



THE HAWKER ASSOCIATION

NEWSLETTER NUMBER 28 - AUTUMN 2010

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EDITORIAL

We have a very significant anniversary coming up in November - 50 years since the first hover of Ralph Hooper's P.1127 prototype, XP831. Spare a moment to consider what this first step led to and how much the lives of many of us were influenced by it. We owe Ralph, and Gordon Lewis (who sadly died in October), Bristol's BE53 designer, a great debt of gratitude.

Our traditional Christmas Lunch is coming up; please note that the date is **8th December**, not 15th as given in earlier Newsletters.

A **Membership renewal form** went out with NL.26 ...but **94 of you**, including 24 for 2009/10 and 12 from 2008/9, have still not responded. Please help your hard working Secretary by paying up! Send your £5 cheques to Barry Pegram at 12 Becket Wood, Newdigate, Surrey, RH5 5A Q. If you are not renewing please call Barry, anyway, so we can take you off the mailing list.

Also, please keep sending your Newsletter contributions to:

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PROGRAMME FOR 2010

Wednesday 10th November

The BAE Systems Heritage Programme. **John L Parker.**

Wednesday 8th December

Christmas Lunch with partners; 12.30 at the Hawker Centre.

Tickets for the **Christmas Lunch** at £16 can be bought from Ken Batstone at the November meeting or you can 'phone him on 01932 229938 then send him a cheque. The menu is: cream of tomato soup or prawn cocktail; roast turkey, poached salmon or vegetarian; Christmas pudding or raspberry Pavlova; tea or coffee and mince pies.

PROGRAMME FOR 2011

Wednesday 12th January

Social with Les Palmer's quiz.

Wednesday 9th February

TBD

Wednesday 9th March

'A picture's worth 10,000 words.' - **David Hassard.**

Wednesday 13th April

Annual General Meeting with video.

Wednesday 11th May

Hawker Hunter Aviation - **Mat Potulski.**

Wednesday 8th June

Summer barbecue.

Wednesday 13th July

Miniature gas turbines - **James Hill.**

Wednesday 10th August

Social with video.

Wednesday 14th September

Social with video.

Wednesday 12th October

Current Harrier activities - **Paul Cheetham.** (tbc)

Project Manager **John Parker** is now in charge of BAE Systems 'heritage'. Member **David Hassard** will show us aviation advertising art, **Mat Potulski** is Managing Director of HHA who run a fleet of Hunters under contract to the MoD, **James Hill** is Chairman of the Gas Turbine Builders Association and **Paul Cheetham** is BAES's Chief Engineer Harrier.

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.

SEA HARRIER NEWS

The Indian Navy has carried out a Limited Update Sea Harrier (LUSH) programme. A new radar, the Israeli Elta 2032 multi-mode pulse Doppler radar is installed as are Israeli Derby active radar guided air-to-air missiles which are carried outboard on twin carriers, inboard alongside Magics.

Sea Harrier FA2 ZD608 has been bought by a collector in Napflion, Greece from Jet Art Aviation of Bradford.

Correction: the Sea Harrier 'art work' is suspended in Tate Britain, not Tate Modern as reported in NL.27.

HUNTER NEWS

Strikemaster aerobatic Team Viper at Exeter has acquired six Hunters: airworthy T.7 W V322 and FGA.9 XE601; under restoration T.7 XL573 and awaiting restoration T.7 XL600, GA.11 XE685 and PR.11 WT723.

SOPWITH NEWS

An airworthy Snipe reproduction powered by a Bentley BR.2 rotary engine has been rolled out by the Antique Aero Company at Paso Robles, California.

HAWKER FORMATIONS

A glorious sight at Duxford's Flying Legends display in July was a formation of a Nimrod, a Demon and a Hind, from the Historic Aircraft Collection, the Shuttleworth Collection and Demon Displays respectively. In September at Duxford's Battle of Britain display a formation of four Hurricanes performed.

DE HAVILLAND AIRCRAFT HERITAGE CENTRE

Blue skies and sunshine favoured the fifteen Members who visited what used to be called the Mosquito Aircraft Museum at Salisbury Hall near Hatfield. We were greeted with coffee and biscuits by Ralph Steiner, the Centre Operations Director who had opened the museum specially for us. He gave an introductory talk in the Members' Club Room and Library before taking us round the exhibits.

The Mosquito prototype, Ralph said, was designed and built in eleven months on this site in converted farm buildings of which one remains. The museum is staffed entirely by volunteers and now attracts 6,500 visitors per annum. Besides housing the collection of de Havilland aircraft, engines, missiles, memorabilia and other artefacts, maintenance and restoration work is carried out on the exhibits and premises. Funds are being raised for a new £1.6m hangar to protect the aircraft currently outside. Proudly, Ralph reminded us that the de Havilland Company not only built aircraft but also piston engines, jet engines, rocket motors, propellers, guided missiles and ballistic missiles. The Comet was the world's first jet airliner and its engine, the DH Ghost, the first jet engine in the world to be certificated for civil air transport use. The Halford H-1 Goblin powered America's first jet fighter prototype, the Lockheed XP-80 Shooting Star, as well as the first Gloster Meteor to fly, Britain's first jet fighter prototype.

