

CENTENARY OF POWERED FLIGHT

124-PAGE SPECIAL SOUVENIR ISSUE

HISTORY IN THE AIR

www.aeroplanemonthly.com

AEROPLANE

WIN
Classic Films
on Video
& DVD

USA \$7.95 Canada C\$10.25 (GG70382)

DECEMBER 2003 £3.95



How it all began...

The Wright Flyers

in detail PLUS cutaway
and scale drawings

DATABASE

100 GREAT AIRCRAFT

ALSO IN THIS ISSUE:

- A Century of Air Films
- Reno Air Races
- Anson pilot
- Bristol Brabazon
- Preservation Pioneers
- Sir George Cayley



PLUS: LATEST NEWS ■ FLYING THE HURRICANE ■ TRAINING THE FEW



from the Editor

DAN PATTERSON photographed the Wright 1903 Flyer, which is preserved in the National Air and Space Museum in Washington DC, as part of his *AeroPlane* Century book project with Air Vice-Marshal Ron Dick (see www.flyinghistory.com). The Wrights' aircraft are the subject of this month's *Database* section

HOW TO CONTACT US:

EDITORIAL

Editor Michael Oakey (020) 7261 5846
 Assistant Editor Tony Harmsworth (020) 7261 5551
 Design Editor Tanya Caffrey (020) 7261 5668
 Sections Editor Nick Stroud (020) 7261 6401

General enquiries & back issues

Lydia Matharu (020) 7261 5849 • Fax (020) 7261 5269

e-mail: aeroplane_monthly@ipcmedia.com

Editorial assistance Philip Jarrett, Mike Hooks

Webmaster David Siddall

e-mail webmaster@aeroplanemonthly.com

ADVERTISING

Head of Sales Scott Caisley (020) 7261 5634

Advertising Manager Lee Morris (020) 7261 6459

Advertising Executive Dave Stone (020) 7261 6292

Advertising Executive Paul Mikhailoff (020) 7261 7299

Classified Ads (020) 7261 2739

For all insert sales - Innovator (020) 7261 7710

LI Management (020) 7261 7098

PUBLISHING AND MARKETING

Publishing Director Hamish Dawson

Publisher Fiona Mercer (020) 7261 7261

Marketing & Promotions Assistant

Thomas Borthen (020) 7261 7656

International Editions Srinilya Nawalkar +44 (0)20 7261 7082

e-mail srinilya_nawalkar@ipcmedia.com

READER SERVICES

Back issues (020) 7261 5849

Subscription enquiries +44 (0) 845676 7778/

e-mail ipcsubs@qss-uk.com

Aeroplane Monthly

King's Reach Tower, Stamford St, London SE1 9LS

Internet: www.aeroplanemonthly.com

Published on the first day of the month preceding coverdate by IPC Media Limited, Distributed by Markonforce (UK) Ltd, 5th Floor, Low Rise Building, Kings Reach Tower, Stamford Street, London SE1 9LS. ©IPC Media Ltd 2003. ISSN 0143-2240.

Periodicals postage is paid at Rahway, NJ. USA distribution by Mercury VMD. Postmaster: please send address corrections to *Aeroplane* Monthly, c/o M.A.I.L. America, 365 Blair Rd, Avenel, New Jersey NJ 07001.

While every care will be taken with material submitted to *Aeroplane*, no responsibility can be accepted for loss or damage. Opinions expressed in this magazine do not necessarily reflect those of the Editor.

Origination by Graphics Kent Ltd, 2-4 Powerscort Rd, Sidcup, Kent DA14 5DT. Printed by Polestar Chantry Ltd. Covers printed by CSM Impact Ltd.

Aeroplane® is a registered trademark of IPC Media Ltd

©IPC MEDIA LTD, 2003

This periodical must not, without the written consent of the publishers first being given, be lent, sold, hired out or otherwise disposed of in a mutilated condition or in any unauthorised cover by way of trade or otherwise or as part of any publication or advertising literary or pictorial matter whatsoever.



ABOVE There's a Wright way and a wrong way . . . the little-known Mines biplane, seen at the Doncaster aviation meeting in 1909, was not a success. It did, however, attract the nickname "the coffee stall", owing to its rather awning-like forward elevator.

The Whole Story

SOME PEOPLE MAINTAIN THAT, if you cannot say something positive about a subject, then you should say nothing at all. Well, up to a point. My view of aviation history — and aircraft preservation, for that matter — is that the mistakes and the cock-ups are an important and often colourful part of the full story. Aviation, with all its romance and risk, is an unforgiving activity, and learning about the failures simply throws the many successes into even sharper relief.

This good/bad balance is one theme in this special issue of *Aeroplane*. On the serious side, our *Database* section shows how the Wright brothers made their masterful leap into the air, but failed to achieve dominance of the aviation industry; on the less serious side, our "100 great aircraft" feature shows some great foul-ups as well as great triumphs.

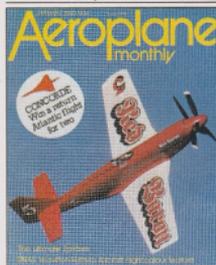
Michael Oakey

Michael Oakey - EDITOR

Want to subscribe? Call 0845 676 7778



AEROPLANE, JANUARY 1980



Launched as a monthly magazine in 1973 by Richard T. Riding (Editor until 1998), *Aeroplane* traces its lineage back to the weekly *The Aeroplane*, founded by the legendary C.G. Grey in 1911 and published until 1968.



REGULARS

4 NEWS

Preservation news, with Tony Harmsworth

14 LOST AND FOUND

Philip Jarrett asks about odd markings on a D.H.9A

17 CONTACT!

Paul Coggan comments on preservation

18 SKYWRITERS

Readers' letters on a wide variety of topics

21 FLYING VISIT

A potted interview with Old Rhinebeck engineer and display pilot Ken Cassens, by Melynn Hiscock

37 PICTURE OF THE MONTH

This month's photograph features a delectable Hawker Hunter 

91 LOOKING BACK

Nick Stroud browses in *The Aeroplane* of 50 years ago

92 HIGH SOCIETY

The Farnborough Air Sciences Trust

120 CROSSWIND

Columnist John Maynard wraps up our special issue

FEATURES

22 IN THE EYE OF THE HURRICANE

Flying a Hawker Hurricane is very different from a Mustang or Corsair — as American warbird pilot Bruce Lockwood found out when he first tried it

28 PERSONAL ALBUM

Previously-unpublished pictures of Bristol's Brabazon

30 FIVE HUNDRED MILES PER HOUR

Michael O'Leary reports from the Reno Air Races

32 TRAINING THE FEW

Sir Arthur Marshall opens our special Centenary of Powered Flight section by describing how he and his company tackled the severe shortage of RAF pilots at the start of World War Two

38 100 YEARS, 100 AIRCRAFT

A special Centenary selection of the world's fastest, most beautiful, ugliest, most dangerous ...

46 82 YEARS OF AVIATION MEMORIES

John Stroud, the elder statesman of aviation writing, looks back on a long aeronautical life

77 A CENTURY OF ... AVIATION FILMS

A survey of 100 years of aircraft and aviators in the cinema, by Alan Smithie ...

83 FILM QUIZ

... and a chance to test your knowledge and win prizes

86 PRESERVATION PIONEERS

David Ogilvy recalls the 1950s Vintage Aeroplane Club

93 INVENTOR OF THE AEROPLANE

Dr John Ackroyd on Sir George Cayley and his work

99 FROM THE (FIRST) EDITOR

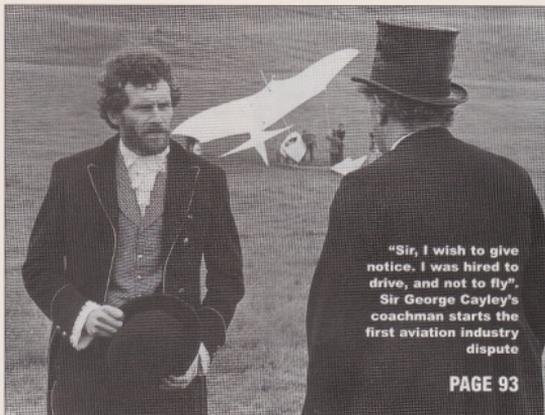
In 1953 C.G. Grey looked back on 50 years of flying

100 PEACE & WAR

Dopey Edwards DFC continues his recollections of flying in the RAF in the lead-up to World War Two

Contents

December 2003 Vol 31 No 12 Issue No 368 (on sale November 1)



"Sir, I wish to give notice. I was hired to drive, and not to fly".
Sir George Cayley's coachman starts the first aviation industry dispute

PAGE 93

22 IN THE EYE OF THE HURRICANE

EDITOR'S CHOICE



Celebrate the Centenary of Powered Flight with *Aeroplane* — this issue contains a special section of features to mark the Big Day on December 17. But it's not all Wright Brothers: we look at a wide range of the aircraft and people that have made the first century of aviation

PAGES 32 TO 99



Does it qualify as one of the world's 100 most beautiful aircraft? Or most dangerous?

PAGE 38



"Get off your horse and SUBSCRIBE!"

To subscribe quickly and easily, telephone 0845 676 7778 or take advantage of our secure online ordering service at www.aeroplaneonthly.com. And then turn to page 83 of this issue, where you could win famous aviation films in our fiendish Film Quiz



Flying the Hurricane — from an American perspective
PAGE 22

RIGHT Join the RAF and see the world — trainees at Cambridge in World War Two
PAGE 32



100
YEARS OF
FLIGHT
1903-2003



LEFT Hotter than ever — see our picture-report from this year's blistering Reno Air Races
PAGE 30

CAR STICKER COMPETITION

Be spotted anywhere in the UK with one of our stickers in your car and be a winner

This month's winning car registration number is

HK51 OWW

If this is your car registration*, congratulations! Please contact Tom Borthen, Room 2108, Kings Reach Tower, Stamford St, London SE1 9LS; tel 020 7261 7656
* You will need to answer a security question to identify yourself

NEED A STICKER?
If you missed out on a sticker with our January issue, write to Tom Borthen at the above address and you will be sent one free of charge



Database

COVER STORY

THE WRIGHT FLYERS

53 BEFORE THE AEROPLANE

US Air Force historian and early aviation specialist Dr Richard P. Hallion describes the lead-up to the Wright Brothers' incredible achievements

55 THE PATH TO POWERED FLIGHT

The Wrights undertook numerous experiments with kites and gliders between 1899 and 1903

57 THE DREAM TAKES FLIGHT

One of the greatest events in human history, the 1903 Wright Flyer made the first manned, sustained, controlled, powered flight at Kill Devil, North Carolina

60 CUTAWAY CENTRESPREAD

The historic 1903 machine and its engine in technical detail by Frank Munger PLUS evocative photographs by Dan Patterson of preserved and reconstructed Flyers

65 THE PRACTICAL AEROPLANE

After their initial success, the Wrights then had to start work on refining the aircraft for practical use

67 THE BATTLE FOR SURVIVAL

Dr Richard P. Hallion explains how the brothers began to lose their way in an increasingly competitive field

70 THE PASSING OF AN ERA

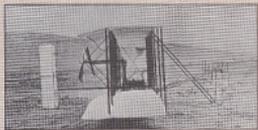
By 1916, the Wright company's designs were outdated — the Wrights' glory days had passed

72 WILD HORSES

Pilots' perspectives of the tricky Wright Flyers

74 SURVIVORS

What's left of the originals, and their whereabouts



LEFT The machine that changed the world forever — the Wright 1903 Flyer

Navigator

Just when you think it's all over...

Our Navigator section at the back of the magazine tells you all you need to know about what to buy and where to go:

105 Book & video reviews

107 Internet review

108 Reader offers

108 Information exchange

110 Airshows, events & Discovery

Wings TV highlights plus Competition 112 Arrivals

116 Next month in Aeroplane 117 Aeroplane services



Bf 109 and Hurricane for Canada

■ New collection gets former Santa Monica Museum of Flying fighters

CANADIAN ARCHITECT Ed Russell has purchased Messerschmitt Bf 109E Werknr 3579/NX81562, the world's only flying example, and Hawker Hurricane XII "P2970"/N678DP from California-based collector David Price.

Russell will base the historic fighters, along with his recently-acquired Spitfire IX, MK912/G-BRRA, at a new flying museum at Niagara South, only five minutes' flying time from the tourist "honeypot" of Niagara Falls.

The two fighters were previously displayed at the Santa Monica Museum of Flying. The Hurricane will soon be taken by road to Niagara from its current location at Camarillo, California, with the Bf 109, currently at Mojave, following on a crate in late November.

The deal that has taken the fighters north was set up by the Duxford-based Aircraft Restoration Company, who will be setting up a maintenance outpost at Niagara South to look after the new collection.



APRIL 10, 2003



Russell has also acquired Noordduyn-built Harvard IIB FE992/G-BDAM from Duxford.

Niagara South, once an operating base for the Fleet Aircraft Company, has long been disused. The old, mile-long runway is still intact, and two grass runways will be re-

commissioned. Other vintage aircraft are expected to gravitate to this new, working collection in due course.

Canada has not had an airworthy Hurricane since the Canadian Warplane Heritage's C-GCWH was lost in a hangar fire at Hamilton in 1993.

ABOVE Messerschmitt Bf 109E NX81562 and Hurricane XII N678DP over California in late 1999. **LEFT** Seen being dismantled at Duxford in September, Spitfire IX MK912 flew again in Canada on October 10.

Buffalo and Bantam for the Avidrome

THE DUTCH NATIONAL Aviation Museum has acquired the remains of three Brewster 439 Buffaloes, two of which have a Dutch East Indies history. The museum, which will open its new Avidrome complex at Lelystad on November 5, intends to build one complete aircraft from the parts.

The aircraft were discovered in Australia, and arrived in Holland via the USA. In early 2002 the Buffaloes were reported by a senior source at the Royal Air Force Museum to have



APRIL 10, 2003

been acquired for Hendon, but the deal subsequently fell through.

The two Dutch machines, B3-174 and B3-178, arrived in the Dutch East Indies in early 1942, but were too late

for combat, and were among 21 Buffaloes shipped to Australia before their base was overrun by the Japanese.

Another diminutive fighter, BAT FK.23 Bantam K-123, emerged from a 12½-year restoration with the Koolhoven Society at Amsterdam-Schiphol in August. The World War One Koolhoven-designed fighter flew at the 1919 Amsterdam air fair, and was bought from the Shuttleworth Collection in 1990 (see *Aeroplane*, April 1991). It will now go on display at the Avidrome.



APRIL 10, 2003

ABOVE BAT Bantam K-123 ready to go on display at Lelystad. **LEFT** A Brewster Buffalo wing after arrival in Holland.



APRIL 10, 2003

Public flock to see NAT

ON SEPTEMBER 24, 22 classic American aeroplanes arrived at Detroit's Willow Run airport to complete a 4,000 mile, 2½-week trip through 23 states on the 2003 National Air Tour. Organised by Minneapolis-based

Greg Herrick, the tour drew large crowds to the 25 stops made en route. One tour highlight was the September 21 flight over the Wright Brothers Memorial at Kitty Hawk (above). ■ Full report next month.



Battle of Leros Junkers salvaged from the Aegean



BELOW The Junkers breaks the surface on October 12, almost 60 years after ditching off the Island of Leros in the Aegean.

SCROLL The barnacle-encrusted Junkers is in pretty good shape. The centre engine was raised later.

ON OCTOBER 3 a crew from the Greek Air Force Mobile Diving Team raised a Junkers Ju 52 from Alinta Bay off the island of Leros, into which it had ditched 60 years earlier during the German airborne

assault on the island on November 12, 1943. The former Luftwaffe transport had lain at a depth of 42m (140ft), and the remains of an unfortunate German paratrooper who failed to

jump before the ditching were found on board. The machine is in good condition, and technicians from the Greek Air Force Museum are now preparing it for static restoration. It will ultimately go on show at the war museum on the island.

The Junkers was part of an airborne assault which saw 500 parachute troops dropped on Leros. Following the unconditional Italian surrender on September 3, the islands of the Eastern Mediterranean had become strategically vitally important to the Allies, so on September 16 the British occupied Leros.



Hitler then diverted Luftwaffe units from large parts of the Mediterranean to the Dodecanese group of islands, and early on November 12 a seaborne German invasion of

Leros was followed by heavy fighter-bomber attacks and the mass parachute drop. After four days of bitter fighting, Leros fell to the Germans on November 16.



ABOVE Parachute troops streaming from Ju 52s.

Cat makes it home to Oz

The Historic Aircraft Restoration Society (HARS) Consolidated PBY-6A Catalina VH-PBZ arrived at the society's base at Albion Park Airport, New South Wales, on Sunday October 5, nearly a month after setting out from Arcachon near Bordeaux. The PBZ had been stranded in France since sustaining damage on landing in June 2002. Among the problems encountered on the resumed ferry-flight were a shortage of suitable fuel and oil, bureaucratic difficulties in India, loss of avionics, thunderstorms over the Bay of Bengal, and 60°C heat in the Middle East. The PBZ will now be painted as one of the famous RAAF "Black Cats" which flew covert night operations in the South-west Pacific.



Fly a dragon to the edge of space

■ Thrill rides planned in a rocket-boosted two-seat Saab Draken in USA

WELL-HEELED thrill-seekers will soon have a new outlet for their adrenaline. At Mojave, California, Jet warbird owner Greg Forbes and pilot Skip Holm are completing design work on a two-seat Saab Draken which will be fitted with a rocket motor and offer rides to the edge of space.

At the Reno Air Races airshow in September, former Lockheed test pilot and Unlimited race winner Holm flew a single-seat Draken, also Forbes-owned, and said, "At first, I didn't really know what sort of routine I was going to do in the Saab. Each day I'd



try a few things and then ask spectators what they liked. By the Sunday, I had got it down to a pretty good routine. It's a very slick machine; it

will go supersonic faster than any other jet I have flown. With the nose pointed down and the motor at idle it will go supersonic. The double-delta

platform is similar to the F-16XL testbed, and the pilot's seat will recline 30°. It was way ahead of its time — we didn't get that until the F-16!

ABOVE Skip Holm flying Greg Forbes' single-seat SAAB Draken at the Reno air display.



Judging faux-pas over Corsair

GARY KOHS' GOODYEAR FG-1D Corsair N106FG, BuNo 92106, the winner of the Grand Champion Warbird Trophy at AirVenture 2003 at Oshkosh in July, lost out to a Piper L-4 Cub in the judging for the Rolls-Royce Heritage Trophy at Reno on September 14.

Spectators were mystified at the judges' decision, which seemed to take no account of the relative degree of difficulty involved in bringing the two projects to fruition. The Corsair was rebuilt over a 13-year period by John Lane's Airpower Unlimited at

ABOVE First air-to-air of Gary Kohs' FG-1D, off the California coast in late September.

Jerome, and is unanimously considered by the warbird community to be the best ever Corsair restoration.

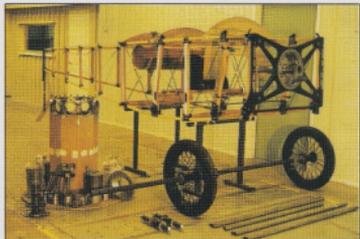
Spanish Jungmann for Old Warden



ABOVE CASA 1.131E G-RETA at Cranfield in 1996.

AS ONE GERMAN BIPLANE leaves Old Warden (see opposite page), another arrives, with the Shuttleworth Collection's acquisition of Spanish-built Bucker Jungmann G-RETA with funds raised by the Shuttleworth Veteran Aeroplane Society. CASA 1.131E E3B-305, superseded by the Spanish Air Force in the late 1970s, was imported to Britain as G-BGZC in 1979.

A Norwegian Baby is reborn



IN A WORKSHOP NEAR OSLO, construction of an airyworthy Sopwith Baby reproduction is now about 35 per cent complete, with a first flight expected sometime in 2006. The biplane is being built with reference to more than 100 drawings discovered in the archives of the Norwegian Naval Aeroplane Factory (NAF), and upon completion it will be operated by the Warbirds of Norway organisation.

The project was initiated by Rune V. Engen, who appointed Tommy Halden Jahr to head the construction team. Special tooling has been made to produce some parts, including engine mounts for the 110 h.p. Clerget rotary, for which a carburettor and oil pump are still required.

The Royal Norwegian Navy operated a total of 19 Babies from 1917, with the survivors finally being retired in 1931. As well as being operated on the floats normally associated with the type, the Norwegians flew Babies configured with either skis (below, seen in 1921) or wheels. Two Babies were modified by the NAF as side-by-side two-seaters and briefly used by the flying school at Horten. Only one original Baby, N2078, survives, in the FAA Museum at Yeovilton.



Last genuine WW1 German flyer grounded

THE SCHEDULED FINAL flying appearance of LVG C VI 7198/18 — the world's last genuine airworthy German First World War aeroplane — at the Shuttleworth Collection Autumn Air Day at Old Warden on October 5 was cancelled, reportedly due to the high cost of insurance. Those lucky to have been at the Shuttleworth Twilight Air Display on September 20 thus saw the reconnaissance biplane's last aerial appearance.

There is currently some debate as to the reason for the grounding of the aeroplane, but enquiries to the RAF Museum resulted in the following statement being issued: "The LVG was subject to a loan agreement between the RAF Museum (the owners) and the Shuttleworth Collection (the operators). The agreement was terminated by the Shuttleworth Collection. The aircraft will be transported to the RAF Museum's Conservation Centre at Cosford where it will receive elementary conservation and refurbishment. One of the



considerations high on our list will be the replacement of its painted lozenge fabric with authentic material. Subsequently it is planned to place the LVG on permanent exhibition at the

RAF Museum Hendon."

The Air Historical Branch presented the LVG to the Shuttleworth Collection on extended loan in 1959, restoration work beginning at Old Warden in 1965. Air

Commodore Allen Wheeler was at the controls for the first flight on September 28 1972. The LVG's fondly-remembered balletic "duels" with Shuttleworth's Bristol Fighter will be sadly missed.

ABOVE LVG C VI 7198/18 on its second-to-last flight on the morning of September 20. The picture was taken from Shuttleworth's Avro 504K, H5199.

Autumn projects keep ARCo busy

PRELIMINARY RESTORATION work is under way on rare, British-built Westland Lysander IIA V9312, acquired from Kermitt Weeks by the Aircraft Restoration Company (ARCo) at Duxford last spring. A survey of corrosion on the airframe has begun, and the wings are now installed in a jig.

Research into V9312's history has revealed that the Lysander was issued to 225 Squadron at Tilshead, Wiltshire, in April 1941, for use on Army Co-

operation work. The following month the squadron's Lysanders were flown on tactical and photo-reconnaissance sorties during a simulated invasion of the Weymouth area. In August 225 Sqn moved on to Thruxton, from where some Air-Sea Rescue sorties were flown.

After re-assignment to 613 Sqn at Doncaster in February 1942, V9312 was damaged in April, and following repair and storage was shipped to Canada in September and used as a



ABOVE An anonymous ex-South African Air Force Spitfire IX is currently being fitted out by ARCo.

trainer. After the war it was sold to a farmer in Assiniboia, Saskatchewan, from where it was recovered in the early 1970s.

Also underway with ARCo is a currently anonymous former South African Air Force Spitfire Mk IX, which is undergoing systems installation on behalf of a private owner. Tony DeBruyn's Former Luftwaffe Rockwell OV-10 Bronco G-BZGK has had its propeller units re-fitted following servicing, and engine

runs are due soon. After test flying, it is hoped that the twin-turboprop, twin-boom machine will join the show circuit in 2004.

Arriving at the adjoining Historic Flying Ltd workshop in late September was Spitfire VC JG891/G-LFVC. It was immediately placed into a fuselage jig, recently vacated by former Irish Air Corps Spitfire Tr.9 IAC161/G-CCCA, which is now having systems installed before fitment of its wings.

News in Brief

- **COMMEMORATIVE** Air Force Grumman FM-2 Wildcat N681S crashed near Ellington Field, Texas, on October 18, after an air-to-air photo session following the Wings over Houston airshow. Pilot William K. Johnson, 55, died.
- **BA's latest** Concorde disposal plans at time of press were: G-BOAC, destination Manchester Airport; 'AE', Museum of Flight, Seattle; 'AF', Bristol Aviation Collection, Filton; 'AD', Intrepid Sea-Air-Space Museum, New York; 'AG', Grantley Adams Airport, Barbados.

■ **THE MUSEUM** of Army Transport at Beverley, Yorks, home to the world's last Blackburn Beverley, XB259 (see *News* last month), went into receivership on October 7. Three parties now claim ownership of '259; the receiver states, "this will take quite some time to sort out".



Yeovil-built Lysander V9312 outside ARCo's hangar at Duxford.

Canadian Spit is back

Authentic WW2 scheme for low-back XVI



AT OTTAWA, ONTARIO, MIKE Potter's recently acquired Spitfire XVI, SL721, has been repainted in the markings of the first low-back Spitfire delivered to 421 Squadron (one of the most illustrious units in Royal Canadian Air Force history) at Diepholz, Germany, in April 1945.

The original Spitfire, Mk XVI TB886, was flown by Flt Lt William Harper of Niagara

Falls, Ontario, bearing the name *Dorothy II* on the cowlings. The name was only applied because the transfers of the unit crest, an Indian-head motif used by the McColl-Frontenac Oil Company, had all been used up by the time TB886 was taken on strength. Apparently Harper had always wanted the crest on his aeroplane, and now, 58 years on, this

has at last been achieved.

Mike Potter bought SL721, above, from Chris Woods at Novato, California, from where it was operated as N721WK in the overall blue scheme it wore as the personal mount of Air Chief Marshal Sir James Robb from 1948 to 1951 (see *Back to the Blue*, December 1998 *Aeroplane*). The Spitfire has now been re-registered as C-GVZB.



PHOTO: JIMMY JACQUES

Comeback for last dogfight in the West

THE HISTORIC AIRCRAFT Collection's (HAC) Fieseler Storch G-BPHZ and Glenn Denney's Piper L-4 Grasshopper will be seen in a unique airshow act for the 2004 season, when they recreate the last World War Two dogfight in the West, which resulted in a kill for an American-crewed machine.

The Storch was on a battlefield reconnaissance mission near Berlin in April 1945 when US Army Lts Martin and

ABOVE The HAC's **French-built Storch, with Glenn Denney's Piper L-4 Grasshopper.**

Francis opened fire from the L-4 with their 0-45in pistols. The Storch was forced down, and the crew captured, in what is thought to be the only Second World War dogfight resolved by small-arms fire.

■ HAC, tel 01580 830215 or e-mail hac@aerovintage.co.uk

MiG-3 project unveiled at MAKS

AT THE BIENNIAL MOSCOW Aerospace Exhibition (MAKS), held at Zhukovsky airfield, Moscow, from August 19 to 24, Russian restoration specialists the Rusavia Company unveiled a MiG-3 fighter project which is expected to fly in a couple of years' time.

There is currently not a single example of this mixed-construction, early Second World War Russian fighter extant, so the sight of the rear fuselage structure and restored cockpit area on a stand at the show was probably the historic aviation highlight of the event.

The aircraft was recovered from the Pskov region in western Russia, and parts have been found at two other crash sites.

Two Polikarpov I-15bis restored to fly by Rusavia were also on show at MAKS. One is based at St Petersburg, the other near Moscow.

Non-professional and sport pilots in Russia are organised under the banner of the Federation of Amateur Aviators (FLA), which is also involved with the preservation of several historic aircraft in flying condition. Sadly, neither of the FLA flagships, a Lisunov Li-2 and Ilyushin Il-14M,



ABOVE One of two Polikarpov I-15bis, restored to flying condition for private owners in Russia by Rusavia, at the MAKS show.

made it to the show. Highlights in the flying display included Four Aero L-29s of the Nebesnie Rizarji, a privately-run aerobatic

team, which created a great impression; and an Antonov An-2, modified with a wide-chord low wing by the Moscow Aviation

Institute, raised eyebrows.

■ Watch out for a feature on Russian restoration activity, coming soon in *Aeroplane*



ABOVE The Moscow Aviation Institute's amazing monoplaner Antonov An-2 at the MAKS show.



ABOVE & ABOVE RIGHT Work in progress displayed on the Rusavia stand at MAKS, featuring the rear fuselage and cockpit section of the MiG-3.



Taildragger pilots train at Mojave

■ Diverse fleet of types keeps the trainee test pilots busy in California

AT MOJAVE, CALIFORNIA, the National Test Pilots School, a modern and very successful business which trains test pilots from air forces the world over, operates a wide variety of aircraft from Beechcraft Bonanzas to Mach 2 Saab Drakens. A number of taildraggers are included in the fleet, including a recently-delivered ex-South African Air Force Douglas C-47TP, a former Royal Canadian Air Force de Havilland Chipmunk, and an Aeritalia-Aermacchi AM.3C Bosbok. President of the school Sean Roberts says, "To fulfil our training syllabus, we need a diverse mixture of aircraft on our books, so that we can acquaint pilots with every type of flying situation".

The C-47TP was an early 1980s domestic solution to the SAAF's likely shortfall in maritime reconnaissance capability, following the

retirement of Avro Shackletons, and the unwillingness of other countries to supply aircraft during the apartheid era. Former SAAF Pratt & Whitney-powered aircraft were converted to Garrett turboprop power and fitted with radar and FLIR (Forward Looking Infra-Red) systems. The C-47TP is now used to train radar operators in how to hunt out surface and submerged targets.

Also from South Africa, the three-seat Bosbok is one of 40 supplied for battlefield surveillance and forward air control in the early 1970s. The AM.3C was originally conceived as a replacement for the Cessna L-19s of the Italian Air Force, and was designed around the wing of the Aermacchi-Lockheed AL.60. The AM.3C first flew in May 1967, powered by a 340



h.p. Continental engine, which was replaced on production machines by a Piaggio Lycoming six-cylinder powerplant of similar output.

ABOVE An unusual formation of Chipmunk, Bosbok and C-47TP, up from the National Test Pilots School in September. The C-47TP, with a USAF crew, was en route to the Pacific Coast on a reconnaissance training sortie.

Khodinka collection kaput



ABOVE An Ilyushin Il-14, now facing scrapping.

THE CENTRAL AIR AND SPACE Museum at Moscow's historic Khodinka Airport was due to close at the end of October to make way for a housing development, reports David Halford. Opened in 1991, it housed a wide range of post-war Soviet-bloc jets. The rarer examples are expected



ABOVE Who will save Khodinka's Ilyushin Il-28?

to go to the Air Force Museum at Monino, 30 miles east of Moscow; the remainder probably now face the scrapman.

Khodinka opened in September 1919. Ilyushin's, Sukhoi's and Yakovlev's offices are all sited nearby.

P-26A reproductions take shape in Kentucky



ABOVE One of Tim O'Connor's pair of reproduction Boeing P-26As at his home in Mount Washington.

WORK IS CONTINUING APACE on a pair of Boeing P-26A "Peashooter" reproductions being scratchbuilt by Tim O'Connor's Golden Age Aeroplane Works in Mount Washington, Kentucky, reports Nick Stroud.

Filling up every inch of floor-space in Tim's garage-cum-workshop, the two airframes are being built to airworthy standard using drawings acquired in more than five years' research into the type's history and structure.

The all-metal P-26A entered service with the USAAC in

December 1933, staying in front-line service for almost five years and remaining on the USAAC inventory until 1942.

Tim and his wife Gayla started work on the ambitious project in 1991, draughting detailed drawings from several sources before building full-scale wooden mock-ups of various parts. "The P-26 was really a wooden aeroplane design constructed in metal, which creates a number of problems", explains Tim. Drawings for the aluminium top-hat sections used

in the aircraft were non-existent, and they had to be fabricated by hand after much research work.

The basic structure of both P-26As is now complete and one of the fuselages has been skinned; the other should be done by June 2004. O'Connor has a pair of Pratt & Whitney R-1340s, as originally fitted on the P-26, but anticipates taking some time before completing the project, which will be moved to Freeman Airport in Seymour, Indiana, in February 2004. Watch this space for updates.

New Farnborough Museum opens

■ British aviation celebrated on former Royal Aircraft Establishment site

OCTOBER 1 SAW a gathering of eminent aviation figures at the former Royal Aircraft Establishment (RAE) at Farnborough to launch the new Farnborough Air Sciences Museum (FASM), reports Michael Oakey. A ten-year effort has resulted in the creation of a museum in the very cradle of British aviation — and in time for the Centenary of Powered Flight this December.

Test pilots Neville Duke, "Winkle" Brown and Duncan Simpson were among 160 guests at the opening, performed by Shadow Defence Procurement Secretary Gerald Howarth MP. Following speeches and a ribbon-cutting ceremony, guests were able to explore the FASM, which is housed in the former RAE's G1 Building, the original HQ of the Royal Flying Corps (formed in 1912).

Exhibits in the museum date back to the earliest aerial activities on the site, by the Army's

Royal Engineers Balloon Section from the 1890s, and Samuel F. Cody's experiments, which included man-carrying kites and the first successful powered flight from British soil in 1908. They chart the often secretive activities of the RAE through both World Wars and into the post-war heyday of the British aircraft industry. A number of exhibits have never been displayed in public before, including the engine compressors for the cancelled Miles M.52 supersonic aircraft of 1946, and exotically-shaped windtunnel models of projected supersonic airliners from the 1950s. It is a worthy successor to the old RAE Museum, which closed ten years ago (see *RAE Removals*, March 1994 *Aeroplan*).

Outside the museum building, Hunter T.7 WV383, Lightning T.5 XS420, Buccaneer S.2B XX894 and ex-Danish Air Force Hunter F.51 E-402 are on show, along



ABOVE Exotic windtunnel models from the 1950s are just a few of the artefacts on show in the newly-opened Farnborough Air Sciences Museum.

with cockpit sections of a Canberra, Buccaneer and Lightning. The museum is also hosting a 100th Anniversary exhibition staged jointly with the Royal Aeronautical Society and local aerospace companies. In addition, via an inspired bit of symbiosis, the FASM shares its home with the new HQ of the Guild of Aviation Artists, giving the museum the extra gravitas of beautiful paintings on its walls, and the Guild a permanent showcase for its members' efforts.

The all-volunteer organisation

behind the FASM is the Farnborough Air Sciences Trust (FAST), which since 1994 has stoically campaigned for the preservation of important historic buildings of the old RAE. Listed status has been granted for some of these buildings, including the vast 24ft windtunnel, thanks to the co-operation of Slough Estates plc which now owns the site. FAST has much more to do, however, and it deserves the support of all enthusiasts who remember with pride the contribution Farnborough has made to aviation

over more than 100 years. See *High Society* on page 92 of this issue for details of how to help. ■ Farnborough Air Sciences Museum is at Trenchard House (a few yards along from Farnborough's famous Swan pub), 85 Farnborough Rd, Farnborough, Hants GU14 6TF; tel 01252 375050; e-mail info@fasta.co.uk; website www.fasta.co.uk. It is open to the public 1000hr–1600hr Saturdays and Sundays, and for prearranged school and group visits on weekdays



ABOVE English Electric Lightning T.5 XS420 arrived at Farnborough during September.

Albatross crashes into woods in Florida

GRUMMAN HU-16E Albatross N70258 of BuccanAer crashed near Lucie County Airport, 50 miles north-west of Palm Beach in Florida, on September 26. Two crew died in the accident, following failure of the amphibian's starboard R-1820 engine.

Owner/pilot John Russell was trying to fly the Albatross back to Lucie Airport when it stalled and came down in a wooded area, ripping off a ten-foot section of wing and breaking the fuselage just aft of the undercarriage.

Russell survived the accident with serious leg injuries, but crew members

Albert Schaaf and John Anderson both died as a result of the crash, Schaaf at the scene and Anderson the following day in hospital. Rescue operations were hampered by a huge swarm of bees which had been disturbed when the aircraft demolished a number of beehives in the woodland.

The former US Coast Guard machine was previously based at Carson City, Nevada, a mecca for the type which could boast a total of 14 resident HU-16s early in 2003. John Russell's N70258 was due to have been ferried to the Caribbean soon.



ABOVE BuccanAer's Grumman HU-16E Albatross at Carson City, Nevada, in spring 2003. The machine and two crew were lost on September 26.

Register Review

Compiled by Mike Hooks

NEW BRITISH REGISTRATIONS towards the end of the year continue to be dominated by microlights and ultralights, with few older aircraft. One new type, the second to be registered, is **Super Marine Spitfire XXVI G-CCJL**, an 80 per cent scale replica two-seater which joins G-CGCH, illustrated in the October issue, while the oldies are **Aztec G-ASND**, re-registered G-EEVA, and **Tri-Pacer G-ARHU** which becomes G-EMSB. **Gazelle AH.1**, appears, somewhat surprisingly, as G-FUKM.

Restorations include **Turbulent G-ARRU**, cancelled by the CAA in May 2001, **Dornier Do 27A-1 G-BNMI** and **T-6G Harvard G-BRBC**, both CAA cancellations in April 2002. Also cancelled is **Friendship G-ECAT**, damaged at Billig in November 2002.

Sales abroad are **Westland-Bell 47G G-BGMU**, once XT807, to Spain, and a batch of **Fokker 100s** to Holland — G-UKFA, 'KFC', 'KFE', 'KFH', 'KFI' and 'KFR' as PH-OFA, 'OFC', 'OFE', 'OFH', 'OFJ' and, oddly, 'KLI'; the first three have gone to KLM Cityhopper. Incoming is **Puss Moth OF-AVC**, the last of 25 built in Canada, which arrived at Ron Souch's workshop in August.

Kemble-based **Stearman N73410** has been exported to Australia and another long-term UK resident, **Morane Paris N9999P**, has left North Weald for restoration and sale in the USA.

In France, **Stampe SV-4C F-BANX** is now F-AZPK, while a new allocation is **Porter F-GRUB**, ex HB-FMJ, for a parachute club at Maubeuge. Another **SV-4C**, F-BEKI, based

at Wevelgem, Belgium, since November 1998, has at last become OO-VSV **Super Cub F-BJDB** has gone to Switzerland as HB-PQJ while the **Hurel-Dubois HD.34 F-BHO0**, whose C of A expired in August 2002, has been cancelled. This former IGN survey aircraft attended a number of French airshows and was a distinctive shape in the sky, so we hope for an eventual restoration. To be cancelled soon is **Fouga Zephyr F-AZPL**, which crashed on September 7 during an airshow in Corsica (see *News*, last month).

In Holland, ex-US Air **Fokker 100s** N852US to '854US have returned home as PH-CXC, 'CXF' and 'CXG'. Others, PH-CXL and 'CXN', have gone to Germany as D-AGPL and 'GPN', while **Friendship 500 PH-FNV** has been exported to Indonesia.

A Belgian cancellation is **Dornier Do 27Q-5 OO-QUB** to Switzerland. **Norecrin F-BEBU** is to be restored in Belgium for static display, while an unfortunate loss is **Pilatus P-3-05 LX-SAS**, written off during an air display at a Luxembourg gliding site on August 2 — it was originally Swiss military A-851.

Scandinavian news: a Swedish restoration is SE-CRK, a **Piper Colt** which now appears as a taildragger dubbed PA-22-V6 STOL Colt Magnum 2000 and looking nothing like its original shape, while Swiss **Hunter F58 J-4082**, resident in Sweden for some time, is now SE-DMX.

Fokker 100 SE-DGR becomes ZS-JEN in South Africa and Danish **Friendship** OY-EBC has gone to Senegal.

Hungarian additions are



ABOVE Hurel-Dubois HD.34 F-BHO0, an unmistakable shape with its ultra-high-aspect-ratio wings, has recently been cancelled in France.



ABOVE Air UK's Fokker 100 G-UKFE, seen at Frankfurt in summer 1995, is one of several returned to Holland, and has become PH-OFE.



LEFT Inactive for some time at North Weald, where it was seen in May 2002, Morane Paris N9999P has gone to the USA for restoration and sale.

Silvaire HA-VET ex N74164 and a pair of UK-based **Yak-18Ts**, HA-YAB and 'YAC'. A new **L-29 Delfin** is OM-JET and Gardan Horizon **D-EBVT**, reported as sold to Poland last month, is now known to have become SP-KSB.

In Spain, additions are CASA-built **Jungmanns EC-YTC**, 'ZCN' and 'ZIZ', **Bü 133 Jungmeister** EC-VQ and **Robin ATLS EC-YYT**, 'ZIA' and 'ZIB', but because the Spanish authorities have adopted a system of issuing sequential numbers instead of quoting true constructor's

numbers their previous identities are not revealed, although ATLS F-GHQH and F-GIKT, cancelled to Spain in November 2001, will probably be two of those above.

Australian additions are **Fouga Magister** VH-ATG ex N395F, **Yak-9** VH-YXJ, previous identity not yet given, and **Agilet** VH-KBQ, which is restored after being withdrawn from use in January 1996. **Three Jet Provost T.5s**, exported to Australia ten years ago, are finally registered as VH-YZB to 'YZD', ex XW362, '408' and '357', and **BI 109G-6**

VH-BFG is cancelled as withdrawn from use.

Fokker 50s appearing in Brazil are PR-OAA and 'OAB', once DLT's D-AFFE and 'FFF', among other identities.

Canada has registered a **Sopwith 1½-Strutter** replica CF-SOP with the Ontario Aviation Historical Society, and two more **Hunter F58As** for the Northern Lights aerobatic team are C-GZIB and 'ZIC', ex N58HH/J-4097 and N58W/J-4060. Another intended for the team was T.7 614XL/ XL614, but it was written off on July 27 on its ferry flight before being Canadian registered. More details on Northern Lights Hunters, including photographs of two more examples which have yet to appear in *Register Review*, may be found in the November issue's *News*.

■ We are indebted to *Air-Britain News* for much of the above information



ABOVE Gardan GY-80 Horizon HB-DCI, seen at Middle Wallop in July 1984, was written off at Prangins in July 2003, noted last month.



ABOVE The "Masefield" Chipmunk G-APDY is derelict in Sweden as reported last month — can't anyone save it?

Historic Harvard IV refurbished

■ First Canadian Car and Foundry machine still earning a living in Ontario

THE FIRST HARVARD Mk IV built by Canadian Car and Foundry (CCF), RCAF 20210/C-FFTP, which first flew at Fort William, Ontario, in November 1951, was recently refurbished by the Canadian National Research Council (CNRC) at Tillsonberg, Ontario. The trainer has been operated by the CNRC on various experimental duties since 1964.

The Canadian Car and Foundry plant at Fort William built 255 Harvard IVs, with deliveries initially going to the Royal Canadian Air Force and United States Air Force. Some 29 RCAF examples were flown to Germany in the summer of

1956, where they became the first trainer for the newly reconstituted Luftwaffe. The same year, 30 redundant USAF CCF-built examples went to the Indian Air Force.

The CCF Harvards differed from previous models by having improved, clearer-vision cockpit canopies. When originally rolled out, RCAF 20210 was christened with a bottle of champagne by legendary Canadian cabinet minister Clarence Decatur Howe, who had headed the War Supply Board in World War Two and had overall responsibility for setting up the Joint Air Training Programme. He was also



instrumental in setting up Air Canada and the Canadian Broadcasting Corporation. With such a history, it would be good

to think that 20210/C-FFTP will one day find a place in the Canadian National Aircraft Collection at Rockliffe, Ottawa.

ABOVE Harvard C-FFTP taxis out in its sparkling new paint scheme in September.



Bücker for Berlin museum

BÜCKER BÜ 131 JUNGMANN D-EBAD, left, arrived at Tempelhof airport, Berlin, on September 29, and has gone into storage locally before its inclusion in the new

Deutsches Technikmuseum building, which is currently under construction in Berlin.

The museum is due to open in February 2005, and the Jungmann will go on display

in the 1920s/30s sportplane hall alongside a Klemm 25, Focke-Wulf Fw 44, Nord 1002 (the French version of the Messerschmitt Bf 108), Arado 79 and Klemm 35.

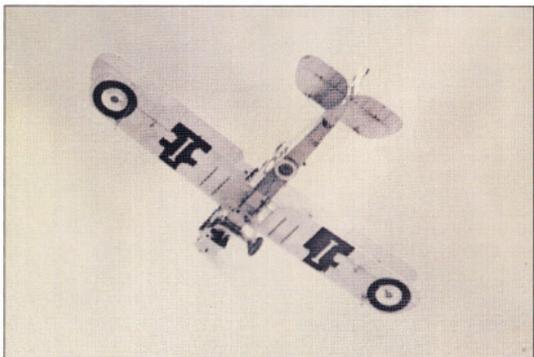
Lost & Found

Markings to muse on

THE AIRCO/DE HAVILLAND D.H.9A was a mainstay of the RAF in the Middle East during the 1920s and early 1930s, serving in Egypt and Iraq in good numbers, and the example depicted here was one of them. It has the undernose auxiliary radiator, and, like many of its kind operating over that

inhospitable terrain, it carries a spare wheel on the fuselage underside, beneath the gunner's cockpit.

An unusual feature of this particular D.H.9A is the markings applied to the underside of the lower wing. A capital letter "I" (or a Roman "1") has been painted on a dark background, probably the



same blue as used for the outer ring of the RAF roundels. The patchy application of this background colour suggests that it has been painted over some other marking. I have been

unable to determine the significance of these markings, the unit involved, or where the pictures might have been taken. Perhaps readers have come across records of the

experiment, or instructions concerning these markings, in official archives or squadron records. If so, I would be delighted to hear from them.

PHILIP JARRETT



Aircraft preservation comment and analysis, with PAUL COGGAN

Contact!

AS WE APPROACHED the deadline for this edition of *Aeroplane*, the Editor suggested I might consider writing something about the Centenary of Powered Flight. After a week pondering the subject, it suddenly occurred to me that I had been around for almost half of the century in question. Perhaps I should outline some of the milestones in my life in aviation; it might prompt you to consider your own favourite aviation moments, and how lucky we are in the vintage aviation world in this celebratory year.

As a youngster living in Nottinghamshire, I spent many of my summer afternoons lazing out in the back garden with an airband radio and an astronomical telescope. There was a lot to see: Handley Page Hastings, Avro Vulcans, usually in pairs or in trail, climbing out of RAF Finningley; and lots of RAF Jet Provosts of various marks low-flying (we lived in LFA 5, I later discovered), training pilots. One of the first McDonnell Douglas F-4 Phantoms also visited Rolls-Royce at Hucknall to do local flying.

On some afternoons I was lucky enough to catch some of the test flying out of Hawker Siddeley at Woodford — a fascinating mix of H.S.748s carrying exotic markings ranging from Brazil's VARIG airliners to Columbian Air Force markings; plus the prototype Nimrods, all eagerly jotted down in an old cashbook. Sad, maybe, but this was my first attempt at documenting aviation history.

While today's youngsters go around listening to rap and Metallica on MP3 players, I can now understand why the neighbours may have viewed me as a misfit when a parade of international airliners talking in code to Swanwick Oceanic were blurred out full volume in the back garden of that little house.

It seemed natural for me to join the Royal Air Force, sadly lacking the qualifications to be a pilot (I spent study time poring over aviation books and magazines, including *Aeroplane*, instead). For my sins I elected to follow a career in Air Traffic Control.

Square-bashing seemed a million miles away from a control tower, but I was soon enjoying life at RAF Shawbury. My first visit to an active airfield at night is one vivid memory.

My first posting was to RAF Wittering, the home of No 1 Squadron (lovingly called F Troop), where I even spent my off-duty hours in the runway caravan; a highlight here was seeing a Gloster Javelin on a practice diversion from RAE Bedford. I stumbled

across the same aircraft at Duxford some years later. A low point was collecting portable airfield lighting from the back of a Land Rover after night flying!

My next posting was to RAF Watton, Norfolk, the home of Eastern Radar — USAF Survival scrambles on a radar scope (Type 82 radar previously linked into a Bloodhound missile system) covering East Anglia under the control of just 14 controllers and 28 assistants. My off-duty time was now spent flying with the various USAF SAC units on KC-135 tankers out of RAF Mildenhall. I managed to accrue some 200hr flight time, ranging from two hours bashing the circuit in a 10th ACCS EC-135 to flying a 13hr tanker mission refuelling F-4C Phantoms (one of which had MiG kills!) from the 57th FIS based in Iceland. Other memories include refuelling a C-5 Galaxy off Portugal in the hours of darkness. Refuelling Air Force Reserve F-105 Thuds was an experience in itself. The latter were, in fighter pilot parlance, "Sierra Hotel" at "taking the boom". The sight of five "Thuds" emerging from the clouds below us, smoking heavily and perhaps low on fuel, is a sight I won't forget.

My involvement with warbirds has brought countless highlights, contrasted with sad times: flying in warbirds, hanging upside-down in the straps in a Yak-11 over Duxford; not knowing whether to laugh or cry upon seeing Harry Prew-Smith cross himself before we got airborne in his Fouga Magister; formation with a Spitfire in Florida; and a Folland Gnat flight in Texas. Talking warbirds with Mark Hanna; watching *Memphis Belle* being filmed; listening intently to the late Doug Arnold about his early warbird collecting days; helping re-fabric a Hurricane with Clive and Linda Denney; seeing a Messerschmitt BF 109E "Emil" come together with Craig Charleston; and seeing many maiden post-restoration flights. Aircraft I could only ever dream of seeing: Hawker Nimrod, S.E.5A biplane, aircraft being restored and agonised over.

Tragically, attrition appears to be higher in civvy street these days than in the military. In a relatively small timeframe some 37 people I have known have lost their lives in vintage and warbird aircraft. Even if I am lucky enough to reach my own centenary year, it will be hard to come to terms with that. Death overshadows even the most beautiful and rare warbird taking to the air, and I wonder sometimes if we need to re-evaluate how we interpret a saying I first heard in my military days: "Flight Safety is Paramount on this Mission". **A**

This month:

■ Paul looks back at the latter half of aviation's first century from a personal perspective

■ PAUL COGGAN joined the RAF in 1973 in the trade of air traffic control. After various assignments, including postings to RAF Wittering, RAF Watton (Eastern Radar) and then 12 Sqn Operations at RAF Lossiemouth, he resigned from the RAF in 1986 to start his own publishing company. He has been researching and writing about warbirds for almost 30 years.

To contact Paul, e-mail pac@warbirdguru.com or write to him via *Aeroplane* Editorial, King's Reach Tower, Stamford St, London SE1 9LS, England



LEFT You know you're getting old when the aircraft you remember in service end up in museums. Gloster Javelin FAW.9 (FAW.7) XH897 is now preserved at Duxford.

