

Annual Review of Helicopter Activities

This is the second review of the helicopter activities of those firms from whom The Helicopter Association of Great Britain receives support

All firms approached were not able to submit material but the Editors are extremely pleased that the number of contributions received this year has increased considerably. They hope that this feature will continue to expand in future years, to become a useful reference section of the Journal

ALVIS LIMITED

Alvis Limited are in production at their aero-engine division with the nine-cylinder radial Leonides and the higher-powered Leonides Major. The Leonides in its special helicopter versions has a maximum five-minute rating of 500/520 b h p. As the Leonides 524/1 it powers both the Bristol 171 and 173 and as the 521/1 it powers the Westland S-51. It is supplied with or without a clutch and fan according to the installation.

Of later design is the 14-cylinder, two-row Leonides Major which, in its helicopter version, is capable of running at any angle of tilt. The appropriate engine is designated A L E M 1/2 and its present maximum rating is 870 b h p. The Leonides Major ran for the first time in July (1954) last year and has since completed hundreds of hours' bench running. It already has many flying hours to its credit installed in two nacelles of the Marathon flying test bed and was seen for the first time in the Westland "Whirlwind" at the Farnborough Display.

When in production, the A L E M 1/2 is to provide the power for the Bristol 173 and presumably also for the Naval version of this aircraft (reputed to be the Bristol 191). It is also scheduled for installation in future versions of the Westland S-55 Whirlwind. It is not fitted with reduction gearing, and in both of the above installations the clutch is supplied by the aircraft company.

AIR SERVICE TRAINING LTD

Two Hiller 12 B's were recently delivered to Air Service Training Ltd, Britain's Air University, and a member of the Hawker Siddeley Group.

Like the rest of A S T's fleet, the Hillers are being used solely for training purposes, so that all the necessary facilities for basic flying and technical instruction, on both fixed and rotating wing aircraft, are concentrated for the first time in a single establishment.



BLACKBURN AND GENERAL AIRCRAFT LIMITED

Production of the Turbomeca Gas Turbines is now proceeding at the Brough factory of the Blackburn and General Aircraft Company. This range of French units has been re-designed to fulfil British standards and British materials have been embodied.

The Blackburn range of Turbomeca Gas Turbines includes four which are eminently suitable for use in helicopters, namely the 'Palouste' air bleed engine, the 'Artouste' shaft turbine and the 'Turmo' and 'Coupled Turmo' free turbines.

The Air Bleed version, the 'Palouste,' is employed on the French Djinn and the Fairey Ultra-light helicopters, in which applications the compressed air is fed to the rotor tips.

The 'Artouste,' the British version of which develops 475 h p, has gained altitude records in the French built 'Alouette' and the American 'Sikorsky' helicopters. In these installations the shaft power of the gas turbine is employed in a conventional manner such as is found with reciprocating power plants.

In all probability the 'Turmo' is the most suited of all to helicopter applications, for the 'Turmo 600' develops 450 h p for a weight of 300 lbs. This engine gives great flexibility, for the power turbine is not mechanically connected to the compressor drive turbine.

The 'Coupled Turmo' consists of two 'Turmo' units driving through a common gear box whilst retaining the ability to operate independently—this ensures twin engine safety.

All these units operate on Kerosene, an aspect which will be particularly appreciated by the Royal Navy. These four engines were on display at the Society of British Aircraft Constructors Exhibition at Farnborough and also the 'Palas' and 'Marbore' jet engines.

THE BRISTOL AEROPLANE COMPANY LIMITED

BRISTOL HELICOPTERS—PRODUCTION AND DEVELOPMENT PROGRAMMES

During the past twelve months production of the Bristol Sycamore has been steadily extended to meet substantial orders for the Services, while flight research in the field of larger helicopters has continued with two twin-engined, tandem-rotor Type 173 aircraft. A third Type 173, fitted with Alvis Major engines of 850 b h p, is being prepared for its initial flight trials.

A significant development in the 173 programme was the installation and successful flight testing of four-bladed rotors. Mr Raoul Hafner (Chief Designer, Helicopters) in a lecture on the design and development of the aircraft, spoke enthusiastically of the results of this modification. He explained that its effect is to spread lift over a greater number of blades, thus reducing the fluctuating component of the rotor forces to about three-quarters of their original value. In addition, the frequency of excitation is increased and the dynamic amplification factor thereby reduced to about 40 per cent that of the three-bladed rotor.

