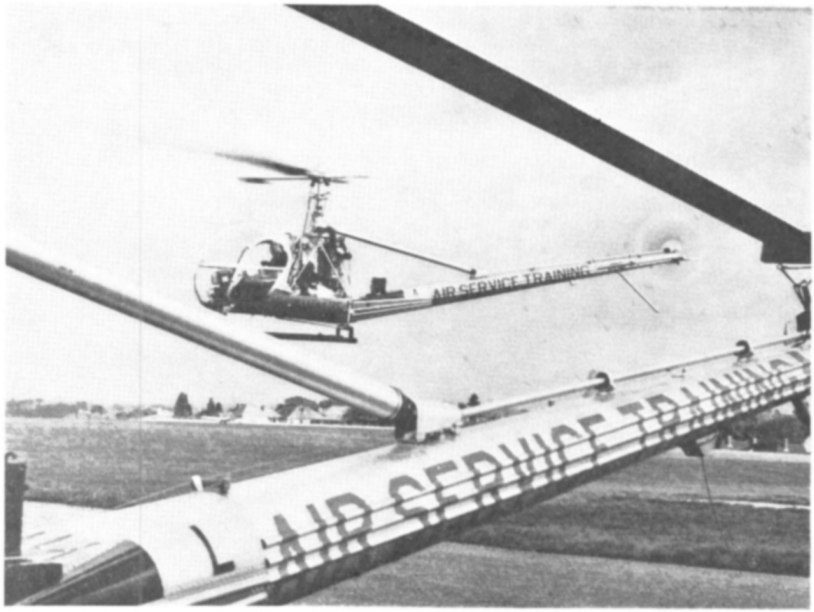
Annual Review of Helicopter Activities

Every year, an invitation is extended to those firms which support the Association to contribute a short review of any new or especially interesting helicopter activities in which they have been engaged during the year The following contributions have been received in response to this invitation for 1957

AIR SERVICE TRAINING LTD

A S T 's Hillers have been kept busy during the past year on an Air Ministry programme for the conversion training of R A F and Army fixed-wing pilots, and have shown a very high rate of serviceability Recognising the need for thoroughness and accuracy in basic training, A S T co-operated with the R A F Central Flying School in producing the syllabus of training, both ground and air Each Service course comprises 20 hours flying and, including the associated technical instruction, lasts for three weeks For the second year running, average time to solo has worked out at just under 5 hours, with surprisingly little variation among the many Service pilots who have now completed their training at Hamble The same figure also held good for the various civilian pupils, who included a number of Commercial Pilots' Licence conversions on to the Hiller This training consists of a 33-hour, 5-week course at Hamble, followed by a further 10 hours flying on the type for which the licence is to be endorsed



Hillers at Hamble

A S T have found it possible to rely on a considerably higher weather factor with these light helicopters than with their fixed-wing training aircraft Results over the past two years indicate a summer factor of 80% for fixed-wing compared with 95% for the Hillers, while in winter the difference is even more marked, with 60% and 90% respectively Non-flying days for the helicopters are mostly caused by wind conditions, solo flying usually being curtailed in surface winds exceeding 25

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knots, especially when the training involves flying in the gusts and eddies experienced near tall trees and buildings It has been found, however, that open field solo flying can safely be continued on the Hillers in 30 knot winds, so long as care is exercised when starting and stopping Visibility has presented very few problems during training, and precision exercises have often been carried out with visibility as low as 200 ft and with cloud base down to 100 ft

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BLACKBURN AND GENERAL AIRCRAFT LTD

The Fairey Ultra-Light helicopter was created to meet the stringent requirements of an Army specification calling for high performance, light weight, reliability, easy maintenance and economical operation All these qualities are also to be found in the Blackburn Palouste gas turbine air compressor, the choice of which as the power plant was based on preliminary design studies which revealed the many advantages of tip-jet driven rotors

The Palouste is used in conjunction with Fairey pressure-jet units fitted to the tips of the rotor blades The rotor is driven by the tip-jet units burning fuel mixed with compressed air supplied by the Palouste through the hollow blades This simple system gives the Fairey Ultra-Light helicopter a greater rate of climb than any other helicopter in the world

The instantaneous starting of the Palouste, by hand or electric starter motor, and the ability to burn all grades of kerosene and petrol add greatly to the utility of the aircraft

The form of transmission adopted shows other returns such as no tail rotor since the tip-jet driven rotor is torqueless and, by far the biggest benefit, no shafts, gears, clutches or other complications inseparable from shaft drive

In short the use of tip-jets and the Palouste have solved the problems of performance, maintenance and simplicity of construction with corresponding saving in weight

PALOUSTE

500 Series

Performance

Maximum 2 71 lb air/sec , 3 88 press ratio, 330 lb /hr fuel

Dimensions (excluding inlet and exhaust ducts)