The first stop of our tour was in the Halford Hall, named after DH's famous engine designer, which houses examples of Gipsy piston engines (III, Major I, Major 8, Six, Minor and Queen 30), Goblin, Ghost, Gyron and Gyron Junior turbojets, a Gnome turbo shaft and Super Sprite and Spectre rocket motors. There is a P.1121 display by the Gyron, the prototype's intended power plant. There is also a very well presented photographic history of the de Havilland Company.

In the Workshop we talked with the volunteers working on the complete restoration of DH 89A Rapide, G-AKDW to flight-worthy condition. The airframe has been completely stripped down with all parts refurbished or remanufactured as necessary.

The Main Hangar houses many famous de Havilland types including: a single-seat crop duster Tiger Moth, a Swiss Vampire FB6, a Mosquito FBMk6, a Mosquito BMk35, a radio controlled Queen Bee based on the Tiger Moth, a Hornet Moth, a Humming Bird, a Chipmunk TMk10 and components of a Sea Venom.

Aircraft parked outside included a Heron, Vampire T11, a Swiss Venom FBMk1, a Dove Mk6, a Dove Mk8, the first production DH125 and a Sea Vixen FAW2. Also outside were an ex Air France Comet 1A fuselage, a BAe(DH)146 fuselage, a Trident 2 forward fuselage and a Comet nose section and cockpit.

Hangar E houses the 'star of the show', the prototype Mosquito (W4050/EO234), currently under restoration but essentially complete. This is the only surviving WW2 twin engined prototype. Alongside were a DH Cierva C24 autogyro and the fuselage of an Airspeed - a de Havilland company - Horsa troop carrying glider; Horsas of Arnhem fame, were built on the site. Amongst the side exhibits, of which there are a great many throughout the museum, was a 57mm 6 lb Molins-feed field gun as fitted to the anti-shipping 'Tsetse' Mosquito. The Memorabilia Display, housed separately, contains scale models of just about every de Havilland type.

Our visit concluded with a visit to the well stocked Aershops where we thanked Ralph for showing us his excellently stocked and presented museum. Your Editor would unreservedly recommend Members who didn't come on this visit to do so independently; you won't be disappointed. It is open from March to October. For opening times see www.dehavillandmuseum.co.uk or 'phone 01727 822051.

EXPERIENCES WITH NEW TECHNOLOGIES

On 14th July Mick Mansell visited Kingston from 'oop North' to tell us about some of the things he was involved with as BAES HQ Future Systems & Technology Director. Most of us remember him from the late '60s to the late '80s as an avionics systems engineer at Kingston and Dunsfold, Head of Avionics, Chief Designer Harrier I and Executive Director Design. He was promoted out of Kingston to be HQ Director of Projects, Director of Advanced Technology at Warton, Joint Strike Fighter Director & Chief Engineer at McAir, St Louis, then back at Warton as Business Development Director, HQ FS&T Director and finally Future Air Systems Director, retiring at the end of 2002.

In his introduction Mick explained that new generations of systems design was now concerned with exploitation of the electromagnetic spectrum using digital networks, high power micro waves and lasers, software and new media. The next steps would involve bioengineering and nanotechnology. In the military field we now had network-centric warfare. Coming up was the exploitation of space, quantum computing, fully autonomous systems, full electromagnetic spectrum dominance and global strike. In the digital battlefield everyone talks together. Target information is fed to central control where target tracks are determined from sensors, analysed and prioritised, then advised to the operators.

Moving on Mick stated that stealth was now paramount. Ways of achieving stealth were then covered. Give-away radar emissions could be minimised by utilising memorised one-pulse bursts which might well go unnoticed or be misinterpreted by the enemy. This is known as Low Probability of Intercept Radar technology. Vehicle radar returns had to be minimised so appropriate shaping and absorbing treatments (known as RAM-Radar Absorbent Material) was fundamental and accurate manufacture and high quality finish with no discontinuities was essential, hence the structure is fitted inside the finished skin. Various radar-absorbent treatments could then be applied externally or built into the aircraft skins or structure. Stealth was very expensive to achieve and maintain so usually survivability, performance, weight and cost were traded to achieve an affordable requirement. However, the B-2 is said to have had no cap on stealth cost with the outcome that each bomber had a radar cross section (RCS) reported to be slightly less than a golf ball...but cost \$800 million.

