



An Association for Retired Professional Engineers

NEWSLETTER August 2023

President's message

Hello again everyone, and a warm welcome to the August Newsletter.

We have now completed another season of interesting talks, which have been once again varied and well attended.

I must thank my fellow committee members for all their hard work in making this happen, everyone having played their part.

This year, due to the closure of our usual venue, we had to find a new venue for the Christmas Lunch, and in December 36 members and guests attended at the Roundabout Hotel in West Chiltington and enjoyed the food and company.

Arrangements are currently in hand to secure a venue for this year's Christmas lunch (probable date Thursday 7th December). As we all know, the cost of everything is on the up and as last year's lunch was subsidised to keep the cost at £30, this year, unfortunately the price will increase. This is one of the reasons why things are not yet finalised, as venues are reluctant to commit to a price at this stage, so watch your emails for more news on this one.

In June there was an outing to Denbies Vineyard in Dorking held in brilliant, hot sunshine (remember those days?) Unfortunately, it was attended by only 13 people, which was disappointing due to the work Derek put into arranging it. This brings up the old question as to whether outings are required or needed; perhaps an AGM discussion???

Talking of the AGM (on September 19th), the present committee are all prepared to stand again, with Jeremy Hopkins (who was co-opted earlier in the year) becoming a permanent member. BUT there is always room for any other members who feel they would like to join us.

As I said earlier, I would like to thank the entire committee for their work and going forward we will do it all again to bring you a range of talks to enjoy in the coming months.

Keep an eye on your emails as our Membership Officer, Mike, will be sending out details of things you need to know as they crop up.

Enjoy the rest of the summer and I look forward to seeing you all at our first talk and AGM in September.

George Woolard

President

August 2023

PROGRAMME OF EVENTS September 2023 – February 2024

19 th Sep	Tuesday	AGM and talk – Artificial Intelligence and simple approaches to machine learning
21 st Sep	Thursday	Coffee – at Spotted Cow, Angmering
28 th Sep	Thursday	Coffee – with Partners at Swallow's Return
10 th Oct	Tuesday	Talk – The Magnetron
19 th Oct	Thursday	Coffee – at Spotted Cow, Angmering
26 th Oct	Thursday	Coffee – with Partners at Swallow's Return
14 th Nov	Tuesday	Talk – My time in the motor industry and with Octav Botnar (Nissan UK)
16 th Nov	Thursday	Coffee – at Spotted Cow, Angmering
30 th Nov	Thursday	Coffee – with Partners at Swallow's Return
7 th Dec	Thursday	Christmas Lunch – venue TBA
12 th Dec	Tuesday	Talk – The Hubble and James Webb telescopes - TBC
21 st Dec	Thursday	Coffee – at Spotted Cow, Angmering
28 th Dec	Thursday	Coffee – with Partners at Swallow's Return
9 th Jan	Tuesday	Talk – Flight Simulation
18 th Jan	Thursday	Coffee – at Spotted Cow, Angmering
25 th Jan	Thursday	Coffee – with Partners at Swallow's Return
13 th Feb	Tuesday	Talk – TBA
15 th Feb	Thursday	Coffee – at Spotted Cow, Angmering
29 th Feb	Thursday	Coffee – with Partners at Swallow's Return

All Talks and Meetings will commence at 2.30 pm and be held in the Pavilion, Field Place, Worthing, unless another venue or time is indicated. Timings for visits and outings will be as printed in the detailed description of the activity. Coffee mornings commence at 10.30 am.

We do sometimes have to cancel/rearrange talks and visits, in which case we will inform our members of changes to our programme by email. Members can always look on our website for up-to-date details of events.

Subscriptions

Subscriptions are due on 1 October this year and should be renewed via Membermojo, which in early September will send you an email requesting you to renew your subscription.

This email will contain a link and will invite you to click on this link to connect you to the correct page on the system.

As a reminder the subscription remains at £15, and we request life members to contribute £5 to ensure that we retain contact with everyone.

Subs for new members who joined after March will carry their membership over to this year and they will not receive a renewal message until next year.

