

A V ROE AND CO LTD
LEADS AND BRADFORD AERODROME
YEADON, YORKSHIRE

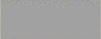
Aviation historians will be well aware of the destruction by fire of the A V Roe library some years ago. A poor carbon copy of the official history of the Avro factory at Yeadon has now been discovered and a fresh corrected copy made. The history does not include any details of production during 1946 which continued with the Anson and the York.

The opportunity has been taken to also reproduce a privately circulated document issued by No 2 Region of the Ministry of Aircraft Production dealing with the aircraft industry in Yorkshire.

I am indebted to E W Harper, Esq, MBE, (A V Roe works manager at Yeadon) and E R Holdsworth, Esq (Assistant works manager at Yeadon) for their help.

Attached is a copy of these documents which please accept with my compliments.

Flt Lt G R Sunderland, RAF (Retd)



December, 1960.

A V ROE & CO LTD, YEADON

Work in the factory of A V Roe & Co Ltd at Yeadon started when the first portion of the building was roofed and completed with a dummy wall, in August 1940, and a handful of men began processing the factory's first job. Building up from this unostentatious start to a monster factory, employing over 11,000 people and turning out impressive numbers of aircraft and components, was a process which involved the solving of innumerable technical and social problems. The successful part the factory played in the nation's war effort is a tribute to the technical and administrative staffs and to the workpeople who produced the Lancasters and training planes when they were most needed.

Construction

The factory is situated off the fringe of the great industrial belt of the West Riding, from which the bulk of the labour supply had to be drawn. Adjoining the old Leeds and Bradford Aerodrome, it is approximately eight miles from each of these towns. The airfield, once the home of the Yorkshire Aeroplane Club, in 1936 became the headquarters of 609 Squadron, RAF and upon the outbreak of war, when the squadron was called into active service, the Blackburn Aeroplane Company ran an elementary flying training school for the RAF. The Aerodrome was taken over by A V Roe & Co in 1941.

Work was started on the building of the factory in December 1939, after the Air Ministry had approached A V Roe & Co in connection with the expansion in the Air Force and the consequent need for increased aircraft production, resulting from the crisis in that year. The site presented certain difficulties to the contractors. Marshy ground, with a sub-soil

of soft clay, it contained several streams and a large pond. The land was drained and the streams diverted, with the exception of one, which is now contained in a 12 foot concrete pipe and passes directly under the factory.

The factory is 1740 feet long and 740 feet wide, with a total floor space (including the basement) of 1,514,190 sq ft and is thought to be probably the largest factory in Europe under one roof. The structure is reinforced concrete and brick on a steel frame and the whole of the factory is air conditioned by the most up-to-date system possible. Canteen accommodation is provided for 7,000 people, and internal air raid shelters hold 8,500 persons.

In the hands of MAP experts the essential task of camouflaging this giant erection was tackled with outstanding success and so effectively was this done that from the air the presence of the factory could not be detected. Earth was banked in ramps round the factory walls and the flat roof was laid out to merge with the surrounding countryside. The illusion of a farm was obtained, with huts, walled fields, (complete with dummy cattle) and even a duck pond. The work cost £20,000 and was generally recognised as one of the finest examples of the art of camouflage in the country.

A 30 foot built-up causeway with a tar macadem surface was built from the factory, so that completed aircraft could be towed straight to the airfield. Thus many of the factory's products were flown by ATA pilots direct to RAF stations or to Maintenance Units, for dispersal. As the factory's output grew, extra hangars were added on the airfield, and the runways had to be extended, at the expense of six nearby houses and several holes of a local golf course. The main runways are now at

their maximum possible length - East/West 1250 yards, and North/South 1100 yards.

Installations

The factory as a whole was completed in February 1941, but in February 1940 the northern end was roofed and a "bulkhead" of corrugated sheet made a dummy wall, so that work could commence in the machine shop before the rest of the building was completed.

Yeadon is the largest Avro factory, the others in the group being at Manchester. With the erection of the first portion and whilst light and power installations were still being fitted, four or five men came over from Manchester and started the processing of the "Albermarle" which was to be the first production job.

At the same time, local labour began to be drawn into the factory, at first a mere trickle and then in a rapidly growing stream. In the summer of 1940 new machine tools began to arrive from the Machine Tool Pool (fore-runner of Lease Lend) and millwrights began to instal these in what became the Tool Room. Gradually the Machine Shop took shape, whilst simultaneously the electrical supply was led to the machines and labour was being trained on them.