Skymasters



Write to: **Aeroplane**, King's Reach Tower, Stamford Street, London SE1 9LS
or email us at aeroplane_monthly@ipcmedia.com

LETTER OF THE MONTH IS SPONSORED BY DIVERSE IMAGES LTD



Tel 01273 600202

www.diverse-images.com

Each month, the sender of the *Skymasters* letter selected as Letter of the Month will win a Diverse Images 1:144 scale Short Stirling model in English pewter, hand-crafted and hand-painted, worth £178



Wright on

SIR — I write to say how much I have been enjoying your series *Claims to Fame* on pioneering flight attempts in this anniversary year.

As a "pro-Wright" enthusiast I particularly enjoyed the disgraceful story of the Curtiss-Langley-Smithsonian affair. I always knew that the 1914 machine had been changed, but did not realise the extent until I saw the comparative drawings in the July issue.

Pity that space did not allow you to mention that the Flyer currently on show in the Science Museum was made by D.H. apprentices at Hatfield, and is more representative of the Flyer of 1903 than the one returned to America, which was "hastily" rebuilt for exhibition after the crash landing on its fourth and last flight. Original drawings and notes were extensively used for the D.H. version, to ensure authenticity.

I particularly enjoyed the debunking of the Ader claim — still brazened to hundreds of overseas visitors at Toulouse via a gigantic decorative mural at the Airbus assembly plant.

MAURICE ALLWARD

Hatfield
Hertfordshire

Rolling a Wellington

SIR — Two accounts in past issues of *Aeroplane* have described, for want of a better word, "out of character" behaviour of a Lancaster (August 2002) and Mr Clutton's report of looping a Halifax (January 2003). I found both articles most interesting.

I was stationed at Cosford as a cook, and one frosty morning in late 1947 or early '48 I, along with three other cooks, was preparing boxes of frozen cod outside the cookhouse on No 1 Wing (someone had to do it!). Our attention was drawn to a low-flying, all-yellow Wellington, over the airfield section. This made, I should think, about four circuits. On each one, as it followed the railway line towards what is now the museum, it was seen to perform several rolls at low altitude and, seemingly to us, high speed.

I believe it was all the more remarkable because it must have been, by those years, a sore old workhorse, a credit to the pilot.

Two members of our work party were Cpl Eccles from Leeds and AC Reynolds of Lambeth. Can any reader enlarge upon it?

L. CRISFORD

e-mail crisfordwalker@fsmail.net

Stalling a Conquest

SIR — I was interested to see the *Database* on the Lockheed Constellation (July *Aeroplane*). In July 2000 I visited the

Farnborough show with the late Ken Rearwin, and he told me the following story.

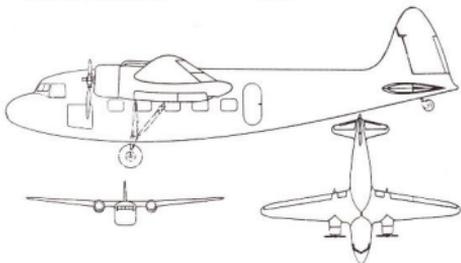
Sometime after the Rearwin Aircraft company was acquired by Commonwealth, Ken and his father Rae were dismissed and Ken took up a post with TWA. This was shortly before Howard Hughes's record-setting transcontinental flight. TWA decided to invite some press and TWA dignitaries for a flight around San Francisco Bay and Ken was one of the passengers. He told me that Hughes was the sort of person who would not waste a test flight on carrying people around for the hell of it, so he continued testing the Connie. This involved deep stalls over the Bay!

Ken said, "You know how a small airplane buffets when approaching the stall, so you can guess how much the Connie buffeted, there were people leaning into handbags and bouncing all over the place. It was a pretty stupid thing to do but Hughes would not listen. It was lucky that the Connie stalled straight ahead and did not drop a wing. I can't imagine how bad it would have been for the company to lose so many top people if he had crashed it!"

That day at Farnborough, I had the feeling that real aviation history was not on show but sitting in the grandstand.

MELVYN HISCOCK

Basingstoke
Hants



ABOVE Airspeed's first Ambassador, the unbuilt A.S.14 project of 1938 — see Jo Ivens's letter on this page.

The other Ambassador

SIR — I can add a tiny piece of the history of the lovely Airspeed Ambassador (*Database*, April *Aeroplane*): there was a pre-war Airspeed design also called "Ambassador". It was then a high-wing twin (radials, I think) not unlike the D.H. Flamingo, but with single fin.

How do I know? A. Hessel Tiltman's son Peter was at prep school with me, and I was staying with them before the 1939 war. A.H.T. took us around the factory, and in to meet the formidable N.S. Norway, who talked about the design from the scale model on his desk. We also met George Errington, and Arthur Hagg at his home, where there was a model of the as-yet-unflown Heston Racer on the mantelpiece.

With thanks for the great pleasure of reading *Aeroplane* over the years — long may we both continue!

JO IVENS

Otford
Sevenoaks
Kent

Bomber Command turrets

SIR — Your Bomber Special (May 2003 *Aeroplane*) coverage touched on the Lancaster-v-Halifax comparisons which have been aired since World War Two, with the crews and ground staff of each usually championing the cause of the aircraft they used.

There was one system in the design of these excellent bombers which was fundamentally different — the defensive armament. Avro used the Frazer-Nash system, in which each turret was powered by an engine-mounted hydraulic pump. A feed-and-return pipe of 25mm diameter was routed to a rotating service joint leading to a valve box in the turret. Mounted outside the turret was a recuperator which maintained an even pressure. As can be imagined, if one of these

**Want to subscribe?
Call 0845 676 7778**

Letter of the Month

An earlier quest for the Mount Kenya Blenheim

SIR — I was surprised and somewhat amused to read *Quest for a Blenheim* (October *Aeroplane*), the story of a British Army expedition to the remains of a Blenheim recently found on Mount Kenya. The reason for my feelings was that 40-odd years ago I tried to organise a British Army expedition to that very same crash site!

I was doing my National Service in the Royal Signals, serving with No 236 Signal Squadron, based at RAF Eastleigh in Nairobi. It was about the beginning of 1959 that I read a very brief paragraph of news in either the *East African Standard* or *Sunday Post* that a Bristol Blenheim with its crew still on board had been found on Mount Kenya, and that it had been missing since July 1942. At that time there were large numbers of Mau Mau hiding in the forests surrounding Mount Kenya, and I would think that a patrol of the King's African Rifles stumbled across the Blenheim while hunting the terrorists.

Our squadron had a very popular safari club run by Mr Haw, the Squadron Sergeant Major. As well as safaris, the SSM organised such things as rambles up Mount Kilimanjaro. As I was, and still am, very interested in aviation archaeology, I thought it would be a good project for the safari club to go to the Blenheim crash site, and approached the sar' major with the idea. But he soon turned me down, the reason being that with us being limited to about four men armed with a hunting rifle and Sten guns, we would be unlikely to deter an attack by the Mau Mau. It is probably for this reason that the remains of the crew were not removed at that time.

I am very surprised that today nobody seems to have had any knowledge that the Blenheim had been found all those years ago.

DAVID HANSON
Leeds, West Yorkshire

The eight serial numbers were RD754, RD788, RD802, RD809, RD850, RD859, RD867 and SR919. During a routine inspection at RAF Luqa, which was the unit's home for ten years or more, SR919 was found to have a corroded main spar and consequently was scrapped.

Several panels, however, were cut from the aircraft and hung in the CO's office. SR919 was the last Beaufighter to be built, a product of Bristol's Weston-super-Mare factory.

Pictures sent in by reader Jack Kendall — see his *Beau fitter* letter on this page.

RIGHT Senior Aircraftman Kendall poses with a Beaufighter at RAF Ta Qali, Malta, in the late 1950s. PAR RIGHT The serial from TT.10 SR919 on the CO's office wall. BELOW A splendid colour shot of TT.10 RD850 on detachment in Cyprus, 1958.



pipes was punctured, high-pressure inflammable oil was sprayed into the fuselage, and the turret was rendered useless.

Handley Page opted for the Boulton Paul turret system, in which each turret was fitted with an integral electro-hydraulic unit. This was powered by a 12mm electrical cable from the aircraft's supply, being far less liable to battle damage than the long pipe-runs of the FN system. Another advantage was ease of installation and turret replacement. It was also found that the many hydraulic glands and joints of the FN system developed leaks in tropical conditions, making the Lancaster unsuitable for use in hot climates.

R. WALLACE CLARKE
Kettering
Northamptonshire

Spotting the Mossie

SIR — As with Mr King (*Skywriters*, April), many of us were puzzled by this fast twin-engine machine whizzing about the sky. We made various guesses as to its nature in our class at school, but none made any sense.

Then, many spotters more observant than myself noticed a disembodied fin in a photograph of an Airspeed Oxford with Gipsy Queen IV engines which appeared in *The Aeroplane Spotter* of October 8, 1942.

Presumably the magazine was still bound by the Official Secrets Act. A little doggerel appeared in the correspondence page of the October 22 issue, as follows:

To Many Correspondents

"Tales of old, and tails of new,
Creeping stern first into view;
End of bodies still concealed
Very soon to be revealed."

In a November issue there was a drawing by a Mr Dudley Froy of de Havilland Aircraft of the famous raid by Mosquitoes on the Gestapo HQ in Oslo.

As to the one-off Airspeed Oxford with Gipsy Queen engines, it was in a hangar at Hatfield in 1946.

A.E. FRAY
Strood
Kent

Beau fitter

SIR — Many thanks for the Beaufighter *Database* in your August magazine. You may like to know that Beaufighters were still in RAF service with the Malta Communication and Target Towing Squadron in the 1950s, and in all, the TT Flight had a total of eight TT.10s during that decade, but rarely more than three at any time.

and in fact by the end of 1958 all had been scrapped.

RD788, however, lives on, in only on film, for it was used in the film *Ice Cold in Alex*, and there is some excellent footage of it. Although it is a black-and-white film, you can still see the distinctive black-and-yellow diagonal TT stripes across its underside.

J. KENDALL
South Horrington
Wells
Somerset

Fw 190 markings

SIR — It has been my intention to write this letter for more years than I dare to contemplate! It concerns an event during the Second World War. Although for me pictorially the incident is very real, unfortunately the actual date is not.

As a young lad (eleven in 1939), I only had a few really close encounters with enemy aircraft. I was a keen aeroplane recognition buff and still have copies of *The Aeroplane Spotter*. The first thrill was on one hot and sunny afternoon in 1941. I was lying on the grass at an open-air swimming pool when the noise of aero-engines attracted my attention. To my astonishment the sky above me seemed suddenly full of German aircraft. It was, thankfully, the "circus" of captured German aircraft which I think toured the country for a time to help the pilots of the RAF familiarise themselves with the enemy's machines.

The closest encounter by far, however, and the main point of this letter, took place perhaps a year later. Early one morning, probably in



1942, I was rolling up the blackout curtain in my bedroom at the rear of the house when suddenly, without any air raid warning, there was a loud roar of engines and a Focke-Wulf Fw 190 screamed past. He was literally just above the rooftops of the house behind us, let us say the length of two small suburban gardens away, and I clearly saw the pilot hunched up in the cockpit. From what I learned later there were several of the same type flying spread out more or less in line abreast. Certainly my mother saw one at the same time as myself. She was sweeping the step at the front of the house and I heard her calling, "they aren't Spitfires, they've square wings!" I was quite proud of her.

Later I found that the trolleybus service that I would normally have used to get to Ilford from Chadwell Heath was not running and I was obliged to walk all the way. Arriving at Ilford it was very obvious why the trolleys were not running. The Fw 190s, obviously Jabos, had dropped a number of bombs in the vicinity of the Regal Cinema.

To return to "my" Fw 190, I failed to note his markings in detail but one curious thing I did see very clearly was a white ring encircling the usual cross on the fuselage. Of this I have no shadow of doubt.

Since that date I have kept a lookout for any pictures of Fw 190s in the hope of finding an aircraft carrying such markings. Nobody I have ever spoken to has heard or seen anything like it. It was once suggested that it might have been intended as a bit of trickery to give the impression of American markings.

Has anyone else encountered such markings? There must be readers who lived in Ilford at the



time who could confirm the date and/or the markings. So much detail still keeps coming to light even after all this time that I am hopeful that confirmation will be forthcoming.

HOWARD MARTIN
Sunbury on Thames
Middlesex

Transonic testing

SIR — The *Preservation Profile* in the November 2002 *Aeroplane* mentions NACA tests made on wing models at transonic speeds on the upper surface of the P-51D Mustang. Similar tests were made at the Royal Aircraft Establishment, Farnborough, in the early 1950s using Vampire VF343. These had the advantage that tests could be made in level flight at stabilised speed conditions and also by using a "glove" section on the wing, minimising the variation of Mach Number over the model. The maximum Mach Number at the model was 1.1; lift and pitching moments were measured at transonic speeds which at that time could not be represented in windtunnels. The photograph shows a model mounted above the "glove" section of Vampire VF343.

Tests were also made measuring the damping in pitch of a 60° delta-wing model representative of the Fairey Delta 2. There was concern about adequate damping of the longitudinal short-period oscillations at transonic speeds on tailless

delta-winged aircraft. These tests in 1954 showed that adequate damping was available. This gave confidence prior to the world's air speed record of 1,132 m.p.h. by Peter Twiss on the Fairey Delta 2 in 1956.

BOB ROSE
Fleet
Hampshire

Mossie losses

SIR — With reference to your article and photograph of Mosquito PR.34 VL618 in the February issue of *Aeroplane*, reading this report brought back memories to me of my time as a flight mechanic on No 39 Squadron, which was equipped with NF.36 Mosquitoes at Kabrit on the edge of the Bitter Lake in Egypt's Canal Zone.

Our main hangar was adjacent to 13 Squadron's hangar. I was standing outside our squadron office with the rest of the lads when I saw this aircraft approaching on one engine and rapidly losing height. My gaze followed its path until it ditched into the lake about 100 yards out from shore.

The lads who were off duty that day were swimming at that spot, which was a normal off duty recreation; needless to say, the swimmers quickly scattered and then swam over to break open the emergency section of the canopy and released the crew. I took a photograph with my Box Brownie, which I enclose.

I examined one of the engines at the side of the lake and found a small hole in the crankcase; I assumed perhaps a conrod had let go.

I would be interested to hear from any of my fellow conscripts who served with me on 39 Squadron from 1950 to 1952.

My own aircraft was NF.36 RL234; I wonder where it finished up?

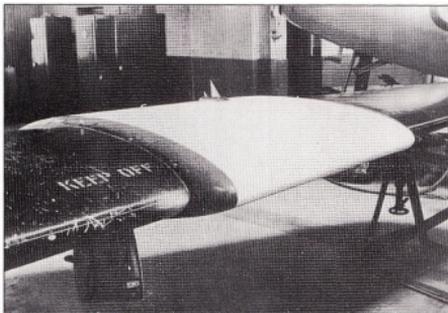
BRIAN MUCKLE
52 Louis Way
Dunkeleswell
Honiton
Devon EX14 4XW

[Mosquito NF.36 RL234 overshot on landing at Kabrit on August 12, 1952, and the undercarriage was raised to stop it — Ed]

Single-engine Mossies

SIR — David Ogilvy's recollections of flying the Mosquito (January—March *Aeroplane*) have, for me, been both fascinating and nostalgic. For about nine months from December 1943 I was a flying instructor at RAF Greenwood, Nova Scotia, converting experienced pilots (mostly ex-SFTS instructors) to the Mossie. We used British-built T.IIs for instruction and Canadian-built B.VIs for solo flying to conserve hours on the scarce T.IIs.

Mr Ogilvy's account of teaching single-engine landing with one prop feathered filled me with horror and I can well understand the practice being banned later! Our routine at Greenwood was to demonstrate the procedure with the port engine windmilling — not easy from the right-hand seat of a T.II. This involved approaching at about 150 m.p.h. (no knots then!) with full flap, allowing the speed to drop off to about 140 over the fence and about 50ft too high, cut the starboard engine, centralise the rudder, drop the nose a little and in



ABOVE Bob Rose provided this picture of a "glove" test section and model on the wing of Vampire VF343 — see his letter.



ABOVE A surprise for the swimmers. Brian Muckle's photograph of an unlucky 39 Sqn Mosquito NF.36 just offshore at Kabrit.

Royal Aero Club Trust

THE ROYAL AERO CLUB TRUST wishes to appoint an Hon Treasurer as the current Treasurer wishes to step down. This is a rare opportunity to play a key role in the life of a very young and prestigious charity. The Trust was created in 1998 and HRH The Duke of York is its Patron.

The Treasurers will be responsible for keeping accounts; able to commit around two to three hours a week; attend around four committee meetings in London per year. We are looking for: a qualified accountant, ideally employed by a medium to large size accountancy practice or a finance director of a commercial company with some broad commercial experience; with budgeting and accounts preparation experience; acquainted with tax-effective giving methods; an interest in sport and/or recreation in the air; computer-literate with telephone, computer and an e-mail address.

The applicant might live in Southern or South-Eastern England. For further information please contact Mr F.O. Marsh, Chairman of Trustees, 36 Edwardes Square, London W8 6HH; tel: 020 7603 3133 or e-mail chairman@royalaeroclubtrust.org.

The Trust's website is www.royalaeroclubtrust.org.

effect finish with a power-off landing. The landing had to be well judged because there was little hope of the port engine picking up quickly enough to go round again. Fortunately there was sufficient runway to allow for some error.

Both Marks were of course fairly light and I have no experience of the later, heavier versions. My operational experience was with the FB.VI, which could also be landed comfortably by this method if not too heavily loaded.

DOUG MALT

Witham
Essex

NAPS remembered

SIR — The article in April's edition about the Northern Aircraft Preservation Society took me back to some good times. As soon as I could, I followed my brother (does Malcolm remember Andrew?) and became a member of NAPS, but as soon as I joined it changed its name to The Aeroplane Collection. I still have a membership card (number 116) with both titles on it.

Having been an active member, I eventually left due to the fact that work took me south, but I feel proud to have been part of it and knowing the likes of Malcolm Goosey, Brian and Olive Robinson and Peter Schofield.

I have memories of travelling with Malcolm to the Air Training Corps at Caterham to collect the Blackburn B-2 cockpit section and what we thought was a Rolls-Royce Welland (now at Cosford). On the way back

north we stopped at the RAF Museum in Hendon to look at its Whittle engine and compare it with ours; it was there that the differences between the Power Jets-, Rover- and Rolls-Royce-built versions started to make themselves known.

Other memories include being involved with the Bensen Wallis autogyro (G-APUD) which was steam-powered through the centre of Manchester, OK towed by a traction engine, but still fun. Then there was the time when I found myself at the Crich Tram Museum commenting on a display by a Vulcan and realising that people on the Sherwood Foresters memorial on the hilltop above were looking down at it.

As I have said, my brother was a member of NAPS before me and I can remember him coming home and asking my father if we could keep a Proctor in the back garden. The decision rested on who was going to mow the lawn underneath it. We never did get a Proctor at the bottom of the garden, although that garden saw me covering the Addyman glider's tail feathers with fabric in the garden shed.

I may no longer be a part of NAPS or The Aeroplane Collection, but aircraft preservation is still part of my life through my affiliation to the museum at Middle Wallop and through my work, the history of British Airborne Forces equipment.

ALASTAIR MELLOR

Tidworth
Hampshire
e-mail aeronut@mellor.flyer.co.uk



Flying Visit

Display pilot and Director of Maintenance at Old Rhinebeck Aerodrome **KEN CASSENS** talks to **MELVYN HISCOCK** about his aviation career

A What is your first aviation memory? Going to La Guardia airport with my parents in the car when I was about four. I saw aircraft in the pattern and thought I could hold them in my hand as they were so small. I used to love model kits — even at the age of four, I just glued them together. I got serious with models when I was six.

A When was your first flight? At the age of ten; it was a sight-seeing ride at Bridgeport in Connecticut. The same year I started hanging around the seaplane base on the Hudson near where I lived. It was a hangar rat.

A What prompted you to learn to fly? The interest was there from a very early age. I started on a Luscombe floatplane when I was ten. That base closed so I went to another.

A When was your first solo? That was in 1961, when I was aged 16 or 17. It was a J-3 Cub at Armonk, New York.

A Who, or what, has most influenced your career? I got the Lindbergh bug at an early age. He became a hero. I discovered we shared the same birthday.

A What do you consider your best aviation achievement? Gosh, I don't know if I have any! The most satisfying is the current Ryan NYP replica. I built a Starduster II which I was proud of but the NYP is special, especially as a Lindbergh fan. I built models of this as a kid; it goes back to my childhood.

A Do you hold any aviation records? No.

A What do you see as the invention of the greatest aviation invention? Wow, there are so many categories. I think some credit should go to the people who had the foresight to preserve old

aeroplanes, as they have done so much for history; these people deserve as much credit as those who develop new technologies.

A Do you have any unfulfilled ambitions? I am sure I do, I just don't know what they are! I want to get the Ryan NYP finished, I'd like to get a seaplane rating. I have been pretty happy; I just want to stay in aviation as long as possible.

A What was your favourite aviation moment? I had my son Ryan in the back of an Aerona Champ, we were about 500ft over hills when we looked down and saw a Bald Eagle with another immature eagle, obviously a family. It was the first time I had seen one and we circled about 100ft above and he was not bothered. It was so smooth and so calm and when I looked back they had gone. It was the most memorable experience — and more so as I had my son with me.

A What was your least favourite moment? I had a couple when I was crop-spraying. Stupid things, real "I learned about flying from that" stuff. One time I was heading towards wires, I came up too fast and had to take evading action. I thought I would never do that again. It is hard looking out of a dangerous situation knowing you screwed up.

A What is your favourite aeroplane? They are all different and some are better than others. A favourite? That is like having five kids and choosing a favourite, you can't do it. They are all your favourite.

A What aeroplane from history would you most like to have flown? There are so many, it would have to be an old aeroplane. Thinking about it, it would have to be the *Spirit of St Louis*

SUBSCRIBE TO AEROPLANE

Make sure you get your copy of *Aeroplane* promptly every month by taking out a one-year or two-year subscription — Call our credit-card hotline on **0845 676 7778** or subscribe securely online via www.aeroplanemonthly.com



Diverse Images
Historic Aviation Collectables

Tel 01273 600202; www.diverse-images.com



In the Eye of the Hurricane

British warbirds not only look different from their American counterparts, they are very different to operate too — as California-based pilot **BRUCE LOCKWOOD** discovered when he first sampled a Hawker Hurricane. With air-to-air and detail photographs by

MICHAEL O'LEARY



OPPOSITE PAGE AND LEFT

The author heads out over the coastline of Santa Monica, California, in Hawker Hurricane N678DP/P2970/US-X, on April 1, 2003. The fighter, of Canadian origin, is painted in the colours of Geoffrey Page's 56 Sqn machine, in which he was shot down in August 1940 (see panel on page 26).

AS DIRECTOR OF RESTORATION and maintenance for the Museum of Flying at Santa Monica's historic Clover Field, it was my job to establish a comprehensive maintenance and flight schedule for all of the museum's fighters — and ten years ago these duties brought me into contact with museum founder David Price's Hawker Hurricane Mk XII for the first time. Helped by my maintenance manager, Chris Wood, I set out to incorporate the Hurricane into our programme. After studying the original manuals and making a complete physical inspection of the aircraft, Chris came up with a fairly complete programme in about two weeks.

As with all the other museum fighters, it was now my job to fly and evaluate the Hurricane and then generate a standard for flight operations, along with checklists and pilot notes. Being very busy at that time with the restoration of the Bearcat, Zero and Invader, I put flying the Hurricane out of my mind for the time being. A week or so had passed when I got a call from David: "Are you ready to fly the Hurricane?" "I'd love to."

"Well, great — you'll like it. It's kind of old and . . .", David paused for a second, ". . . and neat. You'll have no problem with it, but the gear speed is low, so get it up quick. It's a little tricky to start . . . being British and all. Oh, I almost forgot — don't forget to turn on the air!"

"Okay," I responded, as I waited for a little more information.

"I'll fax my flight notes," he continued, "and I left the flight manual on the seat under the parachute. Let me know how you like it, OK?"

At the time, David ran a very large, very successful corporation which employed more than 20,000 people. He is a great pilot and very good friend, and I understood that his rather short briefings were due to his busy schedule. I had flown a lot of different fighters, including the Spitfire Mk IX and XIV, and I took the simple brief as being David's way of saying: "It's an easy aeroplane to fly".

Easy or not, I learned long ago to approach the first flight in any single-seat aeroplane — be it a Pitts S-1 or a Messerschmitt Bf 109E — with a certain caution. Get to know everything you can about your new steed, from pilot's manuals and notes to talking with other pilots who have flown or are flying the same type. Remember, once airborne, any lack of preparation or skill will show up, and there is no-one to hand the controls over to when you get in over your head.

Despite what many enthusiasts may think, there was little in the way of cockpit standardisation among World War Two fighters. There was even a large variation in the way systems worked, especially in British fighters. Although they are lovely to fly, these systems, cleverly engineered and functional, were sometimes odd and overly complex. Knowing this, I allowed for an extra day or so of cockpit preflight with Chris Wood to answer questions as needed.

After sitting in the cockpit for a few minutes with manual in hand, figuring things out, I noticed an odd-looking, prominent lever by my right knee. I quickly looked through the flight manual and found the following:

"Undercarriage and Flap Control. The selector lever for the undercarriage and flaps is on the right-hand side of the cockpit and works in a gate, having a neutral position and an UP and DOWN position for both undercarriage and flaps, the position for operating the flaps being outboard. The catch on the side of the lever must be pressed in order to release it for movement from an operational position, but the lever can be moved from the neutral position without first releasing the catch. To obviate inadvertent selection on the ground of a wheels-up position, a safety catch is provided on the gate which must be turned in a clockwise direction to permit entry of the selector lever into the wheels UP slot. For emergency lowering of the undercarriage, see Par. 35."

Well, I had to admit to myself that whoever designed that device should be given a Nobel Prize for engineering ability. I was amazed that



ABOVE Bruce Lockwood beside P2970. Bruce has been Director of Restoration and Maintenance at Santa Monica's Museum of Flying for ten years.



ABOVE The Hurricane's cockpit shows typical 1930s British features, its "Basic Six" main instrument group the only element of order in a jumble of knobs, switches, levers, wheels and structure.



ABOVE Views of the spartan pilot's seat and headrest, and the undercarriage lever.

levers normally as simple as undercarriage and flaps handles — move either up or down — could be engineered into something so complex and still function. The whole affair was suspiciously reminiscent of the gearshift and linkage assembly of a vintage MG sports car.

My next surprise was the location of the fuel mixture lever, or "slow-running cut-out", as the manual calls it. I could not find it anywhere! I also noticed the lack of an air system "on/off" valve that was within convenient (or any) reach for that matter, and this really concerned me.

"Hey, Chris! Where's the fuel mixture lever and the air valve located?" Chris eased himself on to the trailing edge of the port wing, leaned into the cockpit and pointed to a little device that looked like a brass bellman's bell from a Victorian hotel desk, on top of which was located a switch. "That's the 'mixture switch', and the air valve is located in the gear well," he said. "Apparently, the original lever and cable-operated 'slow-run cut-out' was removed and this new system installed." (The museum has since changed back to the simple original system of lever and cable.)

"What's the bell for? Do I have to ring it for service so that I can turn the fuel on?"

"No," Chris laughed, "but you are going to like this. Remember when David told you to make sure not to forget to turn on the air?"

"Yes, I do."

"Well, if you don't turn the air on, you can't shut the engine down with the mixture control once it's started."

"What? Wait! Explain this whole thing to me." "Okay. Here's what can happen. Let's say you land at an airshow, taxi in and shut down.

Those darn air-operated brakes

FOR READERS UNFAMILIAR with Second World War fighter wheel-brake systems, they may generally be categorised into two distinct types: first, toe-operated hydraulically-actuated brakes (the standard for American, German and Japanese aircraft types), or, secondly, air-operated brakes, as fitted on British and Russian aircraft.

Air-operated brakes are simple, light and easy to use once you get used to them. The pitfalls are:

- 1 Any leak in the system means that you will have little or no brakes upon landing, and
- 2 There seems to be more of a tendency for brakes to fade during hard usage.

The thing I found most difficult to get used to was the slight delay the pilot feels from the time he applies the brakes until the time the brakes start slowing the wheel. With straight-ahead braking this is not much of an issue, but if you are correcting for a wind on landing you need to anticipate half a swerve ahead of yourself to get control.

The brake control lever (which looks like a motorcycle brake lever) is mounted to the control column spade-grip within easy reach of the finger on your right hand as you grasp the spade. This lever is connected via a cable to the "brake-proportioning valve" which, in turn, is connected to the rudder bar by a simple linkage.

Pulling on the brake lever increases the air pressure to the brake-proportioning valve which directs air to the left, right or both brakes, depending on the corresponding position of the rudder bar. The harder the brake lever is pulled, the higher is the air pressure going to the brakes.

A triple-needle pressure gauge registers the overall pressure available to the brakes and the actual pressure that is being applied to the left and right brakes respectively.

Figuring you'll be a while, you walk under the wing to the wheel-well and turn off the air valve. When it's time to depart, you've forgotten to turn the air on. During your cockpit pre-flight you notice the pressure valve say 280lb +/- or full, so you assume your crew chief has already turned the air valve on for you. Surprise! The valve is still off. So you start the Merlin and begin to taxi out. After three or four applications of the brakes for turns and checking your taxiing speed, you notice that your brakes and brake pressure are gone at the same time. At that instant, your calm demeanour goes to full panic, with the vision of that beautiful Rotol propeller turning to splinters on the tail section of that very expensive Mustang taxiing 50 yards in front of you."

I interrupt Chris. "So, the brass bell is a horn to let the other pilots know I can't stop? I already have a gearshift on the right side, so all I need is a clutch pedal and I can drive it!"

"No", said Chris. His patience was wearing thin.

"If you notice on the top of the bellman's bell — I mean the slow-running cut-out — there is a switch. When the master switch is ON, this switch, when moved forward, allows voltage to flow to an electrically-operated air solenoid valve which then allows air, if you have any, to flow through a line connected to a little cylinder which pushes on a piston connected to some lever that opens or closes the barrel valve on the carburettor. So you had enough air to open the barrel valve for the start-up, but after taxiing and using up your air, even though you've moved the switch to close on the slow-running cut-out, there is no air pressure available to operate the piston and linkage to rotate



Chris pointed to a device that looked like a bell from a Victorian hotel desk, on top of which was a switch. 'What's the bell for?' I said. 'Do I have to ring it for service so that I can turn the fuel on?'

the barrel valve to closed. I guess you could just shut the mags off, but that's too easy."

Chris and I continued for the rest of the day as I made notes on all aspects of the rare fighter.

By now I have got the picture, and I understand David's concern. I arrive back at Santa Monica the next day, helmet in hand, for my first Hurricane flight. Walking up to the fighter as it sits on the ramp, I am again surprised by the thickness of the wing. It is almost as if Hawker took the top and bottom wing from the beautiful Fury biplane, blended them together, and then attached the result to a new fuselage. However, the Hurricane looks beautiful parked on the white ramp; a true fighter in every sense.

After a pre-flight I jump up (actually, you have to use the retractable step and numerous flush hand-holds to get up) and strap into the seat.

The start-up is straightforward but takes more skill than the Mustang or Bearcat. Because of the Rotol propeller's light weight, the engine literally bursts into life, unlike the P-51's slower "spool-up." The starting procedure is shown in the *How to start a Hurricane* panel at right.

As with most British Second World War fighters, the visibility during taxiing is good — much better than from the Bf 109E or Yak-3, but not as good as from the Hellcat or Skyraider.

The brakes are very effective, and the aircraft is easy to taxi; rather like a Piper Cub with heel brakes. However, some dexterity is required. At the run-up area I turn into wind and check the cooling door, re-check the rudder trim to "full right" and set the brake. With the oil temp above 40°C and the coolant at 80°C, I advance the throttle to -2lb/in² boost (about 26in manifold pressure (MP)), then check the magnetoes for a

75–100 r.p.m. drop and cycle the propeller three times. You must be careful and hold the stick full aft; relaxing the grip can bring the tail right up.

A last look around the cockpit, checking temps and pressure — the usual GUMPS. Then reduce the power to idle and let the tower know we are ready to go. British aircraft do not allow for a lot of dilly-dallying, since they heat up rapidly on the ground, so it is wise to get going as quickly as possible. I obtain clearance from the tower and taxi into position.

With the brakes on and stick back, I come up to -1lb/in² boost or 28in MP. I like to use a lot of power before brake release for the take-off, as it makes the rudder very effective and makes it easy to control the tendency to swing left. On the P-51D for example, I use 40in+ of manifold pressure before brake release.

I release the brakes, and the Hurricane moves off quite smartly as I ease the back-pressure on the stick, check a tendency to swing right with some rudder and continue advancing the throttle to +9lb/in² boost (48in MP) and 2,850 r.p.m. At the slow count of three, lift the tail up about 1ft 6in and, with 70kt in hand, we are airborne.

A quick half-turn of nose-down trim eases the stick back-pressure from neutral as I start the climb. Because of the 103kt undercarriage speed limit, I quickly switch hands on the stick and, with my right hand, unlock the undercarriage-up safety switch and move the undercarriage/flap lever through its centre then up to raise the wheels. Change hands again, squeeze the brake to stop tyre rotation, and now it is time to deal with the Santa Monica noise monitor. With the end of the runway just passing under the leading edge of the wing and 800ft on the altimeter,

ABOVE The author rolls P2970 towards the camera, displaying the fighter's generous wing area. The aircraft was discovered as a hulk on a Canadian farm before being moved to Britain for complete restoration.

How to start a Hurricane

Air	ON (200lb/in ² min)
Gear	DOWN
Flaps	UP
Trim: rudder	FULL RIGHT
elevator	NEUTRAL
Radiator door	OPEN
Fuel selector	MAIN TANK
Electrical Master	ON
Check gear light	
Mixture lever	CUT-OFF
Propeller	FULL INCREASE
Throttle	1/2 IN OPEN
Friction	SET
Flight controls	FREE
Brakes	SET
Fuel boost pump	ON
Priming pump	4–6 PUMPS
Engage starter and booster coil	
As soon as engine fires: mixture forward (switch forward), mags to BOTH	
Check oil pressure. Secure priming pump	



In the Eye of the Hurricane

I glance at the oil pressure: 90lb/in²; that's good. Airspeed is 100kt, rate of climb 2,000ft/min. At this point I rapidly reduce the boost to zero and r.p.m. to 2,200 as I try to sneak past the noise monitors installed by the "People's Republic of Santa Monica". I select the undercarriage lever back to neutral, and for the next 15sec I hold my breath as I pass over "no-man's-land". Engine failure now, with nose high, reduced power and 15kt under the engine-out glide speed is not something I like to contemplate. At these times I really appreciate the hard work, dedication and unwillingness to compromise quality that Mike, Jose and Steve of Vintage V-12s put into their engines. I fully enjoy the power from the smoothly-running Rolls-Royce/Packard V-1650-225 they built for the Hurricane.

Cleared of the "finc zone" (it should be noted that the City of Santa Monica can impose up to \$10,000 for breaking the noise monitor; and this includes jail time!), I turn right at the edge of the Pacific Ocean and head up the shore and out to do some air work. As I cruise-climb up the coast and then turn inland, a few things become readily apparent: the Hurricane is very easy to take off and to fly; it is very, very loud; and the cockpit is very hot.

Once on station, I do a clearing turn then slow to do some stalls. Clean and in idle they come at around 63kt with a nice buffet and easy right wing drop. Very nice. Next comes a stall in landing configuration. At idle the break comes at around 50kt, with buffet and a sharper left wing drop. Now, with power on, I do the same thing. This time the nose is very high as the airspeed hovers around 45kt before the aircraft stalls and sharply drops the right wing over 90°. "It sure flies slow, but lets go like a Corsair," I say to myself. "Better remember that."

After the stalls, I level out and set the revs to 2,200 r.p.m., +2lb/in² boost, then close the cooling door, retrim and wait as the aircraft settles down to an easy 185kt indicated airspeed.

Because of the low nose-case gear reduction of 0.420:1, the propeller is turning at only 924 r.p.m. at cruise, so you can almost count the blades as they churn past. There is considerable vibration in the airframe, mainly owing to the solid motor mounts and the three-bladed wooden propeller. The Hurricane is also very loud inside, due, in part, to the slipstream drumming on the fabric-covered fuselage.

Increasing to 2,800 r.p.m. and +9lb/in² boost yields 230kt IAS at 5,000ft. Pulling into a climb, I reduce power to 2,650 r.p.m. and +7lb/in² boost and hold 120kt, which gives a 2,800ft/min climb up to 8,500ft for some air work.

Banking 30° left and right, I notice a bit of adverse yaw, and quite a bit of rudder is used in the direction of the roll to counter this. The Hurricane also has a surprising tendency to pitch nose-down when yawed left or right. Although this is easy to counter, it means you have to fly with roll, pitch and yaw inputs at all times to maintain co-ordinated flight.

Pushing the nose over to reach 200kt, I pitch up 10–15° and do a roll. Left aileron, left rudder, then counter the tendency to pitch nose-down with aft stick. Not too bad. A couple more rolls left and right with hand on the stick are easy, and I complete each in 5–6sec.

Levelling out again, I bank hard left into an 80° turn and notice that the elevator has a very dampened feel, almost as if there was a hydraulic damper attached to the elevator system, restricting its speed of movement.

With a smooth pull on the stick, I need about 6lb of pull for each g on the airframe. This tapers off to 0lb of pull at 5g. In other words, if you pulled 5g and let go of the stick, the 5g would stay on until you pushed forward on the stick. This sensation is fairly common to World War Two fighters. With some it occurs at 5g, with others as low as 2g. I prefer the higher numbers.

Second World War fighters are a lot of fun but hard work to do aerobatics in; the Hurricane is

Hawker Hurricane Mk XII RCAF 5481/G-ORGI/N678DP history & restoration

BUILT BY CANADIAN Car and Foundry in 1942, Hurricane XII 5481 was issued to the RCAF that September, joining 125 Sqn at Sydney, Nova Scotia. Little is known of its operational use, and post-war it was sold as surplus. In the 1970s Canadian collector Jack Arnold acquired several Hurricanes, including 5481, from farms, and put them on show at Brantford, Ont.

In 1986 British warbird collector Charles Church bought 5481's remains, and restoration proceeded until he was killed in a Spitfire crash on July 1, 1989. The Church estate decided to auction the project and, hearing of this, British restorer Craig Charleston contacted David Price at the Museum of Flying at Santa Monica, who tendered a winning bid for it.

The aircraft was moved to Dick Melton's workshop at Micheldever in Hampshire, and, about a year after Price bought it, the restored MK XII, registered G-ORGI, was ready to fly. Test pilot Dave Southwood of the

Aeroplane and Armament Experimental Establishment was at the controls for the first post-restoration flight, on September 8, 1991, and the subsequent test programme. Craig Charleston then had the aircraft dismantled and moved to Chino, California, for reassembly.

David Price asked warbird painter Tony Corbo to paint the fighter in the markings of P2970, flown by Geoffrey Page (Frederick Handley Page's nephew) when he was shot down on August 12, 1940, after attacking a formation of Do 17s inbound to bomb the Medway towns. Caught by a bomber's guns, Page's Hurricane burst into flames; he baled out over Epple Bay, and was rescued by the Margate lifeboat. He spent two years in hospital, recovering from the extensive burns to his hands and face suffered during the final agonising seconds in P2970. The paint scheme includes his 2½ kill marks, and the name *Little Willie* as carried on P2970.



ABOVE Hurricane 1s of 56 Sqn RAF at North Weald, May 1940. Hurricane N678DP is painted in the unit's markings — specifically the aircraft of Geoffrey Page. ABOVE RIGHT The 56 Sqn crest. The motto reads "Quid si cælum ruat?" — "What if heaven falls?"





no exception. It is very exhilarating to pull 5g and zoom vertical at 400 m.p.h., but continual effort is required to trim elevator and open/close the coolant door to keep temperatures within limits, and make constant throttle adjustments so as not to overboost the engine.

Surprisingly, most fighters are not very nimble, because they were designed to be stable gun platforms. In addition they had to be stable enough to allow an exhausted fighter pilot returning to base in terrible weather conditions to shoot a needle-and-ball approach and survive the landing.

Because of its very forgiving nature, the Hurricane rates at the top for being easy and fun for aerobatics. The manual lists the following speeds for manoeuvres:

- Loop: At least 280 m.p.h. (I have used 210kt);
- Roll: 220–250 m.p.h. (If the Hurricane is flying, it will roll);
- Half-roll out of loop: 300 m.p.h. (Roll on top needs to be timed right);
- Upward roll: 300 m.p.h. (Fun, but recovery is exciting).

After beating all the clouds into submission, I head back to Santa Monica for the biggest hurdle of any first flight: the landing. Request for overhead approach is approved by the tower. Because the airport is located in the middle of a heavily built-up city, I make it a habit to fly a high, close-in pattern just for insurance in case of an engine or systems problem.

Overhead at 1,800ft and 200kt, I make a flat 3g left turn and reduce power. The downwind leg is used up slowing to the 103kt undercarriage and flap limiting speed. Undercarriage and then flaps are selected down on turning base at 800ft. There is a large trim change when the flaps deploy, so I ease the stick pressure by adding nose-up trim. With 2,400 r.p.m. and -4lb/in² boost I hold 85kt over the approach. Visibility is very good, with nice control all the way down to threshold speed of 75kt. I ease the throttle off and settle in for a three-point landing. The aeroplane slows rapidly, with little rudder or brake input. The Hurricane is very

Hawker Hurricane Mk XII data

Dimensions	
Span	40ft 0in
Length	32ft 0in
Height	13ft 1in
Wing area	257.5ft ²
Weights	
Empty weight	5,640lb
Loaded weight	8,250lb
Performance	
Maximum speed	340 m.p.h.
Climb	20,000ft in 8.9min
Range	470 miles
Ceiling	36,000ft

easy to control, and should be the trainer for the North American T-6!

Turning off the runway, I come to a complete halt, look closely at the single lever that is capable of raising either the undercarriage or flaps, and do a double check. (After ten years of flying this Hurricane, I still stop and do a double-check before putting the flaps up after landing.)

Sliding the hood back, I taxi to the museum tarmac, where Chris is waiting with a big smile. I have returned his new toy safe and sound. Real mechanics lend us their aeroplanes so we pilots can have fun, but you had better treat the aircraft well.

After a 30sec engine run I reach to the bellman's bell and flip the switch to "off". Imagine all the "monkey motions" going on! As the mixture leans, the engine cleans and picks up 20 or so r.p.m. There are no 15–20 turns of the propeller, as on a Mustang; the Rotol makes one revolution and then stops. Sitting in the cockpit after taxiing, I am surprised by how easy and straightforward the Hurricane is to fly. With its good visibility and slow landing speed, it is easy to take off and land; much easier than a Cessna 185, almost like a Citabria. Do not get me wrong. The Hurricane is a big and powerful aeroplane, but it is also a gentle one. I can see why it was the workhorse of the Battle of Britain, and an aircraft loved by its pilots. **A**

ABOVE Little Willie in landing configuration, with undercarriage and flaps down. They must not be lowered when the aircraft is flying faster than 103kt. With power at idle in this condition, the Hurricane stalls at 50kt; with power on, 45kt.

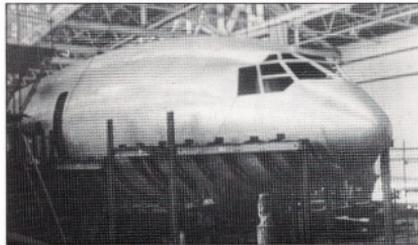
After beating all the clouds into submission, I head back to Santa Monica for the biggest hurdle of any first flight: the landing

Personal Album

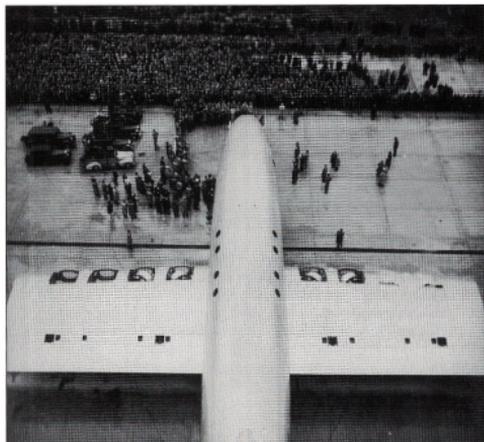
Having been captivated by the sight of Westland Wapitis and Hawker Harts in the 1930s in his native Bristol, **TONY COLMAN** went on to become an apprentice at Bristol Aircraft's Filton works, where he took these previously unseen photographs of the mighty Brabazon during 1946–49

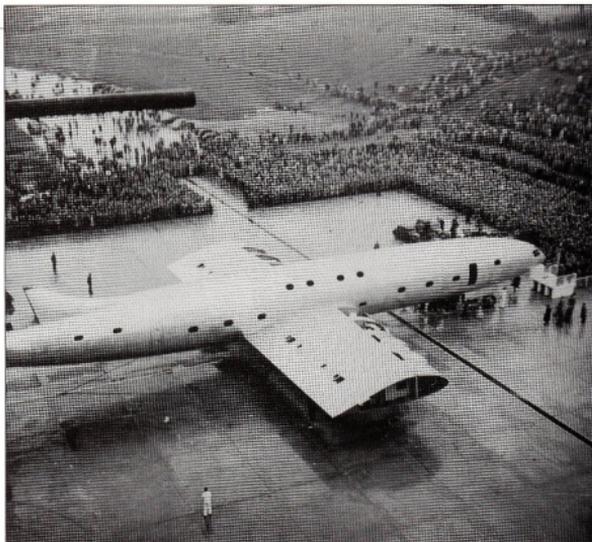


ABOVE Test pilot A.J. "Bill" Pegg in the Brabazon's cockpit. **ABOVE RIGHT** The official naming ceremony of the Brabazon on October 8, 1947. "By the time of the christening I had acquired a Voigtlander Bessa camera, and I exploited my apprentice overalls to sneak into areas where I had absolutely no business to be", says Tony Colman.



ABOVE A picture of the fuselage in 1946, taken in poor lighting conditions with a primitive Coronet Cub camera. **RIGHT** "The view of the hull from the crowd was OK, but I wanted a high angle shot. I climbed to the top of the 115ft-high roof via a series of ladders, meeting a rather green-faced press photographer on his way down."





ABOVE "The view from the roof was good. The incomplete Brab was well framed by the crowd — I sold 200 sets of eight photographs to fellow employees."

ABOVE LEFT The Brabazon in 1949. "I stood alongside one of the engine units at take-off power. The tips of the 16ft contra-rotating props appeared to cycle slowly backwards and forwards, seeming to come within a foot of each other."
LEFT in final assembly in 1949 before control surface completion.



ABOVE & RIGHT "On September 4, 1949, now equipped with a Super Ikonta, paid for with the spoils of my earlier venture, I dropped over the 8ft-high fence when the Police weren't looking, ran down the airfield and took a few pictures of the first flight and the celebrations of Bill Pegg (**BELOW**) and the crew after landing."



ABOVE Despite the technical innovations of the majestic and awe-inspiring Brabazon, the only example, G-AGPW, was broken up with less than 400hr flying time in October 1953.



Five Hundred Miles Per Hour

The 40th anniversary of the Reno National Air Races not only established the event as the world's longest-running air race but also saw the coveted 500 m.p.h. barrier finally broken. **MICHAEL O'LEARY** reports from the fastest racetrack in the world

ABOVE A favourite with the Reno spectators was *Sea Fury Critical Mass*, flown by Tom Dwelle. At Reno 2002, the aircraft suffered an undercarriage collapse, but the crew repaired the machine and Tom took third place in the Gold at a very fast 446-965 m.p.h. **RIGHT** After years in storage, Canadair Silver Star Mk III N99184 *Red Knight* returned to Reno with new owner Chris Rounds.

RIGHT Mike Brown's *Sea Fury September Fury*. Although it did not make it through to the actual racing, some timers stated that it was doing 500 m.p.h. when its fuel-injected Wright R-3350 violently exploded on its first qualifying lap. Mike pulled off a difficult emergency landing, but the machine had posted the fastest-ever *Sea Fury* time.

"IT'S A GOOD DAY," said Skip Holm as he slid back the canopy on highly-modified P-51D *Dago Red*. "Temps are good, no wind, this might be fun." And it was. This Friday event was not a race of any particular importance — that would take place on Sunday.

"I've been watching *Rare Bear* quite closely," said Skip. "They always fly the same race on Friday so I've made some plans." This got our attention, so we watched the race very closely. And what a race! Skip immediately started by breaking the vaunted 500 m.p.h. barrier and then kept increasing his speed each lap to finish the race with a stunning average of 507-105 m.p.h. The crowd went absolutely ballistic — they had just seen air racing history being made.



"I knew one of us [referring to *Rare Bear*] was going to go 500", said the laughing pilot after the race, "and I wanted *Dago* to be first. Somebody came on the radio and told me to pull back the power! Can you imagine somebody saying that during the Indy 500? My first three lap speeds were pretty consistent and as the liquids burned off I was able to bump it up 2kt per lap. I have always said *Dago* is not the fastest racer at Reno and breaking this record is completely due to the fantastic crew."

Not only had Reno celebrated its 40th anniversary, but the 500 m.p.h. record had been broken. For the unlimiteds, it was a very, very fast year. In Sunday's Gold, Skip took the lead and never let go. "I was keeping an eye on the *Bear* (Skip's chief rival)", said Skip. "Between the time Steve [Hinton] pulls up [in



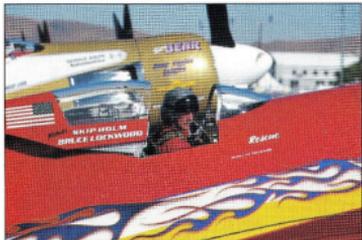
the pace aircraft T-33] and you hit the first pylon is when you have the best acceleration per second. The *Bear* was going over 500 and I pushed the power all the way up."

Skip won in a convincing manner as John Penney was having some engine problems with the *Bear*. However, nothing stays the same. "This winter, we are doing a drag reduction programme with the *Bear*," said Penney. "We are also going to extend the wing leading edge so the *Bear* should be significantly faster for Reno 2004. Watch out, Skip!" **A**

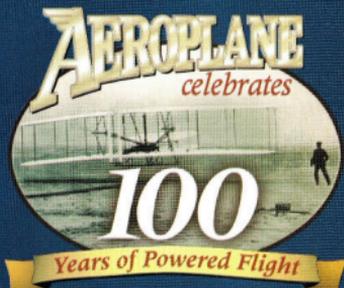


ABOVE After five years on the ground, John Penney, Lyle Shelton, and their crew returned Grumman Bearcat *Rare Bear* to the Reno pylons in a most convincing style, and captured a qualifying first at 495-039 m.p.h., followed by a second in the Gold race at 483-942 m.p.h. "We're starting to reach critical Mach numbers with the *Bear* and *Dago*", states John. "I know we are going to go faster so we need to do some careful research into this area."