Radar detection range is proportional to the fourth root of the RCS; reduce the RCS to reduce the detection range. For every 10 db reduction in aircraft RCS, detection range is halved so a 100 mile detection range becomes 12.5 miles for a 30 db reduction resulting in improved survivability rates.

To be avoided are: slots and cavities which enhance the radar return through internal reflection, points which scatter the radar signal resulting in some returns, circular protuberances round which the radar waves creep back to the sender, joint gaps, discontinuities and joints between different materials which all cause scatter.

Aircraft configuration contributors to the RCS are: radome, radar antenna, cockpit and air intake cavities which all reflect, visible engine fans, external stores, wing leading edge direct reflection and trailing edge scatter, fins and tailplanes which need to be angled to avoid reflections, and engine nozzles. The objective is to ensure that the azimuth spikes in the radar reflection polar diagram are limited in number. Four is the minimum achievable on a bomber (B2) compared to a non stealth aircraft's plethora of spikes allowing detection from any angle. The stealthy fighter design will have a larger number of spikes due to retention of tailplanes and fins dictated by manoeuvre requirements. Each reflecting section is then carefully designed to minimize and control the direction of the spike.

This spike direction control is achieved by careful shaping such as the forward fuselage section with flat planes and chines and by using radar absorbent material (RAM). On wings and tails all sweeps are aligned to give one spike, and fins are deleted or angled. (The B-2 has no fins using split ailerons for yaw control, but in the target area these are locked and differential thrust is used.) All panel edges and hinge lines are similarly aligned. Radomes are designed as filters allowing transmission of only the user's frequencies and the bulkheads are treated with RAM. Engines are buried and fed by long, smoothly curved, RAM-lined, 'S' shaped ducts which hide the fan and attenuate radar waves entering and reflecting within the intake. Boundary layer ducts and ramps are replaced by aerodynamic shaping of the fuselage sides ahead of the intake. Canopies are coated with gold or tungsten carbide to deflect the radar and prevent it entering and being reflected back by the cockpit cavity. Wing leading edges are made from Kevlar and act like radomes so the radar enters the edge cavities to be absorbed by RAM. Joints are filled with "butter"- plastic putty containing ferrous materials (eg iron filings). Pitot sensors are flush and all antennas are buried in the skins (surface mounted).

Radar signature measurement cannot be scaled so all ground rig testing must be done using full size aircraft or components on a special range such as that at Warton. In hostile areas manoeuvring, especially in roll, is to be avoided because this would negate the carefully contrived azimuth spikes and display spikes from the upper or lower aircraft surfaces; approach to and exit from the target is straight and level, a test of pilot nerve. Interestingly there have so far been three generations of stealthy aircraft approximately a decade apart: F-117A of 1983, B-2 of 1993 and the F-22 of 2003.

Thermal control is also necessary to prevent infra-red (IR) sensing. Outlets on the front fuselage are avoided, all hot exhausts being collected and dumped in the engine efflux which is itself mixed with cool air and possibly released, hidden from ground observers, over the top of the wing. Airframes can be treated to minimise IR emissivity, in fact, G-HAWK was used for such trials. The effects of kinetic heating and exhaust plumes cannot be accurately predicted so it's a case of build and test. However, the use of reheat in the target area is to be avoided.

This had been a concentrated, clear and completely absorbing lecture, especially enjoyed by the retired engineers amongst us who felt that they had been brought up to date in one easy lesson. The vote of thanks was given by Mick's old boss at Kingston, Ralph Hooper.

EXPERIMENTAL DEPARTMENT

Peter Hickman completes the story of his early days with Hawkers ...

The final location for my stay at Langley was the Experimental Department. This was situated at the southern end of the hangar complex and comprised the Abbey aircraft structural test frame and the Company collection of aircraft. Reg Price was in charge and he had two very good fitters working for him. If the need arose he was allocated additional staff.

When I joined the department work had just finished on structurally testing the Hunter. At that time a major problem had been discovered in the lower front fuselage skinning near the gun pack. As already mentioned the Hunter fuselages were being built at Squires Gate where the wrong gauge material had been used. Consequently we had to quickly change the already tested correct front fuselage for a sub-standard one. When completed the R & D (Research and Development) department descended on us from Kingston to strain gauge the fuselage. R & D then carried a repeat test programme while we busied ourselves elsewhere.

The Company aircraft comprised two Hurricanes; LF363 and PZ865, both now with the RAF Battle of Britain Memorial Flight. LF363 was all silver while PZ865 was in royal blue with gold lettering and cheat lines as mentioned above. The Tomtit, G-AFTA, and the Hart, G-ABMR, were also in blue and gold. The other aircraft were the Cygnet, G-EBMB, a Rapide and a special Sea Fury.

