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JETS



July/August 2015 £4.25

**Vulcan
XH558 to
Retire!**
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Nimrod

The Mighty Hunter

Dash 7

Turboprop Triumph

Corsair

Vought's A-7 In Detail



PLUS

- › SUN 'N FUN › YC-14 vs YC-15 FLY-OFF
- › RB-47 SHOOT DOWN › YAK 42
- › SWISS P-16 › BOEING POSEIDON
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Issue 19 - F-86 SABRE

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From the Left Hand Seat



The last few weeks have certainly been memorable here at *Jets* HQ as Mrs B and myself have recently returned from a three-week-long road-trip around the USA.

We crammed in almost 4,000 miles around Connecticut, New York City, Pennsylvania, Maryland, Delaware and Virginia and Washington DC (as well as a week soaking up the sun in Florida) and ticked many things off our collective 'bucket lists'.

Highlights were many and varied but one particular day will live long in my memory.

It'll never happen...

Almost a year ago the Commemorative Air Force set into motion a plan to fly a mass formation of 'warbirds' over Washington DC on the 70th anniversary of VE Day on May 8, 2015.

Can you imagine the paperwork and permissions required to fly a single-engined, 70-year-old ex-military aeroplane over the capital of the USA at just 1,000ft? Now multiply that by 50 or more aeroplanes and you can perhaps understand why the naysayers predicted the event would never occur.

However, thanks to a certain dogmatic enthusiasm (and friends in the right places), the event did indeed happen and 56 aircraft gathered at nearby Culpepper Airport in readiness for the Arsenal of Democracy flyover.

Warbirds en masse

On May 7 (VE Day Minus One) Mrs B and I spent the day at Culpepper as the crews rehearsed for the flyover and it soon became obvious just how big and impressive this event was going to be.

From Cubs, Stearmans and T-6 Texans through to fighters, attack aircraft, torpedo carriers, transports and bombers there was virtually a full complement of American warbirds on the ramp.

The flyover would begin with the trainers then follow the course of the war from Pearl Harbor (P-40s), the Doolittle Raid (B-25s), Midway (Catalina, Wildcats and Dauntless), Guadalcanal (more Wildcats), Yamamoto shoot-down (P-38), Ploesti (B-24 and P-51s), Big Week (B-17 Flying Fortresses), D-Day (C-47s), China/Burma/India (A-26 Invader) and the Pacific (TBM Avengers, F4U Corsairs and a Curtiss Helldiver) through to the end of the war with the B-29 Superfortress!

Once in a lifetime

I was honoured when WarbirdRadio.com invited me to join their team to provide a European perspective to the VE Day coverage.

As the online radio station's host (the irrepressible Matt Jolley) and I gathered in their 16th floor studio in Arlington for a production meeting over breakfast, excitement for this once in a lifetime opportunity was running high. We

knew the aviation community was following with baited breath (and Matt had arranged extra bandwidth courtesy of Empire Streaming to accommodate these new listeners) but there was some uncertainty as to how well the event would be attended by the everyday Washington-ite.

Worldwide following

Of course we needn't have worried. In downtown DC 2,000 veterans gathered at the World War Two Memorial (in the shadow of the Washington Monument) and as the flyover grew closer, the streets beneath WarbirdRadio.com's studios began to swarm with people heading towards the Washington Mall.

Balconies began to fill with office workers and spectators took to any vantage point they could as the first wave of aeroplanes arrived overhead on schedule at 12.10.

Truly memorable

I have to admit I genuinely had 'goose-bumps' as the aircraft flew overhead and Matt and I commented live to listeners around the globe, many of whom were interacting with us via the WarbirdRadio.com Facebook page.

In nearly two decades of working in the aviation industry I've been privileged to do some very 'cool' things, but I can categorically say that May 8, 2015 will live long in the memory. So much so that I broke one of my unwritten rules and took a work 'selfie' (which you can see illustrating this page!)

Big day

No sooner had we returned from the USA than Mrs B and I found ourselves in the midst of more planning as we welcomed 90 of our

closest friends to *Jets* HQ to help me celebrate my 'big four oh.'

The day (and needless to say most of the evening and the small hours!) provided an unusual opportunity for the majority of the *Jets* team to be in the same room. You may not realise, but the small team that produce this magazine are geographically split around the UK from Surrey to Lincolnshire and Nottinghamshire to the West Midlands and it is a very rare that we are all in the same place at the same time.

As we all sat in my home office, joined by many of our regular contributors, I realised just how lucky I was to work with such a wonderful team. Long may it continue.

I hope you enjoy reading this issue of *Jets* as much as we've enjoyed compiling it.

Until next time
Blue Skies



Steve
Stephen Bridgewater
Editor



PS, if you missed our Arsenal of Democracy radio show you can 'listen again' at www.warbirdradio.com



JETS PHOTO OF THE MONTH

The RAF's 208(R) Sqn has repainted BAE Systems Hawk T.1 XX350 into a special scheme to commemorate the centenary of World War One. The aircraft, which was scheduled for a repaint after a major service, has been given her new colours by the RAF Valley-based Babcock spray bay team. The 2015 design splits the aircraft into old and new, with the current black training scheme for the front, and the green scheme to the rear. The design was based on the colour scheme worn by the Shuttleworth Collection's airworthy Bristol F.2B fighter at Old Warden, Beds – this being chosen because the 'Brisfit' saw active service with 208 Sqn in 1922 during the Chanak Crisis in Turkey



www.jetismag.co.uk

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Readers in the USA can place subscription orders by visiting our website as above or by calling toll free 800 676 4049 or fax 757 428 6253 or by writing to JETS, 3330 Pacific Ave, Ste 500, Virginia Beach, VA 23451-9828.

Jets is distributed in the USA by Mail Right Int., 1637 Stelton Road B4, Piscataway, NJ 08854. Periodicals Postage Paid at Piscataway, NJ and additional mailing offices.

Postmaster: Send address changes to Jets, Key Publishing Ltd, c/o MailRight International Inc., 1637 Stelton Road B4, Piscataway NJ 08854.

While every care is taken with submissions, the Publisher cannot be held responsible for any loss or damage incurred. All items submitted for publication are subject to our terms and conditions. These are regularly updated without prior notice and are downloadable from www.keypublishing.com

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DISTRIBUTED BY – Seymour Distribution Ltd,
Tel: +44(0)20 7429 4000

PRINTING – Precision Colour Printing Ltd

Published bi-monthly by:

Key Publishing Ltd,

PO BOX 100

Stamford PE9 1XQ, UK

TEL: +44(0)1780 755131

www.keypublishing.com

Printed in England

ISSN 2045-6490



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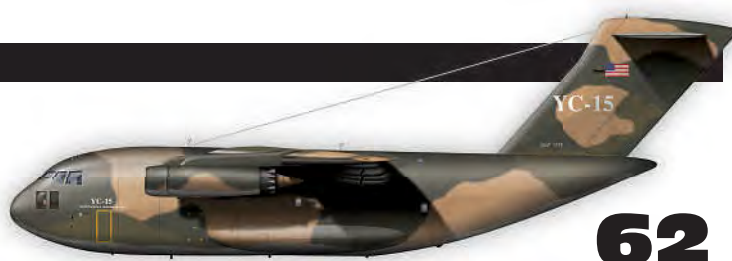
The Russian Yakovlev Yak 42 'Clobber' airliner recently joined the list of aircraft that are still in active service 40 years after making their maiden flights. Spencer Bennett looks back at its history

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With increasing rumours that the much-missed Hawker Siddeley Nimrod may be replaced in RAF service by the Boeing P-8 Poseidon, Sebastian Morgan compares and contrasts two generations of maritime patrol aircraft



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Jet Noise



Dreamliner donated to Pima

On April 17, Boeing donated one of the Boeing 787-8 Dreamliner Flight Test aircraft to the Pima Air & Space Museum in Arizona.

This particular 787, ZA002/N787EX, was the second Boeing 787-8 to be produced. The aeroplane flew for the first time on December 22, 2009 and joined what would become a six-aeroplane flight test and certification programme for the new airliner.

"Boeing has a strong presence in Arizona and is proud to share this important achievement in aviation history with the community, our employees and visitors," said Boeing Commercial Airplanes President and CEO Ray Conner. "The Pima Air & Space

The primary focus of ZA002 was to test systems' performance and it is the second of three flight test 787-8s that Boeing plans to share with communities and future generations of employees and aeroplane enthusiasts

Museum is a world-class facility and has been a great partner throughout the years. It's the perfect location to showcase this pioneering airplane."

Coinciding with the 787 induction, the Pima Air & Space Museum also unveiled its new 'Women in Flight' exhibit, commemorating the achievements of female aviators over the past century.

IAG to Acquire Aer Lingus

International Airlines Group (IAG) has agreed to purchase the Irish government's 25% stake in flag-carrier Aer Lingus for approximately 1.4 Billion Euros. IAG already controls British Airways, Iberia and low-cost carrier Vueling.

Commenting on the deal, Willie Walsh, chief executive of IAG said: "Aer Lingus, Ireland and IAG would all benefit from this deal.

"Aer Lingus would maintain control of its brand and operation while gaining strength as part of a profitable and sustainable airline group in an industry that's consolidating. Ireland's vital air links to Europe and North America would be enhanced, creating new jobs, with cast-iron guarantees on ownership of Aer Lingus' Heathrow slots and their use on flights to Dublin, Cork and Shannon.

"Acquiring Aer Lingus would add a fourth competitive, cost effective airline to IAG, enabling us to develop our network using Dublin as a hub between the UK, continental Europe and North America, generating additional financial value for our shareholders."

IAG is one of the world's largest airline groups, with a combined fleet size of 459 aircraft, transporting over 77 million passengers and 897,000 tonnes of cargo in 2014.



As IAG announced the deal to acquire a 25% stake in Aer Lingus, the Irish airline revealed plans to add a new A320 service from Dublin to Liverpool. The route will be operated 16 times a week

Triple Delivery

During March, Lockheed Martin delivered three different variants of the C-130J Super Hercules.

The aircraft included an MC-130J Commando II Special Operations tanker for the US 17th Special Operations Squadron at Kadena AB, Japan. A month later the unit retired its final MC-130P Combat Shadows; the last examples in the Pacific Air Forces.

Other deliveries included an HC-130J Combat King II personnel recovery aircraft for the 71st Rescue Squadron at Moody AFB, Georgia and a US Coast Guard HC-130J long-range search and rescue aircraft. The latter was flown to the Lockheed Martin facility in Greenville, South Carolina, for post-production modifications and will be 're-delivered' in 2016.



The US Coast Guard's latest HC-130J departs for Greenville, South Carolina in April

Chinese Stealth Fighter?

Images recently 'leaked' onto Chinese internet sites appear to depict the nation's H-20 stealth fighter. Previous images have shown an aircraft that has resembled, variously, the F-117 Nighthawk, the B-2 Spirit and even the stillborn YF-23 but the new artwork seems to show a cross between the Sukhoi Su-24 and the Lockheed F-22. However, more notably, the aircraft is depicted flying over the disputed Senkaku islands.

Meanwhile, China has surprised the West by beginning the construction of artificial islands in the South China Sea. The so-called Fiery Cross Reef could soon serve as a 3,000m-long runway in the middle of the ocean and be used as military base. Similar work also appears to be underway on the nearby Subu Reef.



The latest 'leaked' image of the proposed Chinese H-20 stealth fighter

A400M Lost in Fatal Accident

On May 9, an Airbus A400M transport aircraft crashed in Seville, Spain killing four of the flight test crew. The aircraft (MSN23) had departed from Seville Airport at 12.45pm and crashed just 15 minutes later. It had been destined to become the third aircraft to be delivered to the Turkish military. Ten days later, Airbus sent an Alert Operator Transmission (AOT) to all A400M operators requiring them to perform one-time specific checks of the Electronic Control Units (ECU) on each of the aircraft's engines before the next.

The Latest News from the World of Jets

Varied Air Tattoo Line Up Set to Impress

Among the highlights of what is shaping up to be one of the most impressive Royal International Air Tattoos in recent years will be a special three-ship formation of Tornados from three different nations.

Marking the 35th anniversary of the Tri-National Tornado Training Establishment (TTTE) at RAF Cottesmore, Tornados from the UK, Germany and Italy will fly together in a co-ordinated display.

Other showstoppers at the event, which takes place at RAF Fairford on July 17-19, include the French Air Force's Ramex Delta team (with two Dassault Mirage 2000N strike aircraft), the Team Zeus F-16 from the Hellenic Air Force, a Czech Air Force SAAB JAS-39C Gripen, a Polish Air Force MiG-29, and the last RIAT appearance by Avro Vulcan XH558.



The French Air Force's Ramex Delta team of two Dassault Mirage 2000N strike aircraft is set to provide a dramatic and noisy role demonstration at the Air Tattoo. The Mirage 2000 has not flown at RIAT since 2006, when a singleton appeared in the flying display



FEDEX EARLY RETIREMENTS

FedEx Express has announced it has permanently retired 15 aircraft earlier than planned in an attempt to modernise its fleet. The move affects seven McDonnell MD-11F airframes, three Airbus A300 aircraft, four Airbus A310-300s and a single McDonnell Douglas MD10-10. The company has also adjusted the retirement schedule of an additional 23 airframes



CEBU REBRANDING

Manila-based Cebu Pacific Air has announced it will update its brand with a new logo and colour scheme. The airline, which began operating in 1996 as a low-cost pioneer with four aircraft and 24 weekly flights but now operates 2,200 sectors a week to 62 destinations using 55 aircraft, says the new logo symbolises its growth and evolution. The new scheme uses the country's natural canvas as inspiration, featuring shades of the Philippines' land, sea, sky and sun

British Lightning II Tested at Sea

In May a group of Royal Navy and Royal Air Force personnel embarked aboard the USS Wasp, joining American colleagues for the latest round of F-35B Lightning II trials.

Six US Marine Corps F-35s were on board USS Wasp, off the East coast of the USA, assessing the ship/air integration and effectiveness across flight operations, communications, maintenance support and logistical supply.

Royal Navy Lt Cdr Neil Mathieson, the UK's F-35 Ship Integration Lead, said: "By 2020, UK combat airpower will consist of Typhoon and F-35B Lightning II, a highly potent and capable mix of fourth and fifth generation fighter aircraft. With Typhoon already established as one of the premier multi-role fighters in the world, the F-35 brings a complementary next-generation level of survivability and lethality. This will ultimately provide the UK with an unprecedented level of capability in a single platform."

"United Kingdom participation in the F-35 program has been absolutely critical to our success," said US Lieutenant General Chris Bogdan, Program Executive Officer for the F-35 Lightning II Joint Program Office. "Since the beginning, UK test pilots and engineers have been fully integrated and work shoulder to shoulder with us as we deliver the F-35 to the warfighter."



RAF C-17 FLIES EMERGENCY AID TO NEPAL

An RAF Boeing C-17 aircraft flew a humanitarian mission to Nepal in support of rescue operations after April's earthquakes. The C-17 carried a team of 18 Gurkha engineers as well as 18 tonnes of supplies and more than 1,100 shelter kits – the latter including plastic sheeting, rope and rope tensioners to shelter families from increasingly wet weather in Nepal. Also aboard were a Land Rover and 1,800 solar lanterns to provide lighting and a means of charging phones, radios and torches. The aircraft followed the arrival in Kathmandu of more than 60 UK International Search and Rescue (UK ISAR) responders and four specialist rescue dogs, as well as teams of British medics and humanitarian experts.

Jet Noise



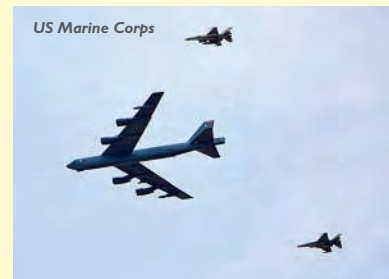
AirTanker Goes Commercial

AirTanker's first ACMI leasing aircraft entered service with Thomas Cook Airlines on May 1 when A330-MRTT Voyager G-VY GK took off from Manchester Airport bound for Cancun and Punta Cana.

The eleventh aircraft delivered to AirTanker as part of its FSTA programme, G-VY GK's release to Thomas Cook followed a three-month in-house conversion process to

remove military modifications and to restore the airframe to its civil A330-200 type.

Tony Carder, AirTanker Services' Director of Aircraft Leasing, said: "G-VY GK's entry into service with Thomas Cook represents a huge step forward for AirTanker's civil aircraft leasing business and a milestone in our journey to become one of the world's leading ACMI leasing providers."



B-52 DROPS JDAMs IN JORDAN

This image was taken over Jordan on May 18 shortly after a USAF B-52H Stratofortress from the 2nd Bomb Wing, from Barksdale AFB, Louisiana had dropped 500lb GBU-38 JDAM (Joint Direct Attack Munition) bombs during Exercise Eager Lion. The jet was one of a pair that flew 30-hour, 14,000-mile nonstop missions from the USA to drop live munitions on the Wadi Shadiya, range in Jordan. After completing their bomb runs, the jets overflew the range and were escorted by two Royal Jordanian Air Force F-16s



Vietnam Airlines will acquire 14 A350 XWBs, including ten on order from Airbus and four under lease agreements. The jets will operate on premium long-haul routes, beginning with services between Hanoi and Paris

First A350 for Vietnam Airlines

On June 1, the first Airbus A350 XWB destined for Vietnam Airlines completed its first flight at Toulouse. The aircraft, bearing the airline's distinctive blue and gold lotus livery, will now enter the final phase of production, including cabin completion, as well as further ground and flight tests. The aeroplane, which will be leased from AerCap, is scheduled for delivery in the middle of the year when Vietnam Airlines will become the first Asian airline to fly the A350 XWB.

VULCAN FINALE
IT HAS BEEN ANNOUNCED THAT 2015 WILL BE THE FINAL FLYING SEASON FOR THE UNIQUE AVRO VULCAN XH558. SEE PAGE 26 FOR THE FULL STORY AND DETAILS OF A SPECIAL FAREWELL TOUR TO TAKE PLACE ON JUNE 26-27.

\$612 Billion Defence Bill

On April 30, the US House Armed Services Committee passed a defence policy bill that authorises \$612 billion in funding for the Pentagon in 2016.

The bill, which was passed after 19 hours of debate, rejected a number of cost-saving proposals requested by the Pentagon, including retiring the A-10A Thunderbolt II, which now has funding for 2016. The panel also passed an amendment that explicitly prohibits the Air Force from retiring the aircraft, following an emotional debate.

The legislation backs pay raises for troops at 2.3% (versus a Pentagon call for 1.3%) and adds additional funding for fighter aircraft for the Navy and Marine Corps, including six more F-35 Joint Strike Fighters than requested and 12 extra F/A-18 Super Hornets.

LEAP-1B Leaps Skyward

Boeing and CFM International successfully began flight-testing the new LEAP-1B engine on April 29. The powerplant was mounted beneath a modified Boeing 747 flying test-bed at GE Aviation Flight Test Operations in Victorville, California for the initial flight.

The testing is the next major milestone in a two-year programme that will culminate in engine certification in 2016 and delivery of the first Boeing 737 MAX in 2017. The engine performed well at various altitudes during the five and a half hour flight.



The LEAP-1B engine will power the Boeing 737 MAX and is part of the most extensive ground and flight test certification programme in CFM's history. It is seen here below a 747 test-bed

The Latest News from the World of Jets

\$25,000 Raised in Sponsorship for Edwards' YF-22A

The Air Force Flight Test Museum at Edwards AFB, California has received a \$25,000 donation from the Bechtel Corporation to sponsor the YF-22A prototype.

The Flight Test Historical Foundation has 80 aircraft available for corporate sponsorship in their prospectus. Each aircraft is assigned a sponsorship level based on its size and historical significance. The funds are put towards the museum's capital campaign to move outside of the West Gate.

Bechtel is the first to take advantage of the opportunity to sponsor an aeroplane.



Bechtel Corporation presented a cheque for \$25,000 to the Flight Test Historical Foundation at the Air Force Flight Test Museum May 21 to sponsor the YF-22A. (Left to right) Dr David Smith, 412th Test Wing Installation Support director, and Lisa Gray, FTHF chairwoman, accepted the donation from Brian Sheridan and Dr Richard Tighe from Bechtel

USAF/Rebecca Amber



An EA-6B Prowler from VAQ-134 Garudas landing aboard the USS George H W Bush during the squadron's final operational Prowler tour last year. A Prowler from VAQ-134 joined the Museum of Flight's collection on May 27

EA-6B Prowler for Museum of Flight

The Museum of Flight in Seattle, Washington took delivery of a newly retired ex-US Navy Grumman EA-6B Prowler electronic warfare aircraft on May 27.

The jet flew in from Naval Air Station Whidbey Island, where it had been in service with Electronic Attack Squadron (VAQ) 134.

"The Prowler will be the first electronic warfare aircraft in the Museum's collection," said Curator Dan Hagedorn, "it is the missing piece that fills our story of modern military aviation. Prowlers have been used since the Vietnam War; and their capability to suppress enemy air defenses is still formidable. This plane will not only complement our older military jets on exhibit, but speak for the current state-of-the-art as well."

After 45 years in service, the Grumman Prowler is in the process of being retired by the Navy, to be replaced by the Boeing EA-18G Growler.

NEWS IN BRIEF

Boeing has delivered Transaero's first Next-Generation 737-800. The aeroplane, sporting a new livery, arrived at Moscow's Domodedovo Airport on May 22. The aircraft has a radome 'bump' on top of the fuselage just behind the wings; this covers a Ku-band satellite antenna system that enables broadband passenger connectivity all over the world – even over oceans. Transaero is the second-largest airline in Russia.

In April the Turkish Air Force received the last of a batch of 117 upgraded F-16 Fighting Falcons from Tuzlas Turkish Aerospace Industries (TAI). The upgrade created a common avionics configuration for the service's fleet of F-16 Block 40 and 50 aircraft and includes AN/APG-69(V)9 radar, colour cockpit displays, night-vision goggles and upgraded navigation systems.

According to Russian media, Russian Navy Sukhoi Su-24 Fencers 'forced' the US Navy Destroyer USS Ross away from its territorial waters. The ship had left the Romanian port of Constanta and the US is adamant it was in international waters at all times. This is the latest 'attack' on NATO warships by Su-24s in the Black Sea in recent months – the jets are thought to be operating from the Novofedorovka airbase, which was captured from Ukraine in 2014.

Manchester International Airport is to get a £1bn transformation complete with a new terminal and faster high-tech security lanes. The ten-year scheme will more than double the size of Terminal Two and link it to an improved Terminal Three. The ageing Terminal One will be demolished and among a range of high-tech changes will be a scheme to pre-clear American immigration in Manchester.

An A-10A Thunderbolt II pilot had to land his jet at Al Asad Air Base in Iraq's volatile Anbar province after a catastrophic engine failure during a mission in support of Operation *Inherent Resolve*. No specific date has been released for the incident, which happened during "routine aerial refuelling."

Satellite images appear to show the Libya Dawn militia group making three MiG-25 aircraft airworthy at an air base in Misrata.

United Airlines has added a seventh airport to its UK network with the launch of seasonal non-stop service between Newcastle and New York's Newark Liberty International Airport. The airline will operate five flights per week between May 23 and September 7.



2015 Aerospace Media Awards

Congratulations to *Jets* Editor Steve Bridgewater and regular contributor Jamie Ewan who have been shortlisted for the 2015 Aerospace Media Awards.

They will compete in the 'Best Aviation Image' category, which is sponsored by Dassault Falcon. Steve's image of the Tin Stix display team and Jamie's photograph of Douglas DC-3 'Flabob Express' were both taken at the 2014 EAA AirVenture show at Oshkosh, Wisconsin.

The winners will be announced at the 2015 Aerospace Media Dinner at the Aero Club de France in Paris on June 14.

Jet Noise

EXTRA DREAMLINERS FOR TUI/THOMPSON

In mid-May the TUI Group, one of the world's largest integrated leisure travel companies, finalised an order for one extra Boeing 787-9 Dreamliner and announced that it will substitute two unfilled orders for 787-8s for two 787-9s. The company will operate a fleet of 13 787-8s from this summer and will add the three 787-9s to its fleet within the next three years – these being shared between the six airlines in the TUI Group (TUIfly, Thomson, TUIfly Nordic, Jetairfly, Corsair and ArkeFly)



REDS' TRIBUTE

Among the aircraft overflying Westminster as part of the UK's VE Day commemorations on May 8, 2015 were the Royal Air Force Aerobatic Team, the Red Arrows, seen here running in over the capital. The day marked the 70th anniversary of the end of the war in Europe



250th EASYJET

easyJet took delivery of its 250th Airbus aircraft on April 22. Europe's biggest A320 family painted the landmark airframe in a unique livery featuring 250 miniature aircraft. easyJet has 158 aircraft currently on order, and in terms of total aircraft orders is Airbus' third biggest airline customer



'Doodlebug' running!

Jerry Yagen's Military Aviation Museum (MAM) in Virginia Beach has begun test runs on a modern replica of the Argus As 014 pulse-jet engine used in the Fiesler Fi-103 guided missile, better known as the V-1 'Doodlebug.'

The Military Aviation Museum has an original, restored V-1 in its collection and although the engine has been test run successfully, it is considered too rare and valuable to risk running on a regular basis.

Mr Yagen purchased the new motor (built by Alex Kunz in Germany) to operate for visitors but it has taken considerable work by the museum's General Manager Tom 'TK' Kurtz III and his team to get the engine into running condition.

Working with Oregon-based Bob Maddox, the team created a new fuel system with six electric pumps incorporated within the tank. Many months of research went into creating the right mixture of fuel and air to allow the engine to run safely for sustained periods in front of the public.



The Military Aircraft Museum's new-build Argus As 014 pulse-jet engine is a unique running exhibit



The Lancer is moved to its new position outside the museum. Visitors will be allowed to walk around and underneath the aircraft in order to appreciate its massive size.

Lancer on the Move

The Strategic Air & Space Museum (SASM) in Ashland, Nebraska has moved its highly unusual Rockwell B-1A Lancer (74-0174) to the museum entrance as part of a plan to expand its outdoor display offerings.

The museum now hopes to attract more attention to its entrance but the decision to move the B-1 from an indoor to an outdoor exhibit required careful consideration. There were only four B-1As built and SASM is caretaker to one of only two left in existence – the other being at the Wings over the Rockies museum in Denver, Colorado.

"The Lancer will be an impressive sight as guests drive into the museum," said Dr Mike McGinnis, Executive Director at the Strategic Air & Space Museum, "[it] was selected to be the prominent outdoor display because of its size and significance in aviation history. The B-1A, which developed into the B-1B, was the last bomber employed by Strategic Air Command and holds a prominent place in history."

Final QF-4 Mission at Tyndall

The McDonnell Douglas F-4 Phantom II moved ever closer to retirement on May 27 when the Tyndall AFB-based 82nd Aerial Target Squadron, a subordinate unit of the 53rd Weapons Evaluation Group, flew its final QF-4 Phantom mission.

The sortie marked the end of almost 20 years of QF-4 operations at Tyndall and saw a pair of QF-4 remotely piloted aerial targets successfully destroyed.

"The QF-4 has really served the Air Force and the nation very well by making sure that our weapons are qualified and tested, and we know they're going to work when our pilots take them into harm's way," said Jerry Heikkinen, 82nd ATRS drone remote controller and pilot. "Instead of wasting away in the desert and sitting in long term storage, these aircraft have been modified to provide valid combat effectiveness testing for our military forces, and it's really a good way for these airplanes to go."

The QF-4 has now been replaced with the QF-16 Fighting Falcon. According to Lt Col Matthew Garrison, 82nd ATRS Director of Operations: "Like the QF-4, the QF-16 is a full-scale aerial target that can be flown manned or unmanned. Unlike the QF-4, the QF-16 has all the capabilities of a newer generation aircraft. We get much more manoeuvrability out of it, and essentially we have a fully capable F-16 Falcon. It can pull 9G, go supersonic and climb up to 55,000ft just like the front line fighters."



The 82nd Aerial Target Squadron's last QF-4 Phantom takes off on May 27, marking the end of 20 years of its use at Tyndall. While this is the last QF-4 flight for Tyndall, the QF-4 still flies at Holloman AFB, New Mexico

The Latest News from the World of Jets

Battle of Britain Commemorated

Both the RAF and the Canadian Armed Forces have unveiled specially painted jets to commemorate the 75th anniversary of the Battle of Britain.

The RAF's 29(R) Sqn has painted a Eurofighter-Typhoon into 1940s style camouflage, complete with the GN-A codes worn by a Hawker Hurricane flown by 249 Sqn's Flt Lt James Nicholson when he became the only Fighter Command pilot to be awarded a Victoria Cross during the battle.

Meanwhile, across the Atlantic, the Canadian Armed Forces has also painted up its flight demonstration CF-118 Hornet in a special scheme. Over one hundred Canadians flew and fought in the skies over England during the Battle of Britain, with several hundred more braving the constant bombings as ground crew. The CF-18 Hornet Demo Team will be appearing at shows across Canada and the USA.