With the completion of the rest of the structure in 1941, work proceeded on installations in the Assembly Bay.

At its peak, the factory used about 800 of these machine tools, as well as the many smaller power tools used in assembly. The Machine Shop is undoubtedly one of the finest and most up-to-date in the country. All the machines are independently power driven, with no shafting or belting. The most impressive is an 8000 ton hydraulic press.

One of the machines, evolved by Avro during the war, is known as a "Manipulator" and can, in two minutes, bend to shape a heavy extruded former, a job which would previously take two fitters as many hours to perform manually.

The figures of production in the machine shop show a steady rise to the peak period in 1944, reflecting the building up of production on the assembly line. In 1944 the weekly total of operations was in the neighbourhood of 2,000,000 and the actual peak in April of that year, had a week's total of 2,118,002 operations. There is an average of 5 operations in making a component.

At this time the percentage of skilled workers in the Machine Shop was only 16.4, the remainder of which 60% were women and girls. The average amount of scrap in the early stages was 2½% (a low figure in view of the large percentage of unskilled labour) and in a very short time the standard of proficiency reached by the personnel enabled the low scrap figure to be further substantially reduced.

Production

The first production job was to be the "Albermarle" a Reconnaissance Bomber designed by the Armstrong Whitworth Company early in the war, for production by firms without previous experience of aircraft engineering. The work of processing this was begun in 1940, but before production had started at Yeoman, the work was withdrawn when a major modification was introduced on the wing.

In October of 1940 work was started on the Hawker Tornado, a single-seater fighter, and up to the Autumn of 1941 the factory produced 100 sets of details and 5 aircraft in various stages of assembly, one of which was actually flown, after

being handed over to the experimental staff at Manchester. Some of the completed wings and components from Yeadon went to the Typhoon, Hawker's successor to the Tornado.

The Anson. The first Avro Anson to be produced at Yeadon was completed and left the factory during the week ended 21st June, 1941. The Anson is a twin engined, low-wing monoplane, which was used extensively in Coastal Command as a reconnaissance plane and light bomber, and as a standard training aircraft for the RAF. During the first year the records show an almost meteoric rise. At the end of the fourth month 29 aircraft had been turned out, and then - as workers surmounted the initial hurdles - the total grew to 414 by the end of April 1942, an increase of ¹⁴⁰~~140~~ in 6 months. The following month's production exceeded the 100, and from then onwards, through two years of concentrated effort the monthly total never fell below this figure. July 1943 was the month when the peak production figure was attained. A total of 130 machines were completed in that month, and for eight more months this total was maintained. Thereafter, according to policy dictated by the RAF, production declined steadily.

It is perhaps worthy of note that in the early days of production the number of machines produced for shipment abroad was more than twice as many as the total for home use, but by the end of 1942 the position had almost been reversed. In January 1943 the first machines were fitted with Bristol power-operated gun turrets, and from this month until December 1943, 887 machines (3/5ths of the year's production) were so fitted.

In March 1944, an order for an ambulance type of aircraft

necessitated the conversion of the standard Mk.I fuselage to fill this requirement. This was successfully achieved and the new version, nominated the Mk.X. Series 2, with Cheetah XIX engines and incorporating hydraulically operated undercarriage and flaps was evolved. The fact that during the first month, 21 aircraft of the ambulance type were produced and delivered out of a total of 91 "flyers" is a tribute to the versatility and resourcefulness of all concerned.

Meanwhile the Design Office had been busy on plans for a permanent version of the Communications/Ambulance and within a matter of weeks the Anson Mk.XI with a deepened fuselage made its bow. Further modifications involving the fitting of variable pitch propellers and the Cheetah XV engine required another change of title and the Mk.XI was superseded by the Mk.XII, the final Communication/Ambulance version embodying a reinforced wing. Through the succeeding months to July, 1944, a total of 85 aircraft of the ambulance type was delivered in addition to the Standard Mk.I with or without the Bristol Turret, production of which had never been allowed to flag.

Below is a summary of total production figures for the

Anson :

1941	96
1942	1217
1943	1459
1944	917
1945 (to July)	192
Grand total	<u>3881</u>

Of the above total 2368 were flown away and 1513 were despatched, packed for shipment overseas.

One of the vital links between production and Services is the

Repair Service run by the firm. Any aircraft which crashes is inspected and when possible is repaired by the firm on the Service station, a squad of skilled men being rushed to the job in order to get the machine flying again in the shortest possible time. The Anson Repairs Service, operated by Yeadon, handled a total of 663 damaged aircraft from 1941 to the end of the war, and of these, 626 were repaired on the site.