The system appeared to work well last year, so hopefully will do so this time. If anyone has significant problems, please email the Treasurer at tony.tomkins@bcs.org

Tony Tomkins Treasurer

Website of the RCEA

Our website, www.rceasussex.org.uk carries the very latest information on all our events.

New Members and Speakers for Talks

The RCEA needs new members and speakers to ensure that we can continue as a thriving organisation. Please think of appropriate people you know and encourage them to come along to our talks and hopefully join the RCEA. We also need more speakers to give talks to us at our monthly meetings on Tuesday afternoons from September to April. We are aware that many members have the knowledge from their working careers to provide interesting talks. If you are willing to give a talk, please let us know.

RCEA Insurance

Members need to be aware that the insurance policy that the Association holds is solely for the protection for the assets and liabilities for the Association as an entity. The policy does not provide cover for personal injury or loss to individual members. Members attend the Association's events at their own risk although under some circumstances there may be some cover from the insurance arrangements of the venue owner.

Newsletter Entries

If you would like to provide an article for inclusion in a future newsletter it would be very welcome as we are always looking for new material in addition to reports on previous talks and visits/outings. From feedback from our members, we know that the newsletter is particularly appreciated by those who are no longer able to get to our meetings and visits, so if you are able to contribute in this way it would be much appreciated. Articles should preferably be Microsoft Word documents, although we can usually convert both text and pictures (even photographs) into a suitable format. Accompanying pictures are best supplied as separate files which will be embedded within the text during editing.

Brief Detail – Talks, Outings, and other activities. September 2023 – February 2024

Talk

Tuesday, 19th September 2023 - Artificial Intelligence and simple approaches to machine learning

Dr. David Jones - member

It is becoming difficult to find industrial, commercial, and healthcare products that don't claim to incorporate some form of Artificial Intelligence (AI). Much of it might be marketing hype, but AI techniques are being used to model systems that are difficult to describe analytically. And if governments are concerned about the application and verification of such systems then we perhaps need to take them seriously. In the same breath as talking about AI, people also mention Machine Learning (ML).

Certainly, any AI application needs to learn about the domain to which it is being applied, but how do you get a piece of software to learn about something in the physical world?

This talk will look at one type of AI and, without using too much maths, describe some of the simpler approaches to Machine Learning.

Talk

Tuesday, 10th October 2023 – The Magnetron

Professor Mike Underhill

It is commonly believed that the main contribution made by radar in WW2 was to facilitate the success of the RAF during the Battle of Britain. Arguably however, a more significant contribution was the development of airborne radar

provided by the British invention of the Magnetron. This outperformed anything the Germans could produce, and in fact they never managed to copy it.

Mike's talk will describe its history and deployment, and how it led to present day uses such as the common domestic microwave oven. But how long will it live on? Will it ever be entirely replaced and by what?

Talk

Tuesday, 14th November 2023 – My time in the motor industry and with Octav Botnar (Nissan UK)

Frank Riddle

Frank tells a remarkable story of how, in 1973, he took a job with the embryonic Datsun UK (became Nissan UK) and worked closely with Octav Botnar. His presentation will be partly about Botnar's background (twice a political prisoner before coming to the UK), and how he grew Datsun UK from zero to selling 150,000 cars per year, and partly about his own career and expertise, especially in homologation - certifying cars for compliance with national regulations, in the UK and abroad. This covered not only Datsun cars but many other well-known brands (including Rolls Royce and Aston Martin).

Although retired, Frank is still passionate about control of vehicle emissions and the way the regulations are currently being flouted in the UK; he will update us on this.

And yes, he will also touch on Botnar's bad press re alleged tax and Nissan Japan problems, and many other interesting topics. Botnar was a great philanthropist and gave over £100m to charity.

Christmas lunch

Thursday, 7th December 2023 - TBC

We do not currently have any further details, but as soon as we have, Mike will send it out along with a booking slip, so please put the date in your diary and join us for what is always a very pleasant occasion.