Jonny Dowen displays the special-schemed 29(R) Sqn jet at Duxford on May 23

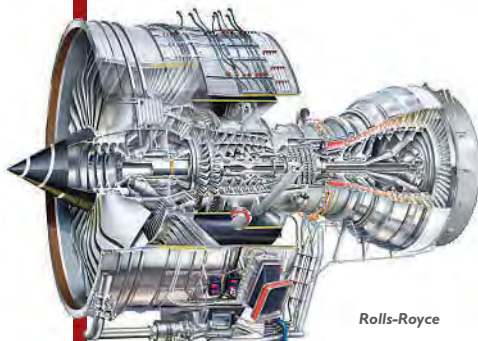


The 2015 CF-118 Hornet demonstration aircraft flies over the Saguenay River near 3 Wing Bagotville, Saguenay, Québec.
Canadian Armed Forces/LS Alex Roy, Atelier d'imagerie Bagotville

Rolls-Royce's \$9.2 Billion Order

Rolls-Royce has won its largest ever order, worth \$9.2 billion, to provide Trent 900 engines and TotalCare service support to Emirates. The engines will power 50 Airbus A380 aircraft that will enter service from 2016.

John Rishton, Rolls-Royce, chief executive, said: "The success of Emirates over the last 30 years has been extraordinary. Rolls-Royce has been proud to have been part of this success, powering Emirates aircraft since 1996. We are delighted that Emirates has again placed its trust in our technology, with the biggest order in our history."



The Trent 900 powered the first commercial A380 in 2007 and is now used by eight operators on more than 70 aircraft, having logged over four million in-service flight hours

50th BOEING 777-300ER FOR CATHAY PACIFIC

Cathay Pacific Airways took delivery of the airline's 50th 777-300ER (Extended Range) on April 30. With this delivery, Cathay Pacific will have 67 Boeing 777s in operation and is slated to receive three more this year. The airline is also one of the launch customers for the 777X, with 21 777-9X aeroplanes on order



Record 66% Profit Increase at Ryanair

Low-cost carrier Ryanair has seen profits rise 66% for the year to the end of March, reporting net full-year profits of 867 million Euros. According to CEO Michael O'Leary the airline's 'Always Getting Better' customer experience programme has attracted "millions of new customers" while falling oil prices also reduced operating costs. Passenger traffic was also up 11% for the year, with Ryanair carrying 90.6 million customers.

American Air Museum 'Shuffle'

The Imperial War Museum Duxford's American Air Museum has closed to the public as it undergoes a £1 million transformation and overhaul.

The ambitious redevelopment work, made possible by a £980,000 grant from the Heritage Lottery Fund, has seen almost all of the aeroplanes emerge from behind the building's striking glass front.

Although many of the moves have taken place outside normal opening hours, enthusiasts have been able to follow the action in almost real time on the Friends of Duxford Facebook page.

Jets seen outside on their way to storage and display elsewhere on site have included the A-10A Thunderbolt II, F-4J Phantom II, F-111 Aardvark and even the SR-71 Blackbird.

The majority of the aircraft are now in the AirSpace hangar and the American Air Museum is not expected to re-open until spring 2016.



Friends of Duxford volunteers have been documenting the movement of the American Air Museum aircraft via their Facebook page. Search 'Friends of Duxford' to keep up to date yourself

SPECIAL SCHEME FOR SINGAPORE A380s

Singapore Airlines is painting two of its Airbus A380s in a special livery featuring a large Singapore flag theme to help celebrate the nation's 50th anniversary. The first aircraft to sport the new livery (9V-SKI) is set to take to the skies in June. The patriotic A380s will be serving routes to Beijing, Hong Kong, London, Mumbai, New Delhi, Shanghai, Sydney and Zurich



The USAF retired its last OV-10s in 1991 but the USMC retained its examples until 1994, some of which served in Operation Desert Storm USAF



BRONCO

NORTH AMERICAN'S WORKHORSE

Fifty years on from the maiden flight of the OV-10 Bronco, Kimberley Hawkins looks back at the history of the reconnaissance aircraft turned mud-mover

By the late 1950s it became obvious to high-ranking members of the United States Marine Corps (USMC) that the service needed a new aeroplane to meet its armed reconnaissance and close air support needs.

With increasing levels of 'anti-guerrilla warfare' operations considered likely, a 1959 study proposed an observation aircraft able to 'live' in the field with the troops it was to support. This aircraft would need to be rugged, simple to maintain and easy to fly and – most importantly – needed to be inexpensive to buy and operate.

Turboprop

At the time, the US Army was still experimenting with armed helicopters and

the USAF was not interested in close air support, so the USMC's foresight should be praised.

The driving force behind the initiative was USMC Colonels WH Beckett and KP Rice and they called for an aircraft capable of operating from roads or unprepared airstrips while being able to fly at both slow and high speeds.

'Loiter' times were also considered important and the newly pioneered turboprop engines were felt to offer the right mix of performance, reliability and economy. As would also be proven, the rugged engines would need no ground equipment to start and could operate on high-octane automobile fuel with only a slight loss of power.

ANNIVERSARY



Left: YOYV-10A prototype 152884 takes off on an early test flight



Middle left: The Convair Charger was a serious contender for the contract but lost out to the Bronco. Convair pressed on regardless but the aircraft was subsequently damaged in an accident and the programme abandoned



Below left: The first OV-10 Bronco to see active service makes its maiden flight in Southeast Asia in August 1968. This was during its 90-day period of combat evaluation with the 19th TASS USAF Museum

Convair Model 48 Charger and entries from Goodyear, Beechcraft, Douglas, Helio, Lockheed, Martin and the North American Aviation NA-300.

Competition

Although the NA-300 was selected by August 1964, and a contract for seven prototypes issued soon afterwards, Convair called for an inquiry into the decision and pressed on regardless with its Charger design.

The type first flew on November 29, 1964 and looked broadly similar to the NA-300 (which did not fly for another seven months). In fact, the Charger outperformed the NAA aircraft in some areas but it crashed after less than a year and Convair chose to abandon its plans to win the contract.

Prototype

It would be July 16, 1965 before the first of seven prototype YOYV-10As (BuNo 152879) lifted off from Port Columbus Airport, Ohio

on its maiden flight, with Ed Gillespie at the controls. By now the aircraft had evolved into a twin-engined turboprop with a slender, two-seat, tandem fuselage pod. The crew sat below a large canopy offering excellent visibility and twin booms extended rearwards from each of the 660shp Garrett T76 turboprops towards a high-mounted tailplane.

Praised for its high-visibility cockpit and rear cargo compartment, the type was immediately recognised as an all-purpose workhorse but on-going testing revealed the need to increase the wingspan by almost 10ft (to 40ft) and Garrett were tasked with increasing the performance of the engines to 715shp without changing the dimensions of the powerplant. The engines were also moved outboard by 6in to reduce noise and resonance in the cockpit.

Under fuselage 'sponsons' were also added to improve flight performance and decrease aerodynamic drag. These would also provide an ideal structure on which to mount additional weapon racks.

Marine Corps Bronco

By now the aircraft had been officially named the Bronco and the first of the reconfigured OV-10A variants took to the skies for the first time on August 15, 1966.

The USMC received its first production aircraft on February 23, 1968 and the Broncos soon arrived in Southeast Asia for a 90-day combat evaluation with the 19th TASS.

Mock-up

Beckett and Rice went as far as building a fibreglass mock-up in a garage and then set about marketing the aeroplane to North American Aviation (NAA). The company soon saw the twin-boom design's potential and began developing it as the NA-300.

In the meantime, the US military was slowly awakening to the idea of armed reconnaissance and in late 1963 a 'tri-service' specification for the Light Armed Reconnaissance Aircraft (LARA) was issued on behalf of the Army, Navy and Air Force calling for a "jungle fighting" light attack and observation aircraft.

Designed to replace the piston powered Cessna Bird Dog and Skymaster, the new aircraft would need to be a twin-engined, semi-aerobatic, two-man aircraft that could carry 2,400lbs of payload and six paratroopers or stretchers.

The aircraft also had to be able to operate from aircraft carriers, take off in less than 240m and fly at 300kts.

In total, eleven proposals were submitted, including the Grumman OV-1 Mohawk (already in service with the Army), the

Right: An OV-10A firing a smoke rocket in the area north of Saigon in February 1969 to show where the F-100 should drop its bombs USAF Museum

Below: YOYV-10A Bronco 152879 demonstrates the pre-production variants' short wing to great effect. Before the type entered service the wing had grown by 10ft to a new span of 40ft



ANNIVERSARY

The type immediately proved its worth and the first combat-ready squadron (VMO-2) became operational on July 6, 1968 from the Marble Mountain airstrip near Da Nang. Before the Marines withdrew from Vietnam in 1971 they had utilised the OV-10A in almost every role for which it had been designed: forward air controller, radio relay station, artillery spotter, helicopter escort, visual reconnaissance, convoy escort, and attack.

Air Force Bronco

The USAF began training OV-10A pilots with the 4409th Combat Crew Training Squadron at Hurlburt Field, Florida and although the USAF had acquired the Bronco primarily as a Forward Air Control aircraft, the first examples arrived in Southeast Asia in July 1968 as part of Operation *Combat Bronco*.

The aircraft served with the 19th Tactical Air Support Squadron (TASS) at Bien Hoa Air Base in South Vietnam and were evaluated for the full range of missions then assigned as Forward Air Control (FAC) aircraft – including day and night strike direction, gunship direction, bomb damage

assessment, visual reconnaissance, aerial artillery direction, and as escorts for aircraft engaged in Operation *Ranch Hand*.

The aircraft's ability to generate smoke internally – and 'mark' a target – was also of great use when trying to direct subsequent strikes by heavier and faster aircraft.

After the end of *Combat Bronco*, the USAF began to deploy larger numbers to the 19th TASS as well as the 20th TASS (Da Nang Air Base) and 23d TASS (Nakhom Phanom).

In combat over Vietnam the aircraft typically flew 5-hour missions and were armed with two LAU-59 rocket pods with 2.75-inch 'Willy Pete' white phosphorus marking rockets and 2,000 rounds of 7.62mm ammunition for the two M60 machine guns. The aircraft also carried a 230US Gal fuel tank on the centreline and linguists often flew in the rear cockpit to coordinate air strikes in support of ground operations involving indigenous troops who spoke little or no English.

Navy Bronco

The USMC purchased a total of 114 OV-10s and the USAF acquired 157 whereas the US



A Royal Thai Air Force OV-10 taxis in at Don Muang on June 2, 1971

Navy chose to borrow 18 USMC aircraft when required.

In Vietnam the Navy used the OV-10 as an attack aircraft in support of troops landing behind lines in UH-1 helicopters and formed Squadron VAL-4 'Black Ponies' to undertake this work on January 3, 1969. The Black Ponies also used the Bronco on convoy escort work carrying an SUU-11 7.62mm mini-gun pod on the fuselage pylon.

The Navy lost seven of its 18 borrowed Broncos and VAL-4 was decommissioned shortly after the end of the Vietnam War. The surviving OV-10s were transferred back to the USMC.

Modifications

The Bronco proved itself adept at changing roles as needed and the 1969 Operation *Misty Bronco* called for the aircraft to adopt a light strike role using its M60 guns and high explosive 2.75in rockets against ground targets.

Then, in 1971, Project *Pave Nail* saw the Broncos modified with a Pave Spot target laser designator pod, a night periscope and LORAN equipment enabling them to illuminate targets for laser-guided bombs dropped by F-4 Phantom IIs.



An OV-10A Bronco fires a white phosphorus smoke rocket to mark a target during a forward air control mission in support of ground troops USAF



With its twin booms, high tail and droning turboprop engines the Bronco is an unmistakable sight and sound USAF

ANNIVERSARY

the process of being phased out in favour of the Mil Mi-28 attack helicopter.

Civilian operators

Since their retirement by the US military, Broncos have found an eager home with both private owners looking for a high-performance and cost effective 'warbird' and numerous civilian organisations.

These include DynCorp International, which flies a number of civilian registered Broncos (under contract to the US Department of State) in support of drug interdiction and eradication efforts in South America, and several fire fighting operations.

In the latter role the aircraft use their existing smoke systems to mark the path towards a forest fire for the following air tankers and also act as aerial co-ordinators for the fire-fighting effort.

Next generation Bronco?

In recent years Boeing, which acquired North American many moons ago, has been quoted as offering a 21st century version of the OV-10 to potential buyers.

The so-called OV-10X will be a new-build version of the Bronco designed to meet demand for cost effective light attack aircraft. While it will retain its rugged design new the new Bronco will offer operators a glass cockpit, intelligence sensors and smart-bomb capabilities. If it enters production, it will compete against the Beechcraft T-6B Texan II and Embraer EMB 314 Super Tucano.

We may not yet have seen the end of the brilliant Bronco... ●



Operation Misty
Bronco called for the aircraft to adopt a light strike role using its M60 guns and high explosive 2.75in rockets against ground targets USAF



Above: The Venezuelan Air Force has operated a number of new build OV-10Es and ex-USAF OV-10As over the years, but these are in the process of being phased out in favour of the Mil Mi-28 attack helicopter FAV

Above right: US Marine Corps OV-10A Bronco 155415 from VMO-6. The Marines deployed VMO-6 to Quang Tri in November 1968 and VMO-6, called the Tomcats and using the tail code WB, was then based at MCAS Futenma, Japan until deactivation in 1976 USMC



However, the type was exported widely and continues to fly on with air arms around the globe.

The USAF provided the Colombian Air Force with twelve OV-10As for use in COIN (Counter Insurgency) and anti-narcotics warfare and these aircraft were later upgraded to OV-10D standard.

The Philippine Air Force also received 24 OV-10As from the USA in 1991 and 17 others have subsequently joined the fleet, including eight ex-Thai Air Force OV-10Cs. Thailand had purchased 32 OV-10Cs in the 1970s and retired the type in 2004.

Elsewhere, Indonesia purchased twelve OV-10F aircraft direct from NAA in the 1980s and continues to operate them in COIN operations after retrofitting 12.7mm heavy machine guns and racks capable of carrying Russian made bombs. Meanwhile the Venezuelan Air Force has operated a number of new build OV-10Es and ex-USAF OV-10As over the years, but these are in

Night observation

The most notable modification made to the basic Bronco airframe was the upgrade to OV-10D NOS (Night Observation Surveillance) standard for the USMC between 1979-1980.

The project can be traced back to the YOV-10D Night Observation Gunship System (NOGS) programme, which modified two OV-10As with a forward looking infrared (FLIR) sensor, laser target designator and turreted 20mm gun slaved to the FLIR.

Although the project was a combat success in Vietnam, no funds were forthcoming and the eventual OV-10D included the laser designator and sensors, but no new gun.

Nonetheless the type would go on to serve the USMC with distinction during the opening days of Operation Desert Storm in 1991.

Exports

The last American operated OV-10 Bronco was retired in 1994 – four years after the German operated OV-10B target tugs had been retired [see page 16].



OV-10A 67-14647 from the 19th TASS is readied for a mission at Osan AB in South Korea in April 1971



The Bronco carried a 230US Gal fuel tank on the centreline during combat missions over Vietnam and was typically airborne for 5-hours at a time



Complete with Day-Glo flying suits the Bronco Cheerleaders promote both the aeroplane and the team at events across Europe

In the early 1980s a young Belgian wandering around an airshow in Holland was stopped in his tracks when he came across a pair of USAF OV-10 Broncos. Some 35 years on, that same man, Tony De Bruyn, now displays an immaculate example of this unique and distinctive warbird around the skies of Europe.

Passionate about aviation since childhood, Tony is the driving force behind one of the most exciting display teams on the European airshow circuit – the Bronco Demo Team (BDT). With over 4,000 hours of flight time under his belt, Tony is the team's display pilot and loves nothing more than showing off the Bronco with great aplomb.

As he puts it, "The Bronco is a machine

that is out of the ordinary. Its distinctive looks mean one thing, a special kind of performance that makes flying the aircraft feel like you're on top of the world!"

Bronco Cheerleaders

Based in the heart of Belgium, the team was formed in 2010 as a tribute to both the type's significant history and to the people who helped make the Bronco a world class thoroughbred – be they those who designed it, flew it or turned the spanners maintaining it.

Behind the scenes but by no means unseen, a team of dedicated crew chiefs cover all engineering matters to ensure the smooth and safe operation of OV-10B Bronco G-ONNA (formerly 99+18 with

the Luftwaffe). Completing the team are the Bronco Cheerleaders, who promote both the aeroplane and the team at events across Europe.

This year sees the team celebrating several themes – including the 50th anniversary of the Bronco's first flight and the BDT's own fifth anniversary. As the team points out: "It's not only the Bronco that flies but also time itself!"

Bavarian Air Force

For 2015, the team has also chosen to celebrate the Royal Bavarian Air Force. Special artwork now features on the aircraft's centreline fuel tank and Königlich Bayerischen Fliegercorps titles in both English and Bavarian have been applied.

BAVARIAN BRONCO

*Half a century after the first flight of the North American Rockwell OV-10 Bronco, **Jamie Ewan** speaks to the Bronco Demo Team about OV-10B G-ONAA*



The Bronco is a remarkably agile aeroplane and performs a highly entertaining airshow 'routine'

All via Bronco Demonstration Team unless stated

Extending that theme to the public, the team's cheerleaders have become Bavarian Dirndls for the 2015 airshow season!

German Broncos

Developed for West Germany as a target tug, the OV-10B saw some radical departures from the basic A variant from which it was derived. The aircraft did not carry a weapons system and had a rearwards facing seat fitted within the cargo bay. Elsewhere, both the observer's seat and the rear cargo door were removed; the latter being replaced by a glass dome for towing operations.

A total of 18 Broncos were delivered to West Germany by North American Aviation (NAA) between 1969 and 1972;

these replacing the all-red ex-Fleet Air Arm Hawker Sea Furies previously used in the role. The OV-10s were delivered without towing equipment as this was developed, manufactured and installed in Germany.

Further adding to the type's versatility, 12 of the Broncos had provision made to allow a 2,950lb/thrust General Electric J-85-GE-4 turbojet engine to be fitted above the wing. These aircraft were designated OV-10B(Z) but despite increased speeds, a shorter take-off roll and a huge increase in the type's rate of climb, the turbojet was retired shortly after operations began – due to high fuel consumption. The aircraft that utilised the defunct turbojet reverted back to the standard B model.

Operating from Lübeck on the German Baltic coast from 1970, the aircraft were both maintained and flown by civilians despite wearing Luftwaffe markings and military serials. Replaced by the Pilatus PC-9 in July 1990, the OV-10s were retired to Manching before being sent on to a number of museums and technical schools, the latter using the aircraft as Aircraft Battle Damage Repair (ABDR) airframes.

Bronco 1 & Bronco 2

A new chapter in the type's history was opened in June 2000 when the German Wing of the OV-10 Bronco Association (GWOBA) formed under the chairmanship of Tony De Bruyn.

The previous year Tony had purchased



Tony positions the manoeuvrable Bronco for the camera-ship with ease during a photoshoot early in 2015

two ex-German machines from the Technische Schule der Luftwaffe 3 (Technical School of the Luftwaffe 3) at Fassberg Air Base, near Hannover. The aircraft, 99+32 (G-BZGK) and 99+26 (G-BZGL), had been used for ABDR duties since their retirement before finally being put up for disposal and stored outside.

Having not flown since their arrival in 1991, the aircraft underwent two years of work to render them airworthy for 'gear down' ferry flights to Duxford, Cambs where a full restoration could be undertaken.

On arrival at the Imperial War Museum's airfield in September 2001, G-BZGK underwent a significant restoration effort, finally flying again on July 11, 2007. The Bronco performed its first displays in 2008 and was seen at a number of flying and static events until 2012, when it was lost during a practice display at Cotswold Airport (the former RAF Kemble) in 2012. Thankfully, the aircraft's rugged and strong design helped save the life of Tony.

Uncertain times

In the meantime, work had been undertaken on G-BZGL but it was still a long way from airworthy condition. However, another Bronco had already found its way into the GWOBA fleet.

Delivered to the Internationales Luftfahrtmuseum (International Aviation Museum) in Schwenningen on its final flight from Manching in 1991, OV-10B 99+18 was destined to spend the rest of its days as a museum exhibit. Manufactured in 1971, the aircraft's future and that of the museum became uncertain when a freak hailstorm hit the area in 2006, destroying a number of hangars and airframes.

As luck would have it, a member of the GWOBA stopped by the museum to see 99+18 while on his way to an airshow and on hearing of the institution's plight, the question soon arose about the fate of 99+18 – which had somehow survived the carnage. A plan was hatched to sell the airframe and help raise funds towards rebuilding the museum. With a call to Tony De Bruyn and the GWOBA, 99+18's future was secured.



G-ONAA's restoration has included fitting a new glass dome to the rear fuselage and installing an original winch operator's seat

Jamie Ewan

Restoration

After a period of negotiations, the aircraft was signed over to the GWOBA on October 8, 2006 and its first engine runs since delivery took place in December that year. Despite the early fast-paced progress, work was eventually put on hold until all the necessary parts were in place and a small hangar could be built to protect both the team and the aircraft from the elements. As Tony explains, "To prepare both 99+32 and 99+26 for their ferry flights, work was done outside as we had no any access to the hangars at Fassberg and at times the working conditions were harsh. It did, however, prove the aircraft's ability to be maintained with just a simple tool kit and very little in the way of specialised tools."

Work recommenced in June 2011 with both Garrett AiResearch T76-G engines replaced with overhauled units. Other jobs

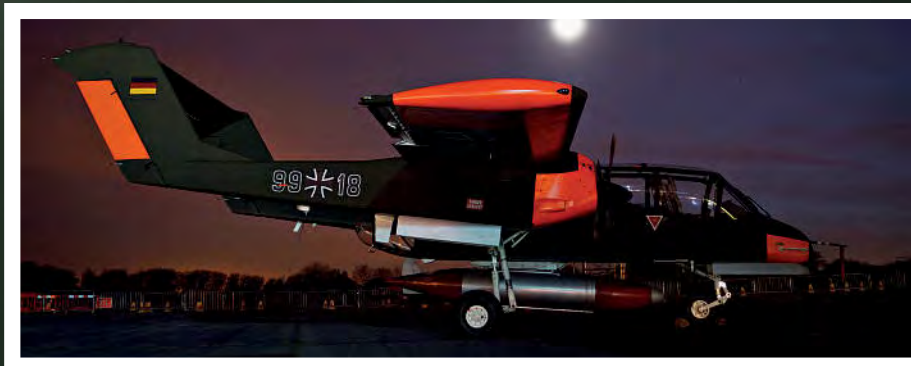


G-ONAA is a fine and rare representative of former German target towing Broncos



Above: The team's first Bronco was used extensively for battle damage repair training and is seen here shortly after its 2001 gear down ferry flight to Duxford for restoration KEY – Steve Bridgewater

Below: The Bronco Demo Team are active members of the European airshow 'circuit' and are seen here taking part in a night photo-shoot at the Abingdon Air & Country Show in May 2014 Jamie Ewan



included fitting a new glass dome to the rear fuselage and installing an original winch operator's seat.

With work completed and the UK Civil Aviation Authority happy, 99+18 (now registered G-ONAA) took to the air again on May 26, 2012. Bidding farewell to the Black Forest region after more than 20 years, the aircraft was ferried to Manston, Kent for further restoration work.

After some 18 months of work, which saw most of the outer panels being re-fabricated and replaced, the aircraft was flown across to Holland for a repaint into the dark green and Day-Glo orange scheme it wore while in service.

Go NAA!

On March 2, 2014 (almost six years after its fate was sealed by a phone call) 99+18 was flown home to the BDT's base at Kortrijk-Wevelgem Airport in the hands of Tony – his first flight in a Bronco since the accident two years before.

Tony explains that: "the aircraft has been kept as close to original as possible with only the additions of a VHF radio and a Mode S transponder to meet civilian regulations." Three internal changes have seen the towing equipment removed, both ejection seats

made inert, and the observer's seat re-fitted to accommodate passengers.

Why G-ONAA? In tribute to the Bronco's manufacturer: GO – North American Aviation!

Display flying

Picking up where they had left off the team was soon back on the airshow circuit, with its first UK appearance appropriately taking place at Kemble/Cotswold Airport on May 3, 2014. The previous day 99+18 briefly stopped at the same spot where 99+32 came to rest two years before – almost as if the baton was being passed on to the next generation.

Since then Tony has been showing off the type's unique shape, sound, agility and often surprising manoeuvrability.

"The flying controls are very light and well balanced throughout the full speed range, which ranges from 70 to 350kts," he explains. "In fact the controls are so light you often wonder if the aeroplane is reading your mind rather than you making control inputs."

The Bronco's distinctive, yet beautiful, appearance has a certain character about it – and the BDT brings this out both on the ground and in the air. As Tony says, "It's Awesome!" ●

Above: For 2015, the team has also chosen to celebrate the Royal Bavarian Air Force. Special artwork now features on the aircraft's centreline fuel tank and *Königlich Bayerischen Fliegercorps* titles in both English and Bavarian have been applied

SPECIFICATION NORTH AMERICAN ROCKWELL OV-10B BRONCO



Crew	2
Length	41ft 7in (12.67m)
Height	15ft 2in (4.62m)
Wingspan	40ft 0in (12.19m)
Wing area	291sq ft (27.03m ²)
Empty Weight	6,893lb (3,127kg)
Max Take-Off Weight	14,440lb (6,552kg)
Max Speed	244kts (281mph/452km/h)
Ferry Range	576 miles (927km)
Service Ceiling	24,000ft (7,315m)
Powerplant	Two Garrett T76 turboprops (715shp each)
Armament	Nil (Target towing equipment only)
First Flight	July 16, 1965 (YOV-10A)



Dash 7

FORTY YEARS OF A CANADIAN CLASSIC

Built only in modest numbers, the DHC 'Dash 7' proved a versatile aircraft and accrued many fans among those who piloted, worked on or flew aboard the hardy propliner. Kimberley Hawkins looks back at 40 dashing years

Having made a name for itself producing the rugged DHC-2 Beaver and DHC-3 Otter as well as the Chipmunk, Twin Otter, Caribou and Buffalo, de Havilland Canada (DHC) set its sights on the commercial airliner market in the early 1970s.

Combining its proven ability to create Short Take Off & Landing (STOL) aircraft with the ever improving turboprop engine technology, DHC decided to create a larger airliner that would be ideal for metropolitan airports.

The new aircraft would compete with the likes of the Fokker F-27, Convair 580 and Hawker Siddeley 748 turboprops as well as

the latest versions of the Boeing 737 jetliner.

DHC realised it could not compete on speed or range but with an increasing number of airlines flying to small, remote and undeveloped airports, it was felt a STOL airliner could be in great demand.

The low noise and steep take-off and landing would also, the Canadian manufacturer felt, result in an aircraft with a much lower noise signature than anything already flying, making it ideal for inner city airports.

Development began in earnest in late 1972 with the specification calling for an aircraft that could fly 40 passengers over routes up to 200 miles while operating from unpaved/

unimproved runways as short as 700m.

Construction of the prototype soon began while the marketing team set about promoting the aircraft to airlines operating to and from short airfields or inner city airports.

Lucky Seven

The aircraft was the seventh design to come from the team at DHC and as such was designated the DHC-7 but the propensity to adopt trendy marketing buzzwords led to the aircraft being referred to simply as the 'Dash 7.'

The aircraft stuck to DHC's ethos of designing simple and rugged machinery. It had a cylindrical fuselage and high wing



Main: The prototype Dash 7 was C-GNBX, here wearing the 'X' suffix to its registration during an early test flight

Below: The second prototype Dash 7 was C-GNCA, seen here during a test flight in late 1975. It subsequently served with Norwegian airline Widerøe and was registered LN-WFU. It was broken up in 1989 and used for ground instruction



Dash 7s on the production line at de Havilland Canada's factory at Downsview near Toronto

that had prominent dihedral and housed four ubiquitous 1,240shp Pratt & Whitney Canada PT6A-50 turboprops.

The engines drove large 11ft diameter broad chord four-bladed Hamilton Standard propellers. These were geared so as to produce ample thrust at low RPM (thus reducing noise) and also had reverse thrust to help reduce the landing roll.

With stringent new noise restrictions coming into effect throughout the 1970s, the whisper-like qualities of the Dash 7 were considered to be a big selling point and much was made of the aircraft's ability to land using just 900rpm and take off at only 1,210rpm!

CLASSIC TURBOPROP



Above: The Dash 7 was envisaged as a four engined version of the Twin Otter. Here a DHC-6 'Twotter' leads a DHC-4 Caribou as well as the prototype DHC-7

Left: The prototype Dash 7 approaching completion in 1974. Today the aircraft can be found in the Canadian National Aviation Museum



The Dash 7's STOL capabilities were aided by an aerodynamic lift enhancement system that provided double slotted flaps over 80% of the wingspan. The wing also boasted outboard spoilers on each wing and pneumatic de-icing boots. Weather radar was provided as standard as DHC felt the aircraft was likely to be flying in areas prone to inhospitable weather.

