



THE HAWKER ASSOCIATION

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EDITORIAL

In this issue you can read about the Association's 8th Annual General Meeting (have we really been going that long?), catch up on our continuing excellent talks, hear what Members have to say about their time with Hawkers, and learn what's happening to Hawker types, including the Harrier so summarily dispensed with by the RAF top brass.

The full programme for the year, below, includes an outing to the Hornby Visitor Centre at Margate which covers Airfix, Scalextric, Corgi and Hornby brands. The reconnaissance team reports that it will be a very interesting day out including a special tour of the trade display, a presentation, warehouse and shop visits, and visitor centre display visit, with lunch and tea included. If enough Members show interest a coach will be arranged, departing from the Hawker Centre. The cost will be in the £20 - £25 bracket; less than it would cost you in petrol! Please register your interest with Ken Batstone on 01932 229938 so that coach planning can be started.

Please have a look at David Hassard's piece on the Kingston Aviation Centenary celebration project for 2012 and if you can, get involved. We all owe a lot to what Tom Sopwith started in 1912.

Subscriptions for 2011-12 are still awaited from over 80 of you. Over 30 have not paid for 2010-11; your names are in bold in the Membership list on the last page.

Please continue to send your Newsletter contributions to the Editor, Chris Farara, 24 Guildown Road, Guildford, Surrey, GU2 4EN. Tel 01483 825955, e-mail cjfarara@ntlworld.com.

PROGRAMME FOR 2011

Wednesday 13 th July	Miniature gas turbines - James Hill .
Wednesday 10 th August	Social with video.
Wednesday 14 th September	Social with video.
Thursday 22 nd September	Visit to the Airfix Visitor Centre, Margate
Wednesday 12 th October	Poacher turned Gamekeeper - Alan Millican
Wednesday 9 th November	Traumas of Ferry Flying - Andy Jones
Wednesday 14 th December	Christmas Lunch

James Hill is Chairman of the Gas Turbine Builders Association, **Alan Millican** was, of course, our last General Manager at Kingston, and **Andy Jones** was Chief Test Pilot. Unless stated otherwise, meetings are at the Hawker Centre, Kingston - the old Sports & Social Club - and start at 2.00 pm. Lunch and drinks are available beforehand, tea afterwards, and there is a large, free car park. Please see the Editorial for details of the **Airfix visit**.

KINGSTON AVIATION CENTENARY 2012

David Hassard writes...

Next year is the 100th anniversary of the formation of the Sopwith Aviation Co. and its move into the roller skating rink in Kingston. A Kingston Aviation Heritage Projects group has recently been formed to spread the word about Kingston's amazing aviation achievements. We are initially focusing on a centenary event in Kingston Market Place over the bank holiday weekend of the 2nd - 5th June 2012. The group includes representatives from the Hawker Association, the Kingston Aviation Heritage Trust, Kingston First, Kingston University, Kingston Museum, Kingston Tour Guides and the Brooklands Museum. Plans for the centenary event include a Sopwith Camel and Hunter cockpit section in the Market Place with historical displays, models and paintings in Market House. Other plans include a properly funded oral history project, a DVD, prepared illustrated presentations and another attempt to get plaques on buildings in the town. If you would like to be kept informed of progress and be made aware of opportunities to help with these projects, please contact David Hassard by e-mail at hassards@talktalk.net or by 'phone on 020 8546 2715.

AIR CADETS NEED HARRIER HELP

Associate Member Peter Bedford reports that the Surbiton and Esher Air Cadets have a static Harrier GRMk3 for which they seek advice and possible assistance on how to avert its deterioration. In particular they would appreciate technical guidance on how best to support the aircraft, complete with engine, with the weight off its wheels. If you are able to help in any way please contact instructor Steve Richards on 07768 930387.

ANNUAL GENERAL MEETING

This, the 8th AGM, was once again well attended although the event was marred by the absence of our Treasurer, Martin Pennell, who at the time was seriously ill. Fortunately he later made a good recovery. In his absence it was reported that the Association currently had over £3,000 in the bank.

Our Chairman, Ambrose Barber, welcomed the Past President, John Glasscock, and Members present and thanked them for turning out on these essential occasions. His annual report would cover the highlights of what had been another satisfying year and reflect on our current situation. We had continued to have the use of this convenient and familiar Hawker Centre for our monthly meetings, barbecue and Christmas lunch, and we had enjoyed another season of really interesting speakers. Pleasure was also evident in our occasional outings which included the de Havilland Heritage Centre at Salisbury Hall and a seminar at Bristol marking 50 years of Pegasus engine flying. The highlight of our jump-jet celebrations was a lunch at Brooklands in November attended by over 100 Members. In all of this we again aimed to organise a combination of socialising, lectures and events for Members.

