

THE AVRO  
REPAIR  
ORGANISATION  
I) Bracebridge Heath.



## THE AVRO REPAIR ORGANISATION

### INTRODUCTION

In 1939, prior to the start of WWII, with a growing number of Avro Ansons in RAF use, and the imminent equipping of RAF bomber squadrons with the new Avro Manchester, A V Roe and Co Ltd decided to establish a repair depot well away from its production facilities in Manchester. It was logical to look at a site near the operational airfields where their aircraft were based, and so a management team was sent across to Lincolnshire to find a suitable place close to the city of Lincoln - where a supply of labour could be guaranteed - and the depot was established at Bracebridge Heath, just south of Lincoln and close to RAF Waddington.

The organisation being set up was to comprise two main Divisions - the first one being the operation of a Repair facility for practically all the sections and assemblies of the Avro aircraft in widespread RAF service - and the second being the control and administration of groups of Avro engineers, known as 'Contractor's Working Parties' or 'CWP's' (later called just 'Outworking Parties'), who were set up on every RAF base where large numbers of Avro aircraft operated.

Where Avro aircraft suffered from Category 'A' damage (ie the repair was beyond the RAF unit's own capability) the CWP's on the base took over, and requisitioned the necessary spares from Bracebridge Heath (and the factory in Manchester if necessary), and repaired the aircraft in a hangar allocated to them with the help of RAF engineering staff.

Where the aircraft suffered from Category 'B' damage (ie repairs on site were not possible, and the aircraft had to be dismantled for transport) the various sections of the Avro Ansons, Manchesters and soon, Lancasters, were sent back on RAF 'Queen Mary' trailers to Bracebridge Heath for complete overhaul and then for re-assembly.

When Bracebridge Heath first opened in late 1939, Ansons were initially dealt with there, the various sub-assemblies arriving by road, being completely stripped and rebuilt. Usually these were then taken down the A15 a mile or so to RAF Waddington, where a large Avro CWP was given the use of Hangar 1 for the duration of the War and re-assembled them there. RAF pilots from the base would be asked to test-fly them when ready, and pass them as fit for Service use again.

As the new Manchester heavy bombers went into service at Waddington with 207 Squadron from November 1940 and operations began over Germany in February 1941, the Avro CWP's rapidly increased in number to cover all the RAF bases involved, and at the same time the size and complexity of the Manchester meant that Bracebridge Heath could not itself cope with the overhaul of all the components. Thus a number of other firms were asked to assist in repairing various parts of the bomber.

Soon, the increasing number of Category 'B' Manchesters and (from March 1942 onwards) Lancasters meant that Avro's needed to open another suitable depot in the area, where complete Lancasters could be rebuilt rapidly from all the overhauled components, and put back quickly into service.

Thus it was decided to open such a facility at the newly-built RAF bomber station at Langar, Notts, in September 1942, controlled from Bracebridge Heath, where sections of Lancasters could - as at Bracebridge - be stripped down and repaired, but assembly of the complete aircraft could also be carried out on a small production-line system. For this, all the components would be sent there from the many works now engaged in Lancaster repair.

Coincidentally 207 squadron (of Manchester fame from Waddington) now re-equipped with Lancasters and moved into Langar in September 1942, the same month that Avro's new works opened there. The history of this Avro site, embracing as it did an absolutely vital role over the next three decades, and yet a largely unsung success to the outside world, is now recounted here with the help of some of the surviving men and women who so conscientiously worked there between 1942 and 1968.

## **PART I**

### **THE BRACEBRIDGE HEATH WORKS**

The site chosen by Avro's for their repair workshops and for the control of the CWP's, was on an old Royal Flying Corps (RFC) aerodrome at Bracebridge Heath, just 2¼ miles south of Lincoln on the east side of the A15 road, but more importantly, just one mile north of the large RAF bomber base at Waddington.

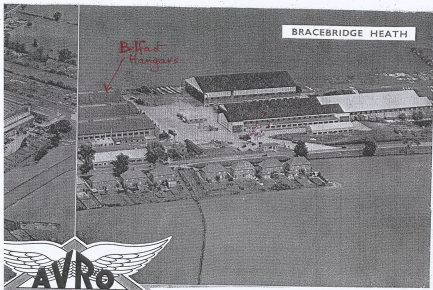
With a cemetery on one side, and a lunatic asylum on the other, the field at Bracebridge Heath had developed in the Great War as a landing ground (called Robey's Aerodrome) where the Lincoln firm of Robey & Co Ltd began to build aircraft under licence (Maurice Farman Longhorns) later joined by Clayton and Shuttleworth Ltd (another local firm) building Sopwith Camels and Triplanes there. Short seaplanes were also built under licence.

In 1917 it became No. 4 Aeroplane Acceptance Park, where newly-built aircraft were flight -tested and accepted by the Royal Flying Corps (RFC), and six permanent brick and wooden lattice 'Belfast' hangars were built, together with a variety of temporary buildings.

The aerodrome closed in 1920, and the six stoutly-built RFC hangars were used between the wars by the Lincolnshire Road Car Co (the local bus company) and other firms in the motor or engineering trades.





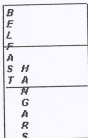


BRACEBRIDGE HEATH

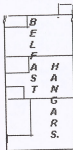
Belfast  
Hangars

AVRO

# A.V.R.O. BRACEBRIDGE HEATH.



USED BY  
COLNSHIRE  
AD CAR BUS Co.  
f the 6 Belfast  
ngars.



MAINTENANCE  
SHOP. >>

MAIN HANGAR FOR  
LARGE  
ASSEMBLIES.

STORES HANGAR.  
MACHINE. >>  
SHOP.

MAIN OFFICE.

WORKS OFFICE CANTEN

GATE OFFICE.

GARAGE

MAIN GATE.

A.15. LINCOLN TO SLEAFORD. >>>>>

As these substantial hangars were still in good shape at the start of WWII, Avros decided to requisition three of them for their new Repair Organisation, and took up occupation in May 1941, gradually expanding to other buildings on the site as the war went on.

#### Site Layout

The layout of the Avro site can be seen in Diagram 1 (not to scale). The No. 1 hangar was divided into three sections, being in effect Belfast hangars No. 4-6 of the original RFC aerodrome (their hangars No. 1-3 were in an identical block parallel to and on the north side of this, and the Lincolnshire Road Car Co retained use of these throughout WWII for use as a bus depot).

A security fence was built around the new Avro site, to segregate it from the bus depot, and the other buildings were added as the War progressed.

The interior layout of No. 1 hangar is shown in Diagram 2. Both of these diagrams were prepared from memory by Frank Harlow who worked there from 1945 to 1950 and thus reflect the layout of the site just after WWII.

1958

8

Frank recalls:-

*"No. 1 Hangar was typical of the hangars of the Great War period, buttressed brick end walls and interior brick arched walls supporting wooden lattice-work curved roof trusses, in this case giving three large, clear, uninterrupted areas.*

*No. 2 Hangar, the Stores Hangar, and Canteen were all new buildings built during the War.*

*The diagram of the layout of No. 1 Hangar gives a general idea of its arrangement. All these different items were not necessarily being worked on at the same time but over an extended period.*

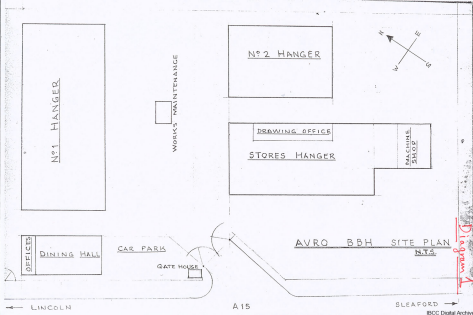
*No. 2 Hangar was almost exclusively used for the repair of Category 'B' Ansons after the war - all different marks."*

#### Personnel

When the works opened, the senior managers and personnel were drafted in from Avro's Chadderton and Woodford factories, and many of the workers were recruited from towns like Hull, Derby, Coventry and Birmingham. Cyril Greenwood was one who came down from Hull to work there just after Avros opened, and at the age of 19 went to work in the newly built No. 2 Hangar.

At first No. 2 Hangar was used for stripping down Manchester bomber assemblies, and in particular the mainplanes - when repaired, the assemblies were sent back to RAF bases where the Avro CWP's put the whole aircraft together again.

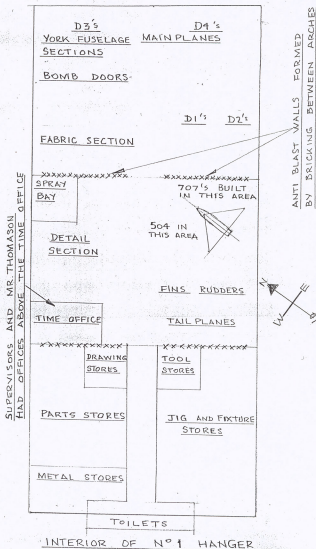
Frank Harlow.



Frank Harlow

Diagram 2

NOTE:- ALL THESE AREAS OF ACTIVITY  
WERE CHANGED AROUND TO  
SUIT THE WORK AVAILABLE



No 1 Hangar  
(Belfast type  
from WWI)



Soon, the Manchesters were replaced by Lancasters, which arrived in ever increasing numbers for the rest of the war.

The first overall Works Superintendent was Mr C L Hatton, who was drafted in from being Superintendent in charge of Avro's Experimental Dept at Ringway Airport. He was in charge of both the Bracebridge Heath works, and the growing organisation of Avro working parties at RAF stations (CWP's). Before long, he would also be in overall charge of the second Avro repair factory, set up at Langar, Notts.

The day-to-day running of Bracebridge Heath - the aircraft repair, and the stores side - was in the hands of Mr Thomason, and the Chief Inspector was Bill Sturrock.