STOL

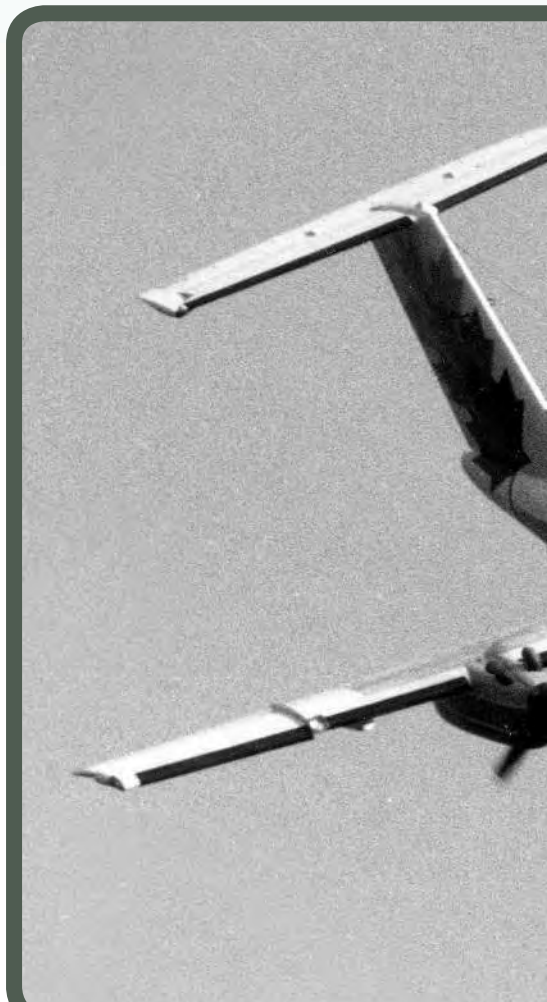
All of this combined to give the Dash 7 an ability to take off and land in less than 700m – half that of the Boeing 737-300, its competition for orders.

Allowing the pilots to 'slam' the aircraft onto the runway if needed meant having a sturdy undercarriage, but unlike most of its predecessors, the Dash 7 would need retractable landing gear to improve aerodynamic efficiency and range. DHC came up with a simple solution using twin main wheels that retracted forwards into the inboard engine nacelles and a hard-wearing nosewheel that retracted aft into the fuselage.

Bigger 'Twotter'

In many ways the DHC-7 was merely a scaled up, four-engined version of the DHC-6 Twin Otter. The most obvious change – apart from the two extra engines – was the addition of a large T-tail, which was intended to keep the elevator clear of the propwash during take-off.

Other modifications included the addition of cabin pressurisation and so-called 'spoilerons.' The Twotter had included drooping ailerons (dubbed 'flaperons') to help increase lift at slow speed but this system was considered too heavy for the Dash 7. Instead, two sets of spoilerons were fitted to each wing to provide both drag and roll control when needed. The inner set were active all the time but the outer spoilerons only came into effect at speeds below 130kts to add roll performance close to the ground. Both sets of spoilerons would extend in unison after landing to destroy lift and help reduce the landing roll.



Into service

Financial backing from the Canadian Government allowed the rapid development of the DHC-7 programme, and with construction complete, prototype C-GNBX was rolled out in February 1975.

On March 27, DHC's chief test pilot Robert H Fowler took the aircraft on its maiden flight. It would be followed by a second development machine, both of which proved to be simple to fly and very reliable. The first production Dash 7 flew on March 3, 1977 and the type was certificated by Transport Canada on May 2 the same year.

On February 3, 1978 the first aircraft was delivered to launch customer Rocky Mountain Airways and was used to provide services between Denver and the Avon STOL-port close to the Vail ski resort in Colorado.

Initial versions

The aeroplane was originally designed as the Series 100 with the DHC-7-101 being a pure freight aircraft, the DHC-7-102 being the passenger variant and the DHC-7-103 version being a 'combi' aircraft capable of carrying a mixture of passengers and freight.

The -102 was able to carry 50 passengers in four-abreast seating along with a flight crew of two and up to two flight attendants. An integral air-stair was incorporated into the rear left door and the aircraft also boasted a galley and a small toilet.

The -101 had a large (71 x 91in) cargo

door in place of the forward left emergency exit and could carry up to 11,000lbs of freight in the 330ft³ cabin. The aircraft was also capable of carrying up to five standard LD-3 containers and a roller system could be installed on the floor to ease cargo handling.

The -103 'combi' could accommodate either a single LD-3 container and 34 passengers, two LD-3 containers and 26 passengers or three LD-3 containers and 18 passengers.

The Series 110, which was designed to meet British CAA requirements, soon followed and then the Series 150 was introduced. The latter offered additional fuel capacity and an improved interior.

DHC had plans to introduce a Series 200 variant with new PT6A-50/7 engines to offer improved performance in hot or high climates, however, after the company was sold to Boeing the project was shelved in 1988.

'Other' operators

As with so many DHC designs, the Dash 7 found a comfortable home within the military. Its ability to fly in and out of inhospitable terrain and its ruggedness made it a favourite with air arms.

That said, the first two military Dash 7s delivered were provided to the Canadian Armed Forces to serve as VIP transports around relatively hospitable Europe! Designated the CC-132 in Canadian military service the type was delivered to 412 Transport Squadron at Canadian Forces Base Lahr, in West Germany.

Transport Canada also operates a Dash 7 in the maritime surveillance role as part of its National Aerial Surveillance Program (NASP). Based in Ottawa, Ontario, the aircraft is also involved in pollution and ice patrol reconnaissance and regularly deploys to the Canadian Arctic and Greenland.



Gulfstream International Airlines acquired N234SL on lease in 1998. The aeroplane had been delivered to ANHSA in April 1980 as HR-AND and in 1983 it was sold to lessor Aviation Enterprises. It then went on to serve with various airlines under lease as N234SL, C-FDNR and TC-JCJ



The type benefited from the exceptional performance and manoeuvrability for which DHC was famous

Unusually, this airframe was eventually fitted with a large observers area perched atop the front fuselage. It also has a side-looking airborne radar (SLAR) and can drop flares and rescue gear.

The British Antarctic Survey (BAS) has also operated the type since 1994. Its striking orange Dash 7 has been modified to include long-range fuel tanks (with a fuel jettison system), a large cargo door and strengthened cargo floor. It has also been fitted with enhanced avionics and navigation systems.

During the Antarctic summer the Dash 7 makes regular flights to and from the Falklands and the 1,180 mile journey can be completed in five hours with up to 16 passengers or 2,000kg of cargo on board.

Other examples of the Dash 7 serve with the United States Army, which operates the type as the EO-5C surveillance platform under the 'Airborne Reconnaissance Low' programme. The type replaced the Grumman OV-1D Mohawk and carries a crew of pilot, co-pilot, and four systems operators. The fleet is expected to remain in service until 2017.

CLASSIC TURBOPROP



City life

Although it had been designed primarily for operations into far-flung airstrips, the Dash 7 found a following in a very different setting.

When London City Airport opened in 1987, the short runways and steep approaches meant the variety of aircraft it could accommodate was limited – but one type stood out from the crowd...

Brymon Airways had ordered a fleet of Dash 7s from DHC in a shrewd move that saw the small operator become a big player

as a feederliner into airports where STOL was an irrelevance and those that operated it into shorter, more rural airstrips were small carriers that were able to cope with the smaller Twin Otter – which was cheaper to both buy and run.

Even the Brymon bubble burst when the runway at London City Airport was lengthened, allowing the likes of the jet-powered BAe 146 and Airbus A318 to offer greater efficiency to operators and cheaper prices to customers.

Above left: Dash 7 9M-TAK, seen here in service with Malaysia-based Berjaya Air in March 2000, began life in 1988 as G-BOAW with London City Airways. It went on to serve with British Midland Airways and Widerøe in Norway as LN-TAW before joining Berjaya in 1995 *Caz Caswell*

Above: Dash 7 G-BOAW joined British Midland in 1988 and is seen here landing at Heathrow in June 1991. It later transferred to Widerøe in Norway as LN-TAW before joining Berjaya Air in Malaysia in 1995 as 9M-TAK *Adrian M Balch*

“The Dash 7 was able to take-off and land in less than 700m”

in a very lucrative market. The aircraft's ability to land between the skyscrapers in the Docklands meant business travellers flocked to the carrier. If ever there was a Dash 7 success story this was it.

Limited appeal

However, sadly Brymon was the exception rather than the rule and despite DHC's initial confidence the Dash 7 met with limited commercial success.

Feedback from operators revealed that the Dash 7's four engines resulted in twice the maintenance of twin-engined rivals. Meanwhile, the aircraft's true unique selling point – its STOL capability – was not actually in that great a demand.

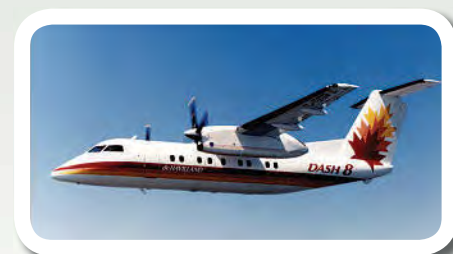
Larger airlines tended to operate the type

Just 100 Dash 7s had been delivered by 1984 when the production line was put on hold in favour of the twin-engined DHC-8 'Dash 8'.

Another 13 were subsequently delivered between 1984 and 1988, when the production lines were briefly re-opened to provide aircraft to Tyrolean Airways, but Boeing's purchase of DHC in 1988 seemed to spell the end for the Dash 7.

Boeing later sold the remnants of DHC to Bombardier but with no intention to reintroduce either the DHC-6 Twin Otter or the DHC-7, the rights to both types were sold to Viking Air in 2006.

Whether the Victoria-based manufacturer will re-launch the Dash 7 remains to be seen... ●



Faced with poor sales for the Dash 7, DHC officials began to consider development of a twin-engined commuter airliner with 30 to 40 seats that would plug a gap between the 19-seat Twin Otter and the 50-seat Dash 7. The resulting Dash 8 first flew on June 20, 1983

SPECIFICATION DE HAVILLAND CANADA DHC-7



Crew	2
Capacity	Up to 50 passengers
Length	80ft 1in (24.4m)
Height	26ft 2in (7.98m)
Wingspan	93ft 0in (28.35m)
Wing area	860sq ft (79.90m ²)
Empty Weight	27,690lb (12,560kg)
Max Take-Off Weight	44,000lb (20,000kg)
Max Speed	231kts (266mph/428km/h)
Ferry Range	795 miles (1,279km)
Service Ceiling	21,000ft (6,400m)
Powerplant	Four Pratt & Whitney Canada PT6A-50 turboprops (1,120shp each)
First Flight	March 27, 1975

Trans Capital Airways Dash 7 C-GLPP lands at Toronto in May 2001. The airline later operated the aircraft in Liberia on behalf of the United Nations Department of Peacekeeping Operations (DPKO) and on May 1, 2006 it was written off after being involved in a gear-up landing at Zwedru while carrying 37 Ethiopian soldiers *Steve Fletcher*





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Vulcan's Final Fling

The Vulcan to the Sky Trust has announced that Avro Vulcan XH558 will retire at the end of the 2015 airshow season, but the iconic V-Bomber is set to go out in style

The unique Avro Vulcan XH558/G-VLCN is embarking on its final flying season.

Returned to the skies in 2007 following an ambitious restoration programme, Vulcan XH558 has cost more than £2 million each year to operate, much of which has come from private donations.

But now, according to the Vulcan to the Sky Trust, which operates XH558: "Having evaluated a great many factors, the three expert companies on whom XH558 depends – known as the 'technical authorities' – have together decided to cease their support at the end of this flying season. Without that support, under CAA regulations, she is prohibited from flying."

"Pragmatic"

At the heart of the technical authorities' decision are two factors. According to the Trust, although XH558 is currently as safe as any aircraft flying today, her structure

and systems are already more than 10% beyond the flying hours of any other Vulcan, so knowing where to look for any possible failure will become more difficult. Secondly, maintaining her superb safety record requires expertise that is increasingly difficult to find.

The decision to ground the last flying V-bomber is "for entirely pragmatic and well-argued reasons related to the age of her airframe and engines and the growing difficulty sourcing otherwise redundant skills," explains engineering director Andrew Edmondson. "I cannot emphasise highly enough that this is not in any way a comment on XH558's safety this year. She has proven to be as reliable as most modern military jets and is maintained to the CAA's

rigorous standards, which are amongst the highest in the world.

"Our technical partners already bring specialists out of retirement specifically to work on XH558; a solution that is increasingly impractical for those businesses as the necessary skills become distant in their collective memories. We have recently been made aware that the skills issue is particularly acute as our engines age and will require a considerable amount of additional (and costly) inspection and assessment."

The Trust says it has worked hard to see if another year may be possible. Unfortunately, following extensive discussion with the technical authorities, some of the challenges have proven to be insurmountable.

On tour

The charity's chief executive, Dr Robert Fleming, told supporters; "If you don't see her this season, there will be no more opportunities to hear a Vulcan's spine-tingling howl as she climbs high into the sky for another memorable display, or to see her rolling onto her side to reveal her giant delta silhouette."

And to ensure XH558 goes out in fitting style the aircrew, led by Martin Withers (who captained Vulcan XM607 on the famous Black Buck mission during the Falklands Conflict) is about to launch

At the end of 2015 Vulcan XH558 is scheduled to make her final landing. It will be the end of an era





"I would like to thank everyone who has donated their time and/or money to help XH558 fly" Dr Robert Fleming

Valuable future

All money raised this year will be used to operate XH558 during her final summer and to continue to maintain her in fast-taxi condition when she stops flying.

When the Vulcan lands for the last time at the end of its 'Farewell to Flight' season, it will become the centre of a new type of education initiative. "XH558 is an iconic example of that remarkable period of intense post-war innovation that made British aviation technology the envy of the

world," says Dr Fleming. "In her new life, she will still be able to accelerate dramatically along the runway [at Doncaster Robin Hood Sheffield International Airport]. XH558 will build on this exciting provenance to inspire and educate new generations of young people, helping to deliver the technical and aviation skills that Britain so badly needs."

There will also be a heritage centre so that enthusiasts can continue to visit the aircraft and learn about the engineering innovation and Cold War politics that brought the bomber into existence. XH558 will be maintained to a high standard and will regularly thrill audiences with her famous Vulcan howl as she accelerates along the runway.

End of an era

This is going to be a spectacular summer for Vulcan XH558 but also a very emotional one. After she has landed from her last flight this autumn, there will no longer be a flying Vulcan.

"We are therefore going to work especially hard to make summer 2015 a memorable flying season for every Vulcan enthusiast across the country," concludes Dr Fleming. "We intend to use every flying hour available, taking her to more people than ever before, celebrating other iconic British engineering achievements and saluting the heroes of Britain's legendary V-Force in which she played a vital role during the knife-edge tension of the Cold War."

● For up to date information please visit: www.vulcantothesky.org

SALUTE TO THE V-FORCE

In collaboration with the British Aviation Preservation Council (BAPC), the Vulcan to the Sky Trust has arranged a special 'farewell tour' on June 27-28 to enable XH558 to visit all the surviving V-Bombers (Vulcans, Victors and the sole surviving Valiant) in the UK.

This will allow the team to display XH558 to a wider audience than usual (having never previously made so many appearances in a single weekend) as it overflies 17* sites and conducts a short display at each venue.

According to the Trust, the tour will include more than seven hours flying, costing more than £50,000 – and this is where they are asking for the help of XH558's loyal supporters one final time. Spectators can text in specific donations of £5 for their favourite or most local airfield and the Trust hopes Vulcan fans will promote these income streams far and wide. Each location needs just £3,000 (that's just 600 donations of £5) to break even.

Here's the proposed route for each day's flypasts**. To donate £5 to the cause simply text your chosen code to 70070!

Saturday June 27

Location	£5 text code
Newark	NWRK555
East Midlands	EMID555
Cosford	COSF555
Woodford	WOFD555
Carlisle	CLSE555
East Fortune	EFRT555
Sunderland	SLND555
Elvington	ELTN555
Doncaster return	DONC555

Sunday June 28

Location	£5 text code
Bruntingthorpe	BRPE555
Coventry	CTRY555
Wellesbourne	WELB555
Hendon*	HDON555
Duxford	DUXF555
Southend	STHD555
Norwich	NORH555
Marham	MHAM555
Waddington	WDTN555
Doncaster return	DCTR555

*The Trust hopes to include the RAF Museum at Hendon, but this will clearly require special permission from the CAA due to the built-up nature of the location. This remains 'work in progress' but the team is hopeful of success.

**The routes are subject to weather and technical conditions on the day and routes may alter (or reverse), subject to local conditions at the time

The V-Force Tour will enable XH558 to overfly other surviving V bombers, including XM607 at Waddington

a dramatic new display routine and other exciting events across the country.

The new display will be seen at a packed calendar of appearances that will take XH558 to more people than ever before. In addition, to mark its final season, the bomber will be going on a 'V-Force Tour' on June 27-28 (see box).

"We will be flying selected items in the aircraft so that as many of her supporters as possible can purchase something that has taken part in this adventure," said Dr Fleming. "I would like to thank everyone who has donated their time and/or money to help XH558 fly, including of course the many specialist companies whose expertise has been invaluable. The pleasure she brings to millions of people each year would not have been possible without you all."

Testing Times

The team put the latest jet-related books and products to the test



BOOK

From Spitfire to Meteor

Albert Horton

www.lulu.com

152 pages, softback, B&W

ISBN 978-1-291-96384-7

£10.50

This enjoyable book is only available from www.lulu.com and is a first-hand account of the selection, training and deployment of an RAF fighter pilot in the post-war period (1947-53).

After training on Tiger Moths and Harvards, Albert Horton transitioned to Spitfire XVIIs, FR.XVIIIIs and PR.19s before converting onto the Gloster Meteor FR.9 in the Middle East.

The pages really bring to life what it was like to be on an active squadron in the Middle East during the 1950s and highlights include an insight into flying with what was probably the first Meteor aerobatic team – complete with disintegrating turbines!

Well written, well edited, well reproduced; well worth £10.50 of anybody's money!



BOOK

Northern 'Q' - The History of Royal Air Force Leuchars

Ian Smith Watson

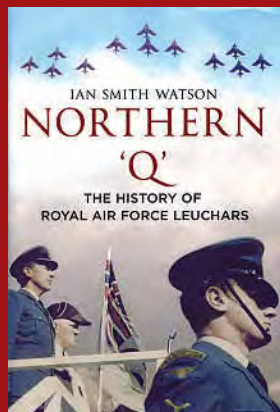
Fonhill Media

208 pages, hardback, B&W

ISBN 978-1-78155-192-9

£20.00

Mention airfields that played significant roles during the Cold War and RAF Leuchars immediately springs to mind; it was at the forefront of the UK and NATO's efforts to maintain peace after WWII. The book derives its title from the primary role of RAF Leuchars during that period: maintaining a Quick Reaction Alert force to respond to potential incursions of UK airspace. As the title implies, this volume covers the history of Leuchars from inception to closure; however, the main focus is the jet age of the Meteor, Hunter, Javelin, Lightning, Phantom and Tornado. Despite the publisher using only black and white photos, and cropping a couple in the wrong place, this is an interesting read and a worthwhile addition to the story of the RAF and the Cold War.



BOOK & DVD

Comet – Unseen Images from the Archives

Bruce Hales-Dutton

Dannan Publishing/A

Flying History Ltd

152 pages, hardback,

B&W and colour

ISBN 9780993016929

£29.99

The Comet was a sensation – and so is this book! Coming from the expert pen of Bruce Hales-Dutton, it traces the history of the Comet from drawing board to retirement and is awash with some wonderful photographs, many of which have never been seen before.

The book is printed on top quality paper but the quality of some of the images is far from perfect. However, it matters not. The story these photographs tell and the aircraft they depict is far more important than the standard of the illustrations themselves. So what if some are scratched or slightly over-



under-exposed? They're still great to see and evocative of the period they were taken.

Likewise, it is refreshing to see well-researched production lists, accident records and photographs of virtually all Comets produced. This book gives the reader a flavour of the excitement of air travel in the 1950s while also providing an invaluable reference work to every Comet built.

Furthermore, the book is accompanied by a well-produced DVD documentary featuring archive footage of this revolutionary aircraft in action and interviews with the people who flew it.

Highly recommended.



GIFT

Paper Aeroplane Kit

Lagoon | www.lagoongroup.com | £8.00

Some kind soul purchased this as a 40th birthday present for the editor and it has proved phenomenally popular here at Jets HQ.

The kits contains 60 pre-printed sheets to produce a variety of weird and wacky paper aeroplanes, all of which fly well although some are more fiddly than others to assemble.

It's amazing how much fun can be had with a few sheets of paper, grown adults and couple of cheeky glasses of wine...

BOOK

Phantom Boys: True Tales from UK Operations of the McDonnell Douglas F-4

Richard Pike

Grub Street

192 pages, hardback,

B&W & colour

ISBN 9781909808225

£20.00

After *Lightning Boys* (1 & 2),

Vulcan, Hunter, Buccaneer, Victor,

Jaguar & Valiant Boys, where next for the series offering genuine insight into squadron life?

Well, the McDonnell Douglas F-4 Phantom II is the latest aircraft to receive the treatment and join the 'Boys' franchise.

Richard Pike, the best-selling author of *Hunter Boys* and *Lightning Boys*, was the obvious choice to turn the reader's attention towards the mighty Phantom and he has done an excellent job.

Throughout the 20 chapters of this book, 13 contributors take readers across the world with adventures in the Falkland Islands, the USA, UK, the Far East and Germany. The Phantom joined the British military in 1969 and was not retired until 1991 and this book is awash with anecdotes of reconnaissance missions, encounters with Russian bombers, record-breaking flights and life on HMS Ark Royal.

BOOK

Fifty Years of Flying Fun – From Hunter to Spitfire and Back Again

Rod Dean

Grub Street Publishing
192 pages, hardback, colour
ISBN 9781909808270
£20.00

Few airshow attendees or military aircraft enthusiasts can fail to have heard of Rod Dean and this new book covers, in a roughly chronological order, his 50 continuous years of flying since his first solo on March 19, 1963.

Rod's military flying ranges from his first operational tour on Hunters in Aden and the early days of the Jaguar in Germany through to two incredible years flying the Jaguar and Hunter with the Sultan of Oman's Air Force.

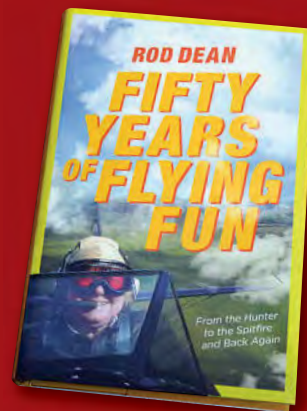
Rod's subsequent civil flying has been exclusively in the General Aviation and flying display fields and he has worked as a flying instructor and well-known display pilot.

With in excess of 7,000 flying hours on 59 different types – and on only one aircraft with a working autopilot (Spencer Flack's Mustang), Rod gives a clear, humorous and very

enjoyable insight into the operation of a cross-section of piston and jet-powered vintage aircraft.

Rod's relaxed writing style means you don't need to be an aviation enthusiast to enjoy this book, rather it acts as an inspiration to get more deeply involved in the wonderful world of flight.

This is possibly the most enjoyable aviation book you'll read this year; it's just a shame the paper quality and reproduction don't do fair justice to some of the incredible images that illustrate its pages. But don't let that put you off, you'll find it impossible to put this book down.



BOOK

Civil Aircraft Markings 2015 / Military Aircraft Markings 2015

Allan SWright & Howard J Curtis
Crecy Publishing

434/226 pages, softback, colour
ISBN 978-1-85780-368-6 / 978-1857-803693
£11.95/£10.95

Dating from 1950 and the 1970s, respectively, the annual Civil Aircraft Markings (CAM) and Military Aircraft Markings (MAM) guides remain indispensable for researchers and enthusiasts alike.

Previously published by Ian

Allan Publishing, these books have now been taken over by Crecy Publishing and have been fully revised and updated with a new, clearer layout and full colour photos.

At the heart of MAM is the most complete listing of all UK Armed Forces aircraft and each entry includes the military serial, aircraft type, unit/operator and usual base. Further listings cover Ireland's military aircraft and historic aircraft in military markings as well as American military aircraft based in Europe, overseas military aircraft which may be seen in the UK, unit markings and a unit

serial number/letter de-code.

CAM has the most complete listing of all aircraft currently on the UK Civil Register and includes more than 21,000 aircraft ranging from historic biplanes through to the latest airliners, and also covering light aircraft, microlights, helicopters, balloons and gliders of every type. For each entry the registration marks, exact aircraft type and owner or operator is given. Also included are the civil aircraft registers of Ireland, the Channel Islands and Isle of Man as well as sections from overseas registers of aircraft commonly visiting the UK.



BOOK

Su-25 Frogfoot units in Combat **Alexander Mladenov**

Osprey

98 pages, softback, colour and B&W
ISBN 978-1-4728-0567-6
£13.99

Often dubbed the 'jet powered Sturmovik' the Soviet Sukhoi Su-25 Frogfoot has proved to be a durable and versatile attack aircraft in a variety of theatres such as Afghanistan, Georgia and Ossetia.

This new book details the technical features and operational performance of the ground-attack jet as

well as recounting its 30-year service history using first-hand accounts and archive photographs. It brings the Su-25 story fully up to date with reports on the type's current operators – including the four ex-Russian examples in service in Iraq against ISIL insurgents and Ukrainian examples flying against Russian-backed forces.

The awkward-looking but faithful Frogfoot is now slated to remain in service with most of its current operators across the globe until at least 2020 and these pages demonstrate its strengths as a formidably armed, armoured and very agile attack aircraft.

Included are some very interesting photographs as well as excellently produced artwork that will appeal to modellers and researchers alike.



BOOK

Air Traffic Control Handbook

David Smith

Crecy Publishing
208 pages, hardback, colour
ISBN 978 08597 91830
£17.95

This updated book offers a reference guide suitable for private and student pilots as well as air band radio enthusiasts. It covers ATC terminology, procedures, radio frequencies and call signs, together with navigation aids, and approach, weather and aerodrome controls. It is a well worded and easy to understand book that helps understand the intricacies of Air Traffic Control and its jargon.

FLIGHT SIM

Mirage 2000C

Just Flight
System Requirements:
Flight Simulator
X, FSX: Steam
Edition, Prepar3D
v2, Prepar3D v1
www.justflight.com
£25.99

The latest simulator from the experts at Metal2Mesh is the Mirage 2000C; the French multi-role fourth generation fighter.

Boasting a highly detailed 3D model and virtual cockpit the new simulator has realistic flight dynamics designed by Bernt Stolle. The software includes 20 high-resolution standard

and special liveries and a paint kit is included so you can design your own schemes.

It also benefits from a realistic afterburner and wing vapour effects and operators can add on a VRS TacPack (not supplied) which enables the Mirage to use weapons, radar and air-to-air refuelling features.





STRATOJET DOWN

On July 1, 1960 a Soviet MiG-19 shot down a USAF Boeing RB-47 Stratojet operating from RAF Brize Norton, killing four of the six-man crew. Steve Bridgewater tells their story

On the afternoon of July 1, 1960 USAF Major William Palm shepherded his crew to their Boeing RB-47H Stratojet reconnaissance aircraft as they walked out across the concrete apron at RAF Brize Norton, Oxfordshire.

Joining him aboard aircraft 53-4281 would be co-pilot Captain Freeman Bruce Olmstead, navigator Captain John McKone and three reconnaissance officers. Known colloquially as 'Ravens', the recce crew on this day consisted of Major Eugene Posa, Captain Dean Phillips and Captain Oscar Goforth – the latter making his first operational mission. Their job was to intercept and record the various signals the jet might encounter during its sortie.

Detachment

The Stratojet and its crew were assigned to the 343th Strategic Reconnaissance Squadron, 55th Strategic Reconnaissance Wing based at Forbes AFB in Kansas but were temporarily flying out of Brize Norton on detachment.

Their mission on July 1 took them northward from the UK and out over international waters where the jet turned east and entered the Barents Sea northeast of Norway. From there, the crew continued over international waters, flying approximately 50 miles from the Soviet Kola Peninsula.

Although there was no intention to enter Soviet airspace, the crew knew the risks. The RB-47 had a relatively low operational ceiling and the Soviet Union

had a history of shadowing, escorting and occasionally shooting at American aircraft flying over international waters near its borders. In the previous decade some 75 US Navy and USAF aircrew had lost their lives in ten separate incidents flying routine reconnaissance missions.

In fact just two months earlier CIA U-2 pilot Francis 'Gary' Powers had been shot down over the Soviet Union [on May 1, 1960] and President Eisenhower had pledged to end the over-flights.

Routine

Therefore it was probably with some trepidation that Major Palm and his crew launched from Brize Norton.