The importance of the Type 173 in the pattern of future inter-city travel was underlined when in June one of the prototypes flew in exactly two hours from the South Bank in London to Le Bourget Airport, Paris. The aircraft's average speed was 112 m p h. The flight served to illustrate the powerful attraction of city-centre to city-centre operation for the passenger in terms both of the elimination of terminal travel, inconvenience and the consequent saving in time. The true measure of the achievement, as the Company pointed out at the time, lies in the fact that for a passenger to travel in orthodox airline fashion from the centre of London to the centre of Paris in the same time as the Type 173 would entail the airliner flying from London Airport to Le Bourget at about 4,000 miles per hour.

The Sycamore now in production is the Mark 4, which can undertake a variety of roles—passenger and freight transport, search and rescue, and ambulance work. Its performance at high altitude was convincingly demonstrated on a number of occasions. In June, one of these aircraft landed on Hafelekar, a peak near Innsbruck in the Austrian Tyrol, at a height of nearly 8,000 feet above sea level, and after taking on board a "casualty" took off again to complete the demonstration with an auto-

rotative landing at Innsbruck, some five miles away along the valley

A month or two earlier, another aircraft had made a landing at 10,000 feet in Kenya—believed at that time to be the highest yet achieved by a helicopter in a tropical country

In Australia, shortly after Sycamores of the Royal Australian Navy had undertaken general transport work for a hydro-electric project in south-west Tasmania, Australian National Airways placed an order for an aircraft of this type and announced their intention of setting up a Helicopter Division. They are to use the Sycamore initially for emergency duties and for feeder services to the main capital airports



Sycamores have expanded their service with the Royal Air Force, the British Army, British European Airways, and the Belgian Air Force, whilst most recently, and following its appearance at the Toronto World Fair, a standard Mk 4 version of the aircraft is being used for general sales demonstration work by The Bristol Aeroplane Company of Canada Limited

BIRMETALS LIMITED

The major activities of this firm in the helicopter field have been concerned with the supplies of aluminium alloy and magnesium alloy sheet, strip and extrusions, principally for the Westland Sikorsky Dragonfly and Whirlwind models

The most interesting extrusion supplied has been the large hollow section for the rotor spars, which is a hollow 'D' section approximately 5'8" wide \times 1'9" deep with two integral stiffening ribs forming the leading edge and main structural member of the rotor blades. This is supplied in alloy Birmetal 016 to draft specification HE 20. The spar is supplied in the fully heat treated condition and twisted all ready for overall final machining and polishing

Also supplied in connection with these spars are the trailing edge sheets which take the form of thin sheets, down to 27 S W G, to specification L 72. These are supplied with a sprayed on Birlon strip coating to minimise damage due to handling during transport and forming operations

In addition to the rotor spars a considerable quantity of magnesium sheet is supplied for skinning purposes. This sheet is supplied in the high strength zirconium alloy ZW 3 to specification DTD 626, as well as in the AZ 31 type of alloy to draft specification M 32. This latter alloy has been supplied in sheets down to 27 S W G

BRITISH EUROPEAN AIRWAYS

REVIEW OF HELICOPTER ACTIVITIES, 1954/55

The helicopter activities of British European Airways during the past year have continued the pattern established in previous years. The main emphasis has been on the development of the helicopter to a state in which it can compete economically and with safety against other forms of transport on stages of up to about three hundred miles. With this end in view B E A has continued to run experimental passenger services with existing types of small helicopter to gain operating experience. At the same time, work has continued on an extensive development programme directed at the investigation of the problems likely to be encountered in high frequency, all weather services, with the larger helicopters which the Corporation expect to operate as soon as these aircraft become available.

Two Westland W S 55 eight-passenger helicopters have been added to the fleet during the year which, together with two Bristol 171, Mk 3A's and two Bell 47B 3's, make up the total complement. A third W S 55 is on order. Total flying hours during the year, including operations, development flying and crew training, amounted to 1,061 hours.

Starting in June, 1954, a passenger service was flown between London Airport Northolt Airport and Eastleigh Airport, Southampton. Bristol 171's were used almost exclusively to fly 450 hours up to the end of May, 1955.

The main objective of this flying is to develop the helicopter to a stage where its mechanical reliability and its component overhaul lives are comparable to those of other types of civil aircraft. Emphasis is being placed on the development of maintenance and overhaul methods and on the engineering development of the aircraft themselves.

A service between London Airport and Central London (South Bank) was started on 25th July. The one way trip is scheduled to take fifteen minutes. Westland W S 55's with five seats and with flotation gear for emergency landing on water are used.