Talk

Tuesday, 12th December 2023 – The Hubble and James Webb telescopes - TBC

Dr. Stephen Wilkins

Dr Wilkins is/has been closely associated with both the Hubble and James Webb telescopes. His talk will discuss the technical problems involved in the design and launch of both amazing telescopes, now positioned in outer space.

More importantly his talk will highlight the successes of both projects, and discuss some of the resulting discoveries, and their contribution to our understanding of the Universe. He will be showing breath taking photos from space.

Talk

Tuesday, 9th January 2024 – Flight simulation

Jeremy Hopkins - member

The presentation will introduce the main components of the simulator and identify key differences from military aircraft simulators. It will discuss the pros and cons of simulation versus simulation of cockpit avionics and give a brief history of technology progress in the simulation host computing engine.

An overview of the architecture of the Boeing 787 flight simulator will be given in order to understand the use of a simulator in pilot training.

If time permits, the presenter will give an overview of the small arms training devices which were derived from aspects of flight simulation technology.

Reports

Visit

Tuesday, 2nd May 2023 – Virgin Atlantic maintenance hangar, Heathrow

Our visit to Virgin Atlantic (VA) had been arranged at short notice to coincide with the changing of the starboard engine on an Airbus A350.

A total of 15 RCEA members and guests attended the tour, shown in the picture on the right, which was taken inside the hangar.

All attendees had previously completed an online safety questionnaire, and on arrival were 'dressed' in steel toe-capped boots, and Hi-Viz tabards, but surprisingly no hard hats or 'bump caps'. There were various hazards on the floor such as trailing cables, and several open cowling doors hung down to about 6' above floor level.



We were split into groups of up to 5 persons to be allocated to our guides, all supervisory grade Virgin engineers.

The picture on the left shows the replacement engine suspended on its cradle by 4 chain hoists, each with a load cell and an operator. All 4 operators took instructions from one engineer who was responsible for ensuring that the engine was always in balance and did not foul any obstacles.

We were told that some engines have just one slinging point and are much easier to change as a result. The 'old' engine would be returned to Derby by road transport.

The engine, a Rolls Royce Trent, is very big as shown in the picture on the right with one group standing in front as a size comparison. It is 3m in diameter, only slightly less than the fuselage of an A320 at 3.28m!

The Trent has a 10:1 bypass ratio, with 85% of the thrust coming from the bypass air. This, plus special surface treatment on the inside of the cowling and the fan blades helps to lower the noise level. The engine has 3 spools, with lubricating oil being passed through a heat exchanger to both cool the oil and pre-heat the combustion air.

This engine change was required as part of the normal routine maintenance programme: the really extensive overhauls take place typically about every 5 years, and are carried out elsewhere e.g., China, Malta or The Philippines.



All tools used during maintenance operations can only be accessed from a digitally locked cabinet, ensuring that an automatic record is generated of who used what tool at what time on what project. This degree of attention to detail is required to maintain the very high degree of reliability that modern engines exhibit, and to provide a 'trail' should a problem occur.

Engine failures do however occasionally happen, and we were told of an incident a few weeks ago on a different Virgin Atlantic A350. During flight a blade from the HP (high pressure – (inner)) turbine broke loose and was ejected out of the exhaust. Rolls Royce in England picked up the fault with their remote monitoring system, even though the pilot was unaware of it until he throttled back and noticed some vibration.

The aircraft landed safely at Las Vegas, and Virgin Atlantic sent out a replacement engine, tools etc, and a team of 7 in a chartered 747 to replace the faulty engine. We were told that part of the reason that a team had to fly out to swap the engine in Las Vegas was because the US and UK have different certification standards.

It was interesting to learn that the engine kept running and hence was not classed as an in-flight shut down.



Although our visit had been arranged primarily to see an engine change, our hosts took us on an extensive tour of the aircraft, both inside and outside.

The picture on the left shows some of our group by the landing gear of the A350. We learnt that retreading of tyres is routine, as it is for commercial vehicles. Tyre pressures can exceed 1.5MPa (218psi).

