WORK PLANNING AT THE R.N.A.Y., FLEETLANDS

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When Fleetlands was established in 1940, in the early stages of the second World War, the aim was to set up a flexible organization which could change tasks at short notice to fulfil the Navy's urgent requirements. This object was achieved both at Fleetlands and the similar repair yards at Belfast and Donibristle, Scotland. Today, some of this flexibility has inevitably been lost as a result of the complexity of high-speed jet aircraft, the fixtures and tooling for which cannot be so readily improvised ; but since the Royal Naval Aircraft Yards exist solely for repair and modification work, and do not have to compete with production, as may be the case when aircraft are returned to their manufacturers for overhaul, these establishments still offer the most efficient and expeditious means of carrying out naval aircraft repairs. Cutting costs and turn-round time, while restoring the aircraft to the ' as new ' condition and current modification standard, are the primary objectives of the Fleetlands organization.

THE MAIN AIRFRAME REPAIR SHOP

Fleetlands' present task is the repair and modification of Sea Hawks and their Rolls Royce Nene engines and equipment, a certain amount of repair and modification work for the Director of Stores at the Admiralty, and jobbing work for the Home Air Command. Preparations are also being made for dealing with the de Havilland Ghost engines of the Sea Venoms and, when the D.H.110 aircraft enter service, Rolls Royce Avon engines. Sea Venom repairs and modifications are carried out at the Belfast Yard, and those of the Fairey Gannets and their Armstrong Siddeley Double Mamba engines at Donibristle.

The Fleetlands Yard covers 73 acres and consists of a number of separate hangars and workshops. This arrangement was influenced by the need for dispersal during the war when Fleetlands was established, and by the system of annual estimates by which the Admiralty is financed.

The main shops comprise : strip and survey ; paint strip ; the main airframe repair shop, where the major fuselage work is carried out ; aerofoils and joinery workshop ; heavy metal work ; engine repair and machine shop ; coppersmith/sheet metal work and metal detail, with a section for fuel tank repairs ; the hydraulic shop ; electrical radio/radar shop ; an armament section, adjacent to the gun test butts ; an aircraft refinishing shop ; and an apprentice training hangar, which is shared with the yard machinery installation and maintenance section.

In addition, there are four stores, two fully silenced jet engine test houses, engine running-up bases, an apprentices' school building, a research laboratory and a drawing office. The purpose of the latter is to prepare major repair schemes for all aircraft, and obtain design clearance for these schemes, to arrange liaison with the aircraft firms on technical matters, design test rigs to suit local requirements, compile works and machinery projects, and to provide an information service of drawings and technical publications.

As in naval dockyards, civilian labour is employed in the aircraft yards under the supervision of naval officers, a system which has proved most satis-

factory in practice, with unusual freedom from labour disputes. At Fleetlands, this happy relationship between labour and supervision is fostered by a flourishing social life and sports activities.

The Superintendent holds the rank of captain. Directly responsible to him are four commanders : the Works Manager, who is the Deputy Superintendent, the Planning Manager, the Electrical Officer and the Chief Inspection Officer ; the remaining heads of departments are civilians, as are most of the other officers of the yard.

The Works Manager is responsible for co-ordinating and carrying out the work in the shops. Although the Electrical Officer is directly responsible to the Superintendent for all electrical repairs, he works in close liaison with the Works Manager and times his shop operations to suit the schedule laid down by the Works Manager. The Chief Inspection Officer's responsibility is to set the standards to which the work is to be carried out and to ensure that those standards are maintained in practice. The Planning Manager is responsible for the forward plans, rate-fixing matters, and day-to-day job and shop planning, the application of work study, shop layout, programme planning, progressing and job control.

The number employed at Fleetlands is about 1,400, of which 170 are ' non-industrial '—of technician or executive status—employed in administration, planning, inspection, production, stores or drawing office. Of the 1,200 ' industrials ' about 670 are skilled craftsmen. Most of the labour is drawn from the local population or from ex-service personnel ; but the apprentice training school, which numbers about 130, is now attracting young men from farther afield.

INCENTIVE BONUS SCHEME

Fleetlands was the first of the naval yards to introduce an incentive scheme, and the satisfactory results obtained have now led to a general policy of incentives throughout naval aircraft yards. When first introduced ten years ago, the Halsey scheme was operated. In 1952, a change-over was made to a straightforward percentage bonus scheme. As an example of how this scheme has increased the number of aircraft dealt with annually and has reduced the cost in man-power, the following figures can be cited. During the year 1945–1946, before the full effects of the scheme had become apparent, 60 aircraft and 150 engines were reconditioned. In 1952–1953, with 200 less operatives in the yard, 135 aircraft and 265 engines were reconditioned.

Since then the figures have dropped because the yard has been changing tasks from Fireflies, Sea Furies and Seafires to jet-powered Sea Hawks ; thus it has been necessary to revise the layout of the factory and to re-equip it extensively to handle the modern machine. The Sea Hawk flying-hours are now increasing rapidly, and it will not be long before there is a regular flow of these aircraft requiring reconditioning.

The quality of the work is safeguarded by the fact that the inspection staff have to certify on the men's bonus cards that the job has been completed to their satisfaction before payment can be made. The inspection staff do not themselves participate in the bonus scheme.

The rate-fixing and planning staff of all the aircraft yards who work out the standard times and prepare the sequencing of operations, receive training in method study at Fleetlands, which is the Navy's pioneer establishment in this practice. Senior officers attend work study courses at Birmingham University, and the subordinate officers at the Birmingham School of Technology, in order to keep abreast advances in modern method study techniques.

