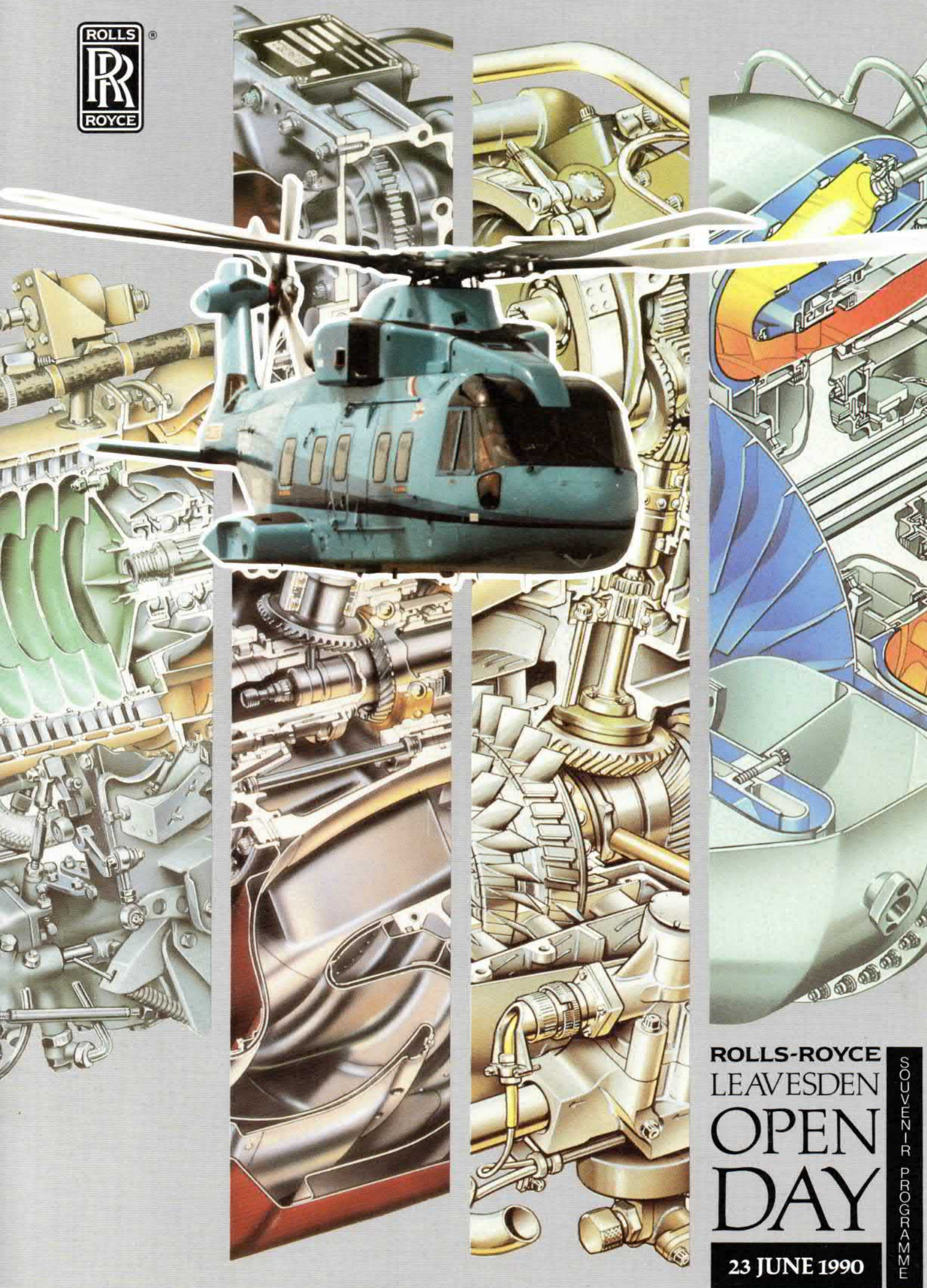


ROLLS-ROYCE

LEAVESDEN OPEN DAY

23 JUNE 1990

SOUVENIR PROGRAMME

INTRODUCTION

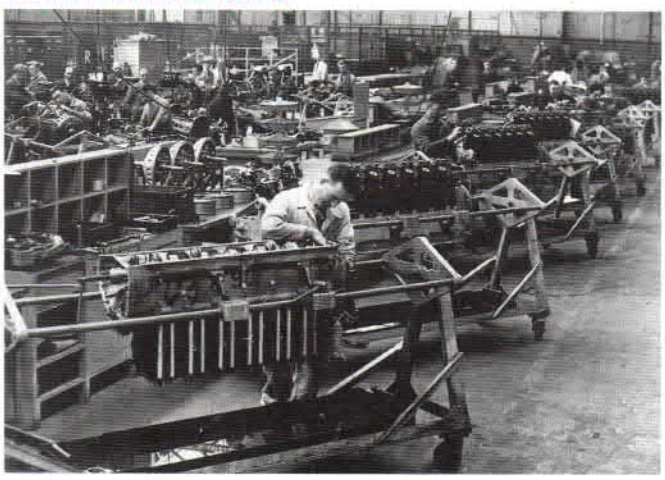
Welcome to our 1990 Open Day here at Leavesden. All of us hope that the programme we have arranged for you today will be both interesting and exciting. The theme today is the history of Leavesden.
The activities and displays that you will see reflect the important contribution made by the site to the Rolls-Royce heritage.
I have witnessed the dedication shown by the team responsible for the planning and execution of today's events and wish to take this opportunity to thank, on your behalf, the individuals and organisations who have worked so hard to make this day a success.
I hope that you and your families have a very enjoyable day.

P F WILKINS
General Manager &
Head of Projects, Leavesden

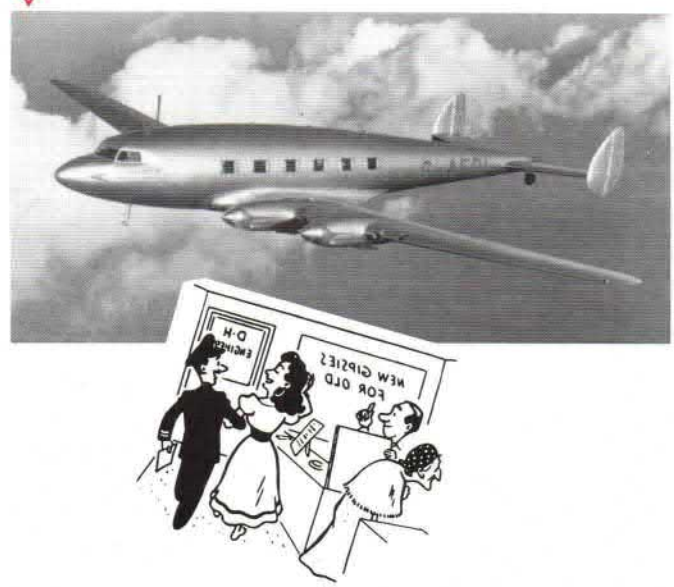
Leavesden aerodrome today showing the 1000 yard runway aligned for the prevailing wind, the two factory areas and the airport facilities.

LEAVESDEN IN THE 40s

The first engine manufacturing activities at Leavesden were those for the famed Gipsy range of piston engines established in the pre-war years at the earlier factories in Edgware.
The Gipsy engines, in four and six cyliner in-line forms and at 80 to 225 hp, in the 1930's powered most of the famous record breaking achievements in the general aviation field. Amy Johnson's 1930 Moth flight and Scott and Black's 1934 Comet flights to Australia were Gipsy powered, as were most of the Kings Cup air race contenders, both pre and post war.