Occasionally the pilot makes a heavy landing which can cause additional stresses in the landing gear and airframe.

Fortunately, the ground crew are aware of such situations through the continuous monitoring systems on the aircraft and carry out appropriate inspections when necessary.

Each group were able to go into the cockpit, the 'lucky' ones to sit in the seats of the pilot (left) and co-pilot seat (right).

The picture on the right shows the flight deck, which is essentially all digital, with most of the essential flight information showing on the 6 screens, each of which is software configurable such that any screen failure in flight can be overcome by switching screens around.

Similarly, the flight computers continuously check each other's outputs to ensure that the correct information is provided in the event of a mal function through a redundancy function, which will also log the error for future investigation.

It was interesting to see a small conventional magnetic compass mounted high up on the central windscreen divider. Obviously, GPS is relied upon for most practical purposes.





The picture on the left shows the side stick used by the pilots to fly the aircraft – one stick for each pilot.

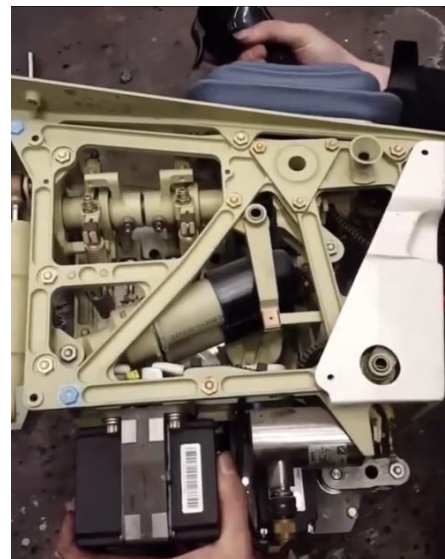
One of our members wondered whether a left-handed person sitting in the RH seat would have any problem adjusting to the position of the stick. We learnt since from an Airbus pilot that after, say a couple of Simulator sessions, pilots quickly adapt.

Although the stick is no longer directly connected to the corresponding flight control surface such as an aileron etc, Airbus designers provide ‘feel’ in the stick through a complex mechanism as shown in the picture on the right.

Although much of the ‘flying’ is under the control of computers today, we were informed that most landings into busy airports are undertaken manually.

Auto pilot has to be used in foggy conditions, but then the separation between aircraft has to be increased in order for the ILS (Instrument Landing System) to work properly.

This in turn reduces the number of landing slots per hour.



The ability to continuously communicate with the ground is obviously paramount in an aircraft capable of carrying over 400 passengers.

Gone are the days when airliners had a wire strung between cockpit roof and tail fin.

The HF aerial is built into the leading edge of the tail fin, which is shown in the picture on the left.

You can also see a slight hump in the top of the fuselage, just in front of the tail fin, which houses the satellite broadband aerial.

Our members could not resist the opportunity to ask lots of technical questions of the Virgin staff, who coped remarkably well under the constant barrage of queries.

One area that was particularly interesting concerned the electrical power system on the aircraft.