There is nothing to suggest the flight was anything but routine until the aircraft reached the Kola Peninsula several hours later. However, a few moments earlier Soviet pilot Vasily Polyakov had strapped into his Mikoyan Gurevitch MiG-19 *Farmer* at Murmansk.

As Polyakov, who was assigned to the 206th Air Division of the Soviet Air Force,

climbed out into international airspace at the beginning of his sortie it is not known whether he was specifically looking for the RB-47, or whether he too expected a routine day in the cockpit.

Engagement

The RB-47 crew were flying at 30,000ft and around 425kts when they first noticed the MiG was shadowing them at a distance.

As they observed him, Polyakov turned in on an intercept course but passed around three miles behind the RB-47. The crew must have sighed with relief as

Spinning

The Stratojet immediately entered a spin but Major Palm and Captain Olmstead were able to pull out and regain level flight. Then, however, the MiG made a second firing pass and caused further damage.

With the flight crew unable to retain control of the stricken jet, Major Palm gave the order to bail out shortly after 6pm.

At least three of the six crewmen (Olmstead, McKone and Palm) managed to eject but the three Ravens seated in the converted bomb bay were likely unable to get out of the spinning aircraft before

The situation was possibly worsened by the fact that as military personnel, the crew were not required to give any more information than name, rank and service number (in accordance with the Geneva Convention). On the other hand, CIA pilot Gary Powers was not protected by the Geneva Convention and the CIA briefed its pilots not to withhold information if shot down over Soviet territory.

Powers acted properly given his instructions, but the USAF pilots may have suffered because they were bound by a different set of standards and were 'expected' to divulge information by their captors.

The USAF captains were interrogated at length nearly every day but resisted all attempts to by the Soviets to get the 'confessions' they sought as part of the pre-trial 'investigation' – even despite threats of death.

When later quizzed, the MiG pilot claimed that the combination of internal pressure and his belief that the USAF jet was heading for a secret naval base (which was actually unknown to the USAF crew!) resulted in him shooting down the RB-47, even though it was over international waters in international airspace.

He did not face any charges and on January 24, 1961, after almost seven months in prison, Olmstead and McKone were released, having never been brought to trial. ●

“Without warning the MiG reversed its course and opened fire”

the radar course now called a turn to the northeast at about 50 miles off Holy Nose Cape at the bottom of the Kola Peninsula.

However, in the blink of an eye Polyakov's MiG was back – and now he was flying in close formation just 40ft off the Stratojet's starboard wing. The crew continued with their turn to the northeast (away from the Soviet fighter) and Polyakov broke right as if he was heading back towards Soviet airspace.

Suddenly, without warning the MiG reversed its course and took aim on the Americans before opening fire. Captain Olmstead immediately returned fire, but the RB-47 was no match for the Soviet fighter, which shot up the wing, engines and fuselage in its initial firing pass.

it crashed into international waters in the Barents Sea.

Survivors

Tragically, Major Palm is believed to have died of exposure before he was found but Captains Olmstead and McKone were able to take to their survival rafts. After six hours they were picked up by a Soviet fishing vessel.

Meanwhile, unaware that the jet had been shot down (the Soviets did not release this information for more than a week) the USAF continued to search for the missing RB-47 and its crew until July 7. No trace was found.

Captured & quizzed

Olmstead and McKone were soon sent to the Lubyanka prison in Moscow and held in separate cells while undergoing interrogation.

Vasily Polyakov's MiG-19 Farmer downs RB-47H 53-4281 over international waters on July 1, 1960. Major Palm's body was returned to the USA a month later but the bodies of the three reconnaissance officers were never found. McKone finished his USAF career as a Colonel and received the Legion of Merit with one Oak Leaf Cluster, DFC with one Oak Leaf Cluster and the Prisoner of War Medal. Olmstead also retired as a Colonel having achieved the DFC, Purple Heart and Prisoner of War Medal during his career Andy Hay | www.flyingart.co.uk



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UDVAR-HAZY CENTER

Where else can you see everything from Great War fighters and bombers to a Space Shuttle, SR-71 Blackbird and the Enola Gay? Dr Nia Jones reports from the Smithsonian National Air and Space Museum Udvar-Hazy Center in Washington, DC

As soon as the Smithsonian Institute's National Air and Space Museum opened in downtown Washington, DC on July 1, 1976 it became obvious that space was at a premium.

The building, which is located on the National Mall [Ed – and is to be featured in a future issue] was able to display just a fraction of the aircraft and space artefacts that were in the collection. Thousands of exhibits were languishing in storage and with an on-going collecting policy, it became evident that more space was needed.

Expansion

Less than a year after the main museum opened Don Lopez, then Chair of the Aeronautics Division, sent a memo to the Smithsonian's Director suggesting that massive buildings be procured at one of the region's airports.

He recognised that modern aircraft were generally larger, heavier and more difficult to move by road, so having a museum at an airport would make their procurement and display much easier. Lopez ruled out any

location more than an hour's drive from the main museum, leaving Washington's Dulles International Airport as the obvious candidate.

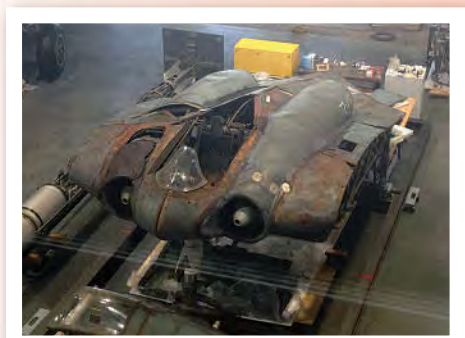
The Smithsonian Board endorsed the plan and the Federal Aviation Administration offered 100 acres of land to the south of the airport. However it would be 1993 before President Clinton signed a law establishing an extension for the museum.

Work eventually began after Steven F Udvar-Hazy contributed \$65 million to the project and doors opened on December 15, 2003. In the first three months almost half a million visitors came through the doors!

Two buildings

The Udvar-Hazy Center features two enormous hangars – one for aircraft and one for spacecraft.

The ten-story-high Boeing Aviation Hangar displays around 170 aircraft both on the ground and hanging at various levels, while the James S McDonnell Space Hangar also displays objects on various levels. Multi-level walkways provide a variety of perspectives from which to view the exhibits.



Top: The museum's Grumman A-6 Intruder served in the skies over Vietnam and is also a veteran of the 1991 Desert Storm campaign, when it flew missions during the first 72 hours of the war. It has accumulated more than 7,500 flying hours and 712 catapult launches

Above: The Horton Ho 229 is currently in the restoration facility. The flying wing promised spectacular performance and the German Air Force's Hermann Göring allocated half-a-million Reich Marks to the brothers Reimar and Walter Horten to build and fly several prototypes. Numerous technical problems beset this unique design and the only powered example crashed after several test flights



Space Shuttle *Discovery* flew on 39 Earth-orbital missions, spent a total of 365 days in space and travelled almost 150 million miles. It shuttled into space and back 184 men and women, many of whom flew more than once, for a record-setting total crew count of 251

Spacecraft

Dominating the space hangar is the Shuttle *Discovery*, which is surrounded by missiles, rockets, space capsules and satellites. Highlights include the Gemini IV space capsule, in which astronauts Jim Lovell and Frank Borman orbited the earth for 14 days in 1965 and the mobile quarantine facility in which the Apollo 11 astronauts stayed after their flight to prevent the possible spread of Moon contagions.

Commercial air travel

As you'd expect from a museum focusing on the pinnacle of aviation the exhibits are second to none. When it comes to commercial air travel highlights include the Boeing 307 Stratoliner *Clipper Flying Cloud* (the first pressurised airliner), the prototype Boeing 707 and an Air France Concorde.

Other airliners and business jets on display include FedEx's first Dassault Falcon and a very early Learjet, whereas one-off jets include Burt Rutan's Virgin Atlantic GlobalFlyer in which Steve Fossett set numerous round-the-world and distance/endurance records.



Just a small selection of the Cold War jets on display within the Boeing Aviation Hangar

The latter hangs above a Lockheed Constellation amidst a myriad of light aircraft, helicopters, flying cars, air racers and legendary airshow 'acts'.

Military might

The standard of military aircraft in the museum's collection makes its display probably one of the most varied and important anywhere on the globe.

Piston-powered gems range from Great War fighters and bombers through interwar rarities to World War Two warriors including a Lockheed P-38 Lightning flown by leading US Ace Richard Bong, the Boeing B-29 Superfortress *Enola Gay* and a Northrop Black Widow!

A large collection of captured German aircraft features piston-powered fighters and bombers as well as some of the earliest surviving jets. These include the sole surviving Arado Ar 234 *Blitz* – the world's first jet bomber. This particular example served with KG 76 from December 1944 until May 1945 when British forces captured it in Norway. It was sent to USA in 1946 for flight testing and three years later it was transferred to the Smithsonian.

American jets

As you'd expect, the majority of the jets on display are of American origin – and the Smithsonian has chosen some very historic examples to preserve.

The US Navy F-4J Phantom II shot down a MiG-21 on June 21, 1972, after Cmdr S C Flynn and his radar intercept officer, Lt W H John, spotted three enemy fighters off the coast of Vietnam. This aircraft also flew combat air patrols and bombing missions during the Linebacker II bombing campaign that same year.

Perhaps though it is the museum's Grumman F-14 Tomcat that has the most unusual history? On January 4, 1989 the aircraft was one of two VF-32 F-14As flying near the Libyan coast from the USS *John F Kennedy* that were alerted to a pair of Libyan Mikoyan-Gurevich MiG-23 *Floggers*. The Tomcats were soon engaged by the *Floggers* and an eight-minute air battle ensued, during which the MiGs continued to threaten the F-14s. Finally, after several attempts to evade the MiG radar threat, the incoming pair

of MiG-23s were declared hostile and the Tomcat crews were cleared to engage. The museum's F-14A successfully 'downed' one of the jets, which exploded shortly after the two Libyan crew safely ejected.

Elsewhere, the museum exhibits the first Lockheed X-35A Lightning II, an F-100 Super Sabre, Lockheed T-33, a Lockheed SR-71 Blackbird and an F-86A Sabre that saw combat in Korea.

Restoration hangar

Construction of the Udvar-Hazy Center continued until late 2010 when the Mary Baker Engen Restoration Hangar was completed. Visitors can now view work in progress from a mezzanine overlooking the restoration facility and current 'inmates' include two very exotic Axis jets – the 1943 Horten Ho 229 and the Nakajima Kikka. The latter was the only World War Two Japanese jet aircraft capable of taking off under its own power and the only example ever completed.

Too much

You'll doubtless find that a day simply isn't enough to see everything on offer at the Udvar-Hazy Center, but being located just minutes from the terminal at Dulles International Airport, you could try what many people do and return for a second visit on the way home! ●



The sole surviving Arado Ar 234 Blitz is an undoubted jewel in the museum's crown

OPENING HOURS

The museum is open daily from 10am to 5pm. Admission is free but there is a \$15.00 car parking fee. The gift shop has an impressive selection of items but catering is limited to a McDonalds! Visit www.airandspace.si.edu/visit/udvar-hazy-center/ for more information.



Civilian and commercial air travel is not forgotten with the prototype Boeing 707 and a Concorde among the gems on display



A-7 CORSAIR II

LTV'S ULTIMATE BOMB TRUCK!

Richard Freail looks at the development and service of the A-7 Corsair II, which retired last year after nearly 50 years of unsung service

Last year on a calm beautiful October's morning far from the Dallas birthplace of the A-7 Corsair II, the Greek Air Force, the type's last remaining operator, prepared to bid farewell to its aircraft 40 years after placing an order for 60 examples in 1974 and nearly half a century since the prototype first flew for the United States Navy (USN) in 1965.

Light-attack

In the early 1960s the USN was seeking an advanced attack aircraft but realised the programme would be both expensive and protracted. Instead, it morphed into a requirement for a small low-cost light-attack aircraft capable of carrying a 15,000lb payload over 600nm. Additional requirements

included air-to-air refuelling, the ability to defend itself and each flight hour to require no more than 11½hrs maintenance. The aircraft was to be in service with the USN no later than 1967. The proposal was issued in June 1963, inviting only the modification of existing in-service designs.

The USN shortlisted four potential submissions: the Douglas A-4F (a larger



Above: The YA-7F Strikefighter, also known as the A-7D Plus, was a stretched, by approximately 4ft, supersonic version of the A-7 powered by a Pratt and Whitney F100 afterburning turbofan. The changes made the A-7 look more like the F-8 from which it was derived! It was designed to meet a 1985 USAF requirement for a supersonic CAS replacement for the A-10 Thunderbolt. The first prototype (71-0344) flew in November 1989 and the second (70-1039) in April 1990. The project was cancelled in late 1990

Right: The first LTV YA-7A prototype (152580) completed its maiden flight on September 27, 1965 with John W Konrad at the controls. This aircraft crashed in March 1966 after an uncommanded roll during 'touch and go' manoeuvres. Test pilot John D Omvig survived after ejecting at very low level

Skyhawk); the Grumman G-12 (a single-seat A-6 Intruder); an upgraded North American Aviation FJ-4B Fury and the LTV (formerly Chance Vought) V-463, which was a much modified and shortened, sub-sonic derivative of their successful F-8 Crusader. By November 1963 LTV's design, named as the A-7 Corsair II in November 1965 after its WWII namesake, had been chosen for development.

SLUF

The Corsair's lineage was obvious; it looked as if someone had crushed the sleek F-8 Crusader from all sides creating a shorter, chunkier and uglier aircraft. The sobriquet SLUF (short little ugly 'fellow') was certainly well-earned!

Designed by the team under John Russell Clark which was responsible for the Crusader, the Corsair had one task: to deliver bombs, and lots of them, with pin-point accuracy. For this purpose the USN required a sub-sonic aircraft, allowing many of the design features of the Crusader to be dispensed with. A non-afterburning engine led to a shorter fuselage while area ruling and the variable incidence wing were no longer needed.



The Corsair employed an all-aluminium alloy, semi monologue fuselage with a low slung air intake beneath its rounded nose. The high wing of its stablemate was retained albeit with less sweep. The engine was a Pratt and Whitney TF30-P-6 turbofan producing 11,350lbs/thrust. A sturdy tricycle undercarriage retracted into the fuselage and gave the Corsair its squat appearance. Forward of the main undercarriage a very large T-shaped air brake was fitted under the fuselage.

The aircraft was equipped with a state of the art avionics package including an APQ-116 forward-looking radar in the nose radome and an APN-153 Doppler radar; an ASN-41 navigation computer and a CP-741 weapons delivery computer in the avionics bays.

Weapons could be mounted on eight

pylons, three under each wing and one either side of the fuselage. The former were for bombs, rockets and fuel tanks and the latter for Sidewinder missiles or rocket launchers, although ingestion of rocket gases caused problems on the A-7A and B variants. Total load was 15,000lbs. In addition, two MK12 Colt-Browning cannons were fitted in the nose, either side of the air intake, with 340 rounds per gun. SLUF it may have been but sat at a catapult awaiting launch, fully laden with weapons, and surrounded by swirling steam and exhaust it looked like the fighting machine it proved itself to be!

Testing

In early 1964 LTV was contracted to build three YA-7A prototypes (Bu Nos 152580-

582), four pre-production and 35 production aircraft. Eventually, a total of 199 A-7A Corsairs would be manufactured. By June a full-size mock-up, complete with weapons, was revealed and the first prototype (152580) was rolled out at Dallas, Texas in August 1965.

Taxi trials commenced on September 20, 1965 followed by the maiden flight a week later with John W Konrad at the controls. Initially things did not go well; considerable airframe buffet and flying surface oscillations were encountered after take-off and the aircraft was immediately landed. The issue was quickly resolved and a second flight, of just over an hour's duration, followed immediately without incident. Thirty-four days after the maiden flight, the YA-7A was demonstrated for the benefit of the navy; one aircraft fully laden and the other in clean configuration. On the ground, a crew removed the engine in less than 20 minutes and completed other tasks, verifying another navy criterion: ease of maintenance and a quick-turnaround between missions.

The flight testing programme proceeded at pace and without major problems. In January 1966 the Navy Primary Evaluation started and USN test pilots began to assess the aircraft to prepare it for service introduction. By June 1966 the YA-7As had completed 750 flying hours in 500 flights and by late July the milestone of 1000hrs was reached,



A pair of A-7Es from VA-72. A Forward Looking Infrared (FLIR) Pod is carried on the inner starboard wing pylon of the nearest aircraft (159971). This late 1970s development assisted with night navigation and weapons delivery, helping to maintain the Corsair's strike capabilities. This aircraft is currently preserved at the Carolinas Aviation Museum in Charlotte, NC

in 681 flights. The most significant discovery during testing was that the aircraft was underpowered, particularly at higher altitudes.

Almost inevitably airframes were lost in early testing, fortunately without loss of life – although it was a close run thing. The first prototype crashed after an uncommanded roll on March 23, 1966 when completing 'touch and go' manoeuvres; test pilot John D Omvig ejected at extremely low altitude, his parachute deploying just in time. The third

YA-7A was lost in August 1966 when Lt R Birtwhistle ejected after a compressor stall; the aircraft flew on and made a gentle belly landing in a farmer's field.

Early aircraft

In September 1966 the USN accepted and flew its first A-7s into Patuxent River for BIS (Board of Inspection and Survey) trials and to Kirtland for weapons evaluation tests. Carrier flight deck trials lay ahead in November but the navy was already making plans to take the Corsair to war.

In October and November of that year the first two Fleet Readiness Squadrons, VA-174 Hellrazors at NAS Cecil Field, Florida and VA-122 Flying Eagles at NAS Leemore, California, received their A-7s in preparation for training operational pilots.

Carrier trials were conducted aboard the USS America and revealed a tendency for the

In early November 1965, just 34 days after its maiden flight, LTV demonstrated the new A-7A to the USN. On the ground, a crew removed the engine in less than 20 minutes; the open panels show that all of the main components are easily and quickly accessible



Below: A-7D 72-0258 of the 174 TFS, Iowa ANG, Sioux City in October 1989. The A-7s had recently returned to combat-ready status after a temporary grounding and inspection for wing skin cracks. Of the 365 airframes inspected, 282 required small minor repairs – most of which were performed in situ



A-7A to ingest too much steam, potentially causing a compressor stall at launch. Fixes were put in place until more powerful engines were available and in the interim the MTOW was lowered.

The first operational A-7 unit, VA-147 Argonauts, was commissioned at Leemore in early 1967 and received its aircraft in June; by December it was flying combat missions over Vietnam from the USS *Ranger* stationed in the Gulf of Tonkin.

While A-7A production was underway the USN ordered an improved aircraft, to be designated the A-7B. An uprated TF-P-8 engine delivering 12,200lbs/thrust would help address the steam ingestion problem and a further upgrade in later service would increase it to 13,400lbs/thrust. Improved flaps and a 16mm camera for bomb damage assessment were also fitted.

The first A-7B (154363) was flown by test pilot Joe Engle on February 6, 1968 and after some initial problems with the new engine, which held up delivery, it began to replace the A-7As in front-line service.



A Greek Air Force A-7H (159645) taxis at Araxos in July 1995. Built as an A-7E for the USN, it served with a number of units including VA-146 and VA-122 before being sold to Greece in the 1990s when 36 surplus A-7Es and TA-7Cs were acquired



Portuguese Air Force Corsairs at RAF Lossiemouth in September 1993. TA-7P '5548' started life as an A-7A (153217) and was placed into storage in 1978. It was sold to Portugal and converted to a twin-seat in 1983. The aircraft and pilot were lost in a crash in 1994

The last of 196 A-7Bs was delivered in May 1969, this mark serving with operational squadrons until 1977 and then with the Naval Reserve for another decade.

USAF

Robert McNamara, Secretary of Defense for much of the 1960s, sought consolidation of cross-service programmes to avoid overlapping and waste, particularly in aircraft acquisition. The USAF had recently purchased the F-4 Phantom – designed for carrier operations – and now, under pressure from the army to support the ground troops in Vietnam with a specialised Close Air Support platform, was about to find itself purchasing the USN's A-7 Corsair to replace a number of different aircraft. The decision was announced in November 1965, while the YA-7A was still under test.

The USAF regarded the Corsair as



A-7A 152650 operated by the Naval Air Test Center, Patuxent River conducts carrier trials from the USS *Independence* in March 1967. It was the seventh airframe and fourth pre-production aircraft and later was the gate guardian at NAS Cecil Field, Florida

underpowered and ordered it with an Allison TF41-A-1 turbofan (a licence-produced RR Spey) generating 14,250lbs/thrust. Other changes included upgraded hydraulics and brakes, better armour protection, self-sealing fuel tanks, an M61 rotary cannon with 1000 rounds replacing the 20mm weapons and 'boom' receptacle aerial refuelling capability. The avionics were also upgraded with new radar, navigation, targeting and weapons release computers, with the information displayed to the pilot via a HUD.

The first five airframes (67-14582/586) were temporarily designated as YA-7Ds while under test; the maiden flight taking place on April 6, 1968. However, the first two aircraft were fitted with the Pratt and Whitney TF30 turbofan but the third prototype (67-14583) completed its maiden flight on September 26, 1968 from Edwards AFB fitted with the new Allison TF-41 engine. The USAF undertook climate and weapons tests during 1969 and then at the end of the year the first deliveries commenced to Luke AFB, Arizona. Pilot training started in earnest the following year and the 354th TFW at Myrtle AFB, South Carolina, with three squadrons of A-7Ds, became fully operational in July 1971. It was not long before the A-7D deployed to South East Asia.



Corsairs under construction in 1975 at the LTV plant in Dallas. In the foreground is the first A-7H (159662) destined for the Greek Air Force. Its maiden flight was in June 1975 but the airframe was written off following a crash in 1977. Immediately behind is an A-7D (74-1750), which flew with the USAF from 1975-84 and the ANG from 1985-92

A total of 459 A-7Ds were manufactured, serving with three USAF Tactical Fighter Wings and two Air National Guard (ANG) Squadrons. By the mid-1980s all Corsairs had been re-allocated to the ANG, having been replaced by the A-10 Thunderbolt II in front-line units.

USN ultimate Corsair

Requiring more power the navy's next variant, the A-7E, adopted the Allison TF41-A-2 engine developing 15,000lbs/thrust together with the avionics and HUD from the air force model. The M61 cannon was also fitted.

Despite a shortage of Allison engines it was decided to continue building the A-7E but fit them with the Pratt and Whitney TF30 turbofan until sufficient new engines became available. Sixty-seven of these hybrid models were manufactured and they were redesignated as the A-7C. The first (156734) flew in November 1968 and deliveries commenced to VA-122 at NAS Leemore.



USAF A-7D 70-0995 of the 76th TFS, 23rd TFW, based at England AFB, Louisiana, drops MK82 retarded bombs over the range at Elgin AFB in May 1980. The bulge beneath the intake is a Pave Penny laser target identification sensor which was retrofitted to all USAF A-7Ds and A-7Ks

The sixty-eighth new airframe saw the Allison engine installed, flying for the first time in March 1969 and entering service at NAS Leemore in October that year. By May 1970, VA-146 and VA-147 were embarked on USS *America* and engaged in the Vietnam conflict.

Many of the existing A-4 Skyhawk and early A-7 Corsair Air Wings converted to the A-7E; the A-7As were retired and the A-7Bs moved to the Reserve Squadrons by 1977.

In the late 1970s the development of a Forward Looking Infrared (FLIR) pod, carried on the starboard inner wing pylon, to assist night navigation and weapons delivery helped maintain the Corsair's strike capabilities.

The last of 535 A-7Es was delivered in 1983; at its height, there were 22 USN Attack Squadrons using the A-7E, but in 1987 Corsair units started the transition to the new F/A-18 Hornet.

Twin-seats

LTV had been pitching ideas for a two-seat variant for training or Wild Weasel missions since the late 1960s. In 1971, LTV converted the first production A-7E (156801) to a twin-seater by inserting a 16in plug in front of the wings and an 18in plug behind. A single side-opening canopy was employed and the rear cockpit raised, giving the aircraft a hump-backed appearance. The additional cockpit had no affect on performance. It was first flown by John W Konrad in August 1972. The initial designation, YA-7H, was later changed to TA-7C to avoid conflict with aircraft exported to Greece.

Following demonstrations the USN awarded LTV a contract to convert 24 A-7Bs and 36 A-7Cs to TA-7C standard. The first



Newly manufactured Corsairs lined up at the LTV Dallas facility in 1970. The seven USN aircraft are A-7Es. The camouflaged airframe is an early production A-7D (68-8228) for the USAF. It is distinguishable by the USN style AAR probe beneath the cockpit; these were replaced by a flying boom receptacle on the dorsal spine early in the production run

conversion to fly, in December 1976, was former A-7B (154477); deliveries to the USN commenced the following year.

In March 1983, VAQ-34 at NAS Point Mugu received a small number of EA-7L aircraft, adapted from the TA-7C, for use as Electronic Warfare threat trainers for both fleet aircraft and surface ships.

In the early 1980s a midlife upgrade saw 49 TA-7C and EA-7L aircraft fitted with Allison TF41 engines, new ejection seats, automatic manoeuvring flaps and, for some, the ability to carry the FLIR pod.

A twin-seat prototype of the USAF's A-7D was ordered in 1979, the YA-7K being converted from A-7D (73-1008). An initial order for 12 A-7Ks was followed by orders for 12 in 1980 and six in 1981. Unlike the USN twin-seaters, these were all new-build airframes but like the navy planes they retained full operational ability. None served with active USAF units but with ANG squadrons. When the last A-7K was delivered in September 1984, production of the Corsair II came to an end.

Exports

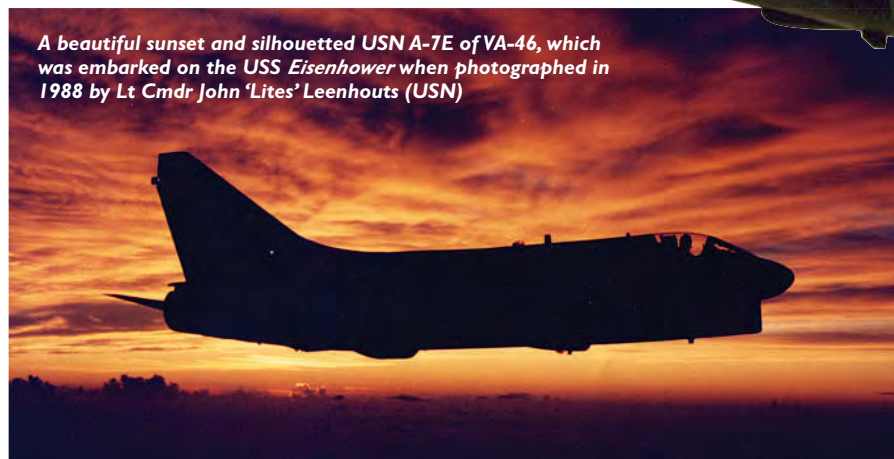
Greece became an enthusiastic user of the A-7 Corsair, obtaining its initial aircraft via the Military Assistance Program (MAP) between 1975 and 1977. The first of 60 A-7H (H for Hellenic), powered by the 15,000lbs/thrust Allison TF-41 turbofan and of a similar specification to the A-7E but without the AAR, flew on May 6, 1975. Greece obtained six two-seat TA-7Hs, five new-builds and one conversion, in 1980. The Corsair's primary



A four-ship of colourful USN A-7Es belonging to VA-27, VA-94 and VA-97 circa 1980. The aircraft nearest the camera, 157502 of VA-27, was later sold to the Greek Air Force



A beautiful sunset and silhouetted USN A-7E of VA-46, which was embarked on the USS Eisenhower when photographed in 1988 by Lt Cmdr John 'Lites' Leenhouts (USN)



Above: This aircraft was originally constructed as a single-seat A-7D (73-1008) for the USAF but was converted as the twin-seat YA-7K prototype. After completion of the test programme it served with the 152nd TFS, Arizona ANG. Unlike the prototype and the USN's two-seat TA-7C aircraft, the 30 production A-7Ks were all new-build aircraft

role was ground attack, with a secondary responsibility for air defence. In the 1990s, a further 36 surplus A-7Es and TA-7Cs were transferred to the Greek Air Force.

Portugal also obtained aircraft through MAP in 1980. LTV modified and refurbished 20 A-7As from storage at Davis-Monthan AFB and fitted the Pratt and Whitney TF30-P-408 turbofan. The A-7E avionics fit was installed but the MK12 cannon were retained. The A-7P together with three spare airframes were delivered from December 1981 along with a single TA-7C, which was loaned for three years. In 1982 a second order for 24 A-7Ps, delivered in 1984, and 6 TA-7Ps, delivered in 1985, was placed.

The final customer was the Royal Thai Naval Air Division, which received 18 surplus A-7Es and TA-7Cs in 1995, together with two additional airframes for spares. They served with 104 Sqn at U-Tapeo and were strictly land-based.