Later on, 'Snowy' Langton succeeded 'Charlie' Hatton as overall Superintendent, and by then he needed a Deputy, Mr Dowell.

One of the early workers to be sent across from Manchester was Mr V A Savory, who was the AID Inspector, and his tall figure, always seen to be walking slowly around, was familiar to all for many years. He walked slowly because of the injuries he had received when he escaped from the crash of the R101 Airship at Beauvais in France.

Cyril Greenwood came from Hull in 1940 to work at Avros at Bracebridge Heath. He stayed until the repair of aircraft on site finished in 1958, but his first impressions of the job are interesting:

*"In those early days we travelled to Avros by bus. At one time the bus company had a strike, but the Air Force and Army stepped in and provided us with various vehicles to get us to work!"*

*We worked seven days a week from 07.30am sometimes until 19.00pm, including overtime. We had one weekend off once a month, and I was then able to go home to Hull. There were always long waits at the railway stations and always crowded trains. I constantly got caught up in the bombing raids on arrival. The City of Hull took a very great battering." (The Avro works did shut completely for the normal summer and Christmas Holidays.)*

*"In Lincoln, I suppose we were rather lucky, we had a share of German raids but no comparison to other places. (Rather surprising, seeing we were surrounded by aerodromes!) My first visit to Lincoln was to find lodgings, which I was to share with another Avro worker, who also came from the same city. He was a very good artist, he drew various caricatures of members of the staff (I still have one of our foreman, although it is now rather dilapidated). Sadly, he died quite young of meningitis.*

*My wife started work on 'nights' at Avros, dismantling the aircraft. All the screws, nuts and bolts which were attached to all the wiring, had to be undone and kept for*

renovation. When she decided to work 'days', she was put on a bench near me, where she was itemising and recording various spare parts all the time."

Ken Mumby started work in 1942 at Bracebridge Heath, and remembers:

*"I started at A V Roe after working as an Electrician on East Coast Radar Stations, when the Manchester bombers were still flying. I only worked on Lancasters at Bracebridge Heath and also at Waddington before going 'outworking' to various sites. At Bracebridge Heath we had all the sections - nose, front section, centre section and rear section, etc. I was on the Electrical Section and in many ways it was so different to the modern day aircraft (we had to deal with the entire aircraft wiring in those days!)*

*I have vivid memories of a Manchester bomber in the early days, being towed on the A15 (minus wings) to Bracebridge Heath to be worked on . . . would be only about a one mile journey. I never saw a Lancaster being towed on the A15 and they were not done so, to my knowledge. At B111 many girls cleaned aircraft with 'Tricolene' and were given a pint of milk a day to counteract the effects of fainting, etc!"*

In those early days there were two main functions at Bracebridge Heath - Salvage (of damaged parts) in Hangar 2, and Repair of all the different sections in Hangar No1 (the 1914 block). Many girls were employed in the Salvage unit recovering various components and instruments, etc.

There were other girls taken on in Hangar 1, like May Chambers in 1941, who was placed in the fabric repair section. She remembers working at first on Anson wings and tails, recovering them with fabric and doping them afterwards. Soon, Manchester tails, and then Lancaster parts arrived, to be recovered. Occasionally odd objects like some of the special bomb doors for 617 Squadron's aircraft appeared at the works for repair. May also remembers that when Rolls-Royce Merlin engines arrived at Bracebridge either before, or after repair, the fitters who took charge of these were usually from Rolls-Royce itself. Large lorries and trailers would take refurbished parts from Bracebridge down the road to Waddington when ready, or to other RAF stations, and later, to Langar.

As the number of crashed and damaged Lancasters rapidly increased, neither Bracebridge nor the new Avro works at Langar (opened in September 1942) could keep pace. Thus, other companies were brought into the Avro Repair Organisation including Brush Electrical at Loughborough and Northampton (wing sections in particular); the LMS Railway works in Derby (centre sections, etc); the Bailgate works in Lincoln (nuts, bolts, rivets and pipes, etc); Avro's own Yeadon factory (bomb-doors, etc); and so on.

#### **Outworking Parties in WWII**

Ken Mumby was put on a 'Contractor's Working Party' soon after starting at Bracebridge in 1942. He remembers:



"While 'outworking', I worked at about 20 or so RAF Stations in Lincolnshire and Yorkshire, a lot of them Satellites, repairing damaged 'Lancs' from various raids. It was much more interesting than being in the Factory, and an interesting incident occurred when I was sent to Linton-on-Ouse (Yorks). As I approached the aircraft on dispersal, I didn't think the aircraft were Lancasters at first because they had radial engines (Hercules). I am given to understand they were one of the few Squadrons in England with the Mk II Lanc.

I also spent some time at Scampton with the 'Dam Busters' Squadron. At first we knew nothing of the planned Dams Operation. We had no idea, except that we saw the Bomb well modification to take the 'spinning bomb', and 'Lancs' flying about 30ft above us whilst we were at dispersal points working on other aircraft.

Whilst working at Syerston near Newark and at other sites, when night operations were taking place, we were not allowed off the 'drome until all aircraft were over our coastline - which meant an hour or two's delay in waiting for 25/30 aircraft getting airborne and away. This was in case there should be any 'Fifth Columnists' amongst us!

Most of the sections of the Lanc used to be delivered from Bracebridge by 60 footers (a common sight down Cross-O-Cliff Hill and along the A46 out of Lincoln, to the various 'dromes and Satellites). This was the general means of transport I had to get to jobs. At other times we were taken by car, often by a Crash Inspector. I recall being taken to Woodhall Spa by an AID Inspector one day to work on a Lanc which had to have 2 starboard fuel tanks fitted. All I had to do was to connect up the fuel gauges and pumps, and the Inspector went to the other side of the airfield to look at another crashed Lanc. He didn't take long, because the main spar was twisted and reduced to salvage, 'Cat.E'.

Sometimes I went to 'dromes further afield in Yorkshire, and on one occasion to an American base where we had to stay several days and lived in the Mess with the Servicemen. At other times, if it meant several days work, we would go to the local Police Station for accommodation."

Ernest Bradley was another Avro employee who started at Bracebridge in 1942, and was soon put into the Outworking Party down the road at RAF Waddington:

"I was in No. 1 hangar working on the Engine staff. I loved it because we could see the aircraft taking off on Bombing raids, and count them next morning when we came to work, and believe me I saw some very gruesome sights. Any damaged aircraft came to us for repairs. I remember going into one Lancaster that came to us. I arrived at work one morning and it was parked outside the hangar, and had some holes in the wings and body. I climbed inside to check it out and the first thing I saw was a shoe saturated in blood and then I saw that the rear turret had a mass of bullet holes in it. It also had blood stains all over it, a very nasty sight, but of course we were at war. I saw an odd aircraft now and again that had belly landed, but were considered to be 'write offs'.

*Working on repairs it was common place that at least one worker had to go up with any aircraft repaired. It could be anyone of the workforce. At the end of the war, after working on an 'Avro Lincoln' it was due to be tested, and to stop any sabotage (the real reason) someone had to go up with it. I remember we completed this aircraft and I was having my tea break, when the 'Boss' came in. He said to me: "Go over to the Parachute Hangar and tell them you need a Parachute". I said "What do I need one for?" He said: "You will be going up at one-o'clock with the aircraft you have just worked on. The pilot will be down shortly". The aircraft was duly taken out of the hangar ready for testing. Everyone joked about it, saying: "I wouldn't go up in that for all the money in the world". Another said "It won't get off the ground", and: "Glad it's you not me!" After tea break a pilot officer came up to the aircraft. "Is this the one for the Test Flight?" The 'Boss' said "Yes, its ready, and this chap will be going with you". Even the pilot said to me jokingly: "If you have to bale out, you will probably fall out of the parachute!" (But he did say he was only joking). A few of the workers standing outside on the tarmac said "It's been nice knowing you 'Charlie'<sup>13</sup>, but I liked it when we got airborne. The pilot stood me behind his seat and said "Hold on to it!"*

Tom Bourne, who worked at Avros as an aircraft fitter, firstly at Newton Heath in 1936, then Chadderton just before WWII started, was selected to be posted to Bracebridge Heath in 1940, as the new Repair Organisation began to expand. He poignantly remembers:

*"We were housed in an old, First World War hangar, not far from RAF Waddington, home to 44 Rhodesia Squadron, who later took delivery of the new Lancaster bomber which was to take part in the daylight raid on Augsburg, Germany - and which resulted in Squadron Leader John Nettleton being awarded the VC.*

*After working at Bracebridge Heath for a while, I joined a small outworking party and made my way to RAF Skellingthorpe near Lincoln to repair a Lancaster damaged the previous night, while on a raid over Germany.*

*On reporting at the main gate, I was issued with a pass and entered a different world, where aircraft were taking off and landing every second. The sound was deafening. My party was directed in the general direction of our aircraft, which was on the other side of this huge airfield.*

*We started off walking round the perimeter, and were soon overtaken by a Lancaster, trundling round to the take-off point. This was closely followed by another so we stood aside to let it go by.*

*This one stopped, with a squeal of brakes and the rear gun turret swung round, and the 'Tail-End Charlie' fired his four Brownings into a sand pit put there for this purpose. He was just clearing his guns, which was a normal procedure - although no one had told us! It caused some amusement with the cockpit crew, who had a good laugh at our expense.*

*Following that, a tractor pulling a train of live bombs zig-zagged its way past. We decided it would be better if we walked on the grass!*

