



ROYAL AIR FORCE

Souvenir Book 1969 Edition

...into the second half century



All proceeds to RAF Benevolent Fund & Royal Air Forces Association 2/6

The RAF Benevolent Fund

Fifty years of charitable achievement

1919

The Royal Air Force Benevolent Fund was founded in October 1919 for the relief of distress or need, actual or potential, among past and present members of all ranks of the Royal Air Force (including the Women's Services), the Royal Auxiliary Air Force, and the Royal Air Force Reserves, and their widows, children and other dependants. Thus the Fund provides relief not only for cases resulting from the casualties of war but also for those arising in peace.

1969

The Royal Air Force Benevolent Fund must be able to render help indefinitely to those disabled while flying or otherwise on duty, to the dependants of those killed, and to those who may at any time, by reason of bereavement, disability, sickness, infirmity, poverty or other ill-fortune, require relief or assistance. The Council appeals to members of the Service and the general public to give generously so that the Fund may continue its indispensable work.



THE ROYAL AIR FORCE BENEVOLENT FUND

Patron: Her Majesty the Queen
(registered under the War Charities Act 1940 and the Charities Act 1960)

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ROYAL AIR FORCE

Souvenir Book 1969 Edition

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For the Royal Air Force Benevolent Fund in its 50th Year

April 1969



Cover Design by *Arthur Gibson*, who also designed the RAF Museum Appeal Display (pp 56/7) and the Benevolent Fund Anniversary Display opposite, the colour work for which was donated by Gibson, Gilbert, White Ltd.

1969. *What a year to remember!* All the nostalgia of the Golden Jubilee celebrations last year about past glories largely obscured the tremendous progress being made with new plans and new planes, which are thus the more suddenly bursting upon us now. When the Diamond Jubilee comes along, air historians will denote this a vintage year, in which the Royal Air Force was restored again to its traditional role in the Air Century as the premier fighting force in Europe and the keystone of Western defence.

What a start to our second half century! Four new combat types entering service (3 all-British, the 4th with British engines), all without peer in their respective roles, and a 5th shortly to come... Harrier, Nimrod, Buccaneer and Phantom, and then Jaguar... and moreover, in substantial numbers—5-600 within the next year or two. It is 20 years since we received the Hunter and Canberra when NATO was created, and almost that since the first of the V-bombers entered Bomber Command to provide an effective nuclear deterrent during a hazardous period of international tension and unrest.

It is practically a decade since the Lightning was injected into Fighter Command, since when the RAF has suffered recurring tragedies and set-backs to its fighting efficiency, morale and recruitment in the vacillations of policy which killed off the superbly conceived TSR-2 and cancelled the advanced (if imperfect) F111 and then AFVG.

The new Defence Policy, however, (distasteful as many of its withdrawals and restrictions may appear to those of us who remember Great Britain as truly *Great* and still subscribe to that belief), dictated principally by limited and 'conventional' police actions in the discharge of treaty obligations, has at least enabled our Aircraft Industry to invent and develop a full hand of ace-high combat aircraft and the Defence Staff to re-appraise the concepts of Air Power in practical terms, and once more to determine a clear defence pattern.

Thus the Air Board has completely re-organised its Command Structure and developed new strategies and tactics for the most effective and economic use of all these splendid new aircraft and other equipments, despite the limited resources available, and with new co-operative attitudes between our own Military Services and with our Allies, has remoulded the

RAF yet again into a fighting machine of the first rank. As John Taylor pleads (p17), now that we have the requisite *quality* of combat weapons and operational control—so much more vital than sheer quality in the tasks which face us today—**LET'S BE OFFENSIVE!**

And on top of this Concorde flies! I make no apology for featuring Concorde so fully in these pages, for this is truly a second-half-century aircraft, and what more fitting illustration of 50 years of progress can be found than to compare this superb supersonic airliner with the Vimy in which two young Britons first flew the Atlantic? Arthur Gibson's clever cover picture thus also provides a reminder of the pioneering role played by Service pilots and Service machines in the development of civil aviation. The Vimy of 1919 was a converted bomber crewed by men fresh from serving in the RNAS and RFC, and between it and the Concorde of 1969, it was mainly the RAF which blazed the trail, opened up the world routes and stimulated the major advances in design and engineering.

Traditionally, commercial aviation has always looked to the military field for the main stimulus to design and development. Tomorrow's Concorde passengers will fly, comfortable and unconcerned, at speeds hitherto experienced only by Service combat crews and a handful of test pilots, (who nearly all have Service backgrounds). In the future, as in the past, it will be the insatiable demand for improved military performance (and not only as regards sheer speed) which will lay the foundations of progress in civil air transport.

The Editor



Another famous pioneering flight which took place 50 years ago should not go unremembered. This photograph, from Air Chief Marshal Sir John Baker's private collection, shows Capt Ross Smith and Lt Keith Smith with their crew, Sgts Burnett and Shires, in the Vickers Vimy at Hounslow prior to taking off for Australia, on 12 November 1919

FIFTY YEARS OF CHARITABLE ACHIEVEMENT

Edward Bishop reviews his Benevolent Fund Golden Jubilee Book

POST-GRADUATE RAF CADETS AT CRANWELL

The RAF College faces an even more distinguished future

THE FIFTIETH ANNIVERSARY REVIEW

A Norman Hoad painting of The Queen at RAF Abingdon, 1968

CAS LEADS US... INTO THE SECOND HALF CENTURY

and John Young illustrates the Air Board's exciting new policies

LET'S BE OFFENSIVE! *John W R Taylor assesses the potential of the RAF's new combat aircraft. O S 12 colour photos*

BY BOAC CONCORDE TO NEW YORK *with Stan Edwards*
Striking colour pictures by Arthur Gibson

AN ILL-ASSORTED PAIR *A 50th Anniversary story of the first Transatlantic Flight by Stan Edwards*

SOUVENIR BOOK PHOTOGRAPHY *We compliment ourselves and pay tribute to a wonderful range of cameras*

THE FALCONS PARACHUTE DISPLAY TEAM *A picture tribute by Flt Sgt Terry Allan (photographer extraordinary) and Norman Hoad*

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The Royal Air Force Souvenir Book is published annually to raise funds for the Royal Air Force Benevolent Fund and the Royal Air Forces Association

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Since October 1919, the RAF Benevolent Fund has devoted over £15,000,000 for relief of distress, most of it since the end of World War II. During each of the past four years, well over £800,000 has been required, an average of nearly £2,200 a day—7 days a week the year round. To mark this year's Jubilee, Edward

Bishop, author of the 'Battle of Britain', The 'Wooden Wonder' and other aviation histories, has written the Fund's story, entitled 'The Debt We Owe', which was taken from Winston Churchill's famous broadcast appeal in 1951, which finally raised £80,000. Here the author describes some features of his book

Fifty Years of Charitable Achievement

THE RAF BENEVOLENT FUND, founded by Lord Trenchard in October 1919, is 50 this year, a milestone which Longmans mark this autumn with the publication of *The Debt We Owe*, the Fund's story. The RAF reached its own half century only last year and 50 years is thus just about as long as possible for the Fund to have existed. But the longevity of the RAF's own charitable organisation will be news to many people, in and out of the Service. Certainly, the whole story of the Fund's origins, its struggle for survival between two world wars and its activities since World War II have not been available hitherto in one volume.

How did it all begin? The winter of 1919-20 provided a raw social climate in which Trenchard, canvassing his RAF Memorial Fund, said, 'Lots of people will get into trouble and go looking for others to help them, but the finest men and women will not ask'. He recognised that, lacking the long traditions of the Royal Navy and the Army, the RAF possessed neither a lobby through which to preserve itself, a Memorial by which to be remembered, nor an existing charitable fund to call and to build on. If, as then seemed possible, the RAF had disappeared altogether, it might have gone almost without trace. Symptomatic of authority's attitude towards the new Service was the difficulty experienced by the Founding Committee in obtaining a suitable location for the proposed national Memorial, but eventually a department known as the Office of Woods and Forests offered a partly submerged site on the Thames Embankment near Westminster, and

here in the summer of 1923 a young Prince of Wales (now Duke of Windsor) unveiled the Memorial. Appropriately, Trenchard's own statue below the Defence Ministry's windows is now in sight of the Memorial.

The fledgling RAF Memorial Fund—the name was changed later—did not await completion of its granite monument before embarking on the relief of distress, and its earliest objectives were remarkably optimistic. Concisely, these were: to build a Memorial, to assist the education of deceased officer's children and to relieve distress among officers and men and their dependants, particularly through the provision of medical treatment. In its first year the Fund aimed to raise £400,000, but only received £125,000 of which £95,000 came from official sources, figures which moved Lord Hugh Cecil, the Chairman, to comment: 'If the objects of the Fund are to be properly supported the public must show great liberality...'

Looking back from this 50th Anniversary, when relief includes substantial home purchase loans for widows and the disabled, the private education of Service children, and smaller comforts which brighten the lives of the disabled and elderly, the Fund's early rates and forms of relief will seem, and were necessarily, modest. But degrees of distress are comparative: after World War I, when men had no boots in which to seek work or lacked perhaps the elementary tools of their trades, such refinements as homes of their own and cars, if they were disabled, were beyond contemplation. *The Debt We Owe* shows how the Fund's objects and the field of its relief work have broadened since 1919 and explains where the money and facilities have come from to make this possible; eg it was barely a year old when Mr Alexander Duckham's gift of his home, Vanbrugh Castle at Blackheath, provided what has since become a flourishing boarding school for sons of deceased, disabled or sometimes serving airmen. It was already well enough established in 1923 to send a party of boys to lift their caps when the Prince unveiled the Memorial.

From its earliest days the Fund's development has run closely parallel with the growth and need of the Service, and the book recalls that in the 20s and early 30s the RAF was actively justifying its post-14-18 war reprieve as an airborne imperial constabulary. Trenchard, supported by Col T E Lawrence, had first urged this role upon Colonial Secretary Winston Churchill in 1922. It was



Air Chief Marshal The Lord Dowding, later to be C-in-C Fighter Command, Battle of Britain, 1940, was a member of the Fund's Council who proposed the novel idea that serving personnel should contribute ½ a day's pay a year



Sir Winston Churchill, Honorary Air Commodore of No 615 (County of Surrey) Sqn, R Aux AF, takes the salute as the squadron marches past, Sept 1954. Churchill was always a great friend of the RAF and the Benevolent Fund

How to send Help

Cheques etc, which will be gratefully acknowledged, should be made payable to:
THE RAF BENEVOLENT FUND
67 PORTLAND PLACE, LONDON W1

Marshal of the Royal Air Force Lord Trenchard (1873-1956)
His statue near the Defence Ministry is close to the Memorial on the Embankment
The 'Father of the Royal Air Force' was also the founder of the RAF Benevolent Fund



Air Marshal Sir William Coles KBE CB DSO DFC AFC succeeded AM Sir John Whitley as Controller of the Benevolent Fund in Aug 68, after serving as C-in-C Tech Training Command. He entered the RAF in 38 and served during the war in the Middle East, North Africa, Italy, Burma, and Europe. He was Chief Instructor at CFS (51-53) Air Adviser to the High Commissioner in Australia (53-55). SASO No 3 (Bomber) Gp, AOC No 23 (Training) Gp, and DGPS (63-66).

Sir William holds a bar to his DFC and has also won the American DFC and is a keen sportsman. In 48 he drove the RAF bobsleigh at the Olympic Games at St Moritz, is a former President of the RAF Rugby Union, was a pre-war captain of Oxfordshire and later played for Blackheath

accepted and the RAF was stationed thinly across the British Empire, far removed from the Fund but never out of mind. No serving member of the RAF could have been more conscious in these years of the Fund's value to the Service than Lawrence of Arabia, who as Aircraftman T E Shaw, had the disconcerting practice of knocking on the Secretary's door to confirm that cases he had submitted confidentially from his own barrack knowledge were being assisted. He was serving in India as 338171 A C Shaw, and Noel Coward was addressing him 'Dear 338171, may I call you 338?' when the Fund learned that out of his literary royalties, this supporter extraordinary had arranged a £20,000 trust to provide an income to educate the children of deceased or disabled officers.

The Book also tells of the Royal Patronage with which the Fund has been honoured; the Royal Presidents including HRH Princess Marina, Duchess of Kent, who presided regularly over the annual Council Meeting for 25 years after her husband, who was Chairman, had been killed flying on active service; the leadership of the Council by prominent businessmen including Lords Wakefield, Riverdale, and Knollys and Mr Harald Peake, ably assisted by famous RAF personalities like the present Deputy Chairman, MRAF Lord Portal, and the Chairman of the Grants Committee, ACM Sir Francis Fogarty, and the executive control of the Fund by AV-Ms Sir Hazelton Nicholl, Sir John Cordingley and Air Marshals Sir John Whitley and today, Sir William Coles.

In the middle 30s, not long after Hitler's seizure of power in Germany, Air Marshal Sir Hugh Dowding joined the Fund's Council. Although Dowding, in his efforts to prepare the fighter defence of his country, was engaged on much more urgent work, he quickly saw how badly the Fund needed money and thought that serving personnel should be the main contributors. This was a revolutionary suggestion in a charitable organisation which had relied previously on private donations and the gate money at Hendon air displays, and it took some time to get Dowding's concept of self-help off the ground, but finally in 1938, the Fund introduced its half-a-day's-pay-a-year scheme, which since has raised nearly £2,400,000.

Thus by the outbreak of war, RAF personnel were already contributing handsomely to the Fund's income. Even so, as casualties increased it was by no means enough, and the financial outlook was decidedly gloomy until the Battle of Britain which completely changed the previous comparatively unimportant fortunes of the RAF Benevolent Fund in 1940. The public, among them Lord Nuffield who sent a cheque for £250,000, responded with unprecedented generosity to the Fund's 1940 Battle of Britain appeal and a broadcast by Lord Trenchard reaped £53,342.

Appeal methods (*eg* the RAF Anniversary Concerts, Foreign Currency Boxes at air- and seaports, Lighter Fuel Scheme and other money-raising ideas), and the sheer business of looking after the many millions of pounds raised and spent since 1940 are given in the book together with case histories which explain how the Fund spends its money. The value of such a Fund in a welfare state whose armed forces are contracting annually is understandably open to question. But the vast number of war veterans growing old, and peacetime disasters, such as the Hastings crash in 1965, when 30 RAF servicemen died, are apt to be overlooked: in fact, this crash alone has already cost the Fund more than £60,000.

Looking ahead, the Benevolent Fund anticipates greatly increased demands on its resources in the 80s and onwards from aged widows and from officers and airmen whose earning power and whose savings have expired. Its tremendous charitable achievement over the past 50 years must, and will, continue into the next half-century on a still grander scale. ©

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164 GRADUATES NEEDED

THIS YEAR, the Royal Air Force is aiming to recruit 164 graduates, nearly twice the previous annual intake. They are required as full career men for the principal officer branches.* All degree subjects are acceptable for those wishing to train as pilots and navigators in the Flying branch and most subjects are equally acceptable for those aiming at careers in the Equipment and Secretarial branches, although 6th formers planning to read (and undergraduates already reading) subjects particularly appropriate to these branches will be given preference. For the RAF Engineer branch, a wide range of engineering and scientific subjects are acceptable.

The aim is to recruit some 130 boys leaving school this year through the RAF University Cadetship Scheme and an additional 50 RAF University Cadetship awards will be made available in 1969 for this purpose. The balance of the requirement will be met by recruitment of men who have already graduated this Summer or in previous years.

In future, therefore, young men wishing to be guaranteed a full career in the Royal Air Force from the start must either already be in possession of a degree or be expecting to obtain a place at university.

As soon as a boy in the 6th form of his school has had his application for a place at university accepted by the University Central Council for Admissions, he will be eligible to apply for a RAF University Cadetship. Early in his final year at school, the applicant will be invited to attend a 4 day cadetship selection board at the Officers and Aircrew Selection Centre at RAF Biggin Hill. If he is successful, he will be told that he has been provisionally selected for the award of a RAF Cadetship, subject only to confirmation of his place at university.

The RAF University cadet lives and works at his university or college like a normal undergraduate. He receives RAF pay and allowances up to £825 a year; becomes a member of a RAF University Air Squadron; and subject to successful completion of his degree, has the guarantee of a career on graduation.

Although, therefore, boys wishing to start life in the

£850 pa FOR UNIVERSITY CADETS

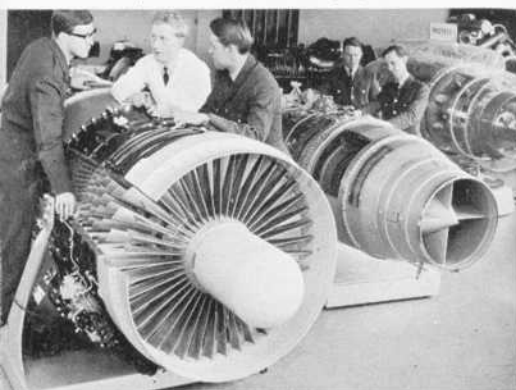
RAF with the *guarantee* of a full career from the date of entry, must be in possession of a degree, the RAF will still require many of its aircrew and ground branch officers to come direct from school with a minimum of five Ordinary level GCE passes. It is recognised that there will continue to be young men who, for one reason or another, cannot get into university but who nevertheless would make first class officers. They will enter initially on 'Supplementary List' shorter term commissions, but at least 40 per cent of the full career appointments will be filled by selection from amongst these shorter term officers. RAF officer careers will therefore continue to be open to young men and women at all levels of academic achievement from school leavers with five 'O' level GCE passes to graduates.

The new policy will of course have an important affect upon the future of the Royal Air Force College, Cranwell. This year, there is only one entry to Cranwell—in October. Boys entering Cranwell in October may volunteer for a 12 month course, devoted mainly to academics, and designed to win them places at university or college in 1970. Those who succeed will then go off to obtain degrees at RAF expense. The remainder will do the present Cranwell course but will not suffer by comparison since, in the early stages at least, they will achieve promotion at slightly earlier ages.

This is an interim arrangement. The final aim is to increase the flow of graduates, both direct and through the medium of RAF University Cadetships, so that by October 1970, the RAF expects to be in a position to abolish the normal Cranwell cadet entry. Cranwell's role is therefore changing from that of the RAF's *cadet* college to that of a *post-graduate* officer and professional training college.

In this way, the RAF expects to get the best of both worlds: first of the academic world of civilian universities and colleges and, thereafter, of the Service world of the RAF College, with all its incomparable facilities for officer and professional training. During the next 50 years, therefore—the RAF's second half century—the importance of Cranwell will increase, rather than diminish. ☉

Centre A lesson in modern history. Inside Trenchard Hall, Engineer officers specialise in mechanical (left) or electrical work (right)



*With a 'full career' commission (i.e. a commission on the *General List*) your career is guaranteed until the age of 55, although you have the option of 'retiring' at 38 (or on completion of 16 years, if this is later). These commissions offer prospects of promotion to the highest ranks.

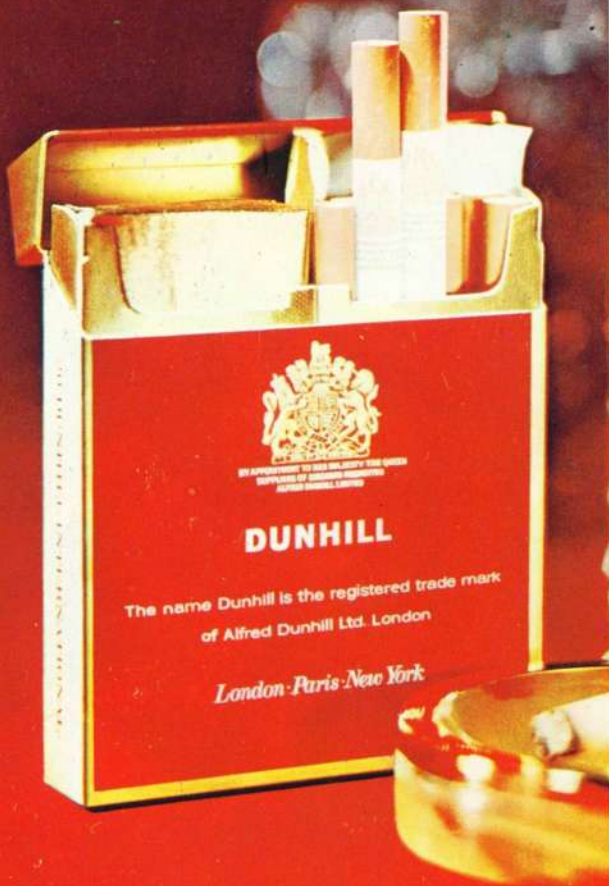
*Trenchard Hall, main building of the
Department of Engineering. Over
180,000 sq ft of laboratories, instruction
and demonstration rooms, opened in 1966*

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Jet Provosts over the main Cranwell facade



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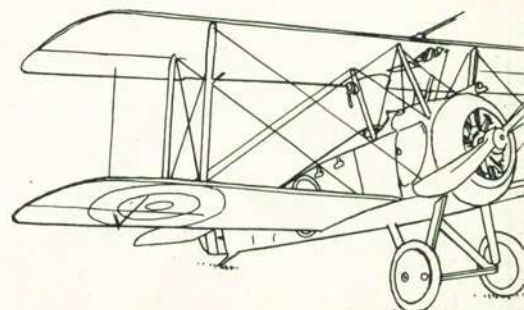
Her Majesty the Queen inspects

Art reproductions available — page 5.9

... into the second half century

CAMEL 1917 £5,800

*The Chief of Air Staff
looks to the future
on page 11 and
stresses the importance
of cost-effectiveness
in defence policy.
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here are 1969
equivalents.*

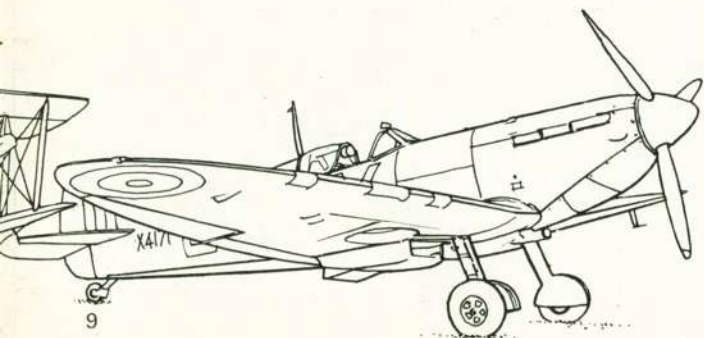




*the Fiftieth Anniversary Review
of the Royal Air Force*

*Specially painted for the R.A.F. Souvenir Book
by Air Commodore N.E. Hoad CBE AFC*

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3. McDonnell Douglas Phantom-Spey. 4. SEPECAT Jaguar-Rolls-Royce Turbomeca Adour.



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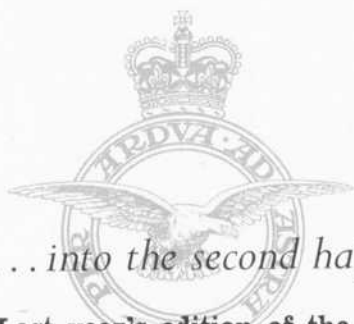


Air Chief Marshal Sir John Grandy

GCB KBE DSO

Chief of the Air Staff

leads us . . .

