

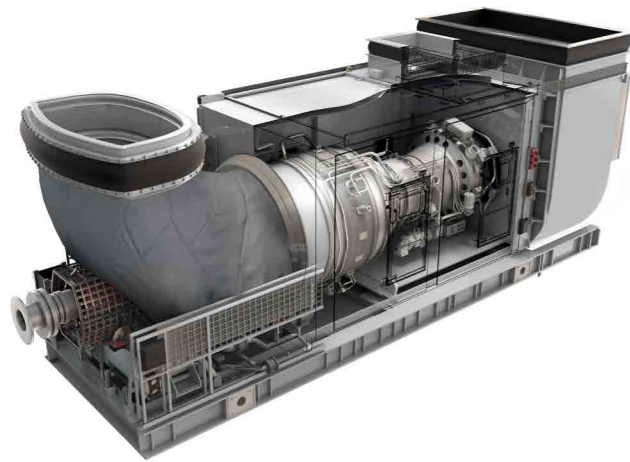


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MT30

Powering the world's future fleets



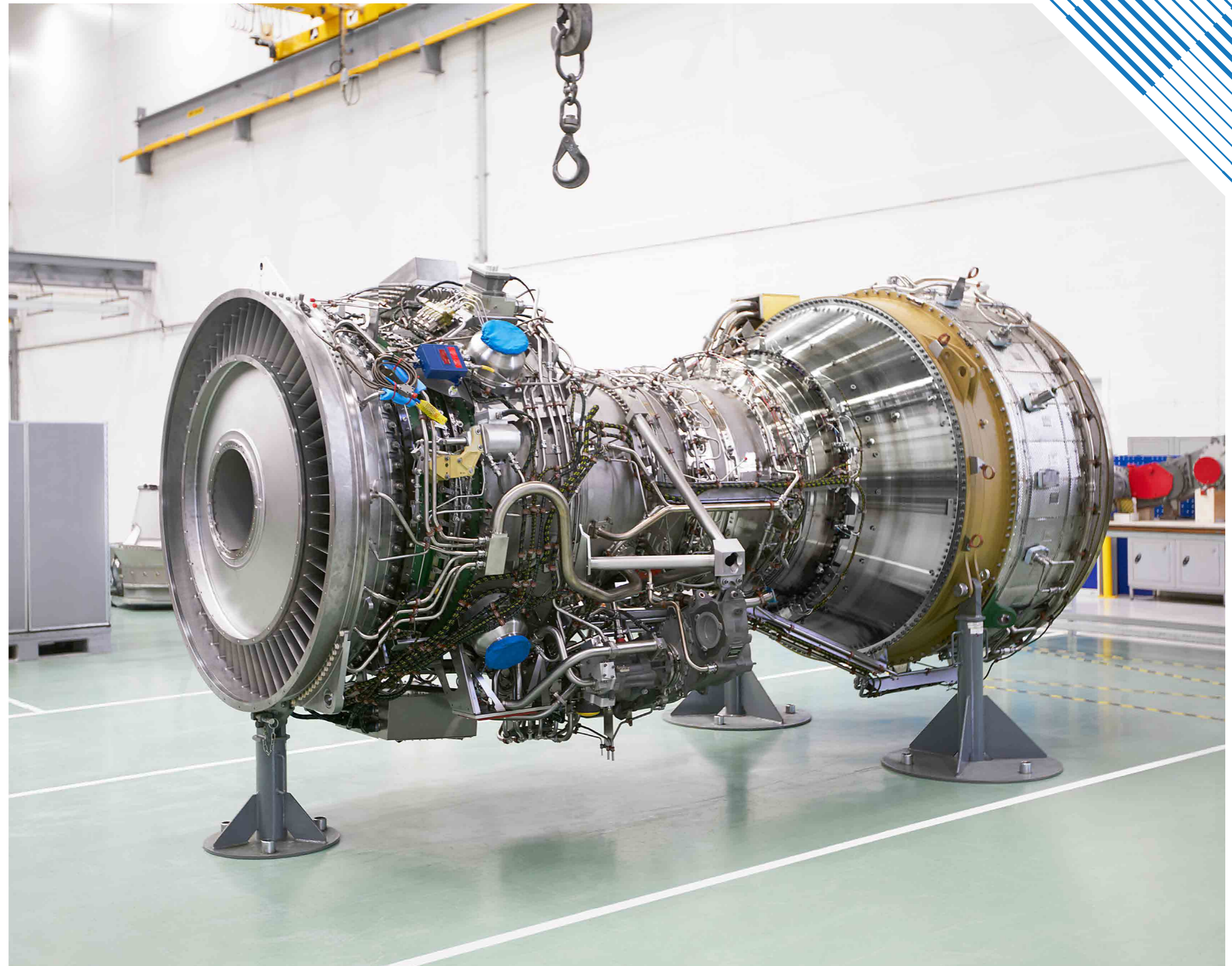


2008 marked the entