

MEDIA TECHNICAL BRIEF

4th July 2014.

Queen Elizabeth Class aircraft carriers

Key facts on Rolls-Royce involvement

Background:

Rolls-Royce is supplying a range of propulsion equipment for use in the two Queen Elizabeth class aircraft carriers for the Royal Navy, including MT30 gas turbines, propellers and stabilising fins to keep the vessel steady in rough seas. Rolls-Royce has a £114m contract with the Aircraft Carrier Alliance to supply a range of specialist equipment to both vessels.

A summary of the equipment being supplied (per ship) is as follows:

- 2 x MT30 gas turbines (assembled / tested in Bristol)
- 2 x Adjustable Bolted Propellers (manufactured in Sweden)
- The entire Low voltage electrical system (essential supplies throughout the ships) (produced in Portsmouth)
- 2 x pairs of Stabilising fins (manufactured in Dunfermline)
- Shaftlines (that link the propeller with the gas turbine / motor - manufactured in Sweden)
- Thrust bearings (that support the huge shaftlines inside the hull - manufactured in Newcastle)
- Steering gear (rudders and associated hydraulic control gear - manufactured in Norway + Scotland)

Rolls-Royce is part of a 'sub-alliance' team comprising Thales, GE and L-3 which has overall responsibility for delivery of the entire power and propulsion system.

Equipment key facts:

Propellers – 2 per ship

The propeller, measuring almost seven metres in diameter and weighing 33 tonnes, has completed acceptance tests at the Rolls-Royce facility in Kristinehamn, Sweden.

The Kamewa Adjustable Bolted Propeller is manufactured from nickel aluminium bronze and features five blades mounted on a central hub – there will be two on each of the aircraft carriers.

Rolls-Royce is also supplying shaft lines which will link each of the vessels' two propellers with the power source. Each propeller will deliver around 50,000 horse-power – the highest power Kamewa propeller ever developed by Rolls-Royce.

The twin propellers deliver around 80 megawatts of power – enough to run 1,000 family cars or 50 high speed trains.

MT30 gas turbine – 2 per ship

Each of the two 65,000 tonne vessels will feature a pair of Rolls-Royce MT30 gas turbines. Before installation the MT30s go through a programme of stringent tests and certification at the Rolls-Royce Marine test facility, in Bristol, where they are operated across a range of load conditions up to the maximum power output of 36MW.

The MT30 is derived from the Rolls-Royce Trent aero engine family (it shares many common parts with the Trent 800 which powers the Boeing 777 aircraft). It is the most powerful in-service gas turbine in the marine market today and on the carriers will form part of an integrated electric propulsion system which includes the giant propellers and propeller shafts as well as rudders, thrust bearings and low-voltage electrical systems.

The gas turbines will, through an innovative electrical system, provide the power needed to turn the propellers and drive these huge vessels through the water at speeds of up to 25 knots.

The combination of Gas Turbine and Diesel driven generators will produce enough power to run a town the size of Swindon.

The MT30 has also been selected to power the Royal Navy's new Type 26 frigates, and major naval programmes for the US and Republic of Korea navies.



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Stabilising fins – 4 per ship

The stabilising fins are retractable and can be extended from their housing in the ship's hull to stabilise the vessel when sailing through rough seas. Once deployed, stabilisers pivot to counteract the roll of the sea and lift the vessel in a concept similar to that of an aircraft's wing. Stabilisers perform an essential role in steadying a ship during various operations such as the use of weaponry, refuelling or during the take-off and landing of aircraft.

Thrust blocks & bearings

The thrust blocks and bearings, which will carry the rotating shafts that drive the ships' propellers, were designed and produced at the Rolls-Royce facility in Newcastle.

The thrust blocks, each weighing more than 20 tonnes, transmit the power from the ships' engines into the large steel shafts that run through the hull of the ship and turn each of the two 33 tonne propellers. The forward motion created by the rotating propellers is transferred through the thrust blocks, which are secured to the hull, to move the 65,000 tonne ships through the water.

The propeller shafts run approximately one third of the length of the 290 metre ships, and Rolls-Royce has also completed the line shaft bearings, which support the weight of the spinning shaft along the hull of the ship. The bearings are designed to incorporate a film of oil, around the thickness of a human hair, between the bearing surface and the shaft ensuring there is no contact between metal surfaces, reducing friction and allowing quiet operation, an essential feature for naval vessels.

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