The latter had an ingenious double-extending main undercarriage which was intended to prevent propeller damage during aircraft carrier landings. The Fleet Air Arm (FAA) landed on the deck with flare whilst the US Navy landed harder without flare, a practice the some FAA pilots were adopting. The Sea Fury had not been designed for such treatment. Dowty, who made the undercarriage, proposed double oleos connected by a heavy steel cable. With the undercarriage extended there was more leg than normal but on retraction the undercarriage fitted in the standard wheel well; very clever. Unfortunately, to carry out retraction and lowering tests we had to use big 'SkiHi' supports, and step ladders to get up to the cockpit where I had the extremely tiring job of operating the undercarriage. However, it was all too late for introduction into the FAA. Another feature of this Sea Fury was the installation of a cartridge recognition signalling device. Normal procedure with a Sea Fury was to load the pistol with a correctly coloured cartridge, insert it into a socket on the port side of the cockpit which opened a small flap, and fire. However, this arrangement was no good for the pressurised cockpits on jet aircraft. The answer was to install the signalling device in the wing upper surface near the tip and fire the cartridge electrically. And yes, inevitably one went off in the hangar, fortunately not doing any damage.

The Cygnet was permitted to be flown only within the Langley airfield boundary. One day some air-to-air publicity photographs were required. The 'camera ship' was the Rapide minus its entrance door and Frank Murphy was the Cygnet pilot. With full flap the Rapide could just fly slowly enough for the Cygnet to keep up; but it was a dodgy flight. Reg Price hated starting the Cygnet. The little Bristol Cherub twin cylinder engine could kick back viciously and he had had his knuckles rapped by the propeller on more than one occasion. Eventually he managed to 'accidentally' break the propeller. That ended the flying because although the propeller was glued and bound it was useless for flight, and there were no spares.

Starting the Kestrel engine of the Hart was also very interesting. One fitter each side stood on a main wheel behind the flying wires and inserted a starting handle in the side of the cowling. On a signal from the pilot the fitters, one sometimes being me, would like mad until the pilot engaged the starter whereupon we would be covered in oily smoke and flames from the exhausts. It was very important to crouch down or else you lost your hair!

I had a further engine starting experience when a twin engined Airspeed Oxford arrived to pick up some spares. Detailed to help the pilot when he was ready to leave, he explained the Cheetah starting procedure. After removing a starting handle from a pocket inside the cabin door I had to climb onto the port wing, undo an access door on the engine cowling and insert the handle. The pilot then signalled me to start winding and eventually the engine started. Taking care not to be blown off the wing I secured the access door, climbed down to replace the handle in its pocket and closed the door, then round to the port wheel to remove the chock. Thank goodness for the cartridge starters and ground starter trolleys that replaced that system!

Sadly, just outside the hangar on the grass adjacent to the sports field were two aircraft waiting to be broken up by Coley's. One was a Lancaster bomber used by Airwork for trials until replaced by a Lincoln which was still flying from Airwork's hangars on the northern side of the airfield. The other was a Tempest Mk VI which had been used for engine trials.

Here ended a most interesting period in my early days at Hawkers, one that I thoroughly enjoyed. It was now time to return to Richmond Road to complete my apprenticeship.

SIR SYDNEY AND I

Ron Williams recalls his early career at Hawkers...

In 1948 I fell out with Sir Sydney Camm when I managed to get a Surrey County Council grant, of £110 with £90 course fees, to finish my degree course full time. I had already completed four years night school at Kingston Polytechnic and spent the previous year cycling after work from Kingston across London to Northampton Polytechnic in Clerkenwell, now City University, five nights a week, and I don't think either of us was benefiting. Sir Sydney reckoned that his people could teach me all I should know and saw no need for my course. I went, anyway.

Next Summer, 1949, I applied to him for vacation employment in the Project Office thinking my five years experience would be useful. I also needed use of a drawing board to catch up on my course work having fallen behind the all-full time students. Sir Sydney refused and I ended up doing semi-skilled fitters' work, albeit with better pay, at Canbury Park road. However, he did take another student from my degree course into the Project Office, so security couldn't have been the issue.

I attained my degree in 1950 but when I applied to return to the Project Office I was only offered a Stress Office post, and again someone from my degree course went into the Project Office instead of me. A year later that person left and I was back in the Project Office at last.

Sir Sydney and I were later friends again through our mutual interest in photography. I was secretary of the Hawker Photographic Club and published the Club magazine. We had an annual exhibition and a competition judged by Cyril Peckham, our renowned Company photographer. Sir Sydney arranged for the Club to have a dark room converted from our Sports Club's old boiler room and supplied his old Leitz enlargers. I repaired the first one and he took it back.

I admired the way he kept the Ministries off our backs. Because he was trusted by them to do the best job possible we had the minimum of interference. Members of the Project Office - Ralph Hooper, John Fozard, Robin Balmer, Trevor Jordan and I - were considered to be his "young men" and would be paraded before visiting VIPs. I like to think he was proud of us.

