



# THE HAWKER ASSOCIATION

**NEWSLETTER 55 - Winter 2019**

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## EDITORIAL

Unbelievably there is only one more meeting until the Christmas Lunch - details below.

In this issue you will find reports on two contrasting talks - Hawker pre-P.1127 jet projects and the F-35 story, as well as news of visits and events and contributions from members.

To ensure continued communications to Members please respond to Richard Cannon's request for your current e-mail addresses. This is important!

Contributions from Roy Evans and Brian Indge will be published as space allows and there will be more from Graham James and Brian Buss.

**Several 2019-2020 subscriptions are overdue - see names in bold on the back page.**

Please send your Newsletter **contributions** to The Editor, Chris Farara, 24 Guilddown Road, Guildford, Surrey, GU2 4EN or e-mail to [cjfarara@ntlworld.com](mailto:cjfarara@ntlworld.com). Tel 01483 825955.

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## PROGRAMME FOR 2019

Wednesday 9<sup>th</sup> October

Hawker Non-V/STOL jet Projects - Tony Buttler

Wednesday 13<sup>th</sup> November

Royal Navy Historic Flight - speaker tba

Wednesday 11<sup>th</sup> December

Christmas Lunch

## PROGRAMME FOR 2020

Wednesday 8<sup>th</sup> January

Test Pilot Collection and Memories - Jill Hollingsworth (Robin Jowitt)

Wednesday 12<sup>th</sup> February

Travels & Aircraft Museums in the USA - Bob Catterson

Wednesday 11<sup>th</sup> March

Managing the Closure of Kingston - Mike Frain

Wednesday 8<sup>th</sup> April

Annual General Meeting

**Tony Buttler** is a well known aviation author with a special interest in British jet projects. **Jill Hollingsworth's** fascination with aircraft and their test pilots led to correspondence with them and an unique collection of personal letters and photographs. These will be on display while she answers questions on her interest and gives her recollections.

**Bob Catterson** will be remembered as a Hawk and Harrier mechanical systems engineer at Kingston and **Mike Frain** was Works Engineer at Kingston.

## CHRISTMAS LUNCH

On Wednesday 11th December, the 17th! Association Christmas Lunch will be held at the usual venue, the YMCA Hawker Centre. Last year the price was £17.50 and while we expect it to be the same this year, it hasn't yet been confirmed. The Menu will be the same as previous years: prawn cocktail or tomato soup, traditional roast turkey or poached salmon (or similar), fruit tart/gateau or fruit salad, with a glass of wine on arrival and coffee with mince pies to finish. When booking please state if you want any of the alternative dishes. The meal will be served at 1.15pm and attendees are requested to arrive from midday but not earlier, please.

Confirmed cost and menu will be sent in a Members' email and announced at the November Meeting when bookings and payments will be taken. Bookings may also be made by letter containing a cheque made out to The Hawker Association, sent to Ken Batstone at 42 Kings Road, Walton on Thames, Surrey, KT12 2RA. Ken's phone number is 01932 229938 if you have any questions. All payments must be received before December 3rd to allow catering arrangements to be finalised. Any Members who have paid, but find themselves unable to attend, will be refunded provided they inform Ken Batstone before December 3<sup>rd</sup>.

## CALLING ALL MEMBERS WITH E-MAIL FACILITIES

So that he can update his e-mail distribution list please, PLEASE, send an e-mail to our webmaster, Richard Cannon, at [richard@cannonr.me.uk](mailto:richard@cannonr.me.uk) - PLEASE, do it now before you forget!

## HAWKER ARCHIVE AT BROOKLANDS MUSEUM

As many of you will know, I, your Editor have been looking after the Sopwith/Hawker/BAe Kingston historical material at Brooklands since I retired from British Aerospace - in fact I received my 25 year award in October. During that time the collection has grown by a factor of at least 100 due solely to donations from Hawker people, most of whom were Members of the Association.

So, if you have any reports, photographs, drawings, publications, in fact anything, that you liberated (or were even presented with) from Kingston or Dunsfold during your time there and you (or possibly your spouses or partners) no longer want it cluttering up your study/loft/garage/shed, then please don't dump it but pass it on to me. I don't want

anything that your family would be wanting to keep but other items, however trivial they might seem, would be very welcome and be given a good and safe home and be available to researchers, authors, and TV programme and film makers. All these categories of people have visited the archive in considerable numbers over the years. My contact details are in the Editorial. Thank you.

### **ANNUAL VISIT - SSTL, GUILDFORD**

On September 24<sup>th</sup> twenty Members were hosted on a visit to Surrey Satellite Technology Ltd, in the Guildford Science Park, by Kuo Wong assisted by his colleagues Marc Casson and Phil Allen. After checking in at Tycho House, the company HQ, we were briefed by Kuo on the history and activities of the organisation.

