Web pages captured by Stewart Gray, 2002.

EARLY AVIATION HISTORY

George A. Frodsham - TECHNICAL AVIATION ILLUSTRATOR

The de Havilland Aircraft Company was founded on 25th September 1920 at Stag Lane Edgeware, on this site was also de Havilland School of Flying, together with the London Flying Club. It was here that Amy Johnson learned to fly, and with others were to make a name for themselves with their epic record-breaking flights.

The following pages contain research and development illustrations and photographs of 50 years of early aviation history with de Havilland Aircraft Company. The images are of Gipsy Moth, *Tigermoth, Comet, DH89 Dragon Rapide, DH86 Express Air-liner, Valiant, DH108, Vampire, Sperrin,* and such engines as *Gyron Senior, Goblin, Gipsy Major, Gipsy Queen, Ghost jet-engine, Super-Sprite rocket engine,* as well as *rocket test-bed, Comet fire-pattern charts* - just to name a few.

EMAIL ENTER

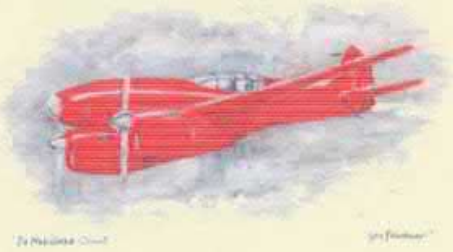
Colsbrij Design Service February 2002

EARLY AVIATION HISTORY

During the early 1930s, I was a pupil at Barnfield school, which was situated less than a mile from the de Havilland factory and airfield at Stag Lane. I was very accustomed to the different aircraft flying at low altitude over the playground. In 1933 at the age of 14, I left school and obtained employment with the de Havilland Aircraft Company at Stag Lane for the princely sum of twelve shillings and sixpence each week. My first task was in the Print Room producing prints of engineering drawings for use in the workshops. We were located in a large wooden barn-like structure adjacent to the main office block, which housed Captain Geoffrey de Havilland and his fellow directors. This office also contained the drawing office. I enjoyed spending my lunchtime touring the workshops studying the wooden airframes in varying stages of assembly. The airframe at final assembly to be covered with fabric, this then to be sprayed with dope, a task mainly by women wearing masks for breathing protection. The airfield was a good venue with plenty of flying activity. From the print room I was promoted to the drawings library. This proved of interest as I became acquainted with draughtsmen who were eventually to make their name in the design of the Mosquito and Comet jet airliners and other notable aircraft of the time. A turn in the company fortunes came when a Mr Edward Hillman who ran a successful coaching business approached Captain de Havilland with a view to designing a small eight-seater airliner. This was agreed and design commenced in August 1932 and by the 24th November, a few months later from the drawingboard the aircraft was flying. Hillman ordered five of these aircraft, which was named the Dragon.

In 1933 Amy and Jim Mollison flew their Dragon called "Seafarer" across the Atlantic, from the Pendine Sands 3300 miles in 39 hours.

The MacRobertson England/Australia International Air Race was planned to start on the 20th October 1934 at Mildenhall Suffolk. Captain de Havilland thought that we could not stand by without some sort of challenge, with barely 9 months before the race de Havilland designed a small low wing monoplane twin-engined two-seater, with retractable undercarriage. Three aircraft built mainly at Stag Lane were completed in time for the race. Three of these aircraft, named Comet were ordered at £5000 each, "Grovenor House" to be flown by Tom Campbell Black and Charles Scott, "Black Magic" to be flown by Amy and Jim Mollison, whilst Owen Cathcart Jones and Ken Waller would fly the third Comet. The race being won by Tom Campbell Black and Charles Scott, Owen Cathcart Jones and Ken Waller finished fourth. The Mollisons reached Allahabad encountered fuel problems, which terminated their race. To celebrate the victory company employees were awarded a day's leave.



The factory and airfield at Stag Lane were now being surrounded by new housing developments, a new factory airfield site was decided upon at Hatfield Hertfordshire adjacent to the A1 bypass and about 13 miles north of Stag Lane. The airfield at Stag Lane was duly sold to developers for a housing estate to become the Aerodrome Estate. The factory was retained for engine development and production and for the development and production of variable-pitch propellers for in 1934 a licence had been obtained from *Hamilton* Standard for the production of the hydromatic propeller and designed for the Stag Lane factory.