FAR LEFT Skip Holm just before the start of the Gold race in *Dago Red*. **LEFT** Skip in low-level action in *Dago Red*.



LEFT Alex Henshaw's Percival Mew Gull, G-AEXF, was freighted to Reno by owner Taff Smith, who bases the immortal machine at Breighton in North Yorkshire. Taff commented, "I thought that the Mew would be a perfect visitor for the 40th anniversary Reno — and anyway, I have always wanted to go around the pylons."



Ready to Celebrate?

NOT LONG TO GO NOW until the Centenary of Powered Flight on December 17 — and it is a great time to be interested in aviation history, with new museums and events coming up, and a whole fascinating century to look back on.

You might like to look on this special Centenary section of *AeroPlane* as a briefing. If you want the story of the Wright brothers, told in a concise, lively way by one of the world's greatest air historians, it is here. If you want to enjoy an entertaining tour of the best and worst of 100 years of aircraft, or a retrospective of the century's aviation films, they are here. If you want to know how a British pioneer laid the groundwork for the Wrights 200 years ago, it is here, along with much more.

We begin, fittingly, with a hard-hitting story by a prominent aviation figure who celebrates his own centenary a few days before December 17 — and without whose efforts many of us might not have been around to celebrate.

Training The Few

Sparked off by an *AeroPlane* article last year on the RAF's shortage of pilots in the early years of World War Two, **SIR ARTHUR MARSHALL** — who is set to celebrate his 100th birthday in December — describes how his famous Cambridge-based family firm played a vital role in ensuring that Churchill's Few were not disastrously fewer



About the author

Arthur Marshall learned to fly in 1928 and ordered his first Gipsy Moth in 1929. He and his father, as the Marshall company, established their first flying training school at Cambridge in the same year and, thus, Marshall of Cambridge has been in the aircraft industry for 75 years of the first 100 years of aircraft flight

BELOW Cambridge Airport in 1938, with Moths and other types in evidence.



MY FATHER ESTABLISHED HIS garage business in 1909, and the company expanded into the aircraft industry with the opening of its first flying training school at Cambridge in October 1929. It became prominent in the aircraft industry from 1936, when there was a very big shortage of flying instructors and pilots. As a result, Marshall's decided to train its own instructors and developed what became known as "The Marshall Ab Initio Pilot and Flying Instructor Training Scheme". This was operated at Marshall's civil and RAF Volunteer Reserve flying training schools at Oxford and Cambridge, and a direct entry RAF elementary flying training school at Cambridge in the pre-war years.

The RAF's long-established procedure for the training of flying instructors entailed the selection of officers with a number of years' squadron experience as suitable material for training as flying instructors. Such selection was considered a great honour, and was followed by being posted to the RAF Central Flying School (CFS) for a flying instructor training course. This meant that, as and when more pilots and instructors were required, pilots would be automatically transferred from



squadrons' active personnel to go on an instructors' training course. Therefore, in time of stress, if the Service wanted an increased number of instructors, officers would have to be transferred from front-line squadron operations to the CFS to be trained as instructors.

Marshall's virtually turned the RAF scheme upside-down. Its plan was to take young men from 18 upwards and give them a course of 50hr elementary, 100hr advanced and 25hr instructor training, when they would be submitted to the CFS. In the pre-war days, they would then be passed out as advanced flying instructors on de Havilland Tiger Moths, Hawker Harts and Hinds, and Fairey Battles, all within three to four months. The young, enthusiastic instructors established day and night and elementary and advanced flying instruction of over 1,000hr instruction per year, compared with the average of 250hr as operated at civil and RAF flying training schools. This provided a four-fold increase in the output of trained pilots and instructors, and also increased utilisation of training aircraft from the average 400 to over 1,000hr per year.

The scheme resulted in at least 200-300 more pilots being available from Marshall's schools for the Battle of Britain than there would have been had the scheme not been established. The C-in-C Fighter Command, Air Chief Marshal Sir Hugh Dowding, often lamented in times of great stress: "If only I had 200 more pilots". Without Marshall's scheme he would have had 200-300 fewer pilots than he actually had at the start of the Battle of Britain.

It is now often asked what would have happened in the Battle of Britain if Dowding had had 200-300 fewer pilots than he actually had

at the start of the war. It was a close-run thing. Churchill visited Headquarters Fighter Command with his Staff Officer, General Ismay, in August 1940, to bring himself up to date with what was happening. The Staff Officer recalls that, when they left, every single squadron was engaged, there was nothing left in reserve, and the map table showed new waves of attackers crossing the coast. He felt sick with fear. Churchill's first words in the car were: "Never have I been so moved. Don't speak to me". After five minutes he said: "Never in the field of human conflict was so much owed by so many to so few".

War broke out on Sunday September 3, 1939, and on Monday I embarked on a major campaign for the Marshall Ab Initio Pilot and Flying Instructor Training Scheme to be universally adopted by the RAF. This included a letter to Lindsay Everard, the MP for Leicester, who

ABOVE Aircrews under training head out to their Elementary Flying Training School (EFTS) de Havilland Tiger Moths in 1940. Marshall's operated No 22 EFTS at Cambridge.

BELOW The members of a flying training course at Marshall's in 1940 pose for a group photograph. How many of them, one wonders, survived the war?





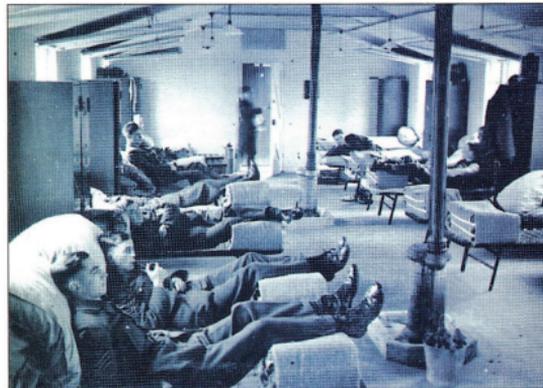
ABOVE Cambridge Airport's control building opened in 1938 — a classic of airfield architecture.

RIGHT Ground instruction under way at Cambridge.

BELOW Leicester MP Sir Lindsay Everard, to whom a young Arthur Marshall wrote for support in launching the training scheme.



BELOW What a life! Typical accommodation for flying students at Cambridge.



was a great aviation enthusiast and kept his own private twin-engined six-seat de Havilland D.H.84 Dragon and had his own personal pilot. He, in turn, made contact with Admiral Murray Suetter, Chairman of the Parliamentary Air Committee, and an emergency meeting of the Parliamentary Air Committee was held in the House of Commons on Tuesday October 10, 1939, at five o'clock. A number of Air Marshall personnel were present and the scheme was discussed, but the RAF spoke against it. A few days later L.M. Jones at the Air Ministry phoned me in a friendly way to advise that, in its own interest, Marshall's should not pursue this as it could damage its working relationship with the RAF. He said that Marshall's suggestion of training young instructors was quite contrary to the long-established RAF tradition of selecting officers with some years of squadron experience to train as flying instruc-

tors, and that Marshall's scheme would undermine the prestige of RAF flying instructors.

The matter was dropped until the Dunkirk evacuation of troops at the end of May 1940, when it was thought it did not matter whom the company upset. I found it difficult to make contact with the Air Minister, so I spoke to Lord Milford, who in pre-war years had done much air charter flying with the company and was a friend of the Air Minister. Milford said I should put in writing all I had said to him and he would send this to the Air Minister, which he did, with a recommendation that the Air Minister should see me as a matter of urgency. A 'phone call was received from the Air Minister's secretary to say that he would be seeing me when he had digested the papers. A week later the secretary 'phoned again to say that he would not be seeing me, as he had decided to appoint for the first time an Air Member for Training to the Air Board, with instructions to make contact with me immediately he assumed office at the beginning of July. The new Air Member was Air Vice-Marshal Guy Garrod, and a meeting was arranged for a Wednesday early in July.

I met Garrod in his office, and he said there were those who said I should be doing the job he had but he, in turn, knew nothing about flying training and had no axe to grind and had arranged for the senior staff responsible for flying training, including the Director of Flying Training, to meet in a conference room for a general discussion. I thought the discussion went well, and the Director of Flying Training, whom I had previously approached on a number of occasions to adopt the Marshall scheme, resigned on the Friday. There were a number of 'phone calls about "How do we do this?" and "How do we do that?", and things were not moving as fast as I had expected.

Finally, I wrote to the Air Member, stating that the Department had full records of all that had been achieved at Marshall's civil and RAF flying training schools before the war, but, if they wanted further proof, Marshall's would be prepared to accept ten pupils at a time, over aircrew age, and train them and have them passed out by the CFS as flying instructors within 14 weeks. The Air Vice-Marshal replied a week later to say that the RAF accepted the offer on condition that Marshall's would not want any more instructors or aircraft, that it would not interfere with the currently established elementary courses, and that the pupils would be over aircrew age. Subject to these conditions Marshall's would be having the first ten pupils the first week in September.

These were all trained and passed out by the CFS during early December and allocated to flying schools as instructors forthwith, including two to Marshall's RAF elementary training school. The Ministry also gave Marshall's authority to cream off ten pupils per course whom Marshall's judged were good potential material for flying instructors, and have them passed-out as instructors as quickly as possible — all this while the Ministry were making their final decisions as to what they were going to do. The Ministry finally decided to establish five Supplementary Flying Instructor Schools (SFISs), one of which was at Cambridge, by

May 1941. These provided instructors to all flying schools and for the Empire Training Scheme in Canada, Africa and Australia, and as the scheme built up there was no shortage of pilots or flying instructors for the rest of the war.

The scheme is operational in the RAF to this day, with the selection and creaming-off of pilots during their initial training as suitable material to become flying instructors. Air Marshal Sir John Day, in his lecture on flying training, delivered as the Royal Aeronautical Society Cambridge Branch's Sir Arthur Marshall Lecture on February 8, 2001, made it clear that, had the Marshall Scheme been adopted at the beginning of the war, there would have been no shortage of instructors or pilots for the Battle of Britain.

The scheme as operated by Marshall's flying schools before the war achieved three things:

- Some 200–300 more pilots were available for the Battle of Britain.
- There was no shortage of flying instructors or pilots after the scheme was put into full operation at the beginning of 1941.
- It was admitted that, had the scheme been adopted as advocated at the beginning of the war, there would have been no shortage of instructors or pilots for the Battle of Britain.

Marshall's RAF pre-war and wartime training centres trained more than 20,000 aircrew for the RAF and glider pilots for the Army.

The Government was responsible for the production of aircraft, and successfully planned for a major increase in aircraft production, and indeed during the Battle of Britain there was no shortage of aircraft. The responsibility for pilot training was that of the RAF, which failed to make any plans for a major increase in the production of aircrew and simply hoped for the best.

While the Ministry and RAF were slow on the uptake in realising what Marshall's rapid training of pilots and instructors was achieving before the war with pilot output, they did realise that, as a result of the flying instructors' four-fold increase in flying hours and the two-and-a-half-fold increase in utilisation of the training aircraft as compared with other schools, the company must have very efficient



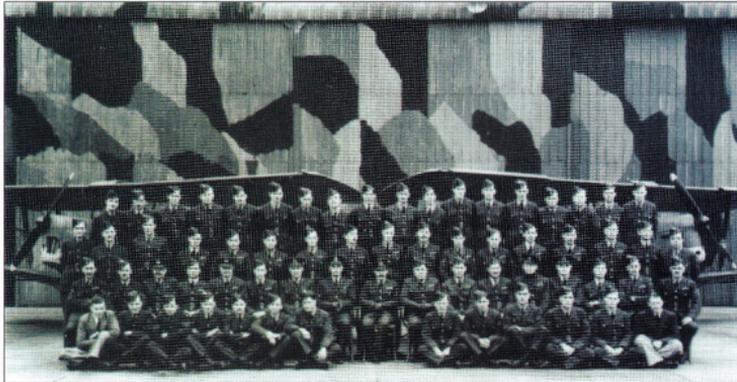
Air Marshal Sir John Day, in an RAeS lecture, made it clear that, had the Marshall Scheme been adopted at the beginning of the war, there would have been no shortage of instructors or pilots for the Battle of Britain

maintenance teams to handle the greater load of aircraft maintenance. As a result Marshall's was awarded a trial contract for major servicing of 16 Gloster Gladiators in mid-1939. This was a great success, and the contract was extended with additional Gladiators through the early war years. As a result of the all-round success of the Gladiator work, the Ministry appointed Marshall's before the war to be completely responsible for the in-service work on Armstrong Whitworth Whitley twin-engined bombers. This entailed a complete set of manufacturer's jigs and tools and major increased hangar accommodation.

This was the beginning of Marshall's being established as the most efficient and versatile of the newly-created Ministry of Aircraft Production's Civil Repair Organisation contractors for aircraft major repair, conversion of role, and development of aircraft in service. **A**



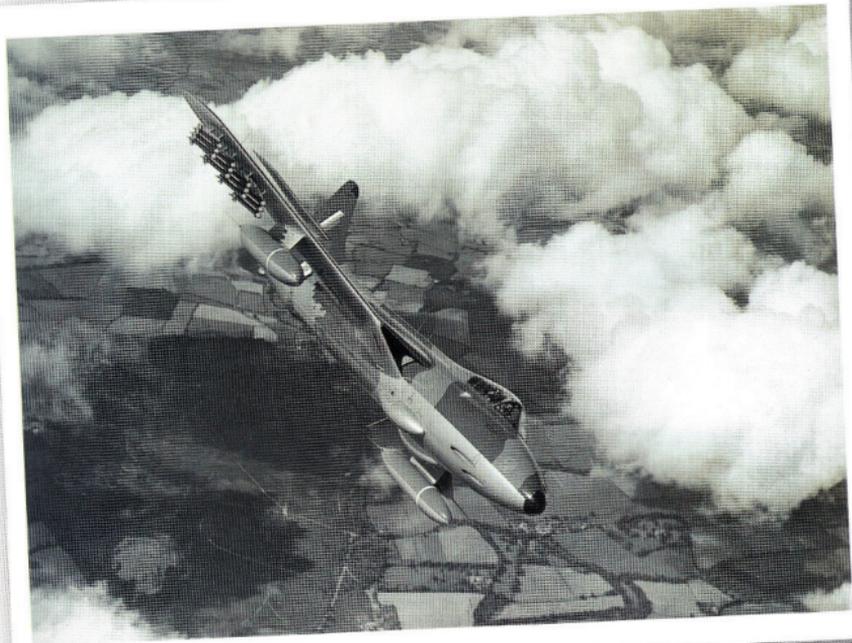
TOP Cambridge Airport in 1944. Marshall's began overhaul work on RAF Dakotas here soon after the Normandy landings. **ABOVE** Top-scoring British fighter ace "Johannie" Johnson, who trained at Cambridge's 22 EFTS from December 1939, with friends in front of a Fairey Battle.



LEFT Marshall's trained 20,000 aircrew before and during World War Two, including glider pilots for the Army as well as RAF personnel.

The **AEROPLANE** Photographic Archive

Picture of the Month



NICK STROUD selects a perfect candidate for a Christmas present from *Aeroplane's* extensive glass negative archive

SYDNEY CAMM, designer of some of the greatest aircraft in British history, said of the Hawker Hunter: "It is my most beautiful aeroplane" — a view shared by many enthusiasts as well as pilots who had the privilege of flying the type.

Developed using parts from the abandoned Hawker P.1083 supersonic Hunter project of 1951–52, the Rolls-Royce Avon-powered F.6 first flew in January 1954 — before the F.4 and F.5 — and entered RAF service with 19 Sqn at Church Fenton in May 1956. The F.6 was also the basis for India's Mk 56s and the Mk 58s of the Swiss Air Force, the latter of which kept the type in service until the early 1990s.

To order your own copy of this superb portrait in a choice of sizes, simply complete and return the adjacent coupon. **A**

ABOVE Avon calling — this dynamic study of Hawker Hunter F.6 XG128 carrying two 100gal external tanks and 24 rocket projectiles in triple tiers was taken during the 1956 SBAC show at Farnborough. The F.6 went on to serve with 19 front-line RAF units before its replacement by Lightnings in 1960.

AEROPLANE PHOTOGRAPHIC ARCHIVE ORDER FORM

Send to: Picture of the Month (December 2003), *Aeroplane* Photographic Archive, King's Reach Tower, Stamford St, London SE1 9LS. Offer closes: December 31, 2003

Please send me the Hunter F.6 print(s)

specified at right. **Prices include UK**

p&p. I enclose a cheque/postal order for the amount of £ _____ made

payable to IPC Media Limited **OR** please debit my credit card; the details are

as follows:

Expiry date _____ / _____ Signature _____

Mr/Mrs/Miss/Ms _____

Address _____

Postcode _____

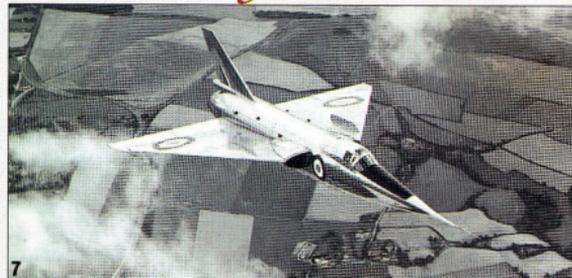
Size	Qty	Price	VAT @17.5%	TOTAL £
7" x 5"		£9.75	£1.71	£11.46
10" x 8"		£10.90	£1.91	£12.81
16" x 12"		£20.90	£3.66	£24.56
GRAND TOTAL (Please add £2 for overseas p&p)				£

If you prefer not to cut up this page, a photocopy of this form is perfectly acceptable. IPC Media Limited, publisher of *Aeroplane* ("IPC") will collect your personal information to process your order and to gain a better understanding of our magazine readership. We may send you details of our magazines and services. Please tick here if you prefer not to hear from IPC. We may pass your details to other reputable companies whose products and services may be of interest to you. Please tick here if you prefer not to receive such offers.

100 Years 100 Aircraft

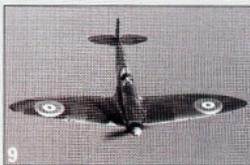


Record-setting . . . 10 world-beaters



1. **de Havilland D.H.88 Comet racer**
Won the speed prize in the 1934 MacRobertson Trophy Race, for which it was specially designed, and set subsequent point-to-point records
2. **Ryan NYP** Used for the first solo non-stop transatlantic flight, also a world distance record
3. **Rutan Voyager** Accomplished the first non-stop, unrefuelled round-the-world flight
4. **Fairey Long Range Monoplane**
Classic non-stop distance record breaker of the inter-war years
5. **North American X-15** Rocket-powered research aircraft which holds long-unbeaten

To celebrate 100 years of powered flight, the *Aeroplane* crew has selected 100 memorable aircraft — with a little help from readers — and asked ten famous aviation people to choose their “unforgettables”. See if you agree . . .



Eyecatching . . .

10 absolutely beautiful aircraft

- Albatros D V** Elegant monocoque-fuselaged First World War fighter
- de Havilland Mosquito** Clean-lined, multi-role “wooden wonder” of World War Two
- BAC/Aérospatiale Concorde** The epitome of elegance in jet transport
- de Havilland Albatross** Sleek four-engined wooden airliner forebear of the Mosquito
- Lockheed Constellation** A great piston-engined airliner of the 1950s with graceful lines
- Hawker Fury biplane** The embodiment of 1930s biplane beauty
- Erich Taube** Delicate bird-winged monoplane which became a dove of peace and of war
- Fairey Fantôme** Clean and curvaceous inter-war fighter biplane
- Supermarine Spitfire** The ultimate in Second World War fighter elegance; an all-round great
- Hawker Hunter** The most beautifully proportioned and elegant jet fighter of its era



- records for extreme speed and altitude
- Lockheed SR-71 Blackbird** Fastest jet-engined aeroplane in the world
 - Fairey FD.2** The first aeroplane to exceed the magic figure of 1,000 m.p.h.
 - North American F-100 Super Sabre** First jet fighter capable of exceeding Mach 1 in level flight
 - Supermarine S.6B** Won the Schneider Trophy outright for Great Britain and then took the world air speed record beyond 400 m.p.h.
 - Nieuport IIN** Captured both the world speed and altitude records in the pioneer era

Reader-pleasing

. . . **Hawker Fury**
On windless days, the forbidden cockpit of the school's old Fury biplane was my lunchroom, despite frequent ejections by prefects (my recalcitrance led to expulsion). The Fury's rocking in any breeze convinced me that my severe nausea in vehicles would always keep me off all aeroplanes. I was wrong, but Fury biplanes remained favourite, especially those with wheel spats.

Stan Fiske, Queensland, Australia

Unforgettable . . .

Ten eminent figures in the world of aviation select their choice of memorable occasions, people or aircraft from the past century



ALEX HENSHAW MBE

Air-racing, record-setting and test-piloting legend Alex Henshaw chooses fellow Spitfire test pilot Jeffrey Quill

A COMPARISON BETWEEN test-pilots of the 1930–40s and those of the modern age would, I think, reveal such differences as to be unrecognisable.

As the years went on, the ability to become an outstanding pilot would not be enough. This aspect was becoming obvious at the time of the design and development of the Spitfire.

Jeffrey Quill was one of those exceptional test-pilots who not only rated as one of the best exponents of aerobatics in the RAF, but was also gifted with a sound grasp of engineering and aeronautical technicalities.

Most important of all was his command of the English language, with his ability to impart the knowledge and experience gained in flight to the design and development team on the ground in a manner that they understood.



WG CDR KENNETH H. WALLIS MBE

The *autogiro* maestro, former RAF bomber pilot and inventor singles out an unsung physicist whose influence is more than skin-deep

NORMAN DE BRUYNE was a physicist who, early in the 1930s, designed an aircraft, the Shark, employing innovative constructional techniques.

Specialising in bonding materials (“glues”), de Bruyne soon established Aero Research Ltd, at Duxford, producing such as Aerolite, Araldite, Aerodux, Redux etc, all well-known names.

Such products led to such wartime successes as the de Havilland Mosquito.

Fibrelam and metal-to-metal honeycomb and special bonding techniques developed by Norman de Bruyne are now in virtually universal use in aviation. His was a very significant contribution to the first century of powered flight.



DESMOND PENROSE

The former de Havilland test pilot, display pilot and historic aircraft owner selects a designer of many Aaaaahh! aircraft

AERONAUTICAL ENGINEERING has produced many shapes in its 100 years of powered flight; practical, grotesque and a few with pure grace of line.

R.E. Bishop of de Havilland had an inspired eye for aeronautical form; as chief designer he was responsible for many pleasing shapes from the D.H.95 Flamingo to the futuristic D.H.108 research aircraft.

Two designs were beauties: the D.H.103 Hornet, surely the most attractive twin-engined fighter ever; and the immortal D.H.106 Comet, the most elegant (subsonic) airliner ever designed.

The man? My monthly reports to him, in the office that had been Sir Geoffrey's, revealed his kindness; but above all I remember his genius as a designer of elegant aircraft.



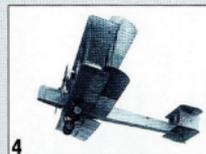
Mirth-inducing . . . 10 preposterous aircraft

- Bonney Gull** An inane inter-war attempt to make an aeroplane look like a bird (it did not fly like one)
- Lockheed XFV-1 Salmon and Convair XFY-1 Pogo** Propeller-driven VTOL tail-sitters that made life unnecessarily difficult for their pilots
- Caproni Noviplano** Extremely inelegant multiplane flying-boat that suffered from a surfeit of wings and a lack of flight
- Phillips 1907 Multiplane** Four Venetian blinds in close line-astern formation
- Caproni-Stipa** A windtunnel with wings that actually managed to get into the air
- Frost Ornithopter** A slavish imitation of the birds (apart from the fact that it would not fly)
- Mobilopter** Something useless to make with your old garden shed and all the lumber it contains
- Simplex-Arnoux tailless racer** A flying pig with a piggy-back radiator
- ML Utility** An aeroplane that, justifiably, did not enjoy an over-inflated reputation
- Seddon Mayfly** The domestic plumber's dream aeroplane



World-changing . . . 10 aircraft that shaped aviation

- Wright 1903 Flyer** The first aeroplane to make powered, sustained and controlled flights carrying a human being
- Boeing 707** The airliner that brought commercial passenger jet operations within the reach of the masses
- de Havilland D.H.106 Comet** The first jet airliner to operate commercial passenger services
- Vickers Vimy** The aeroplane that pioneered routes across the Atlantic, to Australia and down through the African continent.
- Fairey Fox** The private-venture biplane that established the formula for the clean, inline-engined high-speed day bomber of the 1930s
- Blériot XI** The pioneering Channel crosser that established the classic tractor monoplane configuration
- Douglas DC-1/2** Forerunners of the greatest and longest-lived pre-war all-metal, retractable-undercarriage monoplane airliner
- Polikarpov I-16 Rata** First of the low-wing, enclosed-cockpit, retractable-undercarriage monoplane single-seat fighters
- Boeing Stratoliner** The first pressurised airliner, offering passengers unprecedented comfort above the low-level turbulence
- Gloster E.28/39 & Heinkel He 176** The inaugurators of the jet age



Reader-pleasing

... Piper Cub

For sheer fun, the Piper J-3 Cub wins hands down from 100+ types. Leaping into the air in a few feet, side panels down, diving pass at 90kt IAS, slow pass at 40kt: a Tiger Moth without the drawbacks and so much lighter and responsive — and a great camera aircraft! The worst? Without any hesitation — Lake LA-4 "Submarine".

Bob Livingstone, Old, Australia

... D.H. Tiger Moth

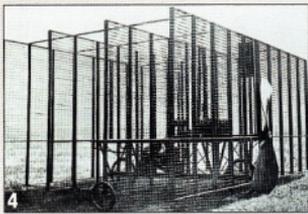
For me the Tiger Moth. First ever flight 1943 at Booker in ATC uniform with added spotted silk scarf, helmet and parachute. "You have control" (must be joking) bellowing down the Gosport communication mouthpiece. Exiting cockpit without disconnecting helmet tube! Beautiful autumn morning 45 years later super flight with Tigerfly at Booker. Open cockpit for real flying.

Peter Saunders, Thame, Oxon

... Vickers Viscount

The Viscount, admirably robust and serviceable, which we even managed to sell to the Americans. After a trouble-free development, it was a joy to fly in, offering one of the last chances to see two propellers turning on each side, through its large windows. Those re-seated for oil-related charters had almost First Class legroom.

S. Stott, Thornton Heath, Surrey.



Unforgettable . . .

DAVE MORGAN

The former Supermarine test pilot selects a fellow test pilot who figured out how to tame the tricky Boulton-Paul P.111 delta jet



LT-CDR J. ELLIOT AFC RN. I met Jock when I joined 7 Course of the Empire Test Pilots School in 1948. He had a brilliant mind, came top and was appointed to Aero Flight at the Royal Aircraft Establishment, Farnborough.

I believe his greatest contribution was the development of variable control gearing for the Boulton-Paul P.111 delta. It was highly sensitive in pitch and roll, especially at high speeds, and Jock proposed variable gearing which could be changed in flight to achieve optimum value.

Automatic gearing was applied to other aircraft with fully-powered controls, but it was the coming of "fly-by-wire" which allowed his concept its widest application.

The late Handel Davies, then Head of Aero Department, told me, "When we were all gropin' in the dark, Jock put his finger on the answer".



PETER TWISS OBE OSC & Bar

The former World War Two naval pilot and Fairey chief test pilot singles out the first manned Moon landing



ON JULY 20, 1969, three brave men were involved with the first landing on the Moon. Two, Neil Armstrong and Buzz Aldrin, in the landing ship *Eagle*; and Michael Collins in the command ship *Columbia*.

At 50,000ft above the proposed landing site, *Eagle's* engines were brought to life to decelerate and control the capsule down to the landing area. They were working against a very limited fuel supply with no margin for error. They had to conserve fuel for their return to *Columbia* after landing. At 1,300ft above the Moon's surface Neil had to use all his experience and skills to align *Eagle* on to a level area between boulders etc. A warning light showed when they had 30sec of landing fuel remaining. A level patch had to be located and a welcome remark from Aldrin, "contact, lights", indicated that the *Eagle* had landed. An amazing feat supported by hundreds at Mission Control, Houston. At the speed of light, exchange of conversation, *Eagle* to Houston, took 3sec. The return of *Columbia* with the three astronauts was faultless.

They were working against a very limited fuel supply with no margin for error

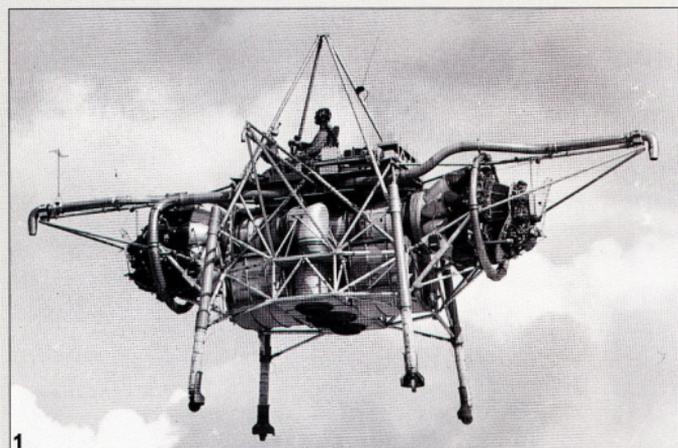
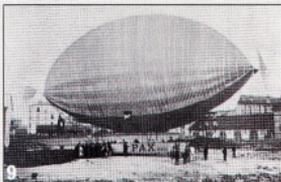


Illustration: de l'Étalon de l'Éclair et de l'Éclair.

Terrifying . . . 10 dangerous aircraft

- Rolls-Royce Thrust Measuring Rig** ("Flying Bedstead") A wingless VTOL pioneer with very marginal capabilities
- Rozière Balloon** A fatally misguided attempt to combine the hot-air and hydrogen balloons
- Douglas X-3 Stiletto** An ill-proportioned experimental high-speed jet with distinctly nasty behaviour
- Christmas Bullet** A disastrous fighter design with weak, unbraced wings that killed two pilots
- Lockheed F-104 Starfighter** Missile-like fighter that had some undesirable qualities
- Granville Gee Bee R** Inept, portly radial-engine racer that required extremely careful handling
- Mignet H.M.14 Flying Flea** The homebuilt aeroplane for everyman that proved to be a killer
- Messerschmitt Me 163** Rocket interceptor with an unpleasant tendency to bite its pilots
- Pax Airship** An early airship that caught fire in the air and exploded, killing its inventor
- SNECMA Coléoptère** An annular-winged, jet-powered VTO tall-sitter; a disaster waiting to happen





8

Reader-pleasing

. . . Grumman Widgeon

My favourite aircraft is the Grumman Widgeon. In 1967 I had the privilege to accompany Capt Freddie Ladd on evening flights to islands in the Hauraki Gulf, next to Auckland, New Zealand. The sheer excitement of watery take-offs and landings and the sunset views were breathtaking. I have flown on 50 types, but this is the best.

Gervais Foster,
Kettering, Northants

. . . Handley Page Heyford

My favourite aircraft, the Handley Page Heyford, stems from before World War Two when, as a boy, I used to spend idyllic summer evenings at the Observer Corps post at East Illislay, between Newbury and Oxford, watching the Special Constables (then) plotting the Heyfords as they crawled gently across the skies; 'twas sheer delight!

Chas Baxter, *Bletchley*

. . . Short Stirling

I was a flight engineer with the Air Transport Auxiliary and whenever aircraft were fitted with dual controls I was invited by pilots (of both sexes) to fly the aircraft straight and level. My favourite by far, on a gin-clear day over the Irish sea, was the Short Stirling, which was most responsive to the slightest touch on the controls for such a large machine.

Ron Roberts,
Broadstone, Dorset

Disappointing . . . 10 might-have-beens

- 1. Martin-Baker M.B.5** An outstanding fighter design that appeared too late to win orders
- 2. Miles M.52** Potentially the world's first supersonic jet aeroplane, but cancelled unbuilt
- 3. BAC TSR.2** The cancelled bomber that promised great things
- 4. Avro Canada Arrow** Delta-winged elegance that was robbed of the chance to prove itself
- 5. Miles Libellulas** An unconventional configuration that held great promise but was never fully developed
- 6. Westland Wyvern** A naval turboprop fighter plagued by development problems
- 7. Saro Princess** The large and graceful commercial flying-boat that succumbed to the scrapman
- 8. Fairey Rotodyne** A brave but doomed early attempt to produce a vertical-take-off convertiplane airliner
- 9. Napier-Heston Racer** A potential world speed record holder that never had the chance to prove itself
- 10. Large Rigid Airships** Lighter-than-air vessels that have never really demonstrated their vaunted capabilities as aerial cruise ships or cargo-carriers



9



CAPT E.M. "WINKLE" BROWN **CB OBE MBE DSC AFC**

The former wartime pilot and test pilot (perhaps most notably of captured WW2 German aircraft) chooses Britain's first jet

B RITAIN'S FIRST jet-propelled aircraft was a trail-blazer in the history of aviation. It first flew on May 15, 1941, and was the culmination of engineer Frank Whittle's pioneering development of the practical turbojet engine. Two aircraft were built and were flying testbeds for a series of Whittle engines, being used for exploratory research into the behaviour of the jet engine at high altitude and high speed, engine relighting, and the effects of aerobatic manoeuvres on engine performance. It was a delightful little aeroplane to fly, simple to operate and astonishingly reliable, considering the early stage of the jet art.



SQN LDR NEVILLE DUKE **DSO OBE DFC** AFC MC(Czech)**

The wartime fighter pilot, test pilot and world speed record holder singles out the ejection-seat pioneer

T HERE IS SUCH a wide and vast choice of events and achievements compressed into the century of powered flight. Survival in the business gets the aviator's attention, but insufficient credit has been given to those whose great courage has resulted in the saving of well over 5,000 lives by the use of the ejection seat pioneered by Martin-Baker. The first live ejection by Bernard Lynch (a fitter at MB) from a Meteor in 1946 at 8,000ft eventually developed to the first live runway ejection by "Fifi" Fifield in 1955. Others involved in later low-level trials were W.T. "Daddy" Hay and Peter Howard in the 1960s. Very hazardous underwater ejection tests were made by John Rawlins of the Institute of Aviation Medicine, Farnborough, and by Surgeon Lt Sandy Davidson at HMS Dolphin.

Survival gets the aviator's attention, but insufficient credit has been given to those whose courage has resulted in the saving of lives by use of the ejection seat



LETTICE CURTIS

The former wartime Air Transport Auxiliary pilot and post-war racing pilot chooses another aviatrix, the "Flying Duchess"

I N 1929 IMPERIAL AIRWAYS opened a route to India with a landplane to Basle, a train from Basle to Genoa and a flying-boat from there on. Mary, Duchess of Bedford, wife of the 11th Duke, to show them how it *could* be done, bought a Fokker and sponsored flights from England to India and back which took eight days. At the age of 64 she took a full part in the flights herself

Pilot-thrilling . . . 10 flyers' favourites

1. **Vickers VC10** A pilot's airliner that also beguiled its passengers
2. **North American F-86 Sabre** The classic second-generation jet fighter
3. **Hawker Hart** An elegant two-seat day bomber of the 1930s that delighted its pilots
4. **de Havilland Hornet** The ultimate twin-piston fighter, evolved from the classic Mosquito
5. **Sopwith Pup** A First World War fighter beloved by all who flew it
6. **Armstrong Whitworth Siskin** Agile and manoeuvrable radial-engined inter-war fighter
7. **Stampe SV-4** A classic sporting biplane renowned for its aerobatic qualities
8. **Hawker Hurricane** A distant descendant of the Pup with similarly wide pilot appeal
9. **North American P-51 Mustang** One of the greatest Second World War single-seat fighters, an ace-maker
10. **Avro Lancaster** A pilot's favourite with exceptional handling qualities for a multi-engine type

Reader-pleasing

. . . de Havilland Dragon Rapide

My favourite aeroplane, without doubt the D.H.89A Rapide. I was intimately involved in a Mk 4 conversion (Gipsy Queen 2s with VP props) at Eastleigh in 1953. My boss was Viv Bellamy, and on the first test flight that Rapide fairly leapt into the air. I spent many happy hours accompanying Viv on Army Co-operation flights in his Rapide.

David Bailey,
Reckendorf, Germany

. . . Lockheed Hudson

Favourite aeroplane? It's got to be the Hudson. What can compare with the view from one's Boulton & Paul turret high on top on the fuselage, sitting in roomy comfort, and the loo only one step below? Even one's parachute and Mae West were supplied free, so even the sora-link sandwiches could not mar one's enjoyment.

Joe Edis,
Cottered, Buntingford

. . . AOP Austers

During my National Service, as an Artillery Range Safety Officer, Austers were used as A(ir) O(bservation) P(osts). I will never forget one flamboyant pilot coming down "inches" above a train, taking his eyes off the "road", turning to a certain quaking passenger, and saying in his inimitable accent: "Eet ees not wise to go too low, onlee foos go too low . . ."

Colin McLean, Holt, Norfolk



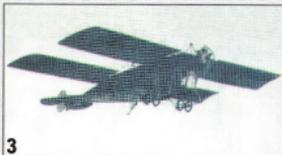
Long-serving . . . 10 willing workhorses

1. **Douglas A-4 Skyhawk** A classic jet fighter-bomber that found wide acceptance
2. **Cessna 172** One of the outstanding private pilots' aeroplanes of the post-Second World War era
3. **Piper Cub A** 1930s design that went from strength to strength in war and peace
4. **Avro 504** A pre-First World War aircraft that was still able to perform a useful function in the Second World War
5. **English Electric Canberra** The greatest of the early-generation jet bombers, an outstanding performer
6. **Boeing B-52 Stratofortress** The big bomber that seems irreplaceable, and simply goes on and on
7. **Boeing 747** A design originating in the 1960s that has a great future
8. **Douglas DC-3** The classic piston transport that outlived countless "replacements"
9. **McDonnell Douglas Phantom** One of the greatest multi-role military jets
10. **Junkers Ju 52/3M** A corrugated classic that endured from the inter-war years well into the post-Second World War era



Ugly-looking . . .

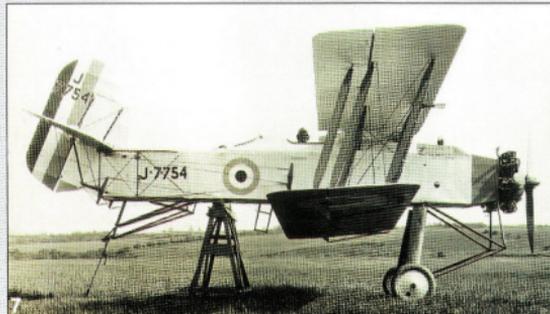
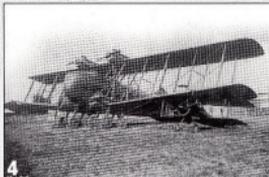
1. **Gurney-Grice Mosquito** The nearest thing to a motorised, winged coffin, lacking only the plated fittings
2. **Blackburn Blackburn** A whale of an aeroplane without a whale's massive beauty
3. **Albessard Aerobus** A carefully ill-proportioned tandem-wing nightmare
4. **Blériot 75 Mammoth** A plethora of struts, wheels and engines surrounding a bloated body
5. **Farman Jabiru** Not just one extremely ugly aeroplane, but a whole family of them





10 designer disasters

- Airspeed & GAL Night Shadows** The horrendous result of an impossibly tight military specification
- Armstrong Whitworth Ape**
One of the most appropriately named aeroplanes in history
- Transavia Airtruk** The twin-boom terror from Down Under
- Bristol Type 92** Laboratory biplane; evidently one of Dr Frankenstein's lesser-known freaks
- Vedo Villi** A truly surrealistic concoction which defies sensible description



Unforgettable . . .



DAVID LOCKSPEISER

The former Hawker test pilot and creator of the Lockspeiser Land Development Aircraft/Boxer picks a war hero and famous navigator

TRANSFERRING FROM THE RAAF to the RAF in 1931, Donald Bennett flew flying-boats and obtained a First Class Navigator's Certificate before moving to Imperial Airways, where he established many distance records with the *Mercury* "piggy-back" Short-Mayo Composite.

In 1941, following his escape from Scandinavia where he had been shot down leading an attack on the *Tirpitz*, he was put in command of the Path Finder Force, dramatically increasing the RAF's bombing accuracy, and at age 32 he was AOC 8 Group with 19 squadrons that flew some 50,000 sorties. After the war he became a Liberal MP and MD of British South American Airways.

Donald Bennett was innovative, full of ideas, outspoken and usually right, an extremely skilful, knowledgeable and talented aeronaut who made an enormous personal contribution to Britain.



The Short-Mayo Composite. Laker off, 1938



SIR ARTHUR MARSHALL

British aviation industry giant Sir Arthur Marshall, of Marshall's of Cambridge, recalls Blériot's Channel flight and his company's wartime flying training scheme

MY FIRST MEMORY OF aeroplane flight was the family consternation resulting from the first crossing of the English Channel by Blériot in 1909. Both my father and I were enthused by flying and aviation which is why I learned to fly in 1928. I take greatest pride in the huge success of the Marshall *ab initio* pilot and instructor scheme which was developed in the 1930s and turned the existing RAF scheme upside down. Our scheme was to take young men from 18 upwards and give them a course of 50 hours elementary, 100 hours advanced and 25 hours instructor training all within three to four months, who were then passed out by the Central Flying School as qualified Elementary and Advanced Flying Training instructors on specific aircraft.

My first memory of aeroplane flight was the family consternation resulting from the first crossing of the English Channel by Blériot in 1909



Eighty-two Years of

Aviation Memories

Veteran aviation author and consultant **JOHN STROUD**, who joined Imperial Airways as a 14-year-old office boy in 1933, reflects on a life in which he has observed aviation developments ranging all the way from rigid airships to Concorde and spaceflight

ABOVE A young John Stroud boards Handley Page H.P.45 Heracles at Le Bourget in May 1937.

BELOW The author's first aviation memory is of the R33 on its way to Croydon in April 1921 to take part in lighted airway experiments.

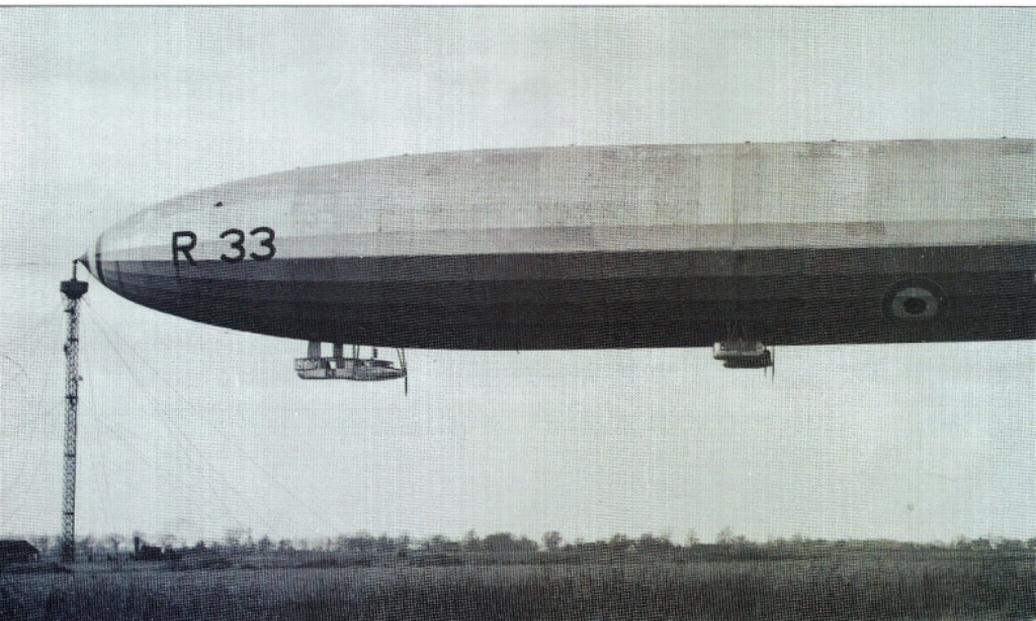
THERE IS NOBODY ALIVE TODAY with first-hand memories of the entire 100 years of controlled, powered, manned flight, but my own memories span 82 years of aviation's first century. My earliest recollection is of an event in April 1921, when I was two years old. It is of the rigid airship R33 at low altitude over Clapham Junction, London, on its way to Croydon Airport, from where it was used in lighted airway experiments.

The second memory also involved Croydon. I was taken to the airport by my parents in the winter of 1922-23 or 1923-24, and I remember two single-engined biplanes outside the hangars. One was red and the other blue. They

were de Havilland D.H.34s of Daimler Airway and the Instone Air Line. The dates are confirmed by the fact that Daimler (red) did not start operating until April 1922, and both airlines became constituents of the new Imperial Airways in 1924.

In 1924 we moved to Upper Norwood, close to the Crystal Palace. Some evenings there were firework displays in the palace grounds, and before these a number of Avro 504s gave demonstrations including wing-walking. Twice a lady made a parachute descent, but on both occasions she had to be rescued by the fire brigade, and as a result her drops were banned.

Our last London move was to Tooting Bec, and from the road in front of our house I could



see the newly-installed neon beacon at Croydon Airport. It was also at Tooting that I discovered William Appleby's paper model kits and acquired the military biplane (based on the Airco D.H.9A) and the Blackburn Velos. Years later Appleby supplied all the fencing for the Society of British Aircraft Constructors' (SBAC) displays. I got to know him, and he told me that the kits were made in the airship shed just north of Newcastle which he rented for £2 a week.

In 1929 we moved to Hatfield. There was no aerodrome there then, but it was the year in which the rigid airships R100 and R101 were completed and made their first flights. I saw the R100 twice and the R101 nine times, the last sighting on the wet and windy night as it passed over on its ill-fated attempt to fly to India. Little did I know that its lighted cabins would in a few hours become the tombs for so many of those on board.

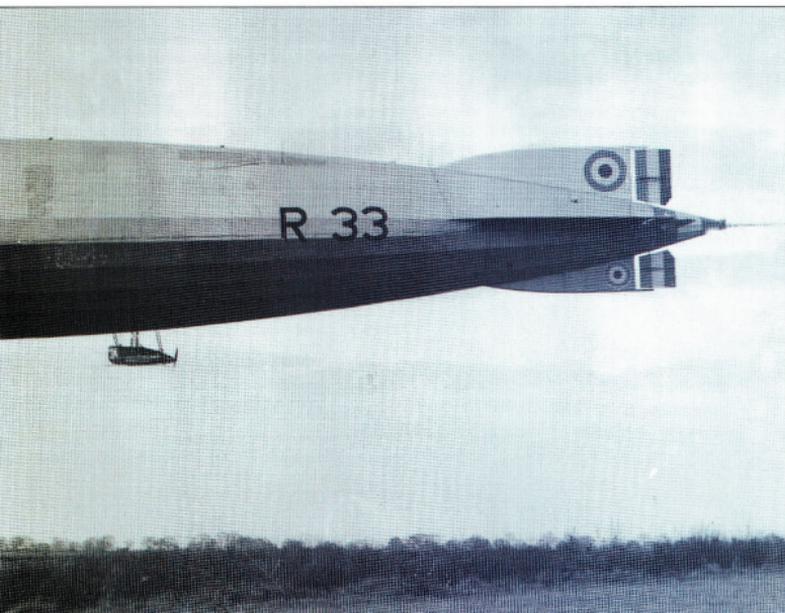
I also saw the *Graf Zeppelin* on its way to Cardington, but from a distance.

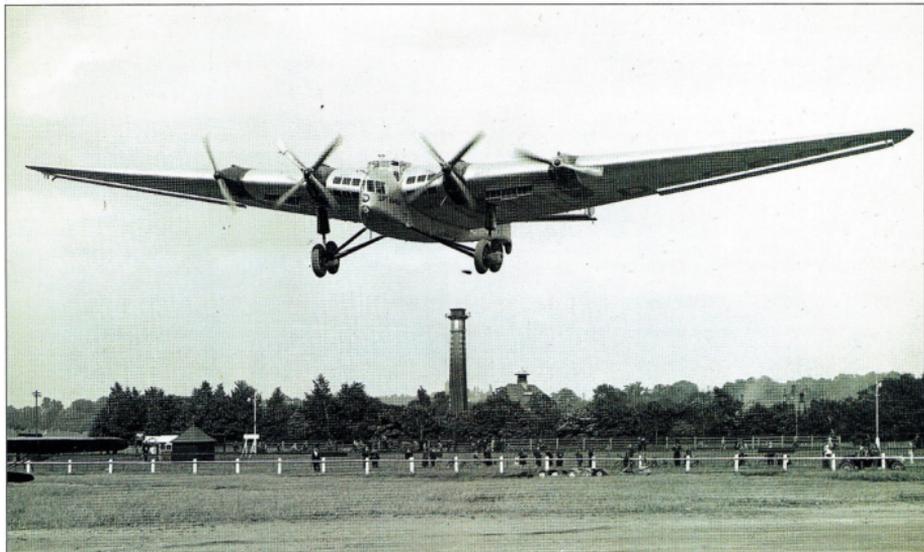
Some time during 1929 my father took me to Brighton in a charabanc. On the way back as we neared Croydon I saw Luft Hansa's Junkers-G 31 D-1310 climbing out over the hills, and on passing the airport I saw two Farman Goliaths outside the Air Union hangar.

In 1927-28 Sir Alan Cobham and crew made a 20,000-mile flight round Africa in Short Singapore I flying-boat G-EBUP. This survey flight was filmed and shown in two parts. I went to St Albans to see it and afterwards made



TOP The original terminal and control tower at Croydon on the Plough Lane site. **ABOVE** Luft Hansa's Junkers-G 31 D-1310 *Deutschland* runs-up its engines on the Croydon tarmac.





While I was at the 1933 Welwyn display Sir Alan Cobham asked me how many times I had flown. I said I had not flown, so he said to one of his people, 'Give him a ticket'

ABOVE By chance the author was at Croydon on July 1, 1931 when the Junkers-G 38 D-2000 arrived from Berlin via Amsterdam. This aircraft crashed at Dessau in 1936.

RIGHT Built as D.H.9B H9277, G-EAAC was the third UK G-registered aeroplane when it entered the register on July 22, 1919. Again modified to D.H.9C, and later '9J' as seen here, it was cancelled in December 1933.