The largest Gipsy engine was the Gipsy 12 or Gipsy King of 525 hp inverted 'Vee' format, geared and supercharged. In 1938 it powered the DH Albatross four engined airliner which in purity of form and with compact power plants showed the shape of things to come with the post war turboprop airliners.

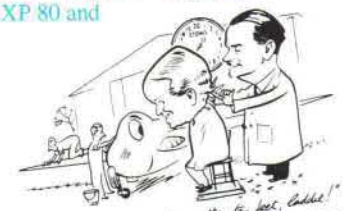


At the commencement of World War 2 the Air Ministry compulsory purchased, on behalf of the Ministry of Aircraft Production from Watford Borough Council, the 117 acres of land previously scheduled for development as the King George Vth playing fields. Two organisations took possession as major employers. London Aircraft Production, administered by London Transport, built and flight tested 710 of the Handley Page Halifax heavy bombers.

From 1939 the runway and hangars were built, founding a major employment area for aerospace products over the succeeding half century.

The 2nd Aircraft Group, administered by de Havilland's, manufactured 1390 Mosquito fighter bombers inclusive of the aircraft still demonstrated today by British Aerospace. As the tide turned post-1940, Reichmarshal Herman Goering made his statement for posterity "I turn green and yellow with envy when I see the Mosquito. The British knock together a beautiful aircraft that every piano factory over there is building . . . There is nothing the British do not have."