Among the Associations other aims is to keep alive the spirit and memories of the Hawker Companies and to publicise their achievements. If we, said Ambrose, who were privileged to be part of it don't, we can't expect others who follow to know. In this endeavour we could continue to be proud of our Association Newsletter. However, we know that our "prophets have not been without honour save in their own country", by which was meant the Royal Borough of Kingston upon Thames, and this despite the dogged efforts of the Kingston Aviation Heritage Trust (KAHT) to which many Members had contributed. Interestingly, our Association, together with the Brooklands Museum and the KAHT, has recently been approached from within the Royal Borough. (Editor's Note - David Hassard spoke on this after the AGM and has written an article in this Newsletter).

At the AGM three years ago the possible long term future of the Association was discussed - should it be handed on or wound up? Ambrose hoped that we hadn't just left the question in the 'too difficult' file. The long-serving Committee had put much thought and effort in the month-by-month running of the Association which the Chairman was most conscious of and grateful for. If they were not happy to take this status quo for granted, members were invited to say what more they would like or expect the Association to achieve in the future.

Barry Pegram, our Secretary then gave a statistical survey of our membership and attendances at meetings. Membership, at 388, up 10 on last year, remains healthy and continues to grow and attendances are gratifyingly high at 45 - 70 for the talks with socials attracting around 20. It was noted that the subscription will remain unchanged at £5 for the time being but there may be a need to raise it next year because BAE Systems have closed their Reprographics Department at Farnborough so the Newsletter will have to be printed commercially. As there was no need for elections, the current committee members continuing in office, and the financial report had had to be postponed, the meeting was closed and some historic film footage of P.1127 model testing at NASA Langley was shown.

HARRIER AND SEA HARRIER NEWS

Libya illustrates the magnitude of the mistake made in decommissioning Ark Royal and Joint Force Harrier. Whilst 4 RAF Tornados were flying a 3,000 mile round trip from Marham with 4 flight refuellings each, 6 USMC AV-8Bs from MAS 542 with the 26th Marine Expeditionary Unit were flying 300 mile round trips from USS Kearsarge off the coast of Libya scoring 100% direct hits on Libyan armour with 500lb LGBs. The UK situation is a bit better now but the Tornados have to fly from Gioia de Colle in Italy and this is still a 1,200 mile round trip. At that distance anything like quick reaction is impossible. It was also announced recently that there is a shortage of attack aircraft in the NATO force and that RAF Apache attack helicopters are to be used, operating from the amphibious assault ship (LPH) HMS Ocean, a much more vulnerable and less effective aircraft than the Harrier GR9 with its SniperPod and precision munitions.

Two-seat Harrier XW 269, ex Boscombe Down Night Bird FLIR trials, as been restored from T4 to its original T2 configuration by Jet Art Aviation of Bradford. Finished in No.4 Squadron markings, the aircraft is for sale.

Art Nalls had a good year in 2010 operating his Sea Harrier FA2 XZ439 on the US air show circuit missing only two performances, one due to an hydraulic failure at St Louis and the other due to a fuel booster pump failure at Culpepper, Virginia, the last show of the season.

Your editor's Harrier Database was published in the April 'Aeroplane'.

HUNTER NEWS

The Exeter based Team Viper Hunter fleet was increased to five aircraft with the arrival of T7 W V372/G-BXFI. The other aircraft are: FGA9 G-ETPS, GA11 G-GAII, PR11 G-PRII, and T7 G-VETA. This formation aerobatic team will perform at Kemble, Fairford and Waddington.

Jonathan Whaley's Mk58, G-PSST, has been repainted, in a revised spectacular multi-colour scheme.

SEA FURY NEWS

The Royal Navy Historic Flight's Sea Fury T20, VX281, flew into Yeovilton on March 4th. Kennet Aviation at North Weald returned the aircraft flying condition after which a permit to fly was issued by the CAA. This season's display pilots will be Lt Cdrs Chris Gotke and Dave Mackay. Lt Cdr Ian Sloan is the Flight's new CO.

Sea Fury T20, VX302, has arrived at Meier Motors of Bremgarten, Germany, from the Cavanaugh Flight Museum, Texas, where it was damaged in a forced landing. It will be restored to the red colour scheme it had when operated by the German DLB from 1958 to 1970.

