



THE HAWKER ASSOCIATION

NEWSLETTER 43 - Winter 2015

Published by the Hawker Association

www.hawkerassociation.org.uk

EDITORIAL

I hope you find this edition's content interesting - from the account of our outing to RAF Northolt, through reports on our talks to articles by Members. Speaking of the latter, I am getting short of inputs from Members so please put pen to paper or fingers to keyboard and record your memories of your time with 'Hawker' or your life in aviation. I'm sure you enjoy such articles so why wouldn't your memories be just as interesting to the rest of us? You don't have to be a great writer; just get it down and leave the rest to the Editor!

Please send contributions to The Editor, Chris Farara, 24 Guildown Road, Guildford, Surrey, GU2 4EN, tel 01483 825955, e-mail cjfarara@ntlworld.com.

It's not long to the Association Christmas lunch on Wednesday the 9th December, as usual at the YMCA Hawker Centre. Get the date in your diary and book now. See below for more details.

I'm disappointed to have to mention again that several of you have still not paid your current **subscription**. Your names are in **bold** on the membership list at the back. Please send cheques for only £5, payable to The Hawker Association, to Barry Pegram, 12 Becket Wood, Newdigate, Surrey, RH5 5AQ. If you are **leaving** please let him know by post or by telephone on 01306 631125. Thank you.

PROGRAMME FOR 2015

Wednesday 11th November

The Royal Navy Historic Flight - **Lt Cdr Chris Goetke**

Wednesday 9th December

Christmas Lunch (see below)

PROGRAMME FOR 2016

Wednesday 13th January

Social and quiz with **Les Palmer**.

Wednesday 10th February

Private Aircraft in British Skies - **David Hassard**.

Wednesday 9th March

Aviation Art - **Graham Cooke**, Guild of Aviation Artists.

Wednesday 13th April

Annual General Meeting.

Wednesday 11th May

Title tbd - **Mark Zanker**

Wednesday 8th June

Summer barbecue

Wednesday 13th July

TBD

Wednesday 10th August

Social and video

Wednesday 14th September

Social and video

Wednesday 12th October

Title tbd - **Gp Capt Peter Bedford**.

The **Christmas Lunch** is at 12 for 12.30 on the 9th December, as usual at the YMCA Hawker Centre with the price the same as last year at £16.50. Book with Ken Batstone on 01932 229938 then send him a cheque (made out to The Hawker Association) to 42 Kings Road, Walton on Thames, Surrey KT12 2RA. The menu will be a glass of wine on arrival, soup or prawn cocktail, roast turkey with all the trimmings or poached salmon, Christmas pudding or Pavlova (or similar) and tea or coffee and mince pies or mints.

Chris Goetke flies in the RN Historic Flight. You all know **Les Palmer** and **David Hassard**, **Graham Cooke** is a well known aviation artist, **Mark Zanker** is an experienced Harrier pilot from GR3 to GR7 and **Peter Bedford** is Bill Bedford's son with a long RAF career. Unless stated otherwise, meetings are at the 'YMCA 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.

AIRCRAFT NEWS

Hawk - The Hawk and other existing designs are out of the T-X competition for the new USAF trainer because they cannot meet the 6.5 sustained g key performance parameter. This means that only a newer design can win. That's another market, like business jets, that BAe has thrown away by not developing a Hawk successor.

Hunter - TMk7 WV372 crashed just outside Shoreham Airport on the A27 road when being flown in the Shoreham Airshow on 22nd August. It hit the ground at the bottom of a loop killing eleven people. The pilot survived.

Gnat - TMk1 XP514 (painted to represent Red Arrow XS111) crashed at Oulton Park when being flown in a Carfest North event. The pilot was killed.

Sopwith - A replica Snipe built by The Vintage Aviator Ltd of New Zealand flew for the first time in the UK in July from Old Warden. It will be operated by the World War One Aviation Heritage Trust from Stow Maries.

ANNUAL OUTING - RAF NORTHOLT AND THE BATTLE OF BRITAIN BUNKER

On 30th September some thirty Members and friends successfully found their way to RAF Northolt (not easy) for a visit to 32 Squadron. We were hosted by the youthful Sq Ldr James Tenniswood who met us at Reception and guided us in our cars to park near the splendid between-the-wars mess.