Length 33 5 in , Max dia 21 4 in Weight approx 204 lb

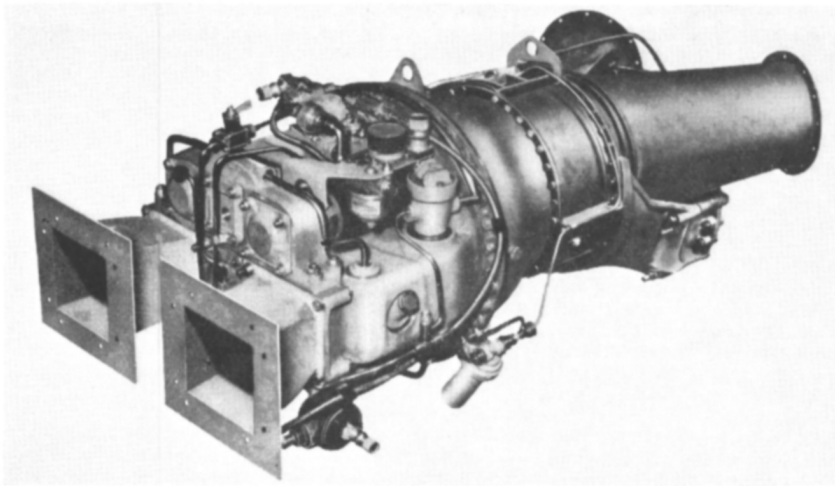
To meet the need for an economical helicopter suitable for civil operators, the Kaman Aircraft Corporation of America has projected the K-600-4, a turbine version of their well proven HOK 1 Power is produced by two Blackburn Turmo 600 free turbine engines each with their own single-stage reduction gearbox driving through a further Kaman gearbox This arrangement permits single engine cruising thereby substantially increasing range and endurance A further attribute is the safety margin inherent with twin-engine operation

Many other improvements in the helicopter have been brought about by the adoption of turbines, not the least of which is the ease of pilot operating procedures

The turbines are mounted externally above the cabin resulting in an approximate doubling of the cabin cubic capacity or, in the passenger version, an increase from five to eight in seating capacity Maintenance has also been eased considerably with the externally mounted engines

Another benefit derived from using a free turbine is that the clutch system, a weighty unit, can be dispensed with Compared with the piston engine version, improvement in maximum speed and rate of climb has been achieved and because of the turbines' lesser weight the useful load has been increased

All these improvements, made possible by the Blackburn Turmo 600, indicate that the cargo carrying version will have direct operating costs of $1 37 (10/2d) per ton mile and that the passenger version, with a pilot and seven passengers a cost of 18 cents (1/4d) per seat mile



Turmo for Kaman Helicopter

TURMO

600 Series

Performance

Maximum 450 S H P	470 lb /hr	fuel
Max cont 400 S H P	425 lb /hr	fuel

Dimensions (excluding inlet and exhaust ducts but with 2-stage gearbox)
Length 46 12 in Max dia 21 in Weight approx 310 lb

BRISTOL AIRCRAFT LIMITED

The transfer of all Bristol helicopter activities from Filton to the Company's factories at Weston-super-Mare is now virtually completed, and the past twelve months have been for the helicopter team a period of consolidation in their new premises

Considerable modifications have been made to the existing factory layout and, where necessary, extensive rebuilding has also been carried out to accommodate new research, development and production facilities One new item of particular interest is a rotor blade test tower, which has been designed and built by the Company exclusively for the testing of production rotor blades

Further details of the twin engine tandem rotor Type 192, which is in production for the Royal Air Force, were announced in May , powered by two Napier Gazelle gas turbines, the aircraft will be used for troop and freight transport, ambulance duties, and search and rescue operations The Type 192 is a development of the Type 173 experimental research aircraft, built by the Company, under Ministry of Supply contract, for intensive research into the military and civil applications of the multi-engine configuration

Production of the Sycamore has been expanded to meet Service requirements and, in addition, the substantial order for 50 machines placed last March by the Federal German Government for their Armed Services By the end of September, ten machines had been delivered to German air force bases at Fassberg and Memmingen Prior to the deliveries, German ground personnel attended courses at the Weston Service School, and since deliveries have begun, a number of German air crews have taken the Sycamore conversion course The helicopters will be operated

by units of the German Army, Navy and Air Force on ambulance, air sea rescue and transport duties

Over 130 Sycamores have now been built and delivered and aircraft of this type are now operating in twelve different countries and in widely varying climatic conditions

BRISTOL SYCAMORE HELICOPTER DELIVERED TO GERMAN ARMED SERVICES

One of the Bristol Sycamore helicopters is taken over by German Air Force personnel after its arrival at the German Air Force Training Base at Fassberg This picture was taken a few moments after the aircraft had touched down

The machine's exceptional versatility has been amply demonstrated on a number of occasions since the last survey of Company activities appeared in the Journal One interesting operation comprised an aerial film exercise in Almeria, southern Spain, involving a round trip of some 2,500 miles With a crew of two, pilot and cameraman, a Sycamore was stripped of doors and windows in order to carry a 260 lb Vista-vision camera, which was used to take sequences for a French film company on location there In over 36½ hours flying, upwards of 100 starts were made on the batteries and not a single mechanical fault was experienced throughout the whole trip

The aircraft have also added to their fine record of operational service in Cyprus, and in Malaya aircraft of this type have successfully evacuated more than 1,600 casualties in the last four years During the Suez operations, Sycamores of the Joint Experimental Helicopter Unit were among the helicopters that took part in the highly successful sea-borne airlifts to the landing area

BRITISH MESSIER LTD

Over the past 12 months, British Messier helicopter activities have been mainly with landing gear and flying control equipment for the Bristol 173 and 192 twin-rotor helicopters, together with associated hydraulic systems

The undercarriages are of rather unorthodox design, this being dictated by the need to cater for the ground resonance problems associated with this type of helicopter On the earlier types of 173, British Messier cross-coupled the pairs of undercarriages, by means of a hydraulic pipe and an accumulator, so that during landing the energy was absorbed by forcing the oil in the shock absorbers through orifices into the accumulator The accumulator was pre-charged with air and, when the helicopter