*We eventually reached our dispersal and safety! It was my first sight of a fully operational bomber and a Lancaster close up! As it had been on a bombing raid over Germany the previous night, everything was in place - the ammunition racks leading to the gun positions were full of live bullets, all of different colours, denoting their particular use. One in every ten was a tracer - then came incendiaries, armour piercing and to make up the ten, the ordinary bullet.*

*On entering the aircraft, I could feel the atmosphere - the smell of sweating bodies, disinfectant from the 'Elsan', gunpowder and stale breath. The interior was still warm from the previous night's operation. We read the damage report and finally got sorted out. The NAFFI van sailed by un-noticed, until it was too late!*

*At the end of our first day at Skellingthorpe, we trudged back round the perimeter, which was by then relatively quiet - all the aircraft were on their dispersals, being 'Bombed-up', ready for the coming night's 'OP'.*

*This was my first experience of a Bomber Station, and one that would be repeated many times over the next three years.*

*Lincoln was surrounded by Bomber Stations. From our digs in the High Street we could hear the different squadrons all starting their engines, one by one, until the air trembled with the noise! It would then go quiet, when they all assembled at the take off point. Then, one by one, they would open up and charge along the runway, the Merlin engines perfectly in tune. When the wind was in a certain direction they flew directly above our digs, their navigation lights winking in the night sky, disappearing above the clouds. Within minutes, all the noise would be gone, and a deadly silence would descend. A large percentage of them would never return.*

*Next morning, after eight or nine hours airborne, the lucky ones could be heard circling above, awaiting their turn to land. Some had been shot up, others had wounded aboard, who would be met by ambulances, and stretchered off to the hospital on the station. We never made friends with the aircrew - there was never any time. They were here today, and gone tomorrow.*

*This was a sample of life on a typical Bomber Station. Damaged aircraft were repaired, aircrew replaced, hearses, bedecked with flowers from grieving relatives, mingled with tractors pulling their load of death. Bicycles by the dozen were being ridden in every direction, many by WAAF's, who played a large part in everyday life on a Bomber Station.*

*Bomber Stations such as Scampton, Waddington and Skellingthorpe, all used Lincoln Cathedral as a beacon, on their return across the North Sea.*

In the hangars, a section was always reserved for 'Old Bangers', formally the pride and joy of aircrews, who had failed to return after a raid. If 'OPs' had to be cancelled, they would pile into them, and chase down the country lanes to their favourite watering hole. Here they drove the usually quiet locals mad, with their antics. After all, they had such a short life - every moment was precious - and if their lives were extended by spending a night in the 'nick' so what? Once a 'Tail-end Charlie' with staring eyes recounted when on the previous night's raid, he opened up on an enemy fighter. It was only the presence of a Staff Sergeant that saved him from being a resident in the local 'nick'! - you were always warned that 'Careless talk costs lives'.

Every so often these 'Old Bangers' would be auctioned off to the local dealers, who would, in turn, sell them back to the new intake. They would eventually end up in the hangar to be auctioned off once again and so on.

There were the odd times when a little light relief helped to ease the tension. Once I was seated in my favourite W Op's seat in the aircraft at dinner time, while I watched the antics of two RAF officers, who rowed out in the middle of a static water tank. One of the officers stood up and pointed a pistol upwards. By the time he had plucked up the courage to pull the trigger, the pistol was pointing across the road and the contents ended up draped over the telephone wires. The two officers finished up in the bottom of the dinghy, laughing their heads off. It seems that the object was a new type of distress signal - a rocket propelled kite, to be used by aircrews who had ditched in the 'Drink' (come down in the sea) after being hit over the target. This was a common occurrence in the days of 1,000 bomber raids.

In those hectic days, as our lads were returning, so the Yanks were forming above, on their way to bomb in daylight raids. On the nights when our lads were at home they met up at the pubs in Lincoln, with the Yanks. There was never any trouble, just high spirits. The Yanks were all six or seven feet tall - and usually commandeered all the city pubs. They, of course, had the money. They were also very generous and would buy anyone a drink!"

#### **The war ends**

As WWII came to an end Frank Harlow arrived at Bracebridge to work for Avro there. He recounts:

"The passing of time may have dimmed my memory, but I will remember the day I started work at A V Roe Bracebridge Heath - it was May 7 1945. The next day, May 8, was VE day and was declared a holiday.

I was one of a group of RAF tradesmen in 1942, given the opportunity to volunteer to work on aircraft production, initially for a minimum period of six months - after review it was decided to leave us doing this vital work of national importance. In the first place I

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was directed to Coventry, to work on the production of Bristol 'Hercules' engines, later in 1945 I was directed to work at Avros at Bracebridge Heath.

My impression on entering the gates was that it looked like a big scrap heap - bits and pieces of aircraft were dumped everywhere! Many times, however, this heap of junk yielded a vital item (not available in the stores) to complete a job. Eventually, during the next couple of years the yard was gradually tidied up.

Inside the hangars things were more organised. I was placed with a group repairing Lancaster D3 and D4 sections which took up one side of hangar No1. On the opposite side was a fabric section mainly doing work on Ansons, 'rebagging' fuselages and re-covering control surfaces and doping them. On the far side was a detail section making various items (ie brackets, ribs, etc, which were made of sheet metal, requiring cutting out and bending or folding), as and when needed for both 'Outworking Parties' and inside shop use. Also in this hangar, spaces were found for working on Lancaster fins and rudders, a drawing store, a tool stores and a spray bay.

Across the concrete yard another hangar (No. 2) at this time, dealt mainly with repairs and re-building of Ansons, and employed quite a large woodworking gang.

Next to this was a large stores hangar dispatching sections and parts of aircraft daily to many destinations.

During the first couple of years while I was at Bracebridge Heath, some special jobs came along for attention, like a York for General Smuts of South Africa, a Lancastrian 'Aries' for polar flights and an Avro 504N for restoration."

With the War over, Lancaster repairs continued for a time but Yorks, Lancastrians and then Lincolns began to appear in small numbers. Later, Ansons needing 'Cat B' repairs began to appear in continuous order, some landing at Waddington and actually being towed up the A15 on their wheels by a company tug. This tug also took some Lancasters on their main wheels - but minus their outer wings which were removed in Hangar 1 at Waddington. These Lancasters were on a one-way journey to be completely broken up at Bracebridge - hence the untidy 'dumps' that Frank Harlow saw on his arrival.

Ron Morley, who worked at Bracebridge from 1946 to 1958, firstly in the Engine Bay and later in Inspection, also remembers seeing the Lancaster's - minus outer wings - being towed up from RAF Waddington along the A15, and on arrival at BBH, someone would operate the undercarriage lever, and the great aircraft would sink slowly to the ground. Men with blow torches would then move in to complete the scrapping.

A York or two were also towed up to Bracebridge with mainplanes removed, overhauled and towed back to Waddington for test-flying, but most Yorks (including that of General Smuts) were dismantled and re-erected in Waddington's Hangar No. 1 - by now only half of which was needed by Avro's outworking party there.

The number of personnel working at Bracebridge (both in the works and with the Outworking Parties) had risen to some 1,582 at its peak in 1943 in WWII (approximately 1,100 being on day shift and 480 on night work), but soon after the war finished and Lancasters were no longer needed, the total workforce dropped to some 623 for the repair work on Ansons, Yorks and Lincolns.

The list of Category 'B' Yorks and Ansons repaired at Bracebridge Heath or Waddington by Avro after the War, as far as is known, is shown in Appendix -----

Cyril Greenfield remembers how, just after the end of the war:

*"I was sent to 'Waddington' Aerodrome for a while. There we worked on the Yorks, servicing and refitting them. One of these belonged to Sir Winston Churchill (LV633 'Ascalon'). Field Marshal Smuts was another whose plane we refitted there (MW107). A pair of binoculars belonging to him which were said to be valuable went missing, and consequently we all came under suspicion and were all questioned about the loss. Eventually, they came to light again. We also serviced Mountbatten's York and gave it a 100 hour service.*

*Back in the factory at Bracebridge again, Lancasters were now stripped of their turrets and other armament and were able then to be turned into passenger planes, some of which were sent to Argentina. We built wing tips and various parts for the Shackletons, including some sold to South Africa.*

*The Anson was another type we worked on, and I remember Sir Stafford Cripps (amongst other VIP's) visited the factory and shook hands with me, saying he was very interested in what we were doing.*

*I thoroughly enjoyed my time and work at Avro's and was so sorry when it was closed.*

*I made some good friends there, some have since passed on, some I still bump into.*

*I also met my wife there and (I might add) we have now spent 52 years together!"*

Frank Harlow remembers the transition from War to Peace at Bracebridge Heath:

*"In my time, I remember that Ansons were towed along the A15 from Waddington to Bracebridge Heath.*

*Larger aircraft needing major over-haul etc, were taken apart at Waddington and elsewhere where outworking parties were based, the various sections and sub-assemblies being sent to BBH. In the event of major damage and repair it could mean replacements being taken from stores to help speed up the turn-around of aircraft.*

Complete assembly of Lancasters was not done at BBH, Outworking gangs being responsible for this at Waddington and other RAF bases.

Q.16.

At BBH, salvage, repair and refurbishment of various sections and sub-assemblies of the Lancaster was one of the main jobs until some time after the war.

When they were finished, checked and inspected they went into stores to form a pool of serviceable items. For instance, my first work at BBH was on D4 sections under chargehand Mr Charlie Rogers. Up to 20 D4s would be on the section at any one time, they were completely stripped out, repaired, resprayed and turned out as good as new. Other sections were similarly organised, working on D3s, D2s and D1s, bomb doors, fins, rudders, etc, emphasis being placed on where the shortages were greatest. I well remember once that main planes were the top priority."

Frank remembers the various people in charge at Bracebridge in the early 1950s.

