159 and this technique could be used on this flexible drive shaft system if required.

It is of local opinion that a reliable and proven method has been developed to simplify the TRDS System for the AW159 by introducing Flexible Tail Rotor Drive Shaft.



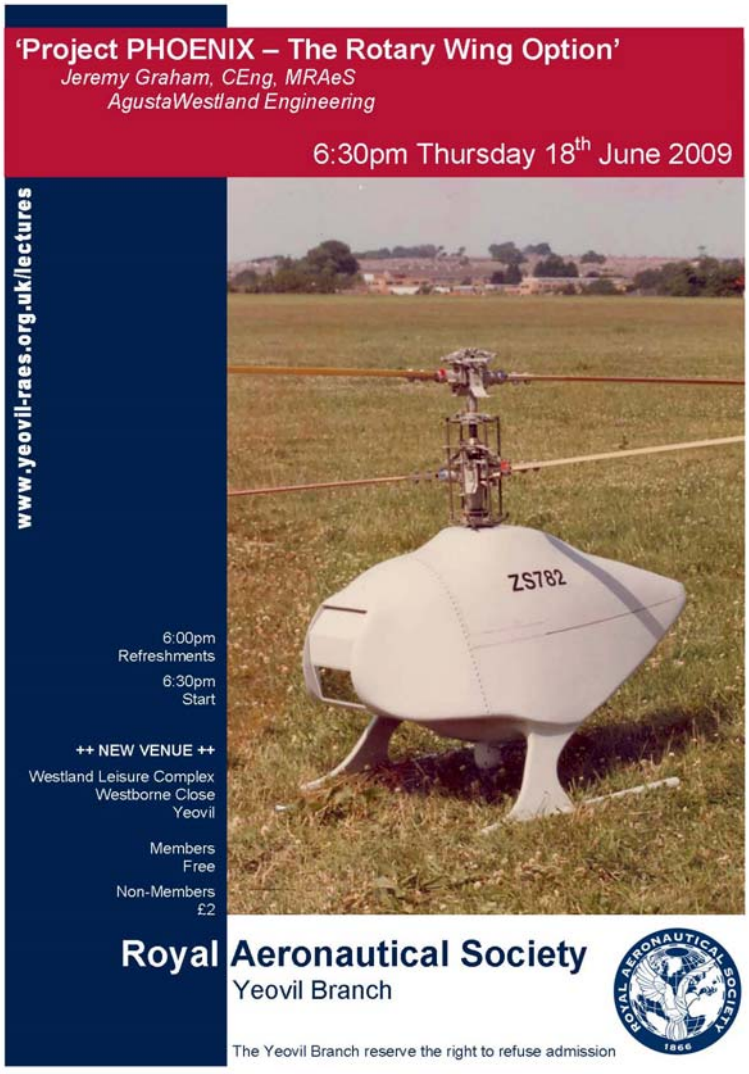
Top- Centre Bearing Support
Bottom- New Tail Rotor Drive Shaft System

YEOVIL BRANCH LECTURE PROGRAMME FOR 2009

LECTURE PROGRAMME 2009

Next Lecture:

18th June 2009. Phoenix UAV Project
Presentation by: Jeremy P Graham, CEng, MRAeS, AW Engineering.



This lecture will be held at the Westland Leisure Complex. 1800 refreshments for 1830 lecture start.

REGIONAL EVENTS

For information on other regional RAeS events, please contact:

Bristol (Alicia Kim, 01225 383375)
Yeovilton (Trev Roland, 01935 456259)

Note: It is advised to always phone prior to attending other Branch Lectures to confirm venue, times etc.