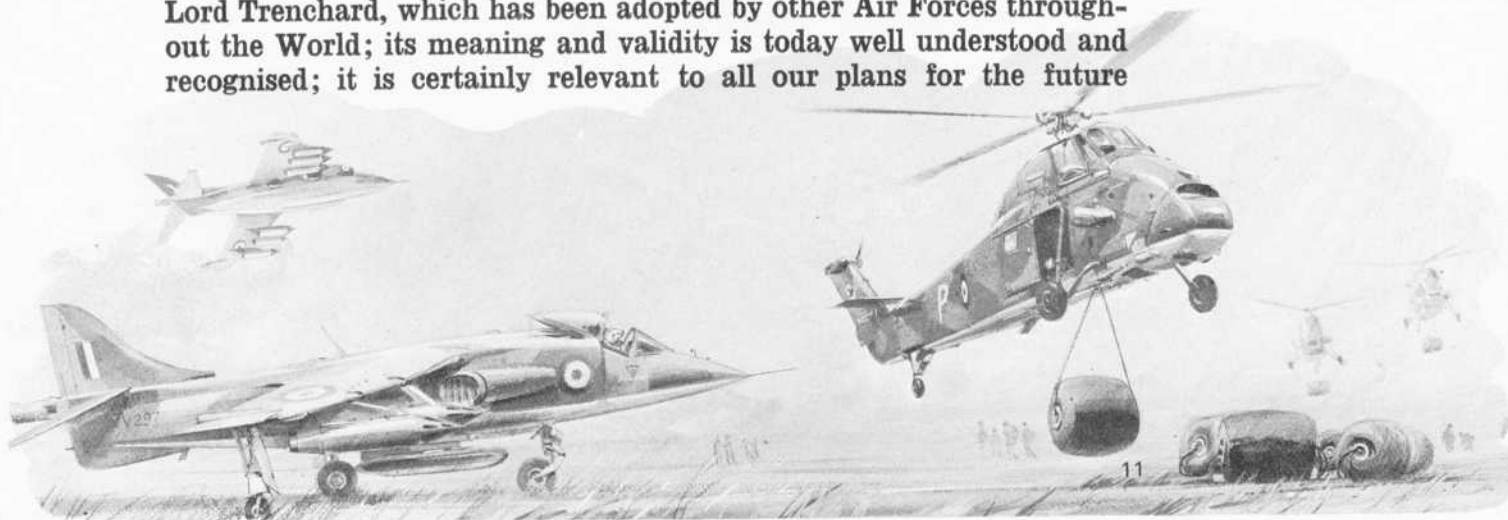


... into the second half century

Last year's edition of the Souvenir Book commemorated the Golden Jubilee of the Royal Air Force as the world's first independent air force and in 1968 we were looking back with pride at past achievement. Now we must look to the challenges which lie ahead of us. Amongst the many excellent articles in the Golden Jubilee Edition was one entitled 'The Next Fifty Years' described by author John W. R. Taylor as a 'bold assessment.' It concluded: 'It is, however, difficult to foresee a time when there will be anything better than a piloted aeroplane or helicopter to provide air support for surface battles.' Such provision is part of the work of the RAF today and I have no doubt that the Service will continue to operate the whole sphere of its responsibilities in the spirit and tradition created over the past fifty years. In broad terms, I support Mr Taylor's 'bold assessment' and will return to it later.

I believe all the articles in last year's book¹ provided the student of air power with excellent food for thought, and indeed, they encompassed a most dramatic period in our history, during which military aircraft added a new dimension to the conduct of war. There are of course innumerable lessons to be learned from the history of air power as it has developed over the past fifty years; perhaps the major principle which evolved, and which will have increasing meaning and purpose in the future, is the need for centralised command and employment of air forces. This was absolutely basic to our success in World War II. It is a principle, originally enunciated as far as the air is concerned by Lord Trenchard, which has been adopted by other Air Forces throughout the World; its meaning and validity is today well understood and recognised; it is certainly relevant to all our plans for the future

Sir John Grandy, born 1913, joined the RAF in 31. A Flying Instructor until the war, he led 249 Hurricane Sqn during the Battle of Britain, later commanding Duxford, where the first Typhoon Wing was formed, before taking over fighter units in the Middle East. He won the DSO for air supply ops on Dakotas in SE Asia, and after Army Staff College in 46 became DD Ops Training at Air Ministry. Other appointments include Air C'dore Ops at Fighter Command and Commandant at CFE. After the IDC course in 57, Sir John commanded 'Grapple', responsible for British Nuclear Tests in the Pacific. Before becoming CAS in April 67, he was ACAS Ops in 58 Commander 2nd TAF in Germany and C-in-C of Bomber Command and then Far East Command.





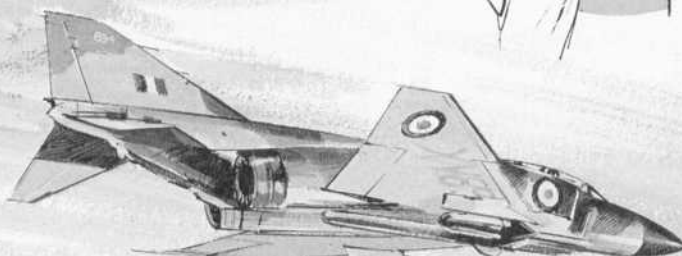
... requires the closest co-operation and trust between the Royal Air Force, the Royal Navy and the Army ... interdependence is the only means of achieving an effective National Defence Structure ...

structure of the Royal Air Force. But right as this doctrine has proved to be, over the years and through many conflicts great and small, we must be alert against becoming too rigid, too doctrinaire in our interpretation of the principle; 'flexibility of approach' must always be the theme, however overplayed that phrase may have become in military jargon.

The increasing costliness of modern weapon systems is of course a factor fundamental to National Defence, posing significant and inter-related problems for each of the Fighting Services. A good example is the relative cost of aircraft over the past fifty years. Using 1969 prices, the Camel of World War I fame was worth about £5,800, the Spitfire of World War II just over £23,000 and today's Phantom about £1,500,000.

The main lesson to be extracted from these comparisons is that we must plan to get the maximum effectiveness out of our limited resources. This does not just mean procuring the right equipment; success rests on the adoption of a policy of flexibility of application, whereby total air power resources are so controlled, organised, trained and deployed as to be capable of being brought to bear against the greatest threat, wherever it may emerge. This requires the closest co-operation and trust between the Royal Air Force, the Royal Navy and the Army. The Nation depends for its defence upon the Armed Forces: more than ever before, each depends on the others for its security and success. Co-operation and interdependence are the only means of achieving a balanced and effective National Defence Structure in the future.

Interdependence also has another, related, international interpretation for us today and here I have in mind interdependence between the



Western Allies in both the political and military sense. There is nothing intrinsically new in this; in recent military history, co-operative operations with allies have been at the root of our successes and we have of course made a significant contribution to NATO² since its inception 20 years ago. During this 20-year period we also held major responsibilities world-wide: the scene is now changing and our future strategy is related almost exclusively to Europe and NATO. In consequence interdependence takes on a new and more cogent meaning in terms of military co-operation. The dovetailing together of the military contributions of nations of the Atlantic community, embracing land, sea and air (and perhaps ultimately, space) has made a great deal of progress but there is much still to be done to give the most effective military meaning to NATO forces. Within an overall NATO framework of the interdependence of land, sea and air power there is the problem of co-ordinating each of the national contributions within the individual elements themselves; and here incidentally the RAF will acquire increasing responsibilities in the provision of strike, reconnaissance and air defence support from land bases for naval forces, in particular of course for the Royal Navy.



'... interdependence between Western Allies has been at the root of our successes in recent military history, and takes on a new and cogent meaning in military co-operation ...'

This new responsibility means that, in addition to the Long Range Maritime Reconnaissance Force which has always been wholly identified with maritime tasks, some elements of our Strike and Air Defence Forces will be primarily identified with maritime operations and will be earmarked in support of SACLANT.³ Strike and air defence elements will also be assigned to SACEUR⁴ but the overall Force, earmarked for both NATO Commanders, will remain as an entity in Strike Command, together with Tanker and other supporting Forces. Strike Command as a whole will be available to NATO (or for National purposes) for use either in whole or in part depending where, or on what scale, a threat presents itself. Operational flexibility of this sort, both in command and application, could not be obtained if there were fragmentation of air resources. The clear trend is thus wholly in the

¹Copies of the enlarged Golden Jubilee Edition of the Royal Air Force Souvenir Book are still available from RAFA Headquarters at 7/6d. each, including P & P (see page 1).

²NATO: North Atlantic Treaty Organisation

³SACLANT: Supreme Allied Command Atlantic

⁴SACEUR: Supreme Allied Command Europe





I said earlier that I would return to the interesting article by John Taylor and particularly his conclusions. Even in a world now accustomed to manned space flight I believe his conclusion as to the need for the piloted aircraft as the prime means of providing air support remains valid. Valid, that is, for so long as man sees the need for military might for the defence of his homeland, his people, his ideals. Our national defence concept today is deterrence. Deterrence means, in modern terms, naval/military/air strength compatible with national resources, backed by a national will and determination to use it if threatened. In the Royal Air Force today we seek to determine the best use of air power in deterrence . . . the emphasis is not so much upon 'air support' as upon partnership and interdependence.

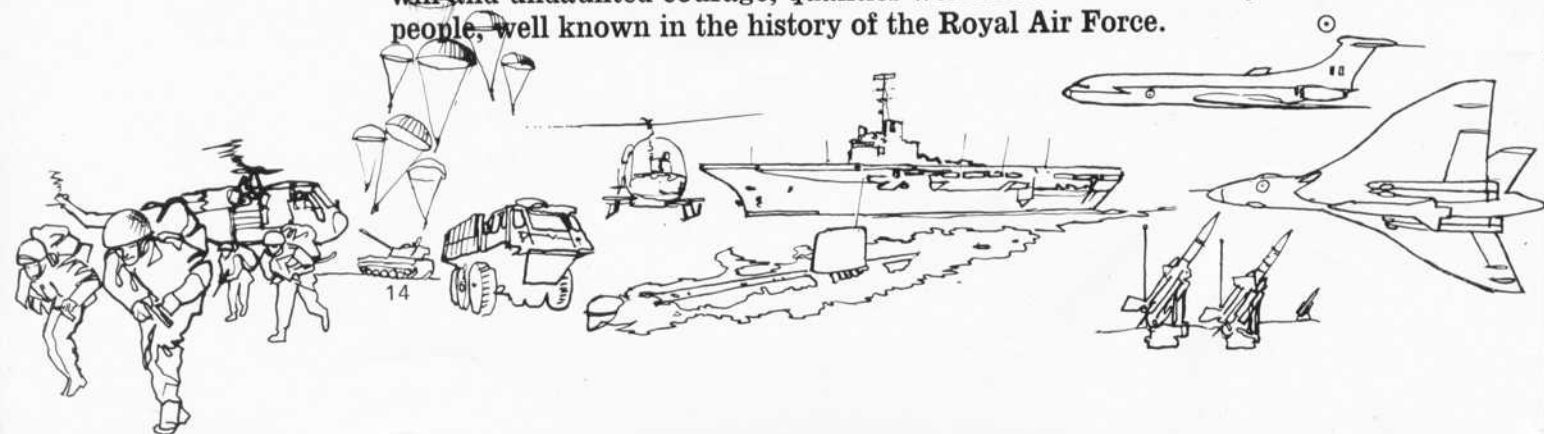
These twin themes underscore all the operational roles of the Royal Air Force today. In addition to those roles already mentioned, our strategic and tactical transport aircraft provide the mobility and reinforcement capability for combat squadrons, troops and equipment; reconnaissance aircraft seek and acquire the vital intelligence, essential to all arms, over land and sea; and ground attack aircraft supply the extra punch and survey capability, necessary in and beyond the land battle area.

The challenges of the future impinge on every branch and activity alike. In the field of communications we have undertaken wide ranging responsibilities on behalf of the other Services, including world wide strategic communications. Techniques are advancing rapidly and already satellite communications are appearing alongside the more conventional H.F. systems which they may eventually replace altogether. Looking to the future the trend is towards wide band high capacity systems on which secure speech, teletype and data channels will carry all our communications and correspondence rapidly from desk to desk.

Finally, we must look to our newly constituted Training Command to provide the skilled manpower necessary to sustain and project our streamlined, highly functional air and ground organisations into the demanding technological environment of the future.

Our new aircraft, our changes in Command structure, our modernisation programme right across the whole spectrum of our activities, have all by now been widely publicised; they combine to provide a sound, exciting and inspiring basis on which to launch the Royal Air Force into its second half century. The policy is deterrence: it demands skill, will and undaunted courage, qualities well known in the history of our people, well known in the history of the Royal Air Force.

... we have undertaken world-wide Strategic Satellite Communications which may ultimately replace conventional HF Systems altogether ... the trend is towards wide band high capacity systems which will carry all our communications and correspondence ...





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LET'S BE

OFFENSIVE!

John W R Taylor analyses the 1969 Defence White Paper critically and discovers assumptions, presumptions, and omissions. Still hankering after TSR2, he feels nevertheless that with the injection of Harrier, Phantom, Buccaneer and Nimrod, the RAF will start emerging once more from the lean years. (It is 9 years since Lightning was introduced). With Jaguar, the RAF will have 5-600 new combat aircraft by the mid-70's and a total of about 1000 new aircraft by 1975

MINISTRIES OF DEFENCE are products of an age that has transformed rat-catchers into rodent officers. The word 'war' must never be associated with government departments. War is beastly: it is something that 'they' might start, but not us. Britain, therefore, refers to its army, navy and air force as defence services. They are for use only in counter-attack, after we have first been attacked – assuming, of course, that they still exist by then.

It is the duty of Her Majesty's Government to ensure that Britain does maintain an ability to mount a second strike – or, more correctly, to 'strike second'. Their latest ideas on the subject, at the time of writing, are contained in a White Paper entitled *Statement on the Defence Estimates 1969*. It makes fascinating reading, especially for anyone with a memory long enough to recall previous White Papers and statements on defence.

In the first two pages, the stage is set. It is a far smaller stage than it used to be, but the compression has advantages. In particular, we are told, the Government's decision to abandon military bases east of Suez has enabled Britain to improve substantially her contribution to the defence of Europe and the seas around it. No diplomatic double-talk is used to conceal the reasons why such a policy is important. The next sentence reminds the reader that in the past year, the advantages of concentrating our military effort west of Suez have been strongly underlined by events in Czechoslovakia and the increase of Soviet naval activity in the Mediterranean.

Then comes the key to current British defence planning. While recording that nothing said or done by the Soviet leaders in 1968 suggests that they envisage the use of war in order to make political gains in western or southern Europe, the White Paper adds that the Czechoslovak crisis demonstrated that the Soviet Government is prepared to invade an independent state against the wishes of its

Government and people, and that a future crisis of this kind might present an immediate threat to the stability of Europe.

This, then, is the primary danger that confronts us – a war between the Warsaw Pact countries and NATO, sparked off by accident or by miscalculation of the possible NATO reaction to a Czechoslovak-type military adventure. It would start as a non-nuclear conflict, and the entire aim and purpose of the NATO reaction would be to contain the fighting, by means of conventional weapons, long enough to give both sides time to consider the consequences of letting it escalate into a nuclear war.

A holding operation of this kind would not be easy,

Russian anti-submarine carrier Moskva



even for a period of five to seven days, which is considered to be a practical minimum. The Soviet Union and its allies moved a quarter of a million men into Czechoslovakia in three days. They struck by night, achieving tactical surprise despite a long period of warning that the invasion might take place; and their use of far greater forces than the task required left no doubt that Soviet military leaders are willing and able to use a steamroller to crack the proverbial nut.

Clearly, therefore, a tremendous responsibility falls on the Royal Air Force, as one of the major units of NATO's forces in Europe. Air superiority would be essential in the kind of holding operation envisaged by NATO. So, as the Warsaw Pact air forces would always have a numerical advantage, the RAF must rely on the quality of its aircraft to survive an initial enemy attack on airfields (the kind of attack by which Israel knocked out Arab air opposition in June 1967) and then to strike back hard and decisively.

By the mid-seventies – which is the period for which we must plan now – Soviet fighter-bombers will be able to attack targets 350 to 500 miles from their forward bases, in all weathers. To be certain of survival, NATO combat aircraft must, therefore, either be based more than 500 miles from Warsaw Pact air bases, which requires large and very costly aircraft, or find some other way of escaping



air forces with an almost impossible task in trying to pinpoint, find and attack it.

Harrier bases can be supplied with fuel and weapons by road transport or helicopter, and servicing can be done on the spot. In one recent demonstration, the engine of a Harrier was changed in a field in 4½ hours, using a special air-transportable crane.

Ninety Harriers are currently on order for the RAF, including a follow-on batch of 20 that will strengthen the Second Tactical Air Force units stationed permanently in



annihilation in the first hour of a war.

At present, there is only one answer to this problem and the RAF will have it this year when the Hawker Siddeley Harrier begins to enter service. No other air force in the world has a combat aircraft to match the Harrier's versatility, for it combines the performance and punch of a conventional transonic fighter-bomber with ability to take off and land vertically, and hover, like a helicopter. As a result, it can be dispersed, hidden and camouflaged, away from normal airfields and within easy range of the east-west border in Europe, presenting enemy

Germany. Three or four times that number will be needed before this unique fighter can become fully effective as a deterrent to aggression, but it would be money well spent. Increased production would lower the cost of an export version to, perhaps, half a million pounds, and there are many air forces throughout the world that would snap up Harriers at such a price, to the benefit of Britain's balance of payments. (In contrast, just two of the aircraft types we are buying from America, the Hercules and Phantom, will cost £559 million in dollars plus £423 million in sterling over a ten-year period).

Above Anglo-French Jaguar will add to the RAF's day attack potential, although their effectiveness will be limited against an advanced defence system by their smallness

Top and Left The highly-supersonic two-seater Phantom fighter/bombers are among the best aircraft of their type in the world

(continued page 20)



The Hercules—champion weightlifter



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From 15½ to 17½, you could join as an apprentice. These boys are on a 2-year electronics course. And they get plenty of sport and adventure too!

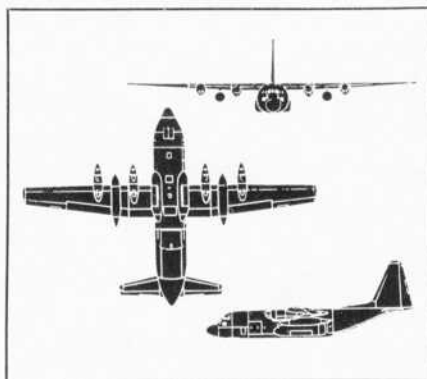


From 17½ onwards, you could come in as a trade trainee. Or with 5 acceptable O-Levels, you could start training as an officer.

The immense Hercules is Air Support Command's express removal van. It can whip 20 tons through the sky at 345 m.p.h. All 66 aircraft have now been delivered.

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When you next see a Hercules winging its way through the sky, remember it's just about the most versatile freight-transport aircraft yet built. To keep it effective needs



the talents of all sorts of different specialists. Aircrew, technicians, mechanics, suppliers, administrators—these are some. And all of them get a first-class, full-time training. If you're interested in aircraft and technology, the R.A.F. might be the life for you one day. Think about it.

Royal Air Force

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The Harrier has a maximum speed of Mach 0.95 (95 per cent of the speed of sound, or 720 mph at sea level), but the radius of action is at present fairly short when carrying a full 5,000 lb weapon load. This will be improved when higher-rated versions of its Pegasus engine become available, but there will still be an urgent need for a longer-range strike-reconnaissance aircraft in the class of the all-British TSR 2, American swing-wing F-111 or Anglo-French swing-wing AFVG, all of which were ordered successively for the RAF and then cancelled successively by the present Government.

It is a difficult requirement to meet and the end product cannot avoid being costly; but what limit in price can one put on continued survival and freedom in a nuclear age?

By the mid-seventies, the Soviet Air Force is expected to have in service pulse-Doppler radar equipment and anti-aircraft missiles comparable with the British Rapier, to deal with low-flying combat aircraft. It should also have by then a 'bomber-destroyer' able to cruise for long periods at heights above 20,000 ft, from where its radar will be able to detect aircraft flying at ground level and attack them with missiles that will 'snap down' towards their targets after launch and home on them automatically.

To cope with defences of this kind, NATO attack aircraft will need to be highly advanced. Ideally, they should be capable of penetrating enemy territory at a speed of Mach 0.9 only 200 ft above the ground, protected by electronic countermeasures equipment that will jam enemy radar, and able themselves to press home their attack by day or night in all weathers. The importance of each of these factors can be gauged from the estimate that losses would be doubled if the terrain-following radar used to pilot such aircraft automatically was incapable of doing its job safely below 500 ft.

What is Britain doing to ensure that the RAF will have a strike aircraft of this calibre by the mid-seventies? The 1969 *Statement on the Defence Estimates* comments: 'Potentially the most important of our collaborative ventures is the multi-role combat aircraft. Last summer we joined a consortium of countries (the others being Germany, the Netherlands and Italy) which had been formed to consider the joint development of an advanced combat aircraft'. These words have a too-familiar ring. Before its cancellation, the AFVG was described by our Minister of Defence as 'both operationally and industrially the core of our long-term aircraft programme.' Perhaps, at the time, we missed the point that one dictionary definition of a core is something that is cut out.

If the projected multi-nation multi-role combat aircraft (MRCA 75) is cut out in its turn, the European partners in NATO will be completely incapable of meeting their commitments, without crippling expenditure on American aircraft that are at present no more than paper projects.

Unfortunately, the whole concept of a multi-role combat aircraft is an anathema to the experienced designer of modern aeroplanes. Many of the troubles of the F-111 stem from the attempt to make it a dual-purpose machine for the US Air Force and Navy. Yet the differences between the USAF's F-111A and USN's F-111B are small compared with those proposed for the British and German versions of the MRCA 75.

If we can believe reports in the technical press, the RAF version is intended to be a sophisticated two-seat all-weather attack aircraft with two Rolls-Royce RB 199 engines. The version for Germany, Italy and Holland is described as a single-seater of simpler overall concept,

powered by one turbofan of American design and suitable for use in both attack and interception roles. It would, surely, require superhuman genius to achieve 85-90 per cent common airframes for two such differing aircraft; yet this is the claim being made for MRCA 75.

Bearing in mind the consequences of failure, it is a time for bold decision. Britain, through the TSR 2 programme, is the only nation in the world with experience of developing an attack aircraft to a specification as rigorous as that envisaged for the RAF MRCA 75. Nothing should be allowed to compromise development and production of *exactly* what is needed, for if the RAF gets the aircraft it must have for the mid-70's, other air forces will buy it. Let us never forget that America bought and built the Canberra because it had nothing as good, and there are many who believe that the USAF would have acquired the TSR 2 if we had had the courage to persist with it.

Until this powerful new strike-reconnaissance aircraft is ready for service, the RAF will by no means be lacking in attack capability. The first squadrons of Phantom fighter-bombers are already forming and these highly-supersonic two-seaters are among the best aircraft of their type in the world. The Anglo-French Jaguars will also add to the RAF's day attack potential when they enter service in the early 'seventies, although their small size and simplified equipment must limit their effectiveness against an advanced defence system.

It is easy to dismiss the Buccaneer as an ageing carrier-based strike aircraft which has been passed on to the RAF second-hand now that the Royal Navy is losing its fixed-wing squadrons. In fact, the total of about 90 Buccaneers that are being built specially for the RAF or



Submarine Commander's view of a Nimrod attacking him. Although Nimrod's electronic equipment cannot yet guarantee detection of submerged nuclear Submarines, it should soon be able to do so, thus rendering the Polaris type deterrent obsolete

updated from Naval production will be formidable low-level attack bombers, almost up to the MRCA specification except in lack of supersonic dash performance and, perhaps, an ability to carry some of the more advanced electronics. They can fly low at transonic speed and have a more than adequate range to penetrate enemy territory in depth. What is more, they will carry from the start the Martel missile, one version of which may well be able to deal with radar-guided missiles fired at the Buccaneers from above or below.