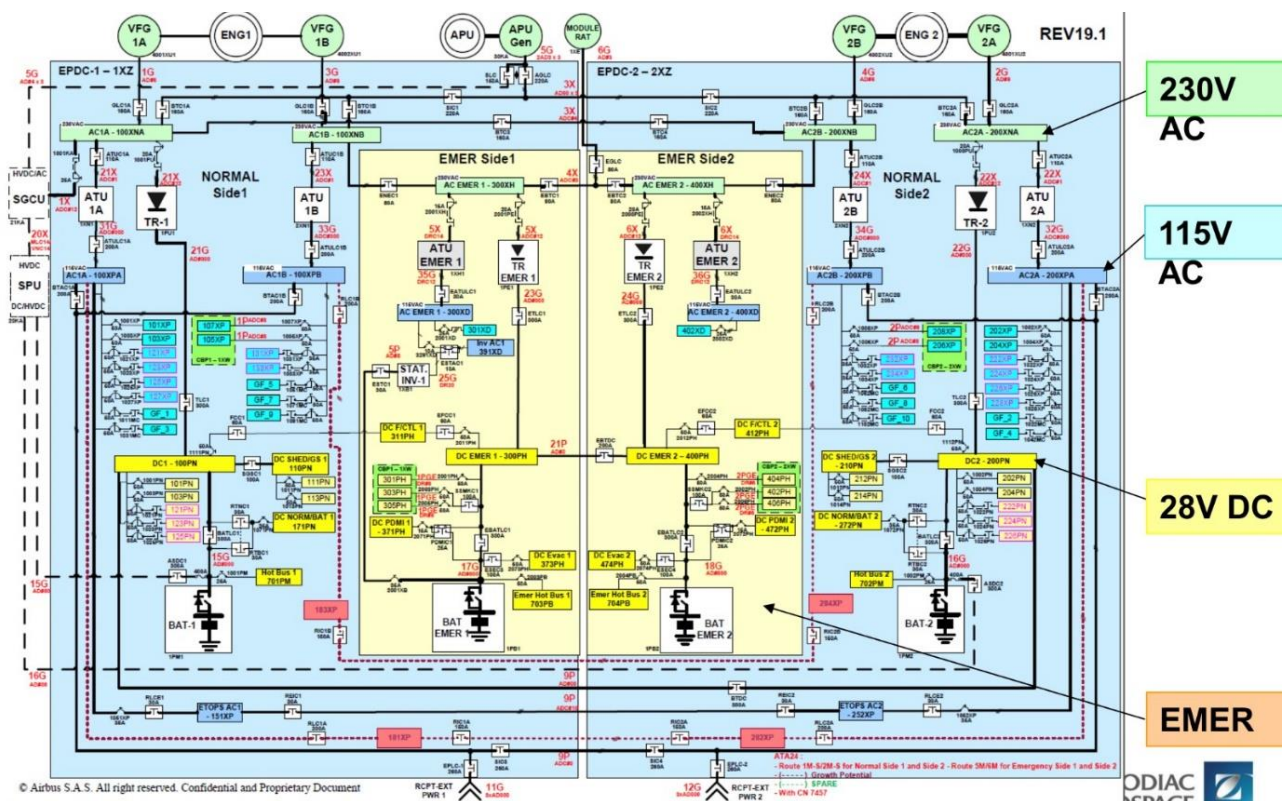
On the A350 each engine generates 100kVA of electrical power at 230vac.

There is a pneumatic starter to rotate the gearbox to start the engine. The source of air is bleed air provided by the Auxiliary Power Unit (APU) in the tail, which also has a 230v, 150kVA generator, allowing the aircraft to be self-sufficient in starting up from cold as the APU is started from the aircrafts' batteries or external ground power.

The 230v ac power system runs at a frequency which varies according to engine speed. In the A350 the frequency ranges from 360Hz to 800Hz (idle to take-off power). The majority of AC loads are fed directly and hence, if consisting of an ac motor, will be designed to accommodate this variation in speed – e.g. fuel pumps. Other equipment is fed with DC.

Historically aircraft had 115vac generators driven by constant speed drives (hydraulic/mechanical units) at 400hz. The move to 230v was made to cut down on feeder weight, and the move to variable frequency was due to the weight and reliability issues with the constant speed drives.

The primary electrical supply system is shown on the diagram below.