SLIM THE WELDER

He was sixfeet tall and weighed about nine stones, which is probably why his workmates called him 'Slim'. Slim's dad was a policeman who was an extraordinary shot with a rifle. In fact, he was the police champion shot for the County of Kent. When the fair visited, he was barred from the rifle range because he used to cut all the target bottles down by firing at the strings from which they hung. Slim wanted to be a greengrocer but his dad insisted that he should go into the motor trade, which would be the business of the future. Slim worked for James Young and Barclays, both coach builders for Rolls Royce. He became a very good oxy-acetylene welder, even mastering the art of welding aluminium by this method. Among his unusual commissions were welding on the Coronation Coach and the Eros statue in Piccadilly Circus, both of which are of cast aluminium construction. In 1939, Slim's skills were recognised and, instead of call-up into the military service, he was dispatched to Hawkers at Brooklands into a "Reserved Occupation". Hurricane production was getting into full swing and manufacturing was deliberately being dispersed around the country. So, Slim was transferred to Acton, welding bits of Hurricane Typhoon and Tempest fuel tanks and wing tips. He stayed at Acton throughout World War II, living most of the time in Ealing with his brother, Ted, who was a rate-fixer. Slim played the drums in the Hawker Acton dance band and was a member of the Acton Home Guard. He used to get home to his wife and two children in Bromley, Kent, once or twice a week but usually after the children had gone to bed. After World War II, Slim was made redundant and worked for a toy company and, later, a maker of loft ladders. In 1966, when his son got married and left home, Slim moved to Bury St Edmunds where he retired and, in 1983, he died of emphysema at the age of 78, emphysema being the result of welding fumes and roll-your-own cigarettes. However, in the meantime, his son had completed an apprenticeship at Hawkers and was now earning his crust as Production Director.

I'm very proud of Slim – you see, he was my Dad. Ray Searle

ICONIC HUMOUR

Roy Braybrook has a couple of Camm memories ...

As a long-time collaborator, I was particularly interested to read Ron Williams's recollections of working for Sir Sydney (in NL28). Just to expand on one of Ron's stories, I recall that on joining the project office in Canbury Park Road as a postgraduate apprentice in early 1956, I was gleefully shown the only drawing they had ever seen Sir Sydney actually make. Pasted to the wall behind one of the framed photographs was a scrap of paper with two concentric circles and two kidney shapes between them. This represented a Hunter rear fuselage and the joke was that nobody was really sure whether he had intended the additional fuel tanks to go above and below, or on either side of, the jet pipe.

On the subject of iconic humour, I also recall that some months earlier, when I was working in Jim Wilde's section of the production drawing office, after carefully looking around to see that Sir Sydney was nowhere in sight, Bob Copland showed me a drawing of the Hunter main spar that the great man had had them make, using a pin-jointed structure. The word was that Sir Sydney had less than total confidence in the ability of the stress office to predict kink-loads in the bent spar-booms of the initial design, so we had this thing that looked like the Firth of Forth bridge, in case Hunter wings started breaking off. Working for Hawker Aircraft was an expensive pastime for most of us, but we had some great times and lots of laughs.

TRIBUTE TO CANADIAN KINSMAN

Les Palmer writes ...

Association Member the Rev. Vernon Lidstone is building a one fifth scale flying model of Hurricane P2961 of 242 Squadron RAF, flown by Flying Officer 'Willie' McKnight. Killed in action, aged 23, on January 12th, 1941, Canadian born Flying Officer William Lidstone McKnight, DFC & bar, was an ace with sixteen enemy aircraft destroyed (8 1/2 Me109s, 4 Ju87 Stukas, 1 Do17 and 3 other bombers). Nicknamed 'Willie' he served as the CO's wing man whilst that 'all Canadian' squadron was commanded by the legendary Douglas Bader at Coltishall. Vernon is working towards the first flight of his model which is expected to take place at Aston Down in the late summer.

RAHARTO, BEDFORD AND THE BECAK

Alan Merriman remembers Raharto, HSA's agent in Indonesia during the Hawk campaign, and Bill Bedford, then our marketing executive resident in the Jakarta Hilton International hotel ...

Raharto was always so generous and helpful to me whenever I went out to Jakarta to see Bill Bedford and promote the Hawk purchase, and I know Bill thought most highly of him; they always got on so well together.