In 1934 the Aircraft Division moved from Stag Lane to Hatfield, and with this move we were given free coach transport for 9 months from Stag Lane to Hatfield. When this terminated I was fortunate enough to obtain transport with George Fawcett a draughtsman who travelled to Hatfield from Mill Hill in his small Austin 7 car. The cost of my travel was five shillings a week, which I could ill-afford on my small salary. Eventually, through reasons of his own, George could no longer transport me. I had to find alternative means of travel, finally having to resort to my bicycle. Cycling to work over 13 miles, largely on the A1 By-pass, with a certain amount of night riding in all types of weather proved to be somewhat tiring! The only respite I had from cycling was when I managed to obtain the occasional lift on a Queen Mary trailer, used for the transportation of aircraft components and engines. The trailer was flat-based; it would take quite an effort on my part to prevent myself and bicycle sliding off when traveling!

At lunch times some of the lads and myself would hasten to the railway bridge at Hatfield Village in order to see the world's fastest locomotive, 'The Mallard' pass through.

As at Stag Lane, the airfield was a good lunchtime venue for the flying. On the odd occasion a certain Flt. Lt. King and Flt. Lt. Moon, would give us an acrobatic flying display. On one occasion I came across a DH89 Dragon Rapide owned by the then Prince of Wales, I had with me at the time a lady tracer who had a camera available and she took a photograph of myself alongside this aircraft. Nearby was a DH86 Express Air Liner and she kindly took another photograph of myself alongside this aircraft.

One lunchtime I was sitting with others, having our lunch by a shallow hedgerow flanking the airfield, when a light aircraft was making a landing and its wheels brushed the hedge just missing us. After landing the pilot came across to apologize, which was generous of him considering I felt that we should not have been there in the first place.

I had spent 3 years at Hatfield, when my boss Charles Erlam, realizing that for some time I had travel problems offered me a job back at Stag Lane in the Print Room. I realized that this was a retrograde step. I had to seriously consider this move, as apart from the problems of travel, was that the fact that our family had purchased in 1936 a chalet bungalow on the new Aerodrome Estate. This bungalow was just 5 minutes walk from the de Havilland factory at Stag Lane, I thought it was too good an opportunity to miss, and so I decided to return to Stag Lane. The road in which we lived was appropriately named Mollison Way, after Amy & Jim Mollison! I worked in the Print Room for a comparatively short period, before being transferred to the Drawings Library working for the Propeller Division.

In 1938 I was promoted to the drawing board as a junior draughtsman. In my spare time I managed to produce some sketches of aircraft, which my colleagues pinned on the walls. It seems that these sketches came to the notice of the chief draughtsman R. H. Warde, who thought perhaps I had some talent in the pictorial art side for upon receiving a request from R. N. Hadwyn, head of the Vibration Department for some illustrations of vibration test equipment, he asked me whether I would be prepared to take this on. I realized that I was totally inexperienced, but decided to take the job on. However Hadwyn was pleased with the results for I was asked to produce some propeller illustrations by Flt. Lt. J. W. Bell head of the Service Department. Once again I managed to produce the desired results. Without fully realizing it at the time, it was the beginning of my technical illustrating career.

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EARLY AVIATION HISTORY

With the start of World War II, and then the onset of the blitzkrieg we were working flat out, seven days a week each week, plus overtime With the threat of air-raids, and the possibility of bomb damage to the factory, I and another ex-colleague named Pinkney, were asked by R. H. Warde whether we would be prepared to work night-shift in order to print a duplicate set of prints in the event of the originals being destroyed by bombing. Pinkney and I were both adept at using the print machine, and knowing how important this was, we both agreed. In six weeks we had achieved our target. Back at the drawing board with the onslaught of the air raids we would take to the shelters. The time spent in the air-raid shelter was considered wasteful; thereafter we would only hasten to the shelter when danger was imminent. Couwhurst one of my colleagues was the first to suffer from bomb damage when his flat was hit and losing most of his belongings. For a little light relief we would run a sweepstake, the winner forecasting accurately the time of the next raid.