Today's scheduled helicopter operations are limited to visual flight conditions. B E A's intention is that future services shall be able to operate to low weather minima for the complete operation from take-off to landing. For this to be possible, ground aids matched to the helicopter's capabilities both for en route navigation and for blind approaches to a restricted landing site must be developed. Similarly, suitable approach lighting is needed to give the pilot attitude, position and height guidance. This involves development work on instrument flying, course flying using the Decca Navigator, measured approach trials with the Decca Navigator and the E K Cole Radar Approach Aid, and night flying to evaluate various systems of landing site ground lighting. During the course of operations, 655 flying hours have been accumulated while evaluating Decca as a navigational aid. A further objective is to determine how far the helicopter can be fitted into present day Air Traffic Control procedures and what use can be made of available ground sites.

As a result of this work, it will be possible to specify the improvements necessary in the helicopter and its instrumentation, the suitability of navigational and approach aids, how the helicopter can be fitted into the pattern of Air Traffic Control and the minimum size of proposed operating sites.

During the forthcoming year, further work is planned on these problems. In particular, a thorough evaluation of available approach aids will be carried out. Of the greatest importance in establishing minimum characteristics of sites is experience with larger multi-engined machines and it is to be hoped that this will be possible in the not too distant future. While all these different types of essential development are proceeding operating experience will continue to accumulate as a result of the London Airport—South Bank Service.

BRITISH MESSIER LIMITED

HELICOPTER UNDERCARRIAGE

BRISTOL B 171 UNDERCARRIAGE

Each main undercarriage consists of a frame incorporating an oleo-pneumatic shock absorber. The nose undercarriage comprises a similar but single vertical leg,

the wheel fork of which is free to castor and is centred when the helicopter becomes airborne

During landing, oil in the shock absorber is forced through a piston to compress further the already compressed air in the top of the leg. After impact, the expanding air forces the oil back through a restriction in the piston, thereby preventing too rapid extension

Apart from dealing with normal loads, the principal problem of helicopter shock absorber design is to damp out rotor-produced unbalance forces. With the B 171, this is done by extra-flexible long-stroke low-friction shock absorbers

BRISTOL B 173 UNDERCARRIAGE

This undercarriage consists of four shock absorber legs, each hinged to a wheel fork. The front pair of wheels can castor but are both centred during flight. The rear wheels are fitted with brakes

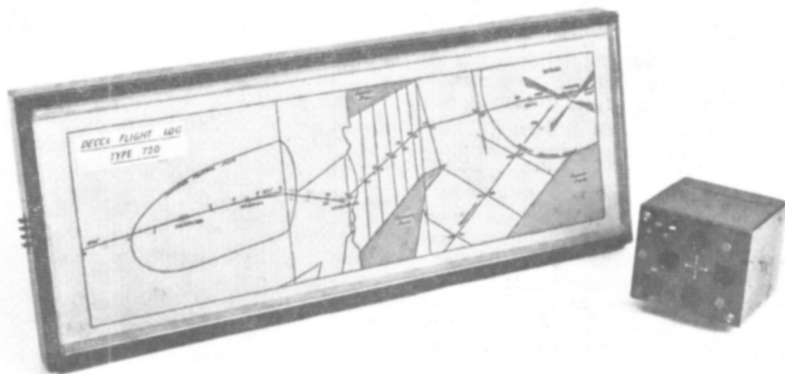
Each wheel fork is linked to a spring-loaded oleo piston in the shock absorber cylinder and each pair of absorbers is hydraulically interconnected, with a branch line to a fuselage-mounted oleo-pneumatic accumulator

Uneven landings and rotor resonance are rectified by the compression of one leg extending the opposite leg, after which the fuselage is levelled by the leg springs. Heavy landings are absorbed by the accumulator while damping is provided by the high-viscosity fluid in the pipe lines

IHL DLCCA NAVIGATOR COMPANY LIMITED

DECCA NAVIGATOR SERVES THE HELICOPTER

In September, 1954, the Engineering Department of B E A published their report No 39 on "The Decca Navigator system and Helicopter". This survey states that the accuracy of the system is adequate for en route helicopter navigation out to at least 150 nautical miles from the Master Station, the area coverage of the system coupled with the map presentation of the Flight Log gives the operational flexibility required for future operations



Trials have been made for Terminal Area navigation, and blind approaches have been successfully completed approaching along a pre-selected lattice line using one meter as a L/R indicator, and one other meter to check distance to go against the cross lattice—by this means any angle of approach can be made by controlling altitude against distance from touch-down. Advanced development work is already in

progress to feed this information via a small computer to a cross-pointer indicator which will present the pilot with this variable glide path/approach information, the angle of approach being selected by the pilot according to requirement. B.E.A.'s London Airport—Eastleigh Helicopter Service achieved 100% regularity during at least one month last summer by the use of Decca Navigator.