In overall charge of Bracebridge, the Outworking Parties and Langar, was 'Snowy' Langton. His duties included travelling regularly to all these sites to sort out problems and keep in touch with the personnel.

Langton's deputy was Mr Thomason, who ran the Bracebridge Heath works and devoted all his time to this.

The Chief Inspector was still Bill Sturrock.

In No. 1 Hangar, Mr Rastall was in charge of the Detail Section. He was a 'master of improvisation' and worked wonders with the simplest of tools.

Mr Lawson - one of the earliest employees at BBH - was the Chargehand on various fuselage sections, while 'Charlie' Rogers was the Chargehand on the D4 sections.

Frank Vamplew was Chargehand on the mainplane sections.

"In No. 2 Hangar", Frank remembers, "where the Ansons were undergoing repairs, Mr Andrews, Mr Brown and Mr Hutchinson supervised the work with Mr Pratt in charge of the woodworkers ('chippies'). At one time in No. 2 Hangar, when the Electrical Section was based there, Mr Lance Wingard was in charge. The Hydraulic Section was also based in this hangar, but I cannot remember who was in charge."

Ron Morley also remembers the transition from War to Peace at Bracebridge Heath:

"I went there after the war and did not see an Anson for some time, as the factory was engaged in the demolition of Lancasters. Eventually the Ansons started coming in for Repair and Reconditioning, etc. I worked at first in the Engine Bay, preparing Engines for the Lancastrians and Yorks. Then I joined the Inspection Dept. and soon found

myself in the Inspection Office, where I took over the job of Quality Control Inspector, which included the acceptance of Aircraft items for repair on Contract Loan, and issuing the details to the appropriate Departments for action. At that time I had about 20 Departments to inspect, and had to issue Reports on them each month (including Waddington, where we had half a Hangar where Lincolns were repaired). I don't recall the exact date when the Ansons started to come in, but it was part of my duties to go to Waddington to check the Modifications embodied and to draw up a list of Appendix 'A' items (such as Radio Equipment, Clocks, Instruments etc) - in short, all Air Ministry Equipment destined to be replaced when the Aircraft returned to the RAF.

When I returned to BBH I had to prepare lists of my findings for the various Depts before the necessary work could be commenced. This particular work was not always as easy as it might seem - for instance one day our Transport Dept took me to Waddington in the snow and when I rang for them to collect me they said the road was blocked. I was the only one there at this time, so decided to walk back via the main Sleaford Road, which was the nearest, so I set off across the aerodrome where the wind was so fierce that it was blowing most of the snow in my direction. Luckily I had my 'clapper board' which I held in front of my face. I thought it was like Amundsen going to the Pole! When I reached the main road, the snow was quite deep, but it was only another half a mile and was I glad to get back!

My job latterly concerned the collating of all Modifications, etc, and typing them into the Aircraft Log Books and submitting them to the AID for perusal and signature, prior to the Test flight and despatch. I rarely saw the Test Pilots, but was informed of their arrival from Manchester or wherever."

#### **Developments in the 1950's**

Frank Harlow remembers how the 1950's began to bring changes to the work at Bracebridge:

"Early in the 1950's space was cleared for the building of the experimental delta wing 707 aircraft. Two were built, a 707A and 707C. When completed the aircraft were towed along the A15, which runs past the depot, on to Waddington airfield, and flown off from there. I did quite a lot of work on these aircraft, and recently after over 40 years I saw the 707C again in Cosford Aerospace Museum!

Various members of the supervisory staff had an interest in the building of the 707's, in particular a Mr Taylor. I worked closely with him on several occasions during this period. Later, due to his recommendation I was transferred to the Machine Shop to the job of marker-out.

Meantime work was still continuing on Ansons, and Lancaster sections. About this time a small Machine Shop was set up at one end of the Stores Hangar, its main function being machining 'one-offs', or small batches of 'priority' and 'urgent' items. I had about eighteen months working in there as a 'marker-out'.



*As near as I can recall in 1953/54 a small Drawing Office was established, to which I transferred from the shop floor. The Drawing Office", Frank remembers, <sup>66</sup> was originally established to take over the work concerned with the development of the Vulcan, as Chadderton's Drawing Office was getting swamped with work on the new Avro Supersonic developments of the Vulcan - the Avro 730 and later, 732. But cancellation of these projects in 1956 left BBH with DO capacity to spare. At this time at Langar work was proceeding on an order for the South African Air Force for Shackleton MR3 aircraft with tricycle undercarriage. This drawing office at Bracebridge Heath became involved with much of the work to do with modifications to these aircraft. This meant frequent trips to Langar, producing the necessary 'on-the-spot' sketches, and instructions for work to progress.*

*It was not unusual by the mid-50's to see various sections of Lincoln, or Hunters undergoing repairs etc, but work in the repair hangars then tended to ease off*

*Mr Stobart, often called 'Tubby' was in charge of the newly installed machine shop, while Peter Lodge came to BBH to set up the Drawing Office, and interviewed me when I applied to be transferred to his department.*

*The sections of Hunter fuselages I saw at BBH were new items in Primer paint only. I think they were sent in for modification, and returned to store.*

*Not having an airfield at BBH, flying and flight-testing did not take place, hence there was hardly any contact between personnel here, and the test-pilots at Waddington or Langar.*

*Equally, the Out Working Parties at Waddington, Scampton and elsewhere had very limited contact with the workers at BBH, in the normal routine.*

*I finally left A V Roe's in 1958, after 14 happy years."*

*Some funny stories were told of the towing efforts up and down the A15 road between Bracebridge and RAF Waddington. Ron Frost, who was born in Hamble and worked in the Detail (and later the Jig & Tool Section) at BBH from 1959 to 1962, collected these from the monthly meeting of 'Avro-ites' who still meet on the first Thursday of every month in Lincoln, to talk of the old days:*

*" 'Ron' Dickens was the aircraft tug driver who carried out this task, and his friends remember that in order to swing on to the road from the works there was little room to clear the wingtips, due to a telegraph pole in the way. A chap had to unwind the turnbuckles supporting the offending pole to get past. This was standard practice until one day there was a cry from up the post - it appears they had missed seeing the GPO engineer up the post doing his job! Another story was told, that one day a large car met them head on, while towing an Anson on the A15. The car driver challenged their*

*authority to be on the road with an aircraft in tow. The answer was: 'We have been doing this for years'. The reply was: 'Well, I'm the Chief Constable, so get permission from me in future!'* "

### **The 707s**

Five of these small delta wing research aircraft, built to provide data for the Vulcan bomber programme, were flown between September 1949 and July 1953, the last two being assembled at Bracebridge Heath and test-flown at RAF Waddington.

The first of these, an Avro 707A (WZ736) was actually test-flown at Waddington by Sqd Ldr Jimmy Nelson, AFC on February 20<sup>th</sup> 1953, and the second, an Avro 707C (WZ744) was test flown at Waddington on July 1<sup>st</sup> 1953 by Sqd Ldr Jack Wales, DFC.

Ron Morley remembers that there was a works dispute on at the time that one of these was waiting for its first flight, and the entire Inspection Dept was recruited to get it ready for flying.

Donald Broomhead, in the Wing Dept remembers working on making wing ribs for the 707s, and John T Woods recalls:

*"Eventually I made some of the patterns, being a cabinet maker by trade, for the prototype 707A aircraft. I have many memories of the days at Bracebridge Heath, including when the first 707 was towed up the Sleaford road to Waddington Airfield for its first flight, and one wing tip hit a tree! On another occasion, the 707's under-carriage would not lock down.*

*Many of the machined parts of the Vulcan airframe controls were made in the machine shop at Bracebridge Heath. At this time I was a machine shop inspector, and I remember the difficulty we had with the aileron bearing housings!"*

### **Bracebridge's versatility**

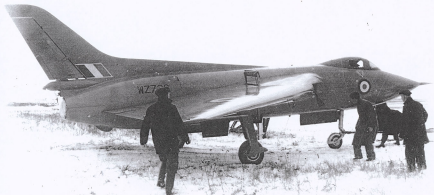
Len Binding joined Avros at Bracebridge Heath at the beginning of February 1946. He had served with the RAF in India during the War and was a brilliant airframe restorer. It was he who had discovered that the glue in the wooden Mosquito wings was perishing in the humid Tropics, and had them grounded - thereby saving pilots lives.

He listed the chronological order of events as the 1950s and 1960s passed by at Bracebridge:

*"With the war over, surplus Lancasters were being cut up for scrap in the open areas between the hangars when I arrived there.*

### **Avro York and Lancastrian**

*In hangar C1, an Avro York and a Lancastrian were under-going major repairs. The fuselages were split at the transport joints and the sections fitted in their respective*



Avro 707A, WZ736, built at Bracebridge Heath, being towed up the A15 to Waddington Airfield to be flown by Sqd Ldr Jimmy Nelson, AFC.

bogies. When structural repairs were completed and the sections re-assembled, the fuselages, complete with centre sections and undercarriages, were fully equipped and tested.

With the co-operation of the police, the aircraft, less mainplanes, would be towed from the factory along the A15 road to the boundary fence entry point at RAF Waddington. Factory personnel working on the station carried out fitting of mainplanes, outstanding work and finals.

Other departments at the factory were repairing York mainplanes - tailplanes - fins - ailerons - elevators and rudders. This work rapidly increased during the Berlin airlift.

Major repairs to a second Avro York followed, along with various sections:- (D1 and D2f, also fD4).

#### **Avro Anson (All Marks)**

Major repairs and overhauls to Avro Anson aircraft commenced in B1 Hangar, followed by the manufacture of Anson metal tailplanes, mainplanes and centre sections in C1 Hangar. The Ansons were completed at Bracebridge Heath, then towed to RAF Waddington via the usual route.