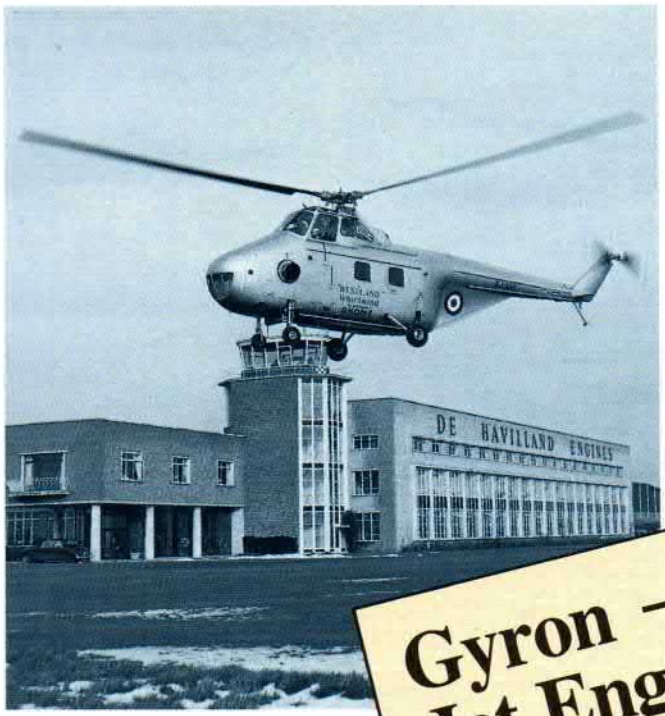
With the birth of the jet propulsion era, the Leavesden-produced Goblin engine was the first to be produced by an established aircraft engine manufacturer and the first to undergo the Air Ministry type test. It powered the prototypes of the British Meteor and Vampire and the American XP 80 and these latter aircraft were the first to exceed 500 mph in their respective countries. The later Ghost engine was the first to be civil type-approved and powered the Comet, the world's first operational jet airliner, and the British Venom and Swedish J29 fighters.



First flown in 1949, the Ghost powered de Havilland Comet became the world's first turbojet powered aircraft to gain a Certificate of Airworthiness in the Public Transport Category.

Two World Records in Three Weeks!

In March 1948 a height record of 59,492 feet was achieved by John Cunningham in a Ghost powered Vampire. On April 1st a Goblin-powered de Havilland 108 flown by John Derry established a new 100 km closed circuit record at 605.2 mph. Also in September 1948 the de Havilland 108 flown by John Derry made Britain's first officially recorded flight to exceed the speed of sound.



In the late 1950's a licence agreement with GE in the USA founded Leavesden's manufacture of helicopter gas turbine engines with the Gnome derivation of the T58 engine fully anglicised and with unique electronic control. Initially a speculation for the future, its production set a new course for the site following the Government's short lived intent to terminate manned military aircraft.

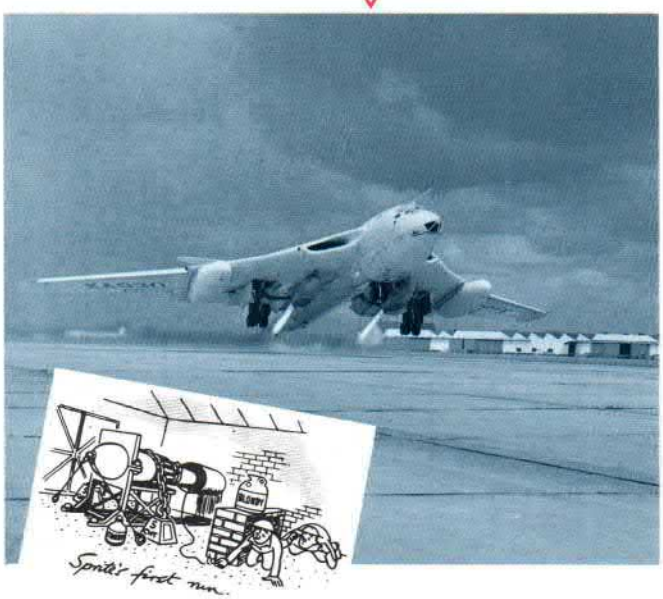
Gyron – Most Powerful Jet Engine in the World!

The Gyron Junior turbojet first ran during August 1955 and went on to power the early Royal Navy Blackburn Buccaneer aircraft and the experimental supersonic development Bristol T188 aircraft.
The 25,000 lb thrust Gyron Senior was an earlier engine, flown on development and intended for the new generation of military aircraft, the supersonic Hawker Fighter and Avro Bomber, both cancelled in the Defence Review.