From here we were taken by coach to 32 Squadron's hangars which house the BAe146 transports and Augusta 109 helicopters that this Air Transport Squadron operates. There are two grey 146s used for general military transport duties to places such as Iraq and Afghanistan and two white ones used for passengers including the Royal Family and the Cabinet. We were given free rein to wander through the hangars where we saw one grey 146 undergoing deep maintenance and one white 146 being serviced. We were taken into both aircraft so many of us refamiliarised ourselves with the nostalgic smells of 'live' aircraft and saw the first class accommodation provided for the VIPs. It was interesting to see the anti-missile systems fitted to the VIP aircraft. The Augusta 109 had a cabin like a luxury limousine.

Thence we were driven to the 'terminal building' where we were shown the 'Windsor' and 'Royal' lounges where VIPs and the Royal Family await their flights. Both lounges were simply but well equipped with high quality furnishings, paintings and toilet facilities. Many Members were amused to sit in the 'Royal' seats and use the 'Royal' facilities.

Next it was to Building 27 to see the 1929 Operations Room built by Air Chief Marshal Sir Hugh Dowding to house his air defence system. Saved from destruction because there wasn't enough money to pay for its demolition the building is in the process of restoration under the leadership of Phillip Dawe who does much of the work himself. In the same building is a small but interesting museum with a collection of relevant British and German artefacts.

It was now time to leave Northolt and drive to the No.11(F) Group Operations Room at nearby RAF Uxbridge. After eating our picnic lunches in the shadows of plinth-mounted Spitfire and Hurricane full scale models we descended the 79 steps into the bunker where most famously Air Vice Marshal Keith Park controlled his 11 Group fighter squadrons during the Battle of Britain. It was in use from the time of the Dunkirk evacuation to the Normandy landings. We sat round the operations map table while Ian Rushforth clearly explained how the system worked and what the apparently complex wall status indicators meant. In a nutshell it allowed the commander to know exactly what all his forces, down to 'flight' level (three fighters), were doing and capable of at all times. Very impressive especially when one remembers that there were no computers or digital systems, just people, telephones and radio sets.

After spending some time in the adjacent comprehensive museum it was time to leave - back up the 79 steps to our cars. All agreed that the day out, organised by Frank Rainsborough and Richard Cannon, was outstanding. We also had beautiful sunny weather all day.

A LIFETIME IN AIRCRAFT DESIGN

On September the 9th Mike Salisbury spoke to the Association about his career which started at the age of 14 when he designed his first aircraft using data copied by hand from reference documents in the local library.

By 19 he had his degree (following a 2 year wartime course at Southampton University) and started work at Folland where HP Folland himself advised him to start off on the shop floor on what would later be called a graduate apprenticeship. The pay was £2.9.11 per week. However, Mike soon tired of this as the unions would not permit such trainees to do any productive work; they could only watch (or do 'homers' such as re-chroming workers' headlamp reflectors). Offered and accepting a move to the stress office Mike expected a pay increase but this was not to be, due to inter-company agreements that employees under 21 would all be paid the same. His first job was on the Brabazon fin and rudder for the design of which Folland were subcontractors, as they were for the gantry needed for servicing it, and a wing trolley.

Mike then decided, against HP Folland's advice, to move to Supermarine, for higher pay, at Hursley Park. He started as an aerodynamicist working on the Seagull amphibian with a single R-R Griffon mounted centrally on a high, variable incidence high-lift wing giving a speed range of 35 to 240 mph. Its CL max was 5 including the contribution from the upward component of engine thrust. Two prototypes were built and flown but there was no production order.

At that time Supermarine fighters followed two lines of development: single and twin engined. The former had started with RJ Mitchell's Spitfire which was now under the design leadership of Joe Smith, for whom Mike worked as an aerodynamicist, whose axiom was "make one change at a time". So a new wing, designed to National Physical Laboratory laminar flow wing section theory, was fitted to produce the Spiteful and the naval Seafang. However, laminar flow was not achieved (and so far hasn't been) so the predicted performance improvement over the Spitfire did not materialize. No Spitefuls and only 16 Seafangs entered service.