#### **Lancaster Spares**

Various Lancaster fuselage sections, including undercarriages, wheels, tyres and brake units were serviced for the Argentine Air Force, which had bought a number of used Lancasters. This was part of the spares requirement.

#### **Avro 707A and 707C**

It was decided to build an Avro 707A and a 707C at the Bracebridge Heath factory, which included all the relevant sub-assemblies and the majority of details. Main jigs were installed for the assembly of front and rear spars, mainplanes, centre section, rear fuselage and fin, but the nose assembly was built at the Woodford factory and equipped at Bracebridge Heath. Wooden fixtures were used for the other major sub-assemblies.

Final assemblies and functions were carried out at Bracebridge Heath. The aircraft were then towed to RAF Waddington via the usual route, where finals and flight-tests were carried out.

#### **A Slight Deviation from Aircraft!**

During a slack period at Bracebridge Heath, C1 Hangar got involved in the manufacture of 'Choc Ice Cream Machines', which not only coated the ice cream with chocolate, but wrapped the final product!

#### **Hawker Hunter Fuselages**

Quite a large number of crated Hawker Hunter fuselages were forwarded to Bracebridge Heath for modifications. Jigs and the necessary parts were manufactured on site, and when modifications were embodied, the fuselages were re-crated and returned.

#### **Shackleton MR2 and MR3 Aircraft**

Jigs were installed for the manufacture of:

Outer mainplanes, inner mainplanes, fins, rudders, tailplanes, elevators and bomb doors.

#### **Shackleton and Lincolns**

Other departments carried out repairs similar to those mentioned above, plus fuselage sections.

#### **Argosy AWA650 Freighters**

The manufacture of the Argosy freighter was allocated to various sites. The Woodford factory task was the centre section. Bracebridge Heath's task was to build the inner and outer wings.

A meeting was held at the Chadderton factory to discuss the programme, which I attended with the works superintendent from Bracebridge Heath. Pre-drilling had caused many problems in the past, so at my request they agreed to leave the rib flanges undrilled. However I lost the battle regarding the tank bay inner skins, which were delivered pre-drilled.

I don't know who produced the wing spars but they had to be 'returned to sender'. The booms had been produced from an incorrect material specification.

Eventually we received another set of front and rear spars, and so commenced building the inner wings. Although progress was good, it was impossible to meet the completion dates. The Armstrong Whitworth delegation was not satisfied, they wanted the workforce doubled. I think the theory was: 'If the job took one man one hundred hours, a hundred men would produce it in one hour!'

The pre-drilled holes in the tank bay inner skins were not in line with the rib flanges, so blank skins had to be made and the workforce had to be increased to satisfy Armstrong Whitworth.

The inner mainplanes were removed from the jigs and put in transportation bogies before final fitment of the inner tank bay skins, in order to commence work on the second set. It became obvious to me that problems would arise and the job would take longer to complete.

Frank Wilson, the design engineer covering the queries and problems could see the humorous side of the job and wrote the fictitious Drawing Query Form below (Frank later became the Project Designer for the 748 aircraft). On my retirement, I went to see

*Frank Wilson at Woodford and he said : 'Lenny, I've got something for you' and gave me the Drawing Query Form that I had not seen since 1958!'*

#### **Works expansion**

By the early 1950s, Bracebridge had acquired much needed extra facilities, as Len Binding recalled:

*"In Hangar B1, jigs were installed for the manufacture of Vulcan engine access doors, and to keep up with the demand, a nightshift was introduced.*

*Bracebridge Heath factory also by now had:*

- *A small but very efficient Design Office and a comprehensive Drawing Stores, complete with drawing printers.*
- *A large MOD store*
- *An average size Machine Shop was set up at the time we commenced to build the 707A and 707C, which proved a great asset. Outside contracts for machining soon began to flood in.*

*There was also an excellent Instrument Test Room and like the Machine Shop it was not short of outside contracts for overhauling and testing."*

The actual repair of aircraft and production of new ones (eg the 707s) all finished in 1958, however, leaving only the component repair and overhaul sections in operation and the control of the Outworking gangs - which by now had all kinds of varied tasks to undertake.

#### **Outworking Parties in the later years**

Bracebridge Heath's Outworking Parties covered work at RAF and Naval Stations and also airports on the following aircraft: Lancasters, Lincolns, Shackletons, Vulcans, Victors, Nimrods, Phantoms, the Argosy, 748 and Andover (which included the 'Queen's Flight' at RAF Benson and the VIP Flight at RAF Northolt).

The work included repairs (some were extensive), modifications, servicing and occasionally major inspections.

Len Binding, as one of the Foremen at BBH, was soon involved with the Outworking Parties and listed some of the tasks he was engaged on over the next 30 years or so from the HQ at Bracebridge:

#### ***"Shackleton Aircraft Grounded (July 1959):***

*In July 1959 the Shackleton aircraft were grounded at home and abroad until 'Special Technical Instruction 69' was embodied.*

*Outworking parties from the Bracebridge Heath factory carried out the necessary work on the applicable RAF stations in the United Kingdom. An inspector and I flew to Singapore to advise on the embodiment of the above mentioned Special Technical Instruction with 205 Squadron personnel at Changi and Seletar. Another team covered the aircraft in Malta.*

*The work involved the removal of the inner mainplane trailing edge, to expose the rear spar; then the removal of the web-to-boom attachment bolts and dowels in the area, measuring approximately six to eight feet outboard of the inboard edge of the rear spar bottom boom. The holes had to be cleaned and inspected using intrascopes, and all results were recorded. All web-to-boom bolt holes were then opened up to 1/32 oversize, and new oversize bolts and dowels fitted.*

*On my return from holiday, the next task was to commence changing the bottom spar booms on 205 Squadron aircraft, not only on the inner mainplanes but also on the centre section. To do this, quite a lot of equipment had to be removed from the fuselages.*

*We were allocated a hangar at Langar and commenced the removal of engines, bomb doors, inner and outer mainplanes, fuel and oil tanks and landing gear (undercarriages). All electric cables, etc had to be released and withdrawn from the rear fuselage, coiled and stowed in the centre section. The fuselages were split at transport joints (centre section front and rear spars) and the sections located in their respective bays.*

*The inner mainplanes were transported to another part of the group for modification.*

*Centre section bottom booms were removed, using safety raiser and skates to take the weight after the web boom bolts had been removed, and also to assist in withdrawing it.*

*The old booms then became the drilling patterns for the manufacture of new replacements.*

*Then we had to re-fit and line up the pre-drilled holes of the new boom with the existing holes in the web, so that satisfactory drilling and reaming could commence. (Broaching equipment was not available.) When the booms were finally bolted to the webs, re-assembly then commenced."*

#### ***Channel Airways HS748s:***

*On August 15<sup>th</sup> 1967, at the grass airfield at Portsmouth, Hampshire, heavy overnight rain the previous day had made the grass very slippery and in the course of landing there, two of Channel Airways new HS748 Series 2 airliners each skidded when braking after touchdown.*

*Both aircraft damaged their undercarriages and one (G-ATEH) skidded through the boundary fence onto Eastern Road outside, blocking it.*

An over-enthusiastic Chief of Police ordered a tractor to tow this 748 clear of the traffic, back onto the airfield and in so doing the wire hawser of the tractor cut through the rear fuselage and rear pressure bulkhead - "like cheese-wire through cheese", as Len Binding said.

He was invited to take a team down to repair G-ATEH and - as part of the usual procedure - they built a cover around and over the affected ends of the 748s on scaffolding, to enable them to work underneath in a dry atmosphere.

Len remembered:

*"Our hangar was comprised of scaffolding covered with corrugated iron sheeting, and we used old railway wagons for our office and stores. We had very efficient central heating!"*

(He was later congratulated by the Air Registration Board for an excellent repair to both aircraft.)

***© Hindustan Aeronautics Ltd - Kanpur Division (Period 1966 to 1967):***

*Preparations to carry out a modification programme on Venezuelan 748 aircraft were just about complete, when I was asked to take over in India because the team leader had been flown home seriously ill. (He later died within a month or so of his return to Great Britain.)*

*India was an enjoyable experience, but I wanted to be more involved and also with different aircraft. However, the company flew me home for my 25<sup>th</sup> wedding anniversary and then tried hard to get me to return (but they could not persuade me).*

***Andover C.Mk1 (Avro 780):***

*At RAF stations Abingdon and Thorney Island, repairs and modifications were embodied on the above aircraft, including 'The Flight Data Recorder' and the trial installation of height encoding altimeters.*

***Andover C.C.Mk2 (Avro 748):***

*At the 'Queen's Flight' at RAF Benson, various teams worked there embodying modifications and carrying out repairs. Similar work was also done on the VIP Flight at RAF Northolt.*

***748 Aircraft XA-SEY at Miami Airport (1968):***

*The repair consisted of replacement of cracked bottom skins and a reinforcing plate in the vicinity of the main undercarriage. This required the removal of the main undercarriage and pivot members.*

*The 748 aircraft was owned by Fernando Barbachano. He was quite a character, and very generous. On completion of the aircraft repair, Barbachano offered the team a free*



week's holiday on the island of Cozumel, including the return fare to the island from Miami. Payment for drinks would be the individual's responsibility. Two members of the team accepted the offer, and had a wonderful time!

**Belgian Air Force 748 Aircraft at Brussels Airport:**

Fuel leaks had occurred at wing access panels, caused by over tightening panel attachment screws. To rectify, all panels and frames were replaced.

**748 Aircraft G-ATAM - the Company Aircraft leased to Philippine Airlines (October 1968):**

Preparations for the lease of Avro's own 748 aircraft, G-ATAM, were carried out at Langar. The new registration was PI-C1020.