STANDARD BREAKDOWN

The work of the Forward Planning Section begins about two years before the first of a new type of aircraft arrives, with the problems of the layout of the shops, the acquisition of the necessary plant, equipment and tooling, deciding the best methods of achieving a standard breakdown for the aircraft and, finally, devising the necessary documentation to achieve a standard procedure. This is based upon a complete strip of an advanced machine by the planning staff, assisted by technical progress men, the latter being aircraft fitters with a higher rate of pay for their special duties in assisting the planning staff to achieve a properly sequenced operation.

The standard breakdown procedure makes possible the maximum utilization of inspectors and operatives and since the main components—centre fuselage, front fuselage, rear fuselage, port and starboard wings, in the case of the Sea Hawk—are surveyed in parallel, requirements of stores are ascertained at the earliest possible moment. Generally some 80 per cent of store items are held at Fleetlands, and most of the remainder can be obtained within three weeks.

A basic floor plan is drawn up which shows the space, time and man-power requirements for each phase of work on each major component, and shows when the various jobs require to be co-ordinated, e.g. at what stage the fuel tanks are required for re-installation in the re-built front fuselage, etc. A sliding date scale incorporated in the floor plan enables the target dates to be calculated ; these are co-ordinated with the detailed job cards issued for standardizing breakdown, repair and rebuild operations on the floor.

PICTORIAL SCHEDULES

Coloured pictorial schedules, keyed with an action list, are prepared, as an aid to the examiner carrying out the survey, in locating and identifying damaged or missing items requiring replacement ; all related systems, such as airbrake surfaces and their control levers, attachment pins, etc., are identically coloured.

The pictorial representation is carried through to the repair shops. The survey examiner enters up the damage on a line-diagram ' action list ', and calls up the necessary rectification work on a survey action list. These lists are sent as an ' aircraft pack ' to a central office where Block and Anderson duplicating machines produce the action and documentation such as operative's bonus card, single line demand vouchers for spares and modifications call-up, and progress record cards for the Progress Section. This duplicating system has eliminated much manual writing and typewriting which was associated with the previous system.

Progress chasers maintain a visual display of the progress of each component through the shops, and a man-loading chart, colour-coded by trade, shows hold-ups on any particular aircraft, so enabling components to be re-allocated where necessary to smooth out the flow of work. An interesting feature of the Fleetlands organization is the weekly progress meeting, at which such hold-ups are analysed in detail. An incidental advantage of the incentive bonus scheme is that the men's bonus cards provide an accurate record of waiting time and, at these weekly meetings, management is made aware of all the causes of delay throughout the yard, and takes steps to overcome them. The elimination of waiting time, which is paid at the standard rate only, means more production and higher earnings.

Turning now to a brief consideration of the actual progress of the aircraft through the yard : the aircraft may come in for what is known as a ' Category 4 recondition ' after completing a standard service life, based on an assessment of time during which the aircraft can be regarded as fully operational ; or it

may come in at the end of a carrier cycle of operations for a 'Category 2 minor rectification and modification programme', in accordance with Admiralty policy, before re-issue to naval air squadrons ; damaged aircraft also come in at irregular intervals for major repairs. It is to cater for these varying tasks, that the flexible planning of the work is essential.

The aircraft arrive either by road, after landing at a nearby airfield which is connected with Fleetlands by a road specially built for the purpose, or by lighter from the aircraft carriers ; a new jetty is under construction for the reception of aircraft lighters. Before the aircraft is programmed for feed-in for overhaul, a preliminary survey is carried out by a team consisting of representatives of production, inspection and planning at supervisors' level, in order to determine which category of work is called for, after which the aircraft is sent to the paint strip shop. From the paint strip shop it passes to the strip and survey hangar, where it is broken down to major components and surveyed in detail. The aerofoil surfaces and minor components are removed and sent to their various component shops where the detailed survey on these items is carried out, followed by repair or reconditioning. The major components are passed to the main airframe repair shop for Category 4 repairs. Ultimately the repaired components are sequenced back to the major assemblies which are brought together for reconstruction, according to programme, in the main shop. Category 2 work is not carried out in the main shop, but in subsidiary hangars where the inspection rectification and embodiment of modifications is conducted under one roof.

NAVAL AIRCRAFT MATERIALS LABORATORY

The Naval Aircraft Materials Laboratory, although within Fleetlands, exists for the use of the whole of the Fleet Air Arm. Its general function is to carry out those investigations of a chemical, metallurgical and general scientific nature which arise in naval aviation. The laboratory renders assistance to the Admiralty Aircraft Accident Investigation Unit, and is also in close touch with the other repair yards, aircraft workshops and air stations on day-to-day problems.

The accent is on applied research, and much of the value of the laboratory comes from its very close contact with the users of naval aircraft. The range of work covered is considerable, embracing ferrous and non-ferrous metallurgy, corrosion prevention by metallic or organic coatings, fuels, lubricants, strippable plastics preservation of aircraft, and a wide variety of other subjects associated with the behaviour of materials in naval aircraft. Many examples of the laboratory's activities could be given : one involved the internal treatment of fuel tanks which had corroded under certain conditions of carrier operation, another concerned the failure in service of certain high strength aluminium alloy forgings with high internal stress levels and suspected internal defects—this latter aspect was being reviewed by ultrasonic inspection.

The staff complement of the laboratory is comparatively small ; but effective and continually increasing use is being made of the facilities of this department.