During the 1950's aircraft needed more power to cope with extra payloads, consequently the 5000 lb thrust Super Sprite and 8000 lb thrust Spectre rockets were designed as aircraft take-off assistance units.
The Spectre rocket as first applied, was for continuous operation at fully variable thrust. It flew in the SR53 research aircraft but its production application in the SR177 mixed-power interceptor was another of the cancellations of the decade.

DH ENGINES

The Spectre and Super Sprite rockets were mounted in pods underneath aircraft, in this case a Victor. After take-off they were jettisoned and parachuted to the ground, to be recovered and re-used.



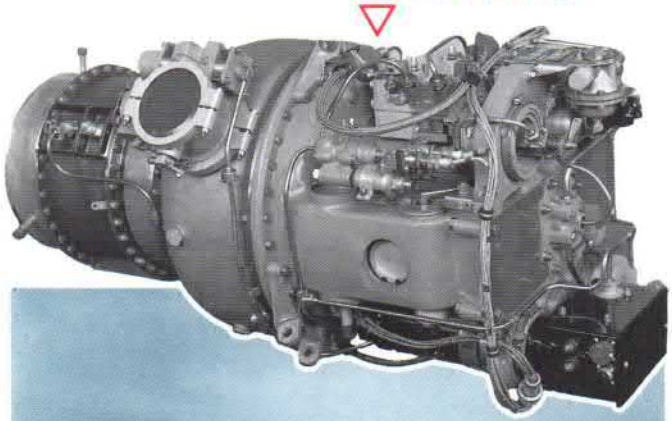
Anglo-French Collaboration

From 1961 the existing range of Blackburn gas turbine engines, derived from the French manufacturer Turboméca, was absorbed and further developed by the Leavesden factory. In 1967 a Memorandum of Understanding was signed between the French and British Governments for joint production of three helicopter engines, Gem, Turmo and Astazou.

The Queen's Flight, based at RAF Benson in Oxfordshire, has had a long association with Leavesden. The Gnome engine has figured prominently with the Whirlwind Mk 12 entering service in 1964 and its replacement, the Wessex Mk 4, in 1969.
The Gnome H1200 was introduced in 1963 and powered versions of the Boeing Vertol 107 twin rotor helicopter, entering service a year later in uprated versions of the Agusta Bell 204B. A direct derivative of the H1200 is the H1400 introduced in a twin-installation for the Westland Sea King, also powering the Westland Commando and the SR-N6 hovercraft.

The Palouste gas turbine engine, built under licence from Turboméca, provided low-pressure compressed air for main engine starting. Major users of these engines were the Royal Air Force and Royal Navy.

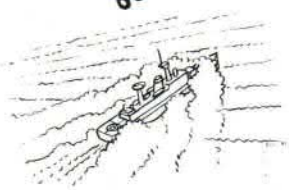
The Nimbus 1050 shp (783 kW) turboshaft engine was built under licence from Turboméca. A torque-limited version powers the Westland Wasp and Scout helicopters. Four of these engines were also used in the SR-N2 hovercraft.



Gem Enters Service

The Gem was initially designed in response to a British Ministry of Defence requirement for an engine to power the new Westland Lynx helicopter, and potential growth derivatives. The Gem 2 entered service with the first Sea Lynx, for the Royal Navy and Royal Netherlands Navy, in 1976, and the first Multi Role Lynx for the British Army in 1977. The first series rated at 900 shp (671 kW) had four LP axial and one HP centrifugal compressor stages, a reverse flow annular combustion system and two gas generator and two power turbine stages.

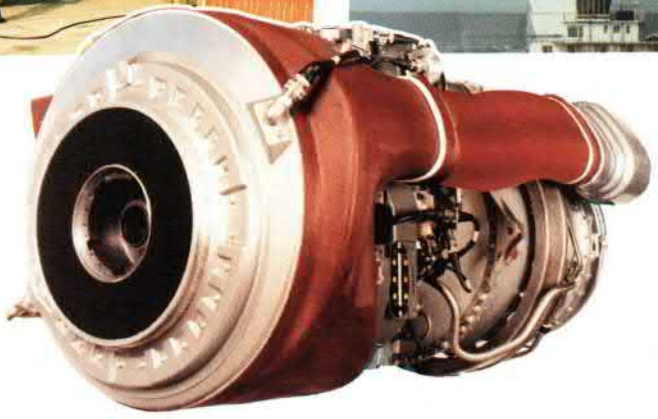
In the early 70's the Turmo III C4, a collaboration between Rolls-Royce and Turboméca, was introduced in the Westland/Aerospatiale Puma.