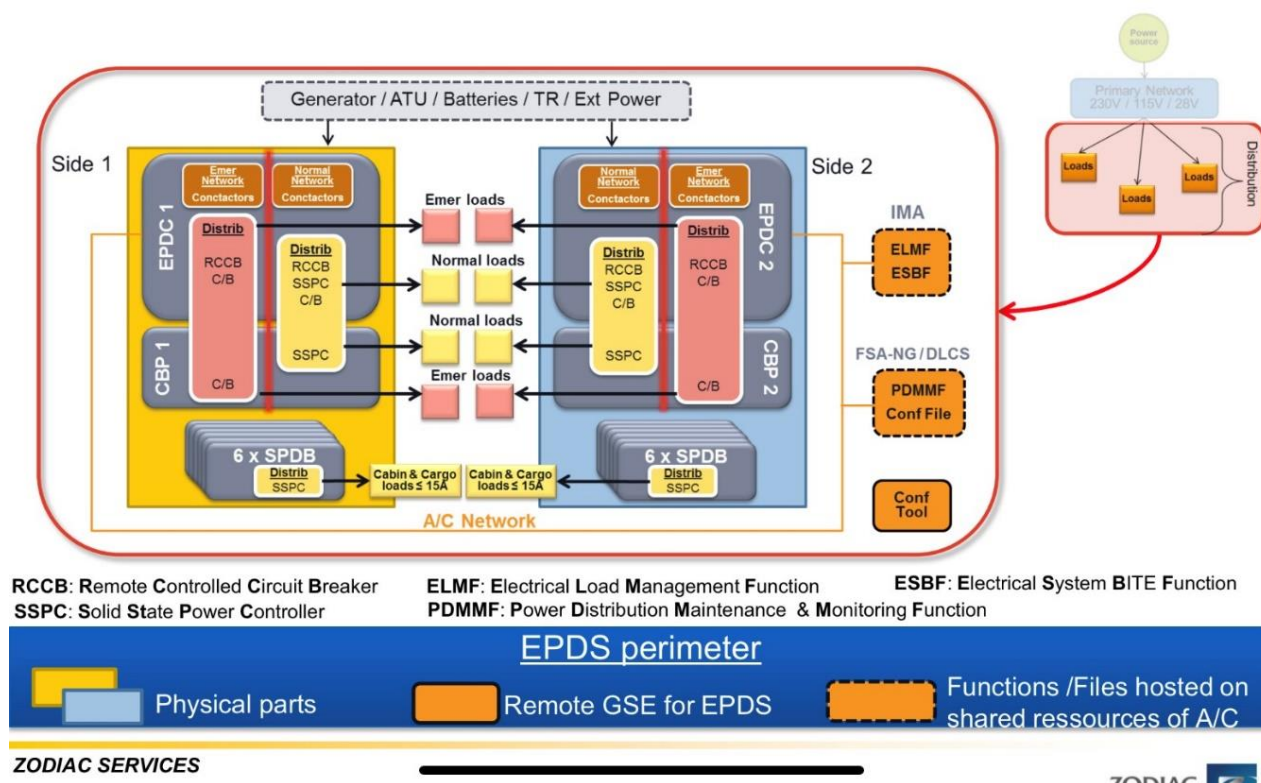


Aluminium has been used for generator feeders for many years.

Although the cables are physically larger than equivalent copper, space is not usually a problem, but weight always is.

Consequently, most heavy current cables are aluminium and are converted to copper close to terminal distribution boards because of the difficulties terminating aluminium and its sensitivity to vibration/heat,

The A350 electrical system optimizes electrical energy based on available sources and guarantees primary network integrity and isolation capabilities as shown in the diagram on the next page.