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was on the ground, the fluid from one shock absorber passed along the connecting pipe to the other The pipe size was calculated to give the necessary damping, thereby combating ground resonance, no fluid going into the accumulator under these conditions

For the Type 192, because of the more arduous specification, it was decided that the system on the Type 173 would not satisfy all conditions, although the principle of separating the damping required for ground resonance, and the shock absorption when landing, was considered necessary Therefore, with the Type 192, each undercarriage has a separate shock absorber and the inflation pressure of the unit is so adjusted that they only move during landing When the aircraft is rolling, as occurs when the rotors are running on the ground, the motion is damped out through a separate hydraulic damper

The flying controls that British Messier are developing for twin-rotor helicopters are of the electro-hydraulic, fully-powered type and initial flight testing is being undertaken on the Type 173 Basically, the flying control unit consists of a hydraulic jack and control valve A differential valve control linkage is incorporated, thereby enabling signals to be fed in—either from the pilot or from an auto-pilot—through a transducer fitted to the jack A selector, also connected to the jack, controls the mode of operation—manual control, power control, auto-pilot operation and electrical signalling with auto-stabilisation All the necessary safety devices, such as reversion to manual control, are built into this unit

As pioneers of high-pressure (4,000 p s i) lightweight hydraulic systems and designers of undercarriages to meet the more difficult problems of modern aircraft, British Messier are also actively applying their experience to the flying control and landing aspects of the latest twin-rotor helicopters

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BRITISH PETROLEUM COMPANY LIMITED

One of the most difficult obstacles to oil exploration in Papua—that of gaining access to drilling sites, has been overcome by the use of helicopters Early this year, a complete drilling outfit capable of reaching to a depth of 10,000 feet, earth moving equipment, building materials and sufficient supplies to begin drilling, were landed by two S 58 Sikorskys at Komewu, Western Papua, where B P is searching for oil in association with Australian and American interests Small helicopters have been used for several years for geophysical work in the Papuan oil search But this was the first time that a drilling rig and equipment had been transported in this way

This " helirig " operation is the first to be carried out in Papua It solves one of the main problems encountered in that area, that of transportation in a country with a rainfall of up to 350 inches a year and where it may take two months to build a mile of road The use of S 58's makes roads to the drilling site unnecessary The rig together with equipment, men and materials, were flown from a " helibase " on a river, some five miles from Komewu

The Komewu site is some 80 miles from the coast of Western Papua and about eight-and-a-half miles beyond the limit of navigation of the Aworra River To build a road across this eight-and-a-half miles of jungle and swamp would have been most difficult and costly and it would have taken many months to complete The landing of the drilling and ancillary equipment by helicopter took only five weeks

During the first 13 days of flying time the two helicopters made a total of 168 flights and carried a total pay load of over 595,000 pounds—an average of over 3,500 pounds per flight The total time taken to make the 168 flights was 51 hours 25 minutes—an average of 16 4 minutes per round trip

With an attachment device on its undercarriage, the S 58 hovers over a load and is directed into position by a man on the ground who attaches the cargo sling at the appropriate moment Then the helicopter rises, the load is lifted, flown to the rig site and deposited by release lever exactly where it is wanted without the machine touching the ground In this way, turning round is rapid and man-handling is reduced to a minimum One helicopter recently flew 33 tons of cargo into Komewu in 10½ hours flying time

AIR LIFT OF OIL DRILLING EQUIPMENT IN PAPUA

Helicopter lowering a crane-jib into position on a caterpillar tractor at Sireru rig-site

The Sikorsky helicopters have proved that they can handle material and equipment faster than they can be handled by the men on the ground Survey operations in Papua were speeded up in 1953 by the introduction of the small Bell helicopter and the Helirigs are already proving most valuable in speeding the pace of drilling exploration

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THE DECCA NAVIGATOR COMPANY LIMITED

It is generally accepted that high frequency radio aids are unsuitable for helicopter navigation The helicopter usually operates either at low altitudes or in built-up areas, or both, so that line-of-sight navigation aids are quite inadequate It is fortunate, therefore, that a low frequency area coverage system already exists The Decca Navigator System meets all the requirements of helicopter navigation and during the last twelve months many interesting developments have taken place within this field

It has become apparent that users prefer to accept a weight penalty in order to obtain greater operational flexibility The standard Mark 8 Receiver and Flight Log allowing full 8 Chain operation has gained much wider use than the lightweight 45 lbs version operating only on one chain

The Royal Air Force decision to equip their air/sea rescue helicopter squadrons with the Decca Navigator has been widely implemented Recently combined trials have commenced with Decca equipped helicopters and air/sea rescue launches with a view to integrating the operation In the past rescue operations have been hampered by the lack of sufficiently accurate navigational information to pin point either survivor or rescuer Under operational conditions when the survivors have been found the

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aircraft has frequently been at the end of its patrol duration and has had to return to base Although this position was located as closely as possible relieving aircraft or vessels subsequently found it extremely difficult to relocate the distressed Using the hyperbolic co-ordinates of the Decca System this problem of air/marine co-operation is easily overcome

The B E A Helicopter Unit at Gatwick has recently been carrying out blind flying trials In America the Bell Helicopter Corporation, in co-operation with the Bendix Aviation Corporation (licencee of the Decca Navigator Company), have also been investigating this problem B E A have reached the conclusion that instrument flight using Decca and a large scale Flight Log display is possible subject to the