All of this emphasises the fact that the RAF is

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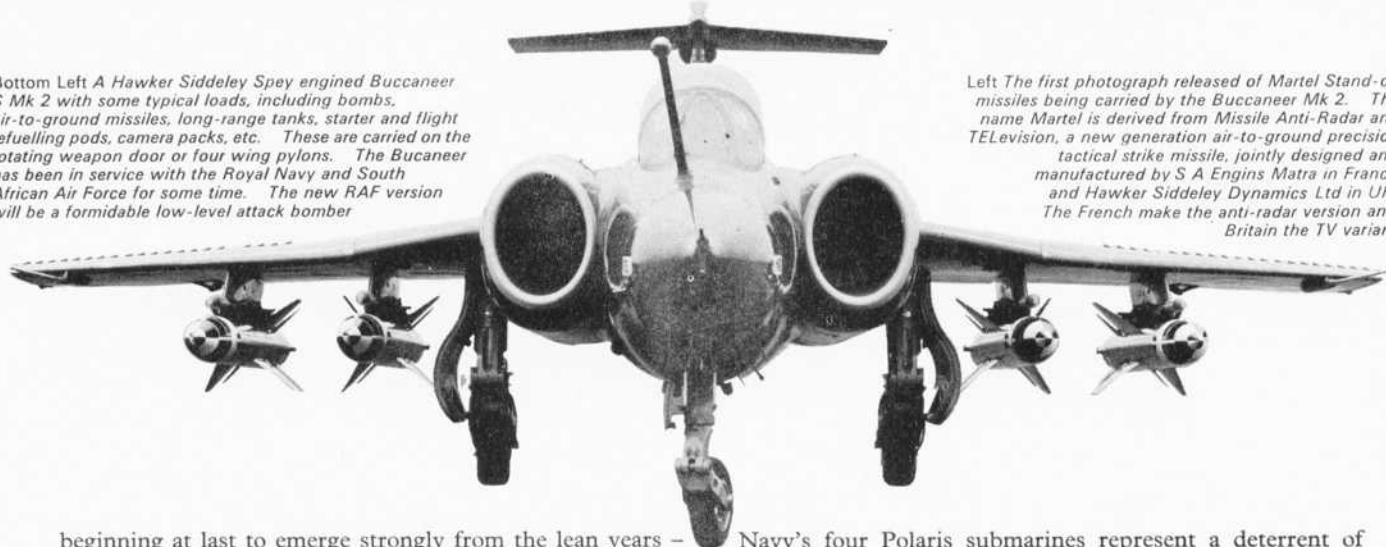
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Bottom Left A Hawker Siddeley Spey engined Buccaneer S Mk 2 with some typical loads, including bombs, air-to-ground missiles, long-range tanks, starter and flight refuelling pods, camera packs, etc. These are carried on the rotating weapon door or four wing pylons. The Buccaneer has been in service with the Royal Navy and South African Air Force for some time. The new RAF version will be a formidable low-level attack bomber

Left The first photograph released of Martel Stand-off missiles being carried by the Buccaneer Mk 2. The name Martel is derived from Missile Anti-Radar and TELevision, a new generation air-to-ground precision tactical strike missile, jointly designed and manufactured by S A Engins Matra in France and Hawker Siddeley Dynamics Ltd in UK. The French make the anti-radar version and Britain the TV variant



beginning at last to emerge strongly from the lean years – not for the first time in its history. After a period of nine years since the last entirely new combat type, the Lightning, became operational, it is now getting four almost simultaneously, in the shape of the Harrier, Phantom, Buccaneer and Nimrod. Including the Jaguar, it will in fact receive a total of 500 new combat aircraft by the mid-seventies, or well over 600 if the MRCA or something equivalent materialises.

To this can be added the total of about 120 new Andover, Belfast, Hercules and VC 10 transports now in service, more than 200 Jet Provost T Mk 5 and Jaguar jet trainers on order, and up to 100 SA '330, SA 341 and WG 13 helicopters that are being produced under the joint Anglo-French programme – giving a total of around 1,000 new aircraft by 1975.

In most cases, these aircraft are the best of their kind in the world. This is certainly true of the Nimrod maritime reconnaissance bomber which offers a better chance of finding and dealing with fast, deep-diving nuclear-powered submarines than anything yet in service elsewhere. But the very efficiency of the electronics-packed Nimrod underlines one of the greatest dangers confronting Britain today.

Whatever we call our Ministries, wars are seldom won by a purely defensive strategy. Nor are they likely to be averted in an atomic age with anything less than a nuclear deterrent force of proven effectiveness.

It is becoming increasingly apparent that the Royal

Navy's four Polaris submarines represent a deterrent of dubious worth, even when viewed as part of an overall NATO deterrent. Polaris itself is vulnerable to even the first generation of anti-missile missiles, which is why the US Navy is superseding it with the multiple-warhead Poseidon; and nuclear submarines will not be undetectable much longer. Aircraft like the Nimrod cannot yet provide the complete answer, but there is good reason to believe that satellites can be used to locate and track all types of submarines and this is only one of several possible developments that will put the deterrent back where it belongs – in the air, in the form of air-launched ballistic missiles.

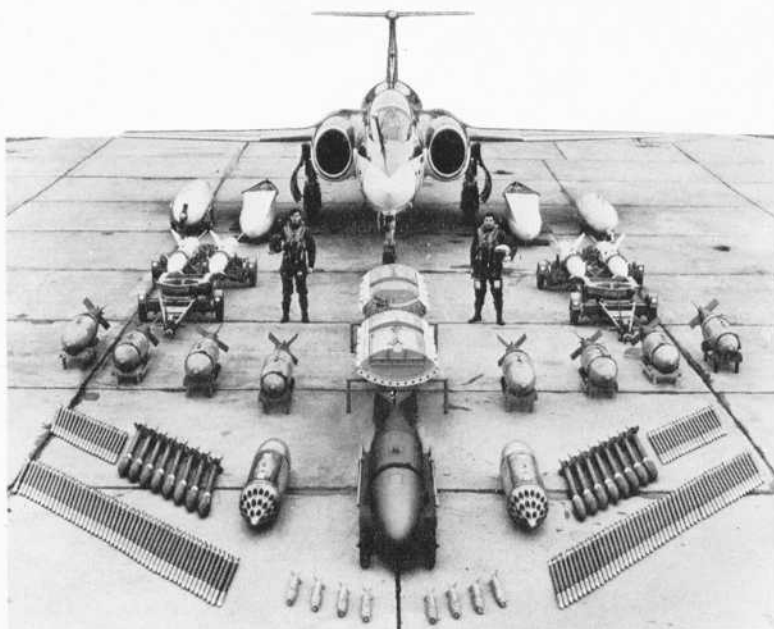
It will require a major change in Government policy before the British deterrent can revert from the Royal Navy to the RAF, but there may be a consolation prize for the Navy. The decision to scrap its carriers is now admitted to have been premature and there may eventually be a renewal of interest in carrier-based fixed-wing aircraft – not on the old lines but in a new form made practicable by the Harrier.

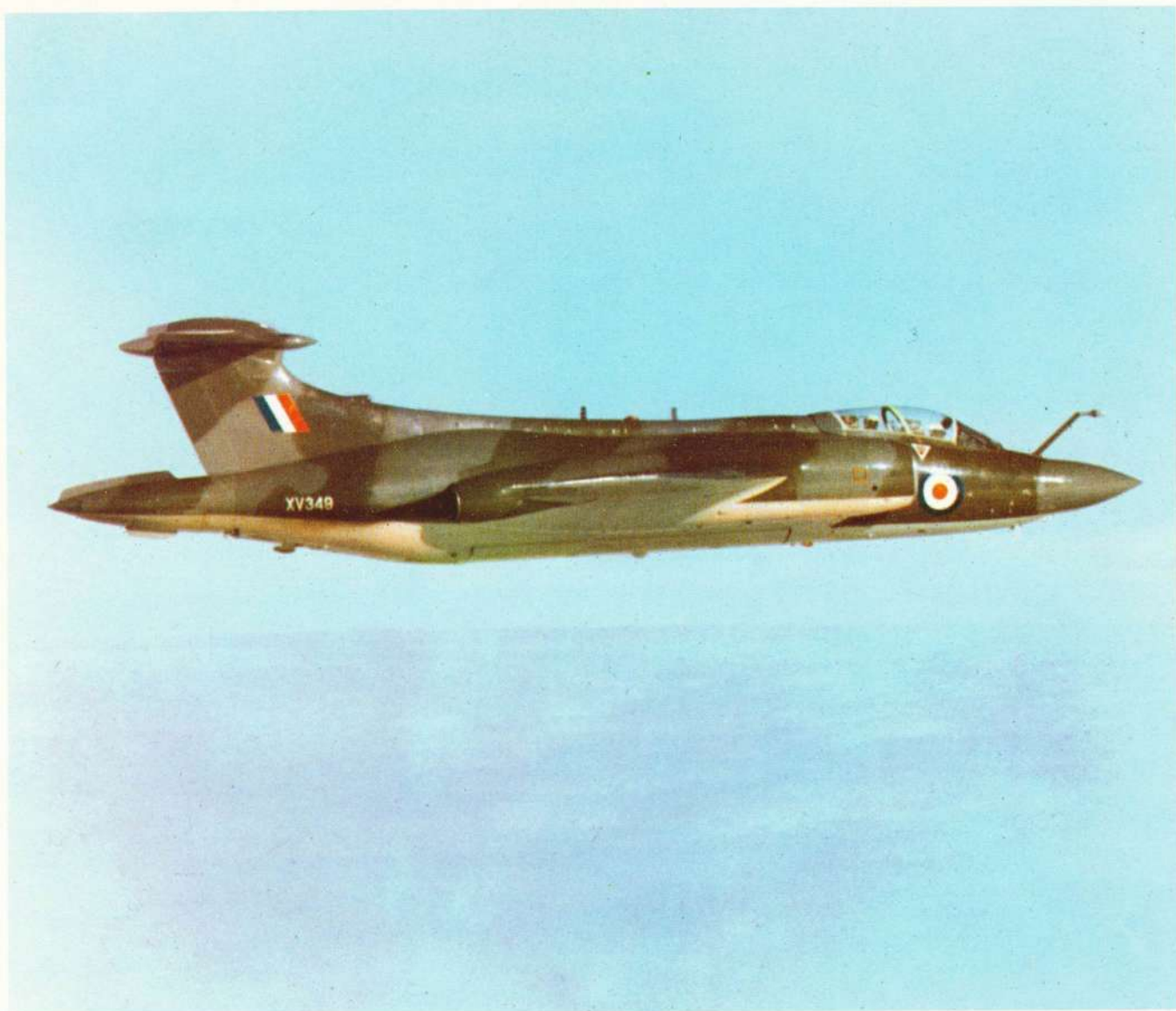
Russia's helicopter carrier, the *Moskva*, which put in an appearance in the Mediterranean in 1968, points the way to a new class of small high-speed carriers equipped with vertical take-off fixed-wing aircraft like the Harrier. If another reversal of Government policy restored our interest in affairs east of Suez, or in other potential trouble-spots beyond Europe, such vessels would enable us to take powerful sea/air assistance to our friends quickly, irrespective of whether or not air bases were available. Korea, Suez, Vietnam, Aden and the Rhodesian oil blockade all serve as reminders of the potential usefulness of carrier-based air power; the Harrier makes it practicable in a missile age.

One serious threat to the future of Britain's air power remains. Page 43 of *Statement on the Defence Estimates 1969* records proudly: 'Our role in NATO has always required a wide range of sophisticated equipment. Nevertheless, the forecast again shows a reduction in the funds to be devoted to research and development. The total expenditure on research and development for 1969-70 is estimated at £236 million; at current prices this represents a fall of over £30 million on the estimate for 1968-69.'

Quality, not quantity, spells success for NATO's very realistic defence policy, and quality stems from continued, costly research – a field in which Britain excels. Here is a battle for all British citizens to fight against whatever Government is in power; for however much we value the welfare state, it will survive only so long as NATO has weapons that little bit better than those on the other side of the fence.

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In few fields of human activity has progress been so great over the past 50 years as in aviation: between the Vimy of 1919 and Concorde stretches a vast and intricate chain of developments affecting every phase of air transport. Suppose Jack Alcock and Arthur Whitten Brown were to step down from their stone memorial at London Heathrow to sample a supersonic flight across the Atlantic—what would they make of it all?

Since their day, air travel has ceased to be an adventure and become an industry: the Atlantic crossing has become one of the great highways of the air, densely trafficked, flown with an ease and regularity that make their risky venture seem to belong not just to another age but almost another world



Captain Andrew, BOAC Project Pilot, at the controls of the 002 Concorde at Filton after the plane had completed taxi trials

To New York by BOAC Concorde with Stan Edwards

LONG BEFORE THE PASSENGERS BEGIN to assemble in the departure lounge at Heathrow for their BOAC Concorde flight, the flight crew is busy preparing for the journey. Nothing is left of that ignorance of conditions over the Atlantic which in 1919 produced moments that teetered between low farce and high tragedy. Everything nowadays is planned in the minutest detail, *eg* the flight plan must be submitted an hour before take-off; every conceivable item is precisely calculated – *eg* the fuel load takes into account the aircraft weight, expected passenger load, amount of mail and of course the weather conditions over the route.

As take-off time draws near, the focus shifts to preparations of the aircraft itself. The ground crew check out and service the mass of complex systems, armed with the report of the flight crew who brought the Concorde in from its previous journey. The fuel is loaded – something like 19,000 glns of it even though, if the reserve of 4,000

was unused on the previous flight, this alone is above five times as much as the Vimy carried.

Preparation goes on almost until the first passengers board. At Concorde's speed, flight times over the Atlantic route are nearer present-day short-haul journey-times than subsonic inter-continental jet flights, and speed of turn-round is essential to profitable use of the supersonic airliner. So cabin cleaning and galley servicing, loading of mail and passenger baggage are only just done when the passengers are welcomed aboard by the cabin crew.

Walking out to Concorde, what impression will they get of their aircraft? Even motionless on the apron, it gives an unmistakable impression of high speed: it looks a different breed from the massive jumbo-jets and older subsonic airliners around it, and it is hard to believe that it owes anything to an ancestor like the Vimy. Inside, the decor of the cabin has been designed to lessen the tunnel effect of the fuselage; by treating the seats as strong blocks

*'Passengers for BA Flight 1973 to New York
please go to gate 9....'*



of contrasting colours set against 'quietly' treated walls, it seems both wider and shorter. While the 100 or so passengers settle into their comfortable seats – two abreast on either side – the flight crew are quietly doing their cockpit checks, and the first intimation of their presence is the whine of the four Olympus 593 turbojets starting up. Then, on receiving clearance from the control tower, Concorde begins to taxi out.

With modern airliners, there is none of the range problem that forced Alcock and Brown to fly between the two nearest chunks of land on either side of the Atlantic; Concorde is flying direct from London to New York. Newfoundland, for 25 years after the Vimy's flight the hub of Transatlantic traffic, has now receded from the scene. The distance flown (3,400 m) now is nearly double and Concorde needs a runway of just over a mile for take-off – an ironic comment on Alcock's struggles to find just 500 yards of reasonably level ground!

Using the 150,000 lb thrust from its four Olympus engines, Concorde climbs quickly until the noise abatement procedure makes it necessary to throttle back, reducing the rate of climb from 3,500 fpm to 500, but minutes later, after clearing the community below, the aircraft is again climbing at full thrust to reach 25,000 ft where, under the watchful eye of Sector ATC, the correct separation procedure begins. Concorde, now cruising subsonically at about 650 mph to avoid sonic boom overland, is closely monitored with the subsonic traffic, so that when it begins to accelerate, its relative position to any nearby supersonic transports satisfies the rules of the air. The captain has already raised the aircraft's droop nose from the 50° down position which ensures good vision near the ground, and minutes later, the visor is raised to provide a clean aerodynamic shape for supersonic flight.

Less than 15 mins after take-off, Concorde is passing over S Wales into the hands of the Oceanic planning section of ATC, which gives clearance to start accelerating. Over the next 400 miles and 25 mins, the passengers are gently transported through the sound barrier and into supersonic cruise at heights above 50,000 ft. The speed of sound (Mach 1.0) is reached at 29,000 ft but not until M 1.15 and 36,000 ft is the first evidence of supersonic flight apparent at sea-level, somewhere off Lundy Island. To overcome the increased drag during the transonic phase and to help Concorde climb rapidly to optimum cruise altitude, the engine thrust is being augmented by the reheat system; the aerodynamic loads are also moving aft, tending to alter the overall balance. Since external devices would impose unacceptably high drag, the C of G and the centre of lift are controlled automatically by moving fuel between fore and aft trim tanks. M 2.0 is reached just above 50,000 ft, and the climbing part of the flight over, the inertial navigation system and autopilot now keep the aircraft on its supersonic course, the crew's main job being to monitor them and the mass of instruments, and to note any weather changes.

But the ice and snow, clouds and fog through which the Vimy had to battle lie far below Concorde. At these great altitudes there is no sense of speed; the aircraft could be travelling at the Vimy's 90 mph for all the effect Concorde's 1,350 mph has so far above the clouds, and without cloud cover, the most striking impression is how much lower the horizon seems, how much greater an area of the earth's surface can be seen than at subsonic cruise altitudes. The sky is blue/black during daylight and at night stars are visible below the horizontal. At 1,350 mph, there is no chance of ice building up as it did on the Vimy. Because of the kinetic heating, the temperature of the aircraft skin reaches about 130°C, even though the air outside is at 56° below zero. This is not noticed in the cabin, since the air



conditioning system maintains a pleasant level, the aircraft's fuel acting as a 'heat absorber' while the pressurisation system maintains a pressure not noticeably different from ground level.

The cabin staff are now going smoothly and efficiently about their work, for though meals don't assume the same importance on these short-duration supersonic flights as on the long-range subsonic jets, there is a hot meal galley service and the usual lavish selection of drinks. 2 hrs 50 mins after take-off, Concorde – now at 60,000 ft and 250 m from New York – reaches the end of its cruise phase. To begin his descent, the captain throttles back almost to flight idling conditions, slowing to about Mach 1.5 when the descent proper at about 2,500 fpm takes 12 mins and the aircraft joins the high-density airways of the subsonic traffic and takes its turn to approach the New York terminal, perhaps having to stack for a few minutes over Deer Park, some 50 m from John F Kennedy Airport.

Once clearance is received, the long approach to the landing begins, the pilot lowering the visor and locking on to the 3° glide slope beam; the undercarriage is lowered, and the final approach is under way at about 180 mph. The aircraft's weight is now 225,000 lb. Concorde's attitude on approach differs slightly from that of subsonic jets, having a floor angle of 10°. For this reason, the variable-geometry nose is 'drooped' at 17½° to let the pilot see the ground, but later on, when full certification is obtained, fully 'hands-off' automatic landings will be normal. After touchdown, the anti-skid wheel brakes combine with reverse thrust on all four engines to bring the 100-ton aircraft smoothly to rest in less than 6,000 ft. As it taxis to the parking area, the ground crew move out to meet it, ready to unload the baggage and begin preparations for the next flight.

And the passengers, moving out through Immigration and Customs – what will they feel about their supersonic flight? Very possibly their main reaction will be a vague disappointment that it wasn't particularly exciting or very different from conventional subsonic airliners. Except, of course, that they have completed their journey in half the time – if they chose a morning flight out of London they could complete their business in New York and return by Concorde to London before the end of the day. In 50 years, aviation has come a long way. What was still high adventure only 30 years or so ago is today part of the almost humdrum routine of big business, and even supersonic flight – which to Alcock and Brown would have seemed sheer fantasy – has become just one more stage in the steady advance of everyday communications. ©



A. W. Brown



Alcock and Brown Memorial by William McWilliam, R.A. Donated by 'The British Aviation Community', fittingly sighted at London Airport—the world's busiest



J. Alcock



Electrically heated jacket and boot pads. Alas, the battery failed and both were without heat in the open cockpit for nearly 16½ hours

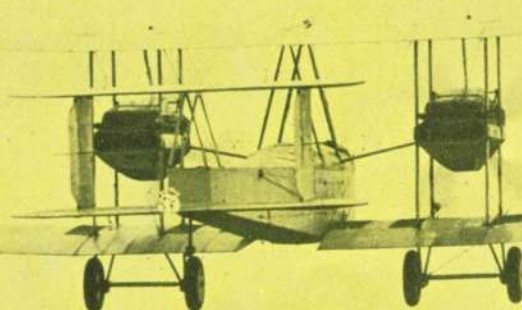


The sextant, compass and chart with which Arthur Whitten Brown navigated the Vimy 1,880 miles over the North Atlantic on 14/15 June 1919



Forerunners of the 'Mae West', the floatation jackets which Brown and Alcock wore on the flight were made by GIEVES of London

The Vimy taking off from Lester's Field in Newfoundland at 16.13 GMT on Saturday, June 14th, 1919. When it dipped out of sight below the brow of the hill, spectators thought for a moment that it had crashed



The Alcock and Brown Story

Stan Edwards recounts the epic tale of an ill-assorted pair

The Vimy being assembled in the open at the tiny airfield at Quidi Vici Lake in Newfoundland



ALCOCK AND BROWN. Names so inseparably linked that one might think the two men were lifelong partners. Yet they were an ill-assorted pair, who met only three months before their epic flight, parted soon afterwards – and never met again. Their nonstop crossing of the Atlantic in June 1919 is a classic example of how military aviation has blazed the trail for commercial flying. Alcock, the pilot, developed his long-range flying skills with the RNAS; Brown, the navigator, first learned his trade with the RFC. Their Vickers Vimy aircraft was designed to bomb Berlin, and its Rolls-Royce Eagles first powered military aircraft.

Not that Jack Alcock was a green hand when he joined the RNAS as an instructor when war broke out. Born in Manchester in 1892, he had quickly become famous as a pilot after qualifying at Brooklands in November 1912. His craving for active service was met in December 1916 by a posting to No 2 Wing at Mudros on the Aegean island of Lemnos. The Wing flew a motley collection of aircraft on all kinds of operations. Though Alcock won his DSC for shooting down two enemy fighters and claimed seven 'kills' in all, he excelled at long overseas flights. 'I hear Alcock is raiding again tonight' became almost a catchphrase on Lemnos. They were long, dangerous flights over Turkey and the Bosphorus, and in October 1917 Alcock's Handley Page o/400 was brought down and he was taken prisoner.

Curiously enough, Arthur Whitten Brown also ended his wartime flying career as a prisoner. Coincidences like this abound in their sorties, suggesting the hand of a freakish Fate. Both men, for instance, grew up in Manchester, served engineering apprenticeships there, even shared mutual friends – yet never met. Brown's parents were American, his father a Westinghouse engineer. He was born in Glasgow in 1886 and moved to Manchester when Westinghouse built a factory there. But they were totally dissimilar personalities. Alcock was a stocky, vigorous extrovert, used to fame and popularity. Brown was a slight, reticent man, who courted fame only once.

In 1912, Brown went to South Africa as a Westinghouse engineer. He returned when war broke out, surrendered his American nationality, and served in the trenches at Ypres and Somme before transferring to the RFC as an observer with No 2 Squadron. Dissatisfied with the hit-or-miss navigation of the day, he began to look for ways of improving it. His opportunities to do so

received an unwelcome boost when his aircraft was shot down and he himself – his left leg permanently damaged – was taken prisoner. Fate was now drawing the threads of their lives together, for both men dreamed in their prison camps of flying the Atlantic.

The lodestone was the £10,000 prize for the first nonstop Atlantic flight offered by the *Daily Mail* in 1913 and renewed in July 1918. Even in 1913, there had been 11 tentative entries and two serious attempts to develop aircraft. In 1918 there were again 11 nominations, though only four ever got to the starting line. Looking back, one marvels that it should have been Alcock and Brown who succeeded. To start with, Alcock – stranded in Smyrna at the Armistice – and Vickers were both late starters. Alcock hurried to Weybridge within 24 hours of his demob in March 1919 and, though Vickers had made no positive plans to enter the Vimy, his enthusiasm and reputation soon won them over.

But other entrants had a long lead. Harry Hawker flew the specially-built Sopwith Atlantic only five days after Alcock's visit to Weybridge. Freddie Raynham's Martin-syde Raymor was near completion, and Handley Page were well ahead with their big V 1500 bomber. Alcock asked for little work to be done on the Vimy – the two cockpits to be combined, fuel tanks to be fitted in the bomb spaces – but he still had no navigator. When Brown visited Weybridge, he was simply looking for a job – but when his interest in navigation emerged he soon found himself squatting beside Alcock under the Vimy, chalking a route on the hangar floor.

Still they should not have been first. When they arrived in St. John's, Newfoundland, on May 13th, Hawker and Raynham had been ready to leave for days. Alcock still had not found an airfield when the Vimy was unshipped at St. John's on May 13th. And on that very day both Hawker and Raynham began their attempts. Raynham crashed on take-off but Hawker was airborne for 15 hours before engine trouble forced him to ditch beside a Danish steamer 1,400 miles out. The tide of luck was running in the Vimy's favour. Not only were its two chief rivals removed, but Raynham generously offered his airfield at Quidi Vici Lake for assembly and test flying. Within days, Alcock found a site at Lester's Field, just long enough for a fully loaded take-off.

By nightfall on June 8th, the field had been cleared and the Vimy was ready for flight – only 13 days after the first

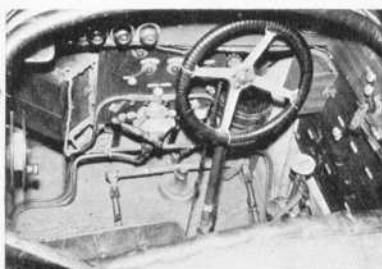
G.M.T. 5-20 C.C. 124 Dev var T.C
Alt Az Lat 47-52 Long 50
Alt Az Lat Long
Distance
El. Time by Obs by D.R. 104 G.S. m.p.h.
Track Des. Track 78 Diff Wind m.p.h.
T.C. 75 Var 30 Dev - C.C. 124 G.M.T.
A.S. 70 Height 1500 Temp
Engines (Port Temp 85 R.P.M. 1750 Oil
(Stbd Temp 85 R.P.M. 1750 Oil
Petrol Tank No Turned on at G.M.T. Flow

Remarks: Impossible to get observation of sun - between fog and high clouds. Started sending position when wireless generator seized and prop twisted off.