WARTIME MEMORIES

Doug Halloway continues remembering life in the early 1940s...

I was working all hours at Slough with a long coach ride each way, every day. There were some nice girls in my section and occasionally some of us would meet at Waterloo Station for a meal at Lyons Corner House and then a full programme at the cinema - two films, news, cartoons and the organ interval. Afterwards back to Waterloo Station; the girls to Slough, we to Kingston. Any raids were ignored but fortunately no bombs fell near us.

However, I got caught in London on 29th December 1940 in one of the heaviest raids at that time. My brother and I had been to Hull to stay with our parents for Christmas and returned to King's Cross at 5.30 pm. As we got off the train the air raid warning sirens started. Nobody wanted to go through the ticket barrier so we jumped down onto the rails, climbed onto the next platform, which was empty, and ran along to get down the 'tube' for Waterloo. The underground station platforms were already being filled with people who were sleeping there so we could only get as far as the Haymarket.

The raid was in full progress with bombs falling mainly in the docks area. The large shutters on the shop windows were moving quite a bit when a bomb was a bit close. We set off across Trafalgar Square and down Whitehall to Big Ben. The underground station opposite was closed so we walked across Westminster Bridge. On the other side of the river a building had been hit and was burning fiercely and practically blocking the road. We were going to attempt to get by but a policeman stopped us and asked where we trying to get to. We told him Waterloo but he said the station had been hit and no trains were running, so we turned back across Westminster Bridge and headed for Victoria Station. As we looked towards Tower Bridge we could see buildings further away all ablaze and barrage balloons were clearly visible above the flames. We didn't see anyone else, only the occasional taxi towing an auxiliary fire pump. Here and there the top floors of buildings were on fire from incendiary bombs but there were no fire services dealing with them.

When we got to Victoria there were no trains or trams running. It was now about midnight and at last we saw bus going to Clapham Junction and got on. The station was crowded but we were told that a train to Kingston would leave at about 1.30 am; and amazingly it did. We got back to Canbury Avenue to find that a bomb had demolished some houses two streets away. Such was life during the war but thankfully it was not always so hectic.

Back at Slough Hawkers was visited by fighter pilots who came to thank us for the Hurricanes. One chap had a hook for a hand but was still flying. They looked very smart in their uniforms with wings; that was for me, so when I was old enough I volunteered for RAF aircrew. I sat exams and had a medical at Oxford University and was very disappointed when I failed the medical; so back to Slough for me. I then volunteered for the Navy and passed the medical but the manager at Slough, Tom Bray, wouldn't release me.

We were still working lots of overtime with alternate months on night shift. (An elderly man on my section had been a pilot in the first World War). I used to see that everyone had jobs and then sometimes had a kip in my office. Occasionally we had a dance at the Good Companions pub which was very good. ENSA (Entertainments National Service Association) played sometimes at lunch time, mostly classical music which was not appreciated by some. One evening we had a big show at Langley with Tommy Trinder and Cyril Fletcher.

The build-up for D-Day started at the end of 1942 which gave me the opportunity to join the Forces, volunteering for the duration of the war. I was in REME (Royal Electrical & Mechanical Engineers) for four and a half years from March 1943, a very different life from that at Hawkers in Slough.

TWO-SEAT FURY

Ron Williams remembers an exciting experience...

In 1948 the Fury two-seat prototype, VX818, was experiencing aerodynamic problems and the Project Office, where I was working, was expected to solve them. One solution resulted in one of Sir Sydney Camm's rare sketches.

The first problem was 'rudder lock'. The fin was stalling at low speed with the rudder hard over so the aircraft would remain yawed and the rudder would not self-centre when the rudder bar was released. The more disturbed wake, when compared to the single-seater, from the tandem hoods was blanking the lower portion of the fin and reducing its effect on directional stability. The second problem, perhaps related to the first, was that in high-g turns at altitude the aircraft would drop a wing and enter a spin. It fell to me to experience both.

By now the Experimental Design Office, having moved back from Claremont House, Esher, had amalgamated with the Production Design team at Canbury Park Road. The new Project Office occupied the space vacated by the Production DO drawing stores, where I started my career in 1943. This office was to the left of the stairs and just along from Roy Chaplin's and Sir Sydney's offices which were on the right. Vivian Stanbury was Project Office head, Alan Lipfriend, who had shared the duty, having left to pursue a career as a barrister. So, when the pilots' office at Langley, our aerodrome and factory near Slough, suggested that someone from the Project Office should be exposed to these problems and act as rear seat ballast, Vivian volunteered me.