American interest in the system has resulted in the lease of a Decca Chain by the U.S. Army for installation at Fort Huachuca, Arizona. A major part of the trials programme will be its' assessment as a helicopter navaid in co-operation with the Air Navigation Development Board.

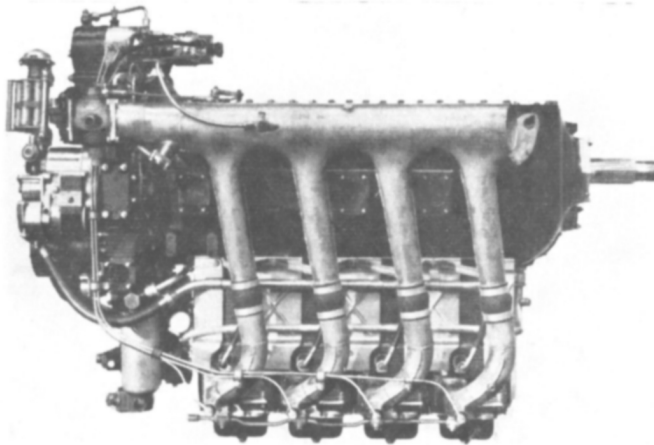
Operations have been carried out with the Royal Netherlands Navy, Royal Navy and other services. In this way valuable experience has been gained with all types of helicopters used for widely different purposes.

The Mark 9 Receiver and Lightweight Flight Log (vide Fig.) have been produced for helicopter use. The total weight of the complete installation is less than 40 lbs. This equipment incorporates the automatic scale change for approach accuracy at terminals and whilst condensing the en route section along-track leaves the heading sensitivity unaffected.

During the past twelve months the Decca Navigator system has gained wide acceptance as the aid for the helicopter, its' high accuracy area coverage allows the flexibility of operation necessary for helicopters, whilst the low frequency transmission is unaffected by terrain, altitude, or the various electronic difficulties peculiar to the helicopter.

THE DE HAVILLAND AIRCRAFT COMPANY LIMITED

This photograph shows the latest de Havilland Gipsy engine which has been specifically designed to provide a compact and powerful power unit for light helicopters.



The engine is now in an advanced state of development and has already accumulated a large number of running hours, both on the test bed and as a power unit of the Saunders-Roe Skeeter Mk 6 two seat light helicopter. Known as the Gipsy Major 200, it is the logical development of the earlier Gipsy Major series but of larger capacity and incorporating many of the components of the more powerful Gipsy Queen six cylinder engines. This new four cylinder Major is already yielding 200 b.h.p. at 2,600 r.p.m.

A new feature of the Major 200 is the induction system which employs inlet port fuel injection in place of the more conventional "float" type carburettion of the earlier engines. This induction system of particularly high aerodynamic efficiency ensures a near-perfect fuel distribution which in conjunction with a higher compression ratio has resulted in considerable gains in power and operating economy.

DOWTY EQUIPMENT LTD

Among the small components manufactured by Dowty and used in helicopters is the C 7059 Y electro-hydraulic valve which helped to make rescue history recently. This unit, a variation of the well-known Dowty 'Hydel' valve, controls the rescue hoist fitted to the Westland Dragonfly which lifted a pilot from the Channel within a few minutes of his forced 'landing' in the sea. The action of the 'Hydel' valve is positive and rapid, so rapid in fact that slight modification was necessary when it was adopted for use with the rescue hoist to avoid the rescued person being snatched from the water too hastily for comfort.

The 'Hydel,' a 4-way solenoid operated selector valve weighing approximately 2½ lbs, is capable of controlling pressures up to 4,000 p s i. Operational timing is 0.3 seconds selection to neutral and 1.2 seconds neutral to selection.

Messrs Dowtys are also now becoming equally well known for their small but ingenious electrical instruments, which are in constant demand for the aircraft industry generally, and are of particular interest to helicopter designers. These include a universal range of push-button switches, drum, commutator, limit, and stepless control type switches, electro-hydraulic valves, and electric indicators of various types. Of these latter two noteworthy additions to the range are now in production, one is a minute three-position indicator which gives three separate and distinct indications on a screen of approximately one inch square, and the other a small magnetic indicator weighing less than two ounces—a type which is often preferred to the more conventional lamp for warning and other indications, because it is immune from the risks of filament failure.