G.M.T. 6-20 C.C. 124 Dev var T.C 94 16.52
Alt Az Lat 47-52 Long 50
Alt Az Lat Long
Distance
El. Time by Obs by D.R. 120 G.S. 130 m.p.h.
Track Des. Track Diff Wind m.p.h.
T.C. 75 Var 30 Dev - C.C. 124 G.M.T.
A.S. 65 Height 2000 Temp
Engines (Port Temp 83 R.P.M. 1700 Oil 72
(Stbd Temp 83 R.P.M. 1700 Oil 72
Petrol Tank No Turned on at G.M.T. Flow

Remarks: Clouds down below, reading impossible at 6-5 Stbd engine extra prime burst.

Pages from
Brown's log



Left The cramped cockpit of the Vimy, shared for 16½ hours of flight by the two men. For the whole of that time, Alcock was never able to let go of the controls

crate was opened. When the V 1500 flew, overhead, Alcock thought Handley Page were ready for the attempt and sent a cable of good wishes, but in fact his rivals were beset by troubles. The next day, the Vimy flew from Quidi Vici to Lester's Field, and Alcock cabled Vickers: 'Machine absolutely tophole'. But again there were setbacks. The reserve fuel was found to be contaminated. Again Raynham came to the rescue, offering his own reserves. Then a near gale blew for 48 hours without pause. Temper weren't helped by a cable from Britain saying 'Weather perfect here please cable reason non-start'. (In that perfect English summer nobody seems to have considered that the weather might be different 2,000 miles away, and every entrant was maddened by cables like this).

Even Alcock's good humour deserted him and, when the V 1500 again flew over, everybody feared it might be off on its journey. It was another test but Alcock decided to fly the Vimy at once. Encouraged by the test, he and Brown decided to start as soon as possible. No sooner had they landed, though, than the weather deteriorated again. Next day, June 13th, Alcock had the Vimy fuelled in readiness despite cold, grey, windy conditions. As he watched the 865 gallons of petrol and 40 gallons of oil being filtered into the tanks and the water being boiled and filtered for the radiators, a shock absorber in the axle gave way. There was nothing for it but for the Vickers team to off-load the fuel and work through the night while pilot and navigator returned to their hotel. The wind dropped before dawn on June 14th. Alcock roused Brown and was halfway down the hall when his partner pointed out he could hardly fly the Atlantic in pyjamas!

When they reached the airfield at about 03.30 hrs local time, the Vimy was ready but the wind had risen. It blew gustily all morning while last-minute preparations went ahead. Brown clipped his sextant to the cockpit dashboard, stowed away coffee and sandwiches. Somebody remembered the black cat mascots, Twinkletoes and Lucky Jim. Lucky Jim was lashed behind Alcock's seat - Twinkletoes would travel tucked into Brown's flying jacket. One of the Vickers team surreptitiously nailed a horseshoe below the pilot's seat.

The wind was now blowing steadily east-west. Instead of using the slope to gather take-off speed, Alcock decided to go uphill, into the wind. Spectators helped to

manhandle the Vimy into position. Another setback: a fuel pipe broken by a tethering rope. Alcock and Brown snatched lunch, watching the crowd increasing. The wind had settled to a steady 30 mph. Quite casually, the two men clambered aboard the Vimy. Brown's walking stick and a bag containing 197 air-mail letters were handed up. There were good wishes from Newfoundland's Prime Minister, a sprig of white heather from a *Daily Mail* reporter. With 40-odd volunteers clinging to the wing and tail to hold the Vimy back until Alcock signalled, the engines were started. Alcock raised his hand, the helpers dropped on their faces - and the Vimy began to move.

It lifted slowly into the air at 16.13 hrs GMT. Seconds later, there was a gasp as the Vimy dropped out of sight below the hill. Then it reappeared, climbing out over St. John's at 1,000 ft over the waters of the Atlantic. For 45 minutes, all went smoothly. Then the Vimy entered a dense bank of fog. Half an hour later, Brown found the radio useless; the propeller of the wing-mounted dynamo had sheared. Alcock nursed the heavy machine above the fog, only to find unbroken cloud above. Brown urged him still higher, anxious for a sight on the sun before nightfall. Suddenly, the rhythm of the Rolls-Royce Eagles was shattered. Part of the starboard exhaust was splitting away with a deafening clatter. It melted away, leaving a tongue of flame which fortunately did not touch the fuselage - but the enging noise was so loud that all communication had to be by notes. Snatching a sketchy meal, they flew on for 4 hours through soaking cloud before, at about 6,000 ft, Brown got his precious fix. They were on course but, almost immediately, the clammy cloud claimed them again.

Midnight found the Vimy between layers of cloud at 6,000 ft. Again they climbed, breaking through after 15 minutes into shimmering moonlight. Standing in the cockpit, Brown got sights on Vega and the Pole Star. They were slightly south of his plotted course and halfway across the Atlantic. Alcock descended to 4,000 ft, just above the cloud surface. After three hours, it began to rain and - suddenly - the Vimy was plunged into an elemental storm. All sense of direction destroyed, Alcock fought to retain control. Abruptly, the Vimy stalled and tipped into a crazy spiral down towards the Atlantic. They were only 60 ft above the waves when they broke cloud. Instinctively, Alcock righted the aircraft. Then Brown looked at the compass: they were flying due west, back towards Newfoundland.

Back on course, they climbed through cloud again. Heavy rain gave way to hail, then snow. Sheathed in white, they ploughed on, Alcock needing all his strength to control the Vimy. For over 16 hours, his hands were never to leave the controls. At 8,800 ft Brown realised ice

Pages from Brown's log

G.M.T. 18.20.0 C. 120 Dev Var T.C. 13652m										M.T. 19.20.0 C. 120 Dev Var 23 T.C. 9714m 52m									
Alt	Az	Lat	Long	Dist	by Obs	by D.R.	G.S.	m.p.h	1.Time	Dist	by Obs	by D.R.	G.S.	m.p.h					
Alt	Az	Lat	Long	Dist	by Obs	by D.R.	G.S.	m.p.h	1.Time	Dist	by Obs	by D.R.	G.S.	m.p.h					
El. Time	36	Distance	270	G.S.	90	m.p.h			rack 77	Des. Track	Diff	Wind	m.p.h						
Track	Des. Track	Diff	Wind	m.p.h					.C	Var	Dev	C.C	G.M.T						
T.O	Var	Dev	C.C	G.M.T					.S	Height	Temp								
A.S	55	Height	9400	Temp					Engines	(Port	Temp	R.P.M	Oil						
Engines	(Stbd	Temp	R.P.M	Oil					Engines	(Stbd	Temp	R.P.M	Oil						
Petrol Tank No	Turned	on at G.M.T	Flow						Petrol Tank No	Turned	on at G.M.T	Flow							
Remarks :	Still in thick cloud and some snow. Planes covered with sleet and aileron hinge frozen																		
Remarks :	Remarks : Continued climbing. Still climbing. Thick clouds + sleet. Got sun at 19.30. D.R. shows 114 track.																		

was choking both the engine air intakes and fuel intake gauges. Despite his crippled leg, he climbed on to the wing to hack the ice from the port engine with a jack-knife. Then he struggled across to clear the starboard engine. Five times he had to repeat his hazardous work. About 07.20, still climbing with the aileron hinges jammed with ice, Brown at last got a sight. They were on course, within reach of Ireland: they could risk descending into warmer air. But now the starboard Eagle – choked with ice – began to backfire. Alcock cut both engines and glided down. Ice slid from the wings, freeing the ailerons. The cockpit was soaked in slush. The altimeter needle dropped past 1,000 ft – and still they were in cloud. They had barely 500 ft in hand when at last the clouds parted. Alcock immediately opened both throttles. The two Eagles fired perfectly. Their ordeal was almost over. At 08.15 they sighted the Irish coast. Ten minutes later they crossed it near the town of Clifden. There was no point in risking everything by flying on – the £10,000 prize was theirs once they landed.

But Fate had one last sour joke to play. The 'green grass' that Alcock chose for a landing proved – too late! – to be bog. The Vimy ended its epic flight with its nose in the mud.

From then on, though, it was a triumphal progress. At the Savoy on June 20th, John Alcock and Arthur Whitten Brown received their prize and the news that they were both to be knighted from Winston Churchill, then Secretary of State for war. 'Think of the broad Atlantic', said Churchill, 'that terrible waste of desolate waters, tossing in tumult in repeated and almost ceaseless storms, and shrouded with an unbroken canopy of mist. Across this waste, and through this obscurity, two human beings hurtling through the air, piercing the clouds and darkness, finding their unerring path in spite of every difficulty to their exact objective... arriving almost on schedule time... I really do not know what we should admire the most... their audacity, their determination, their skill, their science, their Vickers Vimy aeroplane, their Rolls-Royce engines, or their good fortune...'

In the end, certainly, good fortune had outweighed bad. Maybe Twinkletoes and Lucky Jim, the horseshoe and the white heather helped, but the balance was really held by the discipline and skills born of Service training. Not for another eight years was Lindbergh to emulate Alcock and Brown's flight. Not for another 20 years were commercial services to turn that 'terrible waste of desolate waters' into a mere herring-pond.

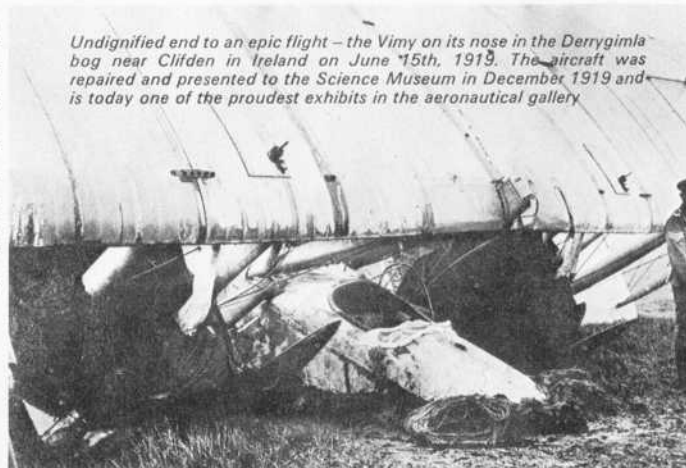
Before 1919 ended, Jack Alcock was dead – killed flying – and Brown had turned his back on aviation. It was a short-lived partnership but it had written, in 16 hours of flight, an undying chapter in the history of aviation. ©

Leaving Euston Station on their return, with vast crowds to greet them



Winston Churchill, Sec. of State for War, handing the Daily Mail's cheque for £10,000 to Alcock; he said that both men were to be knighted

G.M.T. 160 Dev	Var	T.C. 156	G.M.T. C.C.
Alt. 12	Lat. 10N	Long	Alt.
Alt. 12	Lat. 10N	Long	Alt.
El. Time	Distance	by D.R.	G.S.
Track	Dev. Track	Diff.	Wind
T.C. Var	Dev	C.C.	G.M.T.
A.S. 65	Height	~ 400	Temp
Engines (Port)	Temp	75	R.P.M. 1700
Engines (Stbd)	Temp	70	Oil
Petrol Tank No	Turned on at G.M.T.	Flow	Petrol Tank N
Remarks:	G.M.T. 15h 57m Flying time 16h 28m In sight of land Crossed coast at 8.25 a.m. civil time. Identified Clifden wireless, & landed at 8.40 a.m.		



Undignified end to an epic flight – the Vimy on its nose in the Derrygimla bog near Clifden in Ireland on June 15th, 1919. The aircraft was repaired and presented to the Science Museum in December 1919 and is today one of the proudest exhibits in the aeronautical gallery



UP, UP AND AWAY

The Air Sea Rescue Service of the Royal Air Force, operating Westland Whirlwinds rescued a total of 258 people during 1968 and over the period since its inception 1404 people.

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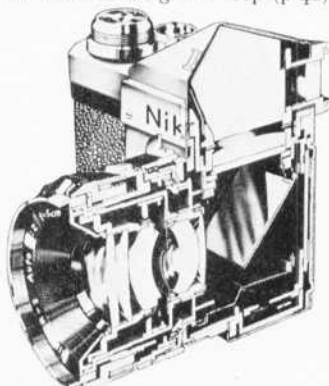
THE INCOMPARABLE NIKON F CAMERA SYSTEM

Left with 85-250 mm 14 telephoto zoom lens & F36 electric motor drive

Centre with standard 55 mm f1.2 lens and cordless flash unit

Right with rapidly interchangeable waist-level viewfinder fitted

The Editor hopes that the hundreds of readers who wrote asking for more colour photos will find their wishes adequately met in this edition. It is more than a coincidence that so many of this year's pictures were taken with Nikon cameras, and readers might like to know about these splendid instruments. Flt Sgt Terry Allen, the Falcons' photographer, used a Nikon F with 35 mm wide-angle lens and a motor drive unit that winds the film on after each exposure to take the fine shots on the following pages; with a battery power pack strapped to his arm, he need only press the switch to take four pics a sec. In the close-up below, the cable which runs to the shutter release in his left hand can be seen, leaving both arms free to control his fall (opposite). The historic and exclusive sequence of Concorde 002's first take-off at Filton on April 9th (p 63) was also taken by our staff photographer Arthur Gibson with an automatic camera making exposures every 1½ secs. Victor Blackman of the *Daily Express* used his Nikon F with 28 mm wide-angle lens at 1/500 sec to take the Red Arrows descending in a loop (p 48) which won him the best colour photograph award in the British Press Pictures 1968 Competition sponsored by the Rank Organisation. Blackman's camera, too, was fitted with the Nikon motor drive to provide a picture sequence, so that even at 450 mph and high 'G', one shot portrayed exactly the impression he wanted, to make a picture of surpassing excellence. Thus the automatic camera can practically guarantee a first-class single shot of a fast moving object – even for the non-professional – and a complete sequence not only has tremendous value in many fields from science to sport, but can make amateur photography far more fun. With a shutter speed of up to 1/1000 sec, it is an ideal camera for 'freezing' low-flying fast aircraft at RAF "At Home" days.



Section through 'Standard Model' F



The basic construction of the Nikon is shown on the right. The titanium foil multi-speed shutter can operate continuously under heavy loads such as are experienced during parachuting and aerobatics. Being a Single Lens Reflex camera, a pentaprism viewfinder shows the exact picture area, whichever lens is fitted, at maximum aperture, so that the brightest view is obtained for focusing and composing. The iris diaphragm is then closed automatically when the shutter is fired. An integral exposure meter, when fitted, also works through the fully open lens, and is thus adjusted automatically for filters and close-ups, with a completely unrestricted view of the subject until the instant of exposure; the meter even

compensates automatically for excess background light, with combinations of speed and aperture indicated by a needle seen through the viewfinder. Thus this finest of 35 mm cameras, used by most of the world's professional photographers, is also one of the simplest to use by the non-technical amateur who wants superb results.

Nikon are themselves one of the world's largest producers of optical glass – 230 varieties – and thus one of the few optical companies who make their own. Small wonder that their range of 30 interchangeable lenses – from a 7.5 mm f5.6 Fish-eye which takes an entire hemisphere to a 2,000 mm Mirror Reflex are amongst the world's finest. We understand Terry Allen intends taking some Free-fall shots with the Fish-eye lens, which we hope to reproduce next year. Besides all the lenses, there are 14 different focusing screens, four different viewfinders and other accessories, which is why the Nikon is described as a *camera system*, in the same way that a modern aircraft which can carry a variety of military stores (eg Buccaneer p 22) is known as a *weapons system*. The Editor uses a Nikon F with a standard 55 mm f1.2 lens both for aircraft shots and for close-up work such as copying diagrams and drawings for making up page layouts. For his architectural work, he uses the unique 35 mm f3.5 P C Nikkor in which the optical axis can be offset to avoid convergence in taking wide-angle shots of interiors where correct perspective is essential. Nikon cameras are handled in UK by Pullin Photographic, a Division of the Rank Organisation.



THE FALCONS

ROYAL AIR FORCE PARACHUTE DISPLAY TEAM

MAIN
PARACHUTE

RIPCORD

ALTIMETER
AND
STOP WATCH

RESERVE
PARACHUTE

SMOKE CANISTER



The Falcons display team is composed of instructors from No 1 Parachute Training School at Abingdon. Free falling, or sky diving as it is more popularly called, was introduced into the RAF in the 50s. A free-fall display team was formed in 1961 and named the Falcons in 1965. It has appeared at the Farnborough Air Show regularly since 1961 and has given displays throughout Europe and the Middle East, and also gave three highly successful displays at Abbotsford on the occasion of Canada's Centenary celebrations. The brilliant free-falling evolutions of the Falcons represent the peak of human parachuting technique, with operational applications as well as providing an exciting display spectacle.

FREE FALL PHOTOGRAPHY

The art of photography during free fall has taken many years and the experimental use of many different types of camera. To carry anything while falling through space needs much skill: full use of arms and legs is needed to control the body and prevent instability. Not until a fully automatic camera was used did results improve, and much ground work went into designing a suitable helmet to mount it, with the shutter switch in the left hand; the helmet and camera weigh 10 lb. Although weightless in free fall, a force of about 4G is experienced when the chute opens and the 120 mph descent becomes virtually nil in 2 secs. The air-to-air shots were taken by Flt Sgt Terry Allen (right) using a Nikon camera.



LEAVING THE AIRCRAFT

The green light goes on and the Falcons leap from their Argosy. The captain is in touch with the dropping zone party and gives the signal to go.







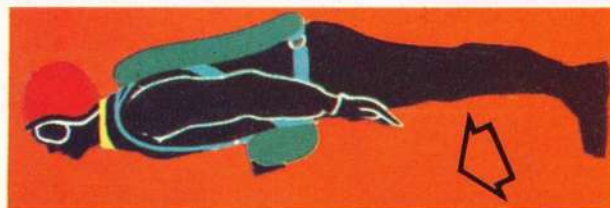
THE PARACHUTE

BASIC STABILITY

Basic stability means falling vertically through the air with the body parallel to the ground. This is achieved by spreading out the arms and legs and arching the back.

TRACKING

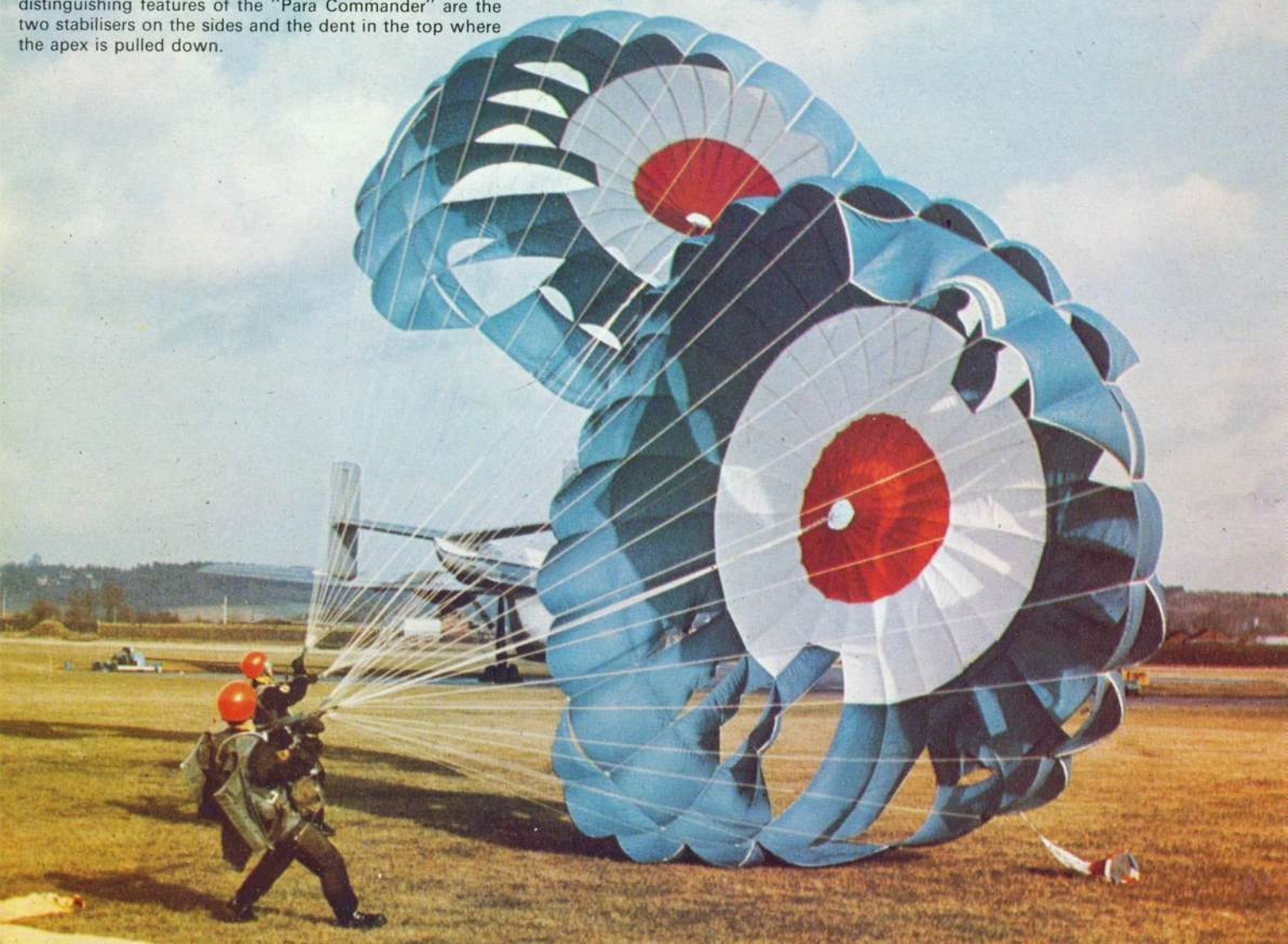
Tracking means falling through the air but also travelling across the ground. This is achieved by adopting an aerofoil position and deflecting the air diagonally. Arms are brought into the side of the body, feet are closed and the upper body is pushed forward.



*How
it's
done*

The Dropping Zone party have an important role to play in every display. The target is controlled by the Dropping Zone Safety Officer who is responsible for passing to the team leader in the aircraft the information essential for an accurate drop. Assisted by two parachute jumping instructors, he makes the necessary calculations regarding wind speed and direction from 12,000 ft. to the ground using a theodolite and hydrogen balloon. He also ensures that the appropriate ground signals are in position and confirms that it is safe for the team to begin their display at the specified time.

The Falcons use the "Para Commander" parachute. This is an unconventional canopy with the apex pulled down inside itself. The complicated series of holes and vents allows it to be guided through the air at 10—12 miles per hour, and it descends comparatively slowly. The most distinguishing features of the "Para Commander" are the two stabilisers on the sides and the dent in the top where the apex is pulled down.





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that makes him try
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Address _____

Date of Birth _____

G.C.E.'s not necessary. But if you have any (or equivalent)

please complete. I have _____ (number) O-Levels

including: English ☐

Maths ☐ Science subject ☐

(please tick)

I have _____ (number) A-Levels.

I have a degree in _____



Prize Winning
Competition Entry

*A Memory of
Malaya by
Flt Lt Jack Newbold*

Rogue Rocket

DURING THE MALAYAN COMMUNIST CAMPAIGN in 1954 I was Armament Officer in a fighter bomber squadron with the task of pouring cannon shells, rockets and bombs into local jungle bandit camps only 20 mins flying time from base. This made it possible for two aircraft to take off, attack and return quicker than our ground crews could re-arm them. So our normal ops pattern was spells of 10-14 days of over 30 sorties a day.

On the last day of one such op we had sent off more than 20 sorties before midday, and I was in my office when there was a loud explosion from the strip. I returned post haste to find that an armourer had connected up a high explosive rocket while his assistant was still testing the circuit. The rocket had fired, blowing off the armourer's arm and almost amputating that of the NCO in charge. I calculated that the rocket would land two miles away near a Chinese village and hoped fervently that it would blow off the 60 lb high explosive warhead without further damage.