Joe Smith's next single change was to put a jet engined fuselage, still with a tail wheel undercarriage, on the Spiteful wing to produce the Attacker, which served with the Royal Navy as their first jet fighter. Substituting a simple swept wing, fin and tailplane for the Attacker's straight wing and empennage produced the Type 510 research aircraft. Amongst its achievements was the world's first deck landing by a swept wing aircraft, in November 1950. The 510 was developed into the tricycle undercarriage Type 535 and eventually the Type 541 Swift with provision for wing mounted guns. The resulting change in wing sweep needed to house the guns led to high altitude handling problems. The outbreak of the Korean war made the need for a new RAF fighter urgent and there was no time to design a new wing so the

eventual service Swift suffered accordingly. However in its reconnaissance FRMk5 form it performed well at low altitude.

Mike was deeply involved in the aerodynamic design of the Type 545 fighter, with a new wing which was designed according to the '3D' theory developed by Dietrich Kuchemann, the German mathematician who was working at RAE Farnborough. This precursor of today's computational aerodynamics was handled by Mike using a mechanical calculator. The 545 also had a waisted fuselage to maintain wing sweep effectiveness at the roots. Mike predicted that the aircraft would suffer from pitch-up but his boss would not report this to the chief engineer saying it would be better full scale. 'Luckily', although built, the 545 was cancelled before first flight, the almost completed airframe going to the Cranfield College of Aeronautics.

The twin engined Supermarine line started with the straight winged, butterfly tailed Type 508 which was derived from a very thin winged, undercarriageless, precursor project, the 505, that was to have landed on a rubber membrane carrier deck being developed by the RAE. The 508 had a wing thick enough to house the main undercarriage. With swept wings and tail it became the Type 525, incorporating an innovation, blown flaps. Developed for the Royal Navy, the type entered service as the Scimitar. Mike did the deck take-off calculations and was invited to go on the carrier trials on Ark Royal. From Weymouth he was taken by launch to the heaving ship where he had to board her by a scrambling net! On the first deck take-off Mike noticed a black track behind the main wheels; at the deck end the aircraft sank out of sight below the bow but did recover and fly away. The test pilot, Mike Lithgow, had forgotten to release the handbrake and the aircraft's acceleration prevented him from reaching forward to let it off during the deck run.

Supermarine's supersonic fighter to OR 329 was cancelled as a result of the 1957 no-more-manned-fighters White Paper but they were working on OR 339, TSR 2. When Hursley Park closed. Mike, now Chief Aerodynamicist at the age of 28, transferred to Vickers at Weybridge with the Supermarine TSR2 team. There was also a team working on TSR2 at English Electric at Warton. The Government insisted that the two companies collaborate and produce one design. In the event the main contract was awarded to Vickers to work jointly with English Electric. The TSR2 was, after seven year's work by Mike, cancelled, mainly on the grounds of cost. It was also overweight. The Government decreed that all the airframes be cut up and disposed of - out of sight, out of mind.

As the VC10 Assistant Chief Aerodynamicist was away because of illness Mike took over this role. The aircraft had been designed to BOAC requirements and it was found that drag was in excess of predictions and that BOAC performance guarantees could not be met - and they had to be or BOAC would cancel the order - so an affordable solution had to be found. There were also stalling and pitch-up problems. The BAC 1-11 was being developed in parallel and exhibited similar problems and experienced a locked-in super stall resulting in the loss of the aircraft and the entire crew which included Mike Lithgow and the Assistant Chief Aerodynamicist. The VC 10 wing and rear fuselage were tufted and photographed in flight. Interpretation of the photos was difficult. As a result of the 1-11 crash George Edwards forbade non-aircrew from flying on tests but Mike managed to get permission to fly and observe the tufts first hand. The problems were solved and the aircraft were delivered to BOAC and became very popular with passengers. By now Mike was the VC10 Chief Aerodynamicist.