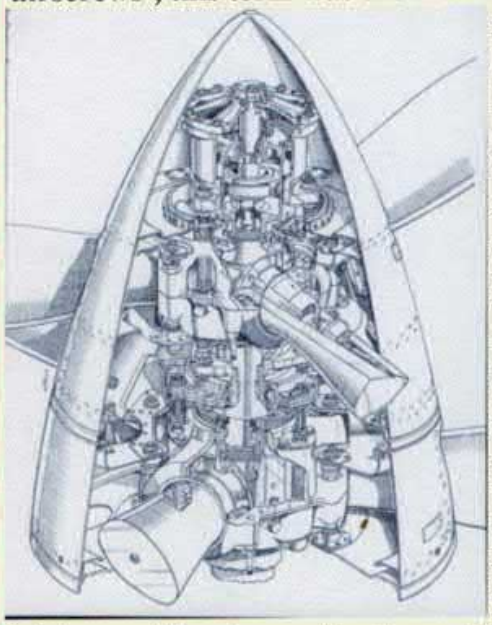
At this time Flt. Lt. Bell had returned from the Services to Stag Lane after his call-up, having been promoted to Squadron Leader. It was his task to set-up a new Propeller Division Technical Publications Department. First he gained R. H. Warde's permission for my possible transfer to the new department and to see whether I was agreeable to the transfer - it was a challenge I could not refuse. Sqd. Ldr Bell started the organization, both he and I took over Captain Geoffrey de Havilland's old office which he vacated with his move to Hatfield, and commenced recruiting staff. Having been thrown in at the deep-end having to manage the Studio and also impart information to the relatively inexperienced newcomers to the Studio I had to work hard without guidance to acquaint myself with the various techniques and engineering skills of technical illustrative work.

At regular intervals Sqd Ldr. Bell had the responsibility of inviting a party of flying personnel from the Royal Air Force to Stag Lane where they would congregate in our office to discuss their flying experiences which I found most interesting. After tea had been served, the party would tour the factory and give a pep talk to the workforce. Thereafter, they were whisked off to a London hotel for dinner, followed by a visit to a nightclub before returning to the hotel. Shortly before the commencement of the Battle of Britain it was discovered that the Spitfire and Hurricane fighters in certain flying conditions, were being out-maneuvered by the Messerschmitts 109. To counter this a propeller constant-speed unit was required. We were responsible for producing the necessary conversion instructions; with the greatest urgency our service engineers were dispatched throughout the U.K. In many cases fighters flew into Hatfield, to have the conversions to save time. The conversions were completed just in time, for without them the Battle of Britain would have been lost was the official verdict.

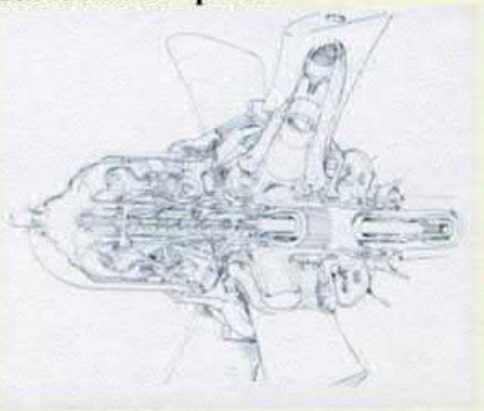
We had the pleasure of a visit from L.A.C. Bill Hooper, responsible for Pilot Officer Prune featured in the Royal Air Force flying instructions. Prune was a renowned cartoon character known throughout the RAF as a prime example of what not to do when carrying out flying duties. After an interesting chat, Bill kindly produced an on-the-spot Prune cartoon for me.

To coordinate the standards of work supplied be the various illustrators of different companies the Ministry of Defence had arranged classes at the Ladies College at Harrogate, Sqd. Ldr Bell thought it would be useful for me to attend. For 6 weeks I attended these classes traveling from Kings Cross to York on a Monday morning and taking a connection to Harrogate, returning home on a Friday. I had accommodation at Starbeck during the week – Starbeck was a major goods and railway junction. The time spent at the college was quite beneficial. Traveling backwards and forwards proved to be somewhat tiring for the trains were always crammed with troops, kitbags and various assortment of equipment, occupying compartment, corridors etc. which usually meant standing room only. To co-ordinate and standardize illustrative work from the various illustrators, I developed an isometric style of projection for use in the Studio and work from different illustrators could be combined often avoiding duplication of effort saving time and labour. This method of projection became commonly known as 'Frodspec'.

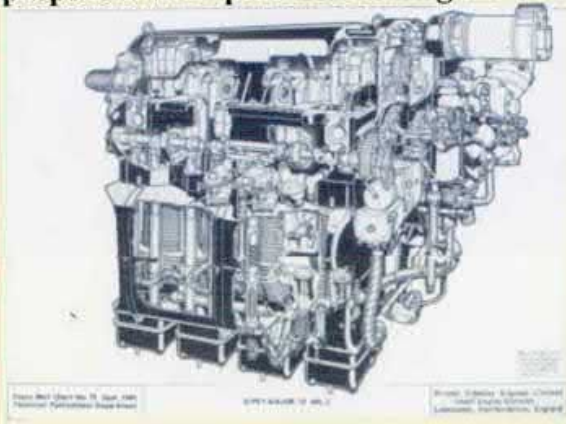
The term 'airscrews' replaced the word propeller and had become common usage; this was to change when a major error occurred involving the posting of 'aircrews' instead of 'airscrews', this term was then reverted to term 'propellers'.