Perhaps the most amusing episode occurred when Bill suggested we did a nightclub crawl around the higher class area of the city. At an early hour in the morning we set off back to the hotel in a couple of pedal cycle becaks (Editor's note: a tricycle rickshaw with a passenger seat for two, propelled by the cyclist in front). Bill made the peddling lads sit in front while he and I fought out the battle of Britain in a dog fight between the two of us all the way back to the hotel. On reaching it Bill used a bottle of brandy as fuel to set fire to the boys' sweaty T-shirts and gave them each a sparkling clean replacement embellished with a red Hawk, as a promotion while they drove round town. The news of this reached Raharto and when the becak was condemned by the Government, much to my amazement a spanking new becak was delivered to my house in Sutton Coldfield, courtesy of Raharto. I still have it reposing in my garden, somewhat dilapidated and in need of refurbishment, but it fills me with nostalgia every time I go near it. Soon after its arrival I sent Bill a photo of it, by coincidence covered in snow. Bill immediately forwarded it to the Jakarta Post editor for publication with the following letter:

"I was most interested to read in the Jakarta Post Monday March 10, 1986, about a historical transport vehicle being redesignated Sea becak. To match this I enclose a photo of a British development known as the Snow becak owned and driven by a famous Royal Air Force test pilot named Marshal (ret'd) Alan Merriman. He says that his becak is a pleasure to drive and that it stimulates immense interest in the UK and is popular with children and at local shows. It is at home in the snow in England, as it is in the sunshine of Indonesia, except the heating is not quite so effective. How about some enterprising young firm reconditioning becaks and exporting them abroad to help the economy rather than just ditching an interesting part of transport history in the sea. This would give pleasure to many people."

Bill was completely irrepressible; what wonderful times we had together.

GROUND VIBRATION TESTING

Peter Hickman was reminded by a recent test report of tests he was involved with on the Hunter and Harrier...

PART 1 - THE HUNTER

I was reading an article in the March 2009 IMechE Journal about the ground vibration testing of the new Airbus A400M military transport. The tests were to detect airframe resonances and verify aircraft flight safety and reliability. The structure was fitted with 50 exciters to vibrate the aircraft and 700 accelerometers to measure frequency and damping. However, what was really interesting to me (you will see why later) was that the aircraft was placed on an elastic rubber platform to simulate the flight condition. The tests measured aircraft dynamic behaviour from an aeroelastic viewpoint. The work was completed in less than a month!

In the Spring of 1957 the Hawker Research and Development (R&D) Department carried out ground vibration testing of the Hunter. For the first trial the aircraft stood on its undercarriage with tyre pressures reduced. The results were reasonable but the analysts wanted further tests to be conducted at lower vibration levels which would require some form of low frequency support. I was given the job of sorting this out. What was needed was a flexible member between the aircraft and its supports and here I struck lucky. The tyre industry was conducting trials with tubeless tyres on electric milk floats. I thought these tyres would be just the job so we obtained details which enabled us to proceed with design work.

The aircraft supports at the fuselage and wing jacking points were to be air cylinders with tubeless tyres providing flexibility. Each support was based on a steel cylinder about 18 inches in diameter and 36 inches high. A thick, oversize, baseplate was welded to the bottom of the cylinder and a flanged ring, drilled with a ring of bolt holes, was welded to the top. One sidewall of a tyre rested on this drilled ring flange and was clamped to it by means of a ring plate, with bolts welded to it, placed inside the tyre. A second, similar ring plate with bolts facing upwards was also placed inside the tyre to clamp it to a thick top plate. A suitable sealant was applied to all rubber-to-metal clamping surfaces.

The top plate had a steel tube passing through it, the lower longer end going down inside the cylinder to be located at the bottom by three roller bearings allowing free vertical movement but preventing lateral movement. The top end of the tube, braced by gussets welded to the top plate, carried a standard aircraft jacking ball which was to engage with a jacking socket on the aircraft. Since all the support cylinders were the same size those for the wings, mid mounted on the Hunter, had steel stools bolted to the baseplate. A Schraeder air valve connector was fitted to the cylinder wall for pressurisation, as was a simple visual indicator to show tyre movement. A 2 BA bolt in the top plate was used for depressurisation - no Health & Safety in those days! With the design complete Charles Plantin and I went to see Roy Chaplin to seek his agreement. I know he was worried about the scheme but he agreed to sign-off our low frequency support design provided that the cylinder wall thickness was increased. This was done.

The recording equipment, borrowed from RAE Farnborough, utilised photo-sensitive paper requiring normal darkroom photographic processing. This posed a bit of a problem since the paper was in 6 inch wide 50 foot rolls. I had to set to and design a cradle and tanks in stainless steel to allow this huge roll to be developed and fixed. We felt sorry for Alison, the girl nominated to do the processing in the darkroom, for the equipment was heavy and cumbersome, but she did a great job. The processed rolls were hung over the hangar roof structure to dry, looking like Christmas decorations.