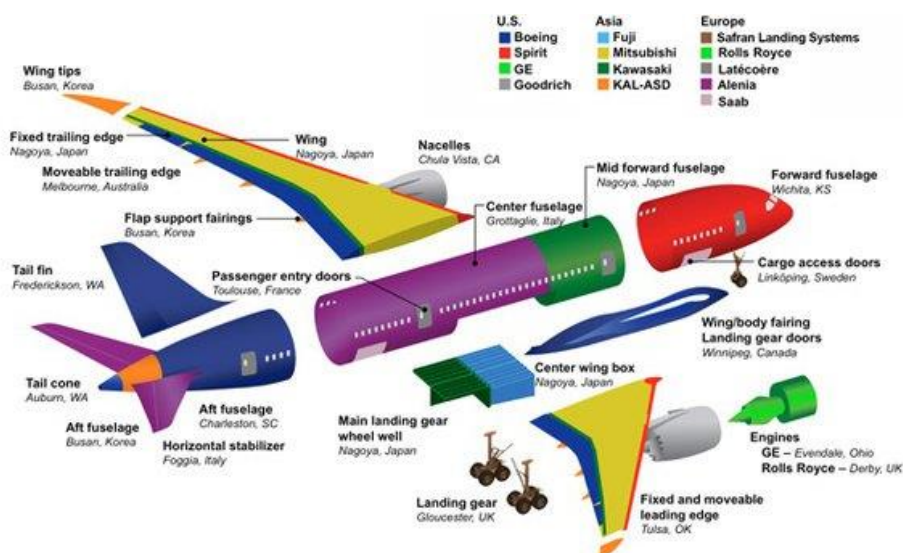


Control signals travel around the aircraft on 1 of 3 data buses which include a CAN-BUS and a military grade one for flight controls.

During our tour of the hangar, we noticed another aircraft parked outside the hangar, a Boeing 787 Dreamliner undergoing a between flights service.

In fact, Virgin Atlantic have 17 Dreamliners in addition to 25 Airbus A350s.

Some of our party ventured outside to view the Dreamliner and to ask questions of the Virgin engineers. The picture on the right shows the Dreamliner just outside the hangar doors.



The diagram on the left shows the main component parts of a Dreamliner and their origins – a truly international airliner.

Although there are many similarities between the Airbus A350 and the Boeing 787 Dreamliner, we did also learn of some of the differences which are listed below: -

The A 350 has winglets, the 787 has raked wing tips (swept back tips).

The A350 has 6 wheels per undercarriage, the 787 has 4.

The A350 has hydraulic brakes, the 787 electric.

The A350 has a 50kVA Ram Air Turbine (RAT) which drops down behind the starboard landing gear, the 787 is 8kva near the tail. If the aircraft is using the RAT to power the Emergency Bus, some loads are shed to prevent the RAT stalling in the disturbed airflow when the landing gear extends.

The A350 has a control column which was shown in an earlier picture, the 787 has a traditional yoke.

The A350 employs pneumatics, 787 is all electric.

The A350 has a smooth exhaust pipe trailing edge, the 787 has a scalloped edge.

We also asked about the early problems with the Dreamliner lithium batteries catching fire. Apparently, the design has changed, and the batteries are now housed in a titanium box.

During the very extensive walkabout, we were able to learn about many other aspects of the A350 and the aircraft industry in general.

Apprenticeships Virgin Atlantic do offer 2yr apprenticeships, but surprisingly they are having difficulty recruiting enough youngsters.

Machine screws. The aircraft industry uses entirely Imperial threads – ANC and ANF, with some UNC and UNF.

Cabin toilet for wheelchair users. We were shown how two adjacent, side by side toilets, could be simply merged into one to accommodate a disabled person seated in a Virgin Atlantic wheelchair.

Crew ‘dormitory’. We were shown a set of vertical steps leading from the rear food preparation area to sleeping accommodation for the crew, a necessity on long-haul flights.

Hangar extension. We noted that the A350 only just fits inside the existing hangar width. Looking at the large sliding hangar door from the inside, the wall on the left is specially strengthened to take the weight of the entire sliding door when open, whereas the wall on the right is of light weight construction to allow it to be demolished and moved outwards if needed to accommodate a wider aircraft, such as the A380 which VA do not currently operate.

Seating. The A350 has 4 types of seating, the most upmarket being ‘Premier Class’ where each passenger has his/her separate ‘compartment’. We were given a demo of how these seats recline and slide partly underneath the compartment in front to give a bed for those lucky enough to be travelling in this way.

ETOPS. This stands for Extended-range Twin-engine Operations Performance Standards. This acronym relates to the maximum distance an aircraft can be from a suitable runway, measured in minutes, that it would take to get there with one engine shut down. All Virgin’s A350s are rated at ETOPS 180.

Clearly a key factor in determining the ETOPS rating is the reliability of the functioning engine. As engine reliability is so important, special precautions are taken, for instance in ground maintenance, if two engines are being worked on, this must be undertaken by two entirely different teams.