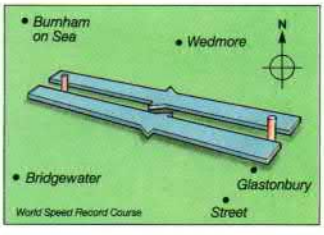
The Astazou III N, another collaboration between Rolls-Royce and Turboméca, was introduced in 1972 initially in the Gazelle helicopter, with the XVID version powering the Jetstream turboprop aircraft.

A Sikorsky S-70C leased by Rolls-Royce and Turboméca was delivered in February 1986 to be used as a mobile test bed for the 2100 shp (1566 kW) RTM 322. After the engines were installed the aircraft was 'rolled out' on 29 April 1986 and the first ground run took place, at Rolls-Royce Bristol, on 8 May 1986, only three months after delivery.

On the 14 June 1986 the RTM 322 powered S-70C (G-RRTM) successfully made its maiden flight at R-R Bristol. Since then the aircraft powered by RTM 322 engines, has flown over 290 hours. In April 1987 the RTM 322 was also flight tested by the US Navy in a Sikorsky SH-60B Sea Hawk at Patuxent River Naval Base, Maryland, U.S.A.



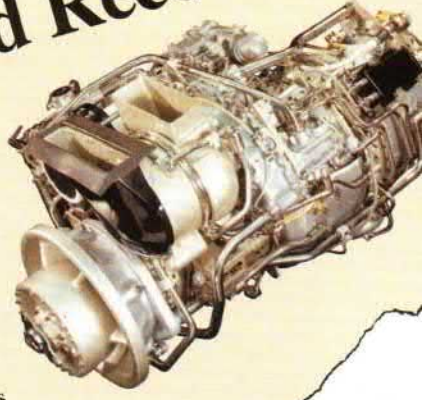
On the 11 August 1986 a modified Lynx helicopter fitted with Rolls-Royce Gem 60 turboshaft engines and special Westland BERP rotor blades broke the world helicopter speed record by travelling at 249.1 mph/400.87 kph.



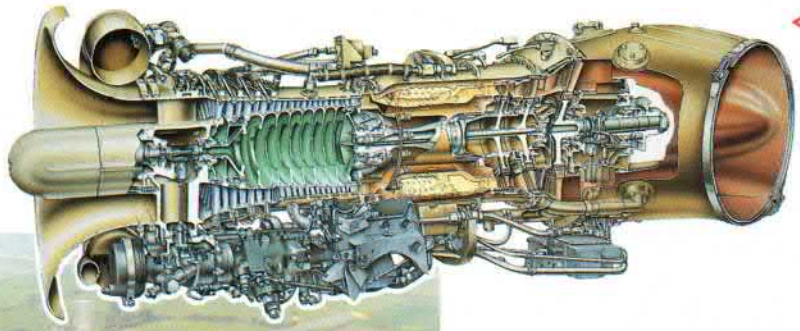
World Speed Record Lynx

In 1987 Rolls-Royce Ltd became a Public Limited Company with a flotation of shares on the stock exchange.

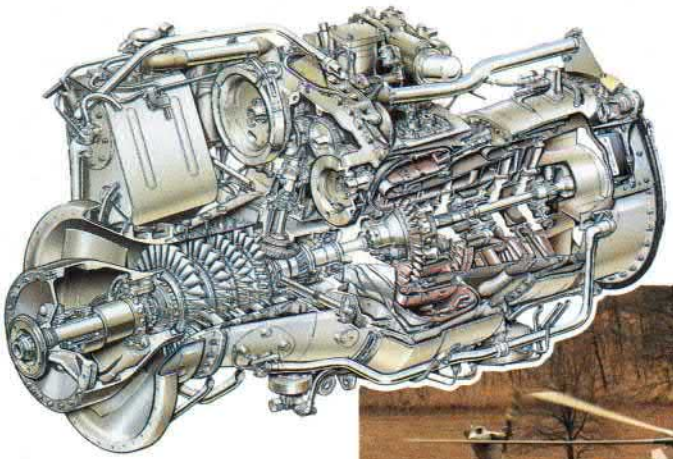
249.1 mph – New World Speed Record!