With the equipment made we descended on the Experimental Hangar at Dunsfold and stood by as Alan Wigginton's fitters prepared the aircraft, a Hunter Mk4. We were to use Jumbo Betteridge's Instrumentation Department facilities: the photo processing laboratory upstairs and the instrumentation room downstairs for analysis and plotting. The Hunter was jacked up on standard aircraft supports and the fuselage and wing contour boards put in place. The nose support was removed and replaced with one of our low frequency supports (LFSs). Shop air was used to inflate the support very carefully. The procedure was repeated with the wing units and when we were all satisfied the contour boards were lowered, but not removed. Alan couldn't believe what we had done to his aircraft and we caught him in the tea break giving the Hunter a gentle prod to watch it floating like a jelly on a plate. In contrast to today's A400M testing we were limited to one exciter and a couple of accelerometer pick-ups. The exciter was joined to the tail bumper position via a strain gauged rod, and we were ready for some exploratory tests. So far, so good. Because the aircraft was 'floating' it was easy to make mistakes. When we arrived the next morning we found the LFS tubes had bottomed due to the hangar cooling overnight, so that evening the contour board were raised to just touch the skin. One fitter, not realising how sensitive the system was, managed to raise a wing support too far causing the central tube to pop out of its roller bearing fitting. Fortunately, no harm was done and we got it back in place. Every night we had to disconnect the strain gauged rod from the rear fuselage.

When Rochefort realised just how many of his staff would be required down at Dunsfold for a number of weeks he directed that we were to use mathematician and tracer girls for the bulk of the work, leaving four of us to run the tests. John Barker was in charge supported by Graham Galton, Derek Simms and myself. One girl was put on photographic processing, another, with Derek, fitted the accelerometer pick-ups in turn at the many recording locations, and four others analysed the traces and plotted the results which were returned to Kingston daily. I was put in charge of these girls; my first experience in handling women. What a challenge!

Using the correct procedure with the accelerometer pick-ups was critical. They had only to be placed lightly on the structure and a lot of care was necessary when moving them round the aircraft symmetrically, measuring both vertical and lateral motion at the same time. As we scanned the vibration levels looking for the resonant frequencies of different parts of the aircraft we happened to hit on the right frequency for the tailplane. As it vibrated the noise was unbelievable, stopping all work in the hangar. We did not persist in this mode so the structure was undamaged. Overall the tests were very successful and as we gained confidence we also tested with the undercarriage retracted and with both 230 gallon ferry tanks and 90 gallon drop tanks fitted. We were pleased that there were no accidents whilst testing and when it was all over the equipment was put away in R&D's Nissen hut store, never to see the light of day again until it was scrapped.

I think that Bill Turner, responsible for the Experimental Hangar, had a 'thing' about allowing photography indoors because, sadly, no pictures were taken of this very interesting series of tests.

PART 2 - THE HARRIER

In the Spring of 1967 ground vibration testing of the Harrier was to be carried out. Due to the totally different airframe configuration, and particularly the large wing anhedral, the Hunter low frequency supports were unusable (I am not even sure that they still existed). Consequently we had to resort to the well tried method of testing with the aircraft tyre pressures suitably reduced, and we still had to borrow recording equipment and exciters from RAE Farnborough. Fortunately the old photographic processing system had been replaced with much more up-to-date equipment which, nevertheless, was to cause us a lot of problems and delay the start of the testing.

Barry Laight was now Chief Engineer and he decreed that the testing had to be completed in a fortnight. To achieve this we were faced with a three shift system, each of eight hours, and continuous testing for seven days a week. We needed teams of seven people for each shift and Kingston could not provide enough of the right disciplines of engineers so people were recruited from Woodford, Brough and Hatfield. Accommodation for them was provided at the Burningfold Hall Hotel outside Dunsfold village. Those on the 4 pm to midnight shift had an evening meal there. To prevent testing delays the 8 am to 4 pm shift brought a daily menu back for the later shift to fill in so that the meal would be served more quickly. With the travelling to and fro, in a Company minibus from the airfield, we managed a one hour break. One day we lost a visiting engineer; he just disappeared. After many 'phone calls we found out that he had gone home without telling anyone. He didn't like being away!

The Dunsfold canteen manageress had to put out coffee, milk, tea, etc and also prepare soup and sandwiches for the midnight to 8 am team. She proved to be a very difficult and unhelpful person. She would not give us the canteen keys, insisting that they were left every day, at her normal going-home time, at the police box by the north main gate, so in all weathers I usually had to walk from the Production Hangar to the gate to collect them. One Friday she forgot to leave the keys, took them home and went out to a party. In those days mobile 'phones didn't exist so we couldn't contact her. That left us with a problem. Lo and behold Barry Laight turned up to see how we were getting on. Assailed by us about a lack of sustenance his response was, "I know what I would do". So we did; we broke in. The following day all hell broke out with the manageress but she did reluctantly agree then to hand the keys over to us directly.