Mike then was made the UK industry representative on the European Joint Airworthiness Requirement Flight Study Group and also worked on the BAC 2-11 and 3-11 'airbus' projects which came to naught as Government launch aid was not forthcoming. Collaboration with the USA was proposed so visits were made to Lockheed (who were only interested in an entrée to BEA), Douglas (who would collaborate) and Boeing (who just wanted to get rid of competition).

In the British Aerospace Commercial Aircraft Division Mike was made Chief Aerodynamicist, covering Weybridge and Filton and spent a lot of time on the M4! This meant he became responsible for the Concorde aerodynamics but he saw his role as supporting the Chief Aerodynamicist (Concorde) rather than taking over.

Next during the BAe Airbus future project studies he coordinated the Hatfield and Weybridge teams at Airbus meetings. As a result he was responsible for recommending to BAe management that the next Airbus aircraft should be the A320. When BAe eventually decided to join the A320 all three countries, Britain, France and Germany, wanted to design the wings and Airbus set up a design competition. Mike was in charge of this and had to write an executive summary for Airbus. This concluded that the UK wing design was superior. After some dissention the report was accepted. The A 320 sold, and is still selling, in large numbers and all Airbuses have wings designed and made in Great Britain. Mike was appointed Chief Engineer UK for the A320. Later when all Airbus work was moved to Filton he relinquished the A320 work and became Head of Design at Weybridge.

In 1986 the Weybridge and Kingston-Dunsfold Design Offices were joined up and Mike became Head of Engineering on the three sites, working on the Hawk and Harrier, supporting the Chief Engineer (Mike Hoskins) and deputizing for him when he was away. A decision was then made that the Kingston technical department would move to Weybridge. As a prelude the Company arranged a week at Ashridge College for all Kingston and Weybridge department heads to get to know each other and to devise a new organisation to Mike Hoskins's guidelines. The evening that everyone arrived at Ashridge Mike Hoskins phoned to say that the planned move had been abandoned. Mike asked what he was to do with all these people for the week. "You'll think of something" was the Hoskins response. During Mike Hoskins's lengthy illness Mike had to stand in for him. He noted that he was treated most kindly by the divisional

directors in this new and unexpected role. A highlight of Mike's time at Kingston was observing RAF Harriers operating in the field in Germany. Subsequently the decision to close Weybridge was made and Mike had to deal with the redundancy situation. When this had been achieved he took early retirement.

In conclusion Mike said how much he had enjoyed his life in aircraft design and considered himself lucky to have experienced it. After questions the vote of thanks was given by Chairman, Ambrose Barber.

HOWARD PIXTON BRITAIN'S FIRST SCHNEIDER TROPHY WINNER

The internationally recognised authority and writer on early aviation, Philip Jarrett, spoke to the Association on 14th October. This talk was based on the speaker's lecture to the Royal Aeronautical Society Historical Group in April 2014 and covered the subject in great detail with copious illustrations, so only a summary can be presented here.

Howard Pixton, born in Manchester in December 1885, the son of a stockbroker, was educated at Manchester Grammar School before taking up an apprenticeship at the Simplex Engineering Co. and at the same time studying at the Manchester School of Engineering. His first job in aviation, in 1910, was with A V Roe at Brooklands where he learnt to fly, gaining Royal Aero Club Certificate No 50, and became Roe's test and competition pilot and flying instructor. In 1911 Pixton moved to the Bristol Co at Brooklands initially. He continued test and competition flying but also started Bristol's flying school and demonstrated their aircraft at home and in Europe resulting in significant sales. In 1913 he joined Harry Hawker at the Sopwith Co at Brooklands and while Hawker was in Australia with his Tabloid on a sales tour took over his Sopwith test and competition flying work. In 1914 Sopwith decided to enter a Tabloid seaplane in the Schneider Trophy international seaplane race to be held at Mont Carlo. Pixton not only won the race easily in the 93 mph Tabloid at 86.7 mph but also set a new world speed record. This was the first international competition win by a British Aircraft and it had a seismic effect on British aviation.