Vietnam

The A-7 served across the globe with the USN Carrier Air Wings and supported US forces and allies in a number of conflicts and actions including Grenada, Lebanon, Libya, Panama and Operation Desert Storm, the liberation of Kuwait. However, the conflict where the A-7 gained its reputation was the Vietnam War; as soon as the aircraft was operational with the USN in 1967 it went to war making a significant contribution, with its pin-point bombing accuracy and ability to survive in hostile environments. It had the lowest loss ratio of any aircraft in theatre; around 100 A-7s were lost in the conflict with just over half being to enemy fire. The

USAF flew nearly 13,000 combat missions with the A-7D; only six were lost – four to enemy fire, one in a mid-air collision on a mission and one to an accident.

The final curtain

Once Operation Desert Storm was concluded in early 1991, the end came quickly for the USN's A-7s. The last two units, VA-46 and VA-72, were disestablished at the end of May 1991, outlasting the type's service with the Naval Reserve by a matter of weeks. The A-7 soldiered on with land-based units such as VAQ-33, VAQ-34 and the Naval Strike Warfare Center, but within a couple of years any remaining Corsairs had retired.

The A-7Ds of the ANG started to retire in the early 1990s with the final unit converting on to the F-16C/D in late 1993.

Overseas, the Portuguese retired their Corsairs in June 1999, the Thai Navy's aircraft went into storage in 2007 and the Greek Air Force examples, the last operator, stood down in October 2014. ●



A Greek Air Force A-7H Corsair under maintenance at Araxos in July 1995. Greece became an enthusiastic user of the Corsair, obtaining its first 60 aircraft through MAP in the mid-1970s

SPECIFICATION A-7H CORSAIR II



Crew	1
Length	46ft 2in (14.06m)
Height	16ft 1in (4.90m)
Wingspan	38ft 9in (11.80m)
Wing area	374.9sq ft (34.83m ²)
Empty Weight	19,127lb (8,676kg)
Max Take-Off Weight	41,998lbs (19,050kg)
Max Speed	595kts (685mph/1,102km/h)
Service Ceiling	42,000ft (13,000m)
Ferry Range	1,544 miles (2,485km)

Powerplant

One Allison TF41-A-2 non-afterburning turbofan (15,000lbs)

Armament

Two MK12 Colt-Browning 20mm cannons, six underwing hardpoints and two under-fuselage hardpoints capable of carrying bombs, rockets, missiles or fuel tanks

First Flight

September 27, 1965 (YA-7A)
May 6, 1975 (A-7H)



The final journey: an A-7E of VA-72 flies home and into retirement after leaving the USS John F Kennedy after the conclusion of Operation Desert Storm. VA-46 and VA-72 were the last two operational Corsair squadrons and were on-station in the Red Sea during hostilities. This aircraft (160552) was later sold to the Greek Air Force Cmdr John 'Lites' Leenhouts (USN)



USS JOHN F. KENNEDY
NAVY
#71
160552



CA

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400

400

In the early 1960s Strike Wing had an allocation of 38 Hunter FGA.9s, four Hunter FR.10s and four Hunter T.7s dispersed around the base with three ground-attack squadrons (8, 43 and 208) and a fighter-recce flight (1417). To this could be added four 37 Sqn Shackleton MR.2s and six Belvedere H.C.1 helicopters. Here a line-up of 20 Hunters is seen on the Khormaksar pan in February 1964. They comprise of a solitary T.7 and a pair of FR.10s of 1417 Flight along with eight FGA.9s from 8 Sqn and nine FGA.9s from 43 Sqn



MEMORY LANE

Jets is all about rekindling the memories of days gone by. As part of this we're keen to hear from you and see the images filed away in your photo albums.

This month Ray Deacon recalls his time at RAF Khormaksar in Aden between 1962-64. Located at the southern-most tip of Arabia, now known as Yemen, it made a perfect

staging point for navigation exercises and 'lone rangers' by V-bombers and Canberras and was also used as a stop-off by RAF squadrons relocating to and from the Far East.

The airfield had the distinction of being the busiest airfield in the RAF at the time and was home to nine squadrons and three flights with an average allocation of 90 aircraft.



Left: One of four Shackleton MR.2s operated by 37 Sqn, WR962-A, is seen having a port-side engine changed in the heat of a midday sun



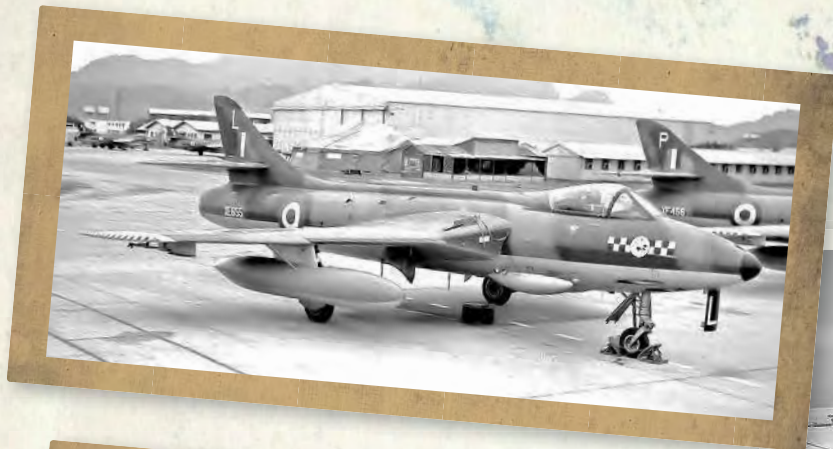
Above: Six 84 Sqn Blackburn Beverley C.1s fulfilled the heavy-lift role for Middle East Command. XB266 is seen lifting off the Khormaksar runway in this early 1964 view

Below: After a decade of sterling service in Aden, the four Search & Rescue Bristol Sycamore HR.14 helicopters were replaced by Whirlwinds and shipped back to the UK on HMS Albion in 1964. The last production aircraft, XL829, is pictured here on the ramp in autumn 1963



Four 26 Squadron Belvedere H.C.1 helicopters were flown out to Aden in early 1963 and initially assigned to Strike Wing in close collaboration with Hunter operations. A further two arrived in 1964. In this photograph, XG457-D lifts away from the 'chopper' pan alongside a Bristol Sycamore as Belvedere XG463-B prepares to launch





Left: A pair of 43 Sqn Hunter FGA.9s on the line at Khormaksar in March 1964 with XE655-L in the foreground and XF456-P behind. The mountain in the background is an extinct volcano called Shamsan. Both jets were later converted to FGA.74 standard for export, XE655 becoming '817' with the Royal Jordanian Air Force and XF456 becoming '509' with Singapore. The latter was written off on April 8, 1971 while the former was sold to the Royal Air Force of Oman in 1975 before it too was written off



Above: Middle East Command occupied a huge area from Kenya in the south to Bahrain in the north, a distance of around 2,500 miles. To enable the AOC and his staff to reach anywhere within that territory in the shortest possible time, Comms Flight received two all-white English Electric Canberra B.2s in 1962. WJ580 is seen here while on a visit to Sharjah in November 1963. The aircraft was written off on January 28, 1964 after receiving unspecified 'Cat-5' damage at Khormaksar



Above: Hawker Hunter FR.10 XF460-DB was in service with 1417 Flight when it was photographed while on detachment to RAF Masirah in June 1965. The initials are those of the pilot, David Bagshaw. Although their primary role was photo-recce, the Mark 10s were often used to fire their guns on live strikes. XF460 was eventually sold to Singapore and flew as '546'. Today it is in storage in Brisbane, Australia Ray Deacon collection



Right: RAF Sharjah was regularly used by the Hunter squadrons for Armament Practice Camps. Here an 8 Sqn FGA.9 (XE618-D) prepares to taxi out for a rocket and gun strike on the Jeb-a-Jib range in November 1963. The aircraft was sold to the Kuwaiti Air Force in 1967, becoming aircraft '217'

The Transport Wing consisted of four squadrons (78, 84, 105 and 233) that were equipped with, respectively, Scottish Aviation Twin Pioneers, the Blackburn Beverley, the Armstrong Whitworth Argosy and the Vickers Valetta. A Communications Flight comprising two Canberras, a VIP Viking C.2 and VIP Handley Page Hastings C.4 completed the aircraft allocation. Transport Command's medium lift capability was greatly enhanced with the arrival of 105 Squadron's Argosy C.1s in June 1962; here XP408 taxis in at Khormaksar in the following December



CLOBBER

THE YAK 42 STORY

*The Russian Yakovlev Yak 42 'Clobber' airliner recently joined the list of aircraft that are still in active service 40 years after making their maiden flights. **Spencer Bennett** looks back at its history*

The Yak 42 can trace its origins back as early as 1972 when the Yakovlev Design Bureau started work on a short to medium range passenger jet to replace turboprops such as the Ilyushin IL-18 and Antonov An-24 and 26.

The resulting aircraft was based on Yakovlev's earlier Yak 40 design (which had flown in 1966 and was already

in service with Aeroflot) and as the programme continued, the manufacturer soon saw the new type's potential to also replace the popular Tupolev Tu-134.

Largest jet

The Yak 40 had found a niche operating from smaller, poorly equipped airfields and a specific design requirement for the new jet was the ability to do likewise.

However, as Yakovlev wanted a larger aircraft to accommodate between 100-120 passengers (instead of the 32 carried in the Yak 40), this meant the airliner would be too heavy to operate from unpaved or grass airfields as the lighter Yak 40 could. These requirements led to the final specifications of the proposed airliner being the largest and most powerful aircraft Yakovlev had ever designed.





Above: CCCP-1974, the prototype Yak 42, aloft in 1975

Below: Yak 42D UR-42426 is seen at Istanbul in June 2002. The aircraft served with Dniproavia (illustrated) and TARCO Air under this registration but was also leased to Turkish airline Top Air as TC-IYI in 1996



Aeroflot was by far the largest Yak 42 operator. CCCP-42304 was later displayed in Moscow as part of the Moscow Economic Achievements Exhibition but is believed to have since been scrapped

Tri-jet

The first proposals submitted by members of the design bureau were for a straight-winged airliner powered by a pair of Soloviev D30 turbofan engines but these plans were ultimately rejected as the feeling was that the aircraft would not be powerful enough to compete with airliners from the West, which were being powered by high bypass ratio turbofan engines.

Yakovlev's designers then looked into

featured two sweep variations – one with a wing swept to eleven degrees and another with the wing sweeping back by 23 degrees.

Initial versions of the aircraft featured a clean wing leading edge with no control surfaces and plain trailing edge flaps, although later variants featured leading edge slats with the trailing edge slats slotted.

As with many other aircraft from the era, the Yak 42 incorporated its own access stairs with one set at the forward port side

“A number of Yak 42s were converted into VIP configuration to operate as private jets”

the option of designing an aircraft with three tail-mounted Lotarev D-36 high bypass turbofans which could each provide 14,330lbs/thrust.

Swept-wing

The wing design also provided Yakovlev with some challenges. The Yak 40 aircraft featured a straight wing but the designs for the Yak 42

of the cabin and another in the underside of the rear fuselage.

Prototypes

Construction soon began at the Saratov Aviation Plant and the first prototype, registered CCCP-1974, performed its maiden flight on March 7, 1975.

It was followed by the second prototype

This Yak 42D was built for Aeroflot in 1987 as CCCP-42316 and became RA-42316 in May 1994. Two years later Aeroflot sold the jet to Saravia, which continues to operate it today. It is seen here at Domodedovo in March 2000





This Yak 42D was built in 1994 for Kish Air as EP-LAN but just a year later it had become RA-42441 with Dacono Air. In 1996 it was transferred to the Russian Ministry of Emergency Situations (EMERCOM) and is seen here at Gromov in August 2001 KEY – Steve Bridgewater



Air Ukraine Yak 42 UR-42544 at Manchester in the summer of 1993. The aircraft operated a weekly summer charter from Lvov and was hired by a local aviation society for at least one pleasure flight Martyn Cartledge via author



Yak 42 YL-LBU visits Larnaca in February 2003 while in service with LAT Charter. The aircraft had originally been built for the Chinese market in 1995 as B-2757 and served LAT from 2001 to 2005. It then transferred to Ukraine as UR-KBR and in 2008 it joined International Jet Tour in Kazakhstan as UP-Y4206. It has been flown by Aircontrol since 2013 and remains airworthy

(CCCP-1975) with the 23-degree wing and a cabin with 20 rows of windows (instead of 17 in the first prototype). After various tests and evaluations, it was agreed

that the more swept wing would give the aircraft good short field performance plus high speed cruise capabilities and was chosen for final production.

A third prototype (CCCP-1976) eventually followed and was fitted with improved de-icing gear.

Aeroflot's 'Clobber'

In keeping with other Soviet Bloc aircraft of the era, NATO assigned the aircraft a reporting name and thus the Yak 42 became known as the 'Clobber'.

Unsurprisingly, Aeroflot was the launch customer for the type and the first production aircraft was completed in April 1978. However, it would be almost two and a half years before the type performed its first scheduled passenger flight (from Moscow to Krasnodar) on December 22, 1980.

Initial aircraft were delivered in a single class, three plus three seating configuration accommodating 120

passengers but this was soon changed to accommodate a first class section. The first class cabin offered two plus two seating and reduced the aircraft's passenger capacity to 104.

Service life

In its first year of operation, Aeroflot's Yak 42 fleet carried around 200,000 passengers mainly on domestic routes from Moscow, but international services were flown from Leningrad to Helsinki and also from Donetsk to Prague.

It had been planned to introduce the type on more international services, but on June 28, 1982 during a flight between Leningrad and Kiev CCCP-42529's tailplane detached whilst the aircraft was over Belarus. The Yak 42 disintegrated and crashed with the loss of all on board.

The subsequent investigations revealed that the crash was the result of the failure of an actuator screw jack and all Yak 42 aircraft were grounded until



Main: Kuban Airlines' Yak 42 RA-42421 landing at Frankfurt on August 19, 2006 after a scheduled flight from Krasnodar Spencer Bennett

further notice to allow for checks and modifications. The fleet would not return to service until October 1984.

Sub-variants

The majority of sales were to Russian airlines, although the introduction of a longer range variant (the Yak 42D) paved the way for an increase in export sales with aircraft being sold to Cuba and China.

In addition to the longer-range Yak 42D, Yakovlev produced other variants including the Yak 42F, which had prominent radar pods for geophysical surveying and environmental monitoring and the Yak 42R, which was designed as a radar test-bed for the Yak 141 fighter. A number of original Yak 42 passenger

aircraft were also converted into VIP configuration to operate as private jets.

The airliner has suffered several accidents in its 40 years of flying with losses occurring in China, Macedonia, Greece and Turkey. However, perhaps the most high profile accident occurred on September 7, 2011 in Russia, when an aircraft operated by Yak Service crashed killing all but one of the Russian Ice Hockey team *Locomotiv Yaroslavl*.

Exports

Although sales were mainly within Russia and the CIS, leases and subsequent sales saw the aircraft operating within many other countries such as Sudan, Indonesia and Pakistan.

One of the more unusual operations occurred in the summer of 1995 when British tour company Sunjet chartered a Yak 42 from Polet Airlines to fly holiday makers to popular resorts in the Mediterranean. However, the aircraft only managed a few weeks of operations before negative publicity caused the planned series of flights to be stopped.

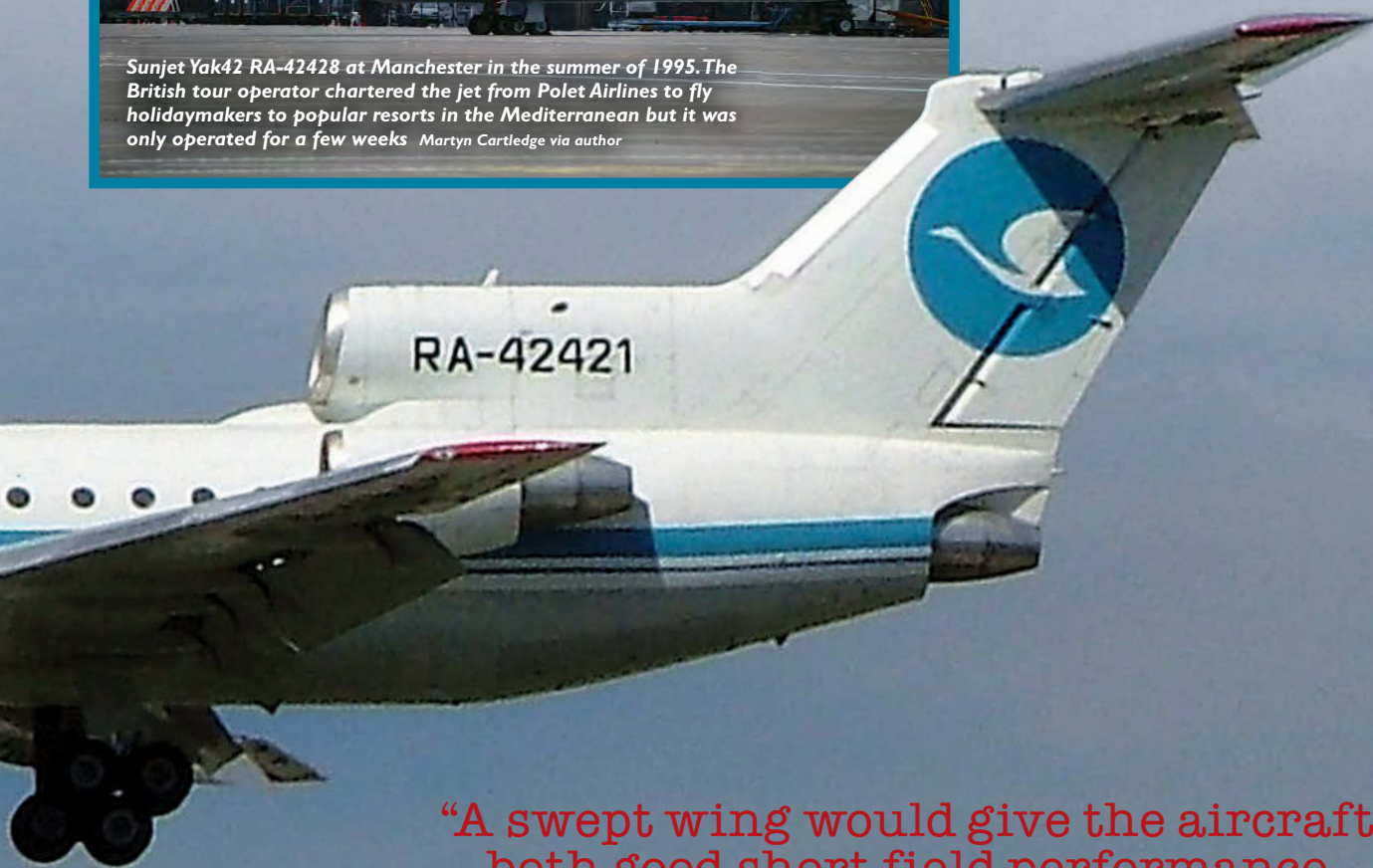
Around 185 Yak 42 aircraft are known to have been built with less than 50 examples believed to be still in service at the beginning of 2015. These survivors fly with airlines such as Gazpromavia, Izhavia, NK Air and Grozhny Avia although numbers are decreasing quickly as airlines replace their aircraft with more modern, economical airliners.

Visits to Western Europe are now increasingly rare and probably only likely for a specific VIP or sports charter.

The Yak 42 may not have succeeded in its aim to be a replacement for aircraft such as the Tupolev 134, but to reach a landmark of 40 years in service has to go down as a success that not all airliners achieve. ●



Sunjet Yak42 RA-42428 at Manchester in the summer of 1995. The British tour operator chartered the jet from Polet Airlines to fly holidaymakers to popular resorts in the Mediterranean but it was only operated for a few weeks Martyn Cartledge via author



“A swept wing would give the aircraft both good short field performance plus high speed cruise capabilities”

SHOWTIME SPECIAL

Sun 'n Fun

The 2015 Sun 'n Fun International Fly-In and Expo took place at Lakeland Linder Airport in Florida from April 21-26 and featured a bevy of jets alongside the more familiar kitplanes and piston-powered warbirds



JetBlue Airways flew specially painted Airbus A320 N775JB into Sun 'n Fun on Wednesday April 22. The jet, which is painted to honour American veterans, carried 150 aviation students from New York City, Orlando and Lakeland for an all expenses paid day out at the aviation festival. JetBlue has made a major commitment to support the Sun 'n Fun Airframe and Powerplant (A&P) Mechanics training courses and hosts students at JetBlue University throughout the school year. All the proceeds from the annual fly-in are returned to aviation-based STEM (Science, Technology, Engineering & Math) curriculums through year-round programmes and activities at the Sun 'n Fun Aerospace Center for Excellence



Above: Greg 'Wired' Colyer flew his high adrenaline 'Ace Maker' routine in the Lockheed T-33 Silver Star during the weeklong event. The display is both graceful and powerful and flown at very low level



Canadair CF-5D 116833 is based at nearby St Augustine, Florida and is currently on the market for \$1.8 million. The jet, which is registered N15FF, was upgraded by the Canadians in 1995 with a full Avionics Upgrade Programme (AUP), allowing it to simulate the CF-18 Hornet



Modern military hardware on display this year included an F-22 Raptor, C-130J Hercules, P-8 Poseidon and this A-10A Thunderbolt II. However, the Thunderbirds were the only military aircraft to take to the skies during the week

Below: Yes, it's a jet! The Screamin' Sasquatch jet-powered Waco biplane from John Klatt Airshows was flown during the show by Jeff Boerboon. The aircraft is a highly modified 1929 Waco Taperwing and is powered by both a 450hp Pratt & Whitney 985 Wasp Junior radial engine and a General Electric CJ-610 turbojet that creates 3,000lbs/thrust. This means the aircraft can hover on its propeller, spool up the jet and climb away vertically!



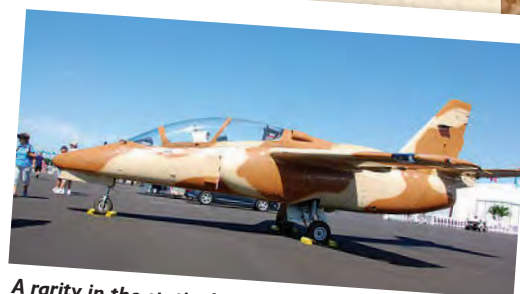
Right: Draken International now operates a fleet of more than 50 jets on government contracts. These include 28 Aero L-159s, five Aero L-39s, eleven Douglas A-4 Skyhawks, nine Aermacchi MB-339s and an amazing 27 Mikoyan-Gurevich MiG-21s. The organisation provided an ex-Royal New Zealand Air Force MB-339 and A-4 Skyhawk for static display at Sun 'n Fun



One of the highlights of the 2015 event was a scintillating routine by Doug Matthews in Classic Fighters Airshows' North American F-86F Sabre. The Sabre is painted in the markings of the Skyblazers display team, which was formed by USAF pilots in Germany in 1949. After flying the F-80 Shooting Star and F-84F Thunderjet, the team converted to the Sabre in late 1953



The Breitling Jet Team performed their US debut at Sun 'n Fun. The team received accolades from all who saw their new routine, which now includes flares



A rarity in the static display was this SIAI Marchetti S-211. Now registered NX270CF, it previously served with the Singapore Air Force as '385'



Classic jets on display included BAC Jet Provost T.5 XW306, countless Aero L-39s and this Douglas A-4C Skyhawk (BuNo 149606/NX2262Z) in the colours of VFA-192. After restoration it flew again in August 2011

The show was one of the first to feature the 2015 USAF Thunderbirds Air Demonstration Squadron. This year the team is commanded by Lt Colonel Christopher Hammond and will appear in 71 demonstrations at 39 locations across the USA





Part of the Imperial War Museum's VE Day Anniversary Airshow theme was to "commemorate peace" – and what better way to close the weekend than with a display by the RAF Aerobatic Team. Despite grey and damp weather throughout the Sunday flying programme, the clouds broke and the sun came out within minutes of the Red Arrows starting their display. Red One, Dave Montenegro, adapted the team's display from a 'flat' show to a 'rolling' and eventually a 'full' performance as the conditions rapidly improved *Steve Bridgewater*



Seldom seen in recent years, the Classic Air Force's Gloster Meteor NF.11 G-LOSMI/WMI67 flew a spirited display in the hands of Jon Corley at the Abingdon Air and Country Show on May 3. Finding a gap in the rain that blighted most of the day, WMI67's performance was one of few to be graced by the sun *Jamie Ewan*



The air around the sleepy village of Bruntingthorpe, Leics, was filled with the sound of jets when the first of two Cold War Jets Days planned for 2015 took place on May 24. One of the stars of the day was Handley Page Victor K.2 XM715 *Teasin Tina*, which treated the crowds to a ground-shaking run with all four Rolls-Royce Conway engines howling before streaming its huge drag 'chute *Jamie Ewan*

SHOWTIME

The Jets team travels to Abingdon, Bruntingthorpe, Coventry and Duxford

Richard Freail



AIRBASE at Coventry opened its doors on Saturday May 2 to highlight the forthcoming season and the return of its aircraft from Newquay. Despite the conditions the 2500-strong crowd were treated to displays including the de Havilland Vampire T.55 and Gloster (AW) Meteor NF.11 which reprised their 'Heritage Pair' routine for the first time in more than a decade



The Imperial War Museum's VE Day Anniversary Airshow at Duxford, Cambs on May 23-23 provided an opportunity to see both of 29 Sqn's specially painted Eurofighter Typhoon FGR.4 aircraft. During the Saturday display Flt Lt Jonny Downen flew the Battle of Britain camouflaged jet (painted to depict Flt Lt James Nicolson's Hawker Hurricane complete with 249 Sqn GN-A codes) and on the Sunday he demonstrated ZK353, complete with special tail art commemorating 29 Sqn's centenary *Steve Bridgewater*



The Classic Air Force's Gloster Meteor T.7 (WA591/G-BWMF) is now the oldest flyable jet in Europe and the oldest flyable British jet anywhere in the world. The 1949-built jet starred at the Imperial War Museum's VE Day Anniversary Airshow where it was the sole classic jet to appear in the skies *Steve Bridgewater*



Incoming! Letters to the Editor



HAVE YOUR SAY

Write to: Incoming! **Jets**, Key Publishing Ltd, PO Box 100, Stamford, Lincs, PE9 1XQ, United Kingdom or e-mail steve.bridgewater@keypublishing.com

While we try to reply to all correspondence it is not always possible to reply individually to every letter. Please note, letters may be edited for style or length.

You can also send comments via our Facebook page or on Twitter at @JetsMonthly

Changi Meteors

Congratulations on the latest edition of *Jets*. As an ex-RAF Halton apprentice who served 1957-1970, *Jets* is my favourite aviation publication.

I served two tours on the Lightning (111 Sqn with the F.1A and 29 Sqn on the F.3) but between the Lightning postings I spent three years at RAF Changi. This was during the Indonesian Confrontation and your readers may be interested to know that we had a number of Meteors on strength.

They were a mix of F.8s and NF.13s; all used for target towing. During the height of the confrontation the F.8's 20mm cannon were re-activated and the good old Meteors became our airfield defence force – backed up by RAAF F-86 Sabres armed with sidewinders!

The NF.13s were all modified with the target-towing winch fitted to the starboard

wing. All the Meteor pilots were NCOs and were a fine bunch so there was no shortage of volunteers to act as winch operator in the rear seat.

One minor point about your excellent article. Someone seems to have mixed kts, km/h and mph. The article credits the NF.14 with a top speed of 808kts. I don't think so! Elsewhere in the article the NF is credited with 475kts which, roughly translated, is about 810km/h so that seem to be where the confusion arose. *Jets* is a great magazine. Keep up the good work!

Ken Smith, by e-mail

Ed: Mea Culpa – the spec box should read 475kts/503mph/810km/h. The person responsible has been shot to ensure we do not get repetitive faults. There is now a vacancy for a volunteer Proof Reader...



RAF Meatbox Tugs

Thanks for another excellent edition of *Jets* full of the types of aircraft I'm particularly interested in.

I'd like to offer just one amendment to the article about the Meteor Night



Fighter aircraft. The target tugs section makes it seem that the Royal Navy were the only UK Air Arm to use the Meteor TT.20, whereas the RAF's 3 CAACU based at Exeter Airport also used the TT.20 for many years.

From my logs it seems that they started replacing the Mosquito TT.35s in mid 1962 and carried on until early 1970 when the Canberra TT.18s of 7 Sqn based at RAF St. Mawgan took over the job.

I attach a photo of 3 CAACU Meteor TT.20 WD646 at Exeter on June 26, 1965.

John Murray, by e-mail

Thailand Photo Identified

I've really enjoyed the May/June issue of *Jets* and thought you might be interested to know that the airfield in the photograph at the bottom of page 63 is indeed, in Thailand. In fact it is Don Muang, which at the time was Bangkok's main airport. It was quite a location with joint civil and military operations and a golf course between the parallel runways! It had a good observation deck also.

You may like to know that the Air Siam 'DC-10' in the photograph is actually an Airbus A300 (the door is the giveaway).