The Harrier was rigged in the western bay of the Production Hangar and we used one of the Inspection offices upstairs for analysing the records. At the start of the testing there were a lot of delays whilst sorting out the equipment, which resulted in most of the team keeping out of the way while the problems were solved. As well as reading, some started playing cards, and one evening Roch popped in to see us and caught them at it. He was furious and took it out on me, telling me to make sure it didn't happen again. Of course it did; but we kept a very good lookout. Transport for the teams was provided by the Company in the form of a minibus and driver. My shift assembled at Richmond Road at 2.30 pm to give us plenty of time for the 4 pm shift hand-over. We were using the old A3 from Kingston and had to go through the middle of Guildford to get to Dunsfold. On arrival we sorted out our evening meal (top priority) and the bus returned to Richmond Road with the off-going earlier shift of Kingston people. It later returned to Dunsfold arriving by midnight with the Kingston people for the night shift so that we could then be taken back, finishing our trip at around 1 am. One night we were stopped in Guildford by Police believing that we were a gang, in spite of the bus having 'Hawker Siddeley' on the side! After that we were often given a Police escort through Guildford - just to make sure we left town!

The test results were reasonable but I don't think they were as good as those obtained on the Hunter trials ten years earlier. Apart from involvement in a test at the A&AEE outdoor wind tunnel on a Harrier front fuselage to establish smoke and fumes clearance times, the Harrier vibration programme was my last big test before leaving the Research and Development Department in 1968 to join Gordon Jefferson in engineering management.

APICTURE'S WORTH TEN THOUSAND WORDS

On March 9th Member David Hassard gave an illustrated talk sub-titled "Exploring aviation painting and drawing" covering the whole gamut of paintings, posters, illustrations, technical illustrations and advertising from the 15th to the 20th centuries. The subject has been a life-long passion of David's and he has built up a wonderful collection of examples of this class of art, a selection of which he brought to the meeting. His talk was illustrated with digital scans from the collection. Clearly the talk was essentially visual so a verbal report can only hope but to give a taste of the wonders revealed to the audience together with David's astute observations.

For an introduction David showed works by masters of aviation painting: Frank Wootton who did beautiful atmospheric works for de Havilland, John Young, Terrence Cuneo who did many factory scenes and Wilfred Hardy - 'head-on' Hardy responsible also for many posters where the subject is flying out of the picture straight at the viewer. As with any subject, a successful aviation artist must have in mind a clear purpose for his work, must research the subject, must create a pleasing composition and decide on the style choosing the medium, colour palette and technique to be employed. His idea must have inspiration, be executed with skill and have the required visual impact.

Art critics might ask "is it art?" Paul Klee, the renowned German abstract painter said that the purpose of art was not to reproduce what is visible but to make visible that which cannot be seen, so David set out to find aviation pictures that were the work of acknowledged mainstream artists, for here there could be no argument. There are not many who included aviation in their pictures but David showed paintings by several artists including Henri Rousseau, Pablo Picasso, Robert Delaunay, Fernand Leger, Eric Ravilious, Paul Nash, Graham Sutherland, Dame Laura Knight and Terrence Cuneo. Many styles or movements, from traditional through cubists, orphists and futurists to abstracts, were attracted to aviation motifs.

Next David turned to graphic design, or what used simply to be called commercial art. These illustrators picked up new ideas from mainstream art but continued their own stylistic progression. Many striking and bold examples of poster design were shown, the artists achieving quite remarkable results from the two or three colour printing processes used. The job of such illustrators is to blend the picture with text and lithographic printing gave the artist the freedom to design his own lettering. Outstanding examples were done for Shell Petroleum and many airlines in Britain, in Europe and in the USA. Initially designs were centred on the aircraft and its attractions but gradually destinations were featured and eventually became dominant. Posters for events such as air shows were created from Edwardian times right up to today where 'head-on' Hardy thrives! Book and magazine illustration is a major field for the aviation art enthusiast. Early newspapers used line drawings as striking illustrations packed with visual information and often employing artistic licence for effect. The Illustrated London News had large spreads of illustrations. Books featured paintings on their covers, good examples being the Wonder Book of Aircraft series, as did magazines such as WE Johns' Popular Flying. In wartime the artist was free to create dramatic depictions of events where photographs were not available or were too bland. Puffin Books were completely illustrated with paintings and drawings as were the later Ladybird Books. The Eagle comic introduced its young readers to engineering and technology with colourful cutaway drawings and Airfix kit boxes had, and have, excellent paintings to tempt the buyer. Battle Picture Weekly pocket sized 'comics' told war stories with accurate drawings of aircraft. Dust jackets of 'secret projects' books, very popular today, show irresistible lifelike renderings of what un-built projects might have looked like, and specialist aviation publishers such as Osprey use attractive colour art work on their covers.