Having despatched my Bomb Disposal NCO, Sgt Jim Mawhood and a Cpl to track down the errant rocket, I sent off the injured by ambulance to the emergency operating theatre and carried out the investigation of the aircraft myself. An hour later, I was reporting to my CO when I received a message from Sgt Mawhood: he had found the rocket, unexploded and embedded backwards under the stairs in a Chinese shop-house, in the middle of the village street. Although the thermal fuse had initiated, it had spun on entering the shop and failed to impact sufficiently to detonate the main charge: to date the only casualty at his end was a cat. He had tried to dig out the warhead, but further digging would bring down the stairs and any attempt to blow it in situ would demolish most of the street!

With a volunteer assistant, Flt Lt McEwan, I drove to the village with all speed, and there decided to try to drag the warhead out in the hope that it wouldn't explode. The Police and Fire Brigade evacuated the few people left in the village and we went to work, backing the van to within 15 yds of the shop. Sgt Mawhood and I then gingerly lashed a rope round the warhead and hitched it to the back bumper, having first taken it round a pillar so that the van was not directly in line if the thing blew.

Mac and the Cpl manned the van and the Sgt and I flattened ourselves against the wall round a corner whence we could direct operations. On our signal, the rope took the strain round the pillar . . . and snapped. The warhead

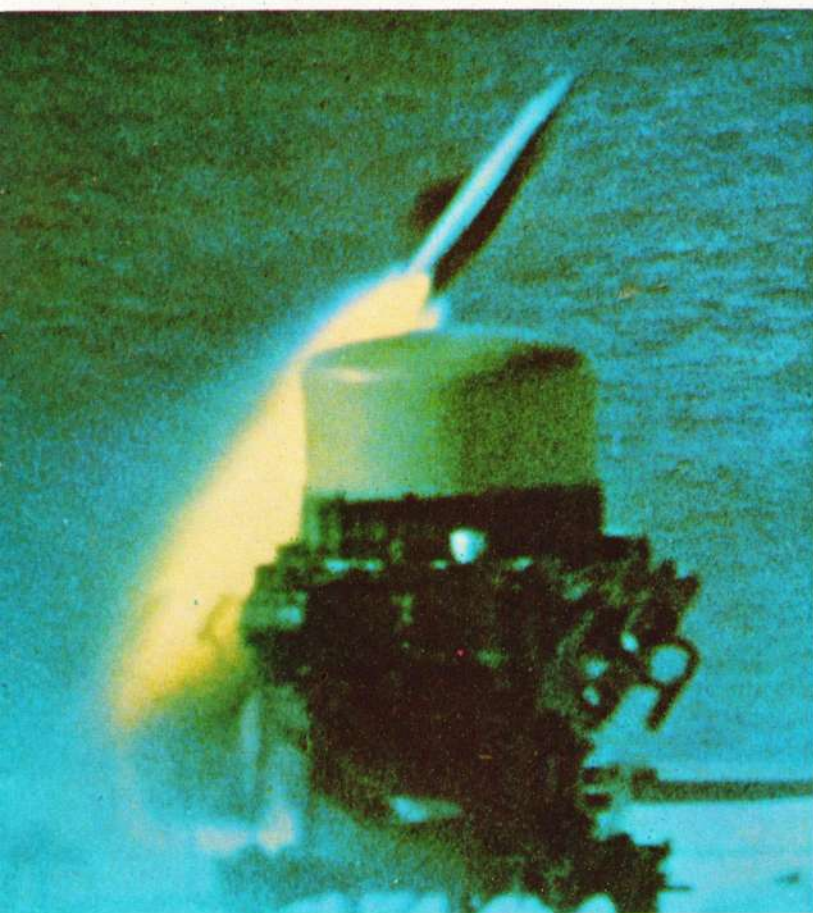
had not moved an inch. Rifling the deserted shops produced a coil of stout wire cable. We were having a second go when a car came hurtling down the dusty street. The District Commissioner had arrived to tell us that we must under no circumstances blow up the village or he would have a riot on his hands. I pointed to the taut cable, told him what was on the other end, and the car disappeared in an even greater hurry.

This time the cable held as the vehicle inched forward, and the warhead was on the move. But the fuse, already initiated, might blow the warhead if it hit an obstruction. We thought that if it fell into the monsoon drain outside the shop, this, being of solid concrete and about 3 ft deep, would sufficiently divert the blast to save the street at the expense of the drain itself. But the cable stopped before the warhead appeared and it was obviously stuck behind some obstruction. We couldn't risk a jerk or shock, so we signalled the van to ease off and the Sgt and I went in to see. There it was, fuse slightly bent, jammed neatly under a large sack of rice, and I was sorely tempted to stick a few lbs of demo explosive alongside it and another sack of rice on top and blow it and hope for the best.

At this point Jim Mawhood volunteered to carry it outside. I put it to him that he had more children and less pension than I, and I would rather do the carrying than explain later. I eased the sack of rice away carefully and picked up the offending article like a small but very heavy baby. We felt it would be tempting providence to transport it by van, so I set off to carry it out of the village. With 100° in the shade, and no shade anyway, Jim Mawhood and I alternatively carried the 60 lb warhead about a quarter mile to a palm grove. There, we all dug a neat little grave and interred it with demolition explosive and detonator, ran out our cable and retired to a safe distance. I depressed the dynamo exploder and there was a thunderous bang, a cloud of smoke and earth shooting upwards and finally, pieces of palm tree coming downwards. I remember thinking that if the aircraft it left so suddenly had been turned 2° more to port, it would have landed just about where we interred it.

The Police came back, the Fire Brigade came back, the DC came back, and the deserted village came to life. We looked at each other, dirty, soaked with sweat and out of fags. The Cpl solemnly produced 4 twenty packs from inside his shirt. 'From the shop', he said 'Seemed a shame to let 'em all be blown up'. ©

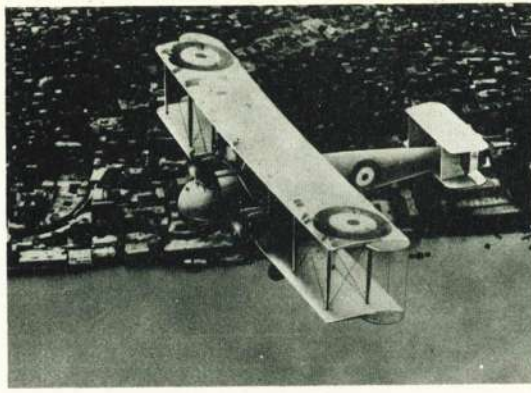
*Once the need was simply
to arm an aeroplane
to intercept other
70 mph aeroplanes . . .*



*. . . today it is to destroy
low-level attackers
flying at supersonic speeds*

BRITISH AIRCRAFT CORPORATION





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150 miles at 120 mph . . .*



*. . . today it is to fly 150 fully equipped soldiers
halfway across the world in a dozen hours*

*Once the need was to police remote frontiers
against the uprisings of primitive tribes...*



*... today it is to protect the heart of our world
against the most sophisticated weapons of war*

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*Once the need was to
defend the shores
of our country . . .*



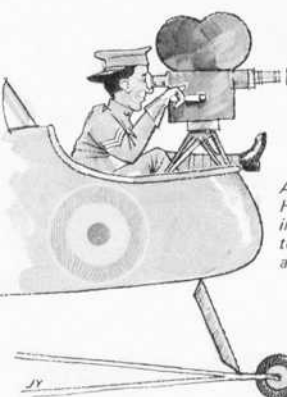
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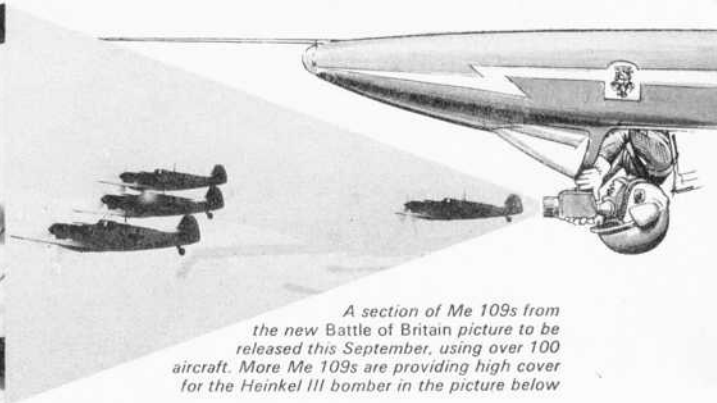
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Written by Tom Hutchinson
Researched by Jill Adams



An exciting dog-fight from Howard Hughes' *Hell's Angels*, made in 1930, which cost \$4,000,000 and five lives to make. Using 54 planes, it has always been acclaimed the flying film to end all flying films



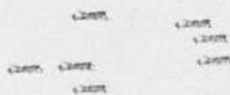
A section of Me 109s from the new *Battle of Britain* picture to be released this September, using over 100 aircraft. More Me 109s are providing high cover for the Heinkel III bomber in the picture below

AIR FILMS - a brief history

IF YOU SEE THE CINEMA AS A MIRROR (sometimes a distorting one!) of the Air Century, it's astonishing that so few films about flying have achieved real distinction. Considering the way flight has propelled the literary muse upwards from Parnassus via such talents as the luminous Antoine de St Exupery or the grievous Richard Hillary, Film has treated its heroes of the upper air with sad disregard. Yet there is, you'd think, everything there for the cinema—speed, peril, the dramatic thrill of watching man-and-machine slice through in the air in spectacular movement.

But after being involved with the making of *The Battle of Britain*, I can see why there are so few really good aerial films . . . and why those few have their spare footage of celluloid cannibalised to make others; the difficulties of making films about planes and the men who inhabit them are enormous. The cost and practical problems of getting aerial hardware aloft to pose and posture to suit the story are so enormous that the sky-minded film-maker often comes down to earth with a bump—and chooses a land-battle to film. Or, if he does go ahead, the prohibitive price means setting the major part of his story on the ground and, as with the recent, marvellous *The Blue Max*, he then gets bogged down in a story which is far less believable than the aerial antics. Scale models, of course, are one way out—and tell me one aerial film that hasn't succumbed to the temptation?—but most producers see a model as a symptom of defeat. An Odeon-reared public knows a model when it sees one for more than ten seconds. And, rightly, it feels cheated.

Producers Harry Saltzman and S Benjamin Fisz (both wartime airmen) saw those difficulties and determined to overcome them all in *The Battle of Britain*, which will get its premiere on Battle of Britain Day (Sept 15) this year. It took a vast amount of research and know-how, plus the



amassing of 'the world's 35th largest air force', about which more later. But let us first look at earlier flying films and how they have developed from the primitive *Wings* of 1927 (the first air film about WW 1) to the sophisticated camera techniques used in *The Battle of Britain*.

Wings was directed by William Wellman, an airman who later made several films against an aviation background. He met the basic difficulty of convincing an audience that they are seeing reality (and not rather skilful models) by having camera mounts welded over engines and behind rear cockpits, to convince the audience it was flying in single-cockpit planes. In fact there were two cockpits, with a camera shooting over the real pilot's head. Other cameras were mounted on the wings and under-carriage. It cost a lot of money, but its success generated a great spin-off of such movies, though not all of the same high-flying standard. Some of their titles tell their own story: *Hard Boiled Haggarty*, *Dog of the Regiment*, *Now We're in the Air*, *The Lone Eagle*, *Captain Swagger*. And in 1928,

Wellman made *The Legion of the Condemned* from negative he hadn't used in *Wings*.

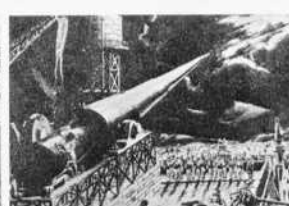
One of the best of these films was *The Dawn Patrol* (1930) directed by Howard Hawks, a man of considerable talent, but whose studio had so little faith in the picture that it was inserted quietly into cinemas without even a premiere. But it stands up today as a very exciting film. Hawks used only a few original Nieupoorts, and mostly dressed-up more modern planes for his purpose, but the flight sequences were good enough for a re-make 8 years later when it starred Errol Flynn, Basil Rathbone and David Niven.

In 1930 appeared a flying film which hitherto has been considered the flying film to end all flying films, *Hell's Angels*. It cost \$4,000,000—and five lives, one when the German Gotha was put into a tail-spin by stunt-pilot Al Wilson. A mechanic was to throw out lamp-black to simulate the bomber being hit and going down, but Wilson couldn't recover from the spin. He shouted for the mechanic to jump and himself parachuted, but the mechanic went into the ground with the plane. *Hell's Angels*, starring Ben Lyon and Jean Harlow, was directed by the billionaire-recluse Howard Hughes, an aviation enthusiast. Harry Perry was director of photography and worked on the film for two years. Amongst some remarkable shots with a 'circus' of pilots whom Hughes recruited, is the classic of a cloud-massed sky with a geometrically-precise formation of Allied planes approaching. The camera then swings to an armada of Fokker D 7s before a close-up of the leader reveals the ominous words below the cockpit rim: Von Richtofen.

It was shots like this which caused *The Times* to comment '... it bears every evidence of being, not a studio fake, but a record of genuine flying ... the sky is wonderfully slashed and patterned with machines; the illusion of peril is complete ... a spectacle which in speed and scope and daring has no equal on the screen.' To achieve this Hughes used 54 real planes, a number which has only now been surpassed—*The Battle of Britain* has over 100. But *Hell's Angels* was a fantastic landmark in flying films and its success sparked off a score or so of lesser films determined to live off the fat of its fame, a lot of them using left-over footage from *Hell's Angels*. Howard Hughes himself did so with *Cock of the Air* and *Sky Devils*; he had shot miles of aerial negative, and when you're a billionaire you don't waste a thing!

The impetus for most aerial films seems to have come from America, but the first 'high-flying' film was French. That was *Voyage Dans La Lune*, an animated burlesque of Jules Verne's story by the French master, George Melies, but not until the late 30s did Britain begin to display its 'wings' and then with no great distinction. Not until wartime could we boast any real filmic medals with a movie such as *Target for Tonight*. Then, after the war there were titles such as *Angels One Five*, *The Sound Barrier*, *The Blue Max*, and *633 Squadron* to stimulate the public with their shots of aircraft in action. And it's interesting to note how the names of technicians keep cropping up in these films, adventurous specialists in photographing this kind of thrill in the air. Aerial unit director Tony Squire (eg) created the exciting air-to-air material in *The Sound Barrier* as well as *The Blue Max*, on





Above Left The first 'high-flying film was French, an animated burlesque of Jules Verne's famous story 'Voyage to the Moon' by George Melies Above A Mosquito crashes on landing at its home base and bursts into flames in the exciting United Artists film 633 Squadron—about a wartime bombing raid

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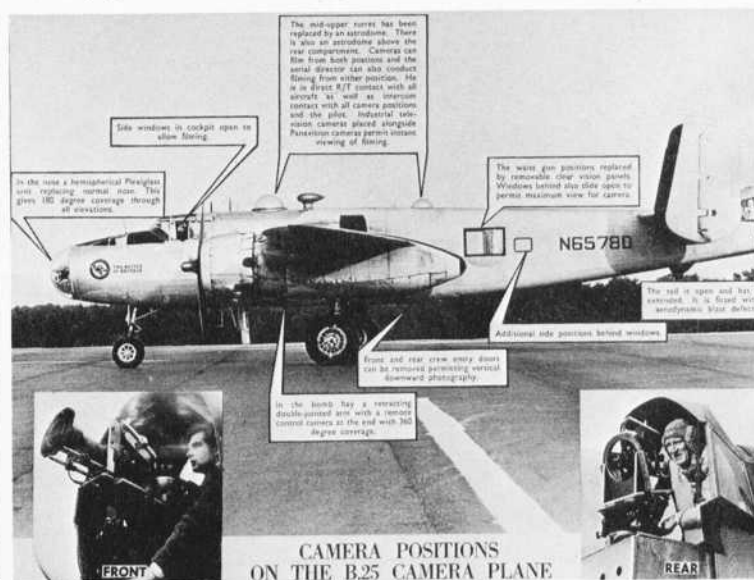
which aerial cameraman Skeets Kelly worked before photographing *Those Magnificent Men in Their Flying Machines* (which did for vintage aeroplanes what *Genevieve* did for vintage cars). Kelly admits that something gets in the blood on this sort of film, because he and John Jordan were the aerial cameramen on *The Battle of Britain*.

How will *The Battle of Britain* compare with these earlier films? Guy Hamilton, the director, said early on: 'You know, sometimes I think it would be simpler and cheaper just to declare war on Germany and film selected bits from the resultant chaos.' (In the event, it cost some £5,000,000.) His organisation has been a remarkable feat, and if *Hell's Angels* acquired a sheaf of statistics then *The Battle of Britain* has a whole wheatfield! It took three years of research and preparation to ensure its authenticity. Five separate film units were working on the film at one time, recording different facets of this intense battle, which actually lasted for 16 weeks; the filming took a lot longer. Gp Capt Hamish Mahaddie, succeeded, after months of wheedling and bargaining, in collecting a remarkable total of over 100 Spitfires, Hurricanes, Messerschmitts, Heinkels and Stukas together at Henlow airfield, at a cost exceeding £100,000. He was in Syria when two young officers, suspecting his interest in aircraft parts, drew guns on him, and he had to talk fast, but sometimes his job was easier, as when the RCAF ferried over a Spitfire.

Producer Saltzman, who helped bring superman James Bond to the screen, wanted no gaudy Bond-type wrapping paper to cover up the facts, so the film is based on the brilliantly-documented book, *The Narrow Margin* by Derek Wood and Derek Dempster, and on historical records provided by MoD and the RAF, and former senior officers of the Luftwaffe have co-operated with research and advice. Wg Cdr Robert Stanford Tuck, a Battle of Britain ace, and Gen Adolf Galland, former head of the Luftwaffe, were brought in as tactical advisers to give their different viewpoints on the Battle.

More than 100 planes seems a remarkable number, but, of course, unless very well photographed, the enormous kennel of dogfights that made up the Battle could look very tame indeed. To that end a B 25 Mitchell bomber was converted into a 'flying platform' so that flying sequences could be photographed air-to-air with no loss of reality or excitement. A hemispherical optical Plexiglass nose was installed so that the camera could cover 210° without distortion: clear vision camera positions were fitted along the body, and in the bomb-bay, a retracting double-jointed arm with a remote-control camera to cover 360°. The owner and pilot of the flying platform is John R Hawke, considered by many to have assumed the mantle of the late aerial film pioneer Paul Mantz, who crashed to death while on the last day of shooting *The Flight of the Phoenix*. An Englishman, now living in Florida, Hawke has worked on many films and is well aware of the dangers inherent in his chosen profession, but says that to him it's no more

The 'Flying Platform' used for shooting aerial combats in The Battle of Britain

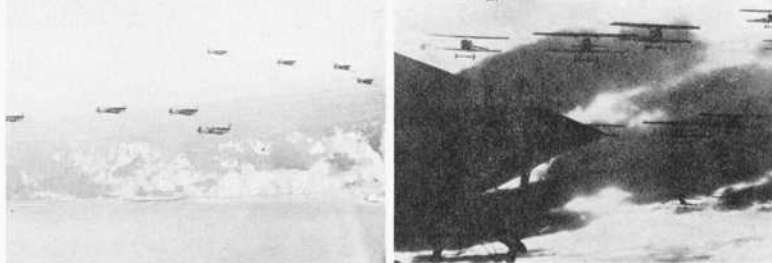




Above Fighter 'Scrambles' from two films about 'The Few'. Angels One Five (l) and The Battle of Britain (r) The airfield attack is also from the latter. Below Note the similarity of these scenes from Wings (r), the first WWI air film (1927), and the others from the recent The Blue Max—20th Century Fox

dangerous than taxi-driving. Director Guy Hamilton disagrees. 'John was fabulous to work with' he said. 'The things he could do with that B 25 were amazing. He could almost bring the thing to a grinding halt in mid-air so that we could get close-ups of the pilots. He's one of the big reasons why the film will look so realistic'. An ex-Naval type, Hamilton was on torpedo boats during the war. He determined that not one inch of newsreel material be used, which meant that the whole Battle had to be re-created in Panavision and Technicolor.

The stars of the film have already been much written about . . . Harry Andrews, Michael Caine, Trevor Howard, Curt Jurgens, Ian McShane, Kenneth More, Nigel Patrick, Christopher Plummer, Sir Michael Redgrave, Sir Ralph Richardson, Robert Shaw, Patrick Wymark and Susannah York, and Sir Laurence Olivier in one of the most challenging roles of his career—that of Air Chief Marshal Sir Hugh Dowding, Fight Command's C-in-C during the Battle. But the super-star of the film is the story itself. Its plot differs from all others in that it needs no overlay of superficial tension to move it along and entertain the audience; it has an inherent dynamism that rejects false heroics. *The Battle of Britain* re-creates, with integrity and realism, a set of unique and vital circumstances already embedded in the fabric of Britain's history. It is a truth which must not be distorted or damaged. And after three years close association with the film, I know that this attempted truth will be honest and well worthy of the episode it celebrates. For generations, I prophesy that *The Battle of Britain* will be regarded with the kind of awe with which *Hell's Angels* is seen today, and in the history of air films it will undoubtedly be unique. ©



Me 109s near Dover in The Battle of Britain

A large formation from the 1927 film Wings



From The Battle of Britain
Hein Riess plays Goering
Sir Laurence Olivier plays
ACM Dowding, C-in-C
Fighter Command and Trevor
Howard A V-M Park,
AOC No 11 Group



One of Hell's Angels on his enemy's tail



A Heinkel limps home in The Battle of Britain



Gen Milch inspects a Heinkel line-up before the Battle

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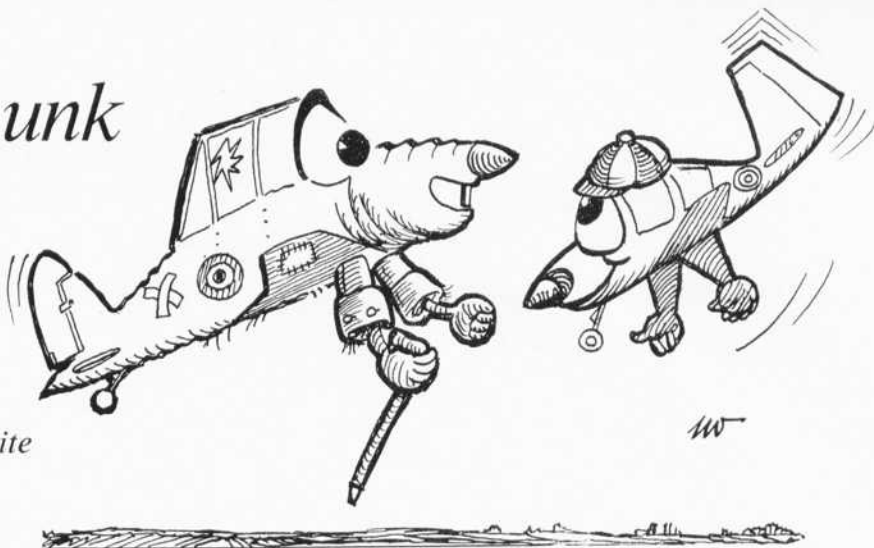
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helps you to plan

The Chipmunk Saga

by

Sqn Ldr Jonklaas

Cartoon by Jack White



"You are old, Mother Chipmunk," the young Pup said,
"And there's one thing that does me intrigue;
How you carry on spinning, to the left and the right.
Does it not cause you over-fatigue?"

"In my youth," said the crone, "when my main
spar was new,
Fatigue used to cause quite a scare.
Now I double my fatigue life time after time
So I always have something to spare."

"You are old, Mother Chipmunk," the young Pup said,
"And your available radio aids slim.
Yet your limited frequencies don't cramp your style
And you wander around at your whim."

"In my youth," said the crone, "it worried me sick,
As I dodged all those airways and cloud.
But now I keep tuned to 'Distress' all the time
And yell 'May Day'—three times—very loud."

"You have an old engine," the young Pup sneered,
"That cuts out with negative G.
Yet you do a slow roll whenever you please.
Seems like asking for trouble to me!"

"Since my youth," said the crone as she rolled
once again,
"I've had just a touch of a cough.
Now they call it some fancy name—'rich out' I think,
But it doesn't put my pilots off."

"You are old, Mother Chipmunk," the young Pup said,
"And it's high time I took your place.
You are tandem; and slow; and don't climb all that well;
You must surely be slipping from grace."

"In my youth," said the crone, as her engine coughed
twice,
"I was thought of as a real little honey.
And you don't stand a chance of stepping into
my wheels
Because the Air Force has run out of money."