At short notice I caught the mid-day postal coach from Kingston and was soon ready for the test flight. I was told that the previous 'ballast', Reg Price, a five foot tall Charge Hand, had hit his head on the canopy during a spin. Over the lunch break a foot long triangular section wooden wedge had been taped, apex leading, to the inner inboard starboard wing leading edge to balance the oil cooler air intake on the port side. It was thought that this aerodynamic asymmetry might have been causing the wing drop departures in the turns.

Squadron Leader Trevor 'Wimpey' Wade, now Chief Test Pilot, gave me my briefing. The intercom was not working (I suppose normal inert ballast would not have needed it) so if there was an emergency he would draw his hand across his throat and I was to jump out. I did have a parachute, though the instructions seemed rushed, but no 'g' suit, and I had to sign a 'blood chit'.

Having strapped in I just had time to find out how to lock the rear canopy before we were off. The tremendous torque from the Centaurus engine and five blade propeller made the aircraft crab across the bumpy grass runway. In the climb Wimpey demonstrated the rudder lock. At 20,000 ft he started a steep dive to 500 mph to test that the emergency signal Verey light pistol could be pushed through its hatch in the cockpit wall against the outside air pressure. Climbing back to 15,000 ft he began a series of increasingly high g turns in each direction. The first one was so sudden that I was caught with my head forward, chin to chest. There were no incipient spins until the last one when we flipped onto our back and the ground and sky appeared in funny places as the Sea Fury pitched and rolled rapidly in its descent. Back at the airfield there was the obligatory barrel roll on the down-wind leg.

At the apron I exited the aircraft full of admiration for what test pilots put their bodies through. However, it seemed that the wedge of wood had not helped as it did not appear on the production Sea Fury T.20 two-seat trainer.

When Wimpey visited the Project Office a few days later he was shown my drawing of the profile of the flight with all the manoeuvres labelled. Vivian Stanbury asked if he would sign it but he refused because I had put 'bumpy take-off'.

The Project Office told Sir Sydney that to cure the rudder lock the fin area would have to be increased, preferably out of the hood wake towards the tip. He then made a sketch showing a fin leading edge chord addition increasing from nothing at the root to moderate at the tip with a small bump above the top of the rudder. We smoothed it out with more tip chord and no bump; this was adopted and gave satisfactory directional stability and rudder behaviour. The only other Sir Sydney sketch I saw was the cross section of a rear fuselage, possibly of the Hunter, with a saddle fuel tank above the jet pipe.

PWS 'GEORGE' BULMAN

The Brooklands Museum has recently been given a collection of Bulman papers and photographs. He was, of course, chief test pilot of Hawkers between the wars but less well known is his preceding career as an experimental test pilot with the RAE at Farnborough. Amongst the papers was the following original manuscript letter from the CO of the Experimental Flight, Squadron Leader RM Hill (later Air Chief Marshal Sir Roderick), for whom Bulman flew.

*Recommendation for award of Bar to AFC.
FO Bulman MC AFC (Flying A) PC
Director of Research*

I recommend the above mentioned officer for the award of a bar to the AFC; generally for exceptional services at all times as an experimental pilot; especially on the following grounds.

1. At the request of the Accidents Department an experiment was in progress to investigate the flying qualities of the Sopwith Camel, with reference to the considerable number of accidents attending its use as a training aeroplane. F/O Bulman, further to his normal spinning experiments, abandoned all controls in a spin and only attempted to recover when the aeroplane was in an over-the-vertical dive. He volunteered to undertake inverted flying experiments to attempt to throw some light on the Camel's abnormal behaviour inverted. Besides taking measurements of airspeed when in inverted flight, he deliberately used his controls to stall the aeroplane when inverted and also to attempt to produce an inverted spin.

2. On a similar request from the Accidents Department, F/O Bulman investigated the recovery from spins on the Bat Bantam aeroplane. It was anticipated that it would be difficult to recover from a right hand spin with the propeller stopped. This officer commenced his experiments at 4000 ft, allowed the propeller to stop in a spin, and had great difficulty in recovering. He found that the use of engine assisted recovery. He continued his experiments at 10000ft and carried out between 25 and 30 spins in one flight, (and) in all cases of right hand spins, engine-stopped, experiencing difficulty in recovering, and in one or two cases becoming so giddy that he was unable to recollect his control movements. He immediately volunteered to repeat the experiments and attempt to measure the time of recovery with a stop watch, the airspeed, and height drop. On one occasion, after employing every known method of using the controls, it took him 3000 ft to make a recovery; in spite of this he was just able to record the time and height drop.

I consider that his pluck and keenness, combined with a determination to make a scientific record of his experience, deserves the highest praise.