Towards the end of the lease, PI-C1020 was damaged at San Fernando Airport, situated on the West Coast of Central Luzon.

Philippine Airline employees repaired the aircraft, under the instructions of our Bracebridge Outworking Party.

**AW Argosy Freighters (June 1969):**

A hangar was made available at De Havilland's works at Downsview, Canada for the repair of Argosy aircraft which had developed fatigue problems in the bottom boom of the front spar (inner wing), at the root end joints, port and starboard.

When building the Argosy wing, all holes were produced to BS 1916 H7 fit, whereas the Shackleton wing was to Newall Standard 'A' fit.

Simulated tests on replica joints proved the Shackleton joint was superior.

We experienced great difficulty in removing the bolts and bushes, but the breakthrough came when we warmed the spar boom and used liquid Nitrogen to shrink the bushes. The root ends were then cleaned, including the removal of stress corrosion. Reinforcing plates and shackles were re-plated at De Havilland's. The holes were opened up to Newall Standard 'A' fit and oversize bolts were fitted. The main boltholes required oversized bushes to be fitted.

**Blackburn Beverley Freighters:**

At RAF Abingdon, a working party carried out a major inspection and a modification programme on the Beverley freighter.

**Vulcans on various RAF Stations:**

Bracebridge Heath had working parties on Vulcan RAF stations at Finningley, Scampton, Waddington, Coningsby and Cottismore, working on modifications and 'Category 3' repairs.

The 'Rapid Start' modification programme commenced at RAF Coningsby. Other stations were involved later. (November 1969)

The work on 'Blue Steel' was mainly carried out at RAF Scampton. (October 1971)

I visited RAF Akrotiri in Cyprus on two occasions, once to advise 103 Maintenance Unit on repairs to a Vulcan that sustained a bird strike and had caught fire. The second time I went out with a small team to deal with corrosion problems.

**Vulcan Fatigue Modifications (1001 and 1013):**

The aircraft had to be jacked up and roughly levelled using the star plate, then finally rigged using a dumpy level and sighting rod. The trestles were positioned at the respective points and adjusted during the rigging procedure. At this stage the wing tips needed to be raised 1½ inches so the root end wing joints were in the no-load condition.

Modification 1001 consisted of the removal and replacement of the front bottom wing root forgings port and starboard. (The forgings have four legs, one leg mates with the bottom boom of the mainplane, another with the bottom boom of the centre section, the other two legs fit into the transport rib, one vertical the other one aft.)

Modification 1013 comprised the removal of shackles and reinforcing plates from the remaining wing root forgings, port and starboard, that were not covered by Modification 1001. The shackles and reinforcing plates were sent to the Chadderton factory for checks and replating. When re-assembled, all joints got cocooned.

To gain access to all root end joints to front and rear spars top and bottom, the following had to be removed or partially removed:-

Engines, jet pipes, intake skins and jet pipe tunnel skins. The outer top and bottom skins port and starboard of the centre section were peeled back sufficiently to gain access to the root end joints.

Extensive drill and reamer kits were required, complete with pilot and slip bushes, plus 'Delapina' honing equipment.

The holes were to Newall Standard 'A' fit with a honed and polished finish - hole sizes were 5/8 inches to 1½ inches in diameter.

Hardened steel reinforcing plates were fitted both sides of the booms and produced a sandwich of hardened steel - light alloy - hardened steel. Great care was needed when honing, not to produce a barrel shaped hole. The equipment used for checking were internal micrometers and dial test indicator.

The transport rib bottom boom had to be cut back to allow the removal of the old forging. This was replaced by steel shackles, when fitting the replacement.

*Although the main bolts through shackles, reinforcing plates and booms were relatively easy to remove, special extractors were required for the removal of the remaining bolts holding the forgings to the aircraft.*

*Due to the light tolerances on these holes, temperatures could and did affect fitment of bolts.*

*We carried out these modifications at RAF stations Waddington, Coningsby and Finningley.*

***Vulcan B.Mk1 XA911 at RAF Waddington:***

*During a flight over the North Sea, Vulcan B.Mk1 XA911 suffered a bird strike in one of the port engines, which ingested the birds, coughed and blew up. The debris from this was sucked into the adjoining air intake, causing the second engine to go the same way.*

*One turbine disc smashed through the engine casing, cutting two engine access doors in half.*

*The inboard engine rib 63.5 was damaged. The centre engine rib 113.5 was sliced in two.*

*The outboard engine rib 162.5 was extensively damaged and required special drawings for the repair, also special equipment for blending out and polishing of the bottom boom, which took many hours of tedious work before the repair could commence.*

*Turbine blades had been flying around like shrapnel, some going right through the port wing fuel tanks. One piece went through to the outboard tank and then through the mainplane front spar web.*

*Repairs were carried out to most port mainplane ribs and the recuperator bay. A number of intake skins, expansion joints and jet pipe tunnel skins had to be replaced.*

*Bird strikes have caused similar damage to other Vulcan's, but not quite so severe.*

*A modification was introduced much later - the fitment of titanium shields to protect the engine ribs.*

***Vulcan 'butchery' at RAF St Athan (1970):***

*Design and Stress Departments asked for a perfectly serviceable Vulcan aircraft to be taken out of service for research purposes, before agreeing to extend the life of the fleet. A drawing was produced, indicating how the aircraft should be cut up.*

Ken Smith, the Vulcan Project Designer, arranged a meeting at the Woodford factory to discuss the requirements with personnel from an RAF maintenance unit who were going to take on the task. I was also asked to attend this meeting.

However, after studying the drawings, the RAF representatives requested the company to do the work, and so it was given to me to do!

The Vulcan selected for this 'butchery' was the first B.2 production aircraft, XH533.

**Phantoms:**

When Vulcans moved from RAF Coningsby, they were replaced by the Phantoms. The predominant work involved modifications, although the working party was involved with a couple of 'Category 3' repairs. 'Category 3' repairs were also carried out at HMS Heron at Yeovilton, and HMS Daedalus at Gosport.

**Nimrods:**

The major work at RAF Kinloss and RAF St Mawgan included modifications, corrosion problems and the occasional 'Category 3' repairs.

At RAF Wyton there was a modification programme only.

**Ghana Airways 748 Aircraft at Accra Airport (May 1971):**

Ghana Airways personnel were manoeuvring the aircraft from the hangar when the damage occurred. The hangar door grazed the aircraft in the area of the pressure head and static plate.

We carried out a small skin insertion repair and replaced both the static plate and pressure head.

**Dan Air 748 Aircraft repaired in the Concorde Aircraft Hangar:**

At Charles de Gaulle Airport a Dan Air 748 aircraft made a bad landing. The nose landing gear was torn from the nose wheel bay structure. During preparation for the repair, corrosion was found at Former 252F, and further aft. It was obvious a galley had been fitted in this area, but the floorboards had not been properly sealed to prevent spillage seeping through and collecting in the fuselage bottom structure, which caused the corrosion.

**Avro York at Staverton Airport:**

The curator of 'Skyfame Museum' obtained an Avro York aircraft that originally belonged to 'Skyways of London'. He requested Avro's, Hawker Siddeley Aviation and Titanine (the paint manufacturer) to re-spray the aircraft gratuitously, and to make it look like Churchill's aircraft (LV633 'Ascalon').

*Titanine agreed to supply the paint and Hawker Siddeley Aviation agreed to supply the labour. We had a drawing of Churchill's aircraft showing the square windows. So by masking the round windows, and by careful spraying, we achieved the desired effect.*

***Varig 748 at Porto Alegre - Brazil (March 1972):***

*At the request of Varig Airlines, Peter Grimly and myself flew to Porto Alegre in Brazil to carry out a survey on a badly damaged 748 aircraft. A pilot under instruction was doing an asymmetric take-off, and to correct a fault, power was applied - but to the wrong engine - and the aircraft dropped one hundred feet and pancaked! I would like to have repaired it, but after a meeting with the engineering director in Rio it was decided to write it off.*

*In appreciation for our services a conducted tour of Rio was laid on, including a hotel adjacent to the Copacabana Beach!*

***The President of Ecuador's 748 at Guayaquil, Ecuador (October 1972):***

*The President's VIP 748 Series 2A (FAE 001) was severely damaged by an 'Andes Airline' DC-6 aircraft that was being taxied by their Chief Engineer. He was immediately arrested and imprisoned for sabotage, however, several weeks later he was cleared of the charge and subsequently released.*

*Jim Hayworth, the Assistant Chief Stressman, and myself travelled to Guayaquil to assess the damage, and after a meeting with the Fuerza Aerea Ecuatoriana (FAE) it was decided to produce a section of the starboard wing in the jig at Chadderton, which we then spliced to the existing undamaged part of the aircraft.*

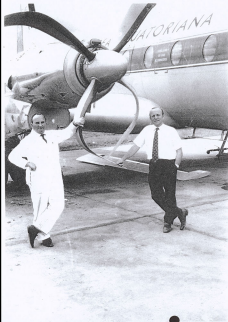
***Colombian Air Force (FAC 1103) at Bahia Solano (July 1973):***

*My first visit to Bahia Solano almost ended in disaster when we developed engine trouble during our flight in a DC-3 aircraft flying from Bogota. The aircraft lost height rapidly over the mountainous jungle of Choco. Thankfully we just made the airstrip.*

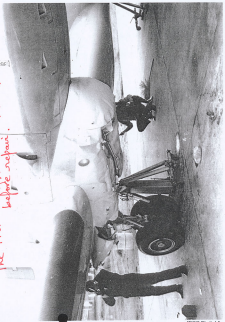
*A radio fault on board prevented communication with Satena Airline's headquarters, so on landing, Bahia Solano's short wave radio was used to contact them. The call sign was 'ALCATRAZ'. Four hours had elapsed before contact was made, and by then Satena assumed we had crashed, so they instigated a search, using five aircraft.*

*The spares required for the engine did not arrive until the following day, so we had to stay overnight at the shanty Hotel Bahia. That evening we sat down for dinner on benches at tables that did not look particularly clean. When the first course arrived it was 'Fish Head Soup'. I realised then I would have to get food and water flown to us weekly from Bogota, and also obtain a cook!*

*That evening I met Michael G A Hillyard, a John Simon Guggenheim Memorial Foundation Fellow - (Becado) 1972. He was carrying out a geographical study of Colombia's Pacific Mountain coast. During our conversation, the subject of communications came*



The President of Ecuador's Avro 748  
before repair.



up and it was then he advised me to use the Morse facility, even though Satena and Company Agent, Robert McAllister disagreed. Michael's advice was to 'print all messages clearly, do not write'. This turned out to be good advice, as the operator could not read the message but understood the letters.