An H 34 helicopter of the American Army equipped with the Decca Navigator and Flight Log at present carrying out trials at Schleissheim Army Airfield

helicopter being equipped with a really accurate altimeter Developments on the present Flight Log presentation will be the means of indicating to the pilot the trend of his course during the last few minutes of flight, thus minimising the work of the pilot during the final stage of his approach Trials by the Joint Experimental Helicopter Unit of the British Army during the past 12 months have proved that in the tactical role the Decca Navigator System will do all that has been expected of it The American Army Headquarters in Europe have also commenced a trials programme with an H 34 helicopter The equipment again will be used tactically and results so far have been very encouraging The ability to operate at any altitude in any weather controls the operational efficiency of any such unit and the development of navigational and instrument flight techniques are therefore of the greatest importance

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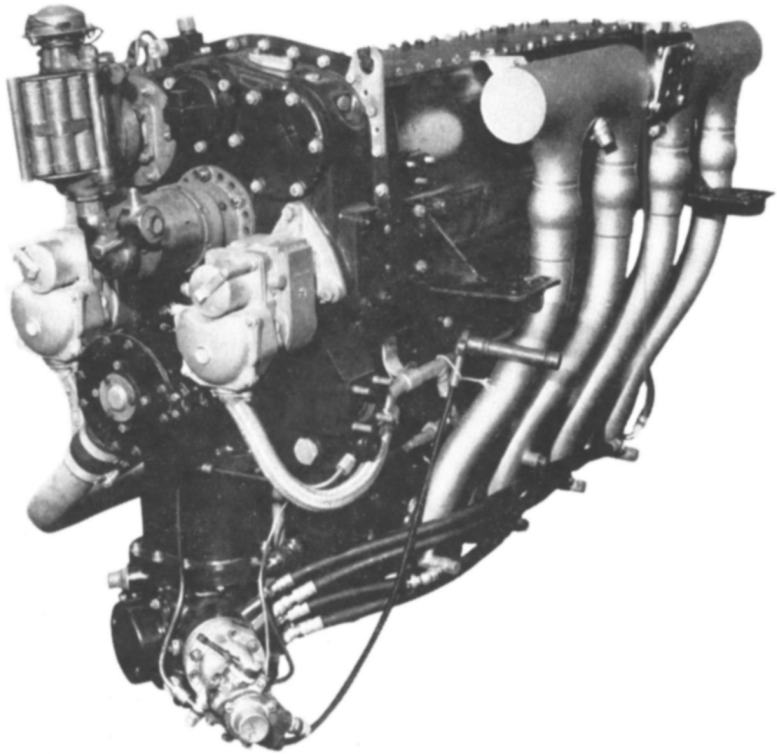
THE DE HAVILLAND ENGINE COMPANY LTD

Development of a new series of Gipsy Major engines for installation in helicopter aircraft has been under way at the de Havilland Engine Company during recent years The first of these 200 series Major engine was the Major 201, capable of delivering 200 b h p at 2,600 r p m at sea level This followed the well-proven four-cylinder air-cooled layout of previous Major engines and obtained its higher power output as a result of the greater capacity provided by the use of Gipsy Queen-size piston and cylinder assemblies A further new feature introduced by the Major 201 was that of inlet port fuel injection in place of the more conventional float-type carburettor of the earlier Gipsy Major engines The resultant near-perfect fuel distribution and the enhanced efficiency of the induction system, together with an increase in the compression ratio of the engine, enabled considerable gains in power and economy to be achieved

As the powerplant for the Saunders-Roe Skeeter Mk 6 two-seat light helicopter, the Major 201 has already completed a comprehensive programme of ground and flight testing In particular, the engine has been developed to meet the rotary wing requirement of being able to operate at its maximum take-off rating for periods of up to one hour's duration

Recently, development running of the second engine in the new 200 series of Gipsy Majors was initiated This was the Major 215 which has a maximum power output of 215 b h p , the higher rating being achieved by operating the engine at a



The compact form of the Gipsy Major 215 is clearly illustrated in this photograph which shows a full-scale model of the new engine As with the Major 200, *it has been designed to give its take-off power for periods up to one hour's duration—an essential feature of engines destined for helicopter operation*

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take-off speed of 2,850 r p m It is this Major which will power the Skeeter Mk 12, on order for the Royal Air Force, the British Army and the Federal German Army and Navy

The engine has been designed so that it is capable of functioning either in a normally aspirated fashion or with an exhaust driven turbo-supercharger In the latter form it is intended that full throttle power will be maintained up to 4,000 feet and ICAN + 30 degrees C Under normal temperate conditions at sea level the engine will develop 222 b h p with the turbo-supercharger in operation Until such time as this item of equipment is ready for installation, water-methanol injection equipment is to be fitted as a temporary measure This will enable temperate sea level power to be maintained up to ICAN + 30 degrees C As with the 201, the Major 215 is being developed to operate for up to an hour's duration at full throttle output

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DUNLOP RUBBER CO, LTD

Probably in no other form of aircraft are windscreen wipers of more importance than they are in helicopters In rescue operations and ground observations such as traffic control, unobstructed air-to-ground view even in adverse weather conditions is essential

One of the wiper systems in which this aspect has received particular attention is the Dunlop 'Maxivue' system The blade actuator is only 3″ × 2′ × 1″ which allows for mounting on the windscreen frame and does not encroach on the pilot's vision The wiper has a self contained hydraulic system powered by a small self-priming electric pump unit which can be located at any convenient point in the control cabin up to 6 ft away from the actuators

Although the presence of hydraulic fluid under pressure is not normally favoured in the cabin, in this system the amount of fluid involved is less than one-tenth of a cubic inch and can be tolerated