SSTL was founded by University of Surrey (UoS) PhD student, Martin Sweeting (now Professor Sir Martin Sweeting OBE FRS FREng, FRAeS, FIET, Executive Chairman SSTL and director of the Surrey Space Centre). In 1979 while at the UoS, with a team of two staff and two students in one room and a simple clean room, he created UoSAT-1, the first modern 'microsatellite,' (150 lb) which he persuaded the National Aeronautics and Space Administration (NASA) to launch, as a secondary piggyback payload, into low Earth orbit. This satellite and its successors used amateur radio bands to communicate with a ground station on the UoS campus. During the 1980s Sweeting raised funding to develop the small-satellite concept further and created a research group that launched a number of satellites. This led to the formation of SSTL in 1985, with four employees, and a starting capital of just £100. SSTL was later spun off from the University and sold to Astrium EADS in 2009. It is now an autonomous entity in the Airbus group.

From Tycho House and its fully automated and normally unmanned satellite Operations Centre we moved across the road to the manufacturing facility, the Kepler Building, with clean rooms, test facilities and laboratories for satellite assembly and installation. Divided into three groups we toured the building, the most impressive part of which was the very large satellite assembly hall, a giant clean room. We were also shown remarkable images of the Earth's surface captured by SSTL's photographic and radar satellites.

SSTL, pioneers in the use of new satellite technologies, has been operating for over thirty years and is the World's leading small satellite manufacturer with a 40% share of the global small satellite export market. Low cost and high value are achieved by utilising commercially available hardware. Currently there are fourteen satellites being operated from the Operations Centre, there are seven SSTL satellite constellations - groups of satellites working together providing, for example, Earth observation, meteorological, navigation (Galileo) and disaster monitoring services - deployed and under construction. Eighteen customer space mission training programmes have been completed, over sixty satellites have been launched with 500 satellite years in orbit. Two satellites are in manufacture together with eight payloads. Current projects include space debris removal systems.

This visit was a real eye-opener. How many people have heard of this remarkable, commercially successful, advanced technology company, designing and manufacturing World-leading space hardware and providing space services from the centre of rural Surrey? Spread the word!

### **HAWK XX154 DELIVERED TO OLD SARUM**

Dick Poole witnessed the first ever HS 1182 Hawk, XX154, arriving at Old Sarum Aerodrome...

The aircraft was retired from the Empire Test Pilot's School (ETPS) and is now displayed in the Boscombe Down Aviation Collection Museum at Old Sarum. The delivery from Boscombe Down was as an underslung load by an RAF Chinook helicopter on the 21<sup>st</sup> August, the 45<sup>th</sup> anniversary of the first flight in 1974 from HSA Dunsfold. The weather on delivery was dry but overcast and fortunately the wind strength was low enough to let the helicopter flight go ahead. Once safely on the ground the lifting slings were removed and the aircraft was towed to the apron with Chris Hodson, son of Gordon Hodson the originator and Project Director of the Hawk, in the front cockpit. It has been housed in the Collection's hangar.

During its time at Dunsfold XX154 was engaged in trials for flight envelope expansion, loads measurement, stalling characteristics investigation and development and tailplane stall rectification. It was flown intensively immediately after the first flight to accumulate enough flight time to be allowed to display at the Farnborough Airshow. On the 18<sup>th</sup> January 1982 XX154 was transferred to the RAE at Llanbedr for unmanned-target shepherding, flight trials and pilot continuation training. It had achieved 406 flight hours and was at a fairly low modification state, including cable operated brakes. Soon after delivery to the RAE it went to RAF Abingdon for servicing and an upgrade. In early 2000 it was transferred to Boscombe Down and finished its service with the ETPS there in December 2018.

### **HUNTER T7 XL623 - CHAIRMAN'S PROJECT REPORT**

Progress slowed a little during the summer largely due to the arrival of G-HAWK at Brooklands Museum. Our team of volunteers was needed to assist with the re-assembly and preparation of the aeroplane for public display.

We have almost finished restoring the rear fuselage, tail cone, fin and rudder and will soon re-paint them in chromate primer. We will delay applying the top coat until more of the airframe is ready for painting. The tailplane has not yet received much attention but is basically in good condition so it is mainly a rubbing down exercise for repainting. There are several layers of paint on 623, so when the team embarks on stripping down a component it is hard work needing a lot of elbow grease. We cannot use many of the chemical paint strippers because they would seep into the joints from where they cannot be cleaned out leading to new paint damage.

The major task for the winter is to make cradles and trestles to support the nose and centre fuselage so they can be separated. We are planning to do more work at Dunsfold than the original plan called for; space is at a premium at Brooklands and we can avoid the costs associated with moving a large section like the centre fuselage.

Fundraising has gone well this year. We have sufficient funds to meet our immediate needs so we are not in a position where work will stop due to a lack of materials or tools - but we always need more. We thank all our donors for their support and confidence and it should be appreciated that our volunteers are also financial contributors as they cover all their own costs including those relating to travel to Brooklands and Dunsfold.

You can contribute via the project bank account "The Hawker Association - Hunter Project" with sort code 30-84-46 and account number 36893268. Please use your name as a reference so we can thank you.

Paul Rash: Rowallan Lodge, Farnham Lane, Haslemere, Surrey, GU27 1HE

Chris Roberts: 3 Sole Farm Close, Bookham, Leatherhead, Surrey, KT23 3ED

## **LANGLEY MEMORIAL UNVEILED**

Frank Rainsborough reports...