After more test and competition flying for Sopwith, Pixton joined the Aeronautical Inspection Department (AID), a new government civilian testing and inspection establishment at Farnborough, where he flight tested aircraft submitted by industry. He subsequently joined the Royal Flying Corps. continuing to test for the AID. This involved going to 'aircraft acceptance parks' and to manufacturers all over the country as well as being posted to Newcastle and Dublin. By the end of the war in 1918 Pixton had flown some eighty types and accumulated 3500 flying hours. After the war he gave pleasure flights in Avro 504 seaplanes from lake Windermere and pioneered newspaper delivery flights to Douglas in the Isle of Man (IoM) for the Manchester Daily News. Howard Pixton retired to the IoM but did rejoin the AID in World War 2. He died age 86 in 1972 and is buried at Jurby, IoM.

The vote of thanks for this fascinating lecture was given by David Hassard who had invited Phillip to talk to the Association.

LANCASTERS

Ambrose Barber remembers a very special experience....

I would never describe myself as a Lancaster pilot but the sight of two Lancs again flying together prompted me to let slip to your Editor that years ago I'd logged nearly five hours as co-pilot on a couple of Lancs. "Tell us more", he said.

Well, as we Hawker people know, the pinnacle of aircraft design involves a single engine and usually a single seat. However, as a wartime twelve-year-old allowed to stand in a Halifax cockpit while all four engines were fired up, I did find something rather majestic about a big bomber. So, when ten years later I got the chance actually to fly in one I jumped at it.

The opportunity came at the end of my two years in the Royal Air Force training to fly early jet fighters. I was posted into Fighter Command (good news) but as a mere National Serviceman was then given a desk to fly (not such good news). However, my boss's boss, B.A. Templeman-Rooke, also desk-bound, was a distinguished former bomber Wing Commander. With the clout of a DSO, two DFCs and an AFC he had an arrangement to keep his hand in at RAF St Mawgan, a nearby Coastal Command Operational Conversion Unit and the last RAF station still to be equipped with Lancasters. This good-natured hero took pity on me and the early hours of 29th March 1954 saw me climbing into Lancaster III SW294 alongside him and a crew which was preparing for maritime reconnaissance postings on Shackletons. This role involved long periods of navigating over featureless water.

Just taxiing and taking off were thrilling even if at the time 'my' seat was occupied by the flight engineer. Once safely airborne he retired to his cruising station and we headed out over the sea. However, in less than half an hour the old Lanc emphasised her seniority when all electrical generation quit and we had to turn back for home. With the airfield in sight I watched T-R intently as he lined up for final approach and performed the feat of bringing in this impressive mass of machinery to alight safely on the runway.

In those days we were able to take a replacement 'off the shelf' so I soon found myself in Lancaster SW295, beginning to feel more at home in these unaccustomed surroundings as we headed out at relatively low altitude for the Bay of Biscay. I was privileged to have a long stint at the controls of this historic type. She seemed very stable after the more agile types I'd flown and I was quite surprised at the physical effort required just to change course when I was given new headings to steer. As hour succeeded hour I felt a growing respect for those who had 'done it this way' and

glad when the long trip was enlivened by our air gunner shooting up the open sea. Fortunately I was not expected to take evasive action from imaginary enemy fighters.

Eventually it was all over before the novelty had quite worn off and I've remained most grateful for that unrepeatable experience. It seems a pity that modern long-haul airline crews don't have the opportunity for a little gun firing to help them pass the time away!

P 1127 FIRST HOVER

Karl Smith remembers the early days of the P.1127...

I was one of the lucky few Hawker employees privileged to witness the first tethered hover of the first P.1127, XP831. In actual fact, in the well known published photograph, the figure in the background, apart from the fireman, could well be me.

At the time I was working in the Installations Department under John Apted and Elias Gabbay, both sadly no longer with us, and had written the pre-flight test instructions for the air conditioning and pressurisation systems. As an aside I had also been the victim sealing the cabins from the inside when they were slightly pressurised. All had gone smoothly except when we were testing the rig in the Robin Hangar at Richmond Road; the hood locks let go and I was depressurised rather suddenly! No harm was done although I am now, over 50 years later, rather deaf in one ear. But I blame Roger Samways and Co for that with the noise made when they were hot testing the reaction control valves, or from the hover rig jet efflux inside the building. Of course, it could just have been Roger's singing.