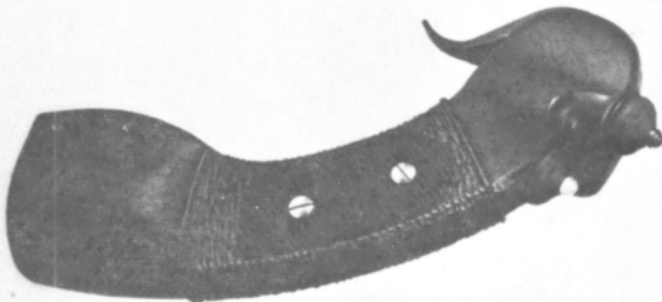
DUNLOP RUBBER CO, LTD

The Dunlop Rubber Company's Aviation Division at Foleshill, Coventry, supplies components for all the leading British helicopters.

Since 1911 when the Company produced its first aircraft tyre and wheel they have increased the range of aviation equipment to cover all types of pneumatic actuation in addition to hydraulic brakes and brake operating valves and, of course, rubber accessories in natural and synthetic, including Silicone compounds.

Their principle products continue to be tyres, wheels and brakes, many of which are suitable for use on helicopters.

A Dunlop hydraulic brake developed for helicopters closely follows the design of the motor car disc brake which has achieved such notable success on sports cars. It consists of caliper body secured to the undercarriage containing in one leg of the



caliper a ram mechanism and friction pad, while the other leg is fitted with a fixed pad. Passing between the two pads is a chrome plated steel disc which is tenoned into the wheel structure by keyways on its periphery. The disc is permitted a slight lateral movement which allows it to be sandwiched between the pressurised and fixed friction pads.

Brake operating master cylinders for foot pedal operation are available in working pressures from 400—1000 p s i.

One of the most interesting Dunlop developments for use on helicopters is a straight control handle based on a design originally intended for use on aircraft with ejector seats. The handles are constructed from a light alloy casting—the hand grip portion is covered with a stippled surfaced non-slip rubber composition, flared at the base to form a comfortable hand rest. All the electrical control switches are housed in the upper end in the most convenient and ‘handy’ positions.

In the handle illustrated the trigger at the front of the handle is the “Press to Mute” control. The globe shaped switch on the top of the handle is a four-way cyclic trim control. Immediately beneath is a two-way hoist control. On the right hand side of the handle shielded from inadvertent operation by a small thumb-operated guard is the “Stores Release” switch and on the left of the handle is a “Press to Transmit” switch.

Switching arrangements can be varied to suit particular requirements and several types of switches are available as separate units.

It is a feature of the Dunlop Aviation Division’s service to the aircraft industry to undertake the development of components to designers and constructors particular requirements. Full consulting services are available to advise on the most efficient use of all Dunlop equipment.

THE FAIREY AVIATION COMPANY LIMITED

In the past twelve months the Company has made very considerable progress with the various types of helicopter under design and construction. All three designs are powered by pressure jets located at the rotor blade tips—a propulsion system whose advantages are becoming increasingly recognised.

The experimental jet powered Gyrodyne has completed its initial test programme successfully. The continued reliability of the pressure jets is an excellent augury for their future performance in the Rotodyne. In other important respects the aircraft is also very satisfactory. The vibration level is low even at high forward speeds and the pilots report that the hydraulic controls are smooth and pleasant in operation. The relatively high inertia of the rotor blades gives the aircraft very good handling qualities in a fully autorotative landing. The Gyrodyne was of course designed to fly both as a helicopter—when power is derived from the tip jets, or as an autogiro—when the power is derived from the propellers. Both regimes have



been explored and the transition from helicopter to autogiro and vice-versa has been carried out on many occasions. The aircraft has been flown by pilots of the Government Establishments.

Design and construction of the Rotodyne is well advanced, ground running is expected to begin in the middle of 1956. This is a project of great importance to the future of helicopter operations. The A U W is 33,000 lb and the fuselage has seating accommodation for 40 passengers. The cruising speed of 130 knots will permit the operator to maintain good schedules over the 200 mile stage distances for which the aircraft is designed. A Wind Tunnel survey of a 1/6th scale model less rotor has been completed, and tests on a 1/15th scale model complete with rotor have begun.

Design of the Ultra-Light Helicopter began in July, 1954. The first prototype made a successful maiden flight on Aug 14th, 1955. Details of the aircraft are still classified but it may be stated that it is built for Army observation and communication duties and will provide exceptional performance both in standard and tropical conditions.

The pressure jets are an essential feature of the Fairey helicopter programme. Their success on the Gyrodyne promises well for the future. Extensive test facilities are being built at White Waltham further to improve performance and fuel economy. Recent research indicates a means by which noise can be reduced very considerably without undue effects on performance.

HUNTING PERCIVAL AIRCRAFT LTD

Hunting Percival Aircraft Limited have been awarded an M O S Research Contract for the design and development of a helicopter using mixed gas tip-drive to the rotor. As no suitable turbine was in existence, a special gas-producer was designed and has been made by D Napier & Son under the name of the "Oryx".