The memorial, sponsored by The Airfields of Britain Conservation Trust (ABCT), sited near the centre of the former airfield at Harvey Park, Langley, was unveiled on October 5<sup>th</sup> 2019. The event had the full support of Slough Borough Council and the ceremony was presided over by the Mayor, Avtar Kaur Cheema, and Councillor Harpreet Kaur Cheema.

For twenty years from 1938 to 1958 Langley Airfield played a substantial role in Britain's aviation history. The airfield was built by Hawker Aircraft Ltd (HAL) on the village's Parlaunt Park Farm site and became the company's production and flight development centre when its Brooklands site was vacated. Almost 7000 Hawker Hurricanes were constructed and flew from Langley airfield as well as Tempests and Sea Furies. The airfield also played its part in ushering in the jet age with the Hawker P.1040, P.1052 and P.1081. Aside from Hawker, Langley helped start British post-war international commercial air travel before Heathrow was fully established.

In the 1950s Langley airfield activities were gradually wound down as HAL moved its final assembly and flight testing to Dunsfold Aerodrome in Surrey. Langley airfield closed completely in 1955 and has now almost disappeared under housing and industrial development

Over time the importance of Langley had effectively been forgotten with the local populace totally unaware of just how significant their aviation heritage is. Thankfully, this has been rectified. Kenneth Bannerman, from the ABCT, announcing that "In the run-up to the unveiling it was quite noticeable how forgotten the importance of Langley Airfield in the war effort had become," adding "Unveiling memorials like this is one of the vital things we do to remind people of the role these airfields played." Aviation historian Pete Trafford added a few words and at that point Hawker Association Member Frank Rainsborough thought that was appropriate to ask "Who else here is from Hawkers?" Richard Cannon and Kieron Kirk announced themselves and Angela Bailey, daughter of Hawker test pilot Frank Murphy, who had drawn our attention to the event, said that, given her connection to Hawker she felt entitled to join that group! Consequently Kenneth Bannerman invited those four to pose with the Slough Borough Council representatives behind the memorial stone for photographs to be taken.

Angela drew us to the local history table on which there were many interesting items set out, amongst which were her high quality biographical books of photos, press cuttings and text describing her father's life as a World War II RAF fighter pilot and Hawker test pilot and executive. Angela has been invited to come to Kingston and give the Hawker Association her personal recollections of Frank Murphy's career at HAL.

## **HUNTERS IN QUASI MILITARY SERVICE**

Chris farara has been scouring the internet (which see for more detail)...

A number of civil organisations operate Hunters under government contracts for use, amongst other applications, as aerial targets, for threat simulation, for trials support and for mission support training. The Hunter is praised by the operators for its reliability, ruggedness, range and duration (with drop tanks), adaptability to new roles with new equipment, its high speed and low running costs. The extremely well maintained and low-hours Swiss Air Force F.58s were purchased when the type was withdrawn from service in 1994.

The major users are:

### **Airborne Tactical Advantage Company (ATAC)**

An American company, based at Williamsburg International Airport in Newport News, Virginia, operates fourteen F.58s on United States government contracts.

### **Apache Aviation**

A French company contracted to the French Navy, Apache is based at Istres in Provence. It operates two single-seat Hunters and one two-seater. Operations are in association with Lortie Aviation (see below).

### **Hawker Hunter Aviation**

Based at RAF Scampton, HHA operates a fleet of twelve F.58s and three two-seaters (T.7 and T.8) to provide services for the UK and overseas governments. These aircraft carry current military serial numbers.

### **Lortie Aviation**

A Canadian company contracted to the Canadian and US governments, Lortie is based in Quebec City and operates 21 Hunters, mainly F.58s.

That's a total of 53 aircraft, about four squadrons. Not bad for a type that first flew in 1952, 67 years ago

### **FROM V/STOL TO ASTOVL AND STEALTH**

On July 19<sup>th</sup> Mick Mansell visited Kingston again to tell us about the Lockheed-Martin F-35 Lightning II. Most of us remember him from the late 1960s 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 Future Systems & Technology Director and finally Future Air Systems Director, retiring at the end of 2002.

The Joint Strike Fighter (JSF) project, which led to the F-35 programme, started in the US in 1986 with the merging of the Common Affordable Lightweight Fighter (CALF) and the Joint Advanced Strike Technology (JAST) projects. CALF was a Defense Advanced Research Projects Agency (DARPA) programme to develop a STOVL fighter for the USMC and an F-15/F-16/A-6 replacement for the USAF. JAST was a Department of Defense (DoD) programme to define and develop aircraft, weapon and sensor technologies for future tactical aircraft. In 1993 the UK MoD and the US DoD signed a partnership memorandum of understanding (MoU) and STOVL proposals were submitted by McDonnell-Douglas, Northrop-Grumman, Lockheed-Martin and Boeing with BAe teamed with McDonnell-Douglas and Northrop-Grumman. Between 1995 and 1999 Joint Initial and Operational Documents (JIRD and JORD) were agreed for USAF, USN, USMC and RAF/RN aircraft.