The Gem 60 engines fitted to the World Record Breaking Lynx were fitted with straightened tailpipes and water/methanol injection. Apart from this and a necessary re-rating no modifications were made. For the record attempt the 2.5 minute contingency rating was extended to 5 minutes to cover the 15 km/9.3 mile course. The engines were returned to normal service without further work.



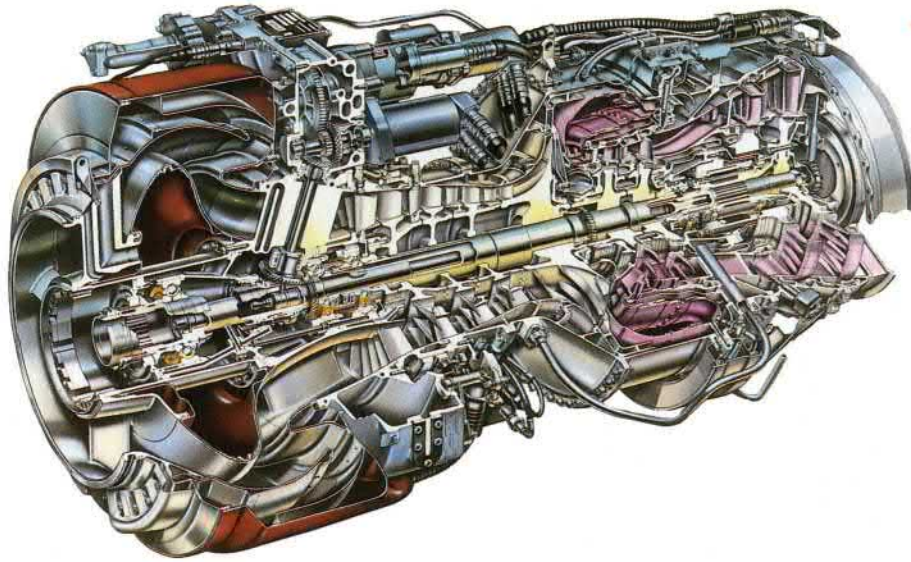
The 1500 shp (1119 kW) Gnome H1400 has also developed to the 1660 shp (1240 kW) H1400-1, currently the most powerful Gnome variant, powering latest versions of the Westland Sea King and Commando and has re-equipped some Boeing/Kawasaki Vertol 107 helicopters. Gnomes have completed over 5.5 million running hours in five different helicopter types and three hovercraft variants in both both military and civil operations.



The RR1004 (left) with a take-off rating of 880 shp (656 kW) is in production for the Agusta A129 Mangusta anti-tank helicopter (below) as used by the Italian Army. The 1120 shp (835 kW) Gem 42, in service in the uprated version of the Lynx, incorporates specific design features to enhance reliability and improve performance retention. The Gem 60 series 1280 shp (995 kW) uses an advanced digital fuel control system and a simplified torquemeter system. This engine is in service in the Westland 30, and has been certified by the CAA in the UK and the FAA in the USA.

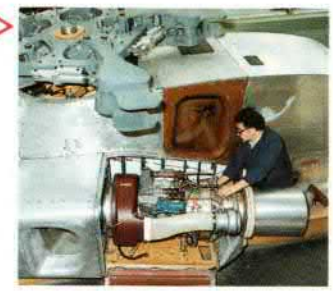
The Astazou IIIN, 592 shp (441 kW) built jointly with Turboméca, powers the Aerospatiale/Westland Gazelle used by the British and the French armed forces.

The Turmo III C4 1384 shp (1032 kW), built jointly with Turboméca, powers the Aerospatiale/Westland Puma used by the British and the French armed forces.



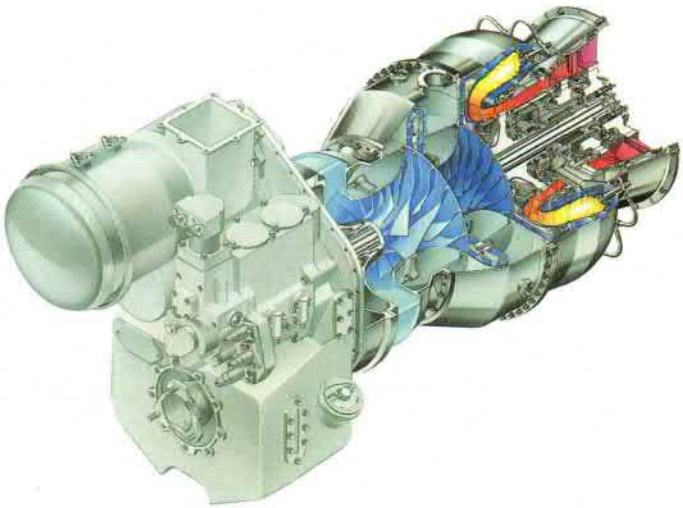
Rolls-Royce and Turboméca have combined their wide experience of helicopter gas turbines to produce the RTM 322 engine family. The launch engine is a 2100 shp (1566 kW) turboshaft, with growth potential to 3000 shp (2237 kW). Later, turboprop and turbofan derivatives will share the common core. This new European product is supported by the British and French Governments and the German and Italian engine industries. In addition, a licence agreement for North American Government sales has been concluded with United Technologies Corporation.