At the time of clearing the aircraft for its first hover John Apted and I had driven to Dunsfold in John's Hillman Husky one Monday lunchtime and remained there with day, night and day shifts until mid afternoon on Tuesday when Stan Williams arrived to free us to return to Kingston. I actually nodded off very briefly in Acre Lane, Carshalton, driving home after that. Luckily there was less traffic in those days. Pressure testing XP831 went smoothly and that, we thought, was that. Unfortunately the BS53 engine did not produce enough thrust to exceed the weight of the aircraft so weight reduction was sought; out came the entire cabin air systems totalling 105 lbs! So much for our test programme!

Anyway, and I've never known why, I was back at Dunsfold for the first tethered hover over the grid-covered VTO pit. I suspect the need for the pit came from the results of hover rig model tests conducted by my colleagues. They were concerned about possible re-ingestion of exhaust gases, hence the pit, grid and deflector vanes. To preclude any runaway after take-off the aircraft was tethered by heavy cable attached to chain so that the weight to be raised increased the higher the aircraft lifted.; simple and ingenious. As to the weight saving, I've always held the view that the Deputy Chief Test Pilot Hugh Merewether should have flown instead of Bill Bedford. (I'm sorry that neither of them is around to respond to that tongue-in-cheek comment.)

JOHN FARLEY ON THE HAWKER P.1127 AND THE SHORT SC.1

In 1964 I was a Flight Lieutenant working for the Aerodynamics Research Flight at RAE Bedford (or Aero Flight as it was known) and in our hangar was the Short SC.1 VSTOL research aircraft which had four lift engines and one for propulsion. Meanwhile, at Dunsfold, Hawker had flown six P.1127 prototypes, with each one incorporating improvements based on the earlier versions. As a result the very first P.1127 (XP831) was looking distinctly old hat so Hawker were quite happy to release it to the RAE so that the boffins there could compare its vectored thrust principle with the lift engines of the SC.1.

As the junior pilot of four on Aero Flight (and less than a year out of ETPS - the Empire Test Pilot's School) I was naturally pretty chuffed to be asked to go to Dunsfold and bring back XP831 for comparison with the SC.1. Indeed I considered I had blundered into the best job in the UK.

There were so many differences between flying the Short SC.1 and the Hawker P.1127 that the phrase 'chalk and cheese' comes to mind. By the time I finish this comparison you may be inclined to feel that it all boils down to 'Hawker got it right and Short got it wrong'. However, that is far too simplistic a view and involves hindsight - and believe me, in 1964 hindsight about jet VSTOL was in short supply.

At the simplest level both aeroplanes were similar because both were single seat fixed wing jet aircraft that could take off and land vertically. Both could fly on their wings, both could hover, both could transition to and from the hover and both used pure jet thrust to achieve all this.

However, the design teams at Short and Hawker used very different solutions because they started from very different positions. The Short SC.1 was specified, designed and purchased to enable the RAE to do research into jet VSTOL. On the other hand, the Hawker P.1127 was conceived by a fighter design house, with a long history of supplying fighters to the Royal Air Force, as a possible way of achieving a jet fighter that could land and take off vertically. It was not originally designed to a government specification but to meet a need, as perceived inside Hawker, that the RAF (and others) needed a VSTOL capability to counter the possibility that conventional aircraft could be grounded by attacking their runways.

This difference in objective was fundamental in determining why Hawker finished up with a single-engined vectored thrust aircraft, that they hoped they could make work but which had the potential to become a fighter, while Shorts filled a small airframe with four lift engines and one cruise engine to meet Specification ER143T.

One level up from my 'chalk and cheese' comment, may I say that it took me very many flights in the P.1127 before I could climb down the ladder without offering up thanks that I had not bent the thing. Yet after shutting down the SC.1, I always felt relief that it had not suffered one of several possible nasty failures!