*RM Hill
Squadron Leader*

BOOK REVIEWS

Published to coincide with the 70th anniversary of the Battle of Britain is a new book by Leo McKinstry: 'Hurricane - Victor of the Battle of Britain.' If you only buy one book on the Hurricane, make it this one. Although very readable it is a scholarly work with 23 pages of source notes referenced to statements in every chapter (including the HA Newsletter!), a 9 page bibliography, a 15 page index and 38 well chosen illustrations. The complete history of the aircraft is covered in considerable detail from origins through design, development and production to service, 'The Last of the Many' and retirement. This 373 page book is published by John Murray and is very good value at £20 (ISBN 978-1-84854-339-3).

Another excellent 'B of B' book is 'Park - the Biography of Air Chief Marshal Sir Keith Park GCB, KBE, MC, DFC, DCL' by Vincent Orange. This is another readable, scholarly work with extensive source notes, bibliography and index. As commander of No. 11 Group, Fighter Command, New Zealander Keith Park was responsible for the air defence of London and South-East England. As Marshal of the Royal Air Force Lord Tedder said of Park, "If ever any one man won the Battle of Britain, he did." This biography covers Park's entire life and RAF career from WW 1, through the Battle of Britain, Training Command and Malta to South-East Asia and retirement. This 301 page book is published by Grub Street in paperback at £12.99. (ISBN 978-1-902304-61-8)

MEMBERSHIP AND HAWKER PEOPLE NEWS

Sadly we record the deaths of Member Jack Dowson earlier this year and recently, of designer Dennis Mason, production manager Len Woodward, Pegasus designer Gordon Lewis, and Ron Mears.

Also recently deceased are Jim Morley, who demonstrated his little radio controlled Harrier to us, and Ray Grayston, 'dam buster' and Dunsfold chief inspector.

More cheerfully we welcome new Members Andy Jones, Barry Kensett, Brian Hennegan, John Wallace, Roland Van Haeften, Chris Oliver and Dave Byford.