Should an engine fail in flight, the A350 has automatic rudder control to maintain the flight heading.

Readers will by now have concluded that this was a fascinating visit for which we have Mike Wooldridge to thank for organising (and providing transport for some of us).

Mike Wooldridge, Malcolm Hind and other contributors.

Outing

Tuesday, 13th June 2023 – Denbies Vineyard

The outing had been organised by Derek Webb who had arranged for our party of 13 members and guests to have sole occupancy of the rearmost carriage on Denbies' land train so that it could also accommodate wheelchair users.

Derek had also arranged perfect weather conditions – sunny, hot and with excellent visibility.

The picture on the right shows some of our party inside and some outside on one of the many stops to take pictures.

Our tour of the vineyards started promptly at 12:30pm, but we were informed by our tour guide and driver that the usual pre-recorded commentary was not functioning in the land train.



Whilst initially this was disappointing news, in fact it turned out to be beneficial as our very knowledgeable guide more than made up for this by stopping more frequently, dismounting, and then giving us very detailed information about the vineyard, and answering barrages of questions.

The picture on the left shows our guide being 'interrogated' by some of our members.

Although the tour was scheduled to take 1 hour, with the sheer number of questions (and an awkwardly parked delivery van on the return journey), we didn't get back to the visitor's centre until about 2pm, at which point we were all ready for lunch, as was I am sure, our rather tired guide.

We learnt that Denbies is the largest vineyard in England, with 265 acres under vines, representing more than 10 per cent of the plantings in the whole of the United Kingdom. It has a visitors' centre that attracts around 300,000 visits a year. It is not though the largest producer of wine in the UK, as Chapel Down, although a physically smaller vineyard, buy in a large proportion of their grapes.

Denbies estate takes its name from John Denby, who owned the farmhouse in the 16th century. The house remained in that family until World War II when it was requisitioned by the military. The heartland of the estate was purchased by Biwater in the 1980s.

The estate, consisting of 627 acres (253 hectares), 200 of which are woodland, was purchased by Adrian White in 1984. It was then mostly farmland, but encouraged by geologist and Dorking resident Professor Richard Selley, Adrian decided to plant a vineyard on the south facing slopes.

Members may recall that in 2014, the RCEA enjoyed a talk by the same Professor Richard Selley on the subject of Fracking, a talk that at the time attracted a very large attendance as it was (and still is) a contentious subject.

Denbies estate is on the North Downs, so the soils are quite chalky. From 1986 to 1989 White had the south-facing slopes planted with vines, which cover 265 acres (1.07 km²) of the 627-acre (2.54 km²) estate, the remainder of which is woodland and pasture. Currently, there are 265 acres (107 ha) of vines, which by English standards is an enormous area.

The average yield is 300,000 litres of wine per year.

Around 65 per cent of Denbies' wine is sold at the visitors' centre, and the remainder through supermarkets, wholesalers and via mail order.

Quality had apparently been inconsistent in the early days, but the owners received a lot of advice from German vineyards where growing conditions are comparable to southeast England, and gradually Denbies focussed on those grape varieties best suited to the soil and climate conditions of the site, with an attendant improvement in wine quality.

Even today wine production is subject to the vagaries of the weather; frost is a big worry, particularly in the lower lying vineyard plots.

Yields can be very low, and Denbies can't produce enough wine to satisfy demand. They are selling everything they make, whereas 20 years ago when they started out demand was much lower and, in some years, production exceeded demand.

The vines do not require watering as the river Mole runs beneath the site and the vines can obtain all the moisture required through their deep tap roots which penetrate the porous chalk sub soil.

Some 90% of the grapes are mechanically harvested, the remaining 10% requiring manual picking to minimize damage to the grape.

Those of us who had not been to Denbies before were very surprised at the sheer scale of the vineyard (see picture of just part of the vineyard on the right).

Some members purchased 'samples' from the shop to consume at home.

This was a most enjoyable outing and our thanks to Derek for arranging it.



Malcolm Hind

End of Newsletter