Why this big difference in how I felt after a flight? The SC.1 had five Rolls RB108 engines - four for lift and one for propulsion. The aircraft was very heavily autostabilised and used full authority autostabilisers in pitch and roll which had priority over the pilot when it came to the reaction controls. Also there was a manual mechanical back up control mode intended as a last ditch option for emergency use. The pilot controlled the thrust from the lift engines using a helicopter-like 'collective' throttle with the left hand. For reasons we shall come to shortly, the SC.1 had very easy handling and later it was established that this good handling even extended to the manual mechanical backup control mode, but the aircraft was a real problem to operate due to very complex systems and the five engines which had to be looked after.

On the other hand, the Hawker P.1127 had a single Bristol Pegasus engine for lift and propulsion and the aircraft was always mechanically controlled by the pilot but had optional low authority autostabilisers in pitch and roll. Piloting-wise, the P.1127 had demanding handling due to having two controls for the left hand, and intake effects. However it was a delight to operate as it had no potentially dangerous systems and only one engine to be looked after.

To sum up - the Short SC.1 was demanding to operate and easy to handle while the P.1127 was easy to operate but had demanding handling.

I think the differences in operation hardly need explanation. In the case of the SC.1 you were operating a five-engine 'bomber' all by yourself. It had none of the benefits of automation that would be available today and so you had five of most things to deal with when it came to starting it up. In the air, after takeoff and getting on to your wings, it was necessary to shut down the four lift engines because they were very thirsty, even at idle. Before landing, the process of restarting them one at a time, using bleed air from the cruise engine, was also easy to get wrong. In some circumstances this had to be done on short finals at below 500 ft. Then there was the issue of the full authority autostabs. These had 100% access to the roll and pitch reaction controls and, unless you kept an eye on a gauge that was quite low down on the right side of the instrument panel, the first indication that they had used up all roll control was when you moved the stick and got no response. Not good.

Compare that to the operation of the P.1127 which was in effect a single seat fighter of the day, say a Hunter, with one extra lever in the cockpit to set the nozzle angle and two extra instruments - neither of which needed much attention. One instrument showed the nozzle angle set (but so did the nozzle lever) while the duct pressure gauge showed that the reaction controls were available (but so did moving the stick). P.1127 handling however was quite another matter.

The reasons why the P.1127 handling was so demanding are rather less obvious. However, I will try to explain them so that you will understand why handling the SC.1 was so easy. The throttle box incorporated the throttle and the nozzle lever and was positioned on the left hand side of the cockpit where your left hand would naturally fall when sitting in the seat. The throttle worked as with any jet fighter - forward for more thrust and back for less. An inboard slim nozzle lever set the angle of the nozzles - pull it back and the nozzles were rotated downwards and so the aircraft went slower, push it fully forwards and the nozzles pointed aft making the aircraft a conventional jet.

While this was a brilliantly simple way to achieve the full range of VSTOL manoeuvres it necessarily posed a piloting trap. Should you move the wrong lever it might not be possible to recover from the mistake depending on what you were doing at the time. For example, raising the nozzles in the hover would have you dart forward and downwards very rapidly, as has happened more than once in public. The other problem stemmed from the intakes and meant that, if left to its own devices, a P.1127 flying slower than about 100 kt wanted to go tail first. The pilot literally had to use his feet to keep the aircraft pointing into the airflow. This was directly analogous with the need for the pilot of a tail-dragger aeroplane to use his feet to stop it swinging and ground looping when landing, especially in a crosswind.

The reason for this was that the aerodynamic stabilising effects of the P.1127 fin were no different from any other aircraft, so faded away as one got slower. Unfortunately there was a destabilising force that increased as flying speed reduced and so defeated the residual efforts of the fin. This force was called intake momentum drag. It exists on all jet engine intakes and gets greater as rpm is increased. Thus, whenever you were flying slowly and necessarily using jet lift not wing lift, up went your rpm and up went the intake momentum drag. To understand why this destabilised the aircraft directionally we need to look at the airflow round the aircraft when viewed from above. Everything is fine when the aircraft is pointing directly into the airflow. However, what happens if the aircraft starts travelling slightly sideways through the air because of a cross wind or a deliberate move by the pilot?