The Joint Strike Fighter (JSF) was to be a fifth generation aircraft incorporating advanced stealth technologies, with the STOVL version fly-away cost of \$30 - 35 million dollars. Hundreds of cost-performance trade studies were carried out, the propulsion configuration being particularly difficult. The baseline engine was the 24,000 lbs thrust Pratt & Whitney F119 engine in production at that time. Supersonic performance and agility dictated a rear engine and stealth required a long, curved intake duct and internally carried weapons. The aircraft empty weight was set at 24,000 lbs but it was required that it could land with 5,000 lbs of unexpended expensive weapons which drove the thrust required for STOVL to 40,000 lbs, making vertical thrust augmentation necessary.

Propulsion studies covered direct lift with plenum chamber burning like Hawker's cancelled P.1154 of the 1960s and their 1980s P.1216 project; a remote forward nozzle augmentation system fed with compressed air ducted from the engine; an additional forward lift engine; and a tandem shaft driven front fan exhausting through rotatable forward nozzles. These studies led to a vertically mounted front fan, shaft driven from the main engine, the layout chosen by the Lockheed-Martin consortium, which after a flight demonstration programme with the X-35, won the JSF competition. BAe was then invited to join Lockheed-Martin after their McDonnell-Douglas partner's failure in the competition. The lift system, with the front lift fan developed by Rolls-Royce, comprised a lift fan driven via a clutch and gearbox from the engine shaft, a three bearing swivelling rear nozzle on the engine jet pipe, and roll reaction controls on engine outriggers feeding high pressure air tapped from the engine compressor casing. Pitch control was by differential thrust from the lift fan and the rear nozzle; yaw control by swinging the rear nozzle. All this and the engine was controlled through an integrated flight and propulsion control system based on techniques developed in the UK by the RAE/DERA/QinetiQ using the 'VAAC' two-seat Harrier.

The P&W 28,000 lb thrust F-135 engine for the F-22 is the current baseline engine. For the STOVL F-35B in VTOL mode the vertical thrust is distributed as follows: 18,000 lb from the rear nozzle, 18,000 lb from the front fan and 4,000 lb from the two roll reaction control nozzles; a total thrust of 40,000 lb.

Other important technologies in the F-35 include advanced aerodynamics and propulsion integration, integrated radar, electronic warfare and electronic countermeasures systems and maintainable, multi-spectrum stealth. For the latter, vehicle shaping is fundamental in minimising radar return spikes (from engine intakes, leading edges, the forward fuselage and canopy) by aligning edges, collecting the spikes and absorbing them using radar absorbent materials (RAM - putty and ferrite) in critical areas. Engine fan radar returns are addressed by having long, curved intake ducts to shield the fan and cause internal reflection into RAM. High airframe build accuracy, surface finish and lack of gaps is essential which led to building the airframe, using improved techniques developed by BAE Systems, from the outside skins and then adding the internal structure. The outcome is low radar signature head-on with reduced all-round signature providing additional survivability in manoeuvring flight. Infrared and optical stealth are also addressed.

The vote of thanks for this engrossing talk was given by our President, Colin Wilson.

*Editor's note* - As at mid 2019 some 400 F-35s of all models have been delivered; 283 conventional land based F-35As, 87 ASTOVL F-35Bs and 30 carrier capable F-35Cs.

## HAWKER NON-V/STOL JET PROJECTS

Tony Buttler came to talk to fellow Members on October 9<sup>th</sup> where he was introduced by our Chairman, Chris Roberts. Tony joined High Duty Alloys in 1974 as a metallurgist and developed a great interest in military aircraft, in particular their design and development. He went on to take a Masters Degree in Archives and Library Studies at Loughborough University, and since 1995 he has been a freelance aviation historian. He has just completed his thirty-third major book, is a member of the Royal Aeronautical Society's Historical Group Committee, lectures extensively and has written many specialist books and magazine articles

Tony explained the sources for today's talk and for his many books on British military aircraft projects. Three-view general arrangement drawings are often the only surviving evidence for many unbuilt designs. If a project was proposed against a government specification or offered as a private venture, these drawings would become part of a brochure which would provide details of the structure, give size and weight data, list the weapons and equipment it might carry and give the estimated performance. Major proposals would be accompanied by wooden scale models. For many years these unbuilt designs remained secret because, even if they were rejected, they still represented the state of the art. However, over time classifications have been removed and it is possible see the work of the British aircraft industry post World War 2.

In his talk Tony looked at Hawker Aircraft Ltd's jet fighter and bomber designs produced prior to the V/STOL era. The talk also touched on some designs that were built, and on the large strike aircraft proposed to the OR.339 Canberra Replacement requirement of 1958. He also made references to Hawker's rival, Supermarine, whose projects ran parallel to those of the Sydney Camm team at Kingston.

Tony started his review with the piston engined P.1030, a 500 mph Tempest development with a 24 cylinder, 3,000 hp Rolls-Royce (R-R) Eagle engine. This was Hawker's last word in piston engined fighters powered by R-R's last major piston engine. Supermarine also proposed the Eagle for their Type 391. One late Hawker piston project that Tony had not been able to track down is the twin boom, twin-RR Griffon-powered P.1037 fighter of 1944. (*Does anybody out there have any drawings or reports? - please contact the Editor*).