Turning to technical illustration David started with Leonardo da Vinci who, besides being a master painter spent a large part of his life as a military engineer producing exquisite drawings of his inventions, many of which were aeronautical. He was the first to produce three-view drawings and 'exploded' views. A study has shown that every mechanical device known to Victorian engineers can be found in da Vinci's work - except rivets. All he lacked was engines and had to rely on man power. Later work was illustrated by a Sopwith Dolphin fuselage side elevation showing the location of all the equipment, a full colour Hawk fuselage 'inboard profile' and an airbrushed project drawing giving a fine three dimensional impression. Illustrated Parts Catalogues demonstrate the practical value of three dimensional renderings which make the identification of parts so much easier than from a three-view. Other example are the detailed cutaway drawings in Flight or Aeroplane, aircraft recognition manuals with perspective views of the subject and Chris Wren's Aircraft Identification cartoons where salient recognition features were accentuated and made memorable.

To illustrate graphic design and advertising David showed examples of what he had gleaned from Flight and Aeroplane, starting with the Sopwith School of Flying. He then showed how style and content changed and how different aircraft and aero engine companies devised and developed their individual styles. For instance Hawker advertisements were initially rather old fashioned whilst Fairey's were modern and dramatic. In the 1930s Art Deco influence became apparent and gradually colour printing was introduced - two colour, three, then four - a Hart ad. being an early example of two colour. In the 1950s drawings built up from parallel lines of varying thickness became popular, a fine example being an ad. for the Sea Fury. As the clean jets came in so the paintings and drawings used became more aesthetically pleasing, a stunning example being a beautiful pale green Hunter ad. with the strapline "the World's finest fighter aircraft." It is notable that many of today's famous aviation artists started their careers as illustrators.

David finished his talk by showing modern 'enthusiasts' paintings, some being portraits of aircraft with little artistic appeal, others with the aircraft set in a context adding to their merit. The examples shown covered 100 years of aviation. In closing David hoped he had shown convincingly that a picture really is worth ten thousand words, a phrase he attributes to a modern advertising executive since he had been unable to identify any earlier usage! The vote of thanks for this wonderful presentation was given by Les Palmer. (To borrow the DVD of David's presentation call him on 020 85462715.)

TEST FLYING THE JOINT STRIKE FIGHTER

Graham Tomlinson came to the Hawker Centre on February 9th to talk about his last test flying job: the STOVL F-35B Lightning II. Graham started as an RAF Harrier pilot in the 1970s based in Germany, went to the Empire Test Pilots' School (ETPS) in 1978, and then on to 'A' Sqn A&AEE where he flew the Sea Harrier, Tomado and Hawk. He was the A&AEE representative at the Naval Air Test Center (NATC) at Patuxent (Pax) River, Maryland, for the early years of the AV-8B programme. He ended his RAF service with six months back on Harrier GR3s in Belize. In 1986 he joined BAe at Dunsfold as a Harrier GR5 test pilot and stayed until the site was closed in 2000 by which time he was Chief Test Pilot. In 2002, after 18 months at Warton, he was posted to Lockheed Martin as the JSF STOVL lead pilot (a BAe position within team JSF). He made the first flight of the F-35B in 2008 then stayed with it through the initial STOVL testing until retiring in Oct 2010; in all some 28 years on Harriers and 31 as a test pilot.

Graham opened by giving some basic information. The STOVL F-35B is for the USMC only (now that the UK has changed to the US Navy's 'C' version). The total vertical thrust is 40,000 lb; 20,000 lb from the forward mounted engine driven lift fan, 16,000 lb from the core engine via the aft vectoring main nozzle and 4,000 lb from the 'roll posts', downward pointing under-wing roll control nozzles. The primary engine is the Pratt & Whitney F135 with the General Electric F136 as the alternative. There is no VIFF capability, thrust vectoring being for take-off and landing only. The maximum vertical landing weight is approximately 37,000 lb with good control margins, and the aircraft is stealthy.