BELOW Three of Swiss Air Lines' five DC-2s on the Croydon apron. The 14-seaters were bought through Fokker, Douglas's European agent.

a drawing of the Singapore. My mother told me to send it to Cobham, which I did. I received a nice letter in return, and some publicity material on his 1929 UK tour in de Havilland D.H.61 Giant Moth G-AAEV *Youth of Britain*, during which he flew civil personalities in an effort to get towns to construct aerodromes. He also gave flights to large numbers of children.

On one visit to St Albans I saw the last surviving 1922 Handley Page W.8b fly over.

In 1930 de Havilland began its move from Stag Lane to Hatfield by moving the de Havilland School of Flying to the new site. The fleet consisted of D.H.60 Gipsy Moths and D.H.9Js, one of the latter being G-EAAC, the third British civil-registered aeroplane.

Soon after the aerodrome opened I stopped a pilot and asked him which aileron went up and which went down when the stick was moved to the left or right. He said: "Come here tomorrow and find out for yourself". I went there, and for the first time sat in an aeroplane. It was Gipsy Moth G-AACU.



The Hatfield aerodrome was in two parts. One area sloped gently down from the hangars to the landing area, and the two areas were separated by a ditch and stream which were bridged at each end. Aircraft were parked in a line facing west, and had to be turned through 90° before taxiing to the take-off area. This meant that someone had to hold on to a wingtip as the pilot applied power, and I was often that someone. Holding a Moth was easy, but a D.H.9J demanded a lot of strength. At about that time I had a ride in the back seat of a D.H.9J from the fuel pumps to the hangars, my first experience of a moving aeroplane. I do not know which aircraft it was, but have always hoped it was 'AAC'.

Hatfield had quite a number of visitors, many from Stag Lane. I saw a D.H.75 Hawk Moth and the sole D.H.81 Swallow Moth, and the first aircraft for the Egyptian Air Force and the Royal Iraqi Air Force were flown from Stag Lane to Hatfield before starting their delivery flights. There were Gipsy Moths plus a D.H.80A Puss Moth for the King of Iraq. On the occasion of the Iraqi aircraft departure there were three Armstrong Whitworth Siskin fighters present, and when they were ready to depart two became bogged while crossing the stream.



I also saw two Puss Moths for Yugoslavia with the strange registrations UN-PAX and UN-PAY.

There were few accidents at Hatfield. I saw a D.H.9J stall and make an inverted spin into the ground, and a visiting Blackburn Bluebird with two lady occupants suffered engine failure on its initial climb and crashed and burned, killing both occupants. I did not see the latter crash, but I saw it burning.

After the swimming pool was in being I saw a Vickers Virginia bomber with the swimmers' clothes draped over the front gunner's cockpit to dry.

There was also the great occasion of the 1933 King's Cup Air Race. I saw all the aircraft on the evening before the event, and spoke to Alex Henshaw as he polished his lovely red Comper Swift (see *Aeroplane*, March 2003). We had many aircraft flying to and from the RAF Displays at Hendon, many of which I attended. These aircraft included Fairey Fawns and IIIFs, and Avro Tutors of the Central Flying School, flying in formation with the leader inverted.

There were also night exercises, with Virginias making their distinctive sound, and I once saw a Handley Page Hinairdi make a night landing with the aid of Holt wingtip flares while taking part in the film *Flying Fool*.

On April 3, 1933, I was 14 and it was time to look for work. I wrote to Sir Alan Cobham, who sent me a list of sites in my area where there would be a National Aviation Day Display and told me to come to one and make myself known. So on April 26 I went to a display at Welwyn Garden City, Hertfordshire. I met Cobham, and he told me to write to C.G. Grey, editor of *The Aeroplane*, and W.E. Johns, editor of *Popular Flying* and author of the Biggles stories. Johns gave me the brush-off, but Grey asked me to come and see him.

While I was at the display Cobham asked me how many times I had flown. I said I had not flown, so he said to one of his people, "Give him a ticket", and a few minutes later I was airborne



ABOVE Imperial Airways' D.H.86 G-AEAP Demeter at Croydon — the author was aboard when *Flight's* photographer took the picture.



LEFT Built to Alan Cobham's specification for pleasure flying, the Airspeed Ferry prototype G-ABSI flew in 1932 and was followed by three others. The prototype was impressed in 1940 as AV968 and eventually became instructional airframe 2758M.

in Airspeed Ferry trimotor G-ABSI on a lovely spring evening. That was the first of my more than 1,700 flights.

I went to see Grey and he wrote to Richard Fairey and to C.F. Snowden Gamble, the author of *Story of a North Sea Air Station* and, at that time, publicity manager of Imperial Airways. Fairey said he had nothing to offer me, but Gamble invited me to attend an interview and I was taken on as office boy and told it was up to me how far I got on. I joined Imperial

LEFT The first two Short S.23 C-Class Empire Flying-boats under construction at Rochester with two Singapores visible in the foreground.



100 Years of Powered Flight

RIGHT Air France Lockheed L-1649 F-BHBL Rochambeau heads an evocative line-up at Orly.

BELOW Pakistan International's Boeing 720B AP-AMG displays the records set on its non-stop London—Karachi flight on January 2, 1962.



I have had a wonderful life in aviation, with thousands of outstanding memories of aircraft and people



ABOVE The author with a treasured relic — a fuel-flow gauge from the Schütte-Lanz airship SL.11, shot down over Cuffley, Herts, in 1916.

RIGHT The author's two flights on Concorde were memorable — here is British Airways' G-BOAA, now sadly out of service along with the rest of the fleet.

Airways at Victoria, London, on August 8, 1933.

In 1935 I was involved in the design of a large Imperial Airways exhibition to be held in the Science Museum during the winter of 1935–36. I spent two weeks in the Croydon Airport control centre, learning air traffic control so that I could design one of the exhibits. My tutor was Bill Lawford, who flew the first aircraft from Hounslow to Paris on August 25, 1919, the day that Aircraft Transport and Travel began regular services over the route.

I stayed in charge of the exhibition, and so every day saw the Wright brothers' first powered Flyer and the Schneider Trophy-winning Supermarine S.6B.

My work often took me to Croydon and to Rochester, and it was at the latter place that I saw most of the Short C-Class Flying-boats under construction. On April 23, 1937, I was lucky enough to fly from Rochester to Southampton in *Courtier* on its delivery flight, and appeared on the manifest as Assistant Flight Clerk.

A 1931 memory of Croydon was seeing the arrival of the massive Junkers-G 38, which made the first powered approach that I saw. I remember one special day at Croydon, most likely in 1935, when I entered a hangar by a small rear door and was confronted by a large, shiny all-metal monoplane; a Swissair Douglas DC-2. It was the first modern airliner I had seen, and it made an enormous impact.

On November 26, 1936, I flew from Croydon to Le Bourget in the D.H.86 *Demeter*. Just after take-off I saw KLM's first DC-3, *Ibis*, making its approach. Its landing was the first in the UK by a DC-3!

My flight to Paris was to see the air show then held in the Grand Palais in the heart of the city. I also attended the 1938 event and many post-war shows, mostly at Le Bourget. Those shows and the SBAC displays at Radlett and Farnborough left me with many outstanding memories and provided me with a great variety of aeroplanes in which to fly.

After the war I flew on many airline training

and route-proving flights. My first transatlantic flight was from London Heathrow to Montreal Dorval in a flight-refuelled Consolidated Liberator. It took 17hr 5min. Another long flight was the 16hr 4min run from Paris to Anchorage, Alaska, in an Air France Lockheed L-1649A.

A particularly memorable flight was the record-making non-stop London—Karachi flight of 3,900 miles, covered in 6hr 43min 51sec in a Pakistan International Airlines Boeing 720B on delivery.

In 1984 I flew the 3,281 miles from Heathrow to Washington DC in the USA in Concorde in 3hr 33min. Sir Peter Masefield, in his autobiography *Flight Path*, describes the first non-stop London—Washington flight, in a Liberator, which took 19hr 55min. In 1992 I flew from New York to London in Concorde in 3hr 8min. We achieved 1,400 m.p.h. at 60,000ft.

I have had a wonderful life in aviation, with thousands of outstanding memories of aircraft and people. I met Lord Brabazon, the first Briton to hold a pilot's licence, and I met John Young, one of the last two men on the Moon. I knew many heads of airlines and aircraft manufacturers, airline and test pilots, but to name them would, I think, be showing off. A lucky few *Aeroplane* readers have their own great days to come, when they visit the USA with the Editor in December for the 100-year celebrations. **A**



Database

The Wright Flyers

On December 17, 1903, Wilbur and Orville Wright made the world's first controlled, sustained, powered, manned flights on the dunes of North Carolina, changing the world of transport forever. Eminent American aviation historian and former museum curator Dr RICHARD P. HALLION sets the scene for the brothers' great achievement

This month

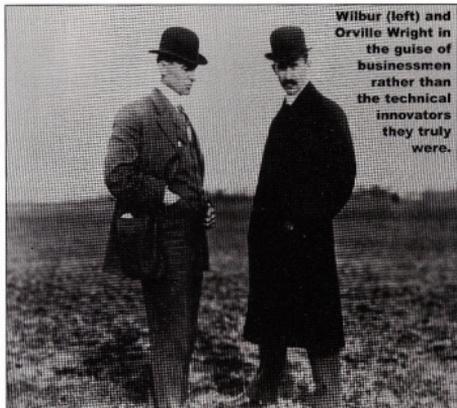
Welcome to *Aeroplane's* 38th Database section, our regular in-depth examination of a specific subject, which this month focuses on the Wright Brothers' series of world-changing flying machines:

- **Before The Aeroplane**
Dr Richard Hallion explains the state-of-the-art before 1903
- **The Path To Powered Flight**
The Wright gliders of 1889-1903
- **The Dream Takes Flight**
The first successful aeroplane PLUS scale drawings by Tim Hall
- **Cutaway Centre-spread**
The 1903 Wright Flyer in detail
- **The Practical Aeroplane**
From proof of concept to the useful flying machine, 1904-1909
- **The Battle for Survival**
The Wright machines 1910-1912
- **The Passing of an Era**
The fading fortunes of the Wrights
- **Taming A Fractious Horse**
Pilots' Perspectives of the Flyers
- **Survivors**
A full list of museum Flyers

ONE HUNDRED YEARS AGO Wilbur and Orville Wright invented the aeroplane. Just two decades later the great

Swiss architect Le Corbusier (Charles-Edouard Jenneret-Gris) wrote: "The aeroplane mobilised invention, intelligence and daring, imagination and cold reason. It is the same spirit that built the Parthenon." Indeed it was. That windswept December day at Kitty Hawk, North Carolina, in the USA, the frail product of Ohio and North Carolina undertook a transformation of the world no less impressive than another that would take place four decades later, with the detonation of the first atomic bomb. The brothers Wright, Microsoft's Bill Gates stated nearly a century later, "created one of the greatest cultural forces since the invention of writing, for their invention effectively became the World Wide Web of that era, bringing people, languages, ideas and values together".

Some measure of this can be seen in two sets of statistics. First, in the



Wilbur (left) and Orville Wright in the guise of businessmen rather than the technical innovators they truly were.

year 2000, 610 million passengers flew on nearly nine million domestic flights across the USA, 1.67 million passengers and nearly 25,000 flights per day, an average of one flight every 3.5 seconds. Secondly, last any

think this revolution is unique to the USA, it should be noted that the intercontinental Boeing 747 family of jetliners have carried approximately 1.5 billion passengers since they first entered service, roughly equivalent to

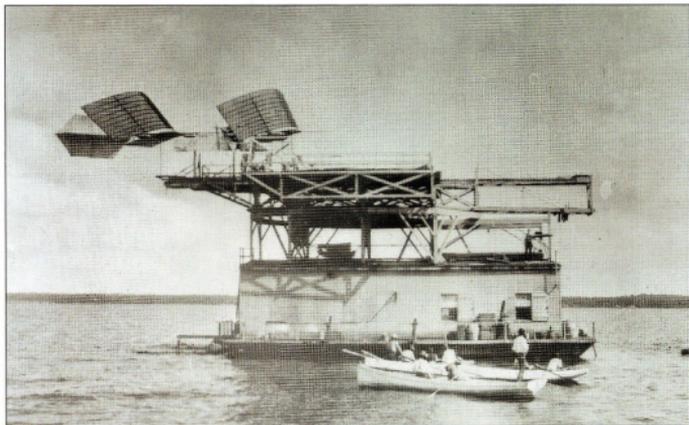
a quarter of the world's total population. Flying, in short, is ubiquitous — and it all began with the Wrights at Kitty Hawk at 1035hr on December 17, 1903, and a strange contraption called the "Whopper Flying Machine".

That machine has gone down in history as the Wright Kitty Hawk Flyer: a wood and fabric canard pusher biplane that has become an emblematic, indeed iconic, symbol of humanity's victory over the sky. In the popular mind the Kitty Hawk Flyer was the creation of two rural mechanics who turned from bicycles to making the world's first aeroplane with hardly a pause in between, a classic example of the oft-cited "Yankee ingenuity".

This it had, but it also had far more than this, and such simplistic appraisals of the Flyer do little credit to the two brothers for their own detailed work; and no credit at all to the long heritage of accomplishment and work that preceded them, work that was critical to their own understanding and undertakings in flight research.

Even a short list would have to include the great names of early aviation: Sir George Cayley (who, but for lack of a prime mover, might well have been the first to fly); Alphonse Pénaud (who was the first to demonstrate a stable, powered flying model aeroplane); Francis Wenham and Horatio Phillips (pioneers in windtunnel research); Louis Mouillard (who meticulously studied birdflight and its applicability to human flight); Otto Lilienthal (the first great flight researcher, gliding pioneer and martyr to the cause of flight), and Octave Chanute (the Franco-American engineer who gave aviation the truss-braced biplane). In addition there were the "how not to" pioneers: Hiram Maxim, Clément Ader and Samuel Langley; the Wrights were determined to understand the disappointing as well as the good.

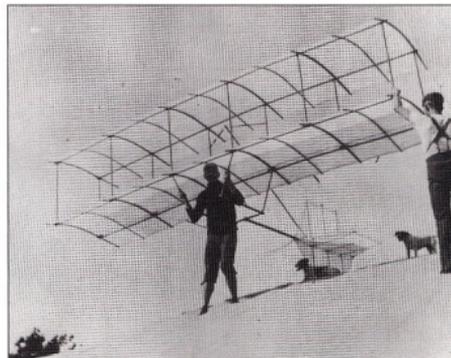
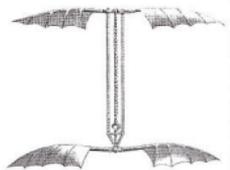
Orville and Wilbur Wright came from an inventive family background which coupled the discipline innate in a household run by a churchman (their father was a bishop of a small Midwestern Protestant sect), with a loving and supportive climate borne largely out of a suspicion of outsiders. Unlike the case with many inventors, we know when their interest in flight was triggered. In the late summer of 1878, returning from a trip on church business, their father gave the young brothers a "flying bat", a rubber-powered flying toy helicopter developed by Alphonse Pénaud and popular in Europe and America. Although the brothers were to do other things with their lives



TOP Langley's creation, the **Aerodrome**, atop a houseboat on the Potomac River in 1903. **Structurally weak, it disintegrated on launch.**

ABOVE German gliding pioneer **Otto Lilienthal** flies one of his own designs. **On August 9, 1896, he fell 50ft to his death.**

LEFT One of **Alphonse Pénaud's** rubber-powered helicopters.



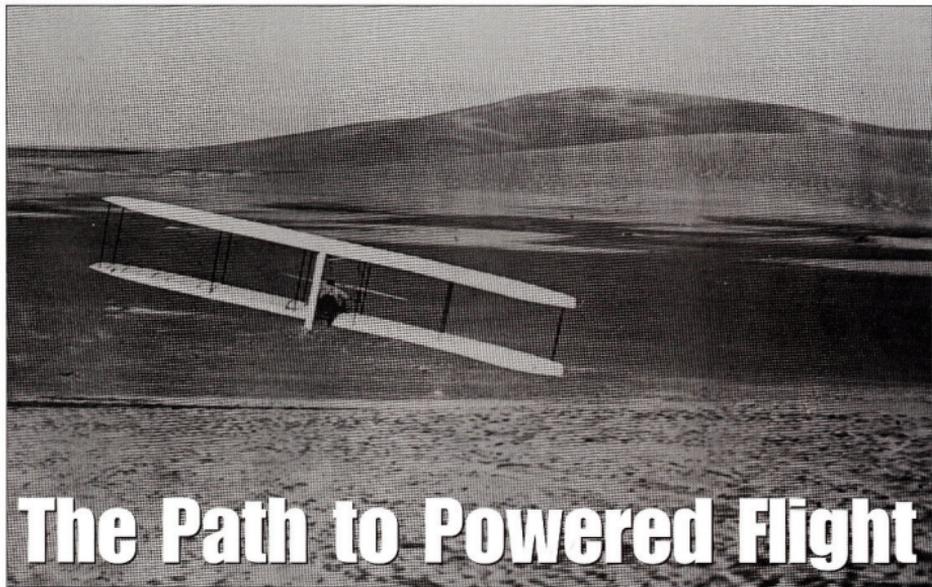
ABOVE A major step forward — the innovative two-surface wing of **Octave Chanute's 1896 glider**, designed with help from its pilot **Augustus Moore Herring**, seen here preparing to launch.

(becoming small-town newspapermen and bicycle mechanics, builders, and salesmen) before turning to flight, aviation was always something that lingered in the backs of their minds.

The triggering event was the death of Lilienthal in 1896. Following his death the brothers read assiduously about flight, and sought to learn as much as they could about it. At the same time they were caught up in the emerging automotive revolution. Indeed, had circumstances been different, they might have turned to the automobile and not the aeroplane, and the aeroplane may have then been invented in Europe, specifically France, sometime before 1910.

That they did not is due to one of the great unsung heroes of aviation, Smithsonian Institution Assistant Secretary Richard Rathbun. In June 1899 Wilbur Wright wrote to the Smithsonian, requesting any information the institution might have on flight. Rathbun received the letter on a Friday, and, given the climate of the time, no-one would have faulted him for simply throwing it away. Instead, Rathbun "stuffed" the letter, directing museum personnel to prepare a response. The resulting package, sent to the Wrights within several weeks, proved most valuable, as it enabled them at once to assess what had been done, what remained to be done, what had worked, and what had not. As for Rathbun, there is no indication that he ever knew the significance of what he had done — indeed, that he ever recalled that he had been in contact with the Wrights at all! As it was, Rathbun's support led inexorably to the next stage of Wright work: building various kites and gliders.



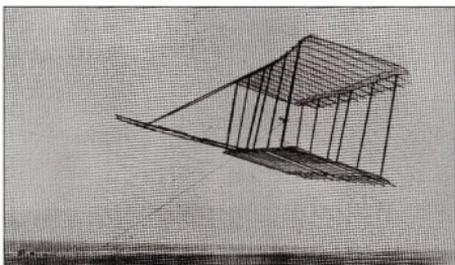


The Path to Powered Flight

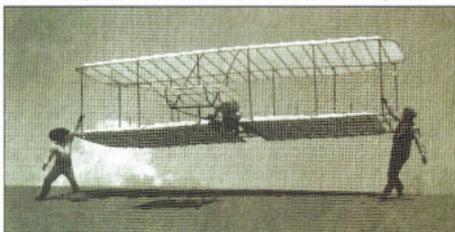
Having absorbed every scrap of information about flight and flying machines they could lay their hands on, Wilbur and Orville Wright set about putting the theory into practice with a series of kites and gliders. Dr RICHARD HALLION describes their progress

THE WRIGHTS very quickly focused on several key problems. They recognised that Lilienthal had perished because he had inadequate control via body-shifting, so they determined to use pivoted surfaces to control pitch. They also recognised that Lilienthal might have survived had he had a better force-absorbing structure in front of him. This drove them towards a canard configuration, the canard shielding them from any impact. (As it transpired, it would also give the aircraft gentler "departure" characteristics at the stalling point.) Finally, they recognised that the critical control problem was one of control during turns, and that it would be necessary to bank into a turn.

In July 1899 Wilbur Wright conceived of using wing warping to control the rolling motion of an aeroplane. "From this," Orville subsequently wrote, "it was apparent that the wings of a machine of the Chanute double-deck [biplane with Pratt-truss cross-bracing] type, with the fore-and-aft trussing removed, could be warped . . . so as to present their surface to the air at different angles of incidence and thus secure unequal lifts on the two sides [hence rolling the machine]."



TOP A magnificent photograph showing Wilbur correcting a right bank at the foot of Big Kill Devil Hill in the 1902 glider.
ABOVE The 1900 glider with a canard configuration was first flown as a kite. Abandoned after testing, its cloth covering was used by Bill Tate's wife for dresses for their daughters.



ABOVE Local residents Bill (left) and Dan Tate assist Wilbur Wright in the launch of the 1901 glider at Kitty Hawk.

The brothers quickly built a biplane kite to test the concept. Flown at Dayton, Ohio, in the summer of 1899, it was the first experimental aeronautical device the Wrights employed. The warping of the wings was controlled by two sets of control cords running to the top-and-bottom of the outer (wingtip) front support struts. Interestingly, it employed a fixed horizontal stabilising surface aft of the wing, in contrast to their subsequent canard configurations.

The Wrights now solicited the help of the US Weather Bureau to determine the best spot for subsequent testing. After evaluating many locations they selected the Outer Banks of the Carolinas, specifically Kill Devil Hill near Kitty Hawk. They planned to build upon their kite experience by making a man-carrying kite-glider, now known as the Wright 1900 glider, in preparation for this phase they contacted Octave Chanute, a distinguished Franco-American aeronautical pioneer, author of one of the field's seminal texts (*Progress in Flying Machines*), flight experimenter, and generous patron and benefactor to many investigating flight. Chanute welcomed their approach, beginning a close association that would last

until his death in 1910. He had one bit of practical advice for the brothers: build their craft of "sawwood, clear, straight-grained, and thoroughly seasoned".

The 1900 glider, tested at Kitty Hawk beginning in October of that year, gave the Wrights their first aerial experiences. It had the same general configuration as the 1899 kite, lacking any vertical surfaces. They found it "a rather docile thing", but also noted (during kite trials) that it flew better backwards than forwards, indicating that the canard configuration made it inherently longitudinally unstable. Despite this, so concerned were the brothers about avoiding a stall and crash that they retained the canard configuration for their subsequent designs.

Tests in September-October of that year were highly encouraging. They could glide between 300 and 400ft, travelling approximately 6ft forward for every foot lost, a performance well in excess of that demonstrated by Lilienthal, and with far better controllability as well. The ease with which they controlled "fore and aft balance" (pitch) "was a matter of great astonishment". The glider readily landed without damage even at speeds as high as 30 m.p.h. The brothers abandoned the 1900 glider on the Kitty Hawk dunes after their tests.

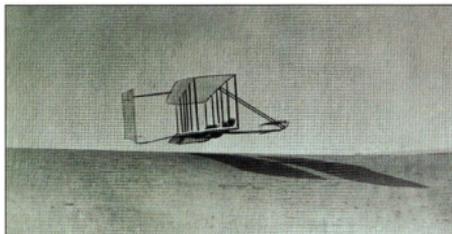
As small businessmen, the brothers had to blend their aeronautical research with the running of their bicycle and newspaper business as well as help out their father in a variety of legal troubles he had with his fellow churchmen. Accordingly, the progress made on developing the Flyer is extraordinary. They relied on the best information they could, typified by data tables of lift values created by Otto Lilienthal based on whirling-arm experiments, and on the commonly-accepted value of 0.00492 as a constant for calculating aerodynamic pressure (the so-called "Smeaton constant", calculated by noted 18th Century civil engineer John Smeaton, and usually rounded to 0.005). In fact, both the lift tables and the constant were erroneous, thanks largely to the deficiencies of both Lilienthal's and Smeaton's whirling-arm test rigs and test methodologies.

But their next glider, tested the following year, proved a serious disappointment, and convinced the brothers that Lilienthal's data tables were incorrect by at least 50 per cent and that, as well, the estimated values for Smeaton's coefficient were off by at least 20 per cent. Like its predecessors, the 1901 glider lacked any vertical surfaces; but beyond

Wright Glider data

	1899 Wing-Warping Kite	1900 Glider	1901 Glider	1902 Glider
Span	5ft 0in	17ft 0in	22ft 0in	32ft 1in
Chord	1ft 1in	5ft 0in	7ft 0in	5ft (upper wing) 4ft 11-75in (lower wing)
Gap	1ft 0in (est)	approx 4ft (est)	4ft 8in	4ft 7in
Length	—	approx 4ft (est)	14ft 0in	16ft 1in
Height	—	approx 5ft 0in	approx 6ft 0in	approx 6ft 0in
Wing area	approx 10-8ft ²	165ft ²	308ft ²	305ft ²
Aspect ratio	4.62:1	3.5:1	3.14:1	6.75:1
Camber	1 in 23 (est.)	1 in 22	1 in 12 to 1 in 19	1 in 24 to 1 in 30
Canard elevator	—	12ft ²	18ft ²	18ft ²
Fin (later rudder)	—	—	—	5-73ft ²
Fixed stabiliser	approx 0-45ft ² (est)	—	—	—
Structure	Pine, cloth covering, cord	Ash, pine, wire, & French sateen weave (highly reflective) cotton covering	Ash, pine, wire & French sateen covering	Ash, pine, wire, & French sateen covering
Empty weight	—	approx 50lb	approx 108lb	approx 112lb
Gross weight with pilot	—	approx 190lb	approx 248lb	approx 252lb
Wing loading	—	approx 0-303lb/ft ² as kite, 1-152lb/ft ² with pilot	approx 0-351lb/ft ² as kite, 0-805lb/ft ² with pilot	approx 0-367lb/ft ² as kite, 0-826lb/ft ² with pilot

Over the period of their 16-year development and flying career the Wright brothers built, or otherwise supervised construction of, a total of one kite, four gliders and 19 separate aeroplanes, a remarkable average of 1½ new aerial vehicles introduced per year, including the almost three-year "sabbatical" the brothers took from aircraft design during 1905-1908. The Wrights were enthusiastic developers who admirably documented their work, but this same care did not extend to the preservation of technical details for their individual aircraft. It is only by good fortune that several key Wright aeroplanes survive. None of the gliders or kites survive, and few other original aircraft. Not surprisingly then, data is difficult to determine with any great accuracy. Readers familiar with other sources on the Wrights may note differences between the data presented in those sources and those presented here. The accumulation of data shown in the various tables in this Database, therefore, represents what the author considers the most accurate interpretation from a variety of reputable (if often contradictory) sources. Information that cannot be determined with absolute exactitude is indicated by the expressions "approx" or "est".



ABOVE The 1902 Wright Glider skims the dunes. **RIGHT** Wilbur kept precise notes on the brothers' activities. Shown here are two transcriptions from 1901 and 1903 of lectures he gave to the Western Society of Engineers.

this, it had a wing of greatly different shape, aspect ratio and size than that of the 1900 machine. Despite its significantly larger area it flew much worse than its predecessor, a circumstance that led Wilbur Wright to exclaim in frustration that no-one would fly "for 50 years".

Discouraged, the Wrights returned to Dayton, where they embarked on a ground research programme using a bicycle test rig and a windtunnel of their own design to develop their own tables of lift and drag values for

tests had a greatly increased aspect ratio, from the 3-14:1 of the 1901 machine to 6-75:1.

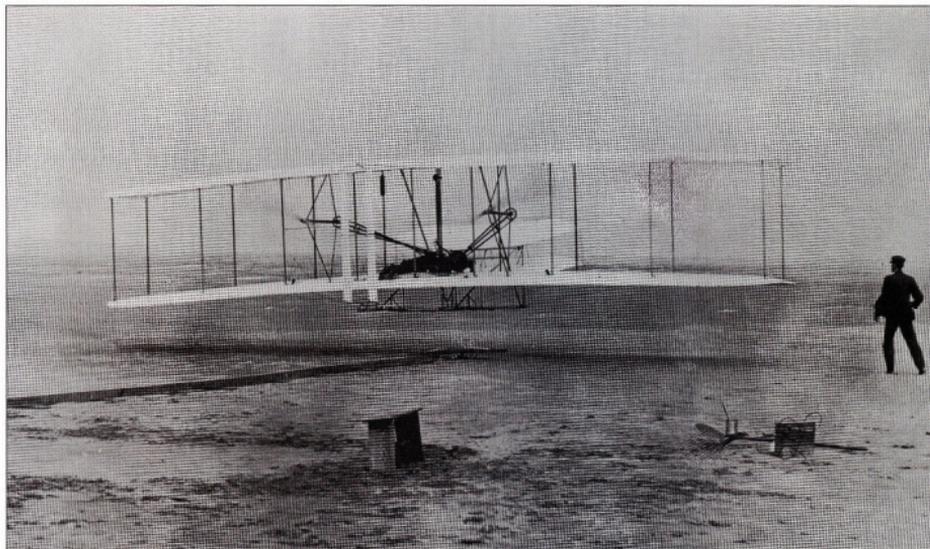
This glider marked a major step forward in Wright flight testing. With it they proved not only that they had resolved the design problems revealed in the 1901 glider, but that their wing-warping lateral control system worked well. However, testing of the 1902 glider revealed serious lateral, directional and longitudinal stability problems, and, in an effort to resolve these, the brothers made the fixed rudder movable, linking it to the wing-warping mechanism.

Thus, the glider possessed interconnected roll and yaw control (lateral-directional control), and independent pitch (longitudinal) control. The 1902 glider enabled the brothers to acquire extensive flight experience; with the modified glider, the brothers undertook intensive flying trials in 1903, making as many as 250 flights in two days.

Orville Wright could write in confidence to his sister Katharine that: "We have gained considerable proficiency in the handling of the machine now, so that we are able to take it out in any kind of weather... we now hold all the records!" The Wrights now had the knowledge and experience required to construct a powered machine. **A**



various wing configurations. This notable research, the first direct use of windtunnel analysis to support the development of a specific flying machine, quickly led them to rediscover what had already been proven by Wenham in the 1870s: the significance of aspect ratio (the broader the wing, the greater the lift). The 1902 glider that followed these



The Dream Takes Flight

After mastering the steep learning curve of working out, by trial and error, how to control their manned gliders, the brothers were ready by the winter of 1902 to build an aeroplane provided with its own powerplant – as Dr RICHARD HALLION explains

BY DECEMBER 1902 THE Wright brothers recognised they were inexorably closing in on solving the problem of powered flight, and they notified Chanute of their intention to build “a machine much larger and about twice as heavy as our present machine. With it we will work out problems relating to starting and handling heavy weight machines and if we find it under satisfactory control in flight, we will proceed to mount a motor.” The result was their Wright 1903 Flyer, commonly called the “Kitty Hawk Flyer” and known by the brothers as “The Whopper Flying Machine”. It was, indisputably, the world’s first successful manned aeroplane, achieving the world’s first powered, sustained and controlled winged flight on December 17, 1903.

In retrospect, reviewing its design and that of the preceding gliders, one can question some of their decisions, such as: selection of a canard configuration, emphasising controllability over stability, and the prone piloting position. But this smacks more than a little of 20/20 hindsight. The canard configuration did give



them much milder departure behaviour at the stall, and the advantages of the protective structure ahead of the operator, and both advantages were demonstrated (with possibly life-saving results) during their gliding experience. The issue of controllability was one over which the brothers really had little choice. The built-in instabilities of the gliders, and the later Flyer, meant that they had to emphasise control, otherwise the aeroplane could never fly successfully. This meant that the Flyer would be, in its own way, the F-16 of its day: a completely

unstable aircraft that required the pilot to make essentially continuous control inputs to maintain any form of steady flight. The choice of a prone piloting position made great sense, for, as Wilbur pointed out, it reduced the drag (by reducing frontal area).

The Wrights knew they needed a lightweight yet powerful engine to propel their craft, and, in late 1902, began the search for one. Enquiries to leading American and foreign manufacturers led nowhere. They would have to develop an engine on their own. As they had relied upon Chanute for counsel on matters of



structures and aerodynamics, they now relied upon a very gifted self-taught mechanic, Charles “Charlie” Taylor, who had worked as a subcontractor to the brothers on some of their bicycle manufacturing projects. In 1901 he joined them full-time, not least because their interest in flying took so much time that they required an on-site manager to run their Dayton plant. Now Taylor would take the plans of the brothers and turn them into mechanical reality.

The brothers had decided upon a cast-aluminium four-cylinder water-cooled petrol engine chain-driving

two "handed" pusher propellers, and capable of producing 8 h.p. The decisions reflected again their essentially pragmatic (and insightful) nature. Using aluminium kept weight down, as did the decision to cast the engine crankcase and water jacket as a single piece. The four-cylinder engine ensured greater smoothness of operation. The decision to use two propellers allowed a greater volume of air to be moved. Chain-driving (reflecting their bicycle manufacturing background) meant they did not need multiple engines like Maxim and Ader, but could use a single unit. "Handing" the propellers (so that, when viewed from the rear of the Flyer, the left propeller would rotate anticlockwise, and the right clockwise) eliminated problems with torque, which would have seriously complicated the already serious control challenges they faced.

Using drawings furnished by the brothers, Taylor began construction of the engine in December 1902. It used the one-piece aluminium-cast engine crankcase and water jacket, cast-iron cylinder barrels and pistons, and a machined steel crankshaft and flywheel. It was 30 $\frac{1}{2}$ " in long, 13 $\frac{1}{2}$ " in high and 23 $\frac{1}{2}$ " in wide, and altogether (with its magneto installed) weighed 179lb. The Wright team began testing the engine in February 1903, starting with natural gas and then moving on to petrol. They had to pause for repairs following a fracture of the engine casting, and then resumed testing in mid-April. They discovered that the engine not only met the 8 h.p. design requirement but exceeded it handsomely, achieving 12-05 h.p. at 1,090 r.p.m. Justly proud of their accomplishment, Charlie Taylor recalled in an interview years later that: "The old one-lunger auto engines of that day really weighed more than our entire flying machine with the first motor installed".

Accompanying development of the engine was design of the propellers. Previous pioneers had shown little appreciation for the propeller as a rotating wing, but the Wrights did. As Orville Wright wrote later: "Screw propellers are simply wings travelling in a spiral course". What the brothers did find challenging was propeller



ABOVE Although not of the greatest quality, this photograph illustrates well the distance covered on the fourth and final flight of the "Whopper" (1903 Wright Flyer) on December 17.

"The old one-lunger auto engines of that day really weighed more than our entire flying machine with the first motor installed . . . we were all highly pleased at being able to hold down the weight"

analysis, for, as Orville Wright again put it: "With the machine moving forward, the air flying backward, the propellers turning sideways, and nothing standing still, it seemed impossible to find a starting-point from which to trace the various simultaneous reactions. Contemplation of it was confusing." But they recognised the vital necessity of such analysis, for they realised that poor propeller design could rob them of the fruits of success and render their accomplishments with their engine design meaningless. Accordingly they set to work and, after much study and testing, finally selected a long, high-aspect-ratio design that gave them 66 per cent efficiency, remarkably high by the standards of the day (and retrospectively most fortunate as well, for the propeller performance more than compensated for unanticipated weight growth of the Flyer itself). Confident of their skills, the brothers did their own bonding and shaping, laminating three layers of spruce, shaping the propeller block with hatchet and

spokeshave, and carefully finishing the surface. Each propeller had a diameter of 8ft 6in, and a maximum chord of 8in.

Structurally, the 1903 machine represented a larger extrapolation of their earlier 1902 glider, and it was constructed from spruce, with wire bracing and a covering of "Pride of the West" muslin, a sturdy cotton of a particularly fine weave destined to play a major structural role itself. Essentially, the brothers built the 1903 Flyer around a rigid, central rectangular box truss comprising the upper and lower wing centre sections joined by vertical ribs and cross-bracing. Joined to this were the outer wing cellules, rigidly trussed only at the leading edge, and not trussed fore-and-aft, to permit wing warping. For their structure the brothers chose West Virginia white spruce which, when kiln-dried, could sustain a compressive stress-loading of up to 6,000lb/in². Structural analysis of the actual Wright Flyer in the 1980s by Dr Howard S. Wolko of the US National Air and Space Museum indicated that the brothers wisely

used a conservative design approach that emphasised building in more strength than necessary, as exemplified by the size of structural members such as spars, ribs and struts, which led him to conclude that "the Flyer was a consequence of practical men endowed with extraordinary engineering perception".

No better example of that perception can be found than in the way the brothers assembled and covered their wing structure. The wing consisted of a leading edge that functioned as a spar and as the primary attachment point for the wing ribs, and an aft spar inserted through the hollow ribs during the construction process. The ribs themselves were built up, with the upper and lower surfaces ensuring the contour profile of the aerofoil shape separated by paper-wrapped wooden spacing blocks that determined what the thickness of the rib would be. The Wrights attached the wing ribs only at the leading edge, using metal strips wrapped around the spar and affixed to the top and bottom of the front portions of each rib. They relied on the wing covering to assume much of the function of holding the ribs in place; thus it played a critical role in the aircraft's structural integrity.

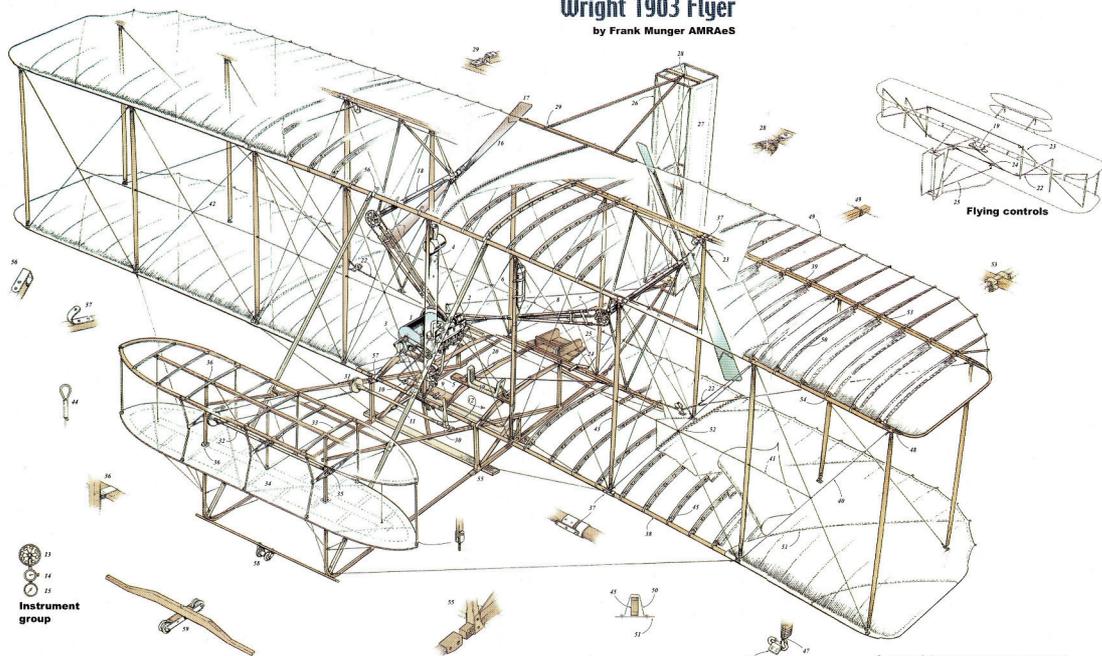
The brothers gave as much attention to the covering as they did to the most complex questions of structure, aerodynamics, or propulsion. They arranged the fabric

This picture of the sheds at Kill Devil Hills in November 1903 with the Wright Flyer outside gives a good impression of the isolation of the brothers' camp at Kitty Hawk.



Wright 1903 Flyer

by Frank Munger AMRAeS



Instrument group

- 1 Engine (designed with all necessary machined parts capable of being produced entirely on a lathe with a 7in swing) — built by the Wright Brothers' mechanic Charles Taylor
- 2 Electric generator for low-tension ignition system
- 3 Revolution counter — not tachometer
- 4 Radiator — steel sheet construction with 3/16in spacers
- 5 Instrument group
- 6 Fuel tank — 0.4 US gal
- 7 Chain adjustment
- 8 Chain guides — 1/16in diameter tube
- 9 Fuel regulating cock
- 10 Fuel shut-off cock
- 11 Engine control lever — engages revolution counter, anemometer (with distance meter), starts stopwash and turns fuel cock
- 12 Restraint line — fastened via eyelet to control lever — then tied to take-off rail — engages instruments at

- 13 start of take-off run
- 14 Anemometer — drives distance meter
- 15 Stopwatch
- 16 Distance (air) meter
- 17 8in propeller — carved from three laminations of white spruce
- 18 Canvas-covered lips
- 19 3in diameter drive shaft
- 20 1/4in-thick-wall rolled-steel tube
- 21 Sliding control cable
- 22 Cradle restraints
- 23 Foot rest
- 24 Main warp wire — 3/16in diameter, carries all lift loads
- 25 Passive balance warp wire, 3/16in diameter — carries "hanging" loads
- 26 Rudder interconnect lever — 3/16in plate
- 27 Rudder control wire — 3/16in diameter
- 28 Rudder frames — 3/16in x 1/16in strip
- 29 Single-surface covering
- 30 Rudder hinge — 3/16in wire

- 31 with 3/16in wire binding and 3/16in plate
- 32 Rudder boom and fitting — 3/16in wire and 3/16in plate
- 33 Elevator control
- 34 Wooden pulleys — wire-wound
- 35 Elevator torque tube — steel
- 36 Flexing elevator ribs
- 37 Elevator covering (single surface) with stitched fabric pockets — hold ribs and spar
- 38 Longish/short levers produce change of camber as well as change of angle
- 39 Elevator hinge — 3/16in wire and 3/16in plate
- 40 Wing spring hinges — facilitate flexing for wing warping
- 41 Rudder interconnect lever — 3/16in plate
- 42 Front spar (ash) — 1 1/2in x 1 1/2in
- 43 Manspar (ash) — 1 1/2in x 1 1/2in
- 44 Diagonal wire bracing (3/16in) — outer panels of front bays only

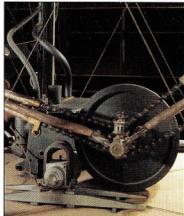
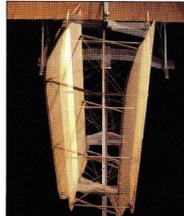
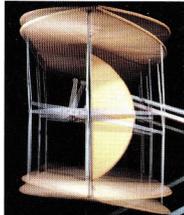
- 45 Sparwise wire (passes through struts) — ferrule soldered each side
- 46 Diagonally-placed wing covering (cotton fabric, unbleached and undoped) — calculated to stiffen structure in drag
- 47 Laced panel joints
- 48 Typical wire end (soldered ferrule) — non-adjustable
- 49 Built-up wing ribs — ash strip and spruce spacers
- 50 Interplane struts-spar attachment fitting (3/16in rod and 3/16in plate — brazed together)
- 51 Typical interplane strut end with rod spliced into strut — bound with white cord and finished with glue
- 52 Wire binding — attaches front and mainspar to wingtip bows
- 53 Trailing edge wire (3/16in diameter) — bound to rib with cord
- 54 Multiple fabric sleeves (stitched to lower covering) — sleeve holds lower

- 55 covering to undercamber while permitting spanwise movement during warping
- 56 Diagonally-placed wing covering (cotton fabric, unbleached and undoped) — calculated to stiffen structure in drag
- 57 Laced panel joints
- 58 Typical wire end (soldered ferrule) — non-adjustable
- 59 Built-up wing ribs — ash strip and spruce spacers
- 60 Interplane struts-spar attachment fitting (3/16in rod and 3/16in plate — brazed together)
- 61 Steel (3/16in) rib nose strip — wraps around spar
- 62 Skid and support frames — ash
- 63 Upper cross-frame to front spar fitting — 3/16in steel strip
- 64 Lower cross-frame to front spar fitting — 3/16in steel strip
- 65 Forward launch roller — modified cycle hub
- 66 Launch dolly

Wright Engine

- 67 Cast aluminum/copper alloy crank case
- 68 Removable steel cover
- 69 Steel tube connecting rod — threaded steel adaptors brazed at each end
- 70 Big-end/small-end — threaded bronze castings
- 71 Crankshaft — cut from flat slab of high carbon steel
- 72 Cylinders (fine grain cast iron) — screwed into case
- 73 Cast iron valve case — screwed into cylinder head
- 74 Pistons — cast iron
- 75 Fuel vapourising jacket — heated from water jacket
- 76 Air intake
- 77 Fuel drip lead
- 78 Inlet manifold
- 79 Atmospheric inlet valves
- 80 Make-and-break operating cam and lever
- 81 Variable ignition timing cam and helix
- 82 Exhaust camshaft
- 83 Generator

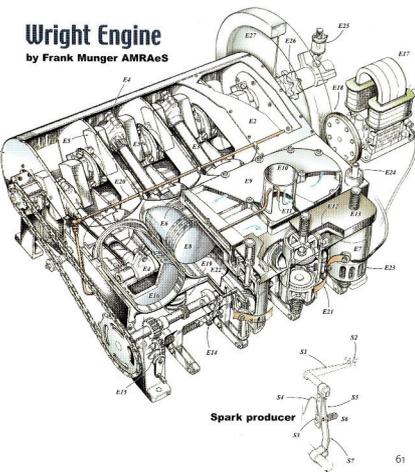
- 84 Friction drive
- 85 Oil pump
- 86 Oil gallery to piston skirts
- 87 Conducting copper strip
- 88 Make-and-break contact arm
- 89 Exhaust ports
- 90 Cooling water outlet — inlet under
- 91 Lubricator
- 92 Drive sprockets — propeller drive chains
- 93 Flywheel (20lb)
- 94 Contact arm — inside cylinder head
- 95 Insulated/fixated contact inside cylinder head — connected to generator
- 96 operating arm
- 97 Light spring — holds contacts closed
- 98 Freely pivoted lever
- 99 Spring — compressed
- 100 Lever S5 (released by cam) strikes operating arm and momentarily snaps contact open



Four pictures by DAN PATTERSON (www.flyinghistory.com) reveal Wright Flyer details. TOP LEFT: A typically simple, steel rod and plate, cord-bound strut fitting on the 1905 Wright Flyer, preserved at Carillon Park (see page 74). TOP RIGHT: A double-exposure photograph showing the motion of the 1909 Wright Military Flyer's biplane camward elevator. ABOVE LEFT: Another double-exposure of the 1909 Flyer's vertical rudders, from behind and above. ABOVE RIGHT: A close-up of the 1903 Flyer's engine, flywheel and chain-drive system.

Wright Engine

by Frank Munger AMRAeS

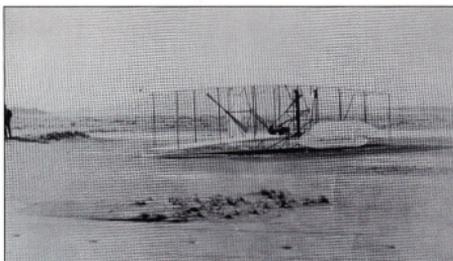


Spark producer

so that its weave was on a 45° diagonal relative to the wing chord. The lower surface of the wing was covered first, and then the cover fabric over the upper wing surface. Thus, the weave pattern went through a 90° directional transition as it passed around the wing from the lower to the upper surface.

But it was not as simple as it seems. The Wrights sewed chordwise pockets on to the upper surface of the muslin sheet used to cover the lower wing. These pockets did not run the full chord of the wing, but ran from a few inches behind the forward rib attachment aft along the rib line to the intersection of the rib and the wing spar; there they ended. When covering the wing, the brothers would start from the trailing edge, slipping the ribs into the pockets and sliding the muslin sheet up to the leading edge. The trailing edge of the ribs would pass through slits cut in the muslin. The aft wing spar would next be slipped into place, passing through the ribs. With the bottom surface covered, the fabric would be stretched taut up to the leading edge, taken around the edge, and then tacked at half-inch intervals on the inside back of the leading edge. The top covering would be fringed over the top of the wing from the trailing edge forward, and then itself tacked in place against the front of the leading edge, again at half-inch spacing. (Altogether, the Flyer used nearly 10,000 tacks.) When finished, the upper and lower wings appeared continuous from tip to tip. In fact, the outer wing panels were made flexible to permit wing warping, whereas the centre section of the wing was rigidly braced and trussed and carried the pilot and engine. This ingenious and simple scheme of covering was typical of the brothers' careful and methodical work.

Though significantly larger than the gliders, the Flyer bore a clear resemblance to them. Not surprisingly, therefore, it had, as well, the same considerable degree of pitch instability, having its c.g. significantly aft of its neutral point, which gave it a negative "static margin" of about -20 per cent, according to later calculations by Professor Frederick E.C. Culick of the California Institute of Technology. To compensate for differences in weight between pilot and engine, the Flyer had wings of slightly unequal span. The engine, mounted just to the right of the aircraft centreline, weighed approximately 34lb more than the pilot, who lay in a warp-controlling hip cradle to the left of the centreline. Accordingly, the right wing had a 4in greater span, giving it approximately



ABOVE The Flyer at the end of its series of historic flights on December 17, resting on the sand with its front rudder broken after making a heavy landing following 59sec in the air.

1903 Wright Flyer ("Kitty Hawk Flyer")

Powerplant	One water-cooled four-cylinder 8.25–16 h.p. (12 h.p. on first flight) horizontal inline of 201in ³ displacement running at 670–1,200 r.p.m., chain-driving two counter-rotating 8ft 6in-diameter two-bladed propellers; engine weight approx 11.25lb/h.p.; bore and stroke, 4in x 4in
Span	40ft 4in
Chord	6ft 6in
Gap	approx 6ft 2in
Length	21ft 1in
Height	approx 9ft 0in
Wing area	510ft ²
Aspect ratio	6.38:1
Camber	1 in 20
Canard elevator	48ft ²
Vertical rudders	21ft ²
Structure	Ash, spruce, wire, and plain weave (muslin) cotton covering
Empty weight	approx 605lb
Gross weight	approx 745lb with pilot
Wing loading	approx 1.46lb/ft ²
Maximum speed	approx 30 m.p.h.
Total flights	4

2-17ft² of additional area. Unlike the gliders, which were hand-launched using a guide holding on to each lower wing, the Flyer rested on a small skate-like truck that ran along a monorail. At engine start, the pilot would move a starting lever that severed a cotton tie-down, and the Flyer would accelerate along the monorail and into the air.