With the total airflow now coming at an angle to the nose, we must think about its two components; that part which is straight on the nose and that part which is blowing directly across the nose. The latter is of course the troublemaker because its effect is felt at the intake which is well ahead of the centre of gravity and so opposes the fin. Should the pilot allow the aircraft to swap ends and fly tail first you might think it would just be embarrassing for him because in his debrief he will be told to try harder on the rudder. Sadly he is unlikely to actually make the debrief because, at speeds greater than about 70 kt as the aircraft goes seriously sideways, the leading wing will generate much more lift than the other and the aircraft will roll out of control, thanks to what is termed 'rolling moment due to sideslip'.

Such asymmetric lift can easily swamp the aerodynamic and reaction controls. Clearly some exotic technology was called for to help the pilot keep the aircraft pointing into the airflow. In fact all that was needed was a simple wind vane as seen on any church steeple. It is mounted in front of the pilot and always shows him where the airflow is coming from. (Ed's note - Later, after a fatal accident, the simple vane was augmented by a yaw autostabiliser working on the yaw reaction controls, a side force indicator in the HUD and pedal shakers to show the pilot which pedal to press to reduce sideslip.)

I hope that by now you will have appreciated why the P.1127 had demanding handling. With that in mind, let us consider the SC.1 where the lift engine intake momentum drag acts vertically down through the centre of gravity, regardless of which way the aircraft is pointing with respect to the wind, allowing the fin to do its job even as speed reduces. This lack of directional instability made the SC.1 easier to handle in the hover and at low speeds. Add to this that when jetborne the pilot had only one control to operate with the left hand and it becomes clear why the chances of the pilot making a handling mistake in the SC.1 were much less than in the P.1127.

As experience was gained at Bedford with the un-autostabilised P.1127, it became clear that the best way to fly the SC.1 was in the mechanical back-up mode which did not use the autostabilisers thus eliminating the serious problems that could arise with autostabiliser failures and so was very good for one's peace of mind. That way the attitude control system became just like the P.1127 with the stick position showing how much reaction control authority you had used.

Although handling-wise the SC.1 and the P.1127 were very different, make no mistake, both aircraft did great jobs in teaching the UK how best to proceed with the development of jet VSTOL.

BOOK REVIEWS

Harrier Boys by Bob Marston, published by Grub Street (ISBN-13:9-781-909808-29-4). This book, Volume 1, covers the period from the Cold War through to the Falklands campaign. The author, an RAF Harrier pilot, shown head-on hovering on the eye-catching cover photograph, has collected personal stories from many well known Harrier pilots including our own Heinz Frick and the author himself. Topics covered vary from the great trans-Atlantic air race to the Belize deployment, via the Falklands and operational conversion. We get the inside view on events that we may well think we know about but these stories put new complexions on the events and add valuable detail to the historical record. The writers are also very witty. The book is enjoyable, well produced and generously illustrated with many previously unpublished photographs. It is well worth the cover price of £20 (£16.59 from Amazon) and is highly recommended to all 'Hawker people'. I can't wait for Volume 2.

The Aviation Historian Nick Stroud's splendid quarterly goes from strength to strength, always packed with interesting articles about unusual topics, wonderfully illustrated with excellently reproduced photographs and drawings, often covering Hawker matters. Issue 12 contains a feature article written by David Lockspeiser about a tour he made to Jordan, the Lebanon, India and Burma, returning via Moscow, making liaison visits to operators of Hunters and Sea Furys. Issue 13 tells the story of the Portugese Hurricanes used in the famous Battle of Britain film. If you haven't yet tried TAH go to www.theaviationhistorian.com where you can see what the publication looks like - and take out a subscription.

MEMBERSHIP NEWS

We welcome new Members Tony Buttler, Mike Drew, Roy Elms, Juliette Hassard, Terry Newell and Terry Summerfield.

Sadly we record the deaths of Eric Ellis, Paul Cope and Dave Fowler, and also of non-member John Lewendon, well known to many. We send our sympathy and condolences to family and friends.

MEMBERSHIP LIST - NOVEMBER 2015

Members who have not yet paid their subscriptions for 2015 - 2016 are in bold below. Please send cheques payable to The Hawker Association to Barry Pegram, 12 Becket Wood, Newdigate, Surrey, RH5 5AQ. If you are **leaving** please let him know by post or by telephone on 01306 631125. Thank you.

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