Dunlop Tyre Wheel and Brake on a Westland Helicopter

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Another component which was originally designed for high performance military aircraft with ejector seats is extremely suitable for helicopter use , this is a pilot's control handle, consisting of a straight hand grip with a flared rest and service control switches located in the upper end The design of the handle and the disposal of the controls enables the pilot to operate services such as the hoist mechanism without removing his hand from the control column

Recently Dunlop Aviation Division made a propeller brake, on the same disc and caliper principle they introduced for aircraft wheel brakes in 1954, and which has now also been adapted for use on motor cars The original purpose of this brake was to stop propellers rotating as soon as possible after touch-down, so that passengers and freight could be unloaded with the least delay and with complete safety from the danger of windmilling propellers Adoption of the same device on helicopter rotors can be of the same benefit and results in considerable saving of ' turn round ' time

It is perhaps curious that the component which demands the most special consideration in design and manufacture is the helicopter tyre This may not be immediately apparent, as helicopter tyres are not normally required to have a long life measured in rolling miles, and may be thought to be merely shock absorbers during landing, and as a means of manoeuvring the aircraft on the ground

However, lateral stiffness of the tyres may have an important bearing on the susceptibility of a helicopter to ground resonance and careful design of the tyre is essential

Vertical or radial stiffness is largely a function of tyre size and inflation pressure and can be controlled by alterations to these factors Lateral stiffness, however, depends not only on pressure but on the normal load rating of the tyre, and can be influenced by the choice of fabric materials (rayon or nylon), the angle of their weave and the number of plies used in manufacture Tread patterns seem relatively unimportant, although minor changes can be effected by using more tread rubber in construction

Investigations are proceeding into the effects of changes of bias angle in the fabric materials and inflation pressures One promising avenue of research seems to be the use of wider rims on helicopter wheels This would seem to give the required stability, although imposing a slight weight penalty

But whatever may be the result of the present investigations and tests, it is obvious that the modern helicopter tyre must always be regarded as a precision component needing close control throughout the design and manufacturing processes

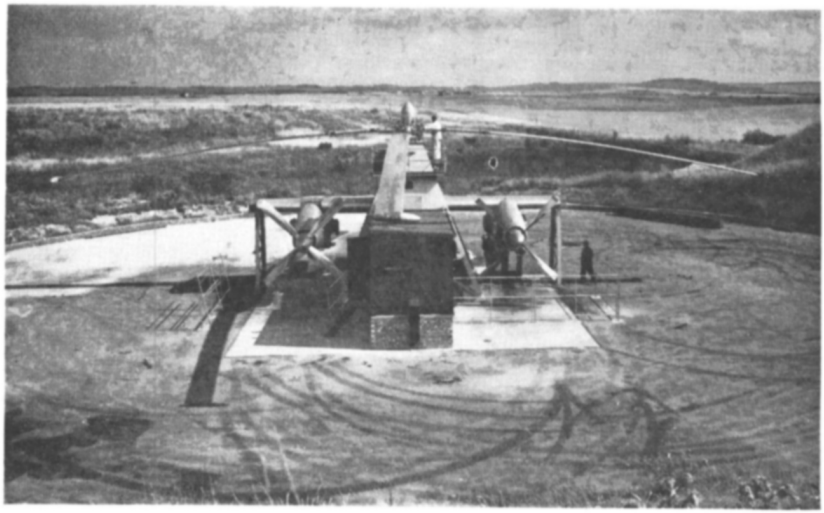
THE FAIREY AVIATION COMPANY LTD

The Rotodyne is about to begin its ground running and flight trials*, this will represent the culmination of many months of intensive effort Building the Rotodyne has been a Fairey venture of great magnitude and the Company enters the flight test phase with high hopes for future success

The project took concrete form some four years ago, and since then design and construction has been going on at an increasing pace Not the least of the difficulties has been the need to lay down certain design cases from first principles of safety rather than from a standard reference , in many ways design of the aircraft breaks new ground More recently activities have expanded to cover tests of all systems, hydraulic, fuel, electrical and so on, while structural tests of airframe and rotor components continue as does the wind tunnel testing All the systems have now been cleared for initial flight, including the engine and propeller together with the associated tip jets

Much of the final testing took place on the rig at Boscombe Down shown in the photograph This reproduces the complete power plant, tip jet and rotor system, together with all associated controls This facility has been of immense value in anticipating full scale behaviour of the aircraft so that many of the inevitable snags and difficulties can be cleared One very useful attribute is that the pilot has become thoroughly familiar with control layout and behaviour before flight Apart from this, a by-product as it were, the rotor system has been proved as a mechanical unit, the tip jet system has been cleared after development, the power control system has been shown acceptable and reliable, the propellers have been strain gauged to check the effect of rotor downwash

* Since this Review was written the Rotodyne piloted by Sq Ldr W R Gellatly, flew for the first time at White Waltham on 16th November 1957 Further successful flight trials are now in progress



The Ultra Light Helicopter G-AOUK has now been joined by a second aircraft G-AOUJ , a third aircraft is almost complete It is the Company's intention to go ahead with tests on these latter two aircraft culminating in obtaining a Certificate of Airworthiness on the type Basically the Ultra Light is suitable for relatively short endurance roles of the order of one to one and a half hours where high performance is an advantage Performance remains good even at elevated temperatures and altitudes A basic design feature is that by using richer fuel/air mixtures at the tips, the same Palouste engine can be used to power a wide development range beyond the present All Up Weight limits The aircraft has been flown in very high wind speeds, and severe turbulence near the ground without presenting any difficulty to the pilot In these high winds, up to some 60 knots in fact, the rotor may be started and stopped without any blade sailing difficulties The aircraft has shown itself well suited to the rugged duties for which it was originally designed