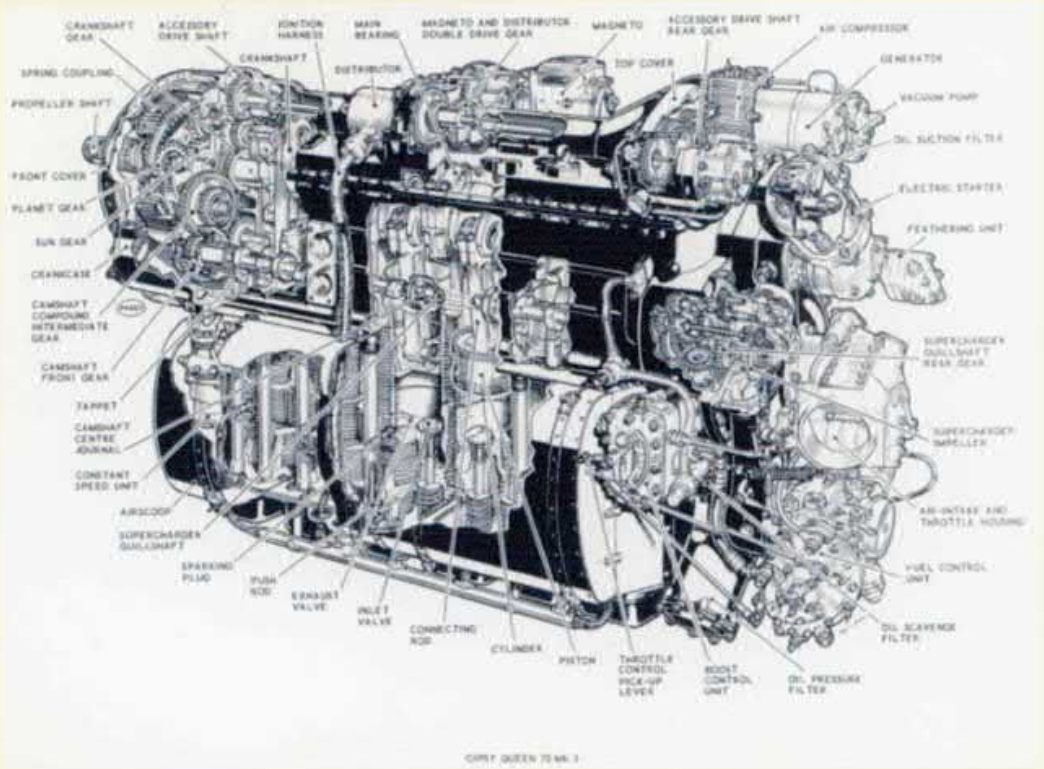
In 1941 design work had commenced on a gas turbine by Major F. Halford, from the principles evolved by Frank Whittle. Later, during the war I was called upon to produce a very simplified illustration of this gas turbine, to be included in the Daily Telegraph with an article by Sir Roy Fedden. This project was top secret, and in order to produce this illustration I was locked-in the drawing office until it was completed.



The Hydromatic propellers were fitted to over 20 fighters, bombers etc. whilst the bracket type propellers were fitted also to over 20 different fighters and bombers. In all over 100,000 de Havilland propellers were produced during the war years.



In 1944 the de Havilland Engine Company was formed, and I was given the opportunity of transferring from the Propeller Division to the new Engine Company as Chief Technical Illustrator. I had enjoyed my time with the Propeller Division Technical Publications, but also looked forward to the new challenges. In 1945 the war terminated and I had the opportunity of gathering a team of efficient and keen illustrators. It was to prove an interesting period, with so many future projects. There were a series of new 'Gipsy Queen' piston engines, which would be installed in the de Havilland 'Dove', 'Heron', and 'Chipmunk'



The gas turbine, which had been developed, was named 'Goblin'; this developed a thrust of 3,000 lb, and first flew on 20th September 1943, and was the first gas turbine to receive the Ministry of Aircraft Production Type Approval in 1945. The 'Goblin' powered the de Havilland 'Vampire' fighter aircraft. It was also used to power the prototype 'Meteor', the American 'Shooting Star', the Swedish 'Saab' fighter, and the de Havilland 'DH108' high-speed aircraft used for the 'Comet' jet airliner research programme.