MEMBERSHIP LIST OCTOBER 2010

A: Mike Adams, Ken Alexander, Peter Alexander, John Allen, Martin Alton, Peter A mos, Terry Ansty, Alma Apted, Steve Apted, John Arthur, Alan Auld, Bryan Austin, Mike Azzopardi. **B:** Brenda Bainbridge, Arthur Balchin, Colin Balchin, Ambrose Barber, Paul Barber, Ray Barber, Derek Barden, Peter Barker, Geoff Barratt, Graham Bass, Ken Batstone, Dennis Baxter, Dennis Becket, Colin Bedford, Anne Beer, David Betteridge, George Black, Guy Black, John Blackmore, Keith Bollands, Paul Boon, Betty Bore, Pat Bott, Steve Bott, Bob Bounden, Alan Boyd, Pat Boyden, Phil Boyden, Roy Braybrook, Clive Brewer, Laurie Bridges, Doug Britton, Arthur Brocklehurst, Capt. Eric Brown, Peter Brown, Ron Bryan, Christopher Budgen, Maurice Budgen, Roy Budgen, Reg Burrell, Robin Burton, Dave Byford. **C:** Richard Cannon, Maurice Carlile, Chris Carter, Tom Casey, Bob Catterson, Jeremy Cawthorne, Maureen Chacksfield, Colin Chandler, Keith Chapman, Keith Chard, Gerry Clapp, JF Clarke, John Cockerill, Hank Cole, Percy Collino, Brian Coombes, Paul Cope, Patricia Cosgrove, Ron Cosgrove, George Cotterell, Nick Cox, Mike Craddock, Shirley Craig, Richard Cripps, Tony Cripps, Russ Culley, Richard Curtis. **D:** Tony Dalby, Clive Dalley, Andy Dalton, John Danse, Afandi Darlington, John Davie, Jo Davies, Ken Davies, Trevor Davies, Charles Davis, Michael Davis, Diana Dean, Ralph Denning, Norman Deviel, Mike Diprose, Richard Dobbs, Mike Dodd, Colin Dodds, Lambert Dopping-Heppenstal, Bill Downey, Diana Dowson, Brian Drew, Peter Drye, Dick Duffell, Jean Duffell, Gwen Duke, Chris Dunhill, Mike Dyke. **E:** John Eacott, John Eckstein, Andy Edwards, Dave Edwards, Barry Elliot, Tony Elliott, Eric Ellis, Celia Evans, Norman Evans, Roy Evans. **F:** Russ Fairchild, Paul Fairweather, Ian Falconer, Mike Fantham, Chris Farara, John Farley, John Farrow, Max Fendt, Donna Ferguson, Stan Field, Geoff Fieldus, Mike Finlay, Wilf Firth, Anne Fletcher, Richard Fletcher, Colin Flint, Dave Fowler, Mike Frain, Steve Franklin, Harry Fraser-Mitchell, Geoff French, Mike French, Heinz Frick. **G:** Roy Gaff, Mike Gane, John Gardner, Patricia Gardonio, Peter Gates, Sandie Gear, Tim Gedge, Mark Gerrard, Tony Gibbs, John Gilbert, John Glasscock, Pat Goodheart, Eric Goose, John Gough, Andy Green, Barry Grimsey. **H:** Douglas Halloway, Liz Hargreaves, Simon Hargreaves, Bryan Harman, Guy Harris, Thelma Harris, Brian Harvie, David Hassard, David Hastie, Sandy Hay, Norman Hayler, Eric Hayward, Bob Head, Sheila Hemsley, Brian Hennegan, Jock Heron, Keith Hertenberg, Frederick Hewitt, Merlin Hibbs, Richard Hickey, Peter Hickman, Vince Higbee, Reg Hippolite, Keith Hobbs, Chris Hodson, Gordon Hodson, Derek Holden, Richard Hooke, Ralph Hooper, Linda Hopkins, Paul Hopkins, Mike Hoskins, Gerry Howard, Dawn Howes, Terry Howes, Simon Howison, Miles Huckle, Gavin Hukin. **I:** Pete l'Anson, Len Illston, Maive Impey, David Ince, Brian Indge. **J:** Keith Jackman, John Janes, Gordon Jefferson, Harry Johnson, John Johnson, Andy Jones, Brian Jones, Ian Jordan, Robin Jowit, Alf Justin. **K:** Andrew Keech, Barry Kensett, Brian Kent, Dennis Ketcher, Bill King, Dave King, Charles Kirk. **L:** Barry Laight, Mike Laker, Charles Lamb, Richard Lane, George Latham, Paul Latham, Pam Lawrence, Andrew Lawson, Stanley Lawson, Ron Leader, Geoff Lee, Mark Lewis, Vernon Lidstone, Gary Lillistone, Andrew Lloyd, Dawn Lloyd, David Lockspeiser, Norman Long, Terry Long, Basil Lockwood-Goose, Gordon Lorrimer, David Lovell, Lynda Lucas. **M:** Albert Magee, Al Mahoon, Mick Mansell, John Marsh, Ann Martin/Disspain/Turk, Brian Maton, Don McGovern, June McKeon, Mike Mendoza, Alan Merriman, Richard Micklefield, Jim Middleton, Buffy Milford, Robert Millar, Jack Mills, George Mitchell, Brian Monk, Pat Moon, Leslie Moore, Pauline Moore, Nicholas Morland, Pete Munday, Carole Murphy, Gloria Murphy (H), Martin Murray. **N:** Mike Newell, Anthea Newman, Jennifer Nicholas. **O:** Roger O'Brien-Hill, John O'Sullivan, Chris Oliver, Robin Owen. **P:** Les Palmer, Glynne Parker, John I Parker, John L Parker, John Partridge, Bernard Patrick, John Pearce, Barry Pegram, Martin Pennell, Bill Phillips, Ted Pincombe, Dick Poole, Don Pratt, Dave Priddy, Mike Pryce. **Q:** John Quinn. **R:** Clive Radley, Raharto, Frank Rainsborough, Colin Raisey, Paul Rash, Diane Raymond, Vanessa Rayner, David Rees, Peggy Remington, Francis Rhodes, Geoff Richards, Bill Richardson, Kelvin Richardson, Chris Roberts, Graham Roe, Chris Russell, Peter Ryans. **S:** Ian Sandell, Tim Sargant, Bernie Scott, Orde Peter Scott, Alex Seaman, Ray Searle, Maurice Shakespeare, Mike Sharland, Arthur Sharpe, Douglas Shorey, Peter Sibbald, Duncan Simpson, Derek Sims, Gerry Sims, Charles Smith, George Smith, Harold Smith, John Smith, Karl Smith, Pete Smith, Selwyn Smith, Roy Sparrow, Don Spiers, Peter Spragg, June Stephens, John Strange, Carroll Stroud, Christine Strudwick, Tony Strudwick, Douglas Stubbs, Bill Swinchatt. **T:** David Taylor, Stuart Taylor, Brian Tei, Reginald Thompson, Geoff Tomlinson, Graham Tomlinson, Rod Tribick, Peter Trow, Ron Trowell, Bert Turner, Michael Turvey. **U:** John Underhill. **V:** Roland Van Haeften. **W:** Terry Walker, John Wallace, David Ward, Harry Webb, Patrick Webb, Graham Weller, Rob Welsh, AP West, Bryan West, Judith Westrop, Jenny Wheatley, Phil Wheatley, Jan White, Mick White, Roy Whitehead, Peter Whitney, Annette Williams, Don Williams, John S Williams, Ron Williams, Sally Williams, Colin Wilson, George Wilson, Hilda Wilson, Paul Wilson, Dick Wise, Helen Woan, Kuo Wong, George Woods, Alan Woolley.