Crucifixion

Bright as a sword against the blue
Vault of the sky, the bomber shone,
Symbol of death it sprang to view,
Hovered a moment and was gone.

Straining my eyes across the skies
They fell upon the church below,
Where the worn stone Crusader lies,
Who died for Christ so long ago.

Must Man be crucified again
Upon the wings of some lone 'plane,
As, years ago, in Palestine,
Before he can new Faith design?

by M H Hunt

Breakfast

His place was laid,
The messroom clock struck eight,
The sun shone through the window
On his chair.
No one commented on his fate,
Save for a headshake here and there,
Only old George, who'd seen him die,
Spinning against the Autumn sky,
Leaned forward and turned down his plate.

And, as he did, the sunlight fled,
As though the sky he loved so
Mourned her dead . . .



Robert R. Rodwell of 'FLIGHT'

FLYING AT FARNBOROUGH WITH THE RED ARROWS

Even the start-up was a carefully timed co-ordinated drill and the two-by-two taxiing a choreographer's delight. Then we had the runway before us—leader Sqn. Ldr. Raynham Hanna heading the forward vic of five, my pilot in No 6 leading 7, 8 and 9 in a finger four to rear. "Reds, rolling—go" the leader said. And so, with 95 per cent power, we went.

Once airborne we joined up into Diamond Nine formation and held height for a short while, awaiting the moment for the opening low-run in from behind the crowd "Let's go down and see what the bumps are like". A wingover to port to kill some of the remaining time; "Run in in one minute", from the tower; then "All Clear".

"We're going to make this a hard pull initially", the leader said; and instants later we were flashing over the candy-stripe tents at 330kt. "The wind is about the same as yesterday". It seemed almost too casual. The heavy hand of g came on and we were going into a loop. "Back five, smoke—go", the g came off; all of Farnborough was 4,000 ft. above, or below, our heads, depending on one's viewpoint, and we were diving on it, into already shredding rags of smoke. We had begun in delta and we emerged in diamond nine, bending away from the crowd at 280kt for a wingover to starboard. Then we were rolling, still in diamond nine, the front five smoking, travelling fast towards Laffan's Plain. Another starboard wingover followed, with 200kt at the top.

"Draken—go" and outboard partners disappeared. We were heading at 45° toward the crowd, pulling up into a Draken loop, using coloured smoke—red to port, blue to starboard. At the top of the loop yet another formation change, to Cutlass. We were bending past the crowd again, still in Cutlass, trailing back-end smoke, through 360°—a long hard grind for the wingmen. Hanna's quiet call again—"Tightening". A small cluster of shadows chased us some way across the grass around the turn, and we were pulling up into a loop on a 45° line away from the crowd. We hit 4g on this one and the formation changed at the top back into diamond nine. For a second or so Hanna's aircraft hung, apparently motionless a few feet ahead before Farnborough rushed at us. Recovery, out on the same line, and into a starboard wingover, and "Arrow—go" half-way through.

The wingmen provided colour and we in 6 turned on the white. Entering the roll at 280kt we topped it at 200kt. Low-g periods now seemed to be sweet relief, so much so that while enjoying an apparently weightless spell I was surprised to see the g meter registering nearly +2.

A big wingover follows. Two formation changes are made within its quite short span. First big nine, with 8 and 9 right out to the wings. "Tightening", followed by "Vixen—go". We move sideways, past the deputy leader at 3° to tuck in tight behind 5; No 7 moves to starboard, thus forming the Vixen's other "boom" and being seen by us for the first time. We are heading for the president's tent (ground datum) and pulling into a loop again.

This is the split loop, completed by a box five with 6 and 8 and 7 and 9 shearing off in pairs. We climb and enjoy a pleasant spell of minus $\frac{1}{2}$ g as we round out and dive to twinkle-roll as a pair in opposition to 7 and 9. This is the beginning of the "synchro stuff"—we close with the other

King's Cross formation.



**No matter
where it happens...**



Photograph by Express cameraman VICTOR BLACKMAN

**the
DAILY EXPRESS
is there**



pair at about 800kt as they hurtle up from Laffan's Plain. A blur of aircraft and crowd, tents and, at datum, a snap roll at about 400kt as we pass each other. It's a short-lived manoeuvre with a roll rate approaching 400°/sec. Somebody says "Very nice", and we are hauling around Laffan's Plain, hitting five g again, while the front five roll in cross formation from the crowd's left to right. We are pulling round in a very tight and rather bumpy turn. It seems horribly close to the ground even if it is above the Farnborough minimum height limit of 100 ft.

We run in from Laffan's Plain at about 330kt for a four-point hesitation roll in opposition to No 7. On these passes No 6 sets up the datum and it's 7's job to avoid collision. A momentary thought that it is a strange thing to hang inverted not far above what is, after all, a trade fair, travelling at over 300kt the while—and we are rolling out, 7's smoke trail passing sideways over the canopy.

We exited the stage in a wide turn which gave us a distant sight of the front five in a line-abreast loop and going into vic formation while diving. Somewhere we had acquired 8 again and 7, too, has been joined by 9. In pairs we ran in over the north-west side, pulled up into opposing loops, half-rolled through 90° at the top.

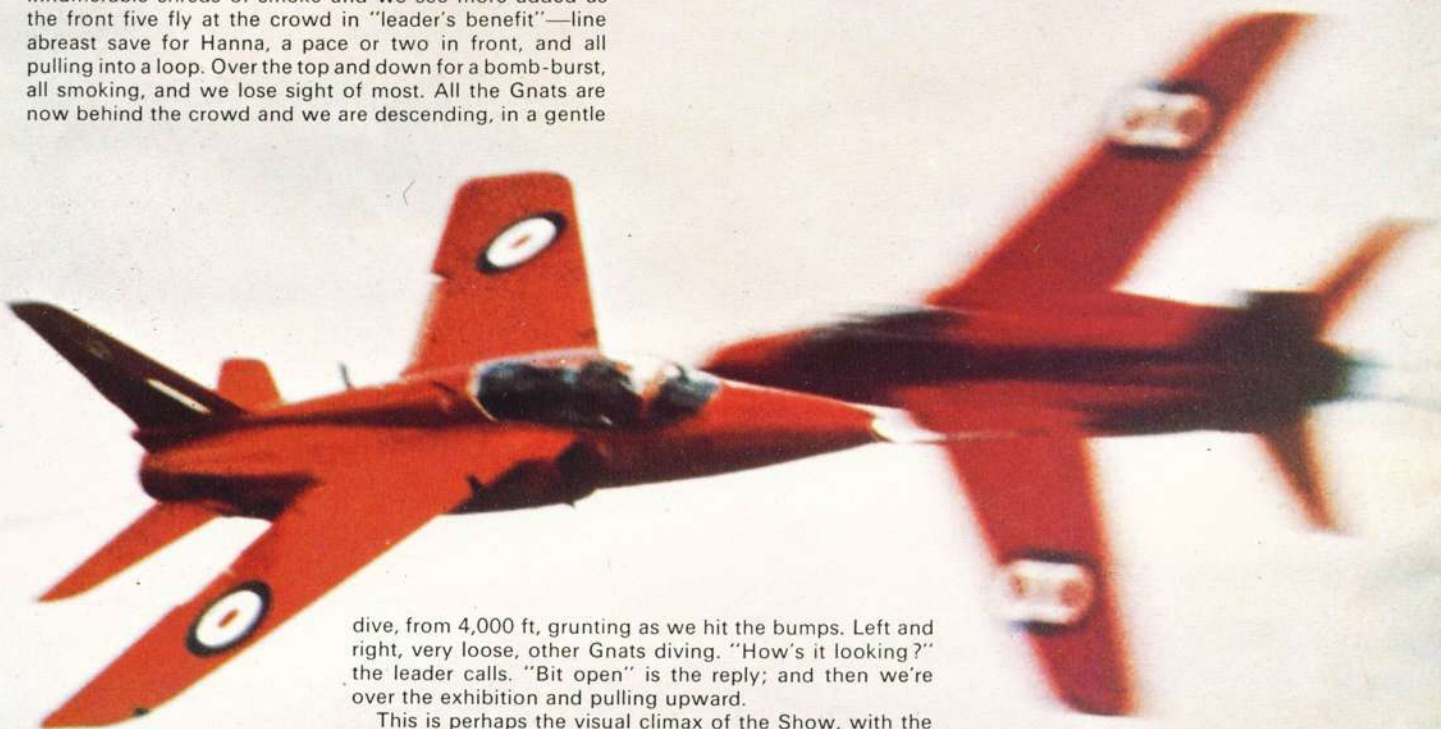
For the front five these are crowded seconds. Following a wide wingover to port in "exploded arrow" they are running from crowd left to right at 400kt for the celebrated twinkle roll. They open the formation slightly for this manoeuvre, having about two seconds to stabilise their speeds and position before the twinkle, running off the trim and ensuring that they are pulling no g before they roll, which would cause them to barrel. It's a particularly hardworking moment for the wing men. This time an added complication, with Hanna calling "Anyone get a bird strike?" as they hit a flock near the decision point. No affirmative, so—twinkle.

We are running in over from behind the crowd with 7 tucked in close astern; pull up, split left and right and once again 5g comes on as we cleave around the bend beyond the black sheds to make the Roulette pass, pull up to roll left and loiter behind the crowd. Over the airfield now are innumerable shreds of smoke and we see more added as the front five fly at the crowd in "leader's benefit"—line abreast save for Hanna, a pace or two in front, and all pulling into a loop. Over the top and down for a bomb-burst, all smoking, and we lose sight of most. All the Gnats are now behind the crowd and we are descending, in a gentle



HAWKER SIDDELEY GNAT T. MK. 1

*Wing span, 24 ft.; length, 31 ft. 9 ins.; height, 9 ft. 7½ ins.
Maximum speed (with under-wing tanks), Mach 0.91 (approx. 600 m.p.h.);
maximum speed in shallow dive, Mach 1.15 (approx. 760 m.p.h.).*



dive, from 4,000 ft, grunting as we hit the bumps. Left and right, very loose, other Gnats diving. "How's it looking?" the leader calls. "Bit open" is the reply; and then we're over the exhibition and pulling upward.

This is perhaps the visual climax of the Show, with the tricky join-up loop. We close again with Hanna's jetpipe—a shade too closely for a heart-stopping second or so as we approach the top. We are on our backs, Farnborough 4,000 ft. below, cemented back into that old diamond nine again. Out of the loop Hanna calls "Bending" on the recovery, for a wide formation turn to the north, for the final pass in "big 9" broad arrow. Up to the final loop, over the top, bomb-burst and landing.

EARLY PIONEERS AT HENDON

Wg Cdr E J Baker

HENDON'S FIRST LINK WITH AVIATION (then called *aerostation*) was a balloon flight in 1862 by Henry Coxwell and James Glaisher, a scientist, in order to make scientific observations for the British Association. Their specially-made balloon *The Mammoth* had an envelope of American cloth, of 93,000 cu ft capacity inflated with coal gas, and carried a basket car fitted with 20 instruments. Glaisher's comprehensive observations made an invaluable contribution to the new science of meteorology. On 25 Aug 1862 they ascended from Mill Hill and 6½ hrs later descended at Biggleswade, having reached a height of 3 miles. 8 days later, flying from Wolverhampton, they reached a height of about 7 miles, (Glaisher losing consciousness at 29,000 ft), a world record unbeaten until 1901.

Coxwell's flying career lasted 41 years, including over 1,000 ascents. In 1845, he had published (using the pseudonym *Wells*) the first British aviation periodical *The Balloon and Aerostatic Magazine* and was always an enthusiastic advocate of the military and scientific uses of balloons. In Germany during 1848 he demonstrated how explosive bombs could be dropped. However, his pamphlet *Balloons in Warfare* failed to obtain military recognition until 1863 when, with two RE officers, he undertook the first official British Army experimental flight. During the 1870 Franco-Prussian War, Germany asked him to help form the first German Balloon Corps. Glaisher's flying career lasted only 5 years, and apart from being the Father of Meteorology, he was a founder member in 1866 of the Royal Aeronautical Society, in which he played a leading role for 30 years. Unlike Coxwell, he believed that balloons had serious limitations, being impossible to steer, and the future lay with mechanically propelled airships.

By the turn of the century, ballooning had become popular at the recreational centre of Welsh Harp, where in 1902, one such flight was made by Frank Hedges Butler, his daughter Vera and Percival Spencer. From Hendon they drifted over London, photographing Buckingham Palace, before landing in Kent. Hedges Butler and his daughter, with the Hon C S Rolls (of Rolls-Royce fame) were the founder members of the Royal Aero Club, which they decided upon during a flight from Crystal Palace in 1901.

Six years later, the aeroplane had arrived, creating a different interest at Welsh Harp. By then the Wright brothers in America had achieved heavier-than-air flight under power (17 Dec 1903). Throughout the 19th century men had been experimenting with gliders and trying to achieve powered flight, and news of the Wright's achievement was slow to reach and be accepted by the rest of the world. Meantime, others were carrying out similar

experiments. Henri Farman, an Englishman who lived in France, in Jan 1908 flew a Voisin biplane on a circular kilometre circuit to win a 50,000 francs prize. Earlier, others had flown in a straight line but it was an inability to steer and turn that had hitherto been the problem.

By this time, all over Britain there were enthusiasts attempting to build aeroplanes; two such were H P Martin and George Handasyde, whose first machine, a monoplane powered by a Beeston Humber 12 hp car engine, was built in an old ballroom at Welsh Harp in 1908. Unfortunately, during ground testing the engine fell off, but their partnership was to enjoy better fortune with later aircraft. Another aircraft designed at Hendon by E I Everett, a local instrument maker, was another tractor monoplane powered by a 35 hp JAP engine. During its trials in 1910, it only succeeded in making short hops and became known as 'The Grasshopper'. Although not a flying success, it is of particular interest, first because a young man who helped build it later formed a major British aircraft company, Fairey Aviation . . . this was C R Fairey's first job in aviation. Secondly, the machine was constructed in a shed specially erected in one of the then many fields of Hendon, the start of the present RAF Station.

1909 was an important year for aviation, the Wright brothers 1908 visit having inspired European aviators to better things: Farman was the established leader of Europe's flying and building his own machines, Cody made the first flight in England; Louis Bleriot flew the Channel first to win the *Daily Mail* £1,000 prize and started building aircraft in quantity. The first international aviation meeting was held at Rheims, followed by British meetings at Blackpool and Doncaster. Shellbeach on the Isle of Sheppey became the country's first major centre of flying, followed by Brooklands, yet despite this activity, there were only two British aircraft which had really flown, Cody's and one built by the Short brothers . . . most British pilots learned to fly in France on French machines.

Amongst them was Claude Grahame-White: he went to the Rheims meeting and stayed for 4 months. He arranged to purchase Bleriot's latest machine as soon as the meeting was completed, only to see its designer crash it in a

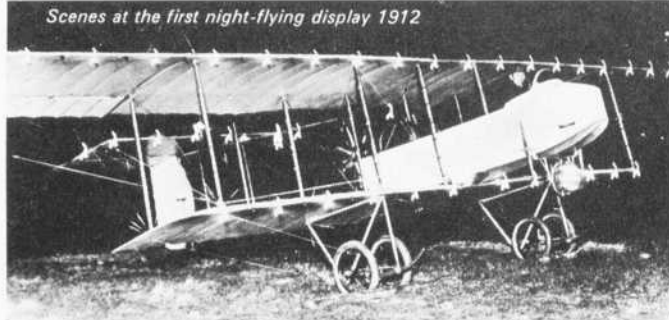


Claude Grahame-White with Lord Trenchard at Hendon in 1951



The very beginning of RAF Hendon—Everett's shed in April 1910

Scenes at the first night-flying display 1912



contest with the American, Glen Curtiss. Undaunted, he persuaded Bleriot to sell him the next aircraft to be built and, into the bargain, to allow him to assist with its building. After 8 weeks the machine was completed and the next morning, without the usual help of six mechanics, Grahame-White was flying his new machine, not having had one minute's tuition. The French Press hailed him as a hero. By the end of 1909, he had decided to establish the first British flying school, initially at Pau in France, but as soon as possible to be transferred to England. After searching the London suburbs for a week, he decided that the fields of Hendon would be the future home of his school, and took an option to purchase.

Grahame-White was determined that his first aviation business venture in England should be a success. Unlike the French, the British public was little interested in flying, and he realised it would take something outstanding to stir the imagination of a country so apathetic. Several years earlier, the *Daily Mail* had offered £10,000 for the first flight from London and Manchester, a distance of 185 miles. If a British pilot won this prize, he thought, the country might become enthusiastic, so he registered his entry and ordered the latest Farman, which was delivered in April 1910 and assembled at Park Royal. Farman came personally to inspect the aircraft, bringing the news that a French pilot, Louis Paulham, had just made a record flight and been persuaded to try for the *Daily Mail* prize. By day-break on 23 April, Grahame-White was heading towards Manchester, but after 3 hrs was forced to land with engine trouble. Even after repairs, bad weather prevented take-off; but Manchester was only 68 miles off and the rules allowed another 20 hours. Sadly, the weather worsened and the wind capsized and damaged the aircraft so badly that it had to be returned to London for rebuilding.

As Grahame-White returned, Paulham arrived in London, taking over Everett's shed at Hendon to assemble his Farman. By 5.20 pm on April 27 Paulham was heading north; an hour later this news reached Grahame-White and he took off in chase. By nightfall both had landed, with Paulham 67 m ahead and 56 m from Manchester. Grahame-White was so desperate that he

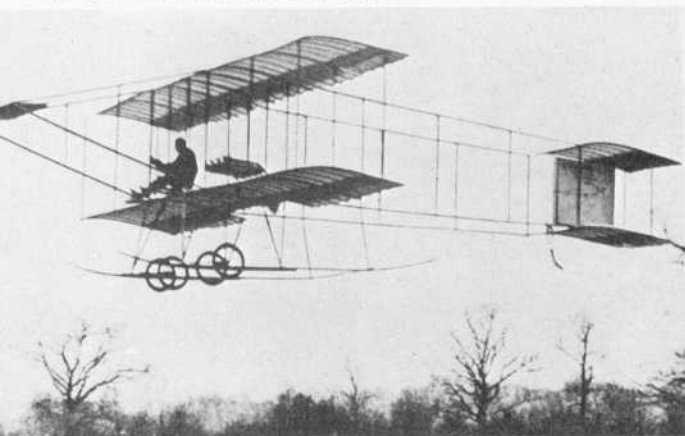
decided to fly during the night, a feat then unknown, but within 10 miles of Paulham, he was again forced to land with engine trouble, and 3 mins later, Paulham flew on to win the contest, although Grahame-White, the loser, had become a national hero. Strangely enough, Louis Bleriot first opened up Hendon, by erecting 8 new hangars in Oct 1910. In 5, he housed a flying school using machines similar to that in which he had crossed the Channel; the others he leased to the Aeronautical Syndicate, who built the strange tail-less Valkyrie aircraft, in which the first air cargo in Britain was carried—a box of Osram lamps from Shoreham to Hove on 4 July 1911.

Late in 1910, Grahame-White was in America winning flying competitions and giving exhibitions which enabled him to return \$250,000 richer; in Washington, he created a sensation by alighting and taking-off in Executive Avenue alongside the White House. On arrival home, he bought the 200 acres of Hendon fields which were to be converted into the London Aerodrome. The following year, with Bleriot and Sir Hiram Maxim, he attempted to float a public company to finance the project, but with insufficient support. Undaunted, he formed his own Grahame-White Aviation Company, which heralded a new era for Hendon. His most outstanding lieutenant was Richard Gates, a popular and energetic young man who was the General Manager of London Aerodrome throughout its pre-war development. Sir Alliott Verdon-Roe has recorded a measure of Gates' shrewdness concerning the first appearance of the Avro 504, when Gates told him he could sell 100 of them. The designer laughed, little realising that before long the aircraft would be built in thousands.

The task of developing marshy fields with 8 hangars into an aerodrome was formidable. Yet London Aerodrome was soon 'the most completely organised airfield in the world'. By 1918, it covered 500 acres, with 50 acres of buildings, including hangars, an aircraft factory, palatial flying club, hotel and residential estate for staff. The initial effort was applied in clearing trees, levelling and draining land, and building an additional 17 hangars, workshops and offices. The Grahame-White Flying School shortly moved to Hendon, and as other hangars were



Grahame-White heading towards Manchester during his vain attempt to beat Paulham



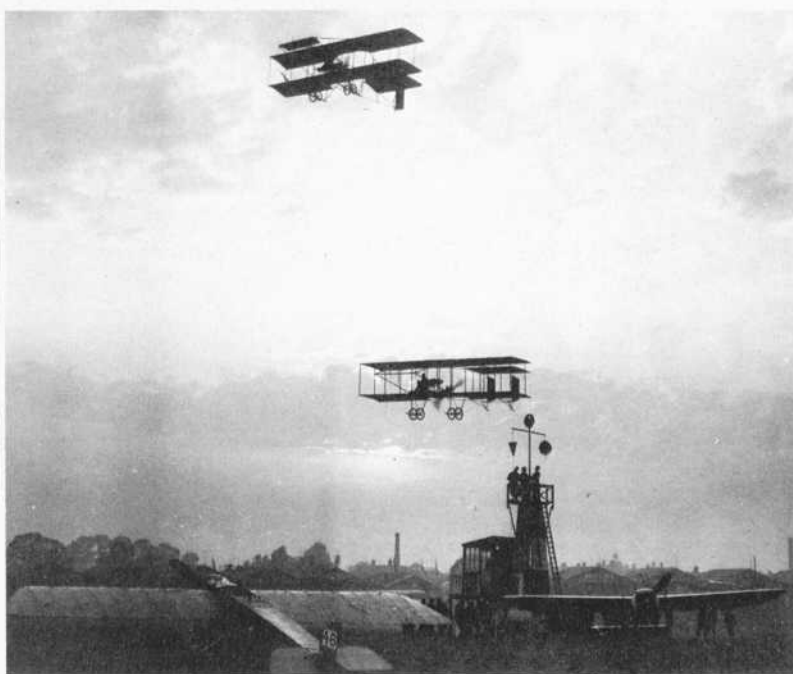
completed, other schools and aircraft manufacturers became tenants; there was a long waiting list.

Throughout this pre-war period, Grahame-White, ever-conscious of the need to demonstrate to Public and Government the safety of flying, its commercial possibilities and significance in war, organised frequent demonstrations and aerial race meetings. In 1911, four major events involved Hendon. In March, a speed test for the return flight between Hendon and Brooklands was won in 58 mins by Gustav Hamel, one of Britain's best pre-war pilots. A month later, Pierre Prier (CI at the Bleriot School) flew non-stop from Hendon to Paris in under 4 hrs to create a point-to-point world distance record. In June and July, Hendon was a compulsory landing point in two classic races, the 12 day Circuit of Europe and the 5 day Round Britain Race; both were dominated by French pilots and won by a naval officer, Lt Conneau.

Grahame-White's persistent campaigning about the inadequacy of British air power led the Parliamentary Aerial Defence Committee to invite him to address both Commons and Lords, and later display the military uses of aircraft. Held in May, the first public demonstration at Hendon was attended by 300 MP's including Mr Asquith the PM, many of his Cabinet and Mr Balfour the Opposition Leader, and hundreds of Navy and Army Officers. It included the accurate bombing of a battleship outline with 100 lb sand bags from 2000 ft, the transport of machine guns and ammunition, the erection of aircraft in the field, and the reconnaissance of troop formations specially deployed around the countryside. Perhaps the most impressive demonstration was Hamel's flying of despatches to and from Aldershot, when (to the embarrassment of the PMG) he proved considerably faster than competing telegrams. After the display, the PM declined to fly, but Mr Balfour flew with Grahame-White. The display had been a definite success and undoubtedly served to influence the Government, for less than a year later the RFC was formed: it was certainly the fore-runner of the magnificent



The Navy assist a take-off Flight photo

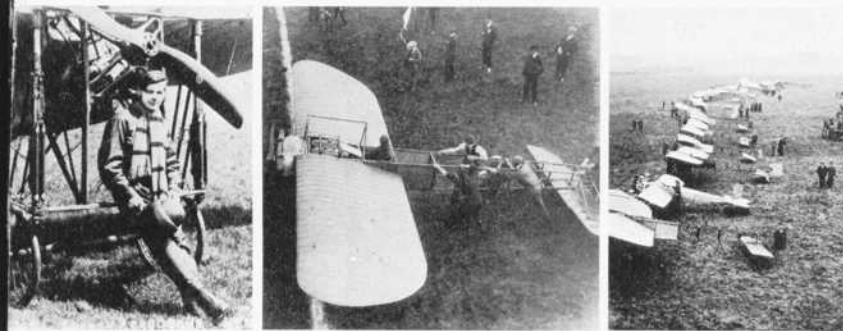


Hendon Air Displays staged by the RAF in the 20s and 30s.