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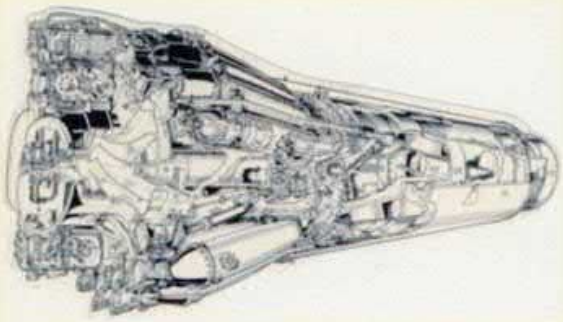
Colsbrij Design Service February 2002

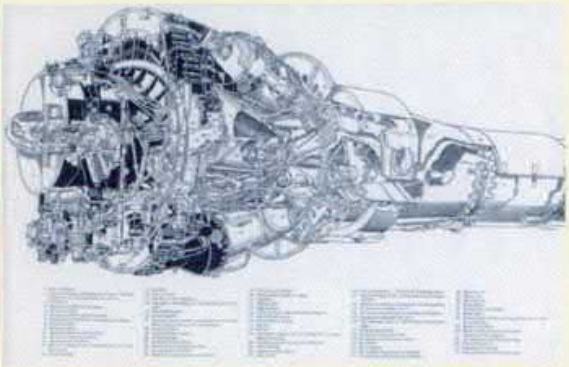
EARLY AVIATION HISTORY



Sadly Geoffrey, son of Captain de Havilland was killed flying the 'DH108'. This was a double-blow as he had lost another son, John, killed during the war in a mid-air collision flying a 'Mosquito'.

The 'Goblin' was supplied to 25 Air Forces and manufactured abroad in Sweden, Switzerland, France, and Italy, bringing great success to the company.

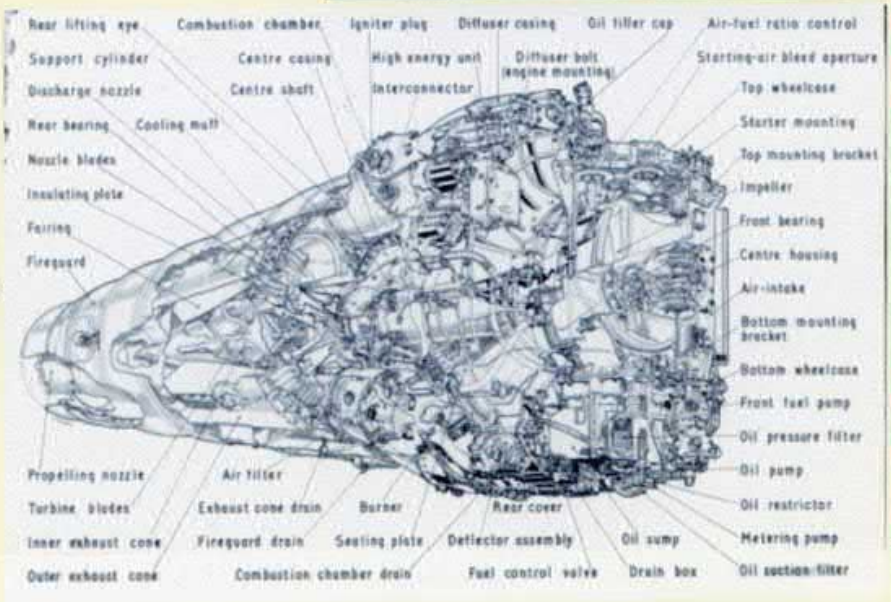
I now had plenty of experience and enjoyed touring the various workshops with sketchpad and pencil ferreting-out the information required, and making the necessary sketches prior to returning to the studio and drawingboard for the finishing work.