For testing a rotor designed to use this form of gas, a ground installation has been built using a "Derwent" turbine and a water spray device to reduce the resulting gas to the desired condition for passing into the rotor. This test equipment is installed in a pit with the rotor below rim level, so that eventually rotors can be tested to destruction with safety. Many engineering problems have had to be solved to produce a duct system which can pass the gas from the turbines through the hub and into the blades with provision for rotation, expansion, and tilt. These ducts and the blades themselves are made of stainless steel, ensuring freedom from fatigue and giving a hard surface, proof against abrasion and corrosion.

During research on the production of a stainless steel blade a combined assembly and spot welding tool has been devised which has created a blade of remarkably smooth and true form. This method of construction is applicable to blades of any form or proportions. The rotor system has been running for some time in the test pit, where the gas drive system and its relevant design features have been satisfactorily proved.

The absence of any shafts, gears, clutches, free-wheels, lubrication systems, etc., overcomes most of the disadvantages of the shaft-driven type. In addition, the absence of torque, whilst saving considerable weight and complication in the provision of a yawing control, also reduces the overall size of the helicopter in that this control can be brought well within the radius of the rotor blades.

The mixed gas drive should result in an appreciable noise reduction compared with other drive systems. Research is being conducted on methods of increasing power by tip-burning, which is particularly apt with a mixed gas system, and does not result in much noise increase. This will greatly extend the field of usefulness of the helicopter and by this means it will be possible to restore the power until the same payload can be lifted in tropical or high altitude conditions as at I C A N sea level. Another advantage of the system is the fact that the temperature of the blades automatically provides de-icing, and the weight saved here may result in the ability to carry the equivalent of two or more passengers with the added benefit of no de-icing equipment to provide or maintain.

A careful study of the complete picture indicates that although the specific fuel consumption is greater, this is more than offset by the overall saving in first cost and reduced maintenance. As a result it is estimated that three gas-driven helicopters should be able to do the work of four of the shaft-driven type.

D NAPIER & SON LTD

NAPIER GAS TURBINES FOR HELICOPTERS

For some time Napier have been designing and developing suitable power units for two of the types of helicopter which will play an important part in the future of civil and military transport, namely the simple and compound helicopter. Particulars of the two engines, the Oryx N O R 1 and the Eland N E L 3, have now been released.

Two Oryx turbo-gas-generators are now being installed in the Percival P 74, a simple helicopter whose rotor is propelled by jet re-action at the rotor tips. Gases and cooling air are fed from the Oryx engine through ducting to the rotor head and along the blades to the jets. A later version of the P 74 is the P 105 and this will also be powered by Napier Oryx engines. The first engines produced 750 g h p but development to 900 g h p is anticipated.

The Fairey Rotodyne is a compound helicopter and will be powered by two 3,000 e h p Napier Eland turbo-propeller engines. By means of auxiliary compressors on the rear of these engines, compressed air is ducted to propulsion units which are fitted to the ends of the rotor blades. At operating conditions in forward flight the stub wings will carry part of the load. Higher operational speeds than are obtainable in the pure helicopter of the same size can be obtained. This 40-seat helicopter will have a speed of 150 miles per hour and a range of 250 miles.

Napier are pioneers in the application of gas-turbine propulsion of helicopter rotors and are confident that the use of the turbine in the helicopter is as profitable a use of the turbine characteristics as the normal fixed wing aeroplane. It is noteworthy that the helicopter height and speed records are both held by a gas turbine powered helicopter.

From experience gained, it would appear that for the multiple engine, gas turbine driven helicopter, engines having a free turbine would be more preferable from the safety stand point, as in the event of one engine becoming inoperative, it would be possible to obtain nearly the full power from the remaining turbines at a somewhat reduced number of revolutions of the rotor. It is probable that development of the helicopter gas-turbine will proceed along these lines.

SABENA

The success of the first year of scheduled passenger operations has led Sabena to expand its helicopter network.



The helicopter fleet of the Belgian Company consists now of 6 Sikorsky S-55s. Four of them have already been completely overhauled in the Brussels shop.

Interior arrangement has been completely remodelled and improved with a considerable effect on the noise level. Five extra windows have been designed in two S-55s leading to improvement of passengers comfort. Modification of the whole fleet will follow.

The second year of operation has confirmed the success of the first year and proves definitely that the Belgian Company has been justified in the policy of their expansion.