Moving on to the jets, the first Hawker design was the P.1035 'Jet Fury', which married the elliptical Fury wings to a new fuselage with a R-R Nene engine, wing root intakes and short bifurcated jet pipes. This was developed into the P.1040 which had straight tapered wings. A prototype flew 1947 and matured into the Sea Hawk Fleet Air Arm fighter. In 1950 the P.1040 became the P.1072 when it was fitted with an Armstrong-Siddeley (A-S) Snarler rocket motor to investigate the mixed power plant concept.

During the second half of the 1940s Hawker began to examine the effects of wing sweepback by fitting such wings to a P.1040 type fuselage resulting in the P.1047 project and the P.1052. The P.1052 retained the straight tail. Two were built, the first, VX272, flying in November 1948. The next stage was to sweep all of the flying surfaces so the second P.1052, VX279, was rebuilt as such, with a single tail pipe, to become the P.1081 which first flew in June 1950. Sadly it was soon lost in a fatal crash. Supermarine's equivalent to this was the Type 510, an Attacker with swept wings and tail, which flew at the end of 1948. It was modified to become the Type 535 leading to the Type 541 Swift.

Amongst the Seahawk variants were two offered in March 1947 as interim interceptors, the P.1062 and P.1068. The former had swept wings, the latter straight wings. Both had the same fuselage, R-R Tay engine - a development of the Nene - a T-tail and a straight through jet pipe.

Aside from what Tony considered the main line of Hawker fighter development came the 1946 P.1048, similar in layout to the Messerschmitt Me 262, with straight wings, a pair of R-R AJ.65 engines (later named Avon), with two 30mm Aden cannon. Also in 1946 the P.1051 medium naval bomber emerged. Powered by two R-R AJ.65s, it resembled a scaled up P.1040.

In January 1947 the Air Ministry issued Specification F.43/46 for a new day interceptor to replace the Meteor. Gloster, Hawker and Supermarine submitted proposals; Hawker, the P.1054. The forward fuselage housed two AJ.65s, below and beside the cockpit, and a massive 4.5in recoilless gun. The P.1054 was expected to achieve Mach 0.93 in level flight but the weapon, with a rotating chamber holding half a dozen shells, was complex and unwieldy, the barrel itself being 10ft long.

Technology in the late 1940s was advancing very quickly, with swept and delta wings, more powerful engines, new materials and the first guided weapons, so F.43/46 was soon outdated and in February 1948 was superseded by F.3/48. A new round of design submissions followed and one of at least three from Hawker was the P.1064. This low wing, all swept design powered by two R-R AJ.65s had the 4.5in gun or four Adens. At this stage the Ministry favoured the proposal for the new day fighter from Gloster which eventually became the Javelin night fighter. Hawker had been improving its day fighter proposals principally by reducing frontal area which, with two AJ.65s, was too large so projects with a single engine plus a rocket motor were schemed.

The night fighter requirement, F.44/46, resulted in orders for prototypes to Gloster and de Havilland for the GA.5 and DH110, which matured into the Javelin and Sea Vixen. Hawker's proposal, the P.1057, was not pursued. This was an all swept, two-seater with two fuselage mounted AJ.65s, armed with four Adens.

Hawker's day fighter effort, using the flight experience gained with the P.1052 and P.1081, culminated in the P.1067 which in 1948 featured swept wings, a delta T-tail and a nose intake. With a single R-R AJ.65, now named Avon, it was expected to achieve 710mph at sea level and would be armed with four Adens. To provide more room in the forward fuselage a solid nose and wing root intakes were substituted and a wooden mock-up of this configuration was built. Subsequently a swept tailplane was mounted low on the fin. The prototype, WB188 flew in July 1951.

Meanwhile at Supermarine the Swift had been ordered as an insurance against the failure of the Hunter but was itself suffering from all sorts of handling problems. Although a disaster as a fighter it did later achieve some success as a low level reconnaissance aircraft in its Mk 7 form.

The Hunter could easily exceed Mach 1 in a shallow dive but was subsonic in level flight. To confer level supersonic speed the P.1083 project of 1951 was developed. The Hunter's 40° swept wing was replaced with a new one of 50° sweep, and the R-R Avon was reheated to give a maximum thrust of 17,750 lb. A prototype was ordered and was due to fly in late summer 1953 but the project was cancelled in July of that year. The unfinished P.1083 prototype was rebuilt as the P.1099, the prototype for the Hunter F.Mk.6 with the updated R-R Avon 200-series engine. Supermarine's rival was the Type 545, the prototype of which was also cancelled before completion.

Many Hunter variants were studied including the delta winged P.1091 of October 1951. The 1957 P.1128 was a six-seat executive jet in which Hunter wings and tail were fitted to a new fuselage with two rear mounted Bristol-Siddeley Orpheus engines. A significant Hunter variant was the two-seat P.1101.