Anson Spares. In addition to the foregoing impressive production totals, a prodigious number of spares was also produced in the factory.

During the period February 1943, to the end of July 1945, an approximate total of 36,000 items, representing 6½ million pieces and a value of over £4½ million were produced and despatched.

When it is considered that these numbers represent, in detail, approximately a further 900 complete machines the record of producing in 50 months an approximate grand total of 4,800 Anson (equivalent to an average of 96 a month) is an achievement of which every individual concerned may be justifiably proud.

The Lancaster

The Avro Lancaster, 4-engined heavy bomber, may confidently be claimed to have played a decisive part in winning the war. Its achievements need not be specified, except to say that many of the Pathfinder type were built at Yeadon, equipped for the installation of Radar. Work on the Lancaster at Yeadon was started in January 1942, and from then until the end of the war 688 complete Lancasters were made.

The monthly totals of completed aircraft only hint at the

amount of work that was put into them, but from the first completed aircraft in April, 1942, the monthly total slowly grew to 7 in the same period in 1943, 12 in October, 20 in January 1944, 32 in March of that year, and then between 30 and 40 a month until the end of the European war. The production figures may be summarised as follows :

	Completed Lancasters
1942	24
1943	103
1944	354
1945 (to July)	<u>207</u>
Total	<u>688</u>

Lancaster Spares. As with the Anson, spares were produced in addition to completed aircraft, the most notable instance being in the production of bomb doors, the factory turning out an average of 160 bomb doors every month, throughout 1943, and 1944. The yearly production figures were :

	Bomb Doors
1942	507
1943	1789
1944	1865
1945 (to July)	<u>850</u>
Total	<u>5011</u>

"Universal" bomb carriers, of Avro design, were produced in huge quantities at Yeadon to be used on many types of aircraft, and as they could be (and often were) jettisoned, and were frequently damaged by "Flak", many replacements were needed. Of the two types produced at Yeadon, 150 to 200 a week were made of the 2000 lb "heavies" and from 500 to 600 of the light 500 lb type. From April 1941, to the end of the war, the total

figures were :- Heavy type - 7331, Light type - 30,895.

Lincoln and York

With the cessation of hostilities in Europe, production schedules had to be drastically altered to meet the demands of the war with Japan. The Lincoln is an adaptation of the Lancaster for service in this theatre of war, having a bigger wing span, greater fuel capacity, and incorporating special equipment.

The Avro York, a four-engined, heavy transport plane, also built with this service in view, is doing invaluable work with the armies of occupation, in RAF Transport Command, and in similar work. The York is an essential part of the vital supply lines in South East Asia, and with its long flying range and large freight capacity is making a major contribution to solving the problem of long distance, speedy transport.

Labour

The labour force which produced these impressive figures was drawn mainly from the industrial towns of the West Riding, and it is an indication of the complexity of the problem of handling and catering for such large numbers when it is remembered that the population of the factory was greater in some cases than that of the towns the workers came from.

From the starting of work labour was taken into the factory in ever-increasing numbers, until the weekly influx in January 1943 averaged 171. At the peak, in April 1944, the factory employed a total of 11,075 people. Of these, the proportion of skilled engineers was as low as 20% and as this figure includes many who were "up-graded" from semi-skilled work, it will be seen that the bulk of the production was the work of

previously unskilled persons. Many of the workers were women, the percentage of female labour in April 1944 being 5%. Only a small percentage of the workers had received preliminary training at the various Government Training Centres; the greater part had no previous training or experience, and these were all trained whilst doing production work.

As an indication of the various types of work in the factory, a list of the Trades Unions recognised by the firm is illuminating. The unions include :

- The Amalgamated Engineering Union
- The National Brass and Metal Mechanics Union
- The Electrical Trades Union
- The National Union of General and Municipal Workers
- Transport and General Workers Union
- National Union of Vehicle Builders
- Amalgamated Society of Woodworkers
- United Pattern Workers Union
- Amalgamated Union of Upholsterers
- National Union of Musical Instrument Makers

Throughout the last three years of the war, whilst production was at its height, there were between 60 and 70 shop stewards, and for the most of this period the convenor and chairman of the shop stewards' committee spent all their time on this work.

The Joint Production Committee was formed in 1942, and consisted of 10 representatives elected by ballot by the workpeople and an equal number from the management. The JPC was given the opportunity of raising any question which might affect output.