The RTM 322 has been selected by the Ministry of Defence to power the Westland/Agusta EH 101 helicopter for service with the Royal Navy and Royal Air Force. The three-engine EH 101 is due to enter service in 1995/96 and in conjunction with the RTM 322 will provide an advanced helicopter fleet for operation well into the 21st century.



The RTM 322 is designed to produce a range of engines for helicopters, commuter, trainer and corporate aircraft. The engine core is derived from a demonstrator programme which began in 1980 and combines low acquisition and operation cost in a new high performance design. The engine, which is suitable for single and multi-engined installations, will be for a range of new and existing helicopter projects including the Black Hawk, EH 101, WS-70, AH-64 Apache and NH 90. Combining reliability, low fuel consumption and low cost of ownership, the RTM 322 is a highly competitive and cost-effective power plant for current and new applications.

The MTR390 is the result of combined studies by Rolls-Royce, Turboméca of France and MTU of Germany to evolve a competitive power plant in the 1200 to 1900 shp (950-1420 kW) class for future combat helicopters. Rolls-Royce will participate by designing and producing the power turbine section of the engine.
The engine has been selected for the Eurocopter Tiger, HAP and Tigre, and is being developed for the JEH A129 LAH, Agusta A129, Westland Lynx and Super Lynx.

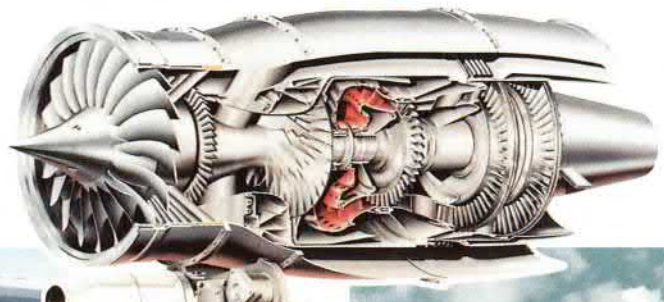


Performance

Ratings	Outer shaft power		Specific fuel consumption	
	kW	shp	g/kW h	lb/shp/h
Normal operation				
Take-off (5 min)	958	1285	274	0.451
Maximum continuous	873	1171	277	0.458
One engine inoperative				
Super emergency (20s)	1160	1556	—	—
Super emergency (30s)	1138	1526	—	—
Contingency (2.5 min)	1027	1378	—	—
Intermediate (30 min)	958	1285	274	0.451

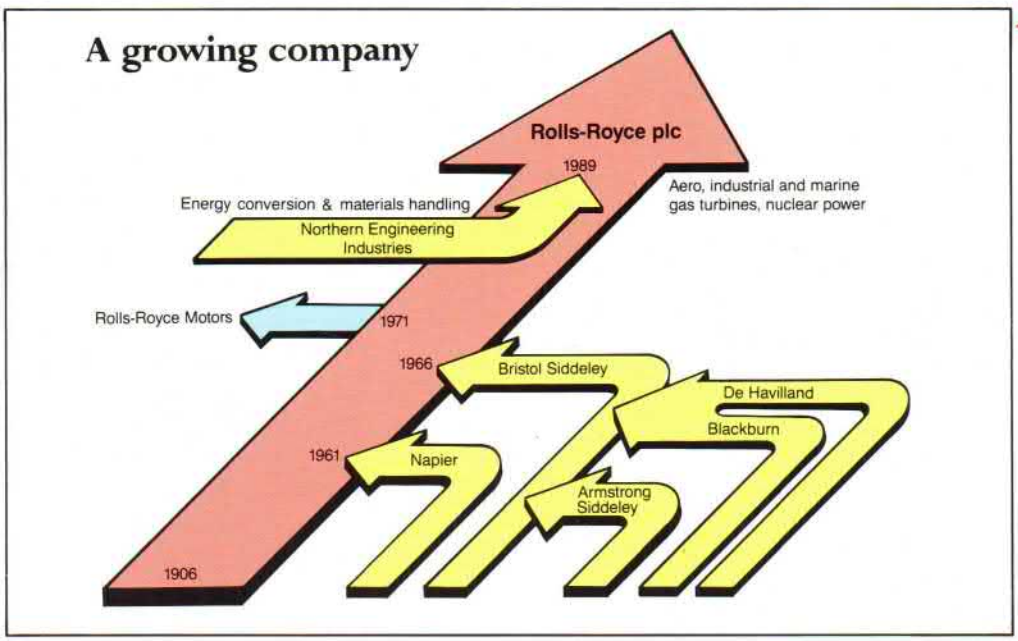
The FJ44 is a simple two-shaft engine in the 1800 lb thrust class being developed, as a collaborative venture between Williams International and Rolls-Royce, to power small, fuel-efficient business jets and military trainer aircraft.