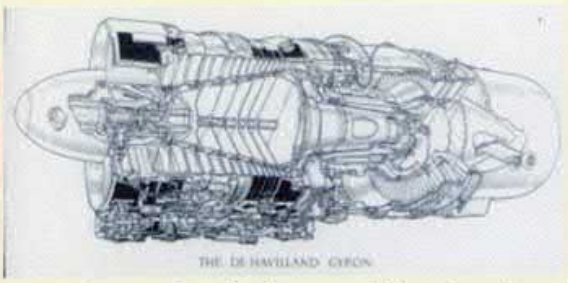


The 'Ghost' gas turbine produced a thrust of 5,000lb and powered the de Havilland 'Venom' fighter, also the 'Comet' jet airliner. The 'Ghost' was the first gas turbine approved for Civil Operation under Air Regulations in 1948, and in 1964 the only jet engine in the world on commercial service.

A 'Vampire' fitted with a 'Ghost' engine and flown by John Cunningham achieved a world height record of 56,000 feet in 24 minutes.

The 'Ghost' was also used to power John Cobb's power-boat 'Crusader' in which he was making an attempt on the worlds speedboat record on Loch Ness. John Cobb sadly losing his life when the 'Crusader' disintegrated whilst making the attempt.





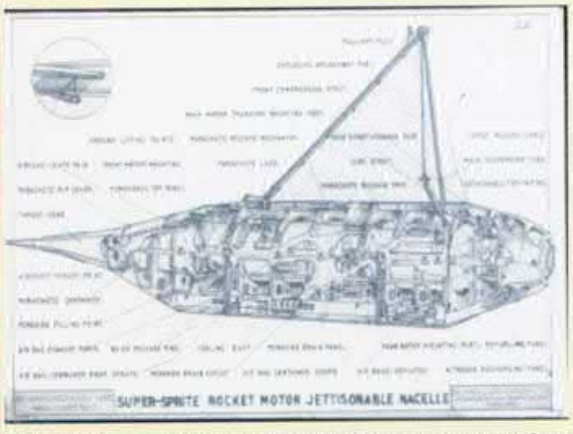
The 'Gryon Senior' gas turbine developed a thrust of 25,000lb at that time the worlds' most powerful jet engine. It was test-flown in the 'Sperrin' aircraft and was to have powered the 'HawkerP1121'.

Sperrin

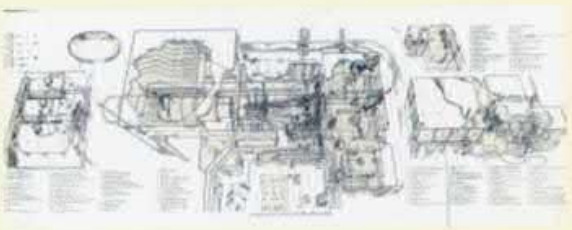
The 'Gryon Junior' was test-flown in the 'Blackburn NA39', which became after development the 'Buccaneer'. The 'Gryon Junior' was also planned to be used in the de Havilland 'Spectre Rocket Engine' as a mixed power plant for the 'Saunders-Roe SR51 High Altitude All-weather' fighter aircraft. De Havilland had initiated some initial design-work on rocket engines, and on 1st January 1955 the de Havilland Rocket Division was formed under the guidance of Val Cleaver. The 'Sprite', 'Super-Sprite' and 'Spectre' rocket engines were developed. The 'Super-Sprite' had a thrust of 4,000lb for about 40 seconds, and was used on the 'Vickers Valiant' bomber as an assisted take-off unit. Tests were carried out at Hatfield where I had the opportunity of being a spectator.

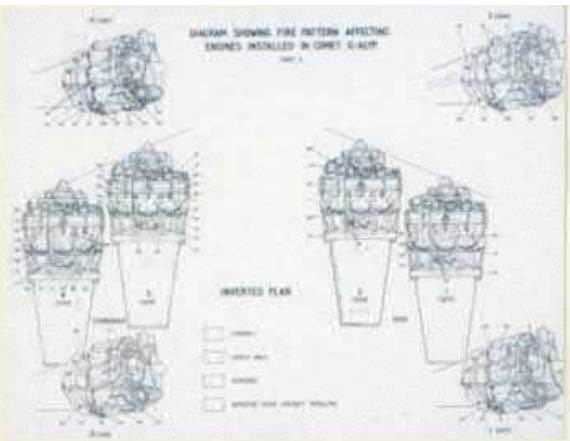
Valiant Bomber

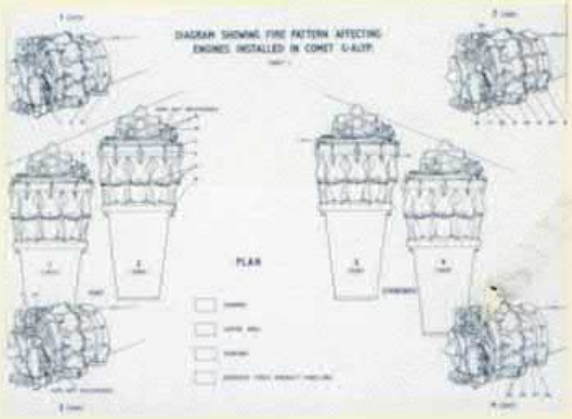
I had the very interesting task of producing the rocket test bed cutaway drawing experiencing the rocket engine testing and various procedures within the safety of the control center.