Early in the Hunter's career the 3<sup>rd</sup> prototype flew with four dummy DH Blue Jay (later named Firestreak) air-to-air missiles under its wings. From 1956 there was a concerted effort to see if the aircraft could be equipped with two such weapons and the new Green Willow AI.Mk.20 radar. The modified airframe with an extended nose was the P.1109. The drag from carrying two missiles was compensated by fitting a more powerful 11,250lb thrust Avon RA24. The Government-funded Hunter-Firestreak development programme was cancelled in May 1956, but it was continued by Hawker as a private venture. Three Mk.6 airframes were fitted with long noses but only XF378 carried the two Blue Jays along with the AI.20 radar installation. XF378 flew in September 1956 and attended the 1957 Farnborough Show. Radar unreliability led to the discontinuation of the project.

In 1951 Hawker had begun to examine fighters with true supersonic capability and in due course produced several project designs, either as Hunter developments or all new layouts. The P.1090 of August 1951 was a Hunter development powered by a DH Gyron engine giving well over 20,000lb of thrust with reheat. It had a 50° swept wing and four Adens. The P.1092 blended delta, two-seat all-weather fighter of November 1951 was powered by a single reheated Avon and was expected to reach Mach 1.5 at 36,000ft and had four Adens mounted in the wings. The Gloster Javelin dominated RAF planning at this time and the P.1092 was not adopted.

The February 1952 the P.1093 supersonic blended delta all-weather fighter was drawn with a single Avon RA.14 or DH Gyron fed by a nose pitot intake. It had six wing-mounted Adens. A Hunter development from 1953 was the P.1100 supersonic 'thin-wing' Hunter with an RA.24 Avon and two rocket motors in the trailing edge wing roots. Mach 1.5 was predicted for this fighter with two Adens, two under-wing Firestreaks and an AI.20 radar. The December 1954 P.1104 was a large, tailed-delta Mach 2 fighter with two under-wing reheated DH Gyron Junior engines, and two Adens under the cockpit.

In 1952 Specification ER.134T was raised to fund a research aircraft capable of flying at Mach 2 for 10 minutes. Several designs were submitted by various companies and the competition was won by the Bristol 188. Hawker offered the P.1096 and P.1097, both to be powered by an R-R RB.106R engine. The P.1096 was predicted to be capable of Mach 2.35 at height, but the P.1097 fell a little short at Mach 1.9. Camm was never really interested in designs produced solely for research but always looked for production types, so these two proposals were examined closely to discover any fighter potential, the P.1097 being drawn with four Adens underneath the cockpit.

In 1954 Specification M.148T was issued for a new tactical nuclear strike aircraft designed to operate from aircraft carriers. The Hawker submission, by Camm under duress because he didn't like it, was the P.1108 powered by four relatively small R-R RB.115 engines. The weapons included conventional bombs and the Green Cheese tactical nuclear bomb. The design was rejected, in part because of Hawker's current workload on the Hunter and a consequent shortage of manpower. The winner from Blackburn became the Buccaneer.

In 1955 the Air Ministry issued specification F.155T for a very capable high-altitude all-weather supersonic interceptor and Hawker was one of seven firms to respond with its Mach 2 P.1103. This design incorporated a chin intake for its DH Gyron engine, a large nose radome and two seats. Auxiliary rocket motors could also be fitted. P.1103 was to carry Red Hebe air-to-air missiles, but the main weapon for F.155T was the huge 1,330lb Vickers Red Dean radar-guided air-to-air missile. Fairey Aviation won the competition but its massive delta wing fighter was cancelled by the 1957 Defence White Paper.

After rejection the P.1103 was remodelled as the P.1116 long range strike fighter with a smaller wing and reduced sweepback. In mid-1956 the P.1116 was redesigned as the P.1121 single-seat fighter. The Hawker Siddeley Group board approved the construction of a private venture prototype. However, the aircraft was never ordered by the RAF and the prototype was only about 50% complete when work on it was halted in 1958. The P.1121 is probably the most important of Hawker's 'lost' designs. It was to be powered by a DH PS.26 Gyron engine giving 23,800lb thrust with reheat, and was to be armed with two Red Top air-to-air missiles (the improved version of Firestreak), rocket projectiles and two Adens.

There were further developments of the P.1121, including the P.1123 Mach 2 tactical nuclear bomber of January 1957 powered by a Rolls-Royce Conway engine. This was quickly followed by the P.1125 of March 1957, Hawker's response to the initial ideas now appearing for a new requirement, GOR.339, for a 'Canberra Replacement'. The P.1125 was a development of the P.1121 with similar aerodynamic qualities. Its was powered by a pair of R-R RB.133s, a supersonic version of the RA.24 Avon, giving a capability of Mach 1.3 at sea level and Mach 2.32 at 36,000ft. The weapons bay could accommodate conventional bombs or gun or rocket packs, while the large nuclear bomb would be carried semi-recessed under the fuselage.