The brothers completed the Flyer over the summer of 1903 and departed with it for Kitty Hawk in late September. They avoided two fatal perils: a fire that ravaged a railway storage yard, fortunately after the Flyer had been shipped through it, and a howling 75 m.p.h. gale that threatened to destroy their camp and forced them to get on to the roof of their shed during the storm and hammer it back together. Despite their original intention to fly the 1903 machine first as a glider, they did not do so. They practised in the 1902 glider, now modified with the same

kind of control system they planned to use in the Flyer, but kept the latter on the ground as they finished it and made preliminary engine runs. These revealed that their hollow propeller shafts were too weak. After they fractured under load, Orville returned to Dayton to supervise manufacture of solid steel shafts, then returned to the Outer Banks, where the shafts were installed on December 12.

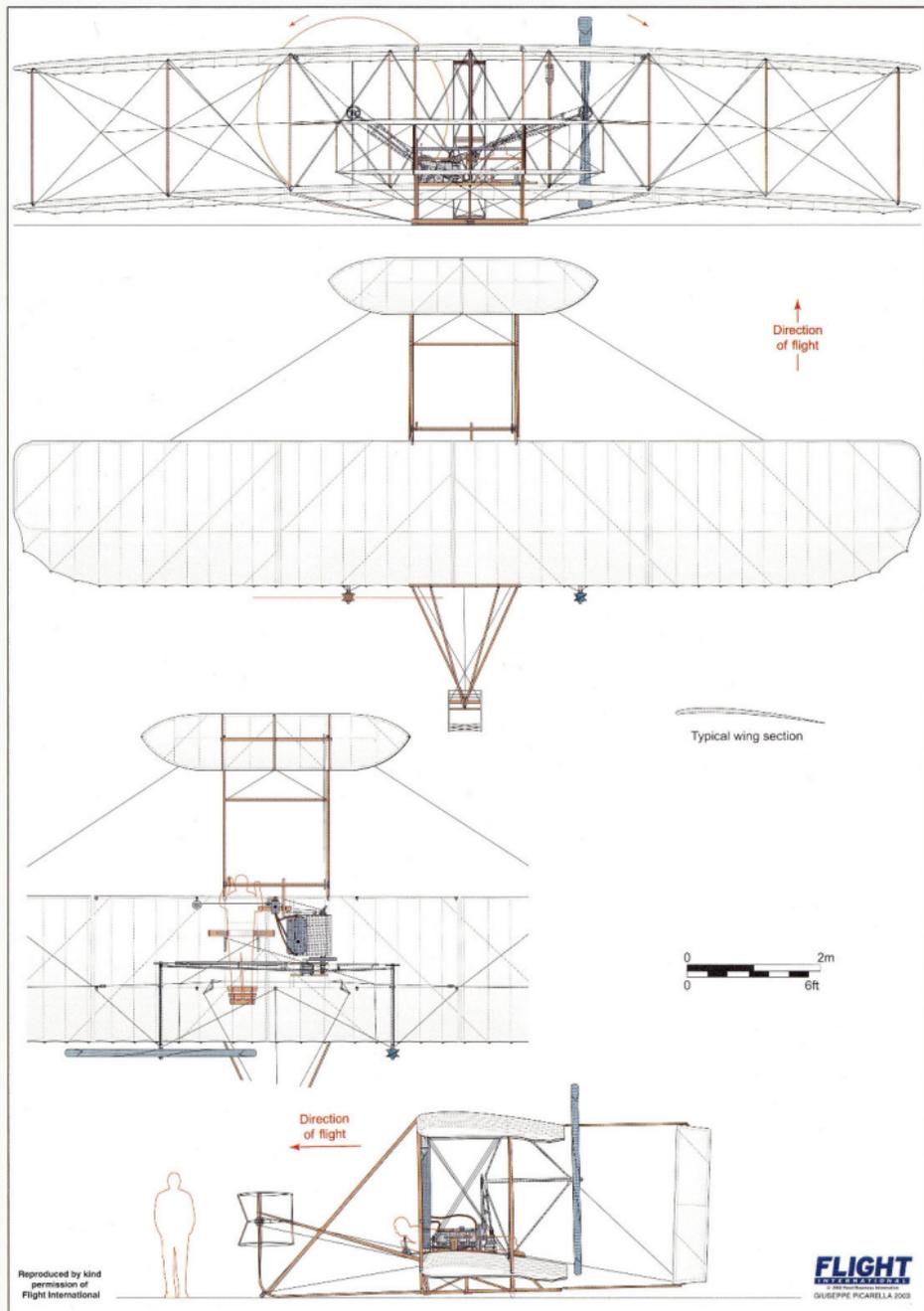
The Wrights now found themselves in an unenviable position. Winter was closing in, and they had to fly quickly if they were not to have to store the Flyer and resume testing the next year. So they pressed on. On December 14 they laid the track out slightly downhill, and attempted a flight. Wilbur won the coin toss and then took to the air. He over-controlled the sensitive Flyer, which stalled and settled heavily to earth about 60ft beyond the monorail, after four seconds airborne. For many pioneers that would have been

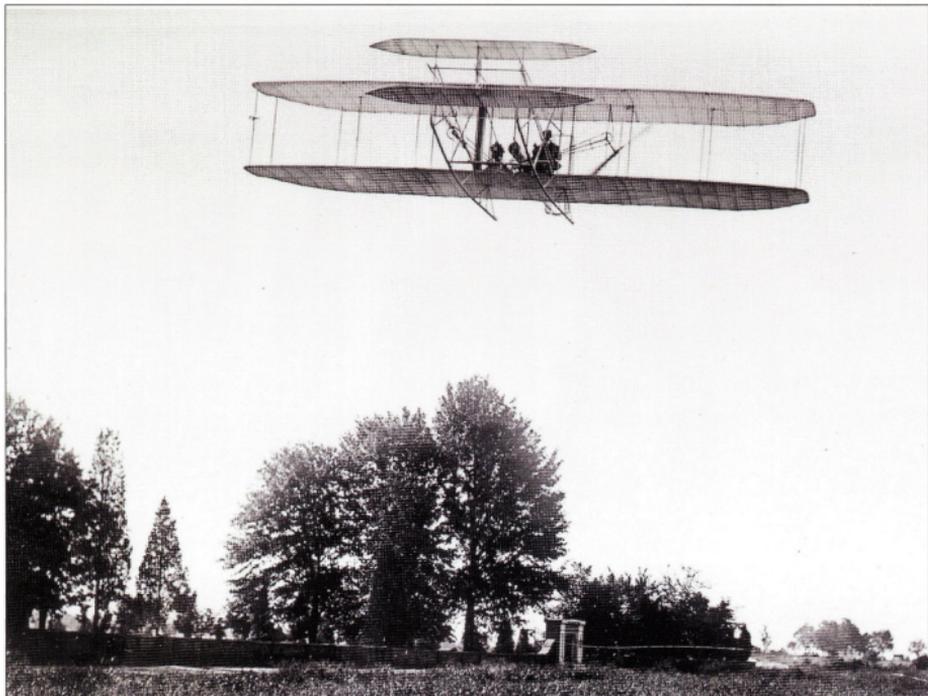
enough to justify a claim of powered flight, but not the Wrights. Repairs to the Flyer (the impact had broken its front skids and support structure) took the next two days. There may have been another significant cause as well: some recent photographic analysis by a study team led by Ken Hyde of The Wright Experience, comparing the length of the pitch control "stick" in photographs taken on the 14th with photographs taken on the 17th, suggests that the brothers may have lengthened the stick after the December 14 accident in a bid to secure greater mechanical advantage in longitudinal control authority. Then, on December 17, all was ready.

On that day, as history records, the Flyer completed four flights, beginning with Orville Wright's historic first flight that morning. The day began with a strong and steady 27 m.p.h. wind gusting across the site, and, after improving slightly, steadily worsened. Nevertheless, the brothers laid out the launch track (this time on completely level ground, an important point in silencing subsequent critics), and, as a small group of observers from the Kitty Hawk lifesaving station looked on, Orville carefully climbed on to the lower wing of the Flyer, resting in the hip cradle. With his left hand he held the pitch control lever; with his right he moved a small horizontal lever to the left, opening a fuel cock and priming the engine. Wilbur swung one of the propellers, and the engine fired, settling down to a steady pattering rasp as the propellers and chains added their own distinctive thrumming and clicking over the moan of the wind and crash of the breaking surf.

At 10:35hr Orville moved the starting lever further to the left, severing the cotton tie-down, and the Flyer rattled briefly on the monorail and then lifted quickly into the air, the little supporting truck running off the end of the rail. Off the right wing, Wilbur ran alongside, having steadied the wing as the Flyer gained speed. For 12sec it remained aloft, as Orville struggled with the oversensitive front elevator; then, with "a sudden dart", it descended to earth. Three more flights followed, the last, by Wilbur, covering 852ft in 59sec. The Flyer was badly damaged by wind after its last landing, being rolled over and broken up. Fortunately, and unlike with their previous gliders, the brothers returned the wreckage to Dayton, placing it in storage. With the first flights a success, the brothers now turned to transforming their invention into a practical, useful aeroplane. A

THE 1903 KITTY HAWK FLYER



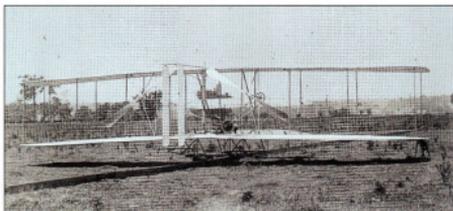


The Practical Aeroplane

Dr RICHARD P. HALLION recounts the successes – and failures – of the Wrights' attempts to make an aircraft for practical use following their 1903 "proof-of-concept" flights

THE WRIGHTS began 1904 by setting to work on their next aeroplane. Dimensionally similar to the 1903 Flyer, with the same control system and prone piloting position, it differed in many details, especially in largely in an attempt to overcome deficiencies in longitudinal stability.

Tested at Huffman Prairie, east of Dayton, the 1904 Flyer was the first to use a weight-driven catapult launch device. Tests began in May and continued through early December, the aeroplane making about 100 take-off starts, completing some 80 short flights and logging a total flying time of about 45min, including two flights exceeding 5min. It showed the same pitch instability as its predecessors, so in June the brothers shifted the engine, fuel tank and radiator aft, but this put the c.g. even further aft. Hastily they moved



the c.g. forward by ballasting the canards with 70lb of iron bars.

The 1904 Flyer then flew better if not well; and on September 20 made the world's first controlled circling flight by a piloted aeroplane. It had a more powerful engine, revised propellers and a changed sprocket ratio on the chain-drive. The lateral instability caused by the marked anhedral led the brothers to remove the droop, with dramatically improved

results. This machine was an important advance as they moved from experiment to production.

The 1905 Flyer, the first "practical" aeroplane, again used the catapult, as would every canard Wright until the Model B. Much modified over its active life, from 1905 to 1908, it was the first Wright to have independent three-axis control, upright seating for the pilot, and a seat for a passenger. It had much-improved longitudinal

ABOVE A remarkable photograph of Orville Wright piloting a Model A Flyer over the entrance to Arlington Cemetery at Fort Myer on September 9, 1908.

LEFT An aft view of the 1904 Flyer, the first aircraft to demonstrate manned circling flight, at Huffman Prairie on the outskirts of Dayton, Ohio, sometime in 1904.

stability, thanks to dramatic changes in length and weight distribution, plus the addition of 70lb of iron ballast. As a result, the -20 per cent static margin of the 1903-04 Flyers was reduced to about -8 per cent, though the 1905 Flyer was still inherently (and seriously) unstable. With this machine the Wrights at last abandoned anhedral, greatly improving its roll stability, though it was still a "close-coupled" aircraft.

The 1905 Flyer's most notable flight was on October 5, when Wilbur circled for 24 miles over Huffman Prairie in 38min 4sec. Originally built with a prone pilot position and interconnected warping and rudder controls, it was later given independent three-axis controls and two seats, flying again in May 1908 at Kitty Hawk as a "trainer" for the Fort Myer and European trials.

With the 1905 Flyer the brothers passed from developmental flight testing to pre-production prototype flight test, for it anticipated the next Wright aircraft, now known as Wright A Flyers. The As were slightly larger and had greater loaded weight.

Concerned lest others learn too much of their "secrets", the Wrights stopped flying and, at the expense of continued research and development, began seeking foreign and domestic orders. This must be seen as the start of their decline from dominance.

In 1903 the French aviation community became aware of the brothers' glider work, and heard that they had completed a powered machine. The *Aéro-Club de France* and the magazine *L'Auto* both sent investigators to Dayton, and their reports stimulated frenzied activity in France, encouraging the development of aircraft that would very quickly surpass the Wrights' technology.

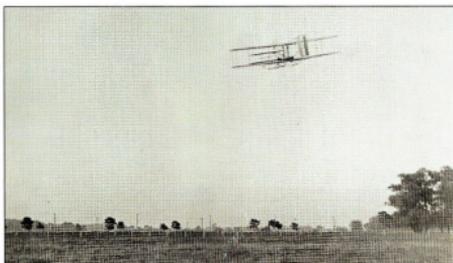
The "generic" Wright A Flyers were the first production aeroplanes in history, at least 11 being made during 1907-10. The Wrights made seven in the USA, and four were built under licence in France. These include the Flyers the brothers demonstrated in 1908 at Fort Myer, Virginia, and in 1908-09 in France, Italy, Germany and New York, as well as foreign Flyers flown by European pioneers. All used the catapult, though two were modified to use wheels. One notable feature was a spring-loaded tailboom to avoid fracture if the Flyer over-rotated on lift-off or landing.

In December 1907 the US Army Signal Corps issued a specification for a military aeroplane able to carry a crew of two at 40 m.p.h. Of the 41 proposals received, including that of the Wrights, 19 were immediately rejected. The other 21 Wright rivals took a little longer to be rejected, then the Wrights received a contract to build a military flyer. They had also signed an agreement with a French syndicate headed by Lazare Weiller to build Flyers under licence.

The resulting demonstrations, held in France and at Fort Myer, were great successes. After seeing Wilbur take off at Hunaudières "like an arrow from a crossbow" on his first flight in the early evening of August

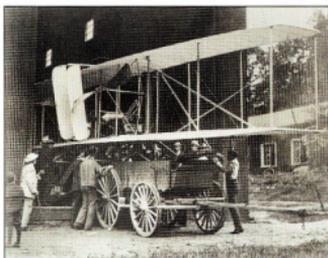
Wright 1904 & Signal Corps Flyers data

	1904 Wright Flyer	1909 Wright Signal Corps Flyer
Powerplant	One water-cooled four-cylinder 15-21 h.p. horizontal inline of 214in ³ displacement running from 1,070-1,360 r.p.m., chain-driving two counter-rotating two-bladed propellers; engine weight approx 8-10lb/h.p.; bore and stroke 4 $\frac{1}{2}$ in x 4in	One water-cooled four-cylinder 28-42 h.p. vertical inline engine of 240in ³ displacement running from 1,325-1,500 r.p.m., chain-driving two counter-rotating two-bladed propellers; engine weight approx 4.29lb/h.p.; bore and stroke 4 $\frac{3}{4}$ in x 4in
Span	40ft 4in	36ft 6in
Chord	6ft 6in	5ft 10in
Gap	approx 6ft 2in	5ft 0in
Length	21ft 1in	approx 28ft 11in
Height	approx 9ft 0in	approx 8ft 0in
Wing area	510ft ²	approx 415ft ²
Aspect ratio	6:38:1	6:42:1
Camber	1 in 25	1 in 20 (est)
Canard elevator	48ft ²	80ft ²
Vertical rudders	21ft ²	16ft ²
Structure	Ash, spruce, wire, and cotton covering	Ash, spruce, wire, and cotton covering
Empty weight	approx 760lb	735lb
Gross weight	approx 900lb with pilot	approx 1,200lb with pilot & passenger
Wing loading	approx 1.76lb/ft ²	approx 2.89lb/ft ²
Maximum speed	approx 30 m.p.h.	44 m.p.h.
Total flights	80	—



ABOVE The 1905 Flyer circles Huffman Prairie on October 4, 1905. The span and chord were the same as those of the 1904 Flyer, but the machine was much longer and slightly taller.

RIGHT The mobility and ease of dismantling of the 1908 Military Flyer are displayed at Fort Myer with the help of a horsecart, as the machine is moved into the large balloon hangar to be assembled.



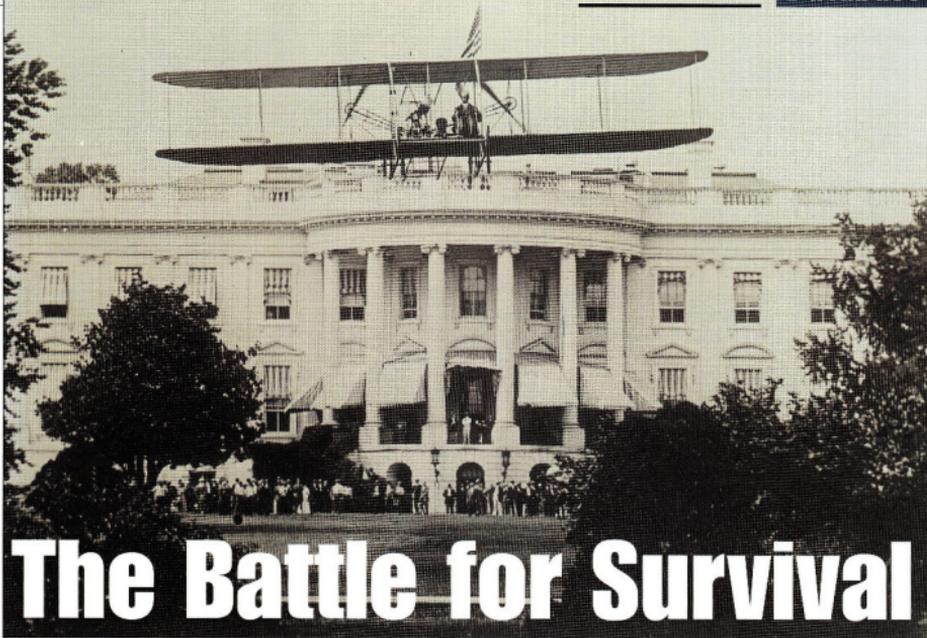
LEFT The first military aircraft to enter service — the 1909 Flyer being prepared at Fort Myer in July 1909 for one of several Army acceptance trials.

8, French aviator René Gasnier said: "Who can now doubt that the Wrights have done all they claimed? We are as children compared to the Wrights". At Fort Myer Orville flew with complete assurance. Even the world's first fatal accident to a powered aeroplane, on September 17, did little to dampen enthusiasm. That day, the starboard propeller fractured, severing a rudder bracing wire and sending the Flyer out of control into the ground. The passenger, Lt Thomas Selfridge, was fatally injured, and Orville suffered a broken hip. The Army agreed to defer judgment until the Wrights flew a second aircraft the following year.

The resulting 1909 Signal Corps Flyer was the world's first military aeroplane accepted into military service. Smaller yet heavier than previous Wrights, it was also faster, and, though still inherently unstable (with a negative longitudinal static stability margin of approximately -5 per cent), it had better flying characteristics. It used the engine from the 1908 Military Flyer. The 1909 Flyer had more distance between the skids and wing, much reducing the chance of over-rotating, so a fixed tailboom was used.

Successful demonstrations by Orville at Fort Myer secured a bonus over the \$25,000 contract price. The 1909 Flyer, given the serial "Signal Corps No 1" (S.C.1), underwent extensive trials.

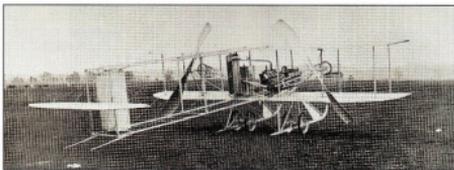
Although the Wrights could now produce a practical, usable aircraft, by 1910 they became locked in a battle for market share in a field evolving so rapidly that it was leaving them behind.



The Battle for Survival

By 1910 the Wright Brothers were facing severe legal problems, as well as strong competition from rival aircraft companies. Dr RICHARD P. HALLION charts their struggle

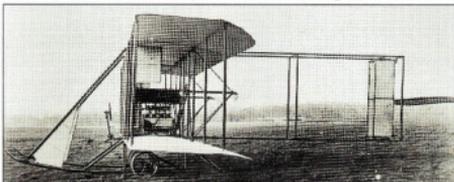
DESPITE THEIR BEST efforts, the Wrights' triumph at Kitty Hawk, and the tremendous public reception to their flying in Europe and America, did not automatically guarantee success in the one area they really wanted to dominate: the marketplace. The explosive growth of European aviation, the rise of competitors at home such as Glenn Curtiss, and the demanding piloting requirements of the original canard Flyers all posed serious challenges to the Wrights. Indeed, as early as 1910 the aeronautical community already recognised, as Horace Short so aptly stated, that the Wright Flyer was "a beast that needs some handling", and the shocking death of C.S. Rolls at Bournemouth in a modified French-built Wright added to disenchantment with the Wrights' technology. (This disenchantment did



ABOVE The Baby Grand of 1910 was designed as a racer, and reached 75+ m.p.h. in trials before crashing at Belmont Park.



ABOVE The 1911 Glider at Kitty Hawk testing an automatic stability system devised by the brothers during 1908-1911.



ABOVE The Model B was dubbed the "headless Wright", owing to the repositioning of the elevator aft of the tail structure.

not, of course, extend to the brothers themselves, who were justly showered with honours and awards.)

The Short brothers had entered into a production partnership with the Wrights, but manufacturing, quality control and supply problems kept the burgeoning company from flying the first of its six licence-built Wrights until November 1909. Although the Shorts used the Wright as inspiration for derivative designs, they began to look elsewhere; such was largely true of other nations that first acquired Wrights, and then moved quickly on to other, typically French, machines.

Witnessing this evolution, the Wrights grew increasingly frustrated at what they perceived was the success of others building upon their work. In fact, much of this foreign work was indigenous, for while Wright partisans have implied that the brothers taught the world to fly, in fact, what they really taught (thanks largely to their intensive work on controllability) was how to fly better.

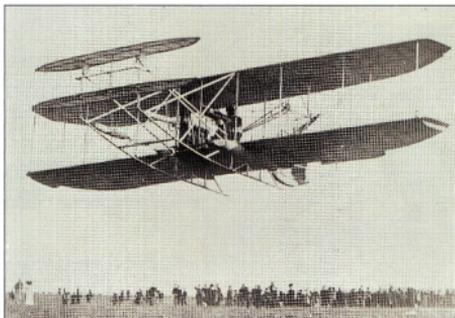
The pattern of the future appeared the next year, when Blériot flew across the English Channel, and a plethora of designs competed in the Reims aviation meeting, which signalled that the era of European inferiority to the

Wrights was clearly at an end.

The Wrights' response was their design of a new aircraft to succeed the older Flyers, the Wright Model B. This marked a major departure for the Wrights; the recognition that their reliance upon an inherently unstable canard biplane configuration was seriously out of step with the latest developments in Europe and elsewhere, and that the catapult means of operation was a serious liability. It constituted *de facto* evidence that the brothers recognised the obsolescence of their layout and the growing prevalence of the inherently stable tail-act concept as the new world standard.

As the 1903 Kitty Hawk Flyer had established a design standard for all subsequent Wright canard designs, the 1910 Model B set a standard that would last through Orville Wright's tenure with the company he founded. As early as 1909 the Wrights experimented with placing the elevator behind the wing. Although the Model B retained essentially the same wing cellule and propulsion layout, it had a greatly lengthened tailboom structure. Gone was the front elevator, instead moving to the rear, aft of the rudder, a change that led to this machine being dubbed, after the fashion of the day, the "headless Wright".

The front framing of the machine was now used simply as protective structure and bracing for the front skids, and had two small triangular fixed vertical finlets for added directional stability. The Model B was the first inherently stable Wright machine, with the c.g. ahead of the aeroplane's neutral point, thus giving it longitudinal static stability which its predecessors had lacked. In addition, the Model B incorporated a wheeled



ABOVE: C.S. Rolls during his historic non-stop two-way crossing of the English Channel in a modified French-built Model A on June 2, 1910. Rolls was killed later that year in the same machine at a meeting in Bournemouth.



ABOVE: The Wrights (seated, centre) with British pioneers in 1909, including the Short brothers, Oswald, Horace and Eustace, at furthest left. LEFT: Orville in the Baby Wright in 1911.



Although increasingly caught up and distracted by their patent fight with Curtiss and other pioneers, the Wright brothers attempted to keep some measure of research under way

undercarriage which greatly simplified its operation.

The Model B quickly entered production, although it did not return the Wrights to a position of predominance in aeronautics. This was because, for all its changes, it was still clearly an extrapolation of earlier Wright practice, not a bold new departure. After briefly borrowing and evaluating a privately owned Model B, the US Army Signal Corps flew three Model Bs, S.C.3, 4, and 7. Although used for notable military experiments including bomb-dropping, all eventually crashed. The Model B inspired three notable exhibition spin-offs intended for use as aerial demonstrators, the Models R, Baby Grand, and E. The Wright Model R (for "Roadster") was a

single-seat racer and display machine, and it influenced the later design of the military Wright Model D "Speed Scout". Essentially it was a scaled-down variant of the Wright B.

Intended as a flashy air racing and altitude-record-setting speedster, the Baby Grand, a short-span variant of the R, was the smallest derivation of the basic Model B formula. Orville piloted it at the Belmont Park Meet in 1910, attaining nearly 80 m.p.h. Assisted by Wilbur, Alec Ogilvie prepared a Model R to race in the 1911 Gordon Bennett, without success; the result, as Philip Jarrett has written, "simply demonstrated the obsolescence of the Wright design". Aviation was changing far more rapidly than the brothers had ever thought possible. The Model EX

was yet another derivation of the B, slightly smaller and carrying only the pilot, intended for air display use. The most famous of the EX series, the so-called Vin Fiz, was the first aeroplane to fly across the USA, completing the journey over nearly three months (with no fewer than 70 landings and multiple crashes) in 1911, piloted by Calbraith Perry Rodgers, who was almost as badly battered as his aircraft. Sadly, he died in a subsequent Vin Fiz accident.

Although increasingly caught up and distracted by their patent fight with Curtiss and other pioneers, the brothers attempted to keep some measure of research under way. Most notably, in 1911, they built a glider to test concepts of automatic stability. It followed the generalised

layout of the Model B, but on a smaller scale, though it used a B's tailbooms and tail surfaces. It also had a long projecting rod (echoing some of Cayley's earlier glider work) ahead of it so that ballast could be applied and shifted to vary the c.g. Flight tests at Kitty Hawk in October 1911 indicated a need for larger tail surfaces and a forward fin for increased directional stability. Thus modified, it flew much better, and on October 24, in the face of a 40 m.p.h. wind, Orville remained aloft for 9min 45sec, essentially "parking" over a single spot of dune and gently weaving back and forth. The record stood for a decade.

By 1911 the Wrights were chafing under increasing criticism that their aircraft were falling behind the rest of the world in capability. While they supported display flying and had their own nine-man exhibition team (five of whom would die in crashes), they were surprisingly (in retrospect) conservative in pushing their products. For example, although clearly able to do so (as Charles Rolls showed shortly afterwards), Wilbur refused an entreaty by Lord Northcliffe to fly across the Channel and thereby secure the £1,000 *Daily Mail* prize. Later, Wilbur turned down an invitation to make the first take-off from a US Navy ship, an opportunity that Curtiss quickly took advantage of, to their subsequent great economic benefit. This aversion to pressing the state of the art, curiously, even led to an attempt by Orville Wright in 1911 to limit future Gordon Bennett races to aeroplanes powered by engines no more powerful than the existing French 50 h.p. Gnome. "If they insist on motors of any size," Wright wrote

to British airman Alec Ogilvie, "the race will not interest us, as we do not care to fly over 100 m.p.h. ourselves, or put our men on such a job."

But others did, as Louis Béchereau and the Deperdussin team would show triumphantly with the first of their magnificent Monocoque Racers the next year. On September 9, 1912, Jules Védrines won the Gordon Bennett in Chicago, averaging 105 m.p.h. over the 124-mile course, a race sans any competitor save fellow Frenchman Maurice Prévost in another Monocoque, as the only American aeroplane aloft, an old Wright, pattered about with a photographer. Nothing could have more dramatically announced the French dominance of high-speed flying, and the decline of America's (and the Wrights') fortunes.

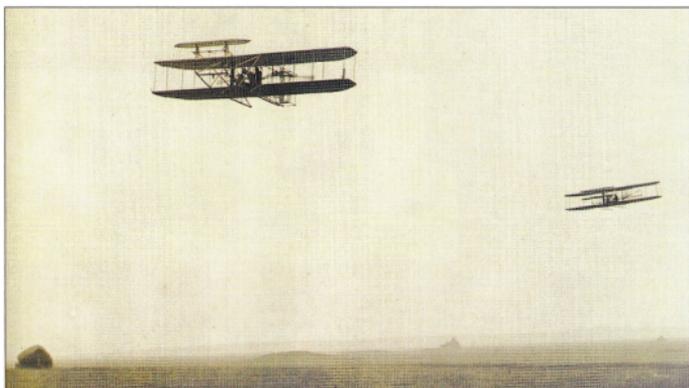
1910-1912 Wright Flyers data

	1910 Wright Model B	1910 Wright Model R	1912 Wright Model C "Weight Carrier"
Powerplant	One water-cooled four-cylinder 28-42 h.p. vertical inline engine of 240in ³ displacement running from 1,325-1,500 r.p.m., chain-driving two counter-rotating two-bladed propellers; engine weight approx 4-29lb/h.p.; bore and stroke 4½in x 4in	One water-cooled four-cylinder 28-42 h.p. vertical inline engine of 240in ³ displacement running from 1,325-1,500 r.p.m., chain-driving two counter-rotating two-bladed propellers; engine weight approx 4-29lb/h.p.; bore and stroke 4½in x 4in	One water-cooled six-cylinder 50-75 h.p. vertical inline engine of 406in ³ displacement running from 1,400-1,560 r.p.m., chain-driving two counter-rotating two-bladed propellers; engine weight approx 4-0lb/h.p.; bore and stroke 4½in x 4½in.
Span	39ft 0in	26ft 6in	38ft 0in
Chord	6ft 3in	3ft 6in	6ft 0in
Gap	5ft 4in	3ft 6in	5ft 0in
Length	29ft 9in	approx 20ft 0in	29ft 9in
Height	approx 8ft 0in	approx 7ft 0in	7ft 4in
Wing area	480ft ²	approx 180ft ²	approx 440ft ²
Aspect ratio	6-34:1	approx 7-80:1	6-56:1
Camber	1 in 20 (est)	1 in 20 (est)	1 in 25 (est.)
Elevator	40ft ²	27-2ft ² (est)	40ft ²
Vertical rudders	16ft ²	10-2ft ² (est)	16ft ²
Structure	Ash, spruce, wire, coated with aluminium powder; cotton covering	Ash, spruce, wire, coated with aluminium powder; cotton covering	Ash, spruce, wire, coated with aluminium powder; cotton covering
Empty weight	800lb (est)	750lb	800lb (est)
Gross weight	approx 1,250lb with pilot & passenger	approx 925lb (est)	1,270lb (est)
Wing loading	approx 2-60lb/ft ²	approx 5-14lb/ft ²	approx 2-87lb/ft ²
Maximum speed	44-6 m.p.h.	approx 55 m.p.h.	60 m.p.h. (est)

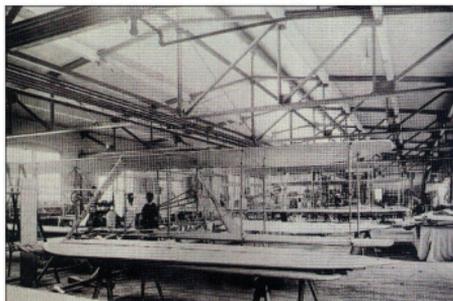
By this time Wilbur was dead, having succumbed to typhoid on May 30, 1912. With his passing, many have suggested the Wright company lost its creative genius. This seems unfair to Orville, whose own writings and utterances clearly indicate his own mastery of aeronautics. Instead, it might be suggested, the Wrights had already reached the end of their creative impulses well before Wilbur's death, with the introduction of the Model B. After that came little more than incremental extrapolation. The two major machines which followed, the C and the D, clearly showed this.

Developed as an endurance (4hr) two-man military scout and "weight carrier," the C replaced the B as the standard Wright production machine. Externally, it most noticeably differed from the B in having two braced vertical finlets (resembling parallel standing rulers) ahead of the wing, replacing the sail-like triangular finlets on the B and its derivatives. Most significantly, the C had a more powerful six-cylinder Wright engine, and a rugged structure. Sadly, the C extended the growing reputation of Wright aeroplanes as dangerous. The US Army operated seven Cs: S.C.10 (assigned twice, once as a replacement), 11, 12, 13, 14 and 16. Six crashed, and the seventh, S.C.16, was condemned as non-airworthy in 1914.

The single-seat Model D blended the small size of the previous R with the higher power of the larger two-seat C. It closely resembled the R, and reverted to the two sail-like finlets forward of the wing, rather than the vertical finlets of the Model C, CH and E. Orville considered the D extremely



ABOVE British aviation pioneer Cecil Grace in Short-Wright No 5 pursues C.S. Rolls in Short-Wright No 6 at Eastchurch on Easter Monday, 1910. Grace was lost at sea attempting to cross the Channel in No 5 in December of the same year.
BELOW One of the first aircraft production lines — Model Cs in the assembly shop at the Wrights' factory in Dayton, Ohio.



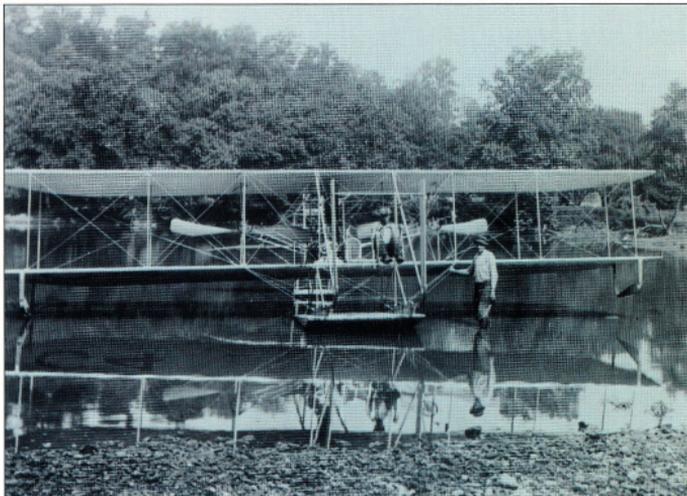
strong and "the easiest to control of any we have ever built", although he later conceded that "its high speed in landing is its only drawback". The Army, which eventually acquired two (S.C.19 and 20) in August 1912, was more critical, and for good reason. One was wrecked (and subsequently rebuilt) during its official trials, and both were flown only infrequently until retired in June 1914. The D was the last "classic" Wright pusher that clearly showed its lineage back to the 1903 machine. From this point on, Wright aircraft would retain elements of the earlier machines, but, by and large, increasingly diverge from them, becoming at once more mainstream and, sadly, even less competitive with the emerging dominant designers in Europe and America.

Unable to compete with newer ideas and concepts in aircraft design, Orville Wright created his last few designs and called it a day, explains Dr RICHARD P. HALLION

FROM 1913 THE WRIGHT company sank increasingly towards collapse, its efforts to dominate both the American and foreign marketplace clearly failing. Attempts to build strong productive partnerships in Europe and America had come to grief, and increasingly Orville Wright retreated into his own work, for he had a nature more suited for the researcher and test pilot than the industrialist. His own company officers became increasingly outspoken in their criticism of his management style. Grover Loening recalled: "Letters would arrive needing prompt answers. They would be relayed to Orville's office on West Third Street [in Dayton], some two miles from the factory . . . some of these would not be answered for weeks, to a newcomer a shocking example of poor organisation". He also showed a marked reluctance to abandon the pusher configuration for the rapidly proliferating tractor, dismissively stating to Loening: "This type is really an invention of the French and we should not be copying it just to keep up". Eventually, the evident success of the Europeans and the Curtiss company spurred the Wright team to change, but to little avail. Once set off-balance by Curtiss's early success, the Wright company could never again get ahead of their rival, and thus remained reactive, not anticipatory, in their behaviour.

In contrast, by 1913, Curtiss was beginning the steady expansion of his aircraft production that would lead him to dominate the USA's aircraft industry within the next five years. His success reflected his radically different business approach to that of the Wrights. He seized every opportunity to set records, listened closely to what his customers wanted and readily changed his design approaches, sometimes dramatically. Between 1909 and 1916 some 69 per cent of the aeroplanes purchased for America's army and navy would be Curtiss designs, and only 9 per cent those of the Wrights.

Until this point, the Wright



The Passing of an Era



TOP The first Wright floatplane, the Model CH, with single 240lb pontoon float, on the Miami River, Ohio, in June 1913. **ABOVE** Although reverting back to the pre-Model E twin-chain-driven propeller layout, the solid-bodied Model F of 1914 signalled a significant departure for Wright in design terms.



ABOVE The first Wright company design following the departure of Orville in October 1915 was the Model K floatplane of 1916.



ABOVE Designed by a very young Grover Loening, the Model G "Aeroboat" accelerates for take-off on the Miami River in 1913.

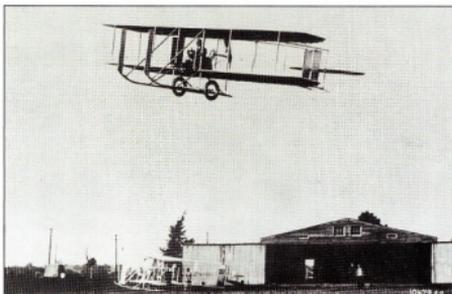
company had concentrated exclusively on landplanes. But now, undoubtedly goaded by the commercial and military success of Curtiss's float-equipped pushers, Orville Wright responded with his own attempt at a "hydroaeroplane", the Model CH, in an attempt to win a share of this potentially lucrative field. Essentially an adaptation of the Model C, and first tested along the Miami River in the spring of 1913, the CH initially featured long twin floats attached to the skids. However, this arrangement proved a failure, as it changed the characteristics of the aircraft during turns, making it even more difficult to control than the already tricky Model C. Accordingly, Wright swapped the twin floats for a single large compartment float, adding additional small stabilisation floats attached under the vertical fin and at the lower wingtips. Thus modified, the CH had much more acceptable flight control characteristics, though undoubtedly higher drag and, hence, lower overall performance. Not surprisingly, the CH did not prove a commercial success, though it did mark the beginning of Wright interest in adapting their design for maritime and naval use.

At the same time, Wright continued with his stability research, and did much of it using yet another derivative of the Model B; more precisely, a derivative of the Model EX. This aircraft was the Model E of 1913. Strictly intended as a one-off

exhibition aircraft (and, as a result, designed for quick assembly and dismantling), the Model E owed its inspiration to the earlier Model EX, from which it differed greatly. The wing was more perfectly rectangular in planform than those of other Wright machines. Significantly, this aeroplane marked (albeit temporarily) the abandonment of the decade-old twin-chain-driven "handed" twin-bladed propeller formula that the Wrights had used since 1903.

Instead, the Model E used a single four-bladed (and hence much smaller diameter) propeller chain-driven from the engine, which remained offset next to the pilot on the lower wing. Because of the single engine/single propeller combination the Model E had a completely different tailboom structure that, although it looked similar to earlier ones from the side, looked totally different when viewed from above or below. The tailbooms, conforming to Curtiss or European practice, were broader-set at the wing trailing edge so as to afford clearance for the propeller, then swept sharply inwards before joining the tail group of elevator and rudder. The Model E used forward vertical stabilising vanes generally similar in appearance to those of the Model C, but with less bracing, and a two-wheel, not four-wheel, undercarriage. It was in this machine that Orville Wright successfully demonstrated a pendulum-controlled automatic stabiliser on December 31, 1913, for which he justly won the Robert J. Collier trophy. But his triumph was shortlived and bitter-sweet, as rival Glenn Curtiss sponsored work by Lawrence Sperry that resulted in the successful demonstration in June of the following year of a remarkable (and much more practical) gyroscopic stabiliser, an important step on the road to the true autopilot, and one that won for Sperry and Curtiss a 50,000-franc prize sponsored by the French Aero Club and ministry of war.

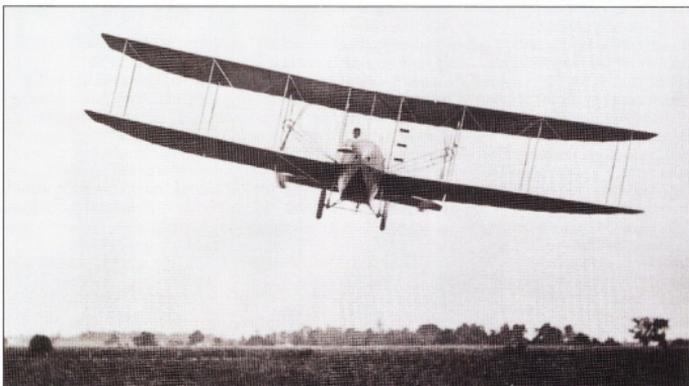
Little is known of the next Wright machine, the Wright Model F, built to an Army requirement in 1913. Although the F reverted to the twin-chain-driven propeller layout abandoned with the Model E, it represented a radical departure from the previous Wright design philosophy in all other respects. A landplane, the Model F featured a boat-like fuselage, the crew sitting in tandem above twin landing wheels. The engine, of foreign manufacture (at government insistence, but for reasons that are unclear) and mounted in a curvaceous streamlined nose, had an extension shaft that passed under the crew seats, and then chain-drove twin tractor



ABOVE In 1913 Orville fitted a prototype automatic pilot system in a Model E, wind-driven servos powering a pendulum to control wing warping and a horizontal vane for the elevators.



ABOVE The Model HS was a shorter-span, lightened variant of the Model H, the latter of which was introduced as another military aircraft along the lines of the larger Model F.



ABOVE The slight dihedral of the Model H and longer-span wings compared with those of the HS are illustrated well in this picture of an H making a low pass over the cameraman in 1914.

propellers located ahead of the wing. The elevator, previously carried on a tailboom and located behind the two vertical rudders, was now supported by the fuselage, and served as the base for the twin rudders. The fuselage assumed a slab-sided tapered rectangular form aft of the wing, and featured a landing tailskid (although it was not, as has been said, the first Wright machine to feature a tailskid).

Flight tests resulted in two design changes to the production machine delivered to the US Army. The propellers were changed from

tractors to pushers, and thus relocated to their more traditional position aft of the wing, and the crew arrangements were changed from tandem seating to side-by-side seating for better cockpit communication and co-ordination. The Army's Model F (S.C.39) was delivered at the end of June 1914, and underwent nine months of protracted trials before its acceptance. Thereafter it completed only seven flights before being dropped from the Army's inventory on June 13, 1915. Apparently through the actions of Alec Ogilvie, a Model F

also made its way across the Atlantic, being delivered to Farnborough for testing in 1915.

The Wright company's next aeroplane, the Model G Aeroboat, represented another attempt to respond to Glenn Curtiss's success (this time, his Model F flying-boat), and yet another extrapolation of the Model C concept. It was notable as the first Wright aeroplane designed by a hand other than Orville or Wilbur's, for the creator of this streamlined short-hull aircraft was the bright young engineer Grover Loening. Yet even here, the rivalry with Curtiss seemed to assume more importance than any other consideration. Loening recalled: "[Wright] would never have approved of the [Model G] sold to the Navy, if its appearance had not been so totally different from the Curtiss F boat that was sweeping the field." Completed in 1913, and tested on the Miami river, it featured a metal-clad wooden boat hull joined to an essentially Model C airframe, although the elevator was of different configuration, being shorter in span and deeper in chord than that of the Model C, and the engine was buried

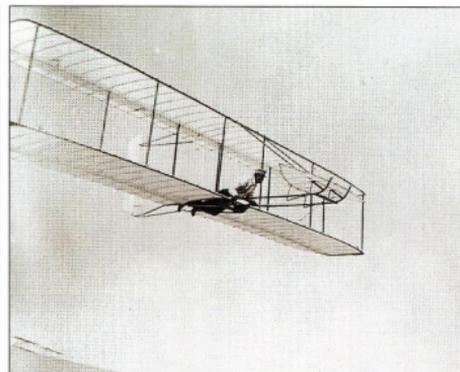
aircraft to have a separate tailplane and pivoted elevator), relocated stabilising floats (now under the lower wingtips), and a relocated engine (shifted forward into the bow of the aircraft, like the Model F, and similarly using an extension shaft that passed under the aircrew's seats to drive the propellers).

The end of the Wright era was rapidly approaching. The company attempted another military aircraft along the lines of the disappointing Model F, though smaller. This, the Model H, looked much like the F, although its front fuselage was faired more pleasingly into the slab-sided contours of the aft fuselage. It also possessed slight wing dihedral, representing the final overturning of Wright aerodynamic design philosophy, which had stressed anhedral for most of the canard Flyers, and a flat level-wing planform for the later Flyers and the Model B derivatives. In 1915 Orville Wright directed that the Model H be slightly reduced in span and lightened by approximately 100lb, in an effort to increase speed. The result was the HS, which was not a commercial success. Disagreement exists about what its actual span was, whether of 32ft or 36ft; Wright himself remembered it in 1919 as 36ft.

In October 1915, worn out by the endless patent suits and discouraged by the state of the company, Wright sold his interest for a tidy profit and settled into a career of general inventing, largely outside the aviation field. Even so, the first product of the reorganised Wright company after his departure, the Model K twin-floatplane, still reflected a lingering influence of the brothers' 1903 machine, namely its twin chain-driven pusher propellers. In all other respects, it marked a significant departure from previous Wright practice — perhaps not too surprising, given Orville Wright's leave-taking. Of conventional appearance, this two-seater had a completely enclosed fuselage of box-like cross-section, and rested on two

long floats. The powerplant installation generally followed the philosophy of the earlier Model F, G, H and HS, being located in the nose, driving the propellers via an extension shaft connected to the chain-drive mechanism. The propellers themselves were tractor-mounted ahead of the wing, and much higher than on other Wright machines, the centreline of the propellers being about two-thirds of the gap from the lower to the upper wing, presumably to eliminate water impingement during taxiing and take-off and alighting operations. The US Navy accepted one Model K, serialised AH-23, later renumbered A51, but despite its trim, purposeful appearance and its generous payload capacity, it was not, like all the later Wrights, a success.

The Wright Model L incorporated some of the design philosophy of the Model K, and thus can be considered the last of the Wright aeroplanes incorporating inputs from one or both of the Wright brothers. First flown in 1916, it was intended as a light single-seat scouting aeroplane. Its design represented an essential rejection of any previous Wright concept. It was a tractor biplane of (very) conventional layout, with a direct-drive engine, ailerons on all four wings (each pair connected by an actuating rod), an enclosed fuselage, a wheeled undercarriage, a separate horizontal fin and elevator, a Fokker-like "comma" tail (though with a separate fin and rudder), and was inherently stable. Even so, its simple, straight lines (except for the curved nose panels) and overlarge tail surfaces (part of the legacy to the Model K) gave it an almost amateur or model-aeroplane-like appearance. It lagged behind the contemporary design standard of aircraft on the Western Front, and, not surprisingly, failed to secure production orders. Later aircraft using the Wright name represented the concepts and designs of others. The era of the Wrights, if not their mark on aviation, had come to an end. **A**



Wild Horses

Speaking about glider flying in 1901, Orville Wright described the best way to tame a "fractious horse" was to get on and learn by practice. Dr RICHARD P. HALLION relates how tricky the aircraft were to fly

THE CLASSIC WRIGHT aircraft all posed demanding challenges for their pilots, as they were generally dangerous designs; but, having said this, in fairness it must be noted that very few (if any) of the early aircraft which pioneers first attempted sustained, powered and controlled flight could be said to be satisfactory flying aeroplanes.

Of the Wright gliders, the 1902-1903 machines had the best flying characteristics, and the 1901 the worst. The latter had serious stability and control problems owing to its general design as well as the positioning of its "front rudder" (the all-moving canard elevator). Wilbur Wright subsequently wrote of its first flight (which covered 300ft):

"The full power of the rudder [elevator] had been required to keep the machine from either running into the ground or rising so high as to lose all headway. In the 1900 machine one-fourth as much rudder action had been sufficient to give much better control. It was apparent that something was radically wrong, though we were for some time unable to locate the trouble."

He commented on another flight in the 1901 glider, when the canard elevator had saved him from a loss of control:

"In one glide the machine rose higher and higher until it lost all

headway. This was the position from which Lilienthal had always found difficulty to extricate himself, as his machine then, in spite of its great exertions, manifested a tendency to dive downward almost vertically and strike the ground head on with frightful velocity. In this case a warning cry from the ground caused the operator to turn the rudder [canard elevator] to its full extent and also to move his body slightly forward. The machine then settled slowly to the ground, maintaining its horizontal position almost perfectly, and landed without any injury at all. This was very encouraging, as it showed that one of the very greatest dangers in machines with horizontal tails had been overcome by the use of a front rudder."

As for the 1902 glider, it exhibited its own instabilities, captured in one account by Orville Wright of a test on September 23, 1902:

"I was sailing along smoothly without any trouble at all from the fore-and-aft control, when I noticed that one wing was getting a little too high and that the machine was slowly sliding off in the opposite direction. . . the next thing I knew was that the wing was very high in the air. . . I threw the wing tips to their greatest [with wing warping deflection] angle. By this time I found suddenly that I was making a descent backwards toward the low



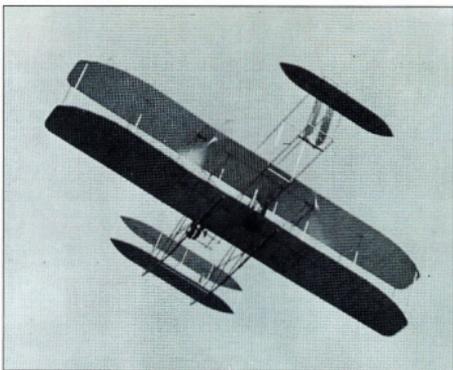
ABOVE The last of the line — compared with other designs of the day the Model L of 1916 was outdated, and the Wright company merged with Glenn Martin and Simplex that year.



LEFT The 1902 Glider, although perilous to fly, was proof that the brothers had grasped the basics of manned flight.

RIGHT A modified Wright Flyer fitted with a fixed horizontal tailplane behind the rudder.

BOTTOM The Model C — five of the six purchased by the US Army crashed, killing six men in the process. The rear elevator proved too small.