The 'Super-Sprite' rocket engine received the Ministry of Supply Rocket Engine Technical Certificate No. 1



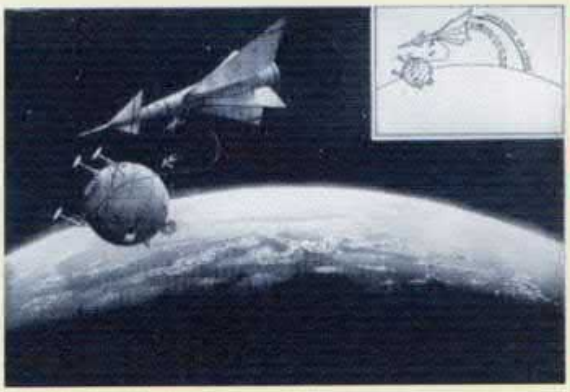




On January 10th 1954 a de Havilland Jet Comet airliner crashed in the sea off Elba, on the 8th April 1954 another de Havilland Comet crashed near Naples. The Comet's Certificate or Airworthiness was withdrawn. Wreckage from the Comet in the Elba crash was transported to Farnborough and the Ghost engines were taken to Stag Lane for examination. I was given the task of preparing charts showing the fire-patterns etc. At the official enquiry the engines were cleared of all blame for the disaster. Sadly this was the beginning of the end for the de Havilland Enterprise from which it never recovered.

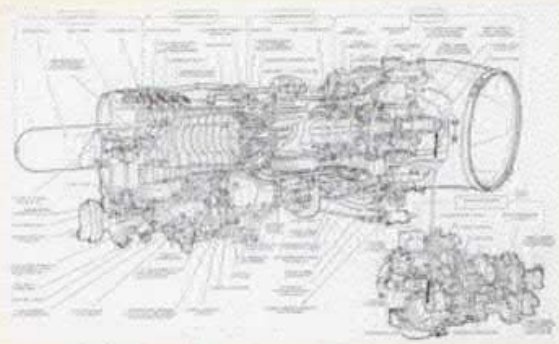
With a partner I became involved with free-lance work producing artwork for Esso Petroleum and others. At times there were problems concerning deadline dates and deliveries whilst still attending to my de Havilland commitments. I was asked to produce an illustration depicting a futuristic flying scene in the year 2003, 50 years hence, viewed from Westminster for the weekly magazine 'Illustrator'.

With Val Cleaver, Arthur C. Clarke, I was a member of the British Interplanetary Society. Arthur c. Clarke, visionary and author of the '2001 Space Odyssey' and many other books predicting communication satellites, space shuttles etc. was preparing another book in 1954 'The Young Traveler in Space'. Val Cleaver mentioned to Arthur that he thought I was capable of producing the necessary illustrations and diagrams required for the book. Arthur agreed and I was told to go ahead. After completing the illustrations Arthur very kindly extended an invitation for me to dine with him at his club in London, which I accepted. Arthur was a good conversationalist and I was very interested. After an enjoyable meal we attended a film show.



Val Cleaver who I had contacts with from my early days on propellers, was eventually to become Director and General Manager of the Rolls Royce Rocket Division.

EARLY AVIATION HISTORY



In 1958 a licence was obtained from General Electric of the U.S. to build and develop the 'T58 Turbo shaft' engine named the 'Gnome'. This was used to power the 'Whirlwind' helicopter, the 'Vertol V107', the 'Agusto-Bell 2C4B' helicopter, and also in the hovercraft trials.

In 1960 our Technical Director Dr. E. Moult who was also President of the Royal Aeronautical Society asked me to assist Mr. Lavvard a director of H. H. Martyn & Co. of Cheltenham, with the design and decoration of a Presidential Chair to be presented to the Royal Aeronautical Society by Sir Roy Fedden and financed by him. It proved a very interesting project, being chauffeur-driven to different venues in order to gather the necessary data. Sir Roy knew what he wanted and although quite elderly traveled by rail from his home in Bwlch in Wales to Paddington Station were we would collect him and transport him to Stag Lane where with Dr. Moult we would discuss the salient points. Finally, with the completion of the Presidential Chair to the satisfaction of Sir Roy, I was pleased that the mission had been accomplished. I felt privileged when Sir Roy presented me with a copy of his book 'Britain's Air Survival' together with a thank you inscription.