The Gyrodyne continues to fly as a training aircraft, enabling M O S pilots to familiarise themselves with the control of a pressure jet helicopter It also serves for tests of a research nature including stability tests and the correlation of theory and experimental results on such items as flapping angle or cyclic pitch

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LAYCOCK ENGINEERING LIMITED

The interests of Laycock Engineering Limited in the helicopter field are confined to the Layrub Flexible Universal Coupling used at each end of the drive shaft between gear-box and main rotor hub

For several years only the Bristol Company have used it but recently Saunders Roe have adopted it for the " Skeeter "

This form of flexible coupling uses rubber under compression as a vibration damping medium and, having proved over many years in the road vehicle field its ability to absorb torsional vibrations efficiently, it is more and more engaging the attention of designers in all forms of aviation

The rubber trunnions in the Layrub Coupling are suitably mounted in a housing which can be of aluminium or fabricated from light steel pressings These trunnions are of a special form ensuring uniform stressing under all conditions of load, and they will respond to certain movements and deformations whilst still maintaining this essential condition In addition to providing torsional flexibility they perform the function of angular working (as understood for an universal joint) and accommodate axial movement on a drive shaft assembly This dispenses with the necessity of in-

corporating sliding splines or other equivalent devices, which need lubrication, for all such movements take place in the rubber elements themselves

By grouping the rubbers in various orders, couplings can be arranged with characteristics to meet exact requirements covering a very wide range The Layrub system also facilitates " built-in " designs where there would be insufficient room to accommodate a standard form of coupling

Except for a few special cases the rubber is a natural mix which will stand up to temperatures between 70°c and —45°c For temperatures above the high limit synthetic compounds are available but the mechanical properties of these are not so good as with natural rubber

To sum up, this form of coupling can be used to absorb sudden overloads or shocks, to isolate vibration and noise from gears and for detuning torsional vibration at critical speeds in all forms of transmission drives either main or auxiliary

D NAPIER AND SON LIMITED

Napier has an interest in four British helicopter projects—the Westland Wessex naval helicopter, the Bristol 192 military helicopter and the Fairey Rotodyne and Westland Westminster commercial helicopters The Wessex and the Bristol 192 are to have Napier Gazelle free-turbines, and the Rotodyne and the Westminster two different versions of the Napier Eland propeller turbine

Gazelle development has gone forward with singularly few troubles and in its first 50 hours flying has raised bright hopes for its future success It completed its first 1,000-hour endurance test in December, 1956, and its 24-hour official flight approval at its N Ga 11 rating, and its first ground running in a helicopter (Wessex) in March, 1957, and made its first flight (also in a Wessex) in May Five months later it successfully passed a 1,000-hour test to U K /U S schedule at N Ga 13 rating

In August, the Gazelle passed three consecutive unofficial 150-hour Type Tests without removal from the test bed or receiving any maintenance attention beyond that required by routine

At the end of April, two Gazelles were delivered to the Bristol company for ground tests in a gantry rig These were in the form of Engine Change Units—that is, complete with accessories, services and cowlings The first two flight engines were scheduled for delivery early in 1958 Gazelles for the production Wessex will also be delivered as Engine Change Units

Five Eland N El 3s have been delivered for Rotodyne development, three for ground running and two for flight The feature that distinguishes the N El 3 from other versions of the Eland is the auxiliary compressor at the rear end which supplies air under pressure to the combustion chambers at the rotor tips for use during vertical and hovering flight The auxiliary compressor is engaged and disengaged through an oil-cooled hydraulic clutch

Eland modifications for the twin-engined Westminster are of quite a different character In this application the engines lie side-by-side in an engine room above the cabin and drive the rotor shaft through an aircraft reduction gear box In this instance, the standard engine reduction gearing is transferred from the front to the rear end of the engine Power is transmitted to the aircraft reduction gear box via a hydraulic clutch Work on the Westminster Eland is still in the design and mock-up stage

Work has continued on the development of the Napier rocket booster system for helicopters, chiefly in conjunction with Saunders-Roe, Limited

SABENA

The S 55 fleet has been progressively replaced by eight S 58C helicopters carrying 12 passengers, with their luggage, at the cruising speed of 90 kts These new aircraft have improved considerably the helicopter services linking Brussels and Melsbroek Airport to Holland, Germany and France The improvements in speed and comfort as well as the increase in size of the helicopters have led to a considerable increase of traffic

The success of the helicopter as a passenger vehicle was highlighted in June, 1957, when Sabena celebrated its 100,000th helicopter passenger On March 1st, 1957, the Brussels/Paris line was opened to the public at a frequency of 3 and then 5 services a day The flight between the Brussels Heliport and the Paris Heliport, located at Issy-les-Moulineaux, takes 1 50h

The latest acquisition is a Bell helicopter which will be operated by Sabena in the Antarctic for the Belgian Expedition, which will leave Antwerp in November, 1957

The Brussels Heliport located at the " Allee Verte " is now being enlarged and a new building is being constructed in order to adjust the ground facilities to the increased traffic Another international heliport is also being erected on the ground of the World Exhibition which will take place in Brussels in 1958 and where most of the scheduled helicopter services will have a stop