"I cut the engine for landing, when a sharp downdraught hit the 'plane and took the controls out of my hands. As the 'plane went down, I went up. My head hit the top wing and I received a sudden headache"

wing, from a height of 25 or 30ft, as a result of the machine having turned up [pitched up to an angle of attack] of nearly 45° in front ... the result was a heap of flying machine, cloth, and sticks in a heap, with me in the centre without a bruise or a scratch."

The 1903 machine exhibited better behaviour, but still reflected its three-axis unstable tendencies, as reflected in Orville Wright's recollections of the four flights made on December 17, 1903:

On the first flight, at 1035hr:

"The course of the flight up and down was exceedingly erratic, partly due to the irregularity of the air, and partly to lack of experience in handling this machine. The control of the front rudder was difficult on account of its being balanced too near the centre. This gave it a tendency to turn itself when started; so that it turned too far on one side and then too far on the other. As a result the machine would rise suddenly to about 10ft, and then as suddenly dart for the ground. A sudden dart when a little over 100ft from the end of the track, or a little over 120ft from the point at which it rose into the air, ended the flight."

On the third flight, by Orville, at 1140hr:

"This one was steadier than the first one an hour before. I was proceeding along pretty well when a sudden gust from the right lifted the machine up 12–15ft and turned it up again sideways in an alarming manner. It began a lively sidling off to the left. I warped the wings to try to recover the lateral balance and at the

same time pointed the machine down to reach the ground as quickly as possible. The lateral control was more effective than I had imagined and before I reached the ground the right wing was lower than the left and struck first. The time of this flight was 15sec and the distance over the ground a little over 200ft."

On the fourth and final flight, by Wilbur, at noon:

"The first few hundred feet were up and down as before, but by the time 300ft had been covered, the machine was under much better control. The course for the next 400–500ft had but little undulation. However, when out about 800ft the machine began pitching again, and, in one of its darts downward, struck the ground. The distance over the ground was measured and found to be 852ft; the time of the flight 59sec."

In December 1909 the US Army's Chief Signal Officer, Brig Gen James Allen, called Lt Benjamin D. Foulois into his office and ordered the young officer to take the first Army aeroplane, S.C.1, to Fort Sam Houston at San Antonio, Texas. Allen instructed Foulois (who had flown as an official observer on the tests of

S.C.1 at Fort Myer earlier that year) to "take plenty of spare parts and teach yourself to fly". This he did, in part encouraged by occasional letters from the Wright brothers. Foulois was not the first Army pilot (Lieutenant Frederick E. Humphreys had earned that honour earlier), but he left the most vivid accounts of his time in the first military aeroplane, particularly in the gusty air of south Texas. Of one flight, he wrote:

"I cut the engine off for the landing when a sharp downdraught hit the 'plane and literally took the controls out of my hands. As the 'plane went down, I went up. My head hit the top wing and I received a sudden headache. As I came down, the 'plane came back up and I was back in my seat with a 'whoomp!' that knocked the breath out of me. The only reason I wasn't thrown out of the 'plane was that there were two truss wires in front of the pilot's seat which prevented me from going overboard. With throbbing head and aching seat, I jammed the nose of the 'plane downward and managed to regain control of my 'bucking bronco' before it stalled. The landing was as near to a crash without being one as could be imagined.

"One day I was flying over the drill field when I flew into one of those little dusty whirlwinds that I had seen rising from the field occasionally but had never before encountered in the air. The 'plane was tossed upwards and over on one wing at a very steep angle. Remembering Wilbur Wright's rule [always to put the nose down when in trouble, so as to prevent a stall] and my own experience, I cut the engine and jammed the nose down to prevent stalling. However, there was one small but important fact that I overlooked. There wasn't sufficient space between the aeroplane and the ground fully to recover control. Suffice it to say that my flight was suddenly terminated amid the nonmusical sounds of ripping linen, spitting wood, and tangling wires."

With the Wright Model B of 1910 the gross instabilities of the original canard Wright aircraft were at last a thing of the past. Nevertheless, the lightly-loaded Model B and its successors exhibited quirks of their own, particularly abrupt stall and departure behaviour, whether from inadvertent mishandling or a great sensitivity to gusts. When coupled with their relatively low control power and control authority, this made them quite dangerous.

The later Wright aeroplanes had a tendency to stabilise in a dive, and their high thrustline made them difficult to recover. While Orville Wright insisted this was not the case, remarking to one correspondent that "the 'light scout' machines which we are selling to the Government are the easiest to control of any we have ever built, although they have a speed of over 65 miles an hour", the actual case seems otherwise. When Lt L.C. Rockwell and Corporal Frank Scott were killed in a Model B (S.C.4) at College Park on September 28, 1912, witnesses noted they were in a steady glide to land and then, as Rockwell added power, the aeroplane abruptly dived steeply (even perhaps vertically) into the ground.

Nose-down power-induced pitch instability is something borne out more recently by airmen who have flown various Wright replicas. So what were the Wright aeroplanes like to fly? The answer must be "tricky and unforgiving".



Wright Flyer survivors compiled by Dr Richard P. Hallion

AT FIRST GLANCE, surprisingly few original Wright aircraft exist; however, when examined against the small number of experimental and production machines that were actually built and flown, the number is actually surprisingly large. Numerous replicas of Wright aircraft and gliders abound, many in museums and visitor centres around the world, as well as flying examples of varying fidelity

1903 Kitty Hawk Flyer *National Air and Space Museum, Smithsonian Institution, Washington DC, USA*

Following its gust-tossed break-up after the fourth flight on December 17, the brothers returned the wreckage of the machine to Dayton, placing it in storage. It narrowly missed being destroyed in a disastrous flood of 1913. Over the next two decades it appeared in several aeronautical exhibitions. Then, in 1928, as a result of the increasingly bitter feud between Orville Wright and the Smithsonian Institution over whether the Langley Aerodrome could have been considered the first successful aeroplane (a foolish and untenable claim that reflected much discredit upon the Institution — see *Claims to Fame, July Aeroplane*), Wright sent it, in response to an invitation, to the Science Museum in London's South Kensington. Following settlement of the Wright/Smithsonian dispute, it returned to the USA after the death of Wright in 1948, and was installed in the Smithsonian Institution's Arts and Industries building on December 17, 1948. Moved to the new National Air and Space Museum, opened on July 1, 1976, it is the centrepiece of that museum's collection, the most historic aeroplane in the world

Wright 1905 Flyer *Wright Hall, Carillon Park, Dayton, Ohio, USA*

The 1905 Flyer narrowly escaped destruction, as it was essentially abandoned in a shed at Kitty Hawk after the 1908 trials. Portions of the aircraft, with Orville Wright's permission, were sent as far as Massachusetts. Fortunately, in the mid-1940s, a concerted effort was made by various Wright enthusiasts, and Orville Wright himself, to reassemble the various parts of the 1905 Flyer. In an extraordinarily successful effort, the craft was rebuilt, with as much as 60 per cent original structure; other portions were fabricated, the whole effort under the supervision of Orville Wright

Wright "Model A" *Deutsches Museum, Munich, Germany*

This is the only surviving Wright A aircraft; Dayton-built but assembled in Germany, it was flown in 1909 at Tempelhof by Orville Wright in a series of demonstrations before the German court. Miraculously, it survived both wars, and is on exhibit in the Alte Luftfahrthalle, together with a good collection of other early German aircraft

1909 Signal Corps Flyer *National Air and Space Museum, Smithsonian Institution, Washington DC, USA*

The world's first successful military aeroplane, the 1909 Signal Corps Flyer has been on continuous public exhibit at the Smithsonian since the Institution received it in 1911. Following flight testing and demonstrations with the military in 1909 and 1910, the aircraft was returned to the Wright factory for possible modification close to Model B

standard. For a variety of reasons this did not occur, and company technicians restored it instead to its 1909 configuration, delivering it to the Smithsonian for exhibition. This Wright aircraft possesses the greatest percentage of original components of all of the Wright machines held in the Smithsonian's collections

Wright Model B *The Franklin Institute, Philadelphia, Pennsylvania, USA*

This aircraft, the world's only surviving "pure" Model B, was purchased by Grover Cleveland Bergdall in 1912. It completed at least 748 flights totalling 312hr 34min before being retired to the Institute after a final flight at Central Airport, Camden, New Jersey, by Marshall Reid on December 17, 1934. Reid thus was almost certainly the last individual to fly an original Wright aeroplane, and this Model B is likely the highest-timed of all the Wright aircraft ever built. Furthermore, if Institute claims that its structure is 97 per cent original are accurate, this particular Model B is probably the most original of all extant Wright machines

Model B (Modified) *United States Air Force Museum, Wright-Patterson AFB, Dayton, Ohio, USA*

This aircraft was a trainer flown by Howard Rinehart at Mineola, New York, in 1916, and last flown in October 1924 by Lieutenant John Macready at air races held at Dayton. It has an eight-cylinder Rausenberger engine of 75 h.p., and (ironically, in view of the bitter battle between the Wrights and Glenn Curtiss) ailerons on the upper and lower wings (connected by an actuating rod) replacing the original wing-warping for more effective lateral control

Model EX ("Vin Fiz") *National Air and Space Museum, Smithsonian Institution, Washington DC, USA*

If nevertheless distinguished, the "Vin Fiz" (named after a grape drink manufactured by the sponsor of the machine's first owner, Cal Rodgers) has a deeply troubling, indeed unsettling, history, for it killed two of its pilots. The trouble began on a prize cross-country journey, when it crashed repeatedly. So many pieces of this aircraft were replaced that by the time it landed in California only the rudder and two wing struts were original components. Shortly thereafter, this aircraft was destroyed in a fatal accident; the wreckage was rebuilt, flown, and again crashed, killing pilot Andrew Drew. The wreckage was restored once more, and the machine flew until finally grounded as a result of a lawsuit filed by first victim Rodgers's mother in 1914. Orville Wright subsequently recollected that the aircraft was scrapped at the Wright factory. In fact, from the accumulated assemblage of spares and scraps, the (or perhaps more accurately "a") Vin Fiz was, in fact, eventually rebuilt. In 1917 Rodgers's mother donated the rebuild to the Carnegie Institute in Pittsburgh, Pennsylvania, which eventually passed it to the Smithsonian Institution in 1934, where it is currently displayed (offered the aircraft in 1912, the Smithsonian originally turned it down). The chain of accidents and misfortunes mean that the aeroplane, as exhibited today, is little more than an assemblage of parts that, at one time or the other, were incorporated on the Vin Fiz during its multiple lives: a sad case where the aircraft displayed far greater "survivability" than its pilots!



1903 Flyer — Science Museum, London, UK



1905 Flyer — Carillon Park, Ohio, USA



1909 Signal Corps Flyer — Washington DC



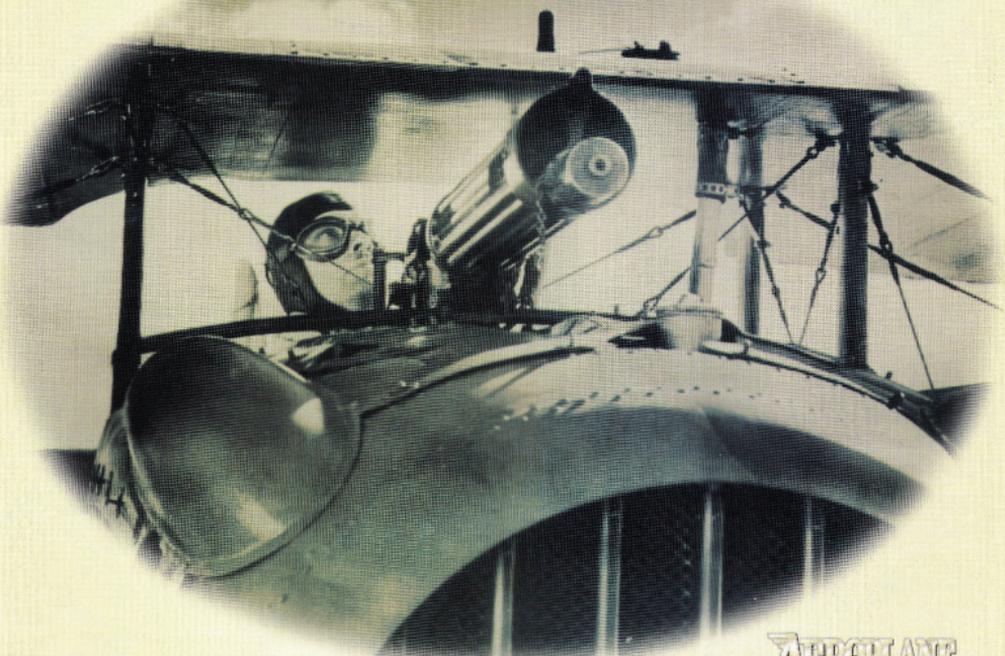
Model B — Franklin Institute, Philadelphia



Model B (Modified) — USAF Museum, Ohio



Model EX "Vin Fiz" — Washington DC, USA



A Century of... Aviation Films



In the final instalment of *Aeroplane's* celebratory 12-part series — in which several specialist authors summarise a specific aspect of aviation development since 1903 — historian **ALAN SMITHIE** takes a whistlestop tour through the history of flying films

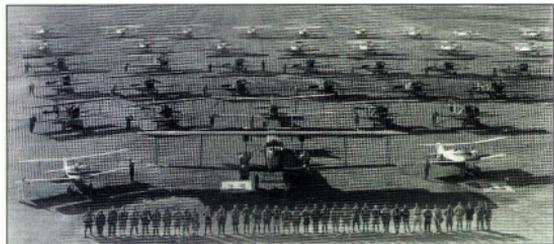
DECEMBER 1903 was one heck of a month. At Christmas in New York City, *The Life of an American Fireman*, considered by many to be the first real feature film, had its premiere. A few days earlier at Kill Devil Hills, the Wright brothers had successfully flown. For the remainder of the century, the parallel development of these two dynamic inventions would coalesce to produce some of the most exciting, enduring images in the history of entertainment.

Just as there had been flying machines predating the Wright brothers, short novelty films featured flying machines before 1903, the first being *A la Conquête de l'Air* (titled *Flying Machine* in Britain and the USA), made by Ferdinand

Zecca in Paris in 1901. For the one-minute film Zecca built a miniature airship, suspended it from the roof of the Pathé studio and filmed it in front of a black curtain. After rewinding the film, the upper half of the lens was covered as the camera filmed views of Paris, so when projected to an audience it appeared that the airship was flying over the city. This split-screen shot was the start of studio or "process" shots which would be, in ever more sophisticated forms, a staple of flying films for the next 90 years.

Flight's fantastical possibilities were explored in what many regard as the first ever narrative film, the 1902 science-fiction fantasy *Le Voyage Dans La Lune* made by France's Georges Méliès. The 14min masterpiece included an olt-repeated

ABOVE Donald O'Connor scans the heavens during William Wellman's 1938 epic *Men With Wings*.



ABOVE The surviving *Hell's Angels*' fleet at Oakland, California, at the completion of filming in 1928. The centre machine is a Sikorsky S-29A, which represented a Gotha in the film.

RIGHT One of the three genuine S.E.5as used in the making of *Hell's Angels*.



Following the Armistice public interest in war films remained subdued, and it was not until 1925 that the subject again became fit for feature films

RIGHT The first official association of stunt pilots, the 13 *Black Cats*, was formed in Hollywood in 1924.



ABOVE Several DH-4s lent by the US Army were used in William Wellman's epic *Wings*. This example is rigged as a camera platform.

RIGHT A camera is mounted behind the cockpit of one of the Travel Air 2000s mocked-up as Fokkers for Howard Hawks's *Dawn Patrol* in 1930.



sequence of a rocket-ship smacking straight into the right eye of the "man in the moon".

The Wright brothers' first flight at Kill Devil Hill on December 17, 1903, was not filmed, and it was not until 1908 that air-to-ground footage of a Wright Flyer, shot at Le Mans during the Wrights' visit to France, was shown in America. In early 1909 this footage was used in a Pathé film, *The Different Aeroplanes*, the first to document aviation's progress to date. Many early American filmmakers were hungry for gimmicks for their lighthearted Nickelodeon "shorts", and the new-fangled flying machines were a perfect subject, but the medium's potential to create serious "airmindedness" among cinemagoers was not overlooked. In 1911 Henry "Hap" Arnold, a young pilot in the United States Army (and later the commander of the USAAF) appeared in a couple of short films promoting military aviation, and in 1912 the Aerial League of the British Empire introduced films into its lecture programmes to keep the public abreast of the latest developments. The same year the "King of Comedy", Mack Sennett, used an aeroplane in his comedy *A Dash Through the Clouds*.

The Great War was the first major conflict in which film was available for propaganda purposes, but by 1916 the war of attrition in the trenches provided scant inspiration for the home front audience, so the propagandists began to lose the idea of the chivalrous, honourable air-fighter. In April 1916 *The Eyes of the Army*, showing activities of a B.E.2c-equipped RFC reconnaissance unit, was released, and in 1917 a young Hermann Goering appeared in *Fliers on the Western Front*, a more "glamourised-up" 10min film which also featured Manfred von Richthofen. Later that year the British War Office's response, *With the Royal Flying Corps*, featured Canadian fighter ace Billy Bishop.

World War One badly affected Europe's nascent film industry, but the USA's was thriving. Following the Armistice, public interest in war films was subdued, and not until 1925 and the success of King Vidor's *The Big Parade*, about American soldiers in France, did the subject again become fit for feature films. Then William Wellman, a 28-year-old former Lafayette Escadrille pilot, was chosen to direct *Wings*. Shooting began in Texas in August 1926 with a grand total of 220 aircraft, including 50 genuine SPAD VII, Nieuports, Fokkers and S.E.5s, plus Curtiss P-1 Hawks, Thomas-Morse M.B.3As and DH-4s on loan from the Army. Although the plot now looks ludicrously melodramatic, the film was very popular with critics and audiences, and won the first ever "Best Picture" Oscar in 1927.

After seeing *Wings*, industrialist and aviator Howard Hughes thought he could do better, and in October 1927 began production of *Hell's*



1902 Georges Méliès, a magician by trade, makes *Trip To The Moon*, in essence a filmed stage play with "artificially arranged" scenes



1910 *Conquest of the Pole*, again directed by Méliès, featured several rival groups of explorers trying to get to the South Pole, with the hero, Professor Maboul, making the trip in a bizarre fantasy aeroplane



1915 Mack Sennett makes *Dizzy Heights and Daring Hearts*, which includes a scene where an actor appears to be plucked from a chimney by a Wright Model B



1919 Harry Houdini is alleged to have faked a stunt on *The Grim Game*, which nearly resulted in the death of three pilots

Angels. Hughes directed the elaborate and demanding flying sequences, during which three pilots were killed, but when the \$3m silent film was released in March 1929 it was not enthusiastically received by an audience which had become accustomed to "talkies" over the previous two years. Undaunted, Hughes shot much of the film again with sound; the second version went down a storm at its premiere in June 1930, with 1.3 million thronging Hollywood Boulevard.

The final great World War One flying film, *Dawn Patrol*, directed by Howard Hawks, was a more thoughtful affair, with actor Richard Barthelmess breaking down under the pressure of seeing younger men dying on their first mission. Hawks flew some of the camera missions himself, filming heavily-disguised Travel Air biplanes and four genuine Nieuport 28s. The film was remade in 1938 with swashbucklers Erol Flynn, David Niven and Basil Rathbone, and utilised aerial footage from the Hawks film.

In Britain a lack of money precluded production of such epics, but in 1935 Alexander Korda began work on the semi-documentary *Conquest of the Air*, for which replicas of early machines were built, and in which Laurence Olivier made his first screen appearance. In 1938 William Wellman similarly over-reached himself trying to record aviation's history with Fred MacMurray and Ray Milland in *Men With Wings*, the first flying film in Technicolor. Rip-roaring entertainment was provided by a series of airfilm films in the 1930s, including *Only Angels Have Wings*, starring Cary Grant and Jean Arthur. *Test Pilot*, also made in 1938, showcased some of the cutting-edge military designs of the day, including the Boeing YB-17 and a Seversky P-35.

With the political situation in Europe worsening, Korda released *Things to Come* in 1936. Set in 1940, it was a spectacular rendition of H.G. Wells's prophetic story with Raymond Massey as pilot John Cabal, returning to a devastated Earth as part of a benign dictatorship of airmen. Released shortly before the outbreak of war, *Q-Planes* was a comedy-thriller in which Ralph Richardson and Laurence Olivier solved the mystery of disappearing experimental Airspeed Envoys, which were being brought down by an unnamed enemy with a large ray-gun. A more serious, but slightly bogus tone was adopted by Korda for his next project, *The Lion Has Wings*, the first aviation feature film released after the outbreak of war. It understandably exaggerated the efficacy of the British bomber force at this early stage of the war.

Before America's entry into the war, Hollywood made several pro-British flying films to encourage America's public to be less isolationist. First came *A Yank in the RAF*, with Tyrone Power as a cocksure Hudson ferry pilot. A 20th



ABOVE Among the replicas built for Korda's *Conquest of the Air* was this 1895 Lillienthal biplane hang-glider.

LEFT A Liellier replica and a Cierva Autogiro during the making of *Conquest of the Air*. BELOW LEFT Clark Gable in a Seversky P-35, which was re-cast as a racer and renamed the "Drake Bull" for the film *Test Pilot*.



ABOVE Howard Hawks's *Only Angels Have Wings* was one of the best of the 1930s airmail/airline pictures.

LEFT Boeing 100 N872H, a camera aircraft for Wellman's *Men With Wings*.

1927 Former WWI pilot William Wellman's *Wings*, with Charles Rogers, ushers in a glorious cycle of World War One flying films.



1929 *Wings* also spawned a lot of cheaply produced flying-flicks, including *The Sky Hawk* from 20th Century Fox.



1933 Ginger Rogers and Fred Astaire star in *Flying Down to Rio*, a musical which featured a chorus line dancing on Sikorsky S-40 flying-boats.



1939 Alexander Korda's *The Lion Has Wings* details the motives behind the war effort.



Aviation's 100 Years

RIGHT James Cagney in his *Waco* in *Captains Of The Clouds*, a call to arms for Canadians in which he and his bush-flying pals flew their aircraft down to the RCAF training base at Uplands to enlist.

BELOW A dodgy plywood Spitfire, used in *Eagle Squadron* in 1942. The model had previously been used in the 1941 film *A Yank in the RAF*.



RIGHT Spencer Tracy gets a rocket from James Gleason after belly-landing his bullet-riddled B-25 in the opening sequence of *A Guy Named Joe*.

BELOW Great stunt pilot Paul Mantz set his B-17 down within 10ft of the aiming point for the belly-landing scene during *Twelve o'Clock High* in 1949, one of the greatest stunt sequences ever filmed.



A Guy Named Joe starred Spencer Tracy as a B-25 pilot who is killed and then returns to earth in spirit form as guardian angel to a trainee Lockheed P-38 pilot



Century Fox crew was allowed to film air operations in Britain for the film, released in September 1941. A year before he directed *Casablanca*, Michael Curtiz made two excellent colour flying films, *Dive Bomber* with Errol Flynn and *Captains of the Clouds* with James Cagney. In 1942 Robert Stack volunteered for the RAF in *Eagle Squadron*, and captured a Messerschmitt in "France", probably in order to get away from his dodgy plywood Spitfire on the set in Los Angeles.

In Britain in 1941, the Crown Film Unit made *Target for Tonight*, a documentary about the bombing offensive featuring real RAF personnel. The next year Michael Powell and Emeric Pressburger made *One of Our Aircraft is Missing*, concentrating on the fictitious crew of Vickers Wellington B-for-Bertie, who are shot down over Holland and battle their way home with the aid of the Resistance. In 1942 Leslie Howard directed *The First of The Few*, in which he effectively portrayed Spitfire designer R.J. Mitchell, although the notion that Mitchell was inspired by seagulls while sitting on the Seven Sisters near Eastbourne was a little fanciful. The first realistic American attempt to depict a World War Two battle came with *Wake Island* in 1942, with five Ryan SCs making convincing Nakajima 97s in combat scenes with Grumman Wildcats.

John Wayne traded in his horse for a P-40 in 1942 for *Flying Tigers*, loosely based on the American Volunteer Group in China. Although some full-size models were used, it was the first Second World War film to have access to appreciable numbers of current fighters, with P-40Es at Curtiss's factory at Buffalo, New York, being painted in AVG markings and flown for the cameras. In 1943 *A Guy Named Joe* starred Spencer Tracy as a B-25 pilot who is killed when he dives his damaged bomber on to a German warship, and returns to earth in spirit form as guardian angel to trainee Lockheed P-38 pilot Van Johnson. Tracy reappeared in mortal form as Lt Col Jimmy Doolittle in *Thirty Seconds Over Tokyo*, a drama-documentary about the B-25 raid on Japan from the *USS Hornet* in May 1942. The war's most famous air combat film was William Wyler's *Memphis Belle*, filmed at Basingstoke and on B-17 raids over Germany in 1943.

Some of the most effective war films were made at the end of or just after the war, and used flashback as a device to tell a more measured version of the conflict. Anthony Asquith's *The Way to the Stars*, starring John Mills, Michael Redgrave and Bonar Colleano, traced the story of a fictional air base from the early days of RAF Bristol Blenheims through to the B-17s of the USAAF, as a tribute to the co-operation of the two air arms. William Wyler's *The Best Years of Our Lives* depicted the plight of American servicemen returning home after the war; some of

1941 Michael Powell and Emeric Pressburger's *One of Our Aircraft is Missing*, featuring a fictitious Vickers Wellington crew, is a hit in America



1948 Raoul Walsh directs *Fighter Squadron* for Warner's, and in the long tradition of "movie faking-up" uses P-51Ds as Messerschmitt Bf 109s

1951 John Wayne stars in *Flying Leathernecks*, Nicholas Ray's tribute to US Marine Corps pilots in the Pacific. Paul Mantz was in charge of the air-to-air sequences



1956 William Holden and a range of experimental aircraft starred in *Toward the Unknown*

1940 1941 1942 1943 1944 1945 1946 1947 1948 1949 1950 1951 1952 1953 1954 1955 1956 1957 1958 1959 1960

the most memorable scenes were shot in the vast aircraft scrapyards near Los Angeles.

On the eve of the Korean War in 1949, Gregory Peck starred as the authoritarian Gen Frank Savage, rebuilding the effectiveness of his B-17 unit and finally breaking under the pressure in the thoughtfully-scripted and well-acted *Twelve O'Clock High*. RAF Fighter Command's Finest Hour, the Battle of Britain, was covered for the first time in *Angels One Five* in 1952, the same year that Supermarine's latest product, the Swift, was the centrepiece of David Lean's *The Sound Barrier*. The most revered British bombing raid of the war was sensitively underplayed in *The Dam Busters* (1954), but in the USA a cycle of films extolling the current need for a strong bomber force was under way, two 1955 offerings being *Strategic Air Command* starring former B-24 pilot James Stewart, and *The Court Martial of Billy Mitchell*, directed by Otto Preminger and starring former Western hero Gary Cooper. The Korean War resulted in two excellent air films, with World War Two veteran William Holden reluctantly giving up his law practice to fly a Grumman Panther in *The Bridges at Toko-Ri* in 1954, followed in 1958 by the Dick Powell-directed *The Hunters*, with Robert Mitchum.

In 1956 Kenneth More played Douglas Bader in *Reach For The Sky*. Filmed at Kenley, several pre-war aircraft were used, including Bristol Bulldog G-ABBB, now in the RAF Museum, and Shuttleworth's Avro Tutor K3215 and Avro 504 H5199. The next major production in Britain was *The War Lover*, another Eighth Air Force B-17 film, which served as a vehicle for the young Steve McQueen in 1962. The high point of this turgid black-and-white effort was ex-RAF pilot John Crowdon's low beat-up of the tower at Bovington. Mirisch Productions, with their "one plot fits all" approach to the war genre, produced 633 *Squadron* in 1964. A lot of the film's Mosquito footage was to turn up in Mirisch's lamentable 1968 production *Mosquito Squadron*. The mid-1960s saw an upsurge in the production of aviation epics, starting with Ken Annakin's *Those Magnificent Men in Their Flying Machines*, a comedy about the 1910 London-Paris Air Race.

Benjamin Fisz and James Bond producer Harry Saltzman created the world's 35th-largest air force for *Battle of Britain* in 1968, and engaged Guy Hamilton to direct it. The 40min of air combat scenes in the final cut remain unsurpassed, but the film had mixed reviews, mainly due to its very broad-brush treatment, with too many perspectives for the average cinema-goer.

Similar criticism was directed at *Tora! Tora!*, which recreated Pearl Harbor at huge expense. It featured the largest fleet of replica aircraft ever constructed, with 30 Vultee BT-13s



LEFT Nigel Patrick, just seconds before crashing during a speed run in a Supermarine Swift during David Lean's 1952 film *The Sound Barrier*. In an unusual reversal of the norm, the film claimed the Mach 1 glory for Britain, at a time when it clearly belonged to Chuck Yeager and the Bell X-1.



LEFT Richard Todd as Guy Gibson, posing in front of a Lancaster at Scampton during the making of *The Dam Busters* in 1954. Four Mk 7s were used in the film, with Lincolns filling in the background.



BELOW LEFT Former bomber pilot and aviation enthusiast James Stewart played Charles Lindbergh in Billy Wilder's 1957 film *The Spirit of St Louis*. This period lobby card shows him checking his course on the transatlantic flight.



LEFT The climax of *Those Magnificent Men in Their Flying Planes* was shot by Alberto Sordi, rescued by Stuart Whitman in his Bristol Boxkite. Various replicas of pioneering types were built for the film, some of which are still flying in 2003. The replica-builders were also hard at work building Fokker Triplanes and Palz scouts for *The Blue Max*, filmed in Ireland in 1965.



1962 Steve McQueen starred in *The War Lover*, for which three B-17s were brought to England. Parachuting champion Mike Reilly was killed during production



1966 *The Flight of the Phoenix*, with James Stewart. Paul Mantz died while flying for the film



1968 *Battle of Britain* is shot. Many Spitfires and Hurricanes are restored to fly for the film, which also utilises licence-built Spanish Air Force Heinkels and Bf 109s



1975 *The Great Waldo Pepper*, a darker version of 1920s Barnstormer movies, is made



1979 Hanover Street, a ceaselessly wartime romance set against B-25 operations from Britain. B-25s never flew raids from the UK

Aviation's 100 Years

RIGHT A Mosquito B.35 bites the dust in 633 Squadron. Although three were destroyed during filming, such productions popularized vintage aircraft, and saw many preserved that would otherwise probably have been scrapped. The film was directed by Walter Grauman, a 12th Air Force veteran who had flown 56 missions on B-25s.



RIGHT Entire battleship sections were replicated for *Tora! Tora! Tora!*, only to be blown up during filming in Hawaii during 1969. The production was really two films in one, with Richard Fleischer directing the American sequences, and Toshio Masuda the Japanese.



In 1978 five B-25 Mitchells were flown to Britain for Hanover Street, a dreadful, romantic pot-boiler which at least spawned a documentary about their delivery flight

RIGHT Alan Arkin as the neurotic B-25 bombardier in Mike Nichols's *Catch 22*. **BELOW** The Old Flying Machine Company, Europe's leading supplier of fighters for films, co-ordinated the flying for *Dark Blue World*, filmed at the Czech Republic's Hradcany airfield during 2001.



and North American T-6s converted to resemble Nakajima "Kates", Mitsubishi Zeroes and "Vals", with another 21 T-6s modified for sequences at Ashiya Air Force base in Japan, which were used on a full-scale mock-up of the flight deck of the Japanese aircraft carrier *Akagi*.

For the 1970 production *Catch 22* stunt pilot Frank Tallman gathered together 20 B-25s, which were flown to a Mexican island where the incredible formation take-off sequences were filmed. British Oscar winner David Watkin was cinematographer on the film, during which he filmed the largest and most complex process shot of his career, when a B-25 was suspended from the studio ceiling for an elaborate front projection shot. The mid-1970s saw a return to barnstorming with Robert Redford in *The Great Waldo Pepper* and in 1978 five B-25 Mitchells were flown to Britain for *Hanover Street*, a dreadful, romantic pot-boiler which at least spawned a documentary about their delivery flight, *Mitchells Do Fly in IMC*.

Second World War films were out of vogue for much of the 1980s, but in 1987 Duxford's Old Flying Machine Company co-ordinated the P-51 Mustang scenes in Steven Spielberg's *Empire of the Sun*, and in 1989 Catherine Wyler, son of William, came to Britain to remake *Memphis Belle* with five B-17s, eight Mustangs and three Messerschmitts. Unfortunately the final cut did not do justice to the aerial unit's hard work: the five B-17s are very rarely seen in the air together, and there is some poor model work. The ground scenes, again with David Watkin behind the camera, are excellent. The same year Spielberg remade *A Guy Named Joe* as *Always*, transposing the action to a firebombing environment, with the opening Catalina water pick-up shot being the film's highlight.

As the 1990s wore on, Computer Generated Imagery (CGI) began to ease out some of the special effects and flying units, but made many flying sequences look like cartoons. Michael Bay's overblown *Pearl Harbor*, the most expensive film ever made, had CGI P-40s flying between hangars in the manner of *Star Wars* spacecraft, totally negating the efforts of the actual second-unit pilots. Thankfully, the most recent war flying film, the low-budget Czech production *Dark Blue World* (2001), used real aircraft whenever it could, cutting in old *Battle of Britain* footage where necessary. The film was not a refreshed, clichéd vanity vehicle, but presented an almost unknown story with unknown actors who looked young enough to have flown in the real Battle. Let's hope that the recently-announced Tom Cruise film *The Few*, which will tell the story of American *Battle of Britain* pilot Billy Fiske, will also remain faithful to its subject matter. **A**



1983 Philip Kaufman films Tom Wolfe's bestseller *The Right Stuff*. Superb ensemble cast plays first generation of astronauts, with Sam Shepard as Chuck Yeager breaking Mach 1



1986 *Top Gun* is one of the year's biggest blockbusters, a glamorous recruiting film for the US Navy with an unsuitable rock back-beat. It stars a youthful Tom Cruise as a hot-shot F-14 pilot



1990 The comic-book yarns of the 1930s brought to the screen. Stars Timothy Dalton as a Daltron as a DeLorean with Errol Flynn's alleged Axis sympathies



2001 Producer Jerry Bruckheimer's grotesque *Pearl Harbor* becomes the most expensive film ever produced, at \$155m. Actors Ben Affleck and Josh Hartnett win the *Battle of Britain* tool

Film Quiz

Exercise your knowledge by trying our quiz, compiled by **MICHAEL O'LEARY** — you could win one of three packs of classic aviation films on video or DVD from DD Video

WIN
films on
video &
DVD
with DD Video

- 1 What is the wrecked aircraft, who is the pilot, and what is the name of this 1957 Rank Film production?
- 2 As their aircraft slips beneath the surface of the ocean, a downed RAF crew paddles for safety. What is the aircraft and what is the name of the 1954 film?
- 3 Tropical location, burning de Havilland Mosquito, and Gregory Peck. What is the name of the film?
- 4 "All right lads, there's the new Kraut clipped-wing Fokker 32 that they're going to bomb London with if we don't stop them!" Name the film, the lead actor and, for a bonus point, the last airline that flew the derelict Fokker airframe masquerading as a Luftwaffe bomber.
- 5 Who is the lovely lass romancing Buddy Rogers and Richard Arlen, and what is the film?
- 6 One of the first films in which a helicopter played a leading role. Name the film.
- 7 This extremely convincing action scene aboard a carrier was from a film about World War Two carrier action seen through the eyes of a padre. What is the film?
- 8 A slightly modified de Havilland Tiger Moth substituted for a Standard J-1 crash scene for this quirky 1972 film about barnstorming. What was the film and who was the main star? For a bonus point, who wrote the story from which the script was derived?
- 9 Small man, big hat. Name the film, actor, and the type of aircraft he is flying.
- 10 The Duke and John Carroll wrestle manfully with the controls as they guide their aircraft on a vital mission. Name the film. For a bonus point, identify the aircraft.
- 11 What film featured the odd sight of a Standard J-1 on floats attacking a rival bootlegger's armada?
- 12 Who is this famous American aviator, getting little respect from a fellow pilot? Name the film and, for a bonus point, the aircraft.
- 13 Who is the once-famous director looking as if he is having a hard time waiting for the next happy-hour? Also, name the film. For bonus points, name the aircraft, its civil registration, and its Woolworth-fortune heiress former owner who equipped the bomber with a bar, bed, and other furnishings for a flying "love palace".
- 14 When you're out of Fokkers... what aircraft did the producers of *The Young Eagles* use for a stand-in for their 1930 film?
- 15 Least likely World War One fighter pilot. Name the actor and film.
- 16 Least likely firebomber pilot. Name the actor and film. For a bonus point, state from which film this film was derived.
- 17 Wooden acting inside an aluminium tube. Name the film.

TO ENTER Send your answers, on a postcard, to: *Aeroplane Film Quiz*, c/o Tom Borthen, IPC Media, Rm 2108, King's Reach Tower, Stamford St, London SE1 9LS, to arrive by **December 31, 2003**. The winners will be the senders of the first three all-correct entries picked at random. Usual IPC rules apply. For great film deals visit www.ddvideo.co.uk

Aeroplane, published by IPC Media Ltd (IPO), will contact your personal information to process your entry. Would you like to receive e-mails from *Aeroplane* and IPC containing news, special offers and product and service information, and take part in our magazine research via e-mail? If yes, write "e-mails please" on your entry. *Aeroplane* and IPC would like to contact you by post or telephone to promote and ask your opinion on our magazines and services. Please write "no post or telephone" on your entry if you prefer not to hear from us. IPC may occasionally pass your details to carefully selected organisations so they can contact you by telephone or post with regards to promoting and researching their products and services. Please write "no other organisations" on your entry if you prefer not to be contacted.





Preservation Pioneers...

Vintage Aeroplane Club

Before World War Two only a few privileged people collected and operated historic aircraft, and there was no organisation to co-ordinate their needs and interests.

DAVID OGILVY, joint founder in 1951 of the Vintage Aeroplane Club, wonders whether this triggered the expansion of interest and activity that has taken place since then

TOP Hurricane G-AMAU is flagged away at the beginning of the 1950 King's Cup Air Race at Wolverhampton.

BELOW LVG C VI 7198/18, seen here at a 1930s display, has been flown by the Shuttleworth Collection for many years, but is now to join the RAF Museum.

BELOW RIGHT Richard Shuttleworth in his Blériot XI at the London Aeroplane Club's show in 1936.

AFTER WORLD WAR TWO, aviation took a few years to stabilise, but one fact is unchallengeable. Despite the downturn in military activity when the war ended, there was far more aviation about in, say, 1950 than there is today. The Services operated almost ten times as many aeroplanes and three times as many types as they do now, and there were 14 civil aerodromes around the south-east coast compared with seven today (and even one of these is under threat of possible closure). But, perhaps most surprisingly of all, on the UK civil register there were more than 1,100 commercial air transport aircraft with current Certificates of Airworthiness (Cs of A), compared with fewer

than 900 today. Certainly these were smaller, with less capacity than modern airliners, but there were more of them. One airline, Silver City Airways, operated more cross-Channel services than all today's companies combined!

This vast array of aircraft included many of considerable historic interest. The word "warbird" had not been invented, and the airworthiness authority of the day, the Air Registration Board (ARB), frowned upon the idea of individual owners operating their own private fighters. Fortunately, though, Britain's manufacturing industry remained at least marginally intact, and about eight UK organisations were still designing and producing their own aircraft. This was before most were absorbed



into today's monolith, which has virtually abandoned building aeroplanes, and when people with initiative were able to make decisions, with the happy result that several companies retained specimens of their former products.

Fairey Aviation at White Waltham maintained prototype Fulmar fleet fighter G-AIBE (now in the Fleet Air Arm Museum), and Swordfish G-AIYN, now with the Royal Navy Historic Flight as LS326, while Vickers operated Supermarine Spitfire VB AB910, now on the RAF Battle of Britain Memorial Flight (BBMF). But perhaps the most noteworthy effort was by Hawker Aircraft, based at Langley, with its dark-blue-and-gold trio of Hurricane G-AMAU (alias PZ865, now in the BBMF), Hart G-ABMR (in the RAF Museum) and Tomtit G-AFTA (K1786 in the Shuttleworth Collection).

Shortly before this, the (then) Air Ministry had disposed of hundreds of war-surplus aircraft at very attractive prices. A de Havilland Tiger Moth in flyaway condition cost £50 and, to encourage the rebirth of private flying, the price was halved for any outfit that was a member of the Association of British Aero Clubs and Centres, a predecessor of today's Aircraft Owners and Pilots Association (AOPA). Often a licensed aircraft engineer would sign-off one of these machines for a ferry permit for £2 or so!

There were dozens of other light civil types enjoying their freedom after release from wartime military use. Most of these had been built during the war, but others were pre-war civil machines that had been impressed, had endured the rigours of Service life and survived to re-enter the private market. The Percival Vega Gull, Desoutter Monoplane, Miles Falcon, de Havilland Gipsy Moth and others were on the sales lists. Most regained their original registrations, which at that time meant something, as, from the lettering, it was possible to determine quite accurately the year and even the month in which a machine had been placed on the register. There was especial acclaim for aeroplanes with a G-E prefix (E for England), as this revealed that they had first seen daylight not later than 1928. Their early origin was given even greater gloss by the requirement to have a large "G" on the rudder. Nowadays the sequence system is in total disarray, with at least one low-cost airline operating a fleet of Boeing 737s with G-E identities. Do the owners know what this means to people who understand such things?

Today, flying displays come second only to football as the nation's most popular spectator pastime. Much of this appeal is because almost every event includes demonstrations by historic aircraft. Before the Second World War active involvement with earlier aeroplanes had occupied the attentions of only a few people. There was the Brooklands-based collection of R.J.G. Nash, whose aeroplanes appeared at a few events, yet these took second place to his wide range of early road vehicles, which had attracted public appeal more rapidly. Then, of course, there were the far-sighted efforts of Richard Shuttleworth, whose initial attentions also were devoted to cars, but who soon moved far ahead of his time in acquiring, restoring and flying such veterans as the 1909 Blériot XI and the Deperdussin of the following year (see Pres-



ervation Pioneers, June Aeroplane). Fortunately his work has been maintained and expanded in the thriving Shuttleworth Collection.

The dogfights between a 1917 Bristol F.2B Fighter and 1918 LVG C VI at Hendon displays of the 1930s received many mentions in the press, yet these stalwarts were fewer than 20 years old when they made their marks as representatives of an earlier aviation era. Today, a basic design almost (or even more than) twice that age could well continue to be in active use, either in a military role (English Electric Canberra, Lockheed Hercules or Boeing B-52) or in the civil field (Cessna 150, Britten-Norman Islander, Piper Navajo or Boeing 747). With the exception of the Canberra, a public appearance by one of these would make little or no historic impact.

Interest in historic aeroplanes increased dramatically shortly after the Second World War, but in general terms (specifically where light aircraft were concerned) it was not a vast number of years that formed the division between

ABOVE Neville Duke in Tomtit G-AFTA and **LEFT** Hart G-ABMR getting airborne at a VAC meeting in the early 1950s. These two historic biplanes shared a smart dark-blue-and-gold livery with Hurricane G-AMAU while they were operated by Hawker after the war.



BELOW Fulmar G-AIBE, seen here in a fine portrait by Charles E. Brown, operated for several years in this silver-and-dark-blue civil colour scheme. It is now preserved in the Fleet Air Arm Museum as N1854.



Preservation Pioneers...

Vintage Aeroplane Club

RIGHT Cirrus Moth G-EBLV is the sole survivor of a batch of eight registered on June 22, 1925. It continues to fly at Old Warden.

BELOW Rebuilt from two naval airframes by Viv Bellamy and registered G-AMRK in May 1952, this Gladiator is still airworthy at Old Warden in Norwegian Air Force colours.



BELOW Avian G-ABEE about to be flagged off at a 1950s race event. Following its withdrawal from use, parts were used in the restoration of G-EBZM, now in the Museum of Science & Industry, Manchester.

the old and the new, but whether a type had seen daylight under its wheels before the civil aviation shutdown in 1939. With military machines, which in those days became obsolete much more rapidly than they do now, a type of younger origin could arouse nostalgic (or some indefinable other) sentiment. So, alien to the 21st-Century heart and mind, an aeroplane might be considered historic even before its 12th birthday.

The situation needed to be clarified and co-

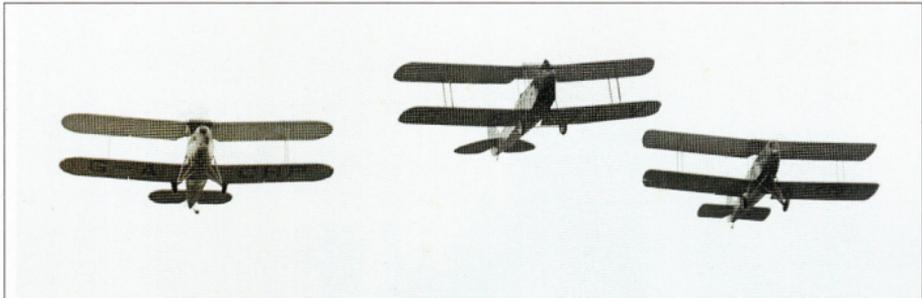


ordinated. Clearly, the time had come for an organisation to foster the needs and interests of owners of pre-war aircraft. Purely by coincidence, on October 6, 1951, two broadly similar letters were published in the correspondence columns of *The Aeroplane* (then a weekly magazine) and *Flight*. There had been no collusion, for until that moment neither writer had known the other, yet each letter suggested that just such an organisation should be formed. The two people met, agreed to join forces and invited all interested people, preferably with their aircraft, to attend a rally at White Waltham on November 3 that same year.

Although that first gathering was small numerically, there was sufficient enthusiasm to justify the instant formation of the new body, to be known as the Vintage Aeroplane Club (VAC). Despite the bad time of year, several interesting machines attended, including de Havilland-owned 1925 Cirrus Moth G-EBLV and the 1929 Hawker Tomtit G-AFTA, then in the care of Neville Duke, Hawker's chief test pilot. Perhaps the most surprising visitor was the now famous Gloster Gladiator G-AMRK, which had just been rebuilt from two naval specimens by Vivian Bellamy. Later this, too, followed the recognised practice of the time and returned to its makers for several years. Fortunately all three aircraft remain intact and active today in the care of the Shuttleworth Collection.

All of those present at this early gathering agreed that, except in the case of exceptional rarity (the Gladiator being one of these), only types designed and out of production before the Second World War would be accepted as "vintage". Therefore, because they had continued to be built during the war, the then-common Tiger Moth and Miles Magister were not eligible!

Without delay a committee was formed. The obvious choice for chairman was Capt Ron Gillman, who had written one of the letters. An experienced wartime pilot and, at that time, a



senior captain with the then British European Airways, Ron was the leading light in a four-man group which owned the 1932 Avro Avian G-ABEE. Much the junior partner in the new venture, 22 years old and flying as a de Havilland Mosquito pilot in the RAF (although already indulging in air racing and other light aviation activities), I was caught for the job of honorary secretary; not because I had any claim to anything, but because I had been guilty of writing the other letter.

We were bristling to get cracking, and little time was lost. The first members' meeting was held on December 1, 1951, and over the week-end of January 19-20, 1952, we staged a small display at Denham in Buckinghamshire. Clearly our impatience overcame the likelihood of a total failure through winter weather, although we were fortunate and the then-unique flying events took place on both days in a crisp and cloudless sky.

The club attracted some very special sights and sounds. We purchased the 1933 Avro Club Cadet G-AChP for the vast price of £75, spent a similar sum on obtaining a C of A and made this delightful aeroplane available for use by qualified members at an all-in "wet" rate of 30 shillings per hour. Perhaps I had an unfair advantage, for I was responsible for the overall operation of this machine, so I had a useful priority on bookings and I managed to fly it at several displays and in a few air races. I realise now, though, that in a purely honorary/voluntary post, perhaps I should not have sought such personal privileges.

Soon we formed what may have been the first-ever touring trio of historic aeroplanes, the 1925 Cirrus Moth, the 1932 Avian and the 1933 Club Cadet, with which we appeared as a team at several events. More spectacular, though, was the combination staged by Hawker Aircraft, then based at Langley aerodrome near Slough. Despite the vast differences in speed ranges of the types concerned, the company's test pilots managed to formate at our events with the Hawker Tomtit (nose-down and flat-out), the Hawker Hart (at a reasonably comfortable knottage) and the Hawker Hurricane, the last flying strictly level in a pronounced begging attitude! This called for considerable skills in handling and airmanship.

At that time, historic aeroplanes were not considered to be good financial investments. Many owners clung to their possessions with justifiable pride, but several aircraft changed



ABOVE The VAC's own formation trio — Club Cadet G-AChP (being flown by David Ogilvy), Cirrus Moth G-EBLV (Wg Cdr Clem Pike) and Avian G-ABEE (Capt Ron Gillman).
LEFT The blue-and-gold Hawker team — Hurricane G-AMAU, Hart G-ABMR and Tomtit G-AFTA.



hands for little more than pocket money. At the right place and moment, an airworthy machine could be acquired for £150. As a result, the movement was dominated solely by a style of enthusiasm that is hard to find today. Certainly several owners were willing to allow their fellow pilots to fly their machines, and I was taken aback when Hugh Scrope, the first post-war owner of the famous Percival Mew Gull G-AEXF, asked me if I would fly it round so that he could see what it looked like in the air. I did

ABOVE Throttle-Benders' Union pilot Nat Somers takes off in Mew Gull G-AEXF (see *Aeroplans*, May & June) for the Kemsley Race at Southend in June 1953.
BELOW Last airworthy Club Cadet G-AChP was destroyed in a crash at Denham on January 1, 1956.





ABOVE Blackburn B-2 G-AEBJ, seen here over Filey in 1960, is still maintained in immaculate flying condition by BAE Systems at Brough.

RIGHT Hawk Speed Six G-ADGP gets airborne at Wolverhampton. It was a frequent competitor in air races in the 1950s.



not refuse to oblige! (The story of the rescue and restoration of the historic Mew Gull, the aircraft used by Alex Henshaw for his record-setting Cape Dash in 1939, was told in *Aeroplane's* May and June 2003 issues)

As well as holding rallies and small displays exclusively for vintage aeroplanes, the VAC made one organisational foray into the world of air racing. On August 2, 1954, the event for the West London Trophy formed a part of the day's Chiltern Hills Air Races at Denham. The line-up at the start line was unique, with such stalwarts as the Cirrus Moth, Spartan Arrow, Blackburn B-2, Club Cadet, Miles Hawk Major, Leopard Moth, Miles Falcon Six and Hawk Speed Six among those awaiting their turn to be unleashed. All of the participating machin-

ery emerged unharmed, and all but two of the machines remain active today, but understandably some people considered it unwise for the club to encourage owners of such sole survivors to "belt" them to their limits, so the exercise was not repeated. Certainly most people consider that historic aeroplanes should be operated in a manner that will increase the likelihood of them enjoying a long life.