Sir Roy at Hamilton Place again privileged me to receive an invitation from the Royal Aeronautical Society for the Chair Presentation. This was followed by a lecture given by Mr. R. Smelt, Chief Scientist of the Lockheed Aircraft Corporation on the 'Agena Satellite ^ Discovery Programme', and this was followed by an informal dinner. This was attended by distinguished personalities in the aviation world.

I was further honored with an invitation for my wife and I to attend the official opening of the Royal Aeronautical Society's new headquarters in London. Anne my wife and I thoroughly enjoyed the evening, meeting-up with so many Who's Who in the aviation world – an outstanding feature was a very humorous episode that Anne and I had with Sir Frederick Handley Page!

In 1952 Bristol Engines acquired through Hawker Siddeley, the de Havilland Engine Company thus we became the Bristol Siddeley Small Engine Division. Things moved-on with very little change and I still retained my title as Chief Technical Illustrator. After a while we were moved from Stag Lane to Leavesden in Hertfordshire. This had been a wartime shadow factory for the production of Mosquito aircraft and Halifax bombers.

We had the pleasure of meeting Douglas Bader who gave us a talk about life in the Royal Air Force during the war. At no time during this lengthy talk would he take a seat but insisted on standing.

On October 5th 1966 Rolls Royce acquired 100% ownership of Bristol Siddeley and in January 1968 Bristol Siddeley Engines became Rolls Royce Engine Division. There were a number of changes although for a time I retained my title. Then the Technical Publications Department became a separate unit to be known as Product Support Graphics, which meant we took on sub-contract work as well as fulfilling our obligations to Rolls Royce. Thus I was moved side-ways to serve as assistant to the Manager. In 1971 Rolls Royce suffered financial problems the Government stepped in and we became known as Rolls Royce (1971) Limited

I felt sad having to say farewell to so many in the Company, the Publications Department, and Engineering and in particular my own team of illustrators who had given me full support many of whom had been with me for twenty years or more.

In 1980 with the earlier problems overcome we again became Rolls Royce with the Small Engine Division, and I again took on the role of Chief Illustrator. In 1981 I applied for early retirement having spent 48 years in the aviation industry.

In the beginning there was:-

GEORGE FRODSHAM

Then followed (But not in this order):-

John Murrell	Eric Partridge	Gary Shadbolt	Alison Midgley
John Marsden	Alan Lee	Ruth Jeffries	Roger Palmer
Tony Lofthouse	Jim Carter	Ray Lawrence	Gordon Chittenden
Peter Hazlehurst	Bill Ordway	John Mosen	Jim Langley
Arnold Turley	Martin Cairns	Rosemary Hedges	Chris Jackson
Colin Rattray	Derek Rayner	Jenny Bamford	Philip Vine
Dave Fowler	Bob Gilbert	Stewart Grey	George Howarth
Ted Jerrold	Barry Austin	John Headlam	Tony Saville
Don Patey	Basil Smith	Richard Brandon	Bob Miller
Tony Townsend	Nita Goodwin	Phil Cox	Studio Clerks
Jeff Phillips	Ray Wakefield	Zara Robinson	George Williamson
Edith Peterson	Colin Parker	Toni Bezzelleca	Eamon Morrisey
Meryl Christy	Bert Griffin	Les Taylor	Tommy Thomas
Honor Crispe	Ron Sambrooks	Brian Banks	Fred Bailey
Jerry Cruikshank	Barry Ferris	John Wood	Rex Floyd
Hugh Lachlan	Alan Titterington	Bob MacGullog	Pat Bowman

We apologise if we forgot to include somebody, but there are so many - and you George are the only person who knew all of them.

We hope that this list will recall events spanning many happy working years, and a lot of people who started as colleagues and ended as friends.

STUDIO Seal of approval June 1985

In addition to the retirement parties I was proud to receive from engineering a presentation piece comprising 'Gnome' helicopter engine compressor blades on a plinth with inscriptions.

There is much I have left unsaid in this write-up, with the ups and downs of my early working life, through the war years, and the aftermath of the many personalities encountered, many sadly no longer with us.

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