Incidentally, I've always liked the way *Jets* doesn't insist/rely exclusively on high quality images. The Don Muang picture mentioned

above probably wouldn't pass the screeners on some online photo hosting sites but it is atmospheric, nostalgic, and reminds me of most of mine from the time, i.e. technically not very brilliant! Its historical value and interest by far make up for the lack of quality and all add flavour. It's "of its time"!

Doug Green, by e-mail



Stateside Meteor

Having read the interesting 'Meteors by Midnight' article in the May/June edition of *Jets* I noticed the image of Meteor NF.11 WD592 at Biggin Hill prior to delivery to the USA.

Attached is a photo I took of the same aircraft at Mojave in October 1982 at almost the same angle as the shot in the article (sorry it is a scan of a print so not the best quality). I thought your readers might be interested to see it?

David Reeves, Chesham, Bucks

Ed: After its sale to the Confederate Air Force's Al Letcher, WD592 was flown to Biggin Hill in December 1974 to be prepared for the ferry flight to the USA. Well-known ferry pilot and film flyer Jeff Hawke flew the aircraft across the Atlantic and the journey was reportedly uneventful except for loss of hydraulics caused by a pump failure – resulting in Hawke having to pump the gear up by hand on the last few legs of the trip. The Meteor was then based at Mojave, California and painted gloss white to protect it from the desert sun



AIR FORCE ONE

THE FLYING OVAL OFFICE

Twenty-five years after the USAF took delivery of its first VC-25A, Steve Bridgewater looks at the history of Air Force One, from C-54 to 747 and beyond

President Barack Obama and his team currently travel the globe in a specially equipped VC-25A (a much-modified Boeing 747-200) but things were very different back in 1910 when Theodore Roosevelt became the first President of the United States (POTUS) to fly in an aeroplane – an early Wright Flyer biplane. On October 11, 1910 American aviator Archibald Hoxsey strapped in beside Roosevelt (who had ended his second term in office in March 1909, having been succeeded by William Taft) and the pair overflew a country fair in St Louis, Missouri.

This historic flight marked the start of presidential air travel and today Air Force One serves as a grand symbol of state, representing the USA around the world.

Pre-war pioneer

By the 1930s, safe and reliable airliners, such as the Douglas DC-3 and Boeing 247, made it more viable for the POTUS to ditch the railroad and travel around the USA by air.

President Franklin D Roosevelt became the first American leader to fly in an aircraft while in office and he went on to order a specially modified Douglas Dolphin amphibian in 1933. The aircraft remained in service until 1938 but there is no evidence that Roosevelt ever used the machine.

During the war years Roosevelt travelled on a Pan Am-crewed Boeing 314 named *Dixie Clipper* but with concerns over the reliance on commercial airlines, the USAAF set about converting a Consolidated C-87A (the cargo version of the B-24

Liberator) into VIP configuration for the POTUS in 1943.

The aircraft carried the tail-number 41-24159 and was named *Guess Where* // but with concerns over the type's safety record – and worries a 'bomber' might send out an overly aggressive impression when visiting foreign dignitaries – the Secret Service refused to allow Roosevelt to fly on the aircraft. Other members of state were not put off, however; nor was Eleanor Roosevelt, who used it for a 1944 goodwill tour of Latin America.

Sacred Cow

It therefore fell to a reconfigured Douglas C-54 Skymaster to act as the first official presidential aircraft. Dubbed the VC-54C,



To mark the VC-25A's introduction into service in 1990 SAM 28000 overflow Mount Rushmore in August of that year USAF

and named *The Sacred Cow*, the aircraft included a sleeping area, radio telephone, and an elevator to allow Roosevelt to be lifted into the cabin in his wheelchair.

The Sacred Cow was used by President Roosevelt only once, on his trip to the Yalta Conference in February 1945, and after his death a few weeks later, his successor Harry S Truman took over the aircraft.

“Air Force One”

On July 4, 1947 President Truman replaced the VC-54C with a modified C-118 Liftmaster which he named *Independence* after his hometown in Missouri. He also had a distinctive bald eagle head painted on its nose.

One day in 1953, legend has it that the aircraft operating as ‘Air Force 8610’ was working New York Center air traffic control at the same time as ‘Eastern 8610’, and confusion ensued for a few moments. The pilot of *Independence* requested a change of call sign to ‘Air Force One’ mid-flight – and the name stuck! Every subsequent aircraft used by the POTUS would be known simply as Air Force One.

Columbine

During his period as POTUS, Dwight D Eisenhower introduced a pair of modified Lockheed C-121 Constellations into service as Air Force One.

“The Secret Service refused to allow Roosevelt to fly on a ‘bomber’”

The aircraft, registered 46-505, began life as the 29th Douglas DC-6 but was modified with the aft fuselage converted into a stateroom. The main cabin seated 24 passengers or could be made up into 12 ‘sleeper’ berths.

The first, VC-121A 48-610, was known as *Columbine II* and the second, VC-121E 53-7885, was named *Columbine III*. The distinctive name was derived from the official state flower of Colorado, from where



Left: On October 11, 1910 American aviator Archibald Hoxsey took former president Theodore Roosevelt aloft in a Wright biplane at a country fair in St Louis, Missouri USAF Museum



Above: In 1947 President Truman replaced the VC-54C with a modified C-118 Liftmaster which he named *Independence* after his hometown in Missouri. He also had a distinctive bald eagle head painted on its nose Truman Presidential Library



When the Secret Service refused to allow the POTUS to fly in a converted bomber it fell to a reconfigured Douglas C-54 Skymaster to act as the first official presidential aircraft. Dubbed the VC-54C, and named *The Sacred Cow*, the aircraft was used by President Roosevelt only once, on his trip to the Yalta Conference in February 1945 USAF Museum



During his period as POTUS, Dwight D Eisenhower introduced a pair of modified Lockheed C-121 Constellations into service as Air Force One. The first, VC-121A 48-610, was known as *Columbine II* and the second, VC-121E 53-7885, was named *Columbine III*. The former is seen here at Washington DC National Park Service

ANNIVERSARY



In October 1962 President John F Kennedy's administration received a highly modified version of the newer, longer-range 707. Registered as SAM 26000, the new jet was initially delivered resplendent in a special red and gold scheme but JFK felt the scheme was "too regal." Soon after it entered service the scheme was changed *US National Archives*



President Kennedy and senators aboard SAM 26000 on October 19, 1963. Just a month later Kennedy was assassinated after he flew to Dallas on the jet. SAM 26000's cabin then played host to Lyndon B Johnson taking the oath as he assumed the office of POTUS *John F Kennedy Library*

First Lady Mamie Eisenhower hailed.

Eisenhower's aircraft received both an air-to-ground telephone and telex machine and he would later introduce a pair of Rockwell Aero Commanders, which to date have been the smallest aircraft to serve in the Air Force One role.



It would be Eisenhower who carried the Air Force One fleet into the jet era when, towards the end of his term in 1958, he ordered three Boeing 707s. These VC-137 jets were known simply as SAM (Special Air Mission) 970, 971 and 972 – the latter seen here during a visit to Europe

Entering the jet-era

It would also be Eisenhower who carried the Air Force One fleet into the jet era when, towards the end of his term in 1958, he ordered three Boeing 707s.

These jets were known simply as SAM (Special Air Mission) 970, 971 and 972 and unlike their predecessors they did not gain specific names or nose art.

Dubbed the VC-137, the type would enter presidential service in late 1959 and between December 3-22, Eisenhower used SAM 970 for the first time as he

his administration received a highly modified version of the newer, longer-range 707.

Registered as SAM 26000, the new jet was initially delivered resplendent in a special red and gold scheme with the nation's name in block capital letters on the side of the fuselage. However, the POTUS is claimed to have described the scheme as "too regal" and, after taking advice from his fashion-conscious wife Jacqueline, he contacted designer Raymond Loewy for help in designing a new livery and cabin interior for the latest VC-137.

"The VC-137 enabled the POTUS to cover 22,000 miles in 19 days"

embarked on his 'Flight to Peace' goodwill tour of eleven Asian nations. The VC-137 flew almost twice as fast as the VC-121 Constellation and this enabled the POTUS to cover 22,000 miles in the 19 days.

Interestingly, although it was replaced in the Air Force One role in 1962, SAM 970 soldiered on within the presidential fleet until June 1996 flying VIPs and the vice-president.

New scheme

President John F Kennedy took over Eisenhower's fleet of jets and used them extensively until October 10, 1962, when

Loewy, whose prior design triumphs included the Le Creuset range of cookware, created a blue and white scheme, complete with the presidential seal on the nose and the American flag on the tail. It was a huge hit and has been retained by every Air Force One since.

First Lady Jacqueline Kennedy designed the interior of SAM 26000 – from the carpets to the President's chair and even the bathroom mirrors!

SAM 26000

SAM 26000 was operational from 1962 to 1998, serving Presidents Kennedy through

JFK took advice from his fashion-conscious wife Jacqueline and contacted designer Raymond Loewy for help in designing a new livery for the VC-137. He created a blue and white scheme, complete with the presidential seal on the nose and the American flag on the tail. It has been retained by every Air Force One since *USAF Museum*



to Clinton. It was also the jet that flew Kennedy to Dallas on November 22, 1963 and later returned his assassinated body back to Washington.

Its cabin also played host to Lyndon B Johnson taking the oath as he assumed the office of POTUS that fateful day and Johnson would use the jet extensively during his career, including visits to troops fighting during the Vietnam War.

SAM 26000 went on to serve President Richard Nixon and was used during his famous visits to the People's Republic of China and the Soviet Union in 1972, both firsts for an American president.

In 1976 Nixon christened SAM 2600 as *Spirit of '76* in honour of the USA's bicentennial and a special logo was briefly carried on the side of the nose.

SAM 27000

In December 1972 President Nixon's administration replaced SAM 26000 with another VC-137 (SAM 27000), although it was retained as a backup until as late as 1998.

Nixon boarded SAM 27000 shortly after he resigned the presidency in 1974 and set course for California. As the jet passed over

Jefferson City, Missouri, word was received that Gerald Ford had been sworn in as his replacement and pilot Ralph Albertazzie was forced to change his callsign from Air Force One to SAM 27000 with immediate effect. The outgoing president reportedly received a good luck message from the controllers at Kansas City.

SAM 27000 served Presidents Nixon to George H W Bush, and was the primary transport for Nixon to Reagan. The jet flew its final mission as Air Force One on August 29, 2001.

Flying Oval Office

In 1990 President George H W Bush took delivery of the current fleet of Air Force One jets – which had been ordered by President Ronald Reagan before he left office.

The aircraft trace their history back to a 1985 USAF Request For Proposal, which called for two wide-body aircraft with a minimum of three engines and an unrefuelled range of 6,000 miles.

Boeing's 747 beat the only other competitor (the McDonnell Douglas DC-10) and production began towards the end of the decade.



USAF Museum

OTHER PRESIDENTIAL AIRCRAFT

In addition to the VC-137 and VC-25A, the POTUS has had access to a number of smaller aircraft over the last five decades – all of which have carried the 'Air Force One' callsign when transporting the President.

An Aero Commander U-4B (illustrated) was used by President Dwight D Eisenhower from 1956 to 1960 for short trips. It was the smallest Air Force One, and the first presidential aircraft to have only two engines.

Two examples of the Bell UH-13J Sioux were purchased in March 1957 for use as the first presidential helicopters. On July 13 Eisenhower became the first POTUS to fly in a helicopter when he took off from the White House lawn.

In the 1960s the Johnson Administration acquired both a Lockheed VC-140B JetStar and a Beechcraft King Air B90 (designated the VC-6A) to carry the POTUS to his family ranch in Texas.

A decade later, on December 26, 1973, United Airlines became the only commercial airline to operate an 'Executive One' flight (the designation given to a civilian flight on which the POTUS is aboard) when President Nixon and his family flew from Washington Dulles to Los Angeles. This was reportedly to conserve fuel in favour of flying the usual VC-137.

In recent years the President has regularly flown in US Marine Corps helicopters under the 'Marine One' callsign and on May 1, 2003 President George W Bush flew in an S-3 Viking to land aboard the USS *Abraham Lincoln* off the California coast. This flight saw the callsign 'Navy One' used for the first time.

The POTUS has also been known to use the Boeing C-32 (the USAF designation for the 757) when he needs to fly into airports that are too small to support the larger VC-25A.



Two examples of the Bell UH-13J Sioux were purchased in March 1957 for use as the first presidential helicopters. On July 13 Eisenhower became the first POTUS to fly in a helicopter when he took off from the White House lawn USAF Museum



Today SAM 970 can be found at the Museum of Flight in Seattle Museum of Flight

Below: In the 1960s the Johnson Administration used the Lockheed VC-140B JetStar to carry the POTUS to his family ranch in Texas USAF Museum

Below: SAM 26000 was operational from 1962 to 1998, serving Presidents Kennedy through to Clinton. President Richard Nixon used the jet during his famous visits to the People's Republic of China and the Soviet Union in 1972, both firsts for an American president USAF Museum



ANNIVERSARY

Based upon the Boeing 747-200 and designated VC-25As, the new presidential aircraft entered service on August 23, 1990 and were named, unsurprisingly, SAM 28000 and SAM 29000. The jets retained the blue and silver colours scheme used on the VC-137 but, in keeping with the tradition established by Jacqueline Kennedy, the interiors were designed by First Lady Nancy Reagan.

Air Force One is maintained and operated by the Presidential Airlift Group's 89th Airlift Wing at Andrews Field, Maryland. The unit is part of the White House Military Office, although its crew are drawn from serving USAF personnel.

Although the VC-25A looks very similar to the Boeing 747 the 'flying oval office' boasts 4,000 sq ft of floor space with living quarters, office space and work and rest areas for the President, his senior advisors, members of the Secret Service and travelling press and other guests.



Above: Today the POTUS has access to a pair of VC-25A aircraft. Here SAM 28000 sits on the tarmac as SAM 29000 (as Air Force One) descends into Hickam AFB, Hawaii with President George W Bush aboard USAF

Below: The VC-25A fleet is flown by the presidential aircrew, maintained by the presidential maintenance branch and is assigned to Air Mobility Command's 89th Airlift Wing, Andrews AFB USAF



WHERE ARE THEY NOW?

Type	Registration	Name	Location
VC-54A	42-72252	<i>The Sacred Cow</i>	National Museum of the USAF, Wright-Patterson AFB
VC-118A	46-505	<i>Independence</i>	National Museum of the USAF, Wright-Patterson AFB
VC-118A	53-3240		Pima Air & Space Museum, Davis Monthan AFB
VC-121A	48-610	<i>Columbine II</i>	Marana Regional Airport, Arizona*
VC-121E	53-7885	<i>Columbine III</i>	National Museum of the USAF, Wright-Patterson AFB
U-4B	55-4647		National Museum of the USAF, Wright-Patterson AFB
UH-13J Sioux	57-2728		National Museum of the USAF, Wright-Patterson AFB
VC-137B	SAM 970		Museum of Flight, Seattle
VC-137C	SAM 26000		National Museum of the USAF, Wright-Patterson AFB
VC-137B	SAM 27000		Ronald Reagan Presidential Library, Simi Valley, California
VC-140B	61-2490		Lyndon B Johnson National Historical Park, Texas
VC-140B	61-2492		National Museum of the USAF, Wright-Patterson AFB
S-3 Viking	BuNo 159387		National Naval Aviation Museum, NAS Pensacola

*VC-121A 48-610 was the only primary presidential aircraft ever sold to a private owner. It is currently stored but efforts are underway to restore it to airworthy condition

The POTUS has a dedicated office, conference room and his own bathroom and the jet also includes a medical suite that can function as an operating room. A doctor is carried permanently on board.

Air Force One also boasts a self-contained baggage loader; integral front and aft air-stairs and twin galleys that can serve 100 people in a single sitting.

However, the principal differences between Air Force One and the standard 747 are the electronics and communications equipment (onboard electronics are protected against an electromagnetic pulse),

self-defence suite and state-of-the-art navigation systems. The VC-25A is designed to function as a mobile command centre in the event of an attack on the United States.

The aircraft can also refuel in mid-air; thus offering the POTUS unlimited range, and on normal missions several cargo aircraft typically fly ahead of Air Force One to provide the President with services needed in remote locations.

Next Generation

Air Force One is one of the most recognisable symbols of the American





Air Force One over Manhattan – an incident that panicked some New Yorkers who thought they were watching a repeat of the September 11 attacks. It turned out to be a photo-op ordered by the Obama administration that was not properly publicised. Heads rolled! USAF

presidency. Emblazoned with the American flag, the president's seal and the words 'United States of America,' it has an undeniable presence wherever it flies.

However, the current fleet of VC-25As are now becoming long in the tooth and it

manufacturer announced that it would not enter the A380 into the competition for the Air Force One contract!

The USAF and the office of the POTUS was therefore left with a shortlist of either the Boeing 747-8 or the Boeing 787

"The VC-25A is designed to function as a mobile command centre"

is intended that they will be replaced within the next two to three years.

The search for a replacement began in 2009 with both Boeing and EADS/Airbus originally in the running. However, in the wake of problems that occurred during the bidding process for the next generation of USAF tanker aircraft, the European

Dreamliner – with many aviation industry pundits suggesting the latter would be the most suitable aircraft for the role.

On January 28, 2015 it was announced that the Boeing 747-8 would serve as the next generation of Air Force One – now all that remains is for First Lady Michelle Obama to design the cabin interior... ●

Below: Air Force One lifts off from Minneapolis in April 2004. Principal differences between the VC-25A and the standard Boeing 747, other than the number of passengers carried, are the electronic and communications equipment aboard Air Force One, its interior configuration and furnishings, self-contained baggage loader, front and aft air-stairs, and the capability for in-flight refuelling USAF



On May 1, 2003 President George W Bush landed aboard the USS Abraham Lincoln in the right hand seat of Lockheed S-3B Viking BuNo 159387. For the historic flight the aircraft, from VS-35 Blue Wolves, carried the callsign 'Navy One'. Bush therefore became first serving POTUS to make an arrested landing aboard a carrier US Navy/Photographer's Mate Airman Gabriel Piper



President Barack Obama meets his staff in Air Force One's Conference Room during an intercontinental flight USAF

SPECIFICATION BOEING VC-25A



Crew	26 (including cabin crew)
Capacity	Up to 76 passengers
Length	231ft 10in (70.60m)
Height	63ft 5in (19.30m)
Wingspan	195ft 8in (59.60m)
Wing area	5,500sq ft (510.95m ²)
Empty Weight	526,500lb (238,800kg)
Max Take-Off Weight	833,000lb (375,000kg)
Max Speed	547kts (630mph/1,015km/h)
Ferry Range	7,800 miles (13,000km)
Service Ceiling	45,100ft (13,700m)
Powerplant	Four General Electric CF6-80C2B1 turbofans (56,700lb/thrust each)
First Flight	May 16, 1987

THE ART OF FLIGHT

The Guild of Aviation Artists' 45th Annual Summer Exhibition takes place in London from July 20-26 with 453 original works of art on display from 150 artists. JETS was offered an exclusive preview of some of the jet art that will be on view at the free exhibition



The exhibition is an unmissable occasion for lovers of original works of aviation art, each the result of meticulous observation or careful research of aircraft, events, personalities and historical achievements blended with artistic skills in land, sea and skiescapes. Among the star exhibits will be *Bolter!* by Simon Mumford AGAvA, depicting a Fleet Air Arm McDonnell Douglas F-4 Phantom FG.1 from 892NAS

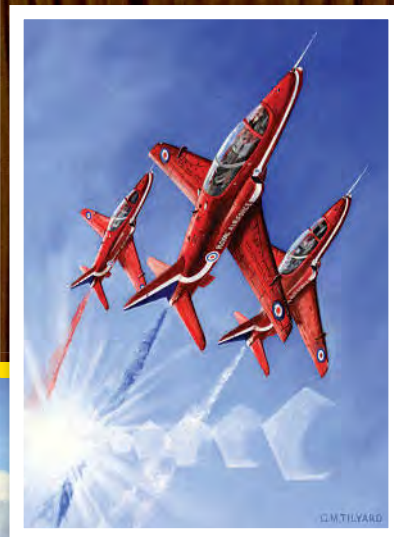


Visitors to the exhibition can discover the wide range of techniques and styles in watercolour, oil, pen and ink, pencil, gouache, pastel and acrylic offered by members and non-members of the Guild. Paintings by many of the world's best aviation artists will be on show as well as works by talented and exciting new artists. Among the Guild stalwarts exhibiting in 2015 will be Patricia Forrest GAvA, whose rendition of Avro Vulcan XH558 in *Spirit of Great Britain* is sure to win the hearts of Vulcan fans in this, the final flying season of the mighty delta



In 1986 British Airways flew a unique formation of four Concorde to mark the tenth anniversary of the type entering passenger service. Graham Henderson GAvA has captured this unusual event in his painting dubbed *Concorde Four-mation*

Right: The Red Arrows are always a popular subject with aviation artists and *Higher than the Sun* has been entered into the 2015 exhibition by Gary M Tilyard AGAvA. If you would like to learn more about the styles and techniques used in paintings like this, why not attend on Thursday when 'walkabout critique' sessions will see Guild Chairman Graham Cooke MBE providing a commentary on exhibits at noon and 6pm



Roger Middlebrook GAvA's painting *Canberra T4 over Coniston* will certainly be in the running for one of the awards presented by The Right Honourable Geoff Hoon during the opening ceremony. Budding artists should consider attending the informal demonstrations of painting in oils, watercolours, pastels and acrylics that can be seen on a daily basis from Tuesday to Saturday



Left: Acclaimed artist Stephen Chard AGAvA will be exhibiting *Venom Vic-Break* at the 2015 event. The painting depicts RAF de Havilland Venom FB.1s cavorting among the clouds during the 1950s

The 45th Annual Guild of Aviation Artists Exhibition takes place at the Mall Galleries, near Admiralty Arch, London SW1 from July 20-26. Public opening times are from 10am until 5pm on Tue/Wed/Fri/Sat and 10am until 8pm on Thursday July 23. On Sunday July 26, doors will be open from 10am until 12.30pm. Prospective purchasers can also apply to attend the Buyers' Preview which takes place from 10am to noon and 2.30pm and 5pm on Monday July 20. Admission is FREE all week. Full details are at www.gava.org.uk

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STOLEN DREAMS

The YC-14 & YC-15 Story

Developed as rival designs hoping to win the USAF's Advanced Medium STOL Transport contract, the Boeing YC-14 and McDonnell Douglas YC-15 showed much promise, yet neither would ever enter service.

Paul Fiddian looks back at the competition



Boeing's YC-14 first flew on August 26, 1975 and would benefit from blown flap technology USAF/USAF Museum

When the Lockheed YC-130 Hercules first flew on August 23, 1954 scarce few onlookers could have envisaged that upgraded versions of it would still be very much in service some sixty years thereafter. Within the tactical airlift arena, the Hercules' longevity remains virtually unparalleled but, by the early 1970s, plans to supplant it were already underway.

In the end, the C-130 range's versatility and relative affordability were the principal reasons why neither Boeing's YC-14 nor McDonnell Douglas YC-15 (the 'Y' indicating 'Service Test') were progressed beyond their trials stages. Developed as rival designs hoping to win the USAF's AMST (Advanced Medium

STOL Transport) contract, they emerged as highly innovative responses to a then-specified need which the USAF ultimately realised it had more or less already met.

Request for Proposals

On January 24, 1972 the USAF released a Request For Proposals (RFP) to see what America's aerospace elite could offer on the Hercules replacement front. By March 31 that same year – courtesy of Bell, Boeing, Fairchild, Lockheed and McDonnell Douglas – it had its initial answer. On completion of in-depth evaluations, on November 10, the USAF made public its intention to take forward Boeing's and Lockheed Martin's proposals. The preliminary design contracts

awarded were superseded, in early 1973, by follow-up contracts involving the construction and testing of two prototypes. These later contracts were not hugely in-depth so far as their content went but were quite explicit where their limited criteria was concerned. Specifically, each manufacturer was tasked with evolving a type able to carry 27,000lbs of cargo across a 400nm range, after having taken off from a runway not more than 2,000ft in length. (To give that last point operational context, recent Hercules sorties in Vietnam had established that 3,500ft-long strips were more than usable but shorter distances required the adoption of 'non-standard' techniques, potentially at the expense of safety.) So, a circa 75% improvement on



Douglas'YC-15 would beat its Boeing competitor into the skies by almost a full year. It would ultimately influence the design of the C-17 Globemaster III USAF/USAF Museum

the Hercules' short-field performance was sought, plus a payload boast of some 6,000lbs beyond the C-130H model's maximum. Relatively modest to begin with, the required range would in due course radically increase. In general terms, minimal developmental costs were much desired so, within the budget restrictions imposed – \$95.2 million for Boeing, \$85.9 million for McDonnell

Douglas – how original could the two firms be? That was the challenge set and, thus, the companies' engineers got to work.

On August 26, 1975 McDonnell Douglas' lead was made abundantly clear

when 72-1875, the prototype YC-15 in its representational USAF Military Airlift Command scheme, made its maiden flight, almost 12 months ahead of the YC-14. It was joined in the skies by 72-1876, the camouflaged second prototype, in December 1975.

Blown flaps

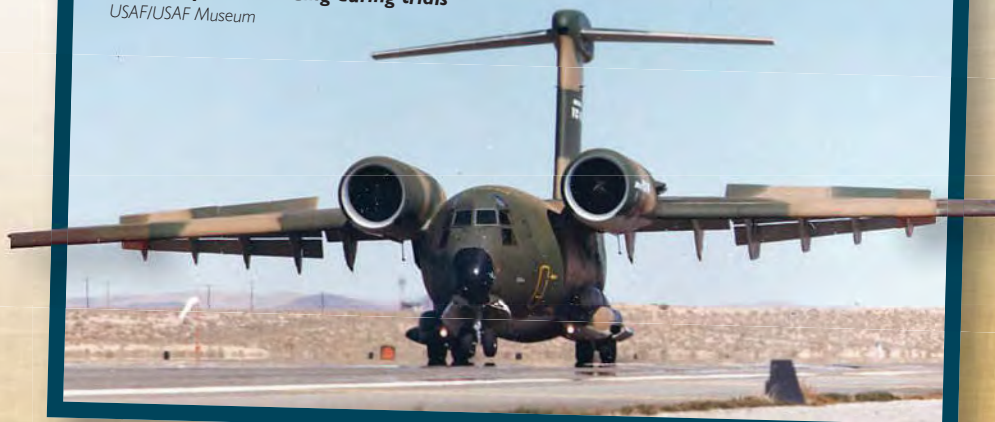
The YC-15 was at first powered by four Pratt & Whitney JT8D-17 turbofans, producing a combined 64,000lbs/thrust. From the outset each engine pylon was designed to accept other engines – a feature upon which McDonnell Douglas would later capitalise. Swept at an angle of 5.9 degrees, the YC-15's NASA-study influenced supercritical wing had externally-blown

flaps (EBFs) running to three-quarters of its length. Looking spectacular when deployed, the double-slotted flap arrangement served to vector a portion of the jet exhaust downwards, thereby enhancing lift. The remaining exhaust quota met the flaps via the Coandă effect, of which more later.

In its contemporary publicity material, McDonnell Douglas described this flaps configuration as 'The key to the YC-15's outstanding STOL performance'. In comparison with 'other, more complex propulsive lift concepts', it boasted, 'the YC-15 4-engine EBF system has fewer flaps and hinge linkage parts'. Other associated benefits comprised 'Greatly simplified aerodynamics while retaining equal or better cruise and STOL performance...

The original specification called for a type able to carry 27,000lbs of cargo and operate from a runway not more than 2,000ft in length. Here the YC-14 performs a maximum capability short landing during trials

USAF/USAF Museum



Superior manual control margins with one engine out' and 'Less complicated and fewer redundant flight control augmentation systems'.

Another advert from the same time highlighted the YC-15's operational aptitude, especially where makeshift airstrip use was concerned. 'Full STOL reverse is available down to zero forward speed and for backing the YC-15 into its parking space', it wrote. 'The four engines can be put in reverse idle for rapid unloading and loading in forward areas. Crew movements are unimpeded by engine intake or exhaust. Simple and effective. It's utility-proven in the flight test program. The YC-15 has what it takes for the combat environment.'

SPECIFICATION BOEING YC-14



Crew	3
Capacity	Up to 150 troops or 69,000lb of cargo
Length	131ft 8in (40.14m)
Height	48ft 4in (14.74m)
Wingspan	129ft 0in (39.32m)
Wing area	1,762sq ft (163.7m ²)
Empty Weight	117,500lb (53,410kg)
Max Take-Off Weight	170,000lb (77,270kg) [STOL]
Max Speed	438kts (504mph/811km/h)
Service Ceiling	45,000ft (13,716m)
Ferry Range	2,734 miles (5,136km)
Powerplant	Two General Electric CF6-50D turbofans (51,000lb/thrust)
First Flight	August 9, 1976

The YC-14 and YC-15 were involved in a number of 'fly-off' contests and also appeared alongside each other at airshows on both sides of the Atlantic
USAF/USAF Museum

Sharing parts

To keep the YC-15's costs in check, significant use was made of modified parts from earlier Douglas products. Such components included the DC-10's cockpit and the DC-8's nosewheel, while the main undercarriage elements came from Lockheed's C-141 Starlifter. Capacious indeed was its fuselage and it was made that way to ensure that 90% of the era's US military combat vehicles could be accommodated.