Williams International has designed the FJ44 to optimise performance, reliability and maintainability while minimising production unit cost.
Leavesden's experience in small engine technology programmes will complement the low unit cost design.



The FJ44 has been selected to power the Cessna CitationJet, Swearigen Jaffe SJ-30 and the Scaled Composites Triumph.

Leavesden Airport is a publicly licensed aerodrome operated by Rolls-Royce plc and open to executive, commercial and private users of light and medium aircraft. The airport also has aircraft maintenance and paint-spray facilities. The aerodrome is fully equipped, services available are: Combined aerodrome and approach control, approach radar, direction finder, high intensity airfield lighting, precision approach-path indicators and aerodrome location light beacon. Runways: 24/06 Asphalt 957m by 46m, 11/29 Grass 970m by 31m.

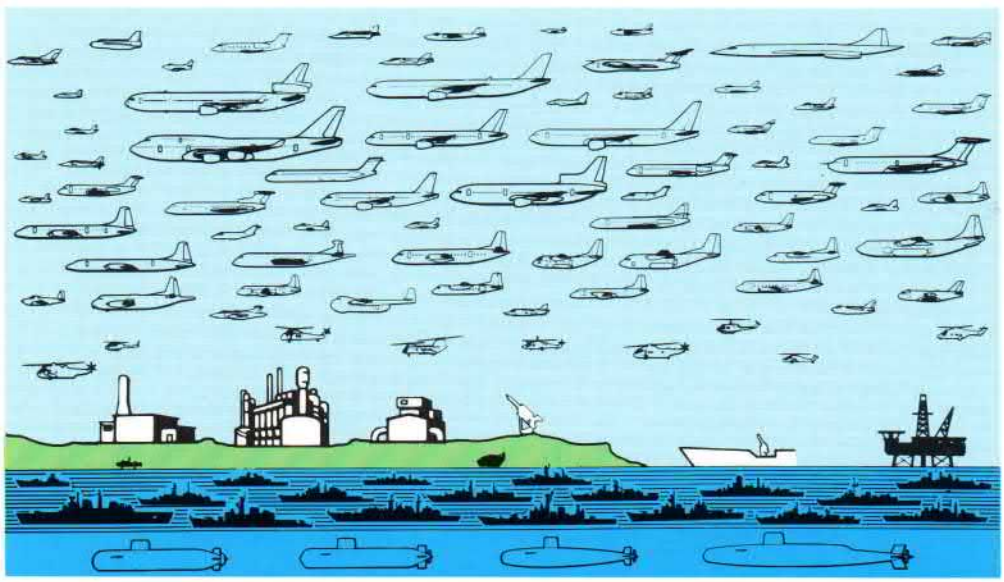


Charles Rolls and Henry Royce began a tradition of quality and reliability when they laid the foundations of Rolls-Royce in 1906. In doing so, they created a company with a reputation for quality which is recognised the world over.

Since those early days there have been many alterations in the structure and products of the Company, through the changes and mergers that have affected the aerospace industry. Throughout this period, the search for excellence has continued and Rolls-Royce faces the market today with a clearly defined, competitive range of products.

Today Rolls-Royce aero-engines are in operation with more than 110 armed forces, 310 airlines and 700 executive and corporate operators around the world. Over 185 industrial customers use its aero-engine derivatives for power generation and gas and oil pumping, while the warships of 25 navies are also powered by Rolls-Royce gas turbines.

In all, over 1300 customers operate more than 26,000 Rolls-Royce gas turbines.



Designed and produced by Technical Publications Studio, Rolls-Royce, Leavesden.

THE WORLD'S FIRST NAME IN AERO ENGINES

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