The following services are operated:

Brussels—Antwerp—Rotterdam (Netherlands)

Brussels—Lille (France)

Brussels—Liège—Maastricht—Cologne—Bonn (Germany)

Brussels—Eindhoven—Duisburg (Germany)

Flessingue—Zierikzee—Rotterdam (Netherlands)

Brussels has therefore the busiest heliport in the World with 24 daily movements.

Up to September 1st, more than 40,000 passengers have flown on Sabena helicopters. Around 30,000 have been carried on the scheduled network.

Sabena is looking forward to bigger and faster aircraft to improve and expand further its helicopter services which answer to a definite need in Western Europe transportation systems.

SHELL-MEX AND B P, LTD

Helicopters are everywhere helping the Royal Dutch Shell Group in a multitude of ways, from oil prospecting to carrying film cameramen.

Latest of the uses is in carrying men to marine drilling platforms at sea and moving heavy machinery—in sections up to 1,000 lbs in weight—in the Persian Gulf, British Borneo and New Guinea. Two Westland S 55 helicopters will shortly go into operation for off-shore drilling work at Doha, in the Persian Gulf, each carrying up to eight passengers and a crew of two.

In July a ten-minute colour film of the Grand Prix at Aintree was made by Shell-Mex and B P Ltd, using a Sikorsky helicopter for overhead shots. In addition, Shell-B P have a special fuelling service at London's South Bank for the use of all helicopters landing there.

Shell's associates, N V Nederlandsche Nieuw Guinea Petroleum Maatschappij, have contracted for the use of two S 55 helicopters for an unusual type of operation in New Guinea.

Plans are in hand to transport a lightweight drilling rig, dismantled into sections weighing not more than 1,000 lbs each, from the main camp to a drilling site about 25 miles away.

In western New Guinea intensive exploration to find new oilfields is continuing, though 250,000 tons of crude oil are now being shipped every year from the new port of Sorong. Technical parties numbering up to 300 men, with 50 tons of equipment and food, must often be moved across dense, swamp-laden jungle.

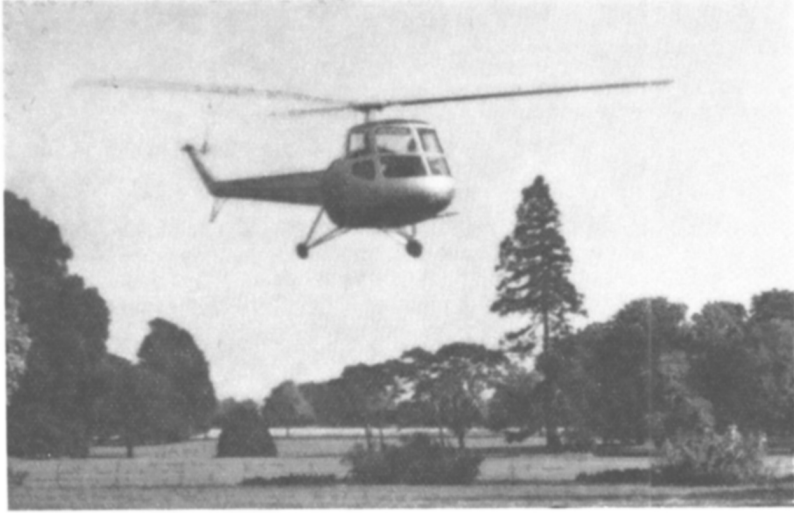
Three single-engined two-seater Bell 47D helicopters, capable of landing in a jungle clearing 100 yards by 30 yards, are carrying 78 tons a month on this job. Floats are fitted to enable the machines to land on local rivers, if required.

Shell are also using helicopters in Venezuela and in Nigeria, where two Hiller 360 aircraft are in use to transport men and light equipment between the base camp at Owerri and the exploration areas.

SAUNDERS-ROE LTD

During the year Saunders-Roe have developed the Mark 6 Skeeter and an order for these aircraft has been received from the Royal Air Force.

The Mark 6 Skeeter is fitted with a de Havilland Gipsy Major 200 engine. The airframe dimensions, however, have not been materially changed from those of the



Mark 5 The Gipsy Major 200 is a 4-cylinder inverted in-line engine with direct fuel injection and, as installed in the Skeeter Mark 6, delivers 200 b h p (one hour power) after cooling power is deducted

Considerable flying has been carried out on the Mark 6 prototypes both at Boscombe Down and by the Company's test pilots One of these machines flew over to the Paris Salon and subsequently to Stuttgart for the German Helicopter Trials The maximum speed is 92 knots and the machine is suitable for a variety of duties such as flying training, personal transport, air mail, crop dusting, traffic control, survey work, photographic reconnaissance, airborne inspection of power and pipe lines, forest fire patrol, radar calibration, and air observation post