1911 also saw the first British Official airmail service, planned to celebrate the coronation of King George V. Special stationery was sold and airmail post boxes were placed in leading London stores. The charge was 1/1d a letter and 6 1/2d a card for a flight between Hendon and Windsor. On the day (Sept 9) the weather conditions were appalling but after some delay the indomitable Hamel took off in a Bleriot to become his country's first aerial postman. In 11 days, 130,000 letters and cards were carried by the Hendon aircraft, despite continued bad conditions.

In April 1912 Richard Gates decided to hold regular weekend race meetings, including a new feature of racing around pylons erected on the airfield. The idea attracted over 22,000 people on the first two days, and 30 such meetings were held during the year, including two night-flying displays, an event quite novel. The dramatic first Aerial Derby—an 81 m race around London—on June 8 was attended by 45,000 sightseers. T O M Sopwith finished 1st but was disqualified for turning inside a pylon at Purley; next, Guillaux force-landed 1 m from the finish, out of petrol. Hamel arrived 16 mins after Sopwith, but was declared the winner and presented with the handsome *Daily Mail* gold trophy. 5 months later, Sopwith's appeal was upheld and he became the victor.

1913 was the golden year for Hendon. The management decided on weekly meetings and held 51, each including team races, altitude contests and speed and cross-country handicaps. Over 70 leading aviators took part, and young and old, rich and poor, flocked to see the exciting fliers. Crowds exceeded 50,000 . . . the Hendon



(Left) A Hendon instructor, Marcus Manton
(Centre) The start of a handicap race, awaiting the starters' flag
(Right) Aircraft at a military display

habit became the popular pastime. A gentleman's season ticket cost 2 gns, lady's 1½ and child's 1 gn, and season tickets for cars covered the chauffeur, providing he wore livery! Passenger flights became popular; two circuits of the aerodrome cost 2 gns and a return flight to St Albans £20. The first-ever night race was packed with thrills, the first three aircraft all finishing within ½ sec. Hamel won the second Aerial Derby, and British pilots started to imitate Pegouds, the originator of aerobatics. B C Hucks, Grahame-White's chief pilot, became the first Briton to loop-the-loop, followed by Hamel. In true Hendon spirit, the local pilots gave an 'upside-down' dinner to celebrate their feats; table legs pointed to the ceiling; the meal started with coffee, followed by liqueurs and the loyal toast, then savoury, sweets, entree, fish, and finally soup! The first 7 months of 1914 brought even greater crowds to Hendon: an American, W L Brock, who learnt to fly there, won the 3 major races of the year, the 3rd Aerial Derby, London-Manchester and return, London-Paris and return. Sadly, Hamel disappeared over the Channel in a new machine.

Then the war stopped all civil flying in Britain, although Hendon continued its less spectacular but vital roles, training and aircraft constructions. Of 664 pilots trained pre-war by British civilian schools, 175 were products of Hendon, and only Brooklands had a greater output. Grahame-White's own school had been the most productive and third best in the country, with 72 pilots qualified; by the war's end, this figure reached 560. Training was then very primitive, the pupil sitting behind with his hand resting on the instructor's to enable him to feel how the joystick was handled. The pupil was then allowed to make short solo hops and subsequently half circuits. Despite the apparent hazards there were very few accidents, and the Grahame-White school had no wartime training fatalities. The £75 fee covered everything required for the Royal Aero Club certificate, but even this test was elementary; the pilot had to make 5 figures of 8 around two pylons 500 metres apart, covering over 5 km. Two such flights were required, plus a climb to 328 ft and descent and landing without power. For a year Hendon also provided airship pilot training for £100, on the Willows Airship Company's non-rigid airship, powered by a 60 hp engine driving two propellers.

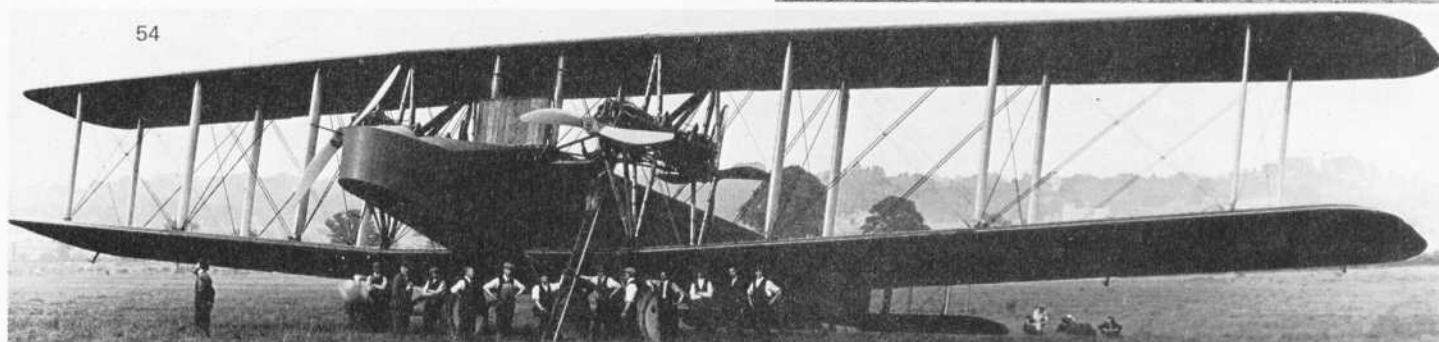
(Right) The DH11, first de Havilland design to be built by AIRCO, 1914

(Below) Handley Page V/1500, 1918

Pre-war aircraft construction was less impressive; many of the Hendon firms, apart from Grahame-White's, contributed little to technical development, since most were manufacturing French designs. But two became important later. The Aircraft Manufacturing Company (AIRCO) took over the Valkyrie assets in 1912 and grew rapidly, acquiring additional large workshops within a mile of the airfield, but building only Farmans until Geoffrey de Havilland became chief designer in 1914, whence in 7 years it produced all the aircraft from DH 1 to DH 18, including the famous DH 2, 4, 5, 6 & 9, and led to the creation of de Havilland Aircraft at Stag Lane, 2 m NW of Hendon. Handley Page Ltd moved from Barking to Cricklewood, 2 m S of Hendon, in 1912 and used the airfield until 1918. HPs' first important design, the o/100, appeared in 1915, followed by the famous o/400 and V/1500, so that by 1918, the name 'Handley Page' had become synonymous with 'Heavy bombers'.

Grahame-White also produced original designs, but none in quantity. Perhaps his most famous was the Type 10 Charabanc, or 'Aerobus' of 1913, designed for the increasing passenger flights at Hendon; piloted by Louis Noel, it established a world record by carrying 9 passengers for nearly 20 mins on October 2. R H Carr then won the Michelin Cup with the same aircraft, also used in 1914 for the first British parachute jump from an aeroplane, W Newell sitting on the under-carriage skid, holding his parachute in his arms. At 2000 ft he was dislodged by the boot of a pilot sitting on the wing. Despite the hazardous procedure, the jump was successful.

During the war, Grahame-White concentrated on building aircraft designed by others, its labour force growing from 20 to over 3000. Their joint production with AIRCO accounted for nearly ½ of the total British war-time output. Thus during only 6 years, Grahame-White's original aims had been well fulfilled: Hendon had, more than any other aerodrome, brought aviation to the British Public; played an important role in pressing the need for a strong air force; proved, as well as possible in those early days, the safety of aircraft; served its country well in peace and in war; most important, it had earned its right, alongside the less spectacular Brooklands and Sheppey airfields, to be recognised as one of the birth-places of British Aviation. ©





our plans approach fulfilment

by Dr John Tanner MA PhD, Director, R A F Museum

MANY THINGS ARE NEEDED to make a national museum: an important theme, great collections, public interest, a dedicated staff, substantial funds, and a visual vitality backed by high standards of scholarship. To bring them all together inevitably takes many years; the process cannot be hurried. The great National Maritime Museum at Greenwich *eg* was based on massively generous benefactions of cash and exhibits, yet before it could open its doors and prove itself, ten long preparatory years had elapsed. Such a gestatory period has its own value, however, for when all the desirable attributes are available, another necessity takes precedence – a suitable building to house them. Such a building must be worthy of the museum's theme, capable of providing all the facilities demanded by modern museum techniques, and situated where the general public can have easy access.

The Trustees of the Royal Air Force Museum deliberated at length over where to locate the Museum, but eventually Hendon received their unanimous vote: it has the space, remains an active RAF Station, has easy access by road and Underground, and is itself part of aviation history. The site chosen had several existing buildings, and as every penny for the Museum has to be raised privately, serious thought was given to the economical and feasible placement of various displays in them. But this solution soon proved unacceptable; four of the hangars demanded retention, because of their splendour as period pieces in which the Museum's aircraft sat so magnificently. The other displays and departments, however, were going to need a building designed around them.

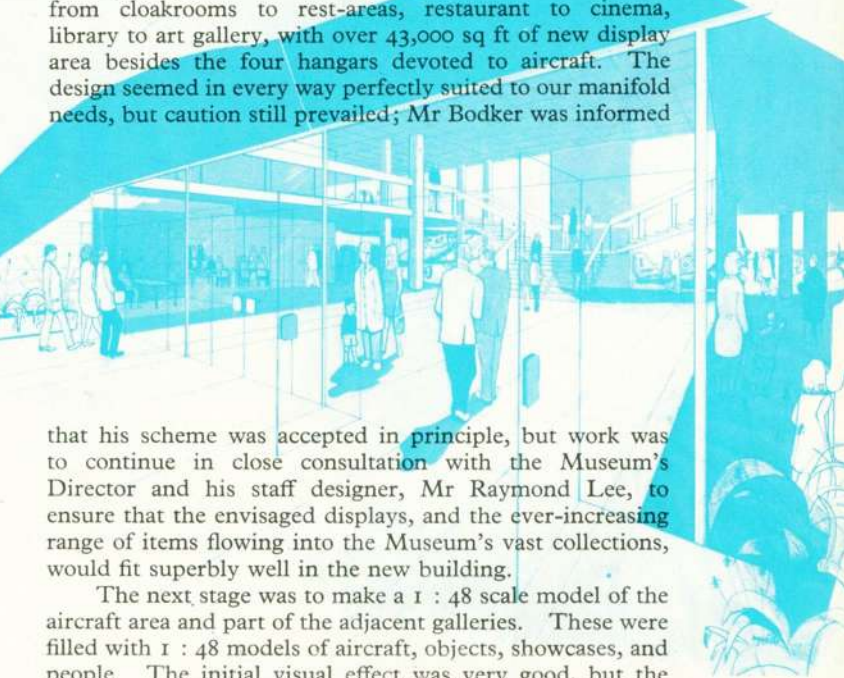
The lack of knowledge in this country about designing major national museums intensified the Trustees' determination to build with great care and distinction. The Director travelled extensively, from Moscow to Mexico, to see what other countries had achieved, and from his eventual brief the advice of several distinguished architects was sought, so that four major architectural schemes, detailed to meet the project's specific needs, became available for study and comparison. Each had much to offer and was minutely assessed with scrupulous attention to detail. Eventually the Trustees, again unanimously, decided that one appeared to achieve all that was required

and in an architecturally brilliant manner. This design was conceived, co-incidentally, by a retired RAF officer, Dr-Ing John P Milford Reid, an engineer who is now Managing Director of the Industrial Development Group, and designed by his architect, Geoffrey Bodker ARIBA, in consultation with Lord Holford's firm, William Holford and Partners.

Mr Bodker's building encompassed the existing hangars in such a way that, although the actual structures remain separate, the whole makes a unity, and the new galleries provide a striking and decoratively modernistic frontage. Every public facility needed to make the Museum a pleasure for the public to visit was included, from cloakrooms to rest-areas, restaurant to cinema, library to art gallery, with over 43,000 sq ft of new display area besides the four hangars devoted to aircraft. The design seemed in every way perfectly suited to our manifold needs, but caution still prevailed; Mr Bodker was informed

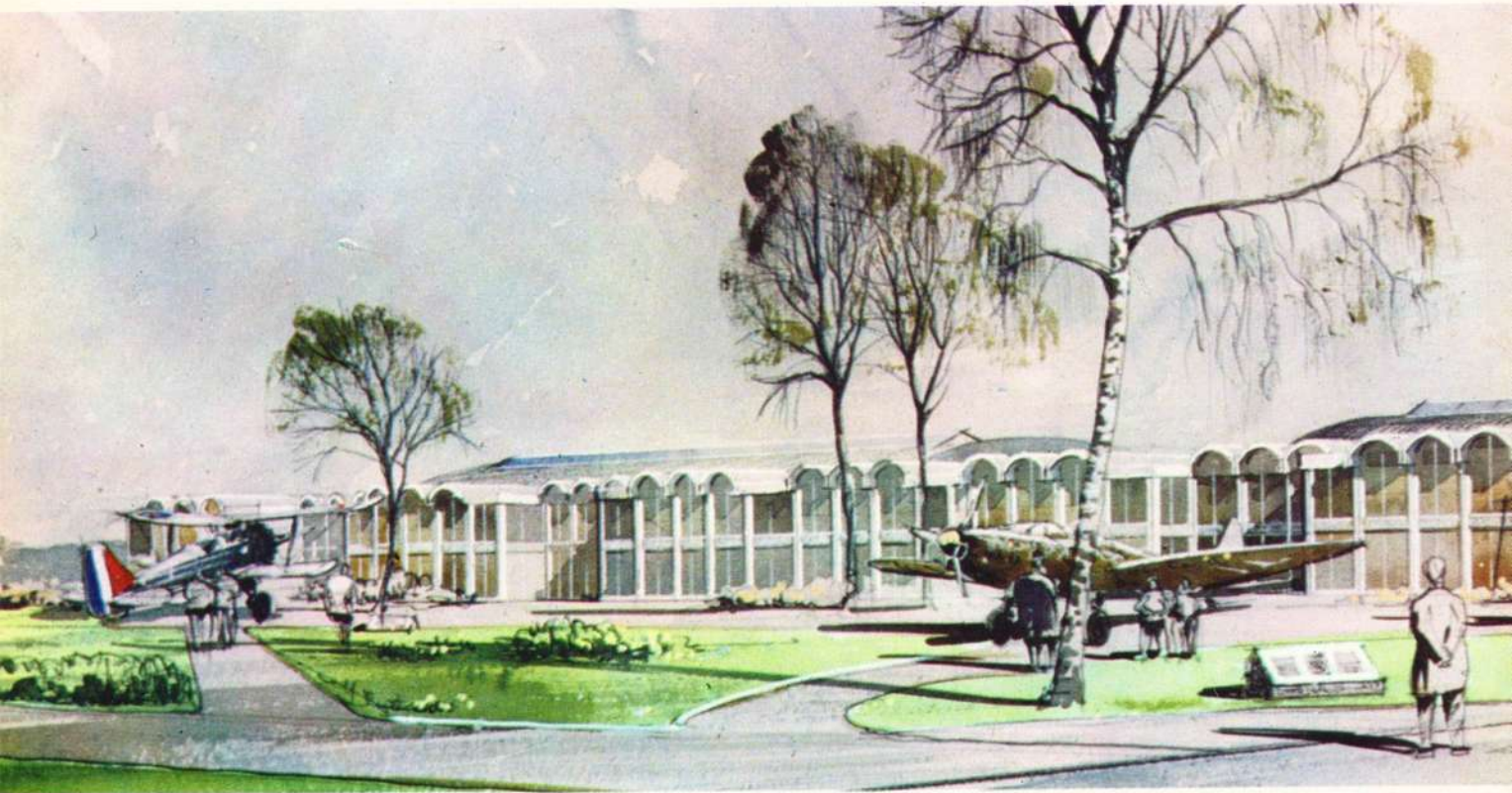
that his scheme was accepted in principle, but work was to continue in close consultation with the Museum's Director and his staff designer, Mr Raymond Lee, to ensure that the envisaged displays, and the ever-increasing range of items flowing into the Museum's vast collections, would fit superbly well in the new building.

The next stage was to make a 1 : 48 scale model of the aircraft area and part of the adjacent galleries. These were filled with 1 : 48 models of aircraft, objects, showcases, and people. The initial visual effect was very good, but the human eye can glamorise small scale models, as compression has an enriching effect. Thus to get a true picture, a modelscope was used. This is a development of the





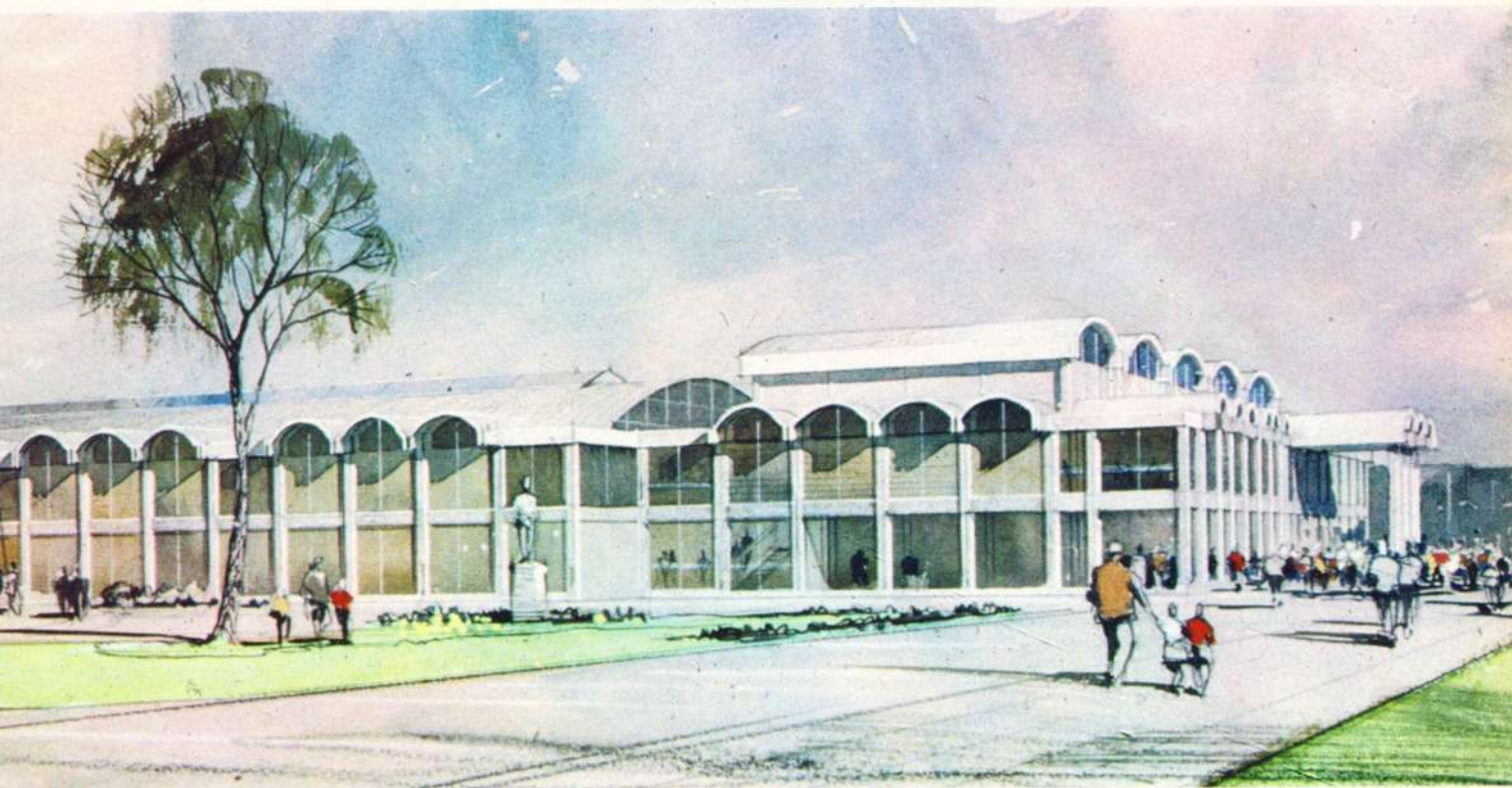
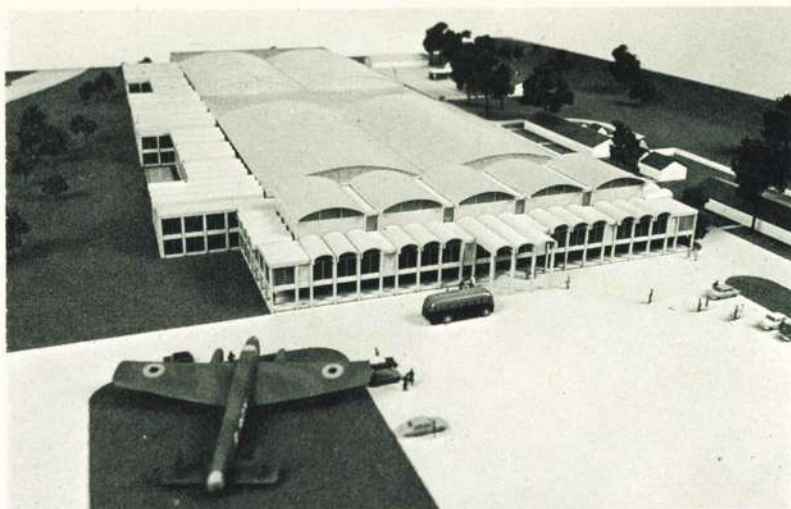
Stake **your** claim
to a permanent place in
R A F History



The magnificent design chosen for

The design selected for the Royal Air Force Museum by the Trustees is of great architectural distinction, in keeping with the national importance of the project. Over 650 ft long and covering 175,000 sq ft, it is on the scale needed for presentation of the full story of the RAF's crowded history and has the flexibility needed to do justice to the great variety of aircraft and equipment already accumulated. At the same time, the engineering approach is totally practical, allowing the exacting requirements to be met at minimum constructional cost. Your contribution will help to bring this ambitious concept to reality. Please send a donation now so that an early start can be made on building the world's finest aviation museum—perhaps by the Autumn of this year

The name of every contributor to the Royal Air Force Museum will be permanently inscribed on a Founders' Roll of Honour. Every contribution that can be raised is needed to enable building to start. Every donation will help to ensure more exhibition space for what is already a unique aeronautical collection. Send your donation to the RAF Museum Appeals Office, 84 Regent St, London W1 and stake your claim to a place in the history of the Royal Air Force!



the Royal Air Force Museum

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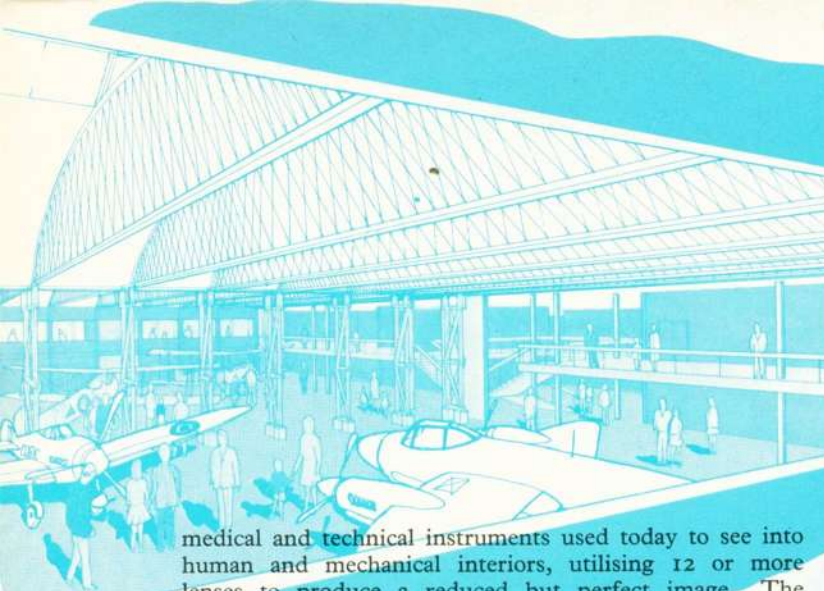
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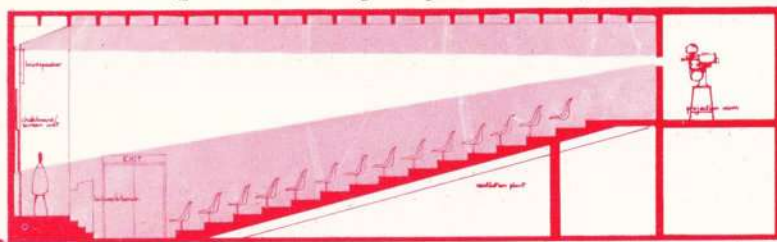


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medical and technical instruments used today to see into human and mechanical interiors, utilising 12 or more lenses to produce a reduced but perfect image. The modelscope revealed that the galleries were not only architecturally impressive, but that most displays were perfectly suited to their setting. A few could now be seen to need more room or height, and suitable alterations were made to the plans. Furthermore, the numerous apertures on the first floor, designed to give vistas over the great aircraft hall, now appeared too frequent and small, so these were replaced by three vast viewing platforms with far more dramatic effect. Many other design details have similarly changed as a result of these studies, the lighting system *eg* having of necessity evolved from simplicity into perhaps the most complex and sophisticated of its kind.