Considering the size of the factory and the number of people employed, belonging to so many unions (and many in none), the factory has been singularly free from major disputes. Whilst many persons came into the factory feeling resentment at being

directed into this work, it could be claimed that, when the maximum effort was being made on the whole the employees tended to settle down and get on with the job.

Essentially linked to the question of labour was the problem of billeting and transport. To help meet housing needs the MAP was responsible in 1941 for the erection of 3 estates of temporary buildings within a few miles radius of the factory. On these estates 300 houses were allocated to Avro workers. An attractive hostel at Horsforth (opened in 1942) provided accommodation for 700 people, and the factory billeting officer found lodgings for between 400 and 500 workers. Most of the remainder had to be brought in special buses from their homes.

At the time of maximum production, 160 buses were needed to bring to work and take home the two shifts, and many of the workers had to travel long distances, the longest involving a daily return journey of 64 miles. Some of those travelling, for example, to Huddersfield had then to take further buses to get home, perhaps another six or seven miles. A striking and unexpected fact is that absenteeism amongst these long distance travellers was noticeably less than amongst people nearer the factory.

Accommodation for the buses was provided in the "Bovia" Plantation, adjoining the works, and this was laid out with roads, pedestrian crossings and a set of traffic lights, all well camouflaged by the original trees.

Welfare work in the factory was made difficult by the large numbers employed, but every effort was made to secure the well-being of factory workers. A Surgery was opened in 1941, since when a Matron and 11 trained nurses have attended to about 600 patients in each two shifts. Epidemics, accidents and

general minor ailments were treated, injections proved quite efficacious in preventing colds, and vitamin tablets were available to those requiring them. By allowing girls, (and men) to spend an hour or so in the rest room when this was deemed necessary, many valuable hours of work were saved, as otherwise most of those workers would have been sent home. No girl was allowed, when ill or injured, to go home alone but was either taken home in an ambulance or given a companion.

In 1942 an Accident Prevention Committee was formed in the factory. This organisation, by investigating accidents and avoidable illness, was able to suggest preventive measures which were undoubtedly partly responsible for the surprisingly low figures for "lost-time" accidents and occupational diseases. Since its formation, the committee's records show that the monthly average rate of 'lost time' accidents was under .5% and most of these were merely minor injuries.

A dentist visits the factory on three days each week, and an optician repairs spectacles and tests eyes free of charge. Protective clothing is supplied for certain specified jobs, and overalls and wooden clogs are available for the girls. A "Sick and Benevolent Fund" is administered by the firm. The Avro "Institute" caters for all sporting and social activities, and choirs and a light orchestra are run by the workers. Special leave of absence has been arranged when a woman's husband or sweetheart has been on leave from the Services.

During the war many notable personalities have visited the factory, outstanding being the visit of Their Majesties the King and Queen in 1942, when His Majesty autographed the first Lancaster to leave the production line. Sir Stafford and Lady

Cripps came to the factory in 1944, when Sir Stafford was Minister of Aircraft Production.

Most impressive of all visitors, however, were, it is thought, the operational flying crews who spoke, with too much personal modesty, but with enthusiasm for the wonderful records of the factory's aircraft. They, more than anyone, provided the urge which enabled the workers to fulfil contracts in the specified time, and to provide the aircraft which were then so sorely needed.

SUMMARY OF AIRCRAFT PRODUCTION

JUNE 1941 TO V-J DAY 1945

YEAR	TORNADO	ANSON	LANCASTER	LINCOLN	TOTAL
1941	5	96			101
	(including 4 completed but not flown)				
1942		1217	24		1241
1943		1459	103		1562
1944		917	354		1271
1945		192	207	2	401
Total	5	3681	688	2	4576

AIRCRAFT COMPLETED

V-J DAY 1945 TO DECEMBER 1945

Anson	76
Lancaster	12
Lincoln	2
York	27
Total	<u>117</u>

Distribution

British Aerospace
(Manchester Division)
Greengate
Middleton
Manchester

Imperial War Museum
Lambeth Road
London, SE1 6HZ

Ministry of Defence
Air Historical Branch (RAF)
Laceb House
Theobalds Road
London, WC1X 8RY

Department of Aviation Records
Royal Air Force Museum
Hendon
London, N9 5LL

Public Record Office
Kew
Richmond
Surrey, TW9 4DU

The Shuttleworth Collection
The Aerodrome
Old warden
Biggleswade
Bedfordshire

Air Britain (Historians) Ltd
12 Woodfield Close
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