The VAC had a short but intensively active life. Because of other commitments, members of the original committee began to disperse, and no fresh people seemed willing to come forward to fill the chairman's and secretary's posts. In that context, at least, it was no different from trends today. So in 1955 the organisation was disbanded, but in its four years of operation the pattern for the private preservation of ageing aircraft in flying condition had become firmly established.

Since the VAC's demise, the scene has changed

Many of the aeroplanes that participated in VAC events remain active today, 50 years later, but recent growth has been among former military heavy metal rather than in light civil types

**Preservation
Pioneers...**

*Vintage
Aeroplane
Club*

VAC or ...er...VAC?

The Vintage Aeroplane Club of 1951-55 is not to be confused with the still-extant Vintage Aircraft Club — see *High Society*, October 2001 *Aeroplane*

RIGHT More familiar now as the BBMF's AB910, this Spitfire VB was granted a C of A as G-AISU in October 1946 and made an appearance at an RAeS Garden Party in primer paint. Here it is at Hendon in a smart scheme and wearing a racing number.



very noticeably. Many of the aeroplanes that participated in the club events remain active today, 50 years later, but the recent growth has been among former military heavy metal, rather than in light civil types. For two years in the late 1950s the famous Spitfire VB AB910 was the *only* airworthy specimen of the type in the UK. Compare that with the current figure of about 20, with yet more to come. These and other warbirds have contributed substantially to the popularity of flying displays.

Nevertheless, current attendances cannot match those of the very early days. At the first-ever organised flying meetings in Britain, at Blackpool and Doncaster in October 1909, between 50,000 and 80,000 people attended each event on each day for a whole week. So, as the two meetings were running at roughly the same time, 94 years ago, more than 750,000 people (including, no doubt, many who attended on several days) watched flying events, in the north, in one week. If this figure makes today's airshow attendances appear thin, its significance grows even more remarkably when we consider the low level of personal mobility at that time; few people had access to anything more mechanical than bicycles!

THE AEROPLANE

Compiled by Nick Stroud

Looking Back 50 Years — December 1953



The Sparrowjet Flies

AFTER MANY MONTHS OF RECONSTRUCTION of the original airframe of Miles Sparrowhawk G-ADNL to accommodate jet power, the M.77 Sparrowjet made a successful first flight on Monday, December 14, at Shoreham, in the hands of Mr George H. Miles. It will be recalled that the well-known racing pilot, Mr Fred Dunkerley, originally conceived the idea of adapting the Sparrowhawk to take two Turboméca Palas turbojets, each of 330lb-thrust.

The installation of the two small turbojets, coupled with the removal of the Gipsy Major in the nose, and the bringing forward of the cockpit, necessitated a complete redesign and reconstruction of the aircraft.

The Sparrowjet is intended for racing and research flying, and this type of aircraft appears to have certain possibilities as a primary trainer.

Air France's New Fleet

LAST WEEK AIR FRANCE put its new Viscounts on to the London—Paris service, replacing the DC-4s on the "Epicurean" runs.

As might be expected, the higher cruising speed of the Viscount has posed a new problem in eating-time versus flying-time. The original lunchenon services, started in 1950 and flown with 33-passenger Languedocs, were flown with a stage-time of 95–100min. Even so, two stewards had to be carried, and when DC-4s replaced the Languedocs the cabin service had to be speeded up because of the shorter stage-time and the larger number of passengers (44).

Since the Viscount is likely to be in the air for only about 50min on the London—Paris flight, the available capacity has been reduced, to give the cabin crew a chance, from 49 to 44 passengers — this reduction also fits in with the need to keep the landing weight below the prescribed maximum when no stand-off or diversion fuel is used.

Canberra Celebration

FLY LT R.L.E. BURTON AFC and Flt Lt D.H. Gannon DFC, the crew of the Canberra PR.3 which won the England—New Zealand air race, have been invited to fly their aircraft over Kill Devil Hill, near Kitty Hawk, North Carolina, during the celebrations there on December 17. The Canberra is scheduled to fly the 3,688 miles from Wyton to Kitty Hawk in 8½hr.

ABOVE The Miles Sparrowjet at Baginton for the King's Cup Air Race in June 1954. In 1957 G-ADNL won the race in the hands of Fred Dunkerley at an (anything but) average speed of 228 m.p.h.



ABOVE BOAC Boeing Stratocruiser G-AMGK Canopus at Heathrow in 1953. The pilot for the Queen's flight to Jamaica was Capt A.C. Loraine, flight superintendent of BOAC's Strat and Connie fleet.

BELOW A typically joyous illustration by Chris Wren to accompany his Wroundabout column story on this page.

The Canberra is to cross via Gander and to fly over Kill Devil Hill as one of the culminating items during the morning commemoration programme, before landing at Elizabeth City. After landing, the crew will lay a wreath on the Wright Memorial with the inscription "From the Air Council and RAF, in tribute to Orville and Wilbur Wright".

A Flying Start To The Royal Tour

FOR THE FIRST TIME the reigning sovereign of this country has set off by air to tour the countries of the British Commonwealth. In flying, Her Majesty Queen Elizabeth II is following in the footsteps of her father, His late Majesty King George VI. But whereas on that occasion in 1947, His Majesty flew in aircraft of the King's Flight, on this occasion the sovereign flew in the Boeing Stratocruiser G-AMGK, *Canopus*, of BOAC.

This was the airliner in which the Queen, then Princess Elizabeth, flew with the Duke of Edinburgh to Canada for their North America visit in October 1951. It was specially furnished for the flight, with royal compartments forward, and with berths aft for other members of the royal party.

Because of weather and cloud conditions in the North Atlantic, a northerly track was flown, adding about 200 miles to the distance between London Airport and Gander, which was the refuelling point used. There were hundreds of people waiting, even though it was 0320hr local time.

HMS Ocean Returns

HMS OCEAN, THE LIGHT FLEET aircraft carrier, returned to Devonport, her home port, last week, after nearly 2½ years' foreign service. During this commission, *Ocean* did two tours of duty in the Korean war zone, and in 1952 her air squadrons set up a record of 123 sorties flown against enemy positions in one day. Her performance was outstanding. During the two tours of war service her aircraft flew 7,964 sorties, attacking gun positions, troop concentrations, communications and transport.

Saucer for the Goose

AN AIR CORRESPONDENT who has been "saucer bashing" in his paper lately is also an Auxiliary Squadron pilot, and fellow members have presented him with a model flying saucer complete with squadron markings. When he went Meteor flying he was given permission to do "orbits and bumps" and was then cleared for the Moon — refuelling away from base. [From Chris Wren's *Wroundabout*]





Farnborough Air Sciences Trust

Contact:

Membership Secretary
11 Coleford Bridge Road
Mytchett
Surrey
GU16 6DH

Membership:

600+ worldwide

Subscription rates:

Members must make a minimum donation of £15 per year

What you get:

Members receive a copy of *FAST News* four times per year with detailed progress reports on *FAST* and the museum, as well as historical items from the archives and specially-written articles. Members also receive full access to the Members' Forum on the *FAST* website (to be launched shortly) and to the Farnborough Air Sciences Museum

Farnborough Air Sciences Trust

THE FARNBOROUGH Air Sciences Trust (FAST) was formed some ten years ago with the aim of preserving Farnborough as one of the world's foremost, and certainly oldest, aviation sites, as well as establishing a centre for visitors and enthusiasts to learn about the Hampshire airfield's rich aviation history.

Initially work was centred around the historic core of the old Royal Aircraft Establishment (RAE) site and included the cathedral-like 24ft windtunnel, the transonic tunnel complex — both now Grade 1 listed — and a smaller wooden 4ft tunnel which carries a Grade 2 listing.

Over the past decade, a huge effort has been put into collecting together as much material as possible from the site, as it was gradually demolished. The result is an impressive collection of aviation artefacts ranging from early historic specimens through windtunnel models of Concorde wing research shapes to modern TIALD (Thermal Imaging Airborne Laser Designator) pods. There is also a priceless collection of films, glass plate and film negatives and important aviation literature.

The culmination of the Trust's hard work is the Farnborough Air Sciences Museum, situated in the Old Balloon School and officially opened on October 1, 2003 (see *News*, this issue). It was here that Lord Trenchard signed the document that joined the Royal Flying Corps (RFC) and Royal Naval Air Service (RNAS) to form the Royal Air Force on April 1, 1918. The building, which has been renamed Trenchard House, latterly housed the RAE Museum, previously closed to the general public. The new museum is open at weekends, and tours for groups may be arranged in advance for other times. No admission is charged, but donations are gratefully accepted.

The Trust plans to maintain a series of exhibitions focusing on the work for which Farnborough was made famous; from the earliest



ballooning days, through S.F. Cody's first powered flight in 1908 to the race into space. Several "gate guardians" adorn the site, including a pair of Hawker Hunters — *T.7 Hecate*, formerly used by the RAE, and a former Royal Danish Air Force Mk 51 — as well as an English Electric Lightning and several cockpit sections. These will soon be joined by a MiG-21, a Folland Gnat and a Vampire.

Restoration work on the aircraft is done by members of the Trust's supporting association, FASTA. Its quarterly-published illustrated magazine, *FAST News*, updates the progress of the Trust and features articles on the history of Farnborough and the museum's exhibits.

FASTA membership currently stands at 600 and rising worldwide, the group having shed speculation that it was only for ex-RAE personnel; all-comers with a passion for British aviation history and for Farnborough's heritage are warmly welcomed. **A**

Society aims

- 1 To preserve the memory and heritage of the historic aviation site at Farnborough
- 2 To establish and maintain the Farnborough Air Sciences Museum

TOP RIGHT See no evil etc... these three exceedingly heavy dummies were used in the original feasibility tests of ejection seats for the "back office" of the Avro Vulcan. It takes two strong men to lift each of these dummies.

RIGHT Hawker Hunter T.7 WV383 *Hecate* and Danish Mk 51 E-402 proudly stand guard over Trenchard House, the premises of the Farnborough Air Sciences Museum.



Sir George Cayley

Inventor of the

Aeroplane

Although 19th Century Yorkshire experimenter Sir George Cayley never built a powered, manned aeroplane, he was the first to identify the principles of flight which the Wrights later put into practice. Manchester University's **DR JOHN ACKROYD** tells his story

IT IS NOT WIDELY KNOWN that the aeroplane was invented by Yorkshire baronet Sir George Cayley in 1799. Yet from this has grown one of the world's largest industries and a popular following that happily has kept this publication in business for many successful years. I hope to persuade the reader not only that Cayley invented the aeroplane, but also that he went a considerable way in explaining the basis of fixed-wing flight. In addition, beginning with his first glider of 1804, he showed how his ideas could be put into practice. Next year, 2004, therefore emerges as the bicentenary of the "world's first aeroplane flight", albeit a model.

George Cayley was born in Scarborough on December 27, 1773, and in 1792 inherited the Cayley baronetcy and its estates around the nearby village of Brompton. Some say Cayley's birth took place at Paradise House, sited below Scarborough Castle and now exhibiting a Blue Plaque in his memory. Others are less specific, mentioning only the Paradise district, while Cayley himself implied that he was born around the area of St Nicholas Street, a good half-mile from that district. His education was largely by private tutors. In this, unusually for a young gentleman of his privileged background, Cayley was encouraged to follow his inclinations towards mathematics and the physical sciences.

Cayley led a busy and highly successful life, his more public activities divided between invention, scientific study and humanitarian concerns. He became a leading authority on land drainage and an effective advocate for railway safety. A prime mover in the establishment of the British Association for the Advancement of Science, he also founded the Polytechnic Institution in Regent Street, London, now part of the University of Westminster. He designed and constructed mechanically articulated artificial

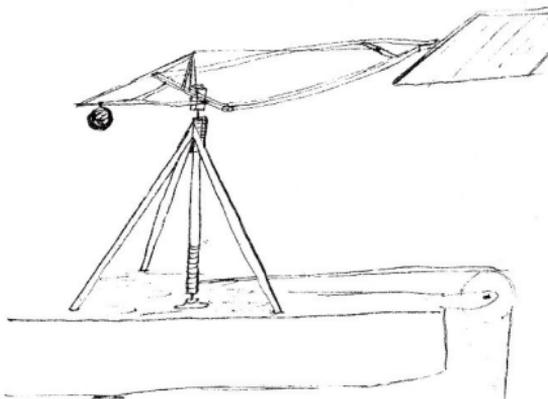


limbs and his other inventions included the tension wheel (the principle of the modern bicycle wheel), a forerunner of the caterpillar tractor, the hot-air engine and, of course, the aeroplane. His scientific interests covered optics, acoustics and thermodynamics. Much of Cayley's work appeared in open literature, as he believed that his labours should be freely available to all, particularly to those less fortunate than himself.

In aeronautics Cayley produced a number of prescient designs for airships, but it was the aeroplane that remained closest to his heart for much of his adult life. His thoughts on mechanical flight began in 1792, and four years later he had built his adaptation of a French helicopter

ABOVE A portrait of Sir George Cayley (1773-1857), painted in oils on canvas by Henry Perronet Briggs in 1840.





ABOVE Cayley used no fewer than four whirling arms during his aerodynamic experiments. This is his device of 1804. The vertical spindle was rotated by a weight and cord over a pulley, and the arm was hinged and balanced so that the lift generated by the angled plate "wing" could be measured.

BELOW In 1807 Cayley built and tested this small experimental gunpowder engine, which used a bow-string mechanism to achieve the return stroke of the piston. It would have powered the flappers of a model aircraft, but Cayley realised that it was not a practical proposition.

toy. In 1799 he invented the aeroplane itself, engraving the basic idea on the faces of a silver disc now preserved by the Science Museum, London. One disc face shows his idea's vital break with the past. Before this, flight had been attempted, unsuccessfully, using flapping wings combining both lift and propulsion in supposed emulation of birdflight. The disc not only shows a lifting wing which is fixed, but also now an entirely separate propulsion system, albeit a flapper arrangement. The cruciform tail is, as yet, probably intended only for steering. The disc's reverse face shows Cayley thinking scientifically about the problem of flight, the wing's total air resistance being split by the triangle of forces into its lift and drag components. Based on this, in 1809 he put the principle in a nutshell in his famous statement:

"The whole problem is confined between these limits, viz. To make a surface support a given weight by the application of power to the resistance of air."

As to power, despite his invention of the hot-air engine, his involvement in current steam engine work and his construction of a gunpowder motor, he was baulked by the lack of a sufficiently light prime mover. Nonetheless, in 1809 he not only produced realistic estimates of the power requirements for flight but also foresaw the advantages of the internal combustion

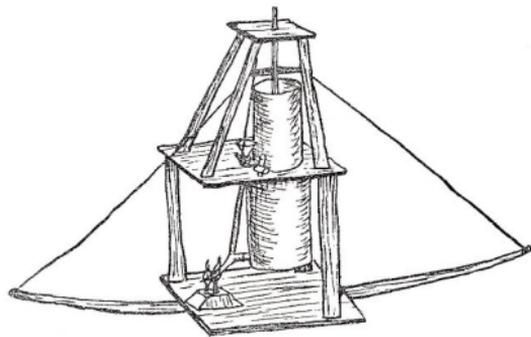
engine. Indeed, from Cayley's day, engine power-to-weight ratios had to improve by a factor of 40 or so before powered flight became possible. Cayley's successful aeroplanes therefore remained unpowered gliders.

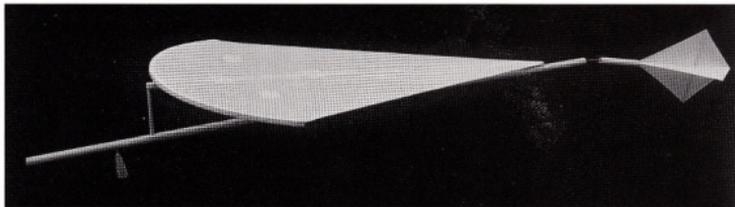
In 1804 he carried out the first experiments to measure wing lift. For these he modified the whirling-arm apparatus first demonstrated by Benjamin Robins in 1747. Cayley's modifications included a horizontal hinge at the vertical weight-driven rotating shaft so that the attached whirling arm behaved as a balance to measure the lift force on a plate lift square. From these experiments Cayley learned two things. The first was that the lift force increased in proportion to the square of the plate's forward speed, in agreement with earlier drag tests for other shapes and confirming Newton's theoretical work of 1687. However, Cayley's more significant finding was that the lift force increased steadily with the plate's incidence angle. Crucially, the trend of his results followed a curve close to that of the sine of the incidence angle, not the square of that sine. The latter behaviour had also emerged from one of Newton's theoretical approaches. Many people believed it and, indeed, adherence to it rumbled on through the 19th Century to be used as "proof" that manned flight would be impossible. However, as early as 1801 Cayley had not only begun to doubt the validity of the sine-squared relation for lift, but had also suspected that a sine relationship would be more correct.

At first glance, readers might find it difficult to appreciate that the possibility of flight depended, in a scientific sense, on whether lift follows one or other of two such closely-related mathematical functions as the sine and its square. But use your calculator. Find the sine of 5° (a quite reasonable incidence angle for a wing), then square it. You will see that the latter result is roughly one-tenth of the former; in other words, if the sine-squared result were correct then the lift force would be very small indeed.

In 1804, the year before Trafalgar, Cayley put his findings into practice, building the first aeroplane to fly. This was a model glider, the wing being a low-aspect-ratio paper kite set on a bamboo fuselage carrying a cruciform tail. Cayley stuck a lead weight near the nose so as to place the glider's c.g. at the mid-area of the wing, probably in the belief that this point would be where the wing's centre of pressure (c.p.) resided. He then found that his tailplane had to be set at the large positive incidence shown in order to achieve steady glides. In this condition the glider descended in straight-line flight at an angle of 18° to the horizontal. Simple theory indicates a lift:drag ratio around 3:1, far lower than would be acceptable now. Years ago, we built a replica of this glider at the University, and it performed exactly as Cayley had stated.

Cayley had already begun to suspect that both wing camber and higher aspect ratio enhance lift. His next glider of 1808 introduced both of these features, its wings also being set at slight dihedral to improve lateral stability. With this Cayley discovered the important point that the wing's c.p. can lie toward the front of the wing, in the ratio of 3:7 in terms of wing area as indicated in his sketch. In the same year he invented the lightweight tension wheel undercarriage





LEFT Cayley's model glider of 1804, the first aeroplane to fly: it was a paper kite fixed to a bamboo stick, with a cruciform tail and a nose-weight.

BELOW This engraved silver disc of 1799 shows for the first time the separation of lift and drag, and of lift and propulsion.



and, in the following year, he sought the best shape for producing low drag. Here he measured the girth distribution of a "well-fed" trout, drawing from this an axially symmetric shape which happens to be very close to a modern low-drag aerofoil section. Commenting on this in 1810, Cayley made the crucial point that a body's rear must be streamlined to reduce drag. He suspected, quite rightly, that a badly shaped rear creates a region of lower-than-ambient pressure which attempts to suck the body backwards. In contrast, the almost universal belief up till then had been that it was solely the body's nose shape that determined drag. The world had to wait until 1904 for the validity of Cayley's point to be fully appreciated, through Ludwig Prandtl's discovery of the boundary layer and his explanation of its tendency to separate toward the rear of badly-shaped bodies, thereby creating regions of drag-producing suction.

In 1809 and 1810 the world learned of Cayley's involvement in "aerial navigation", as he called it, through his publication of a three-part paper in *Nicholson's Journal*. Cayley burst into print through a misunderstanding for which we should be forever grateful. Earlier in 1809 the media had reported the flight of Jacob Degen in Vienna, but had failed to mention that Degen's flap-valve machine had been carried aloft beneath a hydrogen balloon. Unaware of this, Cayley set down his thinking on why powered flight was possible and how it was to be achieved. Indeed, his three-part paper ushered in the science of aeronautics through coverage of those subjects which remain central to any reputable aeronautical curriculum: propulsion, structures, aerodynamics, and stability and control.

His thoughts on propulsion have been outlined earlier. As to structures, he advocated the use of hollow tubular members, these being stiffer than those solid shapes having the same amount of material. Even greater stiffness could be achieved, he explained, by the use of wire bracing. On aerodynamics, Cayley's ideas on streamlining have been mentioned already. But the three-part paper also included the beginnings of the modern explanation for lift. In this he came close to grasping that the approaching airflow's upward motion towards the wing's nose is progressively turned to a downward

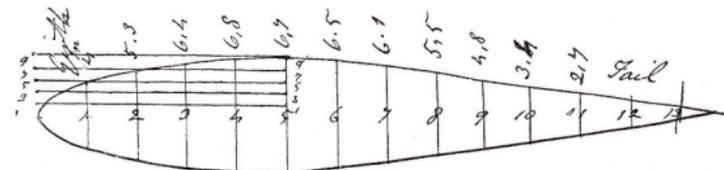
motion at the trailing edge. To do all of this, the wing must push consistently downwards on the airflow, the reaction on the wing being its upward lift force. Cayley also suspected, quite rightly, the creation of a partial vacuum on the wing's upper surface near the leading edge. In a formal sense, these ideas did not emerge fully fledged until Frederick William Lanchester evolved his elementary wing theory between 1894 and 1907, and at the publication of the modern circulation theory of lift by Martin Wilhelm Kutta (1902, 1910) and Nikolai Egorovitch Zhukovskii (1906, 1910). It was from the analyses by these last two that the sine relation for lift finally emerged, it having been assumed in the earlier work of Lanchester.

As to aeroplane control, Cayley saw his tail unit, when rotated, as creating a "steering" action. One further function of the tailplane explained by Cayley is that of re-trimming (re-establishing balance about the c.g.) for different flight speeds. To maintain lift in horizontal flight as an aeroplane slows down, the wing's incidence must be increased. But the latter change causes the wing's c.p. to move along the wing chord. Therefore the tailplane (effectively the elevator) must be adjusted in incidence so that its changed lift contribution restores fore-and-aft (longitudinal) balance. As to control in roll, this remained entirely missing from Cayley's thinking and, indeed, had to await the introduction of wing-warping by the Wrights in 1899.

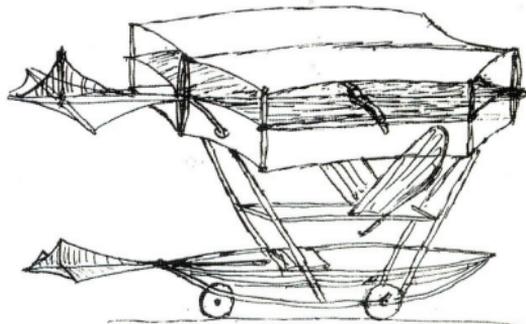
On the subject of stability, Cayley explained the use of dihedral in enhancing lateral stability by analogy with the first, oscillating, parachute descent by André Jaques Garnerin in 1797. No doubt plausible at the time, Cayley's explanation is over-simplistic, however. Concerning longitudinal stability, the limited information Cayley had available at that time on a wing's c.p. movement with incidence change made him conclude that the wing alone would be inherently stable. In other words, as far as stability is concerned, the aeroplane can be tailless. Owing to the poor aerodynamic characteristics of his 1804 glider this turns out to be correct for this shape of wing, as recent experiments in the University's windtunnel have shown. However, this is not correct for the more modern, higher-aspect-ratio wings, for which a tailplane is nec-



Sir George Cayley
Inventor of the Aeroplane



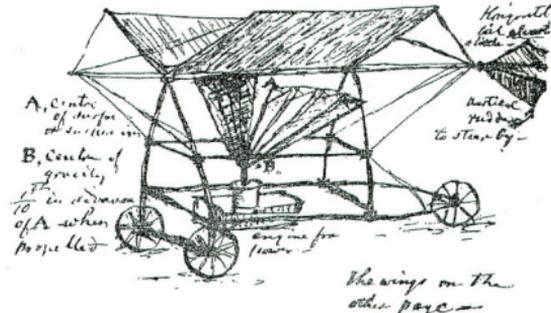
LEFT "A well-fed trout" provided the basis for Cayley's drawing of a solid of least resistance, made in 1809. It shows a profile very similar to that of a modern low-drag aerofoil section.



ABOVE Made by Cayley in 1853, this sketch depicts his triplane boy-carrier glider of 1849. Note the propulsive flappers and the pilot-operated elevator-cum-rudder.

The whole problem is confined between these limits, viz. To make a surface support a given weight by the application of power to the resistance of air

BELOW Cayley designed this flapper-propelled, gunpowder-engined model aeroplane in 1850. It is not known whether it was built or tested.



essary to ensure stability. Essentially, instability is caused by the forward movement of the modern wing's c.p., this direction being first discovered by the Wrights in the kite testing of their No 2 glider at Kitty Hawk in 1901. Their result is in agreement with the aerofoil theory predictions of Kutta and Zhukovskii in 1910. Up to that time, many people continued to adhere to the incorrect belief on c.p. movement, the great hang-glider pioneer Otto Lilienthal being one. In short, then, at this stage of his career Cayley saw the tailplane as providing only steering and retrimming functions. As to the tail's vertical surface, this, too, was seen as merely providing steering, and Cayley made no mention of its further vital function of providing weathercock lateral stability.

The three-part paper also contained an intriguing but sadly brief mention of the first full-size glider, wing area 300ft², which Cayley had built in 1809. When carrying a man, this "would frequently lift him up and convey him several yards together", arguably the first take-off of a man-carrying glider. Unmanned, it would: "... sail majestically from the top of a hill to any given point of the plain below, according to the set of its rudder, merely by its own weight, descending in an angle of about 18 degrees with the horizon."

The latter angle again indicates a lift:drag ratio of 3:1. It is likely that these flight experiments took place in Brompton Dale, the site of many of Cayley's tests.

For many years Cayley was largely silent on the subject of the aeroplane, his interests turn-

ing to airships, flapper systems and other activities. However, his correspondence for 1818 revealed a new glider, similar to the 1804 version but now with two significant changes which may be seen in his sketch. The more obvious feature is his use of dihedral for lateral stability. Less striking, but arguably as important, is the slight negative incidence of the tailplane. Thus the tailplane carried a download, detracting from the wing's lift, and this probably came about because Cayley, led by his experience with the 1808 glider, selected a further forward c.g. position compared with the 1804 version. The significance of this is that a download tailplane is the usual outcome of trim and stability requirements for the modern, conventional (non-fly-by-wire) aeroplane.

William Samuel Henson's published design for his "Aerial Steam Carriage" of 1843 finally renewed Cayley's interest in the aeroplane. By then Cayley was 70 years old, yet even at this advanced age he had much still to contribute.

Cayley's response to Henson's design appeared as two papers, both published in 1843. The first mentioned his ideas for a convertiplane, based on a suggestion from a Mr Robert B. Taylor in 1842. Its design details appeared in the second paper. In this, the aeroplane had lifting surfaces in the form of four circular-planform wings superposed in pairs, each dihedral surface being slightly cambered, he said, "like a very flat umbrella". However, for ascent or descent, these surfaces opened up into eight-bladed rotors, each pair on a common shaft, the latter being driven in contra-rotation by the fuselage-mounted engine. The latter was also to be used to drive the rear propellers for forward motion, a propulsion system unique in Cayley's work with the aeroplane.

No direct descendant of the convertiplane exists, of course, its nearest relatives being the Harrier and V-22 Osprey. However, as to the lower horizontal tail surface, its stated purpose was again for steering but now, significantly, it "forms also the chief means of stability in the path of the flight". The upper vertical tail's function, in contrast, was referred to entirely in terms of its steering action, this to be assisted by differential use of the propellers.

Cayley's additional purpose in the second of his 1843 papers was to criticise Henson's design, largely on structural grounds, since he doubted the integrity of an excessive wingspan. This prompted his suggestion:

"If, therefore, so large a surface be contemplated ... would it not be more likely to answer the purpose to compact it into the form of a three decker ..."

And with that, of course, Cayley had produced the seminal idea for the triplanes and biplanes of the future. Indeed, Cayley took up the idea himself in 1849, his notebook of that year recording the testing of such an aeroplane. Shown in his later sketch of 1853, the triplane wings had the low aspect ratios generally favoured by Cayley, and also incorporated slight dihedral. Flappers were to be used for forward thrust, perhaps driven by a hot-air motor. However, the aeroplane was first tested unpowered as a form of kite-glider:

"The balance and steering was ascertained, and a boy of about ten years of age was floated

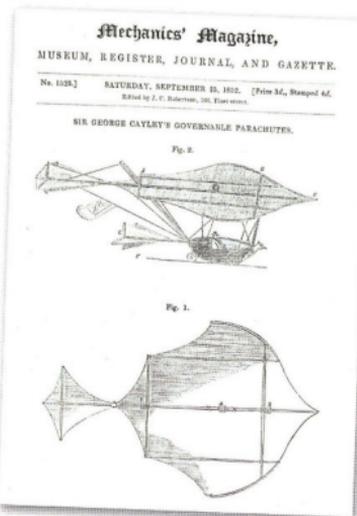
off the ground for several yards on descending a hill, and also for about the same space by some persons pulling the apparatus against a very slight breeze by a rope."

However, the interesting feature of this later-named "boy-carrier" is the duplicated tail unit, the lower unit only being intended to provide steering. The implication is that the upper unit was fixed and for stability purposes.

The duplicated tail unit also appeared in the last of Cayley's published designs, that of 1852, which he called a "governable parachute". Its monoplane wing, aspect ratio a little over 1:1, had a planform unique in Cayley's designs. The achievable gliding angles anticipated by Cayley indicate lift:drag ratios between 5:1 and 6:1. Concerning the duplicated tail unit:

"... there are two rudders formed of horizontal and vertical sails. The larger one is, when it has once been adjusted so as to give a straight and steady steerage, to be permanently secured in that position. It gives the most steady and secure course when slightly elevated, which also tends to secure the parachute from pitching, should it be exposed to an eddy of wind, and, together with the weight of the car, immediately restores the horizontal position."

Here at last we find Cayley's clear recognition of the stability function of a fixed horizontal tailplane. Again, this was to be set at a slight negative incidence, suggesting a forward c.g. which, in fact, Cayley confirmed elsewhere in this publication. Thus toward the end of his career with the aeroplane Cayley reached the

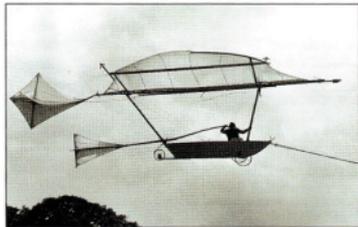


LEFT Described as a "governable parachute", this design for a man-carrying glider appeared in the September 25, 1852, issue of *Mechanics' Magazine*. Cayley proposed that it be carried aloft beneath a balloon and released to glide down.

understanding that the tail requires both fixed and moveable components, albeit separated units in his later designs, which provide stability, retrimming and control functions.

No evidence exists that Cayley built a full-scale glider to the 1852 design. However, John Sproule constructed a reproduction for an Anglia TV programme on Cayley in 1973. It flew successfully, piloted by Derek Piggot. With a forward c.g. the machine exhibited acceptable longitudinal stability. Appropriately, it now resides at the Yorkshire Air Museum, Elvington.

Additional gliders that were built and tested appeared in Cayley's notebooks for 1849 and 1853, together with a description in an unpublished paper of 1853. All had more conventional rectangular wing planforms of aspect ratios around 1.5:1. They also shared the negative-incidence tailplane. His quoted values for glid-



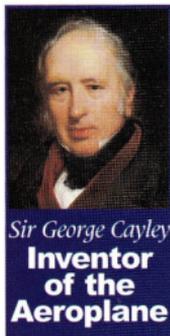
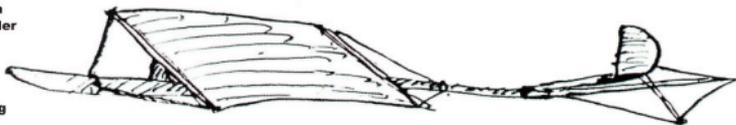
Sir George Cayley
**Inventor
of the
Aeroplane**



ABOVE LEFT Glider pilot Derek Piggott makes a test flight under tow in the governable parachute reproduction, 1973.

LEFT Lieutenant-Commander John Sproule with the reproduction of Cayley's 1852 governable parachute design in 1973. Cayley never built this machine.

RIGHT This sketch, made in 1849, depicts a model glider with a low-aspect-ratio fabric wing between front and rear spars, its curvature formed by the airflow, and a rudder riding on the tailplane.



Sir George Cayley
Inventor of the Aeroplane

BELOW RIGHT John Sproule displays his beautiful full-size reproduction of Cayley's improved riding-rudder model glider of 1853, during tests at Brompton in 1971. It made many flights without damage.

BOTTOM RIGHT John Sproule launches his reproduction of Cayley's 1853 improved riding-rudder model glider in Brompton Dale in 1971.

ing angles indicate a maximum lift:drag ratio of 8:1. In the case of the 1853 version, Cayley's further data for the forward c.g. location and the areas and dispositions of the aerodynamic surfaces indicate a good degree of longitudinal stability. Indeed, Sproule said of his reproduction of it that it "flies beautifully".

The final record of Cayley's involvement with the aeroplane is the recollections of his granddaughter, Mrs Dora Thompson, when aged about 80. She recalled witnessing, at about the age of nine, the testing of some form of flying machine at Brompton Dale around 1853. The sole occupant of the machine was Cayley's "coachman", who, upon landing, sprang out in some agitation, crying: "Please, Sir George, I wish to give notice; I was hired to drive and not to fly".

Cayley died at Brompton on December 15, 1857. The Parish Church of All Saints, Brompton, contains his remains. Cayley's more immediate impact occurred in France, where Alphonse Pénauud revived interest in his work. Indeed, Pénauud used the negative-incidence tailplane for his "planophore" model of 1871. Since then, many fine tributes have been paid to Cayley's work. In 1909 Wilbur Wright said of him:

"About 100 years ago an Englishman, Sir George Cayley, carried the science of flying to a point which it had never reached before and which it scarcely reached again during the last century."

Wilbur's assessment must have been based on only the relatively few published papers left by Cayley. For example, the three-part paper of 1809/1810 was reprinted in James Means's *Aeronautical Annual* for 1895, an article which Wilbur must surely have read. The details of Cayley's work, including the whirling-arm tests, the 1804, 1808 and 1818 gliders and the trout-based model of least resistance, did not emerge until the discovery of Cayley's notebooks at Brompton Hall in 1926, more data being unearthed in 1961. In 1925 the silver disc of 1799 had surfaced at a silversmith's shop in Scarborough. By 1954 eminent aerodynamicist Theodore von Kármán was able to assert that "The principle of the airplane as we know it now, that of the rigid airplane, was first announced by Cayley".

Until recently the British taste for understatement has restricted memorials to this great man's efforts to a Blue Plaque at his supposed birthplace and a small tablet at Brompton. Now, however, a fund has been set up at Brompton to finance some more substantial memorial there. Considering Cayley's advocacy of education, a further, most apt and living memorial has come about as a result of the Royal Aeronautical Society's Centennial Scholarship awards, the first of these being named the Cayley Scholarship. The fund may be supported through the purchase of replicas of Cayley's silver disc, produced by the Royal Mint and each priced at £15 plus £2 p&p, the contact being angelafrank@macace.net.

Cayley's original material, reproduced here, is now in the care of the Royal Aeronautical Society Library. 



Suggested Further Reading:

- J. L. Pritchard, *Sir George Cayley, The inventor of the aeroplane* (Parrish, London, 1961)
- C. H. Gibbs-Smith, *Sir George Cayley's aeronautics 1796-1855* (HMSO, London, 1962)
- J. A. D. Ackroyd, *Sir George Cayley, the father of aeronautics. Part 1. The invention of the aeroplane*, Notes Rec R Soc Lond, 2002, 56, (2), pp 167-181; *Part 2. Cayley's aeroplanes*, Notes Rec R Soc Lond, 2002, 56, (3), pp 333-348



On the very eve of his death at the age of 78, *The Aeroplane's* founding editor, the legendary and opinionated **C.G. GREY**, wrote this characteristically piquant celebration of the first half-century of powered flight for the December 18, 1953, issue

from the (first) Editor

THE EDITOR OF *The Aeroplane* has asked me, as the original perpetrator of the paper, to write a piece about what we have seen in flying in the past 50 years. The answer is that we haven't. We, that is to say the man in the street, or even the man in the grass paddock which was later called a "flying ground", and later still, an "aerodrome", were not allowed to see any flying until 1908. The original experimenters were so secretive, or so sensitive to ridicule, that "we" only came in on the game 45 years ago.

Also, a lot depends on what you call "flying". What about the people who were killed in gliders, and those who went up in man-lifting kites towed by the Navy and showed us the dawn of naval air power? They were pioneers of heavier-than-air flying more than 50 years ago (no names, no pack-drill, on either side).

Anyhow, the first we saw of flying was in the "stick and string", or more properly "wire" days, when the rotary engines, light enough to make a tea-tray fly, as people said, also turned out enough gyroscopic force to make a boxkite on a right-hand turn throw its nose up and stall and kill the pilot, and later, in tractors, make them dive and spin in on a right-hand turn.

The stick and wire designers believed in glue — in spite of the habit that primitive glues had of growing mushrooms (or fungi) inside wings and enclosed spaces. And now the most modern idea is to glue metal to metal. Though even the makers don't know what makes it stick, the fact remains that it does, which saves millions of rivets — countersunk, cheese-heads, flush, heat-treated, frozen, and the rest.

Then the wooden machines, which, when crashed, let the pilot walk away picking splinters out of himself, gave place to metal boxes which made the inmates sympathise with sardines — a feeling which, today, seems to have become more acute since "coach" or "tourist" services have been invented for giant airliners.

Engines also have altered a lot. They still rotate, but not with "prancing pistons" inside. An engineer who writes now and then in *The Aeroplane* wrote a practical article on petrol-gas turbines in 1910, but he hadn't thought of jet propulsion. He only thought of "turbo-prop". In those days we argued about aerofoil shapes for propeller blades, and they were, in truth, very elegant and svelte.

Then engines grew and grew, until, with 28 cylinders and 56 sparking plugs each (think of changing 224 plugs on a routine maintenance job), they turned out thousands of h.p. apiece, which needed propellers of 20ft or so diameter

to absorb the power, and undercarriage legs yards high to clear the ground. So "they" just sawed off the blades to give clearance, and then turned on the boffins to invent an aerodynamic theory which proves that spades are more efficient than aerofoils.

The newest wing-sections recall shapes of 45 to 60 years ago. The beautiful symmetrical sections of the past 20 years have now developed the experimental "entry" of 1893, and the variable leading edge of 1911, and have flaps and slats and slots and spoilers and hurdles all over them.

The performances of transport aircraft have likewise gone crazy — from my old-fashioned point of view. Speed seems to be everything. The long-distance records of the 1930s showed that no place on earth was more than two hops (or stages) from any other.

Today any place can be reached from any other in 24 hours — if you want to do so and can pay for it. The farflungest outpost of what used to be our Empire can be reached in that time — if you don't mind descending by parachute, a vehicle of descent which was fashionable 100 years before anyone flew. And transport from city centre to airport takes longer than does the air journey.

Schoolchildren from distant foreign parts fly home for the holidays if parents can afford the luxury. A parent of a National Service man develops an internal pain, and the soldier is flown home at your and my expense. A small self-determined nation decides to improve its livestock, and cows and bulls and sows and boars are flown to it by the planeload. A gambler full of money wants to win more and he has race-horses flown across oceans to make a bet. We deprived Britishers want meat, and an ingenious Australian develops a scheme to fly disjointed oxen from the almost uninhabited interior to refrigerator ships at the ports. Truly we progress.

In war, atom bombs and hydrogen bombs, delivered by air, threaten to restore the population to within limits which are regarded as reasonable by the best sociologists. And in peace more people cross the Atlantic by air than by boat, and one can go to America and back in a day — a solace to those who want to get away quickly.

Lastly, in our aeronautical development, I would mention that we, as a nation, entrust our beloved and beautiful Queen to air transport, which I, heretically, think is wrong, because an aeroplane is the only vehicle which cannot stand still in the element which supports it. So God save the Queen. **A**

ABOVE LEFT A famous portrait of C.G. Grey, with monocled eye glinting and pen characteristically poised.



ABOVE This article as it originally appeared in the December 18, 1953 issue of *The Aeroplane*. After writing the manuscript, C.G.G. dropped it in a postbox on the way to a dinner at the Admiralty — at which he collapsed and died. The manuscript arrived in the editorial office the next morning.



ABOVE C.G. Grey started *The Aeroplane* in 1911 and remained Editor until 1939.



Peace & War

Part 3 – Anson Antics

Continuing his recollections of his flying experiences in the RAF during the lead-up to World War Two, **DOPEY EDWARDS DFC** recalls the excitement of his first squadron posting — and how he wrung out an Anson through the valleys of his native Wales

TOP A pair of Avro Anson Mk Is of 321 Sqn in the summer of 1940 while the unit, made up of Royal Netherlands Naval Air Service personnel, was based at Carew Cheriton in Pembrokeshire.

RIGHT A common occurrence when trying to introduce an Anson to a muddy airfield; this Anson I, L7905, crashed on landing at Little Rissington on October 11, 1939, while operating with 6 FTS.

IN THE SENIOR TERM AT THE RAF's No 10 Flying Training School (FTS) at Tern Hill, Shropshire, we did applied flying on the Hawker Audax, which carried full military equipment; guns, bombs and cameras. The Hawker Hart was used only for spot checks on our flying ability. We were paired off to fly alternately from the front cockpit as pilot, or in the back for gunnery, bombing and camera exercises. I flew with Lucas, an elderly New Zealander (I think he was 23 years old), and we developed quite a camaraderie. With fewer instructors to keep tabs on us, we had more freedom to frig about.

After two months of largely theory, the last month of the senior term was spent putting it into practice at the Armament Practice Camp at Sutton Bridge on The Wash. Here we fired live ammunition and dropped smoke-filled practice bombs, together with the occasional "Flying Pigs", 112lb high-explosive bombs left over from the First World War. Of odd design, they were nearly as wide as they were long, and it was not unknown for them to tumble end-over-end in their downward flight; hence their name. But even from 4,000ft you could feel the "crump" when they went off.

The Armament Camp was the culmination of

our training, and a few days after flying back from Sutton Bridge we had the passing-out parade, which I enjoyed immensely, as I did all parades. The band played, we swung our arms, marched and counter-marched, fixed bayonets, and finally left the parade ground as fully fledged Acting Pilot Officers, no longer on probation. We were on our way to join our squadrons, in my case 233 General Reconnaissance (GR) Sqn of Coastal Command, whose motto was *Fortis et Fidelis* — "strong and faithful". I hoped to be both.

Most people took a fortnight's leave before joining their squadrons, but I could not wait, so caught a train to Thornaby in Yorkshire, a most





Lt Monty Banks, who commanded A Flight. The remaining pilots had all left their FTSS within the last two months, as had our wireless operators. Similarly, in the groundcrew a few experienced NCOs were in charge of very newly-qualified tradesmen. We were a band of vastly inexperienced men, and were fortunate in having two more years in which to get ready for our war. When it did come, in September 1939, we were a reasonably effective outfit, apart from our woefully inadequate Ansons.

Our wireless sets worked only sporadically, as our wireless operators were even less experienced relatively than we were as pilots, and this caused a great deal of stress in bad weather, as the radio bearings so essential to safe navigation were frequently not forthcoming. This had its toll. In 18 months we had three fatal crashes. The first to go, unfortunately, was Monty Banks, our only flight lieutenant, who vanished at sea one night near the Outer Dowsing lightship. Lowden, our Cranwell-trained adjutant, crashed into the Cleveland hills to the south of us. Thirteen people died in these crashes, leaving the CO with no officer above the rank of pilot officer.

Lowden's death introduced us to a custom of the Service that seemed, at first sight, to be heartless; that of auctioning off the deceased's kit to his brother officers. The thinking behind it was that the parents of the dead officer might be well off, so would have no use for many of the items of Service kit, whereas many junior officers were struggling, and could do with cheap ways of making it up. With the next-of-kin's permission the auction would take place in the mess ante-room, and would start with the CO's indication that high bids were not essential, an indication that the parents did not need the money, or a hint to the contrary, in which case the bidding would be high.

At the sales of dead airmen's kit the prices were almost always high, as the likelihood was that the parents or widow would need the money. It was touching to see an aircraftman 2nd class, the lowest-paid man in the Service, bid twice the new price for an oil-stained tunic that he could not wear without first paying to have it cleaned, unless he relished a rollicking from his disciplinary flight sergeant. Frequently, after a successful bid, the item was tossed back for re-sale. It was an indescribable aspect of Service life that did not exist in Civvie Street. Only within our closed community could the full appreciation of such actions be accepted as the norm, and be expected when the situation arose.

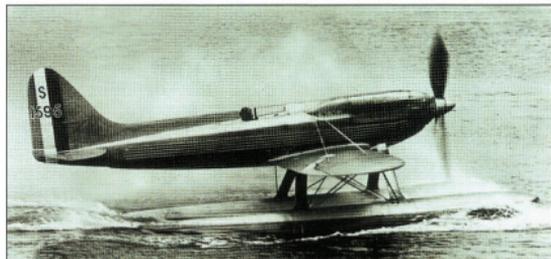
disappointing RAF station on the edge of an industrial conurbation, and into which I never really integrated socially. The mess and the living quarters were drab wooden huts of 1914-18 vintage, with yellow-painted straw-board walls. A tiny coal stove in the corner provided inadequate heat, and the better-heeled found that the chamber-pots tucked under the beds came in handy when draining the oil from the sumps of their cars.

The aircraft, too, were disappointing. The Avro Anson was a hastily-modified civil aircraft designed for economical operation, a poor foundation for a military machine. With its two 355 h.p. Armstrong Siddeley Cheetah IX air-cooled radial engines it was underpowered, and by the time they had installed two machine-guns and the rest of the military equipment its total bomb load was a pathetic 260lb. It was, however, remarkably efficient for its power, and a technical advance in that it was a monoplane with retractable undercarriage, albeit a hand-wound affair which was a real chore.

At first we viewed all monoplanes with suspicion. They had no nice wires that you could see were holding the machine together, and the Anson's wooden wing creaked and groaned when you were taxiing on rough ground or flying in bumpy weather. But it had one big plus in the new six-instrument blind-flying panel with its artificial horizon, gyro direction indicator and sensitive altimeter, which were an enormous contribution to air safety.

Just as our Anson was the product of the rapid-expansion programme, so were the squadron personnel. We had only two experienced officers; our CO, Sqn Ldr Wallis, and Flt

BELOW The quest for speed paid off in terms of fighter development before World War Two. In 1931 the RAF's High Speed Flight, led by Sqn Ldr A.H. Orlebar, won the prestigious Schneider Trophy outright with the Supermarine S.6B. The aircraft's designer, R.J. Mitchell, used his Schneider experience to create the sublime Spitfire, which was to play such a vital role for Britain throughout the war.



RIGHT Anson I K8830 of 233 Sqn sometime during 1937–38.

BELOW RIGHT A Hawker Hurricane I of 111 Sqn at RAF Northolt in March 1938, as flown by Wg Cdr John "Downwind" Gillan the previous month.

BELOW Gillan's flight as covered in *The Aeroplane*. Mention is also made of the GR school at Thorney Island to which the author was posted.



In 1931 Britain's Supermarine S.6B seaplane had won the Schneider Trophy for Great Britain for the third time, at an average speed of 340 m.p.h., thus winning the trophy for the nation in perpetuity. Two weeks later, in an S.6B with its Rolls-Royce "R" engine boosted to a phenomenal 2,600 h.p., Flt Lt George Stainforth became the first man to exceed 400 m.p.h., when he attained 407 m.p.h. These highly-specialised machines were difficult to fly, and required a high degree of courage from their pilots, but experience gained with these racing seaplanes and their engines was to have an important influence on the design of the Spitfire.

Six years after Stainforth's record, an absolutely standard RAF landplane achieved a similar performance. On the night of February 10, 1938, Sqn Ldr John W. Gillan took off in a Hawker Hurricane from Turnhouse, near Edinburgh, climbed to 17,000ft and flew south to Northolt at an average speed of 408 m.p.h. True, he made use of a good northerly tailwind, but it was a propaganda coup for the RAF.

In February 1938 "Hoppy" Hopkins and I had flown out to sea, dropped an aluminium-powder sea marker, and each fired 100 rounds at it with the fixed Vickers gun, the splashes in the water indicating our accuracy. As we flew home the Teesside industrial smog got the better of us, and Hoppy pulled off a good forced landing in a decent field to wait until conditions improved. As usual on such occasions, people sprang out of the ground from nowhere, and it became a social occasion.

"D'you know, this is the first aeroplane that's landed in this field since 1919," said an old codger. "You've landed at the old aerodrome at Marske. Used to be fighters here in the Great War. Camels, they were. Now there's an aeroplane for you!" He looked disparagingly at our modern monoplane.

Hoppy and I reduced our line-shooting to a level acceptable to such a critical audience, and asked to be directed to the nearest telephone. Ignoring the suggestion of a middle-aged man that his was at entirely our disposal, we elected

for the obviously more convenient one offered by two girls in their late teens. Having reassured the flight commander that we were not 6ft under, and would come home when things had improved, we ended up swigging cups of tea and, I think, mightily impressing the girls with our accounts of the perils of air force life. By the time we had eaten the lunch prepared by the girls' mother, the weather had cleared up enough for us to go home.

The rank of our squadron commander was upgraded, and the impressive and energetic Wg Cdr Louis Croke assumed command. Over 6ft tall, he was ex-navy, and gave the impression that he had trained in sail, as his voice at full throttle could be heard above a force nine gale.

By this time pilots and wireless operators had increased their skills, so bad-weather flying had become less hazardous. The final stage of my flight training began when, with others, I was detached to Thorney Island, near Portsmouth, for the four-month navigation/reconnaissance course, during which we practised increasingly complex patrols and searches, and mastered code and cipher systems. Ship recognition featured largely, as we needed to be able to differentiate between the ships of our potential allies, the French, and those of our probable enemies, the Germans and the Italians.

The change of venue from industrial Teesside to Sussex was very welcome. We roamed the coast from Chichester to Portsmouth, picnicked on the Downs, and lay out in the sun watching the butterflies. Four of us put up 25 shillings each, bought a secondhand sailing dinghy, and explored Chichester Harbour from the hard near the mess at Thorney Island.