The scale model soon had to be supplemented by even larger outline drawings; the individual placing of displays is now theoretically plotted on plans over 16 ft long and at every stage the architect, with his team of specialist advisors, works closely with the Museum staff; it is a continuous dialogue in which both sides learn the others' problems and find mutually acceptable solutions. The work of planning has thus gone smoothly and the final design is now nearing completion. The physical exterior



of the building is splendid; the materials, reconstructed stone (concrete with stone finish) and Pilkington's newly-developed Bronzeglass. It seemed essential that the Museum of the RAF – the Service of the present century and the future – should use strikingly modern materials, with the added advantage of lending themselves to advanced engineering techniques to produce the required clear spans economically.

An imposing portico leads to a colonnade – by no means grandiose architectural flights of fancy, but down-to-earth practicalities that will allow the public dry access in wet weather from the car park to the main doors. The spacious entry hall conveys that the museum is vast, indicates by its materials and treatment that this is no mausoleum but a repository of living and contemporary events, provides all the services the public may need, and by

its cleverly designed corridors and handsome staircase, encourages the visitor to proceed into the Museum. It does one other thing strikingly well; it reveals the central collection to even a casual gaze, for part of the hall's back wall is of tinted glass through which may be glimpsed the great area devoted to historic aircraft. It is impossible to describe the overwhelming aspect of a gallery measuring 540 ft by 170 ft filled with machines that have written the history of flight. Even in model form it is – there can be no lesser description – breathtaking; and this is glimpsed from the onset.

To the right is the restaurant; to the left, flanking the aircraft hall, the other galleries on two floors, on the open-plan principle. Their great areas, 440 ft long x 50 ft wide, provide infinite flexibility for the displays, the lack of permanent dividing walls enabling annual changes to be made, impossible in a more conventional building. Midway along the ground floor there is a 90 ft access to the main aircraft hall, which again presents a unique visual impact.

On the upper gallery floor (with visual enrichment from barrel-vault ceiling) the aircraft are also seen from the three



viewing platforms. Thus the aircraft may be seen not only when visiting their own hall, but throughout any tour of the galleries. This is not the place to list again the many other displays to be featured (see *RAF Golden Jubilee Souvenir Book*, obtainable from RAF Museum, Hendon, 7/6d post free) but all are naturally connected with flight, and to have the aircraft both close and visible is a powerful reinforcing factor. Also on the second floor are the administrative suite and art gallery, the latter of some 3,500 sq ft, which will enable the Museum to mount comprehensive shows of Service and aviation art as well as temporary exhibitions. The upper part of the cinema rises to this level, and the cinema will certainly be very useful to many cultural societies and social groups that abound near Hendon, for it can be used not only for films but a wide variety of meetings; like the restaurant, it can be isolated from the remainder of the Museum and kept open at night.

The third floor contains the research centre, wherein will be housed a definitely comprehensive collection of Service and aviation archives, plans, photographs, films, recordings and books, every thought being given to the needs of the material and of its users. This, briefly, is the building chosen in principle by the Trustees . . . vast, handsome, and exciting. Much has to be done before the preference becomes a contractual fact; but so fast is the work progressing, and so ideally does every stage seem to suit its purpose, that actual construction should start by the autumn. One factor only complicates the issue: money! The Appeal has been a great success, but more funds are still required. If everyone who has read the Appeal advertisement at once makes a modest contribution, then this final problem will be solved – and, most appropriately, will find themselves recorded in what will be one of the Museum's proudest possessions – the Book of Founders.



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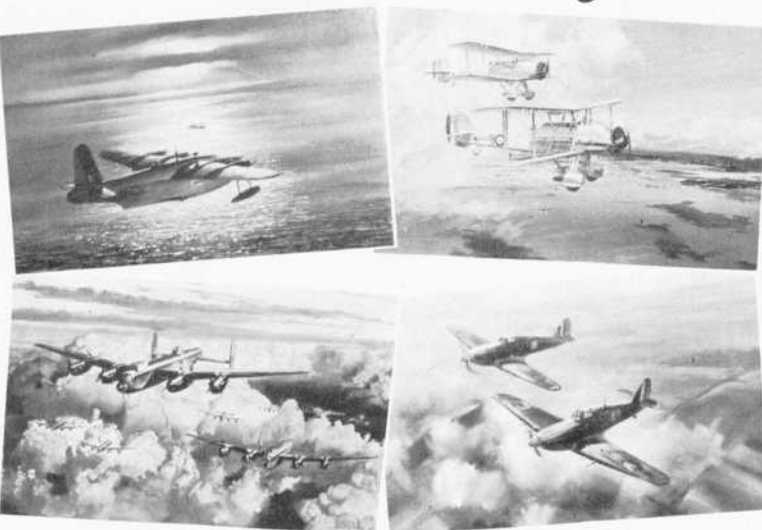
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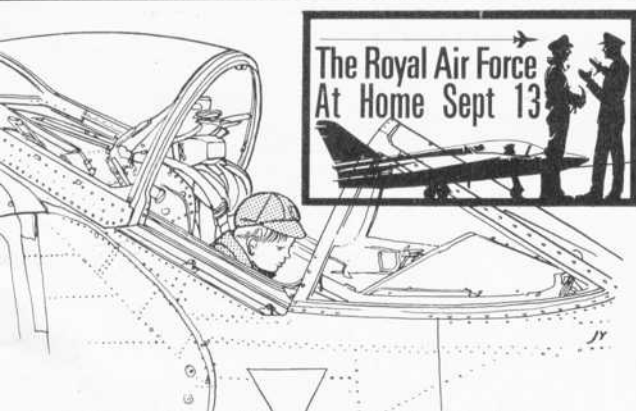
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REPLICA REVIEW

by Leslie Hunt

Plans For The R A F Museum and the world-wide popularity of two recent films – 'Those Magnificent Men in their Flying Machines' and 'The Blue Max' – has focused attention on the art of building replicas of historical aeroplanes

Let us first determine just what constitutes a replica, for dictionaries do not always agree on definition; one says 'a work by the original artist', another 'a facsimile' and a third 'a true copy of the original work'. Perhaps the last is the most apposite in this case. Thus, we must disregard the Proctors that have been 'faked' to represent Junkers Ju 87 dive-bombers, the Harvards purporting to be Mitsubishi Zeros, and the cleverly altered Tiger Moths which have been put to various uses by film-makers in recent years.

Some of the *Magnificent Men* replicas, which delighted millions, have found good homes. For example, one of the Bristol Boxkites went to Bristol's Museum and another to the Shuttleworth Trust, Old Warden, where it still flies in company with an Avro Triplane built for the film. These aircraft are among the latest additions to a large and fast-growing number of other, less-publicised, replicas which one can see in Europe and in North America.

In London's Science Museum is a replica of the Flyer biplane on which Orville and Wilbur Wright made the first sustained, powered and controlled flights at Kitty Hawk, North Carolina, on 17 December 1903. The real thing was displayed there for many years, and when it was returned to the Smithsonian Institution (the US National Aircraft Museum) in 1948, de Havilland apprentices built the faithful replica for all to admire.

Also in the Science Museum we can see a replica of Percy Pilcher's Hawk glider of 1896 'flying' alongside a Lilienthal glider of the same year. The Hawk itself hangs in Edinburgh's Royal Scottish Museum; another replica is on show at Stanford Hall, near Rugby, where Pilcher made his experiments. A third Hawk replica has been built by the Cadets of No.2175 (Rolls-Royce) Air Training Corps squadron, at Hillington, Glasgow, for their city's Museum of Transport, a most commendable achievement.

If you have attended Royal Air Force displays, or air shows with RAF contributions, you may have seen a Royal Aircraft Factory BE2, serial No.6232, and the Sopwith Camel F1921. Both are replicas, built by aircraft apprentices at the RAF's School of Technical Training, St. Athan, Glamorgan. The BE2d/e is a copy of one built by Ruston, Proctor & Co Ltd, at Lincoln; the Camel is a faithful replica of an F.1 built by Boulton & Paul Ltd of Norwich.

The same young airmen have also constructed a Bristol Boxkite, proving that they are the equals of professional replica-builders anywhere in the world.

Officers and airmen at RAF Finningley, Yorks, where No.230 Operational Conversion Unit flies Vulcan bombers, last year built—and taxied at speed—a replica of the 1903 Wright Flyer. It has hand-carved solid spruce propellers, just as in the original, and is powered by a 650cc twin-cylinder BSA motorcycle engine. Inspired by their success, the men are now hard at work on a Sopwith Tabloid.

Miles away, at the huge BAC works and airfield at Weybridge and Wisley, Surrey, home of the VC10 airliner, enthusiasts gave up many hours of their leisure time to produce a flyable replica of the Vickers FB 5/5a Gunbus, with the serial 2345 and name *Bombay* (2). This superb machine flew at several of the Royal Aeronautical Society's centenary events in 1966, and will be presented eventually to the new Royal Air Force Museum.

As members of the Vintage Aircraft and Flying Association (Brooklands), the same people are now building a replica of the Alcock and Brown Vimy to mark the 50th anniversary of the first direct transatlantic flight in 1919. Determined to preserve an even earlier memory, Air Cdre F. B. Sowrey (son of the 1914–18 anti-Zeppelin 'ace') has purchased the Vickers No. 22 monoplane used in *Magnificent Men*.

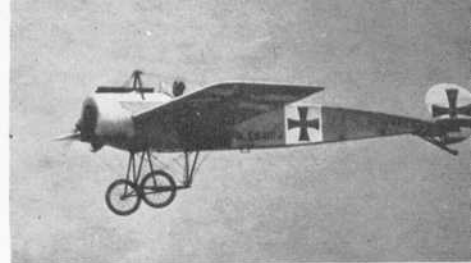
Already firmly established is the Schiphol Museum in Holland. Plans for it date back to 1916, but it was not until 1960 that it was opened to visitors. Here, alongside fascinating originals, are replicas of an 1894 Lilienthal glider, a 1903 Wright Flyer, a Fokker Spin (Spider) of 1911 and the very first Dutch glider, a Zögling, registered PH-1.

An original Blériot XI two-seater which flew in the 1911–13 Lybic War normally hangs on show in the Museo del Genio, Rome, with a faithful replica of it on the floor of the modern Turin Museum. Another Blériot replica was built and then flown across the Channel by veteran aviator Jean Salis, who has more recently completed a replica Nieuport XI for the City Hall at Verdun.

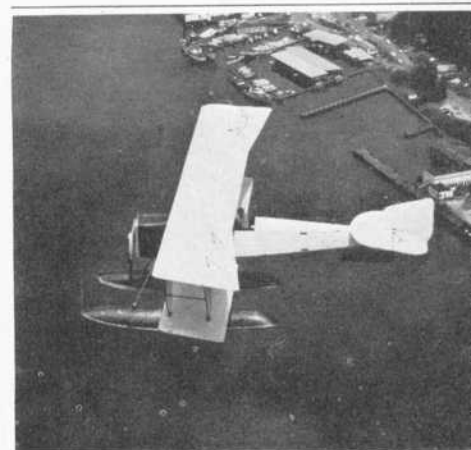
To the north, in Copenhagen, the surviving example of J. C. H. Ellehammer's Standard Monoplane of 1909, built up in balloon linen on iron pipes, is stored for the Royal Danish Arsenal Museum. Happily, Danish enthusiasts have constructed a replica, contrasting with the jet fighters beside which it is sometimes displayed to the public.

Over the North Pole to Canada, and one can call at 'The Age of Flight' Museum, Niagara Falls, to see, in a collection of 30 machines, replicas of the 1903 Wright Flyer, a Chanute hang glider, a Curtiss JN-4D 'Jenny' built for a film and, perhaps most interesting of all, an excellent film replica of a Fokker Dr.I triplane (F102/17), the original of which was destroyed in September 1917.

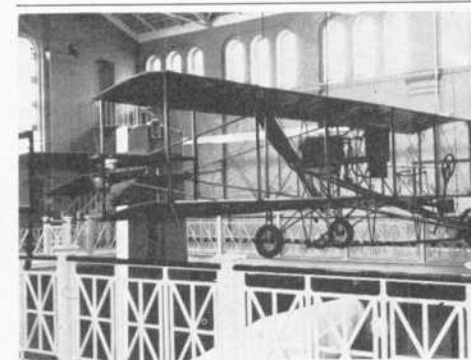
Canada's National Aeronautical Collection at Rockcliffe, Ontario, rivals anything of its kind in the world. Amid more than fifty nostalgic originals are three perfect replicas. The first, a Nieuport XVII constructed by C. R. Swanson of Sycamore, Illinois, is a copy of the late Air Marshal 'Billy' Bishop VC's B1566. To honour AV-M Raymond Collishaw and his famous Black Flight of No.10 Naval Squadron, Mr Swanson has constructed Sopwith Triplane N5492 *Black Maria*. Best of all for many visitors is the Silver Dart replica, honouring J. A. D. McCurdy who, at Baddeck, Nova Scotia, on 23 February 1909, became the first British subject to fly anywhere in the British Empire. His 35 hp



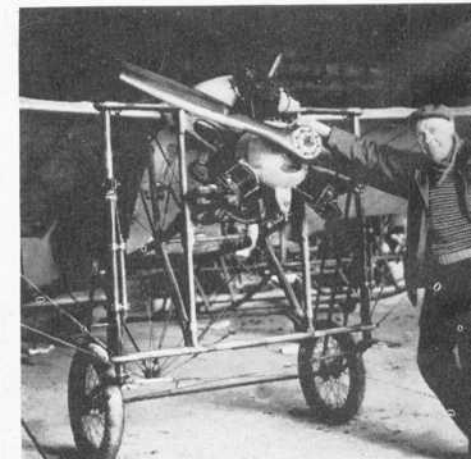
Fokker E.III replica built by Major James Appleby, USAF



Replica of the B & W floatplane, first Boeing-designed aeroplane, built to mark the company's 50th birthday



Curtiss A-1 in National Air Museum, Washington



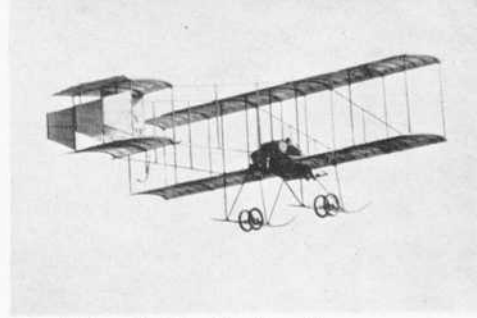
Jean Salis and his replica Blériot



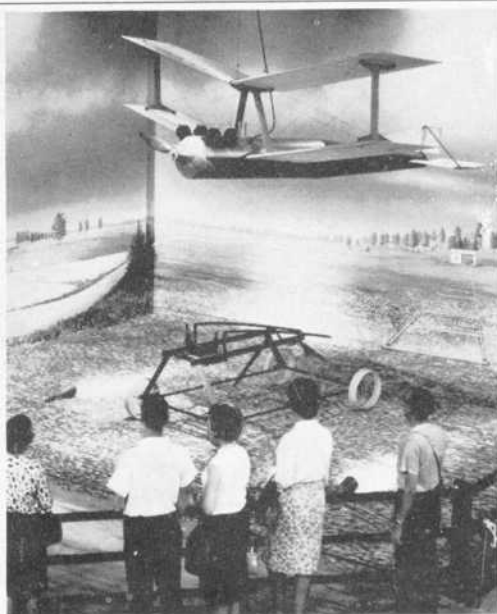
Replica of 'Billy' Bishop's Nieuport XVII



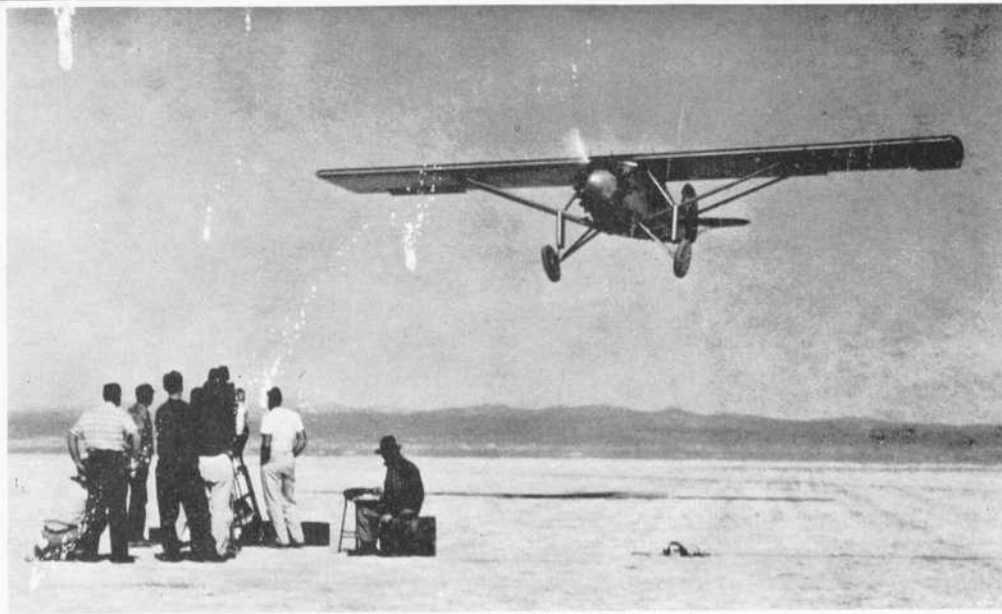
Demonstrator built for the *Magnificent Men* film



Phoenix Flyer, alias Bristol Boxkite replica



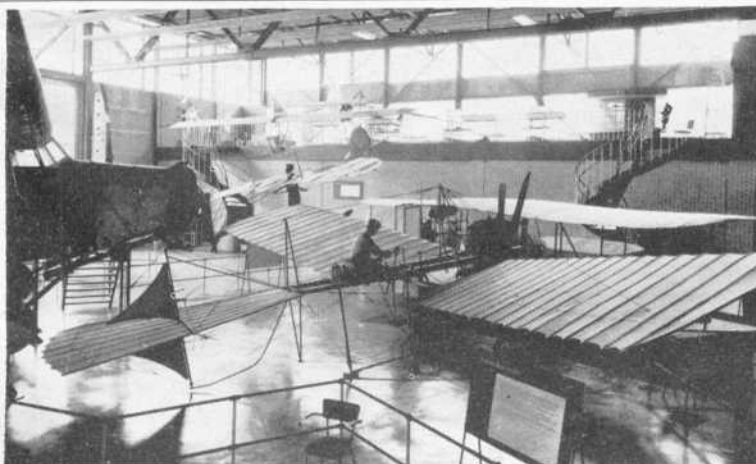
The Kettering 'Bug', claimed to be the first guided missile



One of several replicas of Lindbergh's Ryan monoplane built for the film *Spirit of St Louis*



Memories of 1914–18 air combat are recalled by replicas of (left to right) the Sopwith Pup, Fokker D.VII and Fokker Triplane



Fokker Spin of 1911 at Schiphol



Pfalz D.III built for *The Blue Max*

biplane travelled half-a-mile at a height of 40ft, and on the 50th anniversary of this historic moment, Wing Cdr Paul Hartman, RCAF, flew the replica at Baddeck.

In the USA there are, of course, very many replicas and the museum which does not display a Wright is the exception rather than the rule. The best replica, undoubtedly, is that in the Wright-Patterson Air Force Museum, whose 1909 Wright Flyer was built by Museum personnel. Its engine was donated by Orville Wright, the chains, sprockets and propellers coming from heirs of the Wright estate.

In this Museum, too, is a unique replica of the Kettering 'Bug', claimed as the world's first guided missile. The original was developed and built for the US Army Signal Corps in 1917-18 by the Dayton-Wright Company, but the war ended before the missile could be used in combat. It had a speed of 55mph at a launching weight of 560lb, including 180lb of explosive, and was to have been guided to its target by pre-set flight controls. Over the target, the wings were to have been released, so that the fuselage could fall earthward as a bomb.

It will come as no surprise to learn that there are more replicas of Lindbergh's Ryan NYP (New York-Paris) *Spirit of St. Louis* (NX211) than of any other aircraft, most of them built as reserves for a film of the flight. The example displayed by the Henry Ford Museum at Dearborn, Michigan, was presented by James Stewart, who played the part of Lindbergh in the film and is, in real life, a pilot of considerable experience. Many airworthy replicas of NX211 exist in the States, particularly in California's great museums. At Santa Ana, Lt-Cdr Frank Tallman still runs 'Movieland of the Air', despite the death of his partner, the famous Paul Mantz. Here are a Blériot Scout replica, Curtiss Pusher replica, Garland Lincoln Nieuport replica, and the famous Fokker E.III 417/15, built by Major James Appleby, USAF, and now flown as N3363G.

A 46-year-old dentist in Atlanta, Georgia, named Dr Roy C. Wicken, spent five years building his replica of Nungesser's Nieuport 24B, serial 1895, using the actual factory plans loaned by the Wright-Patterson Museum. Now, spectators at air shows in many States are thrilled as Dr Wicken flies his beautiful machine and patiently answers the questions of visitors to the static parks.

Another dedicated replica builder/flyer is Peter Bowers, an engineer-pilot at Boeing's Renton, (Seattle) factory. A 1912-type Curtiss Pusher built by W. Bullock in 1947 is Peter's mount in friendly 'races' with the 707s. Here, too, is the replica B & W floatplane, built by a team under Clayton Scott (Boeing Chief of Production) and flown during 1966 over Lake Washington, as a true copy of the 1916 pair built at Lake Union. There is, incidentally, a beautiful Curtiss A-1 replica in the Smithsonian Institution and a flyable Curtiss Pusher replica (with original engine) in Cole Palen's collection at Old Rheinbeck Aerodrome, New York, where there is also a Demoiselle replica.

Maybe some of the purists will sneer at the replica builders; but who will deny that enormous pleasure has been given to millions because of the efforts of the few, and the United Kingdom's Vintage Aircraft Group welcomes as members those who fly true replicas.

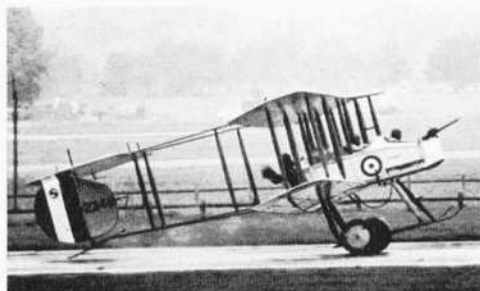
One final point worth remembering is that if steps are taken now to ensure the preservation of rapidly disappearing types, fewer replicas will need to be made by the next generation of aviators



Non-flying BE2 built at St Athan



Silver Dart replica in flight



Vickers FB5/5a Gunbus replica



Avro Triplane IV, a 1909 design



The original Sopwith Triplane *Black Maria* led the Black Flight of No.10 Naval Squadron into action in 1917



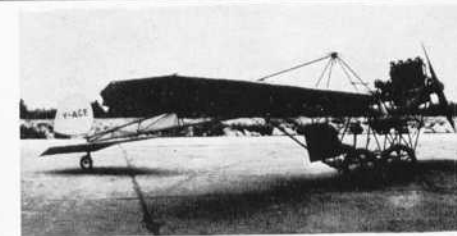
St Athan's Sopwith Camel replica



The Wright Flyer built at Finningley



Lincoln Beachey Pusher replica



Flying replica of 1909 Ellehammer monoplane



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