The compressor unit supplied was unserviceable, so Satena sent a replacement. It ended up with both units being strapped together so the engine on one unit drove the good compressor on the other. Our troubles were not over. Within a few days, the unit's petrol tank disintegrated, and we had to improvise, using a bucket and plastic tubing. The next things to go wrong were the units engine bearers. The only material on site was light alloy extrusion, so I used that, but made two sets of bearers which allowed us to complete the task.

The damage to the 748 was extensive, the undercarriage struts, beams and brackets broke through the mainplane top skin and also through the shroud and jet pipe.

Twelve months after repairing FAC 1103 at Bahía Solano I received a newspaper cutting from an employee of Satena Airlines, showing a 748 crash in the Colombian jungle. It was FAC1103 again! Only this time, it was terminal - the 748 had taken off from Bahía Solano again, and hit a nearby mountain top, killing all 32 passengers and crew on board!

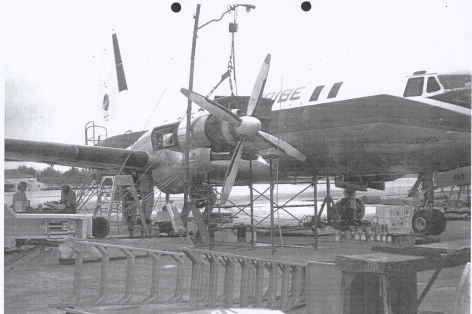
The crash was found to be due to pilot error. To clear the mountain the procedure was to do a circuit of the airfield to gain height. However, the pilot was in a hurry to get back to base to clear outstanding paperwork, so on take-off, he sat the aircraft on its tail and opened up the engines thinking he could clear the mountain and save time. As you can see, he failed!"

Len Binding was at Woodford with ex-Chief Test Pilot Jimmy Harrison (by now Product Support Manager) at the time the news of the Colombian 748 crash came through. Jimmy said there had been a flash in the sky before the crash, and Len remembered that Satena often carried aviation fuel about in drums, to replenish the local supplies at the remote airstrips. Len had noticed once that a can had been leaking on board one his flights in Colombia, and the passengers sometimes smoked near them! He wondered if this might have been a cause in this case.

**"The President's Aircraft (FAE 684) Severely damaged at Cuenca, Ecuador:**

As the President's aircraft was approaching Cuenca, ground control advised the pilot not to land, due to the atrocious weather conditions. The captain decided to land, however, and on touch-down, the aircraft aquaplaned and was heading for a sheer drop at the end of the runway. He managed to slew the aircraft around and into a ditch.

Jim Haworth and myself flew to Ecuador to assess the damage. From the photographs I took we could establish what materials and spares were required, as well as tools, drawings and ground equipment.



*The Avro 748 of Líneas Aéreas del Guibé being repaired at Merida, Mexico.*



**Leeward Islands Air Transport (LIAT) 748 Aircraft:**

*Jim Haworth and myself travelled to St Vincent in June 1977 to survey a damaged aircraft (VP-LIW) which turned out to be the old Channel Airways aircraft (G-ATEH) that I repaired at Portsmouth Airport. On completion of the survey, I received a telex to travel to Bogota to meet 'Airclaims'.*

*At Antigua in November 1979, I carried out a modification programme which included 'Ground Proximity Warning' and Direct Measuring Equipment (DME).*

**Satena 748 Series 2A (FAC 1101):**

*On arrival at Bogota in June 1977, I made contact with 'Airclaims' who asked me to do a survey on a Satena 748 (FAC 1101) at Arauca Airport.*

*The damage was mainly confined to the nose-wheel bay structure, skins, equipment and nose-wheel undercarriage. There was also some damage to nacelle fairings and main undercarriage doors*

**748 (VP - LIW) at St Vincent:**

*I returned to St Vincent to repair the above aircraft (ex-G-ATEH of Channel Airways) which was extensively damaged. The undercarriage struts, side load beams, downlock beams, brackets and undercarriage pivot members were forced into the wing. A lot of debris went through the mainplane top skin and through the shroud and jet pipe. The only parts serviceable of the inboard and outboard engine ribs were the top beams, which gave added problems with alignment. The centre engine rib was scrap.*

*Incidentally, Johnny Briggs, an Avro Engineer, married Jan, an Air Stewardess with 'Leeward Islands Air Transport'. Her father, Frank Delisle, owned the airline at that time.*

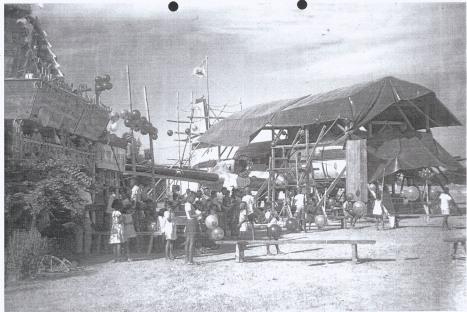
**748 Aircraft at Georgetown - Guyana (November 1977):**

*Problems existed with the flying controls and control locks on the aircraft. It only took a few days to rectify, thank goodness. (The climate there took some getting used to.)*

**748 Aircraft at Longue Pointe de-Mingan (April 1978):**

*Mingan is situated on the northern bank of the St Lawrence River in Canada and when I arrived there the settlement was snow bound. The pilot of Northern Wings (Les Ailes Du Nord Ltee) had a 'white-out' on landing the aircraft. The crash had extensively damaged the fuselage and had also damaged the nose-wheel bay. We built a wood and glass greenhouse building over the entire nose of the 748 amongst the deep snow drifts, and worked under cover.*

**Bundesanstalt für Flugsicherung at Frankfurt Airport:**



Repairing an Avro 748 of Philippine Air Lines at San Fernando Airport.  
The children are having a Christmas Party!

*We were allocated a fabulous unused hangar at Frankfurt Airport, which not only had overhead lighting, but also strip lights along the sides. The hangar doors were power operated. For the company who eventually purchased or leased the hangar there were other facilities that included a large built-in restaurant, kitchen and showers. We appreciated the showers after all, we were not used to such luxury!*

*We carried out a large modification programme on two of their seven aircraft (all used for radio calibration work)."*

This is the end of Len Binding's list of 'Outworking' jobs that he was concerned with, but other Bracebridge teams naturally worked on many other accident repairs during these years, at sites all over the world.

#### **Assistance with test-flying**

'Jock' Donaghy was the name of a pilot who lived at Waddington, and helped Peter Field-Richards out in test-flying the Ansons rebuilt at Bracebridge after 'Cat B' repairs.

He is believed to have been in the RAF and flown Sunderlands during the War. When the war was over, he obviously had difficulty getting a job at first and joined Avros at Bracebridge Heath as a fitter. Ron Morley, an Inspector there, recalls how 'Jock' carried a tool box around with him with only two items in it - a large spanner that was useless (as it had a broken end) and a hammer whose pane had also broken! Perhaps it was more of a gesture!

Later on, when numerous Ansons were being rebuilt, Jock's flying experience was approved by Peter Field-Richards and he was allowed to test fly most of them from Waddington.

Jock was obviously used to over-water navigation - he apparently left it to the Flight Engineer to let him know where he was during the local test flights from Waddington. Ron Morley remembers that Jock always seemed rather remote - a bit of a day dreamer - and every Thursday and Friday he would head for the local fish and chip shop in Bracebridge village. On one notable occasion, when Jock started up his car to get back to the works, his steering jammed and he couldn't turn the car to the right. So he managed to get back by always turning left - sometimes more than a complete circle!

When the Anson testing was finished, Jock kept his hand in at flying, in various other jobs. He was tragically killed some years later, while reportedly flying an ex-WWII German aircraft back to the UK, when the aircraft ditched in the sea, killing his second wife (who was acting as navigator). He left a son.

#### **Out-of-hours activities**

Some of the Bracebridge Heath veterans began to engage in their own aviation activities as a hobby, out of work time.

Thus, the Chief Inspector, Bill Sturrock (who was killed years later in a motor car accident while on holiday in South Africa) had a pilot's licence, as did Jeff Cox and Jack Robie.

Len Binding was also a member of the group and they used to repair and maintain light aircraft and crop-dusters, Austers, etc, at several sites around Lincoln/Leicester, including a hangar at Wellingore, another at Grantham and another on the A46 north east of Lincoln. Bill Sturrock (who had learned to fly in Canada in the RAF) flew the aircraft after they were repaired. After Bracebridge, Bill Sturrock went to Avro in Manchester to become Customer Service Manager, after a spell in Mexico for HSA as a Sales /Service Representative.