Subsequent tests would verify the YC-15's capability to ingest a variety of ground-based systems, including a 26-tonne 155mm self-propelled howitzer, an MICV (Mechanised Infantry Combat Vehicle – a forerunner of the Bradley Fighting Vehicle range) and a wrecker lorry, 33ft in length.

By mid-1976, the YC-15's preliminary trials were complete and its head-to-head with

After having given a series of stunning flying displays at the 1976 SBAC show at Farnborough on its first international visit, 72-1876 also was modified but, in its case, only engine-wise – its outer port pylon gaining a 18,500lb/thrust Pratt & Whitney JT8D-209. In this configuration, it was back in the air on March 4 1977.

Not much more than two months later, it was 72-1875's turn to head for Europe...

Boeing & Coandă

It had been pure coincidence that, 15 days after the USAF's initial AMST contracts award in 1972, aerodynamics pioneer Henri Coandă had died, for it was one of his breakthrough discoveries – the 'Coandă effect' – that the Boeing YC-14 utilised. Bucharest-born Coandă realised he could exploit the phenomenon whereby a fast-moving fluid coming in contact with a

“Engine exhaust is redirected downward to create powered lift”

the YC-14 was about to begin but there was then a twist in the tale. Revised AMST specifications were released, which called for increased payload capacity (to 38,000lbs) and endurance (to more than 2,600nm). These, McDonnell Douglas pursued by modifying both YC-15 airframes. A single more powerful engine – a CFM International CFM56-2, generating 22,000lbs/thrust – was fitted to 72-1875's outer port pylon and the aircraft's wingspan was extended from 110ft 4in to 132ft 7in. In its revised guise, '75 restarted its trials on February 16, 1977.

curved surface tends to adhere to that surface (rather than continue travelling in a straight line) from an aeronautics perspective, and set out to prove it in the one-off Coandă-1910 design. Boeing, having picked up its progenitor's baton, applied the same principles, achieving with their much larger aircraft considerably more incontrovertible success than had Coandă (the extent of his aviation achievements remains a matter of some debate).

By late summer 1975, the YC-15 had flown and its test programme was well





The first YC-14 seen in the Boeing assembly shed in Seattle, Washington in 1974
USAF/USAF Museum



One of the two YC-15s approaches completion at Douglas' plant at Long Beach, California
USAF/USAF Museum

advanced but the YC-14 remained under construction inside Boeing's Developmental Centre. This delay officials attributed to US Congress' decision to reduce the funding allocated. Eventually, 72-1873 – the predominantly bare metal first YC-14 prototype – had its inaugural flight on August 9, 1976. The second airframe – the two-tone camouflaged 72-1874 – soon followed. The YC-14 was fitted with two General Electric CF6-500 turbofans whose combined power was 110,000lbs/thrust. These were mounted on and ahead of the wing's leading edge. Lowering the flaps caused the YC-14's engines' efflux to mirror their geometry, thereby generating aerodynamic lift.

This USB (upper surface blowing) process and its real world potential, Boeing comprehensively explained in a two-page magazine advert published in May 1977. 'Upper surface blowing', it wrote, '[is] based on a phenomenon known as the Coandă Effect. [...] On the Boeing YC-14, engine exhaust is the fluid and the wing and flap assembly act as the curved surface.' The advert continued: 'During USB operation the flaps directly behind the engines are lowered

to almost 90 degrees vertical. The engine exhaust is thus redirected downward to create powered lift. That's what enables a plane the size of a 727 to land at speeds under 100 miles per hour while carrying a payload of 27,000 pounds into and out of a 2,000-foot semi-prepared airfield. And do it with only two engines. With a twin-engine

configuration, manufacturing and operating costs are reduced. And by selecting already proven turbofan jet engines, YC-14 designers were also able to avoid extra development costs. Upper surface blowing is an innovative, logical, efficient and economical way to generate powered lift in a STOL aircraft. And the YC-14 is the only one in the world to use it'

Head-to-head

November 1976 saw the two competing designs' much-anticipated direct comparison trials begin. Edwards Air Force Base was their host and heavy load-lifting assessments were a key element. Notably, the YC-14 demonstrated that it could accommodate an M60 Patton Main Battle Tank which, at 109,200lbs, was some four times heavier than the 27,000lbs payload requirement. However, revised thinking was now already threatening to, at best, radically reroute the whole AMST programme. Earlier in the year USAF Chief of Staff General David C Jones had instigated studies into whether AMST could incorporate both tactical and strategic airlift. If not, could the YC-14/YC-15 – minus its STOL capabilities – become a strategic airlifter? The outcome was essentially a "no", based on the complex and/or costly adaptations required.

Airshow stars

In late May 1977, YC-14 72-1874 and YC-15 72-1875 were among the star attractions at the Mildenhall Air Fete – those present still recall the phenomenal flying displays they gave with nothing less than reverential awe. Their exhibitions of very short take-offs and landings, steep

“Could the YC-14/YC-15 become a strategic airlifter?”

climbs and slow-speed controllability were reprised at the Paris Air Show between June 4-11 – *Flight International's* subsequent review described the YC-14's routine as 'a convincing demonstration of Romanian engineer Henri Coandă's theory'. Later on that year, the USAF's AMST trials completed, Boeing leased back 72-1874, flying it under the civilian registration N8740. Having

The original short wing on the first YC-15 is evident in this photograph taken during the type's maiden flight. The wing was extended from 110ft 4in to 132ft 7in on the second prototype
USAF/USAF Museum



undergone the same process, 72-1873 became N8730B.

Terminated

Politically, the USAF's future transport aircraft requirement was now inalterably heading the strategic type's way. On December 10 1979, the AMST programme was terminated after it had been decided that, for tactical airlift purposes, the Hercules was essentially unbeatable. Initially, the YC-14s and YC-15s went to Davis-Monthan AFB's MASDC (the former Military Aircraft Storage and Disposition Center – now AMARG) but, in mid-1981, 72-1875 was loaned out to the Pima Air & Space Museum. For the next 15 years it remained ground-bound until, in the mid-1990s – not long before its August 1, 1997 merger with Boeing – McDonnell Douglas reactivated it in support of the C-17 programme. Fifteen months to the day

after its post-restoration flight, on July 11 1998, 72-1875's outer port engine failed mid-flight and an emergency landing was made. To have performed the necessary repairs was considered prohibitively expensive, so there ended its flying days once and for all.

“Post-AMST, each type's influence remains”

Now, this aircraft resides within the Century Circle at Edwards AFB's Air Force Flight Test Center Museum alongside other milestone post-war US military aircraft designs. Far less auspicious was the future of 72-1876: it remained at Davis-Monthan AFB until, in March 2012, it was scrapped. YC-14 72-1873/N8730B is these days part of the Pima museum, while AMARG still houses its sister ship.

Influential legacy

Flight International's Paris Air Show 1977 guide had in one part been eerily prophetic, stating: 'Though some would describe the YC-14 and YC-15 as Hercules replacements, Lockheed-Georgia believes that examples of the latter will be rolling

off the production line for a long time yet.' How right this projection would be. To what extent could either have enhanced USAF tactical airlift operations at large? We'll never know for sure but, post-AMST, each type's influence remains much in evidence.

With its high-mounted twin-engines, T-tail and fairly blunt nose, the Antonov An-72 *Coaler* exhibited by Aviaexport at the 1979 Paris Air Show had a most familiar look about it. This aesthetic, *Flight International* referenced in no uncertain terms, labelling the An-72 a 'scaled-down copy of the Boeing YC-14'. Still plying its



After having given a series of stunning flying displays at the 1976 SBAC show at Farnborough 72-1876 was modified with its outer port pylon gaining an 18,500lb/thrust Pratt & Whitney JT8D-209. Here Douglas 'boffins' examine the engine prior to a test flight USAF/USAF Museum

The YC-15 may not have entered production but it strongly influenced the later C-17 Globemaster III

trade in 2015, the *Coaler* remains among the world's most readily recognisable aircraft types and, with some 150 examples built and many diverse taskings undertaken, must be considered a most successful aviation application for the Coandă effect.

In AMST's wake came the C-X programme – the search, in essence, for a Lockheed C-141 Starlifter replacement (the Starlifter, as it turned out, soldiered on until 2006). Issued in October 1980, the USAF's C-X RFP received four responses. Based on the YC-15, McDonnell Douglas' entry was the eventual winner and, on September 15, 1991 it powered into the air for the first time. The Boeing C-17 Globemaster III has since been widely sold, redefining the strategic airlift capabilities of those air arms in whose service it has been placed.

Decades on from their creation, both the YC-14 and YC-15 still are remembered as shining examples of aeronautical ingenuity realised within tightly-dimensioned confines, both conceptual and financial. If the An-72 and C-17 can be considered their natural successors, then the AMST legacy looks set to be sustained for some time yet. ●



After the competition the YC-15 72-1875 was moved to the Pima Air & Space Museum but was returned to flying status by McDonnell Douglas in 1997 as N15YC. The aircraft was flown in support of the C-17 programme but a year later it was damaged after an engine failure. In 2008 it was moved by road to Edwards AFB where it is now on display at the Air Force Flight Test Center Museum's 'Century Circle' display area

SPECIFICATION DOUGLAS YC-15



Crew	3
Capacity	Up to 150 troops or 78,000lb of cargo
Length	124ft 3in (37.90m)
Height	43ft 4in (13.20m)
Wingspan	110ft 4in (33.60m)
Wing area	1,740sq ft (162.0m ²)
Empty Weight	117,500lb (53,410kg)
Max Take-Off Weight	216,680lb (98,286kg)
Max Speed	471kts = 542mph = 872km/h
Service Ceiling	30,000ft (9,144m)
Ferry Range	2,995 miles (4,810km)
Powerplant	Four Pratt & Whitney JT8D-17 turbofans (16,000lb/thrust)
First Flight	August 26, 1975

Artwork: Andy Hay / www.flyingart.co.uk





ALPINE ATTACKER

SWITZERLAND'S FFA P-16

*The ill-fated FFA P-16 ground attack fighter never made it into production for the Swiss Air Force, but as **Pete London** reveals, it would spearhead the innovative Learjet programme*

The historically neutral country of Switzerland has generally met its needs for military aircraft by importing from foreign powers, or through licensed production. However, the small nation has made several serious attempts to become less dependent on equipment from beyond its borders. In particular, during World War Two procurement of military types became difficult, and Switzerland's isolation amid a maelstrom of conflict understandably stimulated self-reliance.

Post-war the Swiss Air Force and Anti-Aircraft Command (SAFAAC) drew up a specification for an indigenous ground-attack jet, tailored to the country's distinctive topography as well as its defence requirements at the time. The resultant aircraft, Flug- und Fahrzeugwerke's P-16, might have seen success but for two unfortunate accidents; that said though, was there more behind the programme's cancellation?

Jet-power protection

As early as July 1945, the Swiss Air Force's commanding officer, Major General Fritz Rihner,



The first P-16, J-3001, seen at Altenrhein airfield. A long instrument probe was fitted at the nose of the first, second and third prototypes. Prominent tip tanks were permanent, and the aircraft featured twin wheels on all three undercarriage legs





Following its crash into Lake Constance on August 31, 1955, P-16 J-3001 was successfully recovered
Pete London Collection

had emphasised the importance of jet aircraft for the future. Switzerland's government, the *Bundesrat* (Federal Council), supported Rihner; the Swiss aviation industry hastened to explore the new form of engine, and also examined swept-wing technology. During 1946 Rihner created a commission to develop a basis for future Air Force procurement.

The resultant report, *Future Tasks of our Air Force*, emphasised the need to protect Swiss borders from the threat of encroaching ground forces and landings, setting out a requirement for a modern ground-attack aircraft. An agile single-seater; the new type would be transonic with a high rate of climb, and able to carry a heavy weapons load. Good short-field performance and low-speed handling would be key, to allow operation from Switzerland's small grass airstrips tucked away in Alpine valleys.

Two contenders

Early in 1948 the requirement was issued to two of the country's three aircraft manufacturers: state-owned *Eidgenössische Flugzeugwerke* (F+W: Federal Aircraft Works) at Emmen, and a private company just coming into being, *Flug- und Fahrzeugwerke* (FFA) at Altenrhein, by Lake Constance. F+W responded with the ambitious N-20 *Aiguillon* (Sting), a tailless swept-wing type which initially found favour; following preliminary design work, in May 1948 an order was placed for a single prototype.

Work on the FFA contender, initially dubbed P.1604 but later the P-16, continued under chief designer *Dr Ing* Hans L. Stüder as a second string to the N-20. FFA's premises had originally been built to circumvent the Treaty of Versailles and had been owned by *Dornier Werke AG*, a Swiss subsidiary of the German company. Formed

out of Dornier in 1948, FFA was led by Swiss national Dr Claudio Caroni, a friend and former colleague of Claude Dornier but a man with a difficult management style.

F+W's *Aiguillon* programme proved problematic. A roughly three-fifths scale demonstrator, the N-20-2 *Arbalète* (Crossbow) flew successfully in November 1951, powered by four tiny 242lbs/thrust Turboméca Piméné jets mounted in vertically-stacked pairs. But the full-size N-20, with four Swiss Mamba SM-I turboprop engines, could only achieve short hops.

The feeling grew that a combination of radical airframe and unproven powerplant was too risky to allow a single procurement.

FAA P-16 design

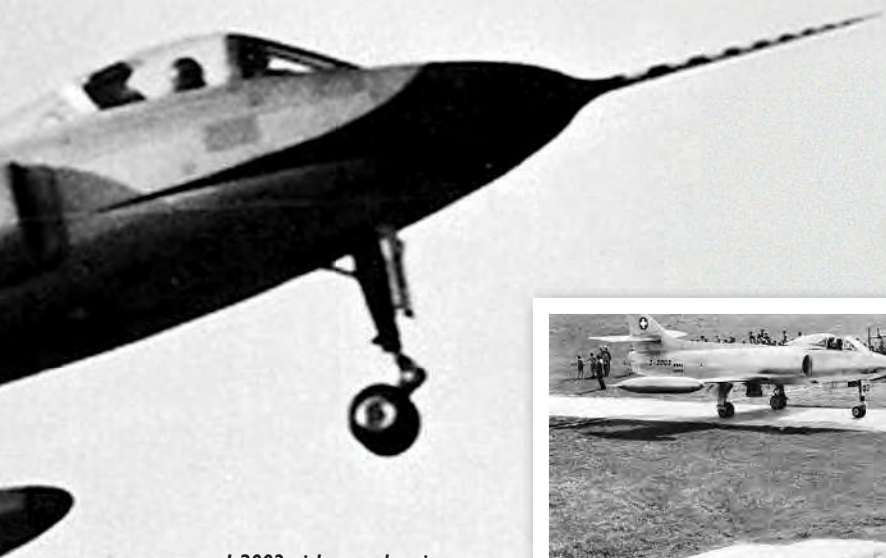
On February 1, 1952 the *Eigenoessisches Militaerdepartement* (EMD: Federal Military Department) awarded a contract for completion of two prototype P-16s, later amended to five. The following January, mindful of the N-20's problems and after a cost comparison exercise, the *Bundesrat* ended the project, estimated at 340 million Swiss Francs against the P-16's 228 million.

Stüder's P-16 was conventionally arranged but employed several original features. Its low-aspect wingform was unswept but with a moderately raked leading-edge. The wing was of thin section, but to boost short-field performance and slow-speed characteristics adopted an innovative combination of surfaces.

Fowler-type flaps with a maximum extension of 45 degrees were fitted inboard of the ailerons at the inner sections, extending beneath the fuselage where they were bulged to align with the ventral contour. At the leading-edge full-span flaps were installed, their technology developed from wartime work by Dr Krüger of Göttingen University. When required, the Krüger flaps rotated downwards through 120 degrees from their flush position; combined with the Fowler flaps and ailerons able to droop to 18 degrees, an exceptional degree of camber was created.

Within the wing a multi-spar arrangement was adopted, combined with a sandwich-type skin creating a stiff and very strong structure. The ailerons were foam-filled, to provide stiffness with minimum weight. The P-16 was designed to a load factor of 13G, greater than most of its contemporaries; strength would be required for low-level high-speed flight in the ground-attack role. Wingtip fuel tanks with stabilising fins, each able to hold 166 gallons, were divided into three compartments. Permanently mounted, they acted as end-plates, while their contents could be jettisoned in less than one minute.

The P-16's pressurised cockpit employed a bubble canopy, its windscreen panel of armoured glass, with further armour fitted at the front and rear bulkheads. The first prototype featured a Martin-Baker Mk.2F ejection seat; on later examples the Mk.4 was fitted. Cheek intakes were adopted, together with a single tailpipe. To help with steep



J-3002 airborne showing sleek lines, its fuselage airbrakes open. The aircraft was natural metal overall, picked out with red painted trim

J-3002 (nearer) and the third aircraft (J-3003) at Altenrhein. On March 25, 1958, J-3003 was lost in Lake Constance and was never recovered





approaches, large fuselage-mounted air brakes were fitted aft of the wing trailing-edge.

Power and armament

Power came from an Armstrong-Siddeley Sapphire ASSa.6, giving 8,000lbs/thrust. To facilitate maintenance the rear fuselage was made detachable; engine changes could be carried out in four hours. The Sapphire received fuel from a 133-gal capacity collector tank positioned between the bifurcated intake ducting, fed by compressed air from the wing tanks.

Horizontal tail surfaces employed parallel chord and the tailplane had variable incidence. The P-16's swept fin was again of multi-spar construction. Ailerons, elevators and rudder were given servo-operation and artificial feel by Leduc-Jacottet units, actuated by a Dowty hydraulic system which also operated all other services. In emergency the flying controls could be operated by a separate electrically-powered standby system; finally there was a manual option.

Armament was substantial. Aft of the cockpit, which featured a Ferranti reflector gunsight, a ventral bay nearly 9ft long contained two 30mm Swiss Hispano-Suiza HS 825 cannon in a winch-up installation, each with 125 rounds. The bay also housed

a retractable MATRA Type 1000 high-speed automatic rocket launcher, armed with 44 68mm MATRA folding-fin air-to-ground rockets fitted with either explosive or hollow-charge heads. The rockets were mounted in four vertical rows; for firing the launcher was extended beneath the fuselage. Intended to receive fire control radar by F+W in the nose-cone, eventually a Ferranti Mk.8 system was fitted.

Undercarriage arrangements were unusual: all three members featuring twin wheels and medium-pressure tyres. This helped reduce loads on rough or slushy surfaces, and improved braking performance. The braking system was hydraulic, with a pneumatic emergency standby. Dowty's liquid-spring nosewheel leg retracted aft, while the main members retracted inwards.

Prototype One

On April 28, 1955 the first prototype P-16, J-3001, made its first flight from Altenrhein in the hands of test pilot Hans Häfliger. In fact, to hurry the programme J-3001 had been built without armament. Initial assessment was encouraging; Major General Etienne Primault, Rihner's successor, wrote: "Testing runs positively; there is no reason not to produce the P-16, and the estimated costs will be in the range of foreign aircraft in this category."

On July 4, 1955 though, during a demonstration before the press, J-3001 suffered brake failure on landing; overshooting, it lost its undercarriage. The cause was found to be a fracture of the hydraulic supply line near a main wheel, made by a stone thrown up from the runway. Fortunately damage was limited and the aircraft was soon repaired.

But during its 22nd flight on August 31, 1955, again with Häfliger, J-3001 experienced fuel starvation and flame-out. Although near Altenrhein and requesting a dead-stick landing, the pilot was not permitted to glide through a thin layer of cloud to return home. Instead he ejected, leaving the aircraft



The P-16's cockpit was fairly roomy, but its instrumentation compared with today's offices was relatively sparse Pete London Collection

at around 500ft but escaping without injury.

J-3001 crashed into Lake Constance, its total flying time just 12 hours 38 minutes. Recovered, examination revealed a fatigue fracture of the collector tank pressure pipe, located behind the cockpit wall, which had starved the engine of fuel. A programme including test-rig simulation was set in motion to ensure no repeat.

Prototype Two

Meanwhile, construction of the second prototype, J-3002, was delayed as modifications were introduced. Enlarged boundary layer splitter plates appeared while revised air intakes were extended forward along the fuselage sides. The fin tip received a fairing, and a bullet bulge at the aft junction of fin and tailplane to house a braking parachute. Cannon armament was also installed, together with underwing hard-points.

J-3002 first flew on June 16, 1956 with Häfliger assisted by a Lear yaw-damper to curb Dutch roll, before completing firing tests where the aircraft proved to be an excellent armament platform. Cannons, rocket launcher, rockets, bombs and napalm tanks were all trialled, though for safety the



Hans Häfliger, the P-16's first test pilot, seen here in a Hawker Hunter. On August 31, 1955 after J-3001 experienced fuel starvation he ejected, fortunately without injury Pete London Collection



The fifth P-16 X-HB-VAC seen with a relative, but not a close one: Lear Jet N803LJ

X-HB-VAC uses a runway improvised from an Alpine road, watched by locals amid typical Swiss scenery Pete London Collection



X-HB-VAC at Altenrhein, displaying the pseudo-military scheme applied during its time as a demonstrator seeking foreign buyers

Pete London Collection



Above: X-HB-VAD outside the FFA hangar at Altenrhein, showing the ventral retractable MATRA Type 1000 high-speed automatic rocket launcher which was trialled with great success

latter were filled with water rather than anything stronger. Within two months the aircraft had flown transonically in a shallow dive; soon after, over Dübendorf near Zürich, it went supersonic for the first time.

In February and March 1957 J-3002 was evaluated by the Air Force. Handling was reported as generally good apart from some elevator flutter at high speed, rectified with help from Zürich's Federal Institute of Technology and its leading-edge Zuse Z4 computer. Exploration of the flight characteristics found placid stalling and no wing drop. Indeed, fully-stalled and at a rate of descent exceeding 7,200ft/min, the P-16 remained controllable. It was also particularly spin-proof, had a rate of roll of 200 degrees per second at Mach 0.8, and landed typically at around 96kts.

Though the cannon installation, brakes and servo controls were felt in need of improvement, in the main the trials were pleasing. On March 7, 1958 the *Bundesrat* passed a resolution agreeing a production contract would be placed with FFA for 100 P-16s. Evaluation of J3002 continued; of the P-16s, that example amassed the greatest number of flights at 310.

Prototype Three

By then the third prototype J-3003 had appeared. This was the sole Mk.II, with an 11,000lbs/thrust ASSa 7 Sapphire and capable of carrying most of the armament

envisaged for production examples, although it was fitted with a single Hispano HS 825 cannon. At first all went well but during a flight on March 25, 1958 just days after the *Bundesrat's* resolution, Lt Jean Brunner of the Swiss Test Establishment experienced loss of control on approach.

J-3003 entered a steep dive; Brunner was too low to right the aircraft using the emergency control system. He ejected from around 1,200ft, landing safely in Lake Constance although he suffered slight spinal compression. J-3003 followed him. That time the aircraft could not be recovered, so it was hard to establish the cause of the crash. The P-16's hydraulic system was reviewed in granular detail by experts including three specialists from Britain's Ministry of Supply. It was speculated that a hydraulic pump coupling had failed, and the system was revised accordingly.

Cancelled

On June 2, 1958 though, at the request of the *Landesverteidigungskommission* (LVK: National Defence Commission), the *Bundesrat* cancelled the entire P-16 programme. The reason, according to Defence Minister Paul Chaudet, was that its power controls did not meet British standards agreed as a design objective; Chaudet said that to achieve this would have added two years to the programme.

But the cancellation was also influenced by other factors. Over the ten years

between the P-16's conception and the Minister's announcement, in some quarters Swiss thinking on future aerial warfare had changed. In particular, by mid-1958 the LVK had formed the view that 'counter air operations' could play a big part, undertaking missions beyond the national border to destroy hostile airborne targets before they penetrated Swiss air space; even nuclear sorties were considered.

Accordingly the LVK began to call for a fighter-bomber able to deliver nuclear weapons, a concept completely removed from the requirement which had brought about the P-16. For those looking beyond the old doctrine, the second crash came at an opportune time. As it was, although Switzerland ended the P-16 programme, the earlier philosophy wasn't abandoned; in 1958, 100 Hunter Mk.58 fighters with ground-attack capability were purchased. It was a move suggesting some disunity in Swiss defence procurement policy at the time.

Customer relations

But the P-16's future might also have been affected by FFA's relationship with its customer community, the EMD, the *Kommission für Militärische Flugzeugbeschaffung* (KMF: Commission



J-3001 aloft on May 15, 1955. This photograph was disseminated to the world's media on June 8 with the caption: "Clinging to its timeless tradition of armed neutrality Switzerland has been finding it a hard pace to keep in step with modern trends of war. Now, at last, she has produced a suitable jet fighter in keeping with the needs and conditions in and around Switzerland"

for Military Aircraft Procurement), the *Kriegstechnische Abteilung* (KTA: War Technical Department), and the LVK. It seems the P-16's development was contracted on a cost-plus-profit basis, not surprising for work of that nature but an arrangement open to suppliers dragging their heels. In 1954 the KTA grumbled: "The longer development lasts the more it costs, and FFA gets more profit." Efforts through the KMF to improve the contract's financial terms came up against FFA's hard-nosed Claudio Caroni: no deal.

There were other customer criticisms. In 1956 the KTA's head, Brigadier General Rene von Wattenwyl, wrote that FFA did not take seriously its development programme time scales. Von Wattenwyl also claimed Caroni had indicated that if a full P-16 production order wasn't placed with his company soon, he'd pursue more profitable business and make sure the development phase slipped down FFA's priorities.

Caroni must have known of the LVK's shift toward a different operational creed. Perhaps he sought to browbeat his customer into a production contract before minds were changed for good. Understandably though, his stance upset people. In November 1956 Von Wattenwyl wrote: "Stop ... the P-16 until the company



The first P-16 is seen at the Altenrhe aircraft works on Lake Constance in May 1955 around the time of its maiden flight

decides on correct behaviour toward the order placing authority." Later, Defence Minister Chaudet told his fellow *Bundesrat* councillors: "After the behaviour of FFA's management, the Military Department did not trust the loyalty of its business partner."

Politics

An added dimension arose from cancellation of the P-16's former rival, the N-20, developed at F+W's premises in the central Canton of Lucerne. When work stopped, seeing jobs, tax benefits and prestige slip away from their region, central Canton politicians attacked the P-16 programme, based in north-eastern Switzerland, seeking to undermine it at federal level; the attitude towards the ongoing project remained cool.

After the second P-16 crash, for a time von Wattenwyl supported a suggestion by the KMF that the programme continue as a collaboration between FFA and F+W. But until the summer of 1958 Caroni refused to consider participation of F+W in the P-16, a move which might have silenced the Cantons; only when he realised his aircraft could be about to be cancelled did he agree to co-operation in principle.

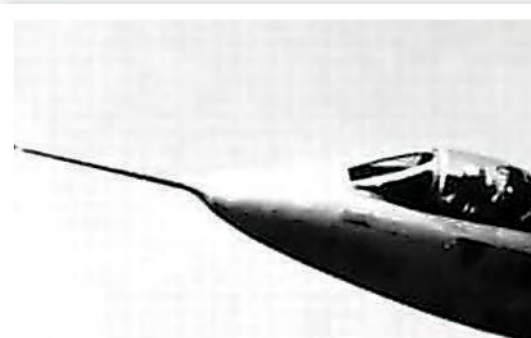
Private venture

Despite such serious setbacks and opposition, P-16 development continued on a private-venture basis. In July 1959 the fourth

example flew, bearing Swiss civil experimental registration X-HB-VAC and designated the Mk III. It was powered by an ASSa 7 Sapphire of 11,000lbs/thrust, and featured enlarged wingtip tanks each of 210 gal capacity. Its two underwing pylons could carry various stores: 500lb or 1,000 bombs; 68mm SNEB (*Société Nouvelle des Etablissements Edgar Brandt*) rockets; 80mm Hispano-Suiza rockets; or napalm tanks. The prominent instrument boom at the nose of previous examples was



The final P-16 was X-HB-VAD. It featured modified boundary layer splitter plates and sported four underwing stores pylons together with rocket rack attachment points. The wings received taper-rolled single skinning rather than the previous sandwich arrangement



The sleek P-16 could be armed with two nose-mounted 30mm Hispano-Suiza HS 825 cannon with 125 rounds per gun. It could also carry a ventral MATRA Type 1000 rocket launcher with forty-four 68mm rockets and four underwing pylons could carry 32 Hispano R 80 80mm rockets; eight 45lb bombs, four 1,000lb bombs or two 2,200lb bombs. The racks could also be used for four 100 Gallon napalm tanks; four rocket pods; four drop tanks or two reconnaissance cameras

dispensed with, and a smaller version added at the port wing tank.