The STOVL mode control system is derived from 'Unified' developed by the 'RAE' on the VAAC Harrier. The throttle commands acceleration and deceleration (or thrust on the ground and in the STO mode, and in all conventional modes); in the hover the stick moved backwards/forwards commands upwards/downwards vertical velocity (or pitch rate elsewhere); in the hover the stick moved from side to side commands bank angle (or roll rate elsewhere) and if released returns the aircraft to wings level; in the hover the pedals command yaw rate (or sideslip elsewhere). Future development will clear full envelope autopilot/auto throttle, automatic deceleration to a spot, and TRC (translational rate command) which in the hover allows the pilot to make small positional corrections easily, and will then bring the aircraft to a standstill if the pilot releases the controls. A pilot's helmet mounted display (HMD) is fitted instead of a HUD.

In the Harrier the pilot must obey the rules. The F-35B fly-by-wire system gives angle-of-attack and sideslip control, and departure protection. Further pilot workload reduction is given by performance deficit protection, conversion speed window protection and FOD protection warning; and flight test has a watching brief on the requirement for possible tail strike protection during slow landings (currently not considered necessary). Pilot cognitive errors (of trying to control thrust with the throttle) have been mitigated in the design. In the unlikely event of the lift fan failing catastrophically the aircraft would pitch inverted in 0.6 seconds, and the pilot is protected by auto-ejection signalled by pitch rate and attitude (derived from the YAK 38 & 141 systems).

The flying controls are powered by electro-hydraulic actuators (electric power to hydraulic pumps at the control surfaces). The IPP (integrated power pack) is a combined gas turbine and electric starter/generator. After starting the main engine, bleed air keeps the IPP spinning all the time to provide ECS and cooling air and standby power generation. Should the bleed air fail the IPP reverts to a gas turbine mode. To convert from the CTOL to STOVL mode a button push opens the necessary intake doors etc (13 in all), prepares the engine and engages the lift fan clutch which transmits 28,000 shaft hp.

Pit testing over a grid, based on the old Dunsfold design, measured thrust and pitch control power achieved through forward lift fan inlet guide vane adjustment and aft vectored nozzle area, both affected by engine RPM. The effects of opening the 13 doors in conventional flight showed buffet and more drag than expected. For STOVL testing the F-35B was flown to the NATC at Pax River on Chesapeake Bay where there were 25 BAES flight test people (in addition to the peak number of 160 BAES staff at Fort Worth). Facilities included VTOL pads, a ski-jump, austere strips, hot pits (for refuelling without shutting down), telemetry, chase aircraft and a simulator for mission practice. Testing started with in-flight conversions, decelerating and accelerating at 5,000 ft and 210 kn, fixed throttle. There was no pitching but some mild heave. Testing then progressively approached the hover flying at 200 - 100 kn at 3-5,000 ft followed by slow landings (SL) at 130 - 110 kn; then decelerations at less than 100 kn blending to the hover followed by SLs at 90 - 70 kn. Apart from some intake door chatter causing a linkage distortion, and the failure of a flight test antenna, all went well. The Short take-off (STO) mode was checked at altitude followed by 100kn STO and then 80 kn STO, circuit and VL from 150 ft on 18 March 2010. Post touchdown the procedure was all automatic. There were no problems in STO.

Problems in the early development testing, which are addressed in the production aircraft, included: clutch drag in conventional flight, driveshaft length issues due to expansion/contraction, intake door structure, roll post heating (it is a continuous bleed system), sideslip in wind-up turns, nose high attitude in land-aheads from hovers, and HMD vibration and latency issues. In the following areas where problems might have been expected there were none; hot gas ingestion, ground effects, weight-on-wheels operation (gives signals to aircraft control systems), conversion dynamics, performance, deficit protection and help from mission control.

During questions the lack of VIFF was commented on. Graham replied that nowadays FBW allows 50 deg angle of attack as in, say, an F-18. This lets the pilot generate both high lift and high drag and compensates for the lack of VIFF. On weapons carriage the primary method is in stealthy internal bays with external carriage an option when battle conditions allow. On battle damage vulnerability Graham said that the US Congress has mandated battle damage survival so survivability is a design parameter. Barry Pegram gave the vote of thanks for this outstanding talk which had been of particular interest to the old 'Harrier' men present.

MEMBERSHIP NEWS

Congratulations to Adrian Orchard on his promotion to Captain.

We welcome new Members: Brian Bickers, Sally Bracher and Violet Hall.

Sadly we record the deaths of Maurice Carlile who joined Hawkers from Follands and rose to be Director Harrier, and Don Pratt who joined from Handley Page and became Head of Ground Test Services. Our condolences go to their families and friends.

Fifteen long term non-payers of subscriptions have been removed from the membership list. Don't let this happen to you! **Those in bold still owe their subscriptions for 2010-2011. You have been warned!**

MEMBERSHIP LIST MAY 2011

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