SAUNDERS-ROE LTD

The production and further development of the Skeeter light helicopter has been the major work of the Helicopter Division of Saunders-Roe Ltd in 1957

The Skeeter is now in service with the Army and the Royal Air Force The Army has formed its first helicopter A O P Flight, equipped with the Mk 10 version of the Skeeter, and it has performed successfully both in this country and on exercises with N A T O Forces in Germany

A new version of the Skeeter, the Mk 12, is now in quantity production for the Army and the Defence Forces of Western Germany The chief difference between the Mk 10 and the new Mk 12 is the increase in power now available from the de Havilland Gipsy Major engine At the same time the transmission has been redesigned, and a number of minor modifications have also been incorporated

Napiers, in collaboration with Saunders-Roe, have continued to develop their rocket booster system for light helicopters The unit has proved so satisfactory that is it now to be put into production, and will be fitted to a number of the Skeeters on order for the German Armed Forces

The advantage of the rocket system is that an extra 62 h p is available to the pilot merely by the flick of a switch on the cyclic control column, without any increase in the torque on the transmission

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The illustration shows one of the many applications to which this equipment can be put Here, the ambulance version of the Skeeter is shown flying with four people on board

The fatigue and flight testing of the metal blades being developed by the Company on behalf of the Ministry of Supply has continued throughout the year

In collaboration with Louis Newmark the Company is engaged, again on behalf of the Ministry of Supply, on the design and installation of an autostabiliser suitable for light helicopters

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THE SHELL PETROLEUM COMPANY LIMITED

Since World War II the Shell Group has watched with interest the development of the helicopter because of its potential application in the oil industry In 1950 Shell made the first experiment with three small Bell helicopters in the jungle of Netherlands New Guinea on seismic work Since then the use of this type of aircraft gradually increased and now Shell helicopter operations are world-wide

At present they are exclusively used in oil exploration and production territories These regions are rugged and often inaccessible to surface transport The helicopter has in many cases provided the answer and proved itself as virtually the only acceptable form of transport Twenty-four helicopters are currently being operated for Shell by contractors in Netherlands New Guinea, British Borneo, Pakistan, the Persian Gulf, Nigeria, Venezuela, Colombia and Bolivia Further operations are anticipated during the coming year World Wide Helicopters Ltd , Fison-Airwork Ltd and Bristow Helicopters Ltd are three contractors who have been working side by side with Shell personnel in the oil territories during the last few years

In places like New Guinea, the oil exploration company employs local labour from the surrounding jungle villages It is a staggering thought that some of these people have never ridden on a bicycle or in a motor car, yet they are to be seen flying about the sky in helicopters, quite unperturbed It has become part of their normal method of getting about

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The problem of transporting crews anything up to 45 miles offshore to a drilling rig in the water has been solved in some cases by the use of a helicopter A landing platform around 50 feet square is built out cantilever-wise from the rig or in some cases at the base of the rig where the workshops, the engines and housing accommodation are sited The larger helicopter, such as the Sikorsky or the Westland S 55, is used to carry equipment or six or seven men to the drilling platform On other occasions the small Bell helicopter with a capacity of three is used where supervisory staff might wish to fly to several offshore drilling locations

The helicopter speeds up work in these out of the way places with their unusual conditions of offshore drilling, seismic and geological survey and general transport It has occurred already that a rig out to sea has been cut off from surface communication due to the roughness of the sea, while the helicopter went backwards and forwards unfailingly This means much to the personnel who are on the rig

It has been amply proved, during the few years that the Shell Group has been using the helicopter, that it is a unique piece of equipment for general communication over jungle and swampy areas, for maintaining contact with small dispersed parties and for enabling senior management to carry out quickly and effectively a survey on the spot

The helicopter is a costly piece of equipment to operate but there is no doubt, like other novel forms of transport, it will become cheaper as its general use increases Nevertheless at this moment the Shell Group and other oil organisations are finding it of great value in their constant search for oil

SPERRY GYROSCOPE COMPANY LIMITED

During the last year the Company has continued to supply gyroscopic flight instruments for a variety of British helicopters These instruments have included the H L 4 and H L 5 Gyro Horizons and the D L 2 Directional Gyros and C L 2 " Gyrosyn " Compasses