X-HB-VAC was flown mainly by Ing Hans Bardill, who'd worked on the P-16's hydraulic system at the Federal Proving Institute and also happened to be a jet fighter pilot in the SAFAAC reserve. During its evaluation X-HB-VAC achieved a speed of Mach 0.92; under manual control only, it still managed some aerobatics, a speed of more than Mach 0.8 and normal landings.

The final P-16 was X-HB-VAD, also a Mk.III. It featured further-modified boundary layer splitter plates, and sported four underwing stores pylons together with rocket rack attachment points. The wings received taper-rolled single skinning rather than the previous sandwich arrangement. X-HB-VAD first flew in March 1960; carrying external stores weighing in at 5,700lbs, it was found take-off runs from grass averaged 3,400ft. Like the first Mk.III, X-HB-VAD completed its test programme successfully.

Hopes dashed

In the light of the favourable trials, for a time FFA hoped for overseas sales or licence deals. X-HB-VAC acted as a demonstrator, wearing a camouflage scheme combined with a red fin. Some interest came from Japan, Mexico, Portugal, Spain and West Germany but never commitment. Exporting proved an impossible nut to crack when FFA's own country had walked away, and with no proven manufacturing or support capability for the type.



The rear end of J-3001 during testing. The aircraft was powered by the Armstrong-Siddeley Sapphire ASSa.6 turbojet

FFA also sought further evaluation by the Swiss, but in June 1960 Defence Minister Chaudet responded: "Procurement whatever the results of the new testing ... cannot be considered any more." With the programme's end perished the company's projected P-16 Mk.III with a reheated Sapphire, a Mk.IV powered by a Rolls-Royce RB.146 of 13,200lbs/thrust, a two-seat trainer version and rocket assistance for take-off.

By the mid-1960s though, the design had been acquired by Aktiengesellschaft Für Flugzeugunternehmungen (Corporation for Aircraft Companies), a development of FFA also based at Altenrhein. Three paper P-16 developments emerged, all with new engines: the SNECMA Atar 9C-powered AA-7 giving 13,200lbs/thrust with afterburning, the AJ-7 employing a 15,800lbs/thrust General Electric J79-GE-11A, and a Rolls-Royce RB.168-25 variant producing 13,000lbs/thrust. However, these ideas came to nothing, and today the only direct reminder of the P-16 is X-HB-VAD, safely preserved at Dübendorf's Flieger Flab Museum.

Inspiring the Lears

But the story didn't end there. The P-16 had come to the attention of William Powell Lear, the brilliant self-taught American electrical engineer and industrialist. Lear's son, William P Lear Jr was an experienced piston and former USAF jet pilot; by 1956 both men happened to be domiciled in Geneva. In March 1960, seeking an independent evaluator to fly the P-16, FFA invited Bill Lear Jr to Altenrhein.

Of his experience, Lear Jr said: "I had the time of my life because the P-16 was such a joy to fly." Father and son talked; at the time William owned the Swiss American Aircraft Corporation based in Zürich, busy drafting an executive twinjet named the SAAC-23. William contacted Claudio Caroni, and FFA agreed to work on the SAAC-23 prototype using a team led by Hans Stüder. But progress at FFA was too slow for Lear Snr's liking. He moved the



Today P-16 X-HB-VAD is in the custody of the Flieger Flab Museum at Dübendorf, near Zürich

Krisztian Gazo/krisztianfotol.blogspot.com via Pete London

enterprise to Wichita, Kansas, establishing the Lear Jet Corporation. In October 1963 Lear Jet 23 prototype N801L took to the skies, marking the onset of a truly iconic marque.

The Lear Jet 23 bore marked similarities to the P-16 around its wing profile, its multi-spar wing structure and the permanently attached wingtip fuel tanks. At times it has been cast as an adaptation of the P-16, but those links have been overstated. Krüger flaps and drooped ailerons were discarded, trailing-edge flaps confined to the wings. The Lear Jet's fuselage, powerplants and tail, of course, were all-new.

Of the P-16 itself, there is no doubt Bill Lear Jr loved it. "I marvelled at how Dr Stüder, a non-pilot, could have possibly contrived the astonishing control harmony this aircraft possessed. Having flown a number of jet fighters ... I can unequivocally state that the P-16 was the finest, strongest, safest and best performing jet fighter, in its class, that I have ever been privileged to pilot." ●

SPECIFICATION FFA P-16 MK III



Crew	1
Length	47ft 0in (14.33m)
Height	14ft 0in (4.27m)
Wingspan	36ft 7in (11.15m)
Wing area	323sq ft (30.00m ²)
Empty Weight	15,500lb (7,037kg)
Max Take-Off Weight	25,800lb (11,713kg)
Max Cruise Speed	604kts (694mph/1,118km/h)
Ferry Range	899 miles (1,447km)
Service Ceiling	46,000ft (14,000m)
Powerplant	One Armstrong Siddeley ASSa.7 Sapphire turbojet (11,000lb/thrust)
Armament	Two nose-mounted 30mm Hispano-Suiza HS 825 cannon; ventral MATRA Type 1000 rocket launcher and four underwing pylons
First Flight	April 25, 1955

Artwork: Andy Hay / www.flyingart.co.uk



Airbus A380 Special



This 100-page special magazine from the team behind Airliner World celebrates the first ten years of the world's largest passenger airliner – the Airbus A380. Taking readers behind the scenes to the A380 production line, inside the aircraft's most luxurious cabins and onto the hangar floor to reveal the work of maintenance specialists. Special magazine, 100 pages.

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XV226 was the first production Nimrod MR.1 and performed its maiden flight on June 28, 1968. The aircraft was later converted to MR.2 standard and was one of the last Nimrods to fly when it arrived for preservation at Bruntingthorpe, Leics on April 27, 2010

NIMROD vs POSEIDON

With increasing rumours that the much-missed Hawker Siddeley Nimrod may be replaced in RAF service by the Boeing P-8 Poseidon, Sebastian Morgan compares and contrasts two generations of maritime patrol aircraft



The US Navy plans to operate 117 Boeing P-8A Poseidon aircraft. Will the RAF also acquire the type? Boeing

By the early 1960s RAF Coastal Command's need to replace its ageing Avro Shackleton MR.2/3 maritime aircraft was becoming ever more desperate and in July 1963 a request for proposals was issued to the aviation industry.

Among the companies interested in the contract to provide a fleet of "sophisticated jet aircraft to replace the Shackleton by 1972" was Hawker Siddeley (HS), which launched a feasibility study in October of that year.

By April 1964 the company was ready to submit its HS.800 long-range maritime patrol

aircraft, which was based on the HS.121 Trident airliner. However, just two months later the Ministry of Supply issued an amended requirement calling for a cheaper and more rapid replacement for the Shackleton.

Trident to Comet

This new requirement led HS to abandon the Trident plan and start work on the HS.801 aircraft, which was based on the de Havilland Comet 4C. The new design was ready to be submitted in July 1964 and an initial order for the 'Maritime Comet' was placed in February 1965. Almost a year later a fixed-price

contract was placed for 38 examples, by now dubbed the HS Nimrod MR.1.

The aircraft were to fulfil a variety of roles, including maritime patrol and search and rescue duties as well as seeking out Soviet ships and submarines.

Prototypes

Two prototypes were constructed using incomplete Comet airframes as their basis – these would be the only Nimrods to contain original Comet airframes as all subsequent machines would be completely built from scratch.

The Comet airframe was heavily modified to include a 'double bubble' pressurised fuselage complete with a weapons bay capable of deploying torpedoes, mines, bombs and other stores. The aircraft also gained a bulbous nose to house radar systems, a Magnetic Anomaly Detector (MAD) boom at the rear (used to detect submarines) and a variety of Electronic Warfare sensors on a redesigned tailplane.

The first two aircraft – the Rolls-Royce Spey-powered XV147 and the Rolls-Royce Avon-powered XV148 – were assembled at Hawker Siddeley's Woodford site and XV148 became the first example to fly when it took to the skies on March 23, 1967. XV147 followed just eight days later:

Spey power

The Spey was found to provide better fuel efficiency compared to the Comet's original Avon engines, particularly at low altitudes where Nimrod would spend the majority of its time.

The Spey was also in use in the BAC One-Eleven, HS Buccaneer and newly delivered Phantom fleet (and in turbo-shaft form in a number of ships) but the variant chosen to power the Nimrod was the RB.168 Mk 250 producing 12,160lbs/thrust each.

In fact, the aircraft was found to have such a surplus of power that it became common practice to shut down two engines after take-off and 'loiter' on the remaining pair to conserve fuel.

Into service

The first production Nimrod MR.1 (XV226) performed its maiden flight on June 28, 1968 and was delivered to Boscombe Down for trials and development work; as did the next three aircraft that followed it off the production line.

The honour of being the first aircraft in operational service therefore fell to XV230, which was delivered to 236 OCU at RAF St Mawgan, Cornwall on October 2, 1969. Six weeks later, on November 27, XV230 flew in formation with nine Shackletons to mark the disbandment of Coastal Command and the



Nimrods on the Hawker Siddeley production line near Chester

creation of 18 Maritime Group as part of the newly formed RAF Strike Command.

Operational

Less than a year later the Nimrod detected its first submerged Soviet nuclear submarine – a role it would continue to fulfil until its final days.

The aircraft proved itself incredibly capable and this was ably demonstrated during the regular Fincastle Trophy competitions, which tested British, Australian, Canadian and New Zealand Air Force

**"136 survivors
were plucked
from the water"**

crews in anti-submarine warfare, anti-surface warfare, intelligence and surveillance gathering roles. The competition was held 36 times between 1971 and 2008 and the Nimrod won the event on 15 occasions!

In fact the aircraft was deemed to be such a success that an additional eight airframes were ordered in January 1972.

Cod Wars

A year later, in 1973, the Nimrod got its first taste of semi-hostile operations during the so-called 'Cod Wars.' The dispute between



Whereas the Poseidon has just five crew stations the Nimrod, seen here, could accommodate up to 13 crew members

Britain and Iceland over fishing rights saw Nimrods protect the British fleets by keeping an airborne watch on the North Sea waters.

Other missions included anti-piracy patrols of the Straits of Malacca and Operation Back Scratch in which they calibrated the chain of listening devices laid on the ocean floor to track Soviet submarines.

SAR

While it was famed for its anti-submarine warfare role the Nimrod equally earned its 'Mighty Hunter' nickname during Search and Rescue (SAR) missions.

The first SAR mission was flown by 201 Sqn in November 1971 and from that point



Nimrod MR.1s on the dispersal at RAF Kinloss in the 1970s. XV262, in the foreground, was scrapped in 1992 after being converted as part of the stillborn AEW.3 project. XV251 (left) was scrapped at Woodford in 2011 after being converted to MRA.4 standard and XV236 (right) was scrapped at Boscombe Down in 2009



Flight test crew (L-R) Martin Garland, Edward Hartley, Bill Else, Jimmy Harrison and Jack Haddock pose with XV226 during her pre-service evaluation



Nimrod MR.2 XV250, seen here in the 1970s, served the RAF until April 2010 when it was delivered to the Yorkshire Air Museum at Elvington



At low levels the Nimrod could shut down two engines to reduce fuel burn. Here XV235 cruises over the Scottish coast in 1992. The aircraft was later scrapped, although its fuselage remains in storage at RAF Scampton

forward at least one Nimrod would be on a '24/7' one-hour standby to launch in support of missing airmen, seamen, walkers or anybody in distress – be they military or civilian and regardless of nationality.

Perhaps the most famous of these missions occurred on August 14, 1979 when 23 of the 300 yachts involved in the Fastnet race were sunk after being struck by Force 11 storms.

Nimrods took part in what was then the largest peacetime rescue operation ever staged by locating survivors then dropping inflatable dinghies, rations and clothing to protect them until a rescue craft could reach them. In total 136 survivors were plucked from the water.

Upgraded

By 1975 it had been decided that the Nimrod needed an upgrade and the first of the MR.2 standard aircraft (XV236) flew on February 13, 1979. The upgrade was mostly to the navigation and attack systems and

included Searchwater radar and a fifty-fold increase in computing power compared to the MR.1.

The first Nimrods (MR.1s XV244 & XV258) to take part in Operation Corporate (the code name given to the British military campaign in the Falkland Islands) arrived at Ascension Island on April 6, 1982 and two MR.2s arrived a week later.

Probed & armed

It soon became obvious that even the Nimrod's impressive range was insufficient in the vast South Atlantic and the lack of air-to-air refuelling capability was going to severely restrict the type's operability in the conflict.

As such a 'Heath Robinson' conversion

process saw XV229 used as the prototype MR.2P (P for Probe). The programme saw an in-flight refuelling probe mounted atop the fuselage and attached to standard fuel bowser hoses that were routed via the cockpit escape hatch, under the floor beneath the crew seats and then connected to the main fuel tanks close to the galley in the rear of the fuselage!

An equally improvised system allowed the Nimrod to carry (and launch) the AIM-9 Sidewinder air-to-air missile, with

XV232 the first aircraft cleared to do so on March 28, 1982.

During the Falkland War the Nimrod flew a total of 111 missions and XV232 set a record for the longest-distance operational mission ever recorded when it flew 8,453 miles in 19 hours 5 minutes.

Recce Nimrod

The aircraft's abilities were not lost on the reconnaissance world and in 1974 a trio of Nimrod R.1 'spy-planes' replaced the Comets in service with 51 Sqn.

The R.1 variant differed from the MR.2 by having no MAD boom. It did, however, have a myriad of sensors in a tailcone and beneath the wings. The fuselage housed all manner of listening devices and top-secret equipment.

In 1977 the Nimrod was also chosen to fulfil the RAF's requirement for an Airborne Early Warning (AEW) aircraft to replace the Shackleton AEW.2. British Aerospace was to convert eleven Nimrods into AEW.3 variants with GEC Marconi radars in a bulbous nose and tail. However, the project was plagued by cost over-runs and computer problems and the AEW.3 was cancelled in December 1986 and the RAF eventually received seven Boeing E-3 Sentry aircraft instead.

Nimrod 2000

The Nimrod MR.2P and R.1 would see service in Gulf War 1 (Operation Granby) spotting enemy ships and carrying out

"XV232 flew 8,453 miles in 19 hours 5 minutes"

SAR duties – as well as flying missions over Bosnia, Gulf War 2 and Afghanistan.

However, as early as 1993 the first moves were made to try to source a Nimrod replacement and no less than 17 contractors registered interest in Air Staff Requirement 420 to provide the next generation of RAF Maritime, Reconnaissance and Attack aircraft.

Contenders included the Dassault Atlantique 3, the Lockheed Orion 2000 and the BAe Nimrod 2000 while the option of upgrading the existing MR.2s was also considered.

In the late 1970s trials began to investigate the best camouflage for the Nimrod fleet. After experimenting with Dark Earth the scheme was soon 'toned down' to a more hemp-like colour that was considered to best hide the aircraft over the sea and on the concrete ramps at their bases. The scheme was later toned down yet again and some aircraft were painted grey prior to their retirement. This is XV254, which was eventually scrapped at Kinloss and the fuselage sent to the Inverness Museum in 2010





Nimrod MR.2P XV232 taxis in at RAF Kinloss in March 1997. During the Falklands War it set a record for the longest-distance operational mission ever recorded when it flew 8,453 miles in 19 hours 5 minutes. The aircraft was also the first to be converted to carry the AIM-9 Sidewinder missile. Today it can be found at AIRBASE at Coventry Airport Crown Copyright

Above right: While it was famed for its anti-submarine warfare role the Nimrod equally earned its 'Mighty Hunter' nickname during Search and Rescue (SAR) missions

In mid 1996 the Nimrod 2000 (later dubbed the MRA.4) was chosen for the role and an order for 21 airframes was placed.

The aircraft used the existing MR.2 fuselages which were refurbished before being fitted with new, larger wings and Rolls-Royce BR710 turbofan engines. The avionics, cockpit and electronic suites were also to be modernised and new radar systems were fitted.

The project suffered many delays, disputes and cost increases and the order was gradually cut to just nine aircraft by the time the first production aircraft flew on September 10, 2009.

Tragedy

By this time the Nimrod had already suffered its darkest day. On September 2, 2006, MR.2 XV230 exploded in mid-air over Afghanistan killing all 14 crew members.

The following May the MoD admitted that 25 fuel leaks had been recorded on the fleet in the previous six months and on December 4, 2007 the Board of Inquiry report into the loss of XV230 blamed problems with the improvised refuelling



system that dated back to the Falklands War.

A subsequent government-led investigation (the Haddon-Cave report) into the loss of XV230 was damning and on March 31, 2010 it was announced that the Nimrod fleet was to be phased out a year early in an attempt to save £1.9 million in running costs.

Within weeks it was announced that the MRA.4, scheduled to replace the MR.2, was further delayed and the UK would suffer a 'capability gap' of two years.

Axed

The first MRA.4 (ZJ514) was handed over to the RAF at Kinloss on March 10, 2010 and it was envisaged that the type would be operational by the end of 2012. However, on October 19, 2010 the UK government announced the cancellation of the MRA.4 and the closure of RAF Kinloss.

Although they had originally been due to retire in March 2011, the small fleet of Nimrod R.1s soldiered on for a few extra months as an essential part of Operation *Ellamy* (over Libya). The last example was retired on June 28, 2011, bringing to an end more than 40 years of Mighty Hunter operations.

The MRA.4 may have been over budget and overdue, but with no replacement aircraft available, Russian submarines now had free rein to ply their trade in UK waters.

Half a decade later nothing has changed... But rumours are rife that the Boeing P-8 Poseidon could soon join the ranks of RAF aircraft.

US Navy requirement

The Poseidon traces its history back to a 1980s requirement for a replacement for the US Navy's Lockheed P-3 Orion – which is based on the L-188 turboprop powered airliner and has been in service in the maritime patrol role since 1962.

Lockheed proposed an upgraded Orion (the P-7) as a successor and a contract was awarded in 1988 but two years later the deal fell through when the project was already \$300 million over budget. The US Navy highlighted "Lockheed's inability to make adequate progress toward completion of all contract phases."

The hunt for an Orion replacement restarted in 2000 and this time Lockheed



During the 1982 Falklands War it became obvious that the Nimrod's range was insufficient to cover the vast South Atlantic. As such the aircraft were modified with an in-flight refuelling probe mounted atop the fuselage and attached to standard fuel bowser hoses that were routed via the cockpit escape hatch, under the floor beneath the crew seats and then connected to the main fuel tanks close to the galley in the rear of the fuselage



US Navy P-8A Poseidons roll down the production line at Boeing's Seattle facility Boeing



A US Navy P-8A lifts off from Seattle on its maiden flight. This aircraft carries the US civilian registration N392DS for flight testing Boeing

A P-8A Poseidon from VX-20 performs for the cameras during a test flight showing its Boeing 737 ancestry to great effect *US Navy*



Marin submitted the Orion 21 variant. Competing against it was a Boeing proposal based upon the 737-800 airliner and the BAE Systems Nimrod MRA.4.

Technology demonstrator

Boeing built a 737 BBJ2 (Boeing Business Jet) technology demonstrator aircraft complete with two functional mission system consoles to demonstrate the capabilities of the aircraft and its systems.

In December 2003, the aircraft completed a tour of US Navy bases and naval air

“US Navy aircraft deployed to airshows were notable for having UK crew members”

stations in Brunswick, Maine, Jacksonville, Florida, Norfolk, Virginia, Kaneohe, Hawaii and Whidbey Island, Washington where it gave demonstrations including maximum power take-offs and climbs to 41,000ft and tactical manoeuvres at an altitude of just 200ft!

BAE Systems had already withdrawn from the competition in late 2002 and, in light of past experience with Lockheed, it was unsurprising that Boeing was announced as the winner in May 2004.

Poseidon

Based upon the Boeing 737-800 airliner, but using the wings from the 737-900, the new P-8 Poseidon has a strengthened fuselage and Boeing 767-400ER-style raked wingtips. In order to power the additional on-board electronics, the aircraft has an electric generator on each engine – this requiring the redesign of the nacelles and their wing mountings.

The P-8's electronics feature the Raytheon APY-10 multi-mission surface search radar but unlike the Orion and the Nimrod, it lacks a magnetic anomaly detector (MAD). This is partly due to its higher operational altitude but also an attempt to reduce weight to improve endurance and range. Instead, the aircraft carries hydrocarbon

sensors that detect fuel vapours from diesel-powered submarines and ships.

Inside the cabin are five operator stations; these being mounted in a sideways row along the port side of the cabin.

A small bomb bay carries torpedoes and other weapons stores and is located aft of the wing, which itself has hardpoints for carrying air-to-surface missiles.

The aircraft is also equipped with the High Altitude Anti-Submarine Warfare Weapon Capability Air Launch Accessory (HAAWCALA) that turns a Mark 54

torpedo into a glide bomb that can be deployed from up to 30,000ft.

The P-8 has two CFM International CFM56-7B27A high-bypass turbofan engines and can cruise at high altitude at nearly 500kts and loiter at just 180kts and 200ft.

The P-8 cannot currently use the US Navy's typical hose-and-drogue in-flight refuelling method (similar to that used by the RAF). Instead, it has a flying boom receptacle on the upper-forward fuselage that is compatible with USAF tankers. For extended endurance, six additional fuel tanks



A US Navy Poseidon crew taking part in the hunt for Malaysia Airlines Flight MH370. Unlike the Nimrod the Poseidon needs a crew of just five radar and systems operators *US Navy*

from Marshall Aerospace are housed in the forward and rear cargo compartments.

Prototype

Boeing began production of the first of five test aircraft in December 2007 and the first flight of the P-8A test aircraft was completed on April 25, 2009. The second and third examples had flown and were in testing by early August 2010 when the US government approved the type for 'low-rate production.'

Flight-testing continued apace and in October 2010 the aircraft released sonobuoys for the first time.

The first P-8A production aircraft was handed over to the US Navy on March 4, 2012 and immediately flew to NAS Jacksonville, Florida, for training with the Fleet Replacement Squadron and Patrol Squadron 30 (VP-30).

The Navy was impressed with the aircraft and in September of that year Boeing was awarded a \$1.9 billion order for eleven aircraft.

It is now expected that up to 117 P-8A aircraft are to be purchased by the US Navy to replace the fleet of 196 P-3C Orion maritime patrol aircraft which are approaching the end of their operational

A P-8A drops a sonobuoy during pre-service trials. The aircraft can carry the AGM-84H/K SLAM-ER and AGM-84 Harpoon missiles as well as torpedoes, bombs and HAAWCALA *US Navy*



lives. The type's initial operational capability (IOC) was achieved in November 2013.

In US Navy service the Poseidon fleet will be complemented by around 40 Northrop Grumman MQ-4C Triton unmanned aerial vehicles (UAVs). These will provide continuous 'Broad Area Maritime Surveillance'

Into service

Boeing had delivered a total of 21 P-8A aircraft to the US Navy as of January 2015. The Poseidon made its operational debut in February 2012 when aircraft took part in Exercise *Bold Alligator 2012*. Two months later the aircraft deployed to the UK to take part in Exercise *Joint Warrior* flying out of RAF Lossiemouth.

Other aircraft from Air Test and Evaluation Squadron One (VX-1) have deployed to exercises in Hawaii and around the USA as well as Japan and the Pacific.

A second squadron, VP-5, completed its transition to the P-8 in August 2013 and a third (VP-45) started to convert onto the type in July 2013.

The aircraft's first flights 'in anger' occurred in mid-2014 when two Poseidons were



The first Indian Navy P-8i performs its maiden flight in July 2012. India has ordered eight aircraft – will the British government follow suit? Boeing

deployed to Australia to take part in the international search for the missing Malaysia Airlines Flight 370.

During August 2014 the type had its first 'run in' with aggressive forces when a People's Republic of China J-11 fighter allegedly came within 30ft of a P-8 in international airspace around 135 miles east of Hainan Island. The Chinese jet reportedly performed a barrel roll in the vicinity of the Poseidon!

Indian P-8i

Marketed as a 'multi-mission maritime aircraft', the P-8 has been approved by the US Department of Defense for export to certain nations.

The first nation to express interest in the type was India, which requested a customised variant of the P-8A for its Navy. The P-8i variant differs from the US Navy aircraft in having a Telephonics APS-143 OceanEye aft radar and a magnetic anomaly detector and in January 2009 India's Ministry of Defence signed a US\$2.1 billion agreement to buy eight airframes to replace the Indian Navy's ageing Tupolev Tu-142Ms.

Four additional aircraft were added to

SPECIFICATION HAWKER SIDDELEY NIMROD MR.1



Crew	13
Length	126ft 9in (38.65m)
Height	31ft 0in (9.14m)
Wingspan	114ft 10in (35.00m)
Wing Area	2,121sq ft (197.05m ²)
Empty Weight	86,000lb (39,009kg)
Max Take-Off Weight	192,000lb (87,090kg)
Max Speed	500kts (575mph/923km/h)
Service Ceiling	44,000ft (13,411m)
Ferry Range	5,755 miles (9,265km)
Powerplant	Four Rolls-Royce Spey turbofans (12,160lb/thrust each)
Armament	Underwing pylons and internal weapons bay capable of carrying 20,000lbs of bombs, torpedoes or depth charges
First Flight	May 23, 1967

the order in late 2010 and the first P-8i took to the skies in July 2012. The aircraft was delivered to India in December of the same year and six examples have so far been delivered. The jets are based at INS Rajali, in Tamil Nadu and, like the US Navy examples, were involved in the search for Malaysia Airlines Flight MH370.

Exports

Australia has also selected the P-8 Poseidon to replace its fleet of Lockheed AP-3C Orions, which are due to retire in 2018. It is thought the first of eight P-8s should enter RAAF service in 2017 and the nation has options on four further aircraft. The Australian aircraft will be optimised to carry the integration AGM-84 Harpoon Block 1G anti-ship missile.

Italy has indicated interest in purchasing the Poseidon and media reports in Norway suggest the Norwegian Navy is also looking at the possibility of leasing the aircraft directly from Boeing to replace its six P-3 Orions.

SPECIFICATION BOEING P-8A POSEIDON



Crew	9
Length	129ft 5in (39.47m)
Height	42ft 1in (12.83m)
Wingspan	123ft 6in (37.64m)
Wing Area	291sq ft (27.03m ²)
Empty Weight	138,300lb (62,730kg)
Max Take-Off Weight	189,200lb (85,820kg)
Max Speed	490kts (564mph/907km/h)
Service Ceiling	41,000ft (12,496m)
Ferry Range	2,761 miles (4,444km)
Powerplant	Two CFM56-7B turbofans (27,000lb/thrust each)
Armament	Five internal and six external stations for AGM-84H/K SLAM-ER and AGM-84 Harpoon missiles, mines, torpedoes, bombs and HAAWCALA
First Flight	April 25, 2009

British order?

But what of the United Kingdom, which has been lacking a maritime patrol aircraft since the premature retirement of the Nimrod?

US Navy aircraft deployed to airshows at Waddington and Farnborough in 2014 were notable for having UK members of crew and in recent months news reports about potential orders have become ever more prevalent.

Any order is expected to come after the next Strategic Defence and Security Review with perhaps up to 12 aircraft likely to join the RAF.

Reports suggest up to £2 billion is likely to be allocated to maritime patrol aircraft – which of course is great news. However, one cannot help but wonder how much money could have been saved if the Nimrod MR.4 had not been scrapped so close to its in-service debut – and after a reported £3.6 billion had been expended on the project... ●



A US Navy P-3 Orion escorts the first P-8 Poseidon on its arrival at Pax River. The Poseidon will replace the Orion in service US Navy





NEXT ISSUE

COMING UP IN THE SEPTEMBER/OCTOBER 2015 ISSUE OF *JETS*



TAMING THE BIG CAT

Dave Unwin tries his hand at ground attack in a 6 Sqn SEPECAT Jaguar

Canada's Voodoos

The McDonnell CF-101 Voodoo served the Canadian Armed Forces for more than 20 years. Robbie Shaw looks at the development and service life of the all-weather fighter interceptor



Don Spering via Robbie Shaw

Advanced Tactical Fighter

Twenty five years on from the maiden flights of the Northrop/McDonnell Douglas YF-23 and the Lockheed YF-22, Kimberley Hawkins looks back at the USAF's Advanced Tactical Fighter competition



USAF



BAC via Brooklands Museum

Europlane

In the mid 70s the British Aircraft Corporation proposed a collaboration with Messerschmitt Bolkow, Saab and Casa to develop a new series of quiet STOL airliners. Richard Payne investigates the 'Europlane' project



Yakovlev's First Jet Fighters

Pete London looks at the Yak-15, Yak-17 and Yak-23 – three of the Soviet Union's first successful jets



Caz Caswell

Special Performance

As the short-bodied Boeing 747SP (Special Performance) marks its 40th anniversary, we look back at the life of the 45 'dumpy jumbos' built from 1975 to 1989

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