#### **The Avro 504**

May Chambers from the Wing Dept remembers the time that she worked hard to re-cover and dope the wings and fuselage of a veteran Avro 504N biplane at Bracebridge sometime in the 1953-56 era. This 504N (D7560) had been shot down in the Great War, and repaired and put on show in Hull Museum. It was a genuine A V Roe built machine, and in WWII German raids on Hull had damaged it again. Hence Avros agreed to restore it once more, and when completely renovated it was sent down to the Science Museum in South Kensington.

In the photograph (taken by the 'Lincolnshire Echo') May Chambers and the head of the Wing Dept, Arthur Wood, are seen with some of the staff who so beautifully restored the 504N.

#### **The 'Dambusters' film**

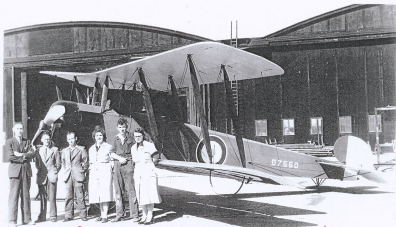
When the famous film was made about the 'Dambusters' raid by 617 Squadron, featuring Richard Todd as Wing Commander Guy Gibson, VC, DSO, & Bar, DFC ~~and~~ & Bar, the Avro staff at Bracebridge Heath were given the task of building the 'bouncing bombs' for the filming.

John Woods and another 'chippie' there remember making these, and fitting them to the surviving Lancasters at RAF Scampton. (At that time, the bombs were still on the Secret List, and those built by Avros were of a spherical shape - not cylindrical, like rather large depth charges, which later turned out to be the correct wartime shape.)

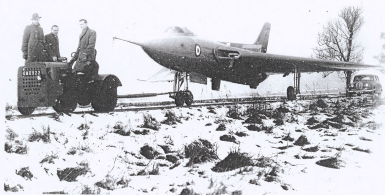
John also helped to renovate the interior of the Avro company 'hack' Anson (G-AGPG) which had a VIP interior for flying Directors and customers about. John and the other 'chippies' French-polished the interior mahogany fittings and renovated all the wood work.

#### **Bracebridge in later days**

After the repair and rebuilding of whole aircraft ceased in 1958, Bracebridge Heath occupied a site of approximately 9½ acres and remained the Headquarters for the Manchester Division Repair Organisation, with a labour force now down to 223. It



*The Avro 504N renovated at Bracebridge  
Heath for the Science Museum.*



*The Avro 707A being towed to Waddington*

embraced the Ministry of Defence CRSP store (Contractors Repair Supply Procedure), the British Aerospace Standard Part Store, and a Design Department, but still retained the facility for the repair and overhaul of some aircraft parts.

### **Stores Organisation**

The Stores Organisation included the largest airframe Ministry of Defence CRSP Stores in the United Kingdom, having a floor area of some 67,449 square feet, a British Aerospace Standard Parts Investment Stores occupying more than 9000 square feet, and a General and Tool Stores occupying almost 4000 feet.

With some justification Bracebridge claimed that the Stores Organisation was one of the most efficient in the British Aerospace Aircraft Group.

### **Military Spares**

The buying and supply of military spares (CRSP) meant placing orders through and on behalf of the Ministry of Defence for the repair and major refurbishing of main components for aircraft produced by all factories within the British Aerospace Aircraft Group. Such spares were also made available to a number of outside companies recognised as approved sub-contractors.

BBH also assisted the Royal Air Force in maintaining their operational requirements and the factory's Contractor's Working Parties continued to undertake major repairs in the field.

### **Investment and General Stores**

The purpose of the British Aerospace Standard Parts Investment Stores was to hold all surplus stock items which had been bought commercially, or manufactured in economical quantities and were surplus to immediate contract requirements. All factories within the British Aerospace Group drew holdings, where available, from Bracebridge which were held for immediate issue on request, obviating the problem of ordering excessive build-up of stock within group factories.

The visual display unit located in Stores Records, supplied up-to-date information on Company outstanding orders and stock - also items on Ministry of Defence orders. The progress of these items being manufactured on the shop floor were able to be monitored, enabling promises to be obtained from Production Control by Progress Department. This ensured an efficient turnaround of spares. Issue of available spares on priority requests were invariably completed between 12-24 hours and ordinary issues between 24-48 hours (as transport permitted).

The General and Tool Store supported working parties (CWPs) operating in the United Kingdom and overseas - also the bay servicing and repair unit at the depot.

Bracebridge carried out these vital functions for Avro (later British Aerospace) for the next 24 Years after 1958, finally closing down completely at the end of September 1982.

The old No. 1 Hangar built for the RFC is now owned by a haulage firm, and the walls still seem in good condition, although the roof and wooden doors are looking dilapidated and the building stays empty. No. 2 Hangar and the Stores building are occupied by the Dalgety Group, and are well maintained. No evidence remains of the heroic work that went on here in WWII to keep badly damaged Lancasters flying, nor of the decades of post-war achievements in repairing all kinds of Avro aircraft.

May Chambers, who worked there from 1941 to 1968 and claimed the customary gold watch for 25 years dedication and service, still says that people seemed so much kinder to each other in those days and everybody cared so much more than they do now - and they were the happiest days in her life! You can't get a much better epitaph than that, for a remarkable aircraft company!

APPENDIX 1

A V ROE & CO LTD - 'BRACEBRIDGE HEATH WORLD SERVICE  
ORGANISATION' (previously the 'Avro Repair Organisation')

PRINCIPAL PERSONNEL AND DEPARTMENTS

1) In mid-1950s:-

a) ← HQ at Bracebridge Heath, Lincoln  
Chief Superintendents (in sequence):

1. → C ('Charlie') L Hatton  
2. → F ('Snowy') Langton

Financial:  
Mr Dowell

Chief Inspector:  
'Bill' Sturrock

b) ← Repair Depot at Langar, Notts:  
Superintendents (in sequence):-

1. → Robert Ingrid  
2. → 'Phil' Lightfoot, and his Asst Supt W G Cooke  
3. → C Oatway  
4. → 'Johnny' Smallwood

Secretary to above:

Mrs Forster  
Sheds 1 & 2 - Senior Foreman  
Ron Eaton  
Sheds 3 - Senior Foreman  
Ernie Beatles  
Sheds 5 & 6 Senior Foreman  
(Dad) Harold Walker  
Shed 7 - Senior Foreman  
Harry Houghton

Flight Shed - Senior Foreman/Flight Test Engineer (in sequence)

1. → George Arthur Norman  
2. → 'Paddy' Armstrong  
3. → Roy Browne

Other Personnel:

Senior Foreman -



Shed 6 (Spray Bay) - Ernie Cooke  
Shed 5 (Detail Section) - Sam Wilcox

← Departmental Foremen -  
Engineering - 'Doug' Fletcher  
Instrument~~s~~ J Nightingale  
~~Instrument~~ - Nobby' Clarke  
Heavy Gang - T Sheppard  
Crane Drivers - Mr Clarke

← Other Staff -  
Tank Shop - L Needham  
Shed 5 - (Hydraulics) F Abthorpe  
~~(Hydraulics)~~ C Kelly  
- (Internals) B Brewer  
- (Electrics) Bill Brumby  
~~(Electrics)~~ Ted Prior  
~~(Electrics)~~ J Johnson

Shed 6 - (signwriter) Mr Mapletoft

Shed 7 - (Fuel & Oil Bowsers) A Kirk  
~~(Fuel & Oil Bowsers)~~ H Pigeon

Control Tower - (Electrics/Radio) T Corfield

Main Stores  
- (Drawing) Miss E Bint  
- (Tool) Miss N Cowlshaw

Canteen  
- (Manager)<sup>ess</sup> 1. Miss Piddington  
2. Mrs Grig<sup>nn</sup>  
- (Cashier) Miss E Spencer  
~~(Cashier)~~ Miss E Spencer

Works Engineer  
- (Maintenance) Stan Rogers  
- (Electrical) Jack Calver

Site  
- (Transport) Paddy Ryan  
- (Fire Tender) A Moor  
- (First Aid) Nurse Smart  
- (Security) J Spencer  
- (Gardener) Eli Tucker

← <sup>1011</sup> Aeronautical Inspection Dept (AID):

Mr Barr  
C Collins  
Alec Messenger  
'Taft' Davis  
Mr 'Dickie' Bird  
Victor Savory (R101 Survivor)

← Avro Inspection Dept:

Chief Inspector - J Yarwood  
Asst Chief Inspector - J McCirdy  
Inspectors -

'Johnny' Smallwood	Les Willis	A Sills
D Fairhome	B Finlay	'Tiny' Wright
A Dale	S Walker	W Pride
'Jock' Cameron	P Haynes	'Bud' Abbott
D Allen	Ken Allen	'Dixie' Deane
G Smith	'Ted' Robinson	B Radcliffe
'Bill' Williams	'Sid' Dawes	E Hopkinson
T Keene	J Forth	D Warren
E Sheppard	'Paddy' Russell	J Worrell
T Jenkins	H Fletcher	S College
D Roberts	C Smalley	J Farmer
A Powell	I King	C Perkins
'Bob' Graham	Mr Pritchett	'Johnny' Bull
H Platt	'Don' Grieves	Doug Culley
Tommy Liffe		

Planning Dept

- Mr Moorhouse  
- 'Pete' Hughes

Drawing Office - Mr Flannery

Time Keeper - H Beard

Police Supt - Joe Spencer

II) Changes in above by 1967:

Johnny Smallwood became Works Superintendent (from Avro Inspection Dept)

Ted Andrews became his Asst Works Supt

Doug Fletcher became Senior Foreman - Shed 2 (from Foreman - Engineering)

Muriel Brown became Canteen Manageress

ton - Neil Cunningham became Works Engineer

Jack Wright became Asst Works Engineer

Alec Farmer became Police Supt

George Norman became Senior Foreman - Trials  
Installation (TI) Hangar.