In addition to sundry project work, the Company has continued with the development of their pulse jet units for helicopter rotor tip propulsion Further development has also been carried out on metal rotor blades

SPERRY GYROSCOPE COMPANY, LTD

HELICOPTER ACTIVITIES DURING 1955

Following the development by Sperry of the first Helicopter Gyro Horizon, the air-driven H L 4, which is now incorporated in the majority of British helicopters, a new version of this instrument has recently been put into production It is the H L 4 Type 'B,' with an improved dial presentation to enable standard attitude indications to be presented to the pilot irrespective of the helicopter configuration Another new project for helicopters is that of an Electric Gyro Horizon which is being developed for the Ministry of Supply This new instrument will enable the increased accuracy of electrically driven gyros, already enjoyed by fixed wing aircraft, to be brought to bear on helicopter instrument flying problems A further advantage is that it will be provided with potentiometer pick-offs to monitor other equipment such as Flight Directors and Automatic Pilots

In the United States, much effort is being devoted to the problems of helicopter instrumentation by Sperry and a close liaison between the British and American Companies is maintained on the progress of technical development The flight research department of Sperry in New York, using their latest acquisition, a Sikorsky S 55 helicopter, have already begun flight trials of an Automatic Pilot designed specifically for helicopters and providing control in roll, pitch, yaw, altitude and rotor R P M Flight trials are also in progress on the "Helicopter Flight Director"

which is being evaluated for the U S Navy This equipment is more comprehensive than the fixed wing flight director in that it provides airspeed, rudder and collective-pitch manoeuvring requirements on the cross pointer indicator in addition to the standard flight director information Preliminary results indicate that the "Helicopter Flight Director" will have an important application in broadening the scope of helicopter operations under all weather conditions

TEDDINGTON AIRCRAFT CONTROLS LTD

The Company has long been involved in the development of pressure anti-surge valves and solenoid valves of various types These units are now used in engine oil systems and fuel systems respectively of rotating wing aircraft

Considerable development work on both light alloy and nickel iron high temperature air valves is being carried out by Teddington Aircraft Controls An interesting application of these valves to the helicopter is the air bypass valve in an air reaction rotor system to enable the rotor to be stopped whilst the engine driven compressor is running In this installation the valve is a butterfly type with full ring sealing giving a low leak figure and pressure drop coupled with low weight

WESTLAND AIRCRAFT LTD

In addition to design investigations of large and small helicopters, development of the "Whirlwind" has continued with larger engines, and flights have taken place with both the Alvis Leonides Major and the Wright Cyclone, though the latter engine is not available for Civil use A full C of A has been obtained for the standard Civil version of the "Whirlwind," fitted with the Pratt & Whitney 1340 engine, and this machine has seen use with various Whaling Companies, British European Airways, and has been selected for petroleum survey work The "Whirlwind," which is in full production, is being built in considerable numbers for the Royal Navy and the Royal Air Force, and is in operational use at home and abroad

Extensive development work has been done with the WS 51 as a result of which the Westland "Widgeon" has been evolved This is a 5-seater of similar configuration to the WS 51, but with a restyled and larger cabin It can be quickly converted to ambulance role, when two stretcher cases are accommodated entirely within the cabin, one above the other, lying fore and aft alongside the pilot and medical attendant seated behind him, the stretchers being loaded through the nose of the aircraft Large side doors and water-proof floors, in conjunction with the standard hoist, enable air/sea rescue duties to be performed

A "Whirlwind" type rotor-head is used on the "Widgeon," enabling ballasting to be dispensed with by reducing the change of trim with the various loading arrangements of which the machine is capable The use of this rotor-head also provides a facility improving standardisation in the production line It flew for the first time in August this year and took part in the Farnborough Flying Display

Design and development has been initiated of a new transport helicopter to be called the "Westminster" This will have a single main rotor powered by twin rear-drive gas turbines mounted on the cabin top The maximum all up weight will be 33,000 lbs, with a disposable load of 13,000 lbs At this gross weight range will be 310 nautical miles cruising at 130 knots on full fuel load This helicopter is designed to meet a variety of military roles and will carry 40 passengers or 32 stretcher cases

The time normally required for development trials should be considerably reduced by the full utilisation of mechanical systems and design features already successfully proved, since Westlands have the particular advantage of access to Sikorsky engineering development

Helicopter Flying School—A full programme of Pilot training has continued with four S 51s fully utilised A 50-hour Course of conversion and advanced helicopter flying is completed in approximately six weeks, similarly the Engineers' School has been operating to provide training for both Service and Civil Ground Crews