For the full GOR.339 design competition, Hawker refined the P.1125 into the P.1129 strike aircraft which was submitted in January 1958. The P.1129 was much bigger than the P.1121. Powered by two R-R RB.142 Medway engines each giving 22,500lb of thrust with reheat its calculated maximum speeds were Mach 1.28 at sea level and Mach 2.3 above 36,000ft. Its weapon bay could house rockets or four 1,000lb bombs, a Red Beard nuclear store would go underneath the fuselage, and more rockets or another four 1,000lb bombs would go on wing pylons. The P.1129 was rejected in favour of the English Electric P.17 and the Vickers (Supermarine) Type 571, that were eventually blended to give the BAC TSR.2. During the GOR.339 design assessment the Hawker Siddeley Group had been criticised for a lack of direction. In fact two projects, the Hawker P.1129 and the Avro 739, were in competition with one another. A company policy change in July put Sir Sydney Camm in overall charge of a Group design team. The P.1129 was modified to incorporate certain features from the Avro 739. This 'P.1129 Development' was submitted in a Hawker Siddeley Group brochure in November 1958. But it was too late; the BAC design remained the choice only to be cancelled in 1965 after a few flights.

The rejection of the P.1121 and P.1129 brought this line of Hawker aircraft development to a close but a new line had already been started in the P.1127 V/STOL project, which led to the Harrier and all its variants. Kingston survived for another 30 or so years as Hawker Aircraft Ltd, Hawker Siddeley Aviation and British Aerospace, but sadly, Supermarine faded away....

The vote of thanks was given by Editor Chris Farara who, as keeper of the Hawker archive at the Brooklands Museum, had assisted Tony in his research for many years. He thanked the speaker for his excellent, well illustrated talk.

## BOOK REVIEWS

What a pleasure it is to open the stout brown envelope which arrives every three months to reveal the latest issue of the **Aviation Historian**, in pristine condition. Then to look at the beautifully colour printed front cover and the intriguing back cover before opening it, smelling it, feeling its quality and scanning the contents page. There is always a feast of aviation writing which one can't wait to start reading!

Issue 29 is no exception. On the cover a Harrier GRMk1 in a field in Germany; on the back an air-to-air shot of a Chipmunk rolling (or "frolicking" as it is aptly captioned) over Portsmouth harbour. And inside, for the Hawker enthusiast, Keith Hayward tells us how the Harrier escaped Healey's axe and we learn how a Hurricane (and other types) was used for UK laminar flow research; the myth of the Mustang's laminar flow wing is also exposed. The Hurricane also features in an article about the RAF's readiness for war in 1939. You can read about a nuclear powered Sud Caravelle project (really), the little known SNCASE/SUD Voltigeur counter insurgency twin; and much, much more unusual and quirky aviation history.

In the **Hawker Hunter** in Key Publishing's Combat Machines series Tony Buttler, who lectured to the Association in October, gives a concise account of the design and development of our favourite fighter. All the UK and export variants are described with production lists, experimental versions are covered, combat deployments explained, as are UK and foreign aerobatic teams. For the modeller there are no less than 35 colour side elevations, a photographic walk-round and a list of kits. Illustrated with well chosen, and sometimes unusual photographs, Tony makes what could be a tired old subject an exciting prospect.

## MEMBERSHIP NEWS

Sadly we record the death of Bill Richardson and send our condolences to his family and friends. We welcome new Member Stuart Leigh-Davies.

## MEMBERSHIP LIST - October 2019

**Subscriptions for 2019 - 2020 (£7) are overdue from those in bold below. Seven Members have not yet paid their 2018 - 2019 subscriptions (£5). Their names are amongst those in bold in Newsletter, No 53.** 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.