As the summer passed we learned that 233 and 224 Sqn had relocated to Leuchars on the east coast of Scotland. Then, as international tension grew over Germany's pressure on



ABOVE The RAF Leuchars crest bears the motto "Attack and Protect".

RIGHT The light, capacious cockpit of the Anson. Although obsolete by 1940, the type was the first type to introduce the retractable undercarriage into RAF service.



Czechoslovakia, the course came to an end, and we took the long trip north of the border.

Leuchars was much different from Thornaby. The mess was a comfortable old single-storey building with newly-built living accommodation, and social integration with local residents was well established. The whole place was redolent of flying history, as for years it had been the flying training school for Army Cooperation and Fleet Air Arm (FAA) pilots, the FAA in those days being run by the RAF, shortly to be handed over to the Royal Navy. There was also an Armament Training Camp, with air-firing and bombing ranges a few miles away on the coast, at which we had done our annual armament training earlier in the year. Leuchars was a colourful place, with trainee pilots wearing every conceivable uniform that the forces could think up; although I never saw a highlander flying in his kilt.

A fascinating feature of the base was the aircraft catapult used for training FAA pilots, unique in that it was cordite-operated, not steam-powered as on naval ships.

The Czechoslovakian crisis of 1938 became serious, and we flew to our war station at Montrose, 30 miles up the coast. Number 8 FTS occupied all the hangarage and domestic accommodation, so we picketed our Ansons in the open and lived in tents like second-rate beings for a while. Thank heaven the war did not start then. The Anson's two 100lb bombs would not have blown a fly off a plate of soup, and our eight 20-pounders were anti-personnel bombs designed for trench warfare.

In September 1938 Prime Minister Neville Chamberlain brought back his useless piece of paper from Munich, and we all went back to civilised living at Leuchars, our pretty silver aircraft now painted in the standard drab green and brown camouflage.

Louis Croke was a fearsome, though kindly, squadron commander, and allowed up to three aircraft to go away on weekend leave, a concession much used, as most of us were far from home. As soon as an aircraft was booked the buzz got round, and applicants clamoured for places. Although four was our normal crew, we would squeeze in a fifth, but dogs had to be of approved placid temperament, and lashed to one of the tubular frame members.

The London aerodromes were very popular, although often difficult to get into, as the units based there got fed up with incessant demands for accommodation. However, you could get round this by carrying your own engine covers, screw pickets and chocks, lashing the wings and tail down after screwing the pickets a couple of feet into the ground.

While most aircraft went to single destinations, we often potted about the country dropping off one here, one there. The system was not the waste of taxpayers' money that might be imagined, as the flights were treated as navigation and wireless exercises, and flight logs had to be handed in for analysis on return. You had to be at your destination by 1600hr on Friday so that the machine could be refuelled and put away before work finished. On Monday morning you turned up after breakfast and flew back home again.

Sealand, near Chester, was my weekend



LEFT A Hawker Nimrod being shot off the catapult at RAF Leuchars in the late 1930s.

aerodrome, as it was only ten miles from my home in North Wales. As my eldest brother worked in Mold, I would fly low over his office until he came out into the courtyard and acknowledged me. My infringement of the low-flying regulations was looked on kindly by the local police, as I was the only pilot for miles, and my grandfather was chairman of the magistrates. By the time I had refuelled my Anson at Sealand my brother would have arrived to pick me up, a door-to-door service. I would reward him on Monday morning by reporting to the duty pilot at Sealand that I had a suspected magneto drop on one engine, so would need to do an air test. Dressing up in my Sidcot suit and helmet, my brother would hop aboard for a local tour. Knowing the topography well, I could slip down into the valley half a mile from home, twisting and turning 50ft off the ground, out of sight until, at the last moment, I would pull back on the stick and, with a roar of mighty engines, rise as though from the very earth itself, with my mother and the village watching — very good for the ego.

Twisting and turning 50ft off the ground, I would pull back on the stick and, with a roar of mighty engines, rise as though from the very earth itself

BELOW In the early days of the war, the Anson performed a number of roles with aplomb, including that of maritime patrol, even shooting down several Messerschmitt Bf 109s and Bf 110s.



Navigator

BOOKS · VIDEOS · INTERNET · OFFERS · EVENTS · RECOMMENDATIONS



A TAKING FLIGHT (by Richard Hallion; ISBN 0-19-516035-5; Oxford University Press, Great Clarendon Street, Oxford OX2 6DP; 10 1/4 in x 7 1/4 in hardback; 553 pages, illustrated; £20.00).

"It is time to reassess and re-examine the early history of flight, address commonly held beliefs, determine what was and was not accomplished by early pioneers, trace the 'transfer' of experiment and practice into what might be called the 'operational art' of aviation, and analyse its impact on the course of subsequent history". So writes the author in his introduction, and that is what he has set out to do. The result is a fascinating survey of the early development of aeronautics, both heavier- and lighter-than-air, from its earliest beginnings.

Hallion has identified seven distinct phases to the "invention of flight", and these form the seven parts into which the book is divided. The first looks at flight's prehistory, from antiquity to the Enlightenment; the second at the era of "ethereal flight", from the late 18th Century to the beginning of the 20th, when balloons and airships were dominant; the third covering early interest in the aeroplane, from the late 18th Century to just before the Wrights' success; the fourth covering the aeroplane's successful development; the fifth featuring the resurgence of European aeronautics during

1905-1909; the sixth surveying the expansion and maturation of flight and its early military adoption, and the final phase seeing flight coming to play an important part in world affairs.

Throughout the narrative one finds informative potted biographies of many of the principal characters and their main contributions.

There are points of dispute. The author seems not to realise that boomerangs used for hunting or war were non-returnable; some authorities now believe that the early toys previously identified as helicopters were nothing more than whirligigs; the alleged take-off of Ader's Eole has now been challenged; and the important and very evident early influence of the Wrights on the rebirth of European aviation through the lectures and writings of Octave Chanute appears to have been overlooked.

The last is the most serious shortcoming of what is otherwise a commendably readable and wide-ranging history, graphically portraying the manner in which the lead in aeronautics passed back and forth between continents. Copious references and a comprehensive index make the feast of information contained between the covers both verifiable and accessible.

The final part, occupying a mere 80 pages, rapidly summarises subsequent developments and the impact of aviation on society. To this is added an afterword in which the impact of the events of September 11, 2001 on the way we regard aircraft. As the author points out, the event says far more about us, and the uses to which we put our creations, than about flight.

PHILIP JARRETT

A BEYOND COURAGE (by Norman Franks; ISBN 1-904010-30-X; Grub Street,

Book of the Month

THE GREATEST SQUADRON OF THEM ALL — THE DEFINITIVE HISTORY OF 603 (CITY OF EDINBURGH) SQUADRON RAuxAF (by David Ross, with Bruce Blanche and William Simpson; two volumes, ISBN 1-904010-49-0 and ISBN 1-904010-51-2; Grub Street, London; 10in x 7in hardback; 800 pages, illustrated; £30.00 per volume).

Painstakingly researched and carefully compiled, this excellent portrayal of the period from October 14, 1925, to the present day is an accurate account of the unit's activities — from first hesitant flights of its Avro 504K and D.H.9A machines (leftovers from the 1914-18 War) to the jet-age bustle of the D.H. Vampire FB.5 with which it terminated flying operations. The effective date of disbandment was March 10, 1957, but such an illustrious title was not allowed to fade away and the RAuxAF formation, 2 (City of Edinburgh) Maritime Headquarters Unit was re-roled and re-numbered 603 (City of Edinburgh) Squadron on October 1, 1999 — so the name lives on.

Spitfire-equipped 603 was in action from the earliest days of the war and over the next 12 months had considerable success against German bomber and reconnaissance penetrations on the east coast of Scotland. Many felt that things would be different when they moved south to Hornchurch and faced fighter opposition, but they need not have worried — 603 was the most effective squadron in the Battle of Britain, with 57-8 confirmed victories and 47 of these were BF 109 fighters! (The squadron enjoyed an extremely high standard of claim accuracy (86 per cent) — see John Alcorn's articles in *Aeroplane*, September 1996 and July 2000, which provide these statistics.)

This is no dry recitation of official documentation, and the combat report narratives are enlivened by personal letters, diary entries and other accounts. The highly detailed descriptions (on technical aspects as required) reflect the thoroughness with which the authors have tackled their work. Volume 1 takes us to the end of 1940 and Volume 2 onwards from 1941. Following fighter sweeps, 603 went to Malta when flown off the *USS Wasp*, on to the Middle East with Beaufighters, then Spitfires again on the Continent before returning to "Auld Reekie" and eventual disbandment.

The text is replete with serial number and markings details, and pilot biographies abound. The fact-filled Appendices (46 of them!) vary from Dowding's report after the Battle of Britain on Spitfire gun harmonisation, to the account of the 33-year-long search to retrieve the squadron badge and nameplate from the *Battle of Britain* Class 4-6-2 Pacific locomotive

No 34077 after it was scrapped in 1967.

There is no doubt that this comprehensive work will remain the main reference source for any future writing on the subject — it is highly recommended to all enthusiasts. Unfortunately the illustrations are poorly reproduced; some of the photographs used were professionally taken and they really should have been better presented.

ALEX IMRIE



These books, strongly recommended to *Aeroplane* readers, are available direct from The Aviation Bookshop at the special offer price of £50 for the two-volume set, plus £4 postage and packing in UK

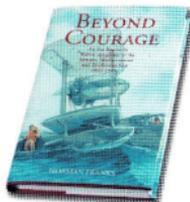
To order, write to The Aviation Bookshop, 656 Holloway Rd, London N19 3PD; tel 020 7272 3630. Please make cheques etc payable to The Aviation Bookshop. For overseas postage rates, please contact The Aviation Bookshop

The Basement, 10 Chivalry Road, London SW11 1HT; 9 1/2 in x 6 1/4 in, hardback; 192 pages, illustrated; £18.99. Not much appears to have been written about the Supermarine Walrus and its air-sea rescue operations;

Norman Franks, in his introduction to this new volume on the adventures of Nos 283, 284, 293 and 294 Squadrons in the Mediterranean Theatre mentions his 1994 book *Another Kind of Courage* which

covers UK-based Walrus operations, but this is unfortunately out of print.

However, this new book, based on contacts with rescuers and rescuees, certainly fills a gap in World War Two literature, reflecting



the courage of crew in these often dangerous tasks, sometimes in bad weather. On occasions, the Walrus, having rescued a bomber crew, was overloaded and could not take off again and had to taxi back to base, sometimes a considerable distance.

Appendices list award citations, serials of Walruses used, main air-sea rescues by squadron, details of squadron bases and equipment and maps showing the main rescue sites. A worthy tribute to the unsung heroes who flew the old amphibian — can we now have a reprint of the earlier book? **MIKE HOOKS**



MYASISHCHEV M-4 and 3M (by Yefim Gordon; ISBN 1-85780-152-0; Midland Publishing, 4 Watling Drive, Hinkley, Leics LE10 3EY; 11½ x 8½ in, softback; 128 pages, illustrated; £18.99).

Additions to the *Red Star* series are always welcome, and Volume 11 deals with the first Soviet strategic jet bomber, probably best remembered by its NATO codename "Bison". The Myasishchev design bureau was not well-known and had been disbanded, but was reinstated to create the new intercontinental bomber, doing so in the remarkably short time of a year. The prototype M-4 was unveiled in 1953 and in the State acceptance trials

proved to have a maximum speed of 588 m.p.h. at 22,000ft on the power of its four 8,700lb-thrust Mikulin AM-3A turboprops. It was big — wingspan 165ft, length 156ft, empty weight 162,250lb, loaded with five tons of bombs and half-filled fuel tanks 286,600lb.

Full-scale production began in 1954, and eventually a number of variants appeared. All are described and illustrated here including the two 3M-T outsize cargo carriers with twin fins and rudders. They flew a variety of loads including a shuttle orbiter and the massive *Energiya* fuel tank which was more than twice the diameter of its carrier aircraft. The bombers served for some 40 years until 1994, but many had been scrapped previously under the SALT agreement. An interesting book on the biggest Soviet bomber. **MIKE HOOKS**

BREGUET 14 (by Alan D. Toelle; ISBN 1-902207; Albatros Productions Ltd, 10 Long View, Chiltern Park Estate, Berkhamsted, Hertfordshire HP4 1BY; 11¼ x 8½ in, softback; 80 pages, illustrated; £23).

This new *Windscock Datafile Special* covers the military versions of France's World War One bomber, 225 of which were in service by 1918. Production by Michelin, one of the eight French builders of the Breguet, reached 110 per month, and it is interesting to record here that the Sals-bu built replica F-AZBP displayed at this year's Paris Air Show has been bought by Michelin in recognition of their original production.

The Americans operated one squadron of 24, and post-war



the type continued in service and in licence production in several countries including Poland, Finland and Czechoslovakia. Modellers in particular will be interested in the 30 colour profiles showing various camouflage schemes and the different typography styles used by the various manufacturers. A listing of Breguet escadrilles shows considerable detail down to victory claims etc.

The author, in his introduction, makes it clear that complete information is not available in some areas, but this is a very good record of an important aeroplane.

MIKE HOOKS



HAMPDEN SQUADRONS IN FOCUS (by Mark Postlethwaite; ISBN 0-9538061-6-2; **HURRICANE SQUADRONS IN FOCUS** (by Philip Birtles; ISBN 0-9538061-5-4; **Red Kite, PO Box 223, Walton-on-Thames, Surrey KT12 3YQ; each 11¼ x 8½ in, softback; 96 pages, illustrated; each £17.99).**

Two more softbacks in Red Kite's *In Focus* series. The Hampden has probably had less coverage than more glamorous types so it is good to see it here in great photographic detail. It served with some 65 units, from squadrons to flights, OTUs, training units etc, all are mentioned here together with their codes, bases, operational losses etc.

The first raid of the war, on September 29, 1939, saw 12 Hampdens of 144 Sqn set off to attack Wilhelmshaven, and five were shot down by Bf 109s. Three years later, 32 Hampdens of 144 and 455 Sqn were sent to Russia to provide convoys with air cover,

but nine were lost en route. With strong headwinds for the return journey, the bombers stood little chance of reaching their Shetlands destination, and the Hampdens landed in Russia where they were handed over to the Russians — there is a photograph of one wearing red stars. Colour profiles show this, a Swedish example, two RCAF and nine RAF aircraft and there is a complete list of unit codes; it is worth remembering that two Bomber Command VCs were won on Hampdens.

The Hurricane volume is Part 1, North-west Europe and Malta, and follows the series style. There are some mini biographies of notable pilots, a list of squadrons and codes and production batches of the 14,350 Hurricanes built, of which 1,398 came from Canadian production lines. While a few of the illustrations are familiar, the majority are not. An example of the latter is L1934/OP-D of No 3 Squadron in a pre-war marking scheme with red/blue roundels on the fuselage and on the port wing only. Another good shot shows L1926 of 55 OTU standing on its nose and port wingtip with no visible means of support. With limited space it has not been possible to illustrate every unit, but these two softbacks are excellent examples of quarts in pint pots and well worth buying.

MIKE HOOKS



W.O. BENTLEY'S AERO-ENGINES (by Graham Mottram; ISBN 0-9540901-2-8; **W.O. Bentley Memorial Foundation, W.O. Bentley Memorial Building, 16 Chearsley Road, Long Crendon, Aylesbury, Buckinghamshire HP18 9AW; 8½ x 5½ in, softback; 28 pages,**

illustrated; £5 inc p&p in the UK & Europe, £5.25 elsewhere in the world). Engine enthusiasts will welcome this little booklet, which is based on a paper read by the author to members of the now-defunct W.O. Bentley Society in 2000. Many readers will recognise the author as the Director of the Fleet Air Arm (FAA) Museum at Yeovilton, Somerset, and will therefore also recognise his authoritative knowledge regarding the engines that powered many of the aircraft flown by the FAA's First World War forebear, the Royal Naval Air Service.

The author opens with a status report on Britain's aero-engine industry at the outbreak of war in 1914, and the origins of the rotary engine. He then recounts Bentley's early life and his progression into the aero-engine business. We then get to the real story; how Bentley came to design and develop his own rotary engine, the B.R.1, by substantially improving the French Clerget. Then came the larger B.R.2, half as powerful again, but Bentley was sidelined by Lord Weir following major changes in procurement in 1918 and received poor reward for his valuable wartime work.

Appended to this account is a hitherto unpublished article concerning a mysterious Clerget engine in the FAA Museum collection that exhibits a number of very unusual features and might conceivably be "Bentley's first engine". Taken as a whole, this is a small but valuable contribution to the literature of aero-engine history.

PHILIP JARRETT

LES AVIONS SABCA ET ASSOCIÉS (by Charles Mail; no ISBN; Belgian Aviation History Association; 11¼ x 8½ in, softback; 140 pages, illustrated; £22.95 post free from The Aviation Bookshop, 656 Holloway Road, London N19 3PD). This new history covers the prototypes and projects of



SABCA (Société Anonyme Belge de Construction Aéronautique), a Belgian company founded in 1920, pre-dating the national airline SABENA by 2½ years. Its rather widespread aims "to study possibilities offered by air transportation, practical testing and manufacturing or overhaul of the required material" initially took the form of repairing World War One types and, from 1922, manufacture of foreign aircraft under licence but the first aircraft built were indigenous designs for touring and gliding and it was not until 1927 that series prototype manufacture began with such types as the S 2, a contemporary of the Fokker F.III and the S 11 and S 12 tri-motor transports, the latter resembling Westland's first Wessex.

The company built aircraft for other designers — Alfred Renard's Epervier metal monoplane fighter, the Servais-Guldentops T-7 trainer and later the ugly Lacab GR-8 twin-engined biplane reconnaissance bomber. In the mid-1930s a batch of seven Savoia S.73s was built for SABENA, while other prototypes included two S 40E trainers.

Annex 1 shows the company's involvement from 1920 to 1940, and in the case of licence production numbers built, while Annex 4 gives full details of SABCA-designed aircraft, certification and registration; there are four colour profiles and a number of reproductions of contemporary advertisements. Text is in French with a two-page English summary. This is an interesting and well-produced survey of a little-publicised Belgian aeronautical company.

MIKE HOOKS

A SPRINGBOOK FIGHTER VICTORY: SAAF FIGHTER OPERATIONS

1939-1945, VOLUME 1, EAST AFRICA 1940-1941 (by Michael Schoeman; ISBN 0-958-4388-5-4; Freeword Publications CC, PO Box 6260, Nelspruit 1200, South Africa; 11¼ x 8¼ in softback; 188 pages, illustrated; no price stated).

This is the first of a planned five-volume series relating the story of the South African Air Force (SAAF) fighter squadrons during the Second World War, and of the attached and seconded SAAF fighter pilots in the RAF. It promises well for the future volumes, being profusely illustrated with monochrome photographs, many of them rare, and helpful maps.

The East African campaign of 1940-41 was the first conclusive Allied victory of the war, during which the SAAF's fighter squadrons established air superiority. In this volume the author presents the most complete and accurate record to date of their achievements. The collection of illustrations of Hawker Furies and Hurricanes, Gloster Gladiators, Curtiss Mohawks and sundry other Allied and enemy aircraft is superb, and the text is detailed and comprehensive, including a great deal of material gleaned from the SAAF war diaries held in the Military Archive in Pretoria.

There are two supporting appendices, one listing SAAF fighter claims and losses in chronological order, and the other listing wartime SAAF fighter pilots alphabetically. The only lamentable shortcoming, and it is a major one, is the complete absence of an index. PHILIP JARRETT



Internet Compiled by Jim Winchester

FOR THE TOTAL AVIATION PERSON, the obvious next step from a home full of aviation memorabilia would have to be a home that actually is an aeroplane. It would be wrong to say that converting a surplus airliner into a house has become a craze, but it has been done, and this month we have the websites to prove it.

So far the Boeing 727 has been the most popular choice for "aerohomes" — but, with the number of airliners stored today that are unlikely to fly again, we will probably see the wide-body house before too long.

Bruce Campbell of Hillsboro, Oregon, has converted an ex-Olympic Airlines 727 into a home. There is an article on him in *Wired* magazine at <http://www.wired.com/news/technology/0,1282,32184,00.html>. He also has his own website at www.airplanehome.com, which explains many of the practicalities of turning a Boeing into a dwelling.

The first person actually to do this was JoAnn Ussery of Benoit, Mississippi, who converted a former Continental Airlines 727 fuselage herself, complete with hot tub in the cockpit. The CNN news archive has a story at <http://www.cnn.com/US/9612/27/fringe/ettiner.home>

If the process of conversion is beyond your DIY skills, Max Power Aerospace in Smyrna, Tennessee, <http://www.max-poweraero.com/ACHomes.htm> is offering fully-fitted 727s for around US\$300,000. These come mounted wheels-up on a support and are allowed to weathercock into the wind. This is said particularly to suit hurricane-prone areas, as the aeroplane homes are guaranteed to withstand winds of up to 280 m.p.h. It is not clear if anyone has actually bought one yet, although their sales material carries a picture of a bikini-clad potential customer with one of the available ex-TWA jets. A full brochure (or *Aircraft Home Owner's Flight Manual*) is provided on the website explaining all the ins and outs of acquiring and mounting a 727 on your land or "submerged property" — for, indeed, they can be mounted in up to 140ft of water.

Over the years several aircraft have been converted into houseboats (such as the RAF Museum's Supermarine Southampton) and caravans (Dick Melton's Walrus comes to mind). Mentioned here before, the *Cosmic Muffin*, a Boeing 307 fuselage converted into a houseboat, has its own site at <http://www.PlaneBoats.com> that tells all about this historic aircraft, once owned by Howard Hughes and later associated with singer Jimmy Buffett before restoration to its current domestic glory.

A surplus airliner is not the only possible theme home for the Total Aviation Person. Why not an old control tower? The fascinating Control Towers website (www.controltowers.co.uk) deals mainly with RAF and USAF control towers and airfield buildings in the UK. Many are derelict; some are museums or in use for agricultural storage purposes, but at least two have been turned into homes. External views may be seen at http://www.controltowers.co.uk/TV/Twinwoods_Farm.htm and <http://www.controltowers.co.uk/PP/Podington.htm>

Finally, if you need a break away from it all and just want to experience "plane living" for a few days rather than permanently, the Woodlyn Park complex at New Zealand's famous Waitomo Caves offers the unique opportunity to stay in an ex-RNZAF Bristol Freighter, which has been converted into a dual motel unit. If that is already booked, there is also a 1950s rail car available. Details may be found at <http://www.woodlynpark.co.nz>.



ABOVE **Airplanehome** explains how to turn a Boeing 727 into a comfortable dwelling.



ABOVE **DIY skills** not up to it? Then buy a 727 home off-the-shelf from Max Power.



ABOVE **Unique Boeing 307** houseboat the *Cosmic Muffin* has a site of its own . . .



ABOVE . . . while the **Controltowers** site details less bizarre "air home" prospects.

AEROPLANE READER OFFER

Three popular items to buy this month, at exceptionally favourable prices for *Aeroplane* readers

Pocket Airband Radio

THIS COMPACT and stylish airband radio is ideal for aviation enthusiasts to use at airshows and airports. The unit receives civilian airband (108–136MHz). Features include an easy-to-use tuning dial, volume control, belt clip and earphone jack (earphones are included) all for the amazingly low price of just £9.95 (p&p free in UK Mainland; for Europe add £2.50, for ROW add £5) — and in time for the summer show season. The radio is powered by 2 x AAA batteries (not supplied). ■ **To order your Airband Radio, simply complete the coupon on page 116 or call 0870 727 4156**

Just
£9.95



Fairey Firefly Flying Scale Model

ONE OF THE STALWARTS of the Fleet Air Arm, the Fairey Firefly makes a superb subject for a flying scale model. This Aero Graphics kit (span 24.8in) is designed for rubber power, but may also be flown with electric or CO₂ motors. Offer price £24.75 + £1.95 p&p on all UK Mainland orders. (For orders outside UK Mainland, call 0870 727 4144 for a postage quotation). ■ **To order, call 0870 727 4156 or complete the coupon on page 116**



Just
£24.75

Brass Pocket Telescope

THIS ATTRACTIVE brass telescope closes to a length of just over 6in to fit in your pocket or bag, and has powerful 15x magnification. Precision 15 x 30 optics give superb clarity. Finished in protective lacquer with leather-look cover and free storage pouch, it is ideal for aircraft identification and other outdoor uses. It costs just £19.99 post free in UK (please add £2.50 for orders from Europe, £5 for rest of world).

■ **To order, see coupon on page 116 or call 0870 727 4156**



Only
£19.99*

■ **To order any of the items shown in the panel above, just call 0870 727 4156 or see coupon on page 116**

Information Exchange

Are you trying to find the answer to a thorny aviation question? Or trace an old aviation friend? Then this page may help

COMPILED BY
MIKE HOOKS



■ After National Service in the RAF in 1946–48, Mike Hooks maintained a strong interest in aviation and became Editor of *Airports International* during 1967–75. He then joined the SBAC, where his duties included managing the Press Centre at the Farnborough Air Shows; he retired in 1993. Mike is an Honorary Life Member of Air-Britain and a member of the Croydon Airport Society.

WRITE TO: Mike Hooks, Information Exchange, *Aeroplane*, King's Reach Tower, Stamford St, London SE1 9LS

■ Aviation artist Rob Evans, 4 Meadow Fields, Hengoed, Oswestry, Shropshire SY10 7EX, seeks aircrew or the project team involved with **Lancastrian PD328 Aries** of the Empire Air Navigation School, Shawbury, and also photographs of the port nose marking to help complete a drawing commissioned by the station's present CO.

■ Australian author Scott Hillier, 10 rue Darcel, 75017 Paris, France, is writing a book on the late Luftwaffe pilot **Siegfried Freytag** who flew with JG77 over Malta in May–October 1942 and would like to hear from pilots operating from Malta at that time and who may have encountered Freytag. Also, can a Spitfire pilot give an insight into flying that aircraft?

■ B.W. Richardson has for more than 50 years owned an identity disc for **Lt P. Ford** of Tarrytown, NY, which incorporates RAF wings. It is of sterling silver and about 40mm long. Can anyone remember Lt Ford?

■ Jack Meatcher, 45 Marks Road, Wokingham, Berks RG41 1NR, is researching **Airco Aerials Ltd** who made aerial photographs in the 1920s and '30s. Companies House records its status as Dissolved, while Arthur Ord-Hume points out that Airco was one of several companies related to George Holt Thomas and his Aircraft Manufacturing Co. The RAF Museum says it was taken over by Surrey Flying Services in 1925/26. Clarification?

■ Dr Markus Veltje, Dorfstr 42C, 14476 Töplitz, Germany, a voluntary historian, is researching a story that in April 1945 a group of 14 aircraft (Mustangs?) was flying over lakes by the Havel river when one left the group, flew under the **Autobahn** bridge between Phöben and Töplitz and quickly rejoined his comrades. Another story says that in 1944 British fighters attacked the airfield at Werder/Havel and one flew under the bridge. Does anyone remember either incident, or are both the same with confusion over dates?

■ For more questions and answers, see *Aeroplane's* website: www.aeroplane-monthly.com

■ **Internet users** — Please include a postal address with your e-mail query as we often have to include hard copy (e.g. photocopies) with a reply



Sponsored by **Corgi Classics**

Die-cast Models for the Adult Collector

The senders of the items on this page will each receive a model from the Corgi Showcases Collection, which comprises a careful selection of historically significant aircraft from the past 100 years of flight. For more details visit the website at www.corgiclassics.com



ABOVE John Bracey's B.E.2 postcard — see below.

■ John Bracey found a postcard in a deceased cousin's possessions which shows a **B.E.2** stationed in India's North-West Frontier and asks if anyone can identify that it would be 31 Squadron, specifically formed to provide the first British military aviation unit in India. Among the B.E.s on strength were 26 B.E.2cs and three '2es. Tonk, mentioned at the top of the picture, was 31's main operating base in 1917.

■ John Evans, 6 Laws Street, Pembroke Dock, Pembrokeshire SA72 6DL, submits a photograph of what he believes is a



USAAF watch. Made by Hamilton Watch, USA, it has 21 jewels and is marked "US Govt 992B C46490." Is there any information on this?

■ On May 28, 1953, **Fg Off Michael Edward Pullen**, serving with No 257 Squadron, Wattisham, ejected from Meteor F8 VZ481. The Wattisham Museum has recovered the remains of the aircraft

and would like to present a piece to Mr Pullen; or, if he is no longer alive, to a friend or relative. Please contact K.A. Hayward, 18 Chilton Lodge Road, Sudbury, Suffolk CO10 2HD.

■ Ludwig Baier, Gen Marshallweg 24, 5623HC, Eindhoven, The Netherlands, recalls an attack by **Avengers** on Surabaya targets when one was shot down by Japanese flak. The wreckage was subsequently shown round the city with the crew locked in a cage beside it. Following the feature *Last Off, Last Back* (December 2002 *Aeroplane*), he wonders if it could have been a Fleet Air Arm aircraft?

■ Brian Cassidy, 3 Queen's Parade, Bath BA1 2NJ, asks whether anyone has prints or drawings of **Shorts S.23, 30 or 33** flying-boats. His website www.flyingempires.4mg.com shows the basis of his drawings, but he needs an authentic Shorts GA, a drawing with an S.23 prefix, as a final check. Some of the vital drawing numbers are known — S.23.C.1000, 1001, 1006 and 1008.

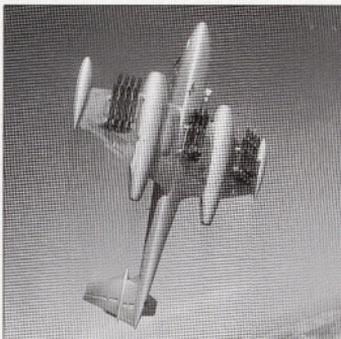
LEFT This photograph from John McCreary seems to be a Blackburn Type 1, at the Yorkshire Show, Bradford, on July 22, 1914 — unless anyone knows better. There is a large M beneath each wing.



Instant Answer

Q Graham Carter asks the colour of the private-venture ground-attack Meteor aerobatted at the 1951 SBAC Display.

A Derek James in *Gloster Aircraft since 1917* states that it was silver overall with B Conditions markings G-7-1 in red, and similarly-coloured RPs.



ABOVE Gloster's PV ground-attack Meteor in aerobatic mode, with red rocket projectiles.

■ Keith Jones, of 9 Woodlands Glade, Beaconsfield, Bucks HP9 1JZ, remembers a **Heinkel He 111** in autumn 1940 repeatedly descending from low cloud to machine-gun the Hornsey/Muswell Hill area and wonders if anyone recalls the incident, knows the date and the aircraft's fate?

■ Robert Copson, 9 ch du Jura, 1292 Chambesy, Geneva, Switzerland, saw, from a distance, a **Constellation** minus engines on rough ground near a nightclub on the D765 road between Quimper and Douarnenez, Brittany in what looked like contemporary Air France livery but the wrong colours. It is not listed in our *July Database* — details of its identity would be welcome.

■ Chris Yound, 47 Pickford Road, Markyate, St Albans, Herts AL3 8RS, is researching the gliders and aircraft of Soviet designer **Boris Ivanovich Cheranovsky** (1896–1950), best known for his BiCh and Che series of designs with parabolic and later flying

wings. The BiCh-19 is credited to him, a variable-incidence wing single-seat biplane glider, but is unlike any of his previous designs. Was it his — or has anyone more information?

■ Hans Olav Lokken, Thyholtvn, 10B, N-7500 Stjordal, Norway, a local historian near Trondheim, is trying to trace relatives of **Fg Off Frederick Ian Malcolm**, shot down in Spitfire PR.IV AB127 on May 10, 1942, during the hunt for the *Tirpitz*. Mr Lokken knows the burial location, and the name of the German pilot who shot him down, and seeks the same information on German relatives.

■ Stephen Cannon, 40 Lavender Walk, Evesham, Worcs WR11 2JR, recalls a **mass formation** of 16 B-36s flanked by 32 B-47s flying over Evesham from the north-west — date not known — and presumes they were en route to USAF bases in Oxfordshire and Gloucestershire. He has never seen mention of this and would like confirmation and date. They would certainly have been heard!

Airshows & Events



Aeroplane's calendar of events is published monthly. All information is correct, to the best of our knowledge, at time of press. Details can change, so check before setting out.

NOTICE TO SHOW ORGANISERS: is your event listed here? If not, contact Nick Stroud on 020 7261 6401 or fax 020 7261 5269 for free inclusion

FREE SPARE COPIES of our 2003 Airshows & Museums Guide (left) are available from the Editorial Office

NOVEMBER

1 North Surrey Military Modelling Group Open Day
Thomas Wall Centre, Sutton, Surrey; tel 020 8873 2786 (after 1900hr) or 020 8393 5480

5 Crash Recovery of RAF Hercules in Norway
A Christchurch Aviation Society lecture by David Atton. Druitt Hall, Christchurch, Dorset; tel 01202 765981

8 Heathrow Aircraft

Enthusiasts' Fair Feltham Community College, Feltham, Middx; tel 01372 725063

11 The Beagle Aircraft Story
A Milton Keynes Aviation Society talk by the PFAs Tom Wenham, Kents Hill Community Centre, Milton Keynes, Bucks; tel 01908 607349

12 RAF Museum Film Evening
A chance to see rare footage from the archives. RAF Museum, Hendon; tel 0208 358 6410

15 Battle of Britain Film Fundraiser
A showing of the classic 1969 film, with all profits to the Yorkshire Air Ambulance. Wetherby Cinema, Wetherby, W. Yorks; tel 01937 845941

DECEMBER

9 Floatplane Flying in Seattle
A Milton Keynes Aviation Society talk by Sue Aherne. Kents Hill Community Centre, Milton Keynes, Bucks; Tel 01908 607349

16 Experiences of an Airline Accident Investigator
An illustrated talk by David Corrie for the Gosport Aviation Society, Stubbington Green, Hants; tel 0239 242 1903

INTERNATIONAL AIRSHOWS & EVENTS

NOVEMBER

1 Flight Testing Includes a display by the Planes of Fame

Museum's Northrop N9M Flying Wing. Chino, California, USA; tel 001 909 597 3722, website www.planesofame.org

4-9 Korea Air Show 2003
Seoul, South Korea; tel 00 82 2761 1105, website www.seoulairshow.com

7-8 Texas Aviation Hall of Fame Induction & Fly Day
Lone Star Flight Museum, Galveston, Texas, USA; tel 001 409 740 7722, website www.lsfm.org

DECEMBER

2-6 LIMA 2003 Malaysia's biggest aviation fair and airshow. Langkawi, Malaysia; tel 00 603 2697 6266, website www.lima.com.my

Take to the skies with STAMP MAGAZINE!

December's **STAMP MAGAZINE** will have a special article on collecting stamps of the pioneers of aviation to mark the centenary of powered flight – it's on sale in newsagents on November 13 for just £2.75!

For the best coverage of aerophilately and airmails take a look at **STAMP MAGAZINE** – out the second Thursday of every month – or visit our website at www.stampmagazine.co.uk



CENTENARY EVENTS



NORTH WINGS

November 12 Pioneers of Flight and the Wright Brothers A London Society of Air-Britain talk by the Science Museum's Peter Davison, The Victory Services Club, London W2 2HF; tel 01444 811317 (1000hr-1800hr)

November 15 The Beginnings of Powered Flight A Royal Aeronautical Society conference on the evolution of flying machines. Includes lectures from *Aeroplane* contributors Dr Richard P. Hallion and Philip Jarrett. Rolls-Royce Leisure Association, Nightingale Hall, Derby; tel 01332 840098

December 13-21 National Aviation Awareness Week A joint effort by the Royal Aeronautical Society and Popular Flying Association to promote the significance of the first century of powered flight. More information on events and educational programmes as part of NAAW may be found on www.naaw.org.uk or www.100yearsflight.org.uk

December 15-21 The Aviation Bookshop Centenary of Flight Celebrations To mark 100 years of powered flight, the Aviation Bookshop is offering substantial discounts on most items. The Aviation Bookshop, 656 Holloway Rd, London N19 3PD; tel 020 7272 3630, www.aviation-bookshop.com

17 Opening of "Milestones of Flight" The inauguration of the RAF Museum's new extension coincides with the anniversary of the first powered flight on December 17, 1903. RAF Museum, Hendon; tel 020 8205 2266, www.rafmuseum.org.uk

ARBORE A Czech contribution to the Centenary celebrations: Albatros Air's Wright Flyer repro airborne at Hradec Kralove, September 27.

INTERNATIONAL

November 5 The Science of Wings, The Technology of Wings Dr Tom Crouch of the National Air & Space Museum gives a free talk on the Wright Brothers, Virginia Air & Space Center, Hampton, Virginia, USA; tel 001 757 727 0900, [website www.vasc.org](http://www.vasc.org)

November 29 Airways Museum Open Day With illustrated talk entitled "The Significance of the Centenary of Powered Flight to Australia". Essendon Airport, Victoria, Australia; [website www.airwaysmuseum.com](http://www.airwaysmuseum.com)

December 3 First Family of Aviation — The Wrights Betty Geiger-Darst presents a living biography of Katharine Wright, Orville and Wilbur's sister, Virginia Air & Space Center, Hampton, Virginia, USA; tel 001 757 727 0900, [website www.vasc.org](http://www.vasc.org)

December 6 100 Years of Flight The Air Museum "Planes of Fame", Chino, CA, USA; tel 001 909 597 3722, [website www.planesof-fame.org](http://www.planesof-fame.org)

December 13-17 First Flight Centennial Celebration A themed celebration at the site of the first powered flight, including exhibitions and events such as Precursors to Flight, Glider Experiments and Century of Flight. Kill Devil Hill, North Carolina, USA; tel 001 252 441 4434, [website www.nps.gov](http://www.nps.gov)

Aeroplane has teamed up with Discovery Wings, the premier aviation channel on satellite TV, to bring you details of its superb line-up of programmes planned in the coming months, culminating in December. Aeroplane is also sponsoring the channel's Monday-night Wingspan schedule

Programme highlights for October 2003

■ **John Nichol Files** — UK PREMIERE

Friday October 5 & 12, 1800hr/2100hr/2400hr John Nichol returns to the cockpit in a new series profiling iconic aircraft from the history of aviation. Episodes include the Lightning, MIG, Hercules, Superfortress, Top Gun and the Boeing 747.

■ **History Takes Flight** — UK PREMIERE

Monday December 15, 1900hr/2200hr/0100hr Includes a visit to Old Rhinebeck Aerodrome in New York to see World War One aircraft being recreated and meets the team behind the USA's National Air Tour.

■ **Flight Fantastic: NETWORK PREMIERE**

Monday December 15, Tuesday 16th & Friday 19th, 2000hr Exploring key aviation milestones — the Wright brothers, Lindbergh's Atlantic flight, the sound barrier and space.

■ **Race for Flight** — NETWORK PREMIERE

Wednesday December 17 (exactly 100 years since the Wrights' first powered flight) Race for Flight follows the evolution of flight from the earliest flapping-wing designs of Leonardo da Vinci to the first glider flight by Otto Lilienthal.

■ **The Wright Stuff** — NETWORK PREMIERE

Wednesday December 17 at 1900hr/2200hr/0100hr Follows Wright replica builder and pilot Rick Young.

■ **Stealth Secrets** — NETWORK PREMIERE

Friday December 19 Travelling at Mach 5, future bombers will have the ability to strike anywhere in the world — within hours.

■ **Kings of SIM** — WORLD PREMIERE

Friday December 19, 1000hr/1400hr/0100hr Flight simulator specialists and addicts explain their absorbing hobby.

See next month's Aeroplane for details of more programmes on Discovery Wings

Win superb prizes with *Aeroplane* and *Discovery Wings*

Each issue from November 2003 to January 2004, *Aeroplane* and *Discovery Wings* give you the chance to win a six-month subscription to *Aeroplane PLUS* a *Discovery Wings* goody-bag. Each month we will set a new question and will pick three winners from the correct entries. At the end of the three months, we will pick one overall winner from all the correct entries to win our grand prize — a VIP trip to the Great Vintage Flying Weekend 2004, including flights in two vintage aircraft.

This month's question is below. You may enter in the following ways: (1) send your answer on a postcard to Tom Borthen, IPC Media, *Aeroplane/DW* competition (Dec), Rm 2108, King's Reach Tower, Stamford St, London SE1 9LS or e-mail aeroplanecompetition@ipcmidia.com; (2) log on to www.discoverywings.co.uk/win, or (3) watch *Discovery Wings* to enter interactively through your TV. A winner will be picked from each entry method.

Q In which year did BAC/Aérospatiale Concord make its maiden flight?

Terms & conditions: Winners will be picked at random and notified by post. Send your entry on a postcard to *Aeroplane/Discovery Wings* competition, King's Reach Tower, Rm 2108, Stamford St, London, SE1 9LS or e-mail to aeroplanecompetition@ipcmidia.com; or log on to <http://www.discoverywings.co.uk/win>; or watch *Discovery Wings* to enter interactively through your TV. A winner will be picked from each entry method each month, i.e. three winners per month. One overall winner will be picked after the prizes are months. The closing date for this competition is November 31, 2003. Employees of IPC Media, *Discovery Wings* and their relatives are not eligible to enter. Only one entry per method per household. The judges' decision is final. All prizes are non-transferable, and no cash alternative is offered. IPC Media Limited, publisher of *Aeroplane*, will collect your personal information to process your entry and to gain a better understanding of our magazine readership. We may send you details on our magazines and services. Please specify if you prefer not to hear from IPC. We may pass your details to other reputable companies whose products and services may be of interest to you. Please specify if you prefer not to receive such offers.



Arrivals

IAN FRIMSTON visits Corgi for a sneak preview of major releases in 2004's Aviation Archive series of collectors' diecast scale models

CORGI AVIATION ARCHIVE 2004

DURING EARLY OCTOBER *AEROPLANE* was able to have a preview of collectors' models due for release next year. Pride of place must go to the 1/2nd-scale D.H. Mosquito. The sheer size (20in span), let alone the accuracy and detail of this diecast model, is impressive. Corgi believes it has overcome the weight problem with models of this size, and research tells the company that they will sell. Two versions will be available, PR.XVI NS503 and a B.XVI MM183 of 692 Sqn, Gransden. All control surfaces are movable, the bomber version having opening bomb bay doors as well as a bomb trolley and two groundcrew. A spare engine in a mount is also supplied. Undercarriages are fixed, up or down. The models are due for release in April and May of 2004 and will retail at £119.99.

A Boeing AWACS is also due for release. This particular model features a radar dish which rotates at a scale speed. Also on schedule for next year is a 617 Sqn Lancaster which will have spotlights in the bomb bay and tail. This is a much-requested model, and production has involved new tooling for the fuselage. With modification, this will enable a "Grand Slam" model to be produced at some time in the future. The recent Iraq conflict has also prompted Corgi to manufacture an up-to-date version of the Tornado.

Due for release in December are four 1/2nd scale World War Two models designed to tempt people into collecting diecast models. Inevitably we each have our wants list; I mentioned the Valiant. While this is not ruled out, it is unlikely to appear owing to the limited colour scheme possibilities. A pity: the three V-bombers in all-over white would look good on anyone's shelf!

Don't miss the new-look Model Collector

Xmas edition on sale November 3

- More pages
- More facts
- More values

PLUS

- Corgi Aviation Archive scooped for 2004
- Including a superb 1/2nd scale Mosquito

FREE Corgi Classics and Lledo Trackside catalogues



FRONT TOP The exceptional (and huge) new 1/2nd-scale Mosquito; A desert-scheme Heinkel He 111; 617 Sqn Dambuster Lancaster, complete with nose & tail spotlights; and an Iraq war Tornado. For more details of Corgi's Aviation Archive collection and where to buy the models, visit the website at www.corgi.co.uk

Arrivals

Once again San Francisco-based aerial photographer **PHILIP MAKANNA** has produced his well-established annual Ghosts calendar — and it is magical

GHOSTS 2004 CALENDAR

WORLD-RENOWNED AIR-TO-AIR photographer Philip Makanna continues to go from strength to strength, as regular *Aeroplane* readers will know — who could forget his superb Lavochkin La-9 centre-spread in our September issue, for instance?

Philip's latest GHOSTS warbirds calendar features yet another rich, moody selection of air-to-air portraits featuring P-40E, Corsair, B-17, Wildcat, P-51D, Spitfire XVII, NA A-36A Invader, Hawker Fury, Mosquito, Sea Hurricane, Lancaster, Grumman Duck and, on the back cover, Shackleton. The large format also provides plenty of space for "this day in 19XX" information. Highly recommended.

■ The 20in x 14in GHOSTS 2004 calendar is available for £11.95 in the UK, C\$22.99 in Canada, and \$14.95 in the USA and the rest of the world. Order it from Ghosts, 665 Arkansas St, San Francisco, California 94107, USA, or via Philip Makanna's website (which also features his books) at www.ghosts.com



ABOVE The front cover of the GHOSTS 2004 calendar.

BELOW "Planemate of the Month" for August is Hawker Fury Mk 11 WJ232/VH-SHF of Flying Fighters in Queensland, Australia.

RIGHT Each spread provides historical notes of important events during World War Two — plus space for 2004 airshow dates and reminders to buy *Aeroplane!*



This month, to mark the Centenary of Powered Flight, John offers a personal view of aviation's first century

■ JOHN MAYNARD

After training at the de Havilland Aeronautical Technical School in 1949–53, John served as a Pilot Officer in the RAF during his National Service. He returned to de Havilland in 1955, and in 1969 he joined BAC. He left the aircraft industry in 1973, but has continued to nourish his enthusiasm for British aviation ever since

BELOW The Queen of the Skies. This delightful rendition of Concorde was the last piece of work done by revered artist and cartoonist Ken Aitken for *Aeroplane* before his death on September 30. It is presented here as a tribute in his memory.



Asides — and broadsides — from the wings, with JOHN MAYNARD

Crosswind

THIS IS A RANDOM, very personal, memoir: I begin by recording that in 1827 George Pocock was towed at speed from Bristol to Marlborough by coach and horses whilst flying astride a soaring kite. To my utter and unceasing amazement that was the year of my paternal grandfather's birth and he, poor fellow, died aged 70, six years before the Wright brothers' first flight!

Arrived on the scene in 1931, and today I look back on just 72 years of powered flight's first century. What years they have been! My older sister saw the 1931 Schneider Trophy Race, but the first aeroplane that attracted my attention was a Vickers Wellesley flying low over our house near Winchester — from 35 Sqn at Worthy Down, I guess. Confused by its underwing bomb containers, I thought it was a seaplane and rushed to tell my 16-year-old stepbrother, who scathingly put me right. At that moment, in a golden age of air-mindedness, my own obsession was born.

Three years later, and able to identify most aeroplanes in an instant, I watched the weaving contrails of the Battle of Britain and the fire-stained clouds of the Southampton winter blitz. My sister, eight years my senior, joined Supermarine with my unqualified approval and then did even better by marrying a young graduate in Joe Smith's design team. In my eyes this new brother-in-law of mine was second only to the late R.J. Mitchell! I met his friends and colleagues, I even met test pilots, and thus my determination to join the aircraft industry fast matured.

One wet morning, mid-war, a single Dornier dropped five or six bombs on quiet Winchester while I watched open-mouthed in the Cathedral Close. I was knocked flat, not by blast but by a shove from my headmaster, appalled at the stupid boy in his charge. My protest that I had, after all, founded the school's Spotters' Club cut no ice! In 1944 the Eighth Air Force's massed vapour trails took my mind off tedious old cricket. The D-Day glider streams thundered overhead and later that year at Charterhouse, on a bright Sunday morning, I saw the airborne assault en route to Arnhem and heard the first hideous racket of a passing flying bomb. As the war ended I remember charting the atomic bomb's destructive power, without the remotest idea of its significance. It struck me, however, that all the might was suddenly in the air, for good or evil.

From Charterhouse I determined to join the de

Havilland Technical School, eschewing university, and did so with impeccable timing just four months before the Comet's first flight. I remember standing one early autumn evening that year close to the threshold of Hatfield's runway with fellow students as we returned from lectures and watching the Comet sigh past mere yards away, navigation and cabin lights colouring the dusk. It was a sight of infinite beauty. The memory of that moment has never left me and even now brings a lump to my throat.

I have written affectionately of de Havilland and of the halcyon summer I spent at Christchurch, home of Airspeed and, in 1951, of the beautiful Ambassador. Thus I witnessed the coming of the first passenger jet and the last significant piston-engined large airliner. The British industry was representative of companies worldwide whose sense of purpose, courage, and inspiration conquered the air and began the journey into space within just 100 years. Although I was to return, in 1953 I left de Havilland for two years' service in the RAF. I loved every moment. The skies were brimming with Meteors, Vampires, and Canberras and I was full of pride to be wearing so revered a uniform. Later, on the reserve at Stradishall, I at least rubbed shoulders with the screeching Javelin and wondered at its brutish immensity. It was certainly a very long way on from the Vickers Wellesley which had first ignited my interest only twenty years earlier.

I was working at Weybridge in the late 1960s and saw Concorde's slender fuselage in the assembly halls. It seemed a hugely brave step in the right direction. Sadly now we are going backwards, and with Britain's usual impeccable timing in this Centenary Year, of all years, Concorde has been grounded. We should have made Tony Benn manager of Concorde operations years ago: he at least has the irreplaceable qualities of faith in the aeroplane and fire in his belly.

People, of course, have made aviation. I especially remember three men it has been my good fortune to meet and to know. First, Cecil Lewis, author, filmmaker and World War One fighter pilot. I talked to him on his 95th birthday, shook his hand and remembered that that same hand had fired an S.E.5a's guns against von Richthofen. Secondly, John Cunningham, perhaps the finest airman of all and an inspirational gentleman. Thirdly, David Shannon, RAAF Lancaster pilot of 617 Sqn, just 21 years old on the night of the Dams raid. A brave, forthright man who lived more fully in four years of war than most do in a lifetime.

Finally I must make reference to the unspeakable evil which just two years ago turned beautiful and beneficial products of man's ingenuity into vile instruments of mass murder and craven, self-serving martyrdom. Is this really where we are, a century on from Kitty Hawk? I think not, for decency and goodness still abound and aviation in all its many aspects will go on to prosper once again. In optimistic vein I remember the last line spoken by Raymond Massey in the classic film of H.G. Wells's *The Shape of Things to Come*... "And when man has reached out and journeyed to the farthest star, still he will be just beginning." So let's get on with it, shall we? **A**