The new Sperry Helicopter Horizon Gyro Unit, Type C

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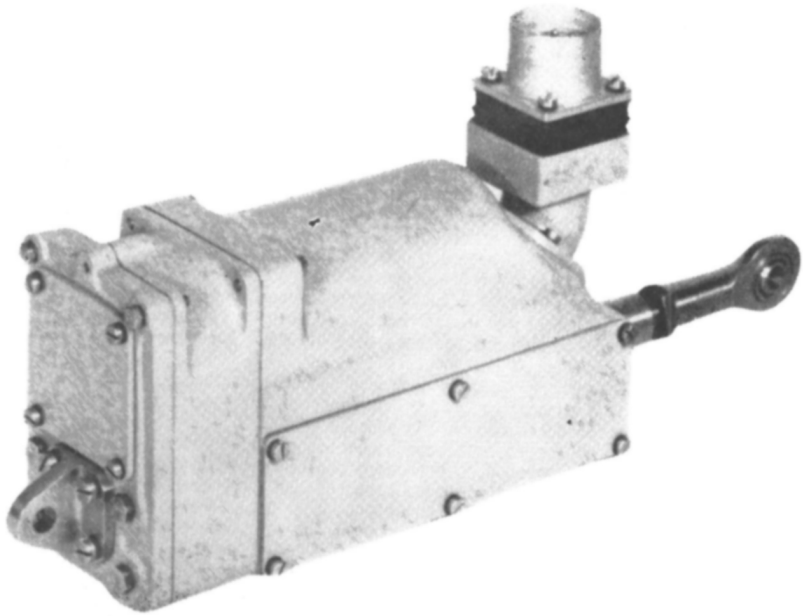
In addition, the year has witnessed a number of new developments Firstly, a new type of electrically operated Gyro Horizon having potentiometer pickoffs to monitor a helicopter auto-stabilization system has been introduced This new instrument, designated Horizon Gyro Unit Type C, embodies new design features which allow it to be mounted on the conventional sloping helicopter instrument panel and it incorporates an adjustable pitch trim datum to cater for pitch attitude changes in varying flight conditions Another development is related to the " Zero Reader " flight director which has been fitted experimentally to both a military and a civil helicopter Flight trials are now in progress to evaluate the equipment as a lightweight stand-by for a helicopter auto-stabilization system There has been an interesting application of Sperry Synchros in the design of a Rotor Speed Indicator suitable for small helicopters and, finally, the Company has begun the supply of Vickers hydraulic pumps and motors built in the U K to operate helicopter air-sea rescue winches This hydraulic equipment, which for many years has had a widespread use in fixed wing aircraft, is now being manufactured by the Sperry Gyroscope Co Ltd under licence from Vickers, Detroit, a Division of the Sperry Rand Corporation

These new developments are among the results of the Company's general policy of continuously matching operational requirements, as they arise, with design progress In pursuance of the same objective, a comprehensive design study on helicopter instrument flight problems has recently been completed by Sperry research engineers Based on information obtained from this study, work is now in hand on the development of new types of instrumentation particularly suitable for the all-weather operation of helicopters in the future

WESTERN MANUFACTURING (READING) LIMITED

Western Manufacturing (Reading) Limited produce a large quantity of actuators and controls for the aircraft industry, and are devoting part of their expanding resources at the Aerodrome, Woodley, to the design, development, and production of specialized types of controls for use in helicopters

These special types of actuators fall into two groups, as follows



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Rotary

(*a*) Clutch controls where the particular need is for the component to be vibration proof, (*b*) Fuel cock and valve controls

Linear

(*a*) Trim controls for "artificial feel", (*b*) Oil cooler flap controls, (*c*) Radiator shutter controls

An important aspect of the actuator manufacture is that the Company make a range of universal actuators which have interchangeable assemblies in which the motor, gearboxes and piston units can be interchanged as desired These have been designed to meet the requirements of S D M (A)215, and are available in rotary and linear types

The principle points in the design of these controls are that they are of high quality, light in weight, of a minimum overall size for the power output ratio, and have a high degree of dependability A special feature is that if required, these actuators can be given a high percentage of fireproofing, thus following the practice in Canadian and American markets

The Company also have extensive facilities for the manufacture of a wide range of other components under sub-contracts These include the production of hoists, gearboxes, wings, flaps, airbrakes, fuselage sections, sheet metal work, undercarriage control gear, hinged wing components, aircraft seats, flare chute release gear, etc

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WESTLAND AIRCRAFT LIMITED

One of the most important contributions to British helicopter development in recent times was the successful first flight in April of this year of the Westland Wessex helicopter powered with the Napier Gazelle free-turbine engine The adoption of this type of power plant for helicopters offers many advantages to operators, not the least of which is economy of operation The great reduction in the noise level of the free-turbine compared with piston driven helicopters is also a factor of the greatest importance The Wessex is on order for the Royal Navy for use on anti-submarine duties, and is the first helicopter in the world to go into production with a free-turbine engine Design studies for the Wessex as a civil inter-city passenger carrier with seating capacity for twelve people have been completed

The application of the gas turbine power plant is being further pursued by Westland in the development of the very large Westminster which will be powered by two Napier Eland engines driving the single main rotor The Westminster has been designed for three principal roles as an inter-continental passenger liner with forty seats, as a military transport for 43 troops, and as an industrial utility vehicle for lifting loads of up to five tons or more Production of the first version of the latter type, which is of simple tubular construction without skin, is nearing completion and is expected to make its first flight early in 1958 It is likely to attract wide interest

Meanwhile, production of the Whirlwind helicopter is continuing apace to meet increasing orders for this extremely versatile general purpose helicopter which is now available with the Alvis Leonides Major engine as an alternative to the Pratt and Whitney This engine is being used to power the Mk VII Whirlwind, which is an anti-submarine development of earlier Marks, the first of which were delivered to the Royal Navy during the year The enhanced performance which the Alvis Leonides Major engine gives to the Whirlwind was evidenced during a series of demonstration flights in the Austrian Alps, when a Whirlwind with seven people on board carried out take offs, hoverings, and landings in far from ideal conditions at an altitude of over 11,600 feet As a result of this performance the Austrian Government has placed an order for six Whirlwinds

The smaller Widgeon helicopter, which flew for the first time at Farnborough two years ago, is proving of interest to Military and civil authorities A large number of the Royal Navy's Dragonflies are to be converted to the Widgeon specification, and they will also be seen in service next year in Brazil, whose Government has ordered them for their Navy Commercially, Widgeons are now operating in the Persian Gulf on behalf of one of the major oil companies, and orders have been forthcoming from other directions

To keep pace with the increasing interest in, and demand for, helicopters, Westland design and production facilities are being constantly extended and the Company is now in a position to offer a range of helicopters capable of meeting almost every known requirement