A: Allan Abbott, Ken Alexander, Peter Alexander, John Allen, Leslie Allen, Peter Amos, Terry Anstey, Steve Apted, John Arthur, Alan Auld. B: Angela Bailey, Brenda Bainbridge, John Baker, Lyn Baker, Colin Balchin, Edward Banstead, Ambrose Barber, Justin Barber, Derek Barden, Peter Barker, Graham Bass, Donald Bateman, Richard Bateman, Ken Batstone, Dennis Baxter, Francis Bebbington, Colin Bedford, Peter Bedford, Brian Bickers, John Blackmore, Andy Bloomfield, Melvyn Bluck, Keith Bollands, Paul Boon, Betty Bore, Pat Bott, Steve Bott, Bob Bounden, Mike Bowery, Alan Boyd, Roy Braybrook, Laurie Bridges, Arthur Brocklehurst, Peter Brown, Christopher Budgen, Reg Burrell, Robin Burton, Clive Bushrod, Tony Buttler, Dave Byford. C: Richard Cannon, Chris Carter, Tom Casey, Bob Catterson, Colin Chandler, Laureen Chapman, John Chitty, Martin Churms, Gerry Clapp, JF Clarke, John Cockerill, Hank Cole, David Collingridge, Nigel Cook, Jonathan Cooper, Patricia Cosgrove, Ron Cosgrove, David Cotton, Nick Cox, Mike Craddock, Shirley Craig, Richard Cripps, Russ Culley, Richard Curling. D: Clive Dalley, Andy Dalton, John Danse, Afandi Darlington, John Davie, Jo Davies, Trevor Davies, Michael Davis, Diana Dean, Ralph Denning, Wilfred Dimsdale, Mike Diprose, Lambert Dopping-Heppenstal, Cliff Douthwaite, Bill Downey, Barry Dreghorn, Mike Drew, Gwen Duke, Chris Dunhill, Graham Dunn, Gordon Dunne, Mike Dyke. E: Andy Edwards, Barry Elliott, Stephen Elliott, Tony Elliott, Celia Evans, Norman Evans, Roy Evans. F: Russ Fairchild, Ian Falconer, Mike Fantham, Chris Farara, Adele Farley, John Farrow, Max Fendt, Ian Ferguson, Stan Field, Geoff Fieldus, Mike Finlay, Wilf Firth, Richard Fletcher, Moira Flint, Ted Forster, Mike Frain, Steve Franklin, Howard Freeman, Geoff French, Mike French, Heinz Frick, Peter Frost. G: Roy Gaff, David Gaitley, Daphne Gaitley, Mike Gane, John Gardner, Patricia Gardonio, Peter Gates, Sandie Gear, Tim Gedge, Mark Gerrard, John Gilbert, John Glasscock, John Gough, Andy Green. H: Margaret Hamilton, Howard Hancock, Valerie Hanscomb, Liz Hargreaves, Simon Hargreaves, Guy Harris, Thelma Harris, Bill Harrison, David Hassard, Juliette Hassard, David Hastie, Norman Hayler, Bob Head, Alan Heasman, Sheila Hemsley, Ted Henbery, Jock Heron, Keith Hertenberg, Frederick Hewitt, Merlin Hibbs, Richard Hickey, Peter Hickman, Reg Hippolite, Keith Hobbs, Chris Hodson, Michael Hogan, Derek Holden, Ralph Hooper, Linda Hopkins, Lesley Hoskins, Diane Howells, Terry Howes, Simon Howison, Miles Huckle, Ed Hui, Gavin Hukin. I: Len Illston, Maive Impey, Brian Indge. J: Barry Jackson, Simon Jackson, Graham James, John Janes, Mick Jeffries, Mark Jennings, John Johnson, Andy Jones, Ian Jordan, Robin Jowit, Alf Justin. K: Andrew Keech, Barry Kensett, Dennis Ketcher, Bill King, Dave King, Jim Kinross, Kieran Kirk. L: Mike Laker, Rich Lambert, Richard Lane, George Latham, Paul Latham, Andrew Lawson, Stanley Lawson, David Lee, Geoff Lee, Stuart-Leigh Davies, Mark Lewis, Vernon Lidstone, Gary Lillistone, Andrew Lloyd, Dawn Lloyd, Norman Long, Terry Long, David Lovell, Lynda Lucas. M: Anthony Mabelis, Albert Magee, Al Mahoon, Mick Mansell, John Marsh, Brian Maton, John McCarthy, Don McGovern, June McKeon, John McKillion, Keith McMahan, Mike Mendoza, Alan Merriman, Jim Middleton, Alan Millican, Jack Mills, Peter Mitchell, Brian Monk, Pat Moon, Pauline Moore, Pete Munday, Carole Murphy, Martin Murray, Helga Mutton. N: Tony New, Terry Newell, Anthea Newman, Jennifer Nicholas, Chris Nicholson. O: Roger O'Brien-Hill, Chris Oliver, David Oliver, John O'Sullivan, Robin Owen. P: Les Palmer, John Pearce, Barry Pegram, Martin Pennell, Dick Poole, Mat Potulski, Dave Priddy, Mike Pryce. R: Clive Radley, Frank Rainsborough, Paul Rash, Diane Raymond, Vanessa Rayner, David Rees, Brian Renwick, Francis Rhodes, Geoff Richards, Michael Richardson, Robert Richardson, Chris Roberts, Alistair Robertson, Edward Rogers, Peter Ryans. S: Ian Sandell, Tim Sargant, Bernie Scott, Alex Seaman, Ray Searle, Maurice Shakespeare, Mike Sharland, Douglas Shorey, Derek Sims, Gerry Sims, Peter Sinclair, Siva Sivalingham, Charles Smith, John Smith, Karl Smith, Roy Sparrow, Don Spiers, Peter Spragg, Mary Stark, Helen Steinlechner, Chris Stephens, June Stephens, , John Strange, Nick Stroud, Christine Strudwick, Tony Strudwick, Terry Summerfield, John Sweetman, Bill Swinchatt. T: David Taylor, Stuart Taylor, Brian Tei, Joanna Terrell, Geoff Tomlinson, Graham Tomlinson, Richard Townsend, Rod Tribick, Kevan Tulip, Bert Turner, Michael Turvey. V: Roland Van Haeften. W: Terry Walker, Mark Walsingham, Dave Weatherley, Michael Weatherly, Graham Weller, Judith Westrop, Jan White, Mick White, Roy Whitehead, Peter Whitney, David Whittam, Kevin Wilkins, Annette Williams, Don Williams, John S Williams, Sally Williams, Rosemary Wills, Geoff Wilshire, Colin Wilson, George Wilson, Dick Wise, Kuo Wong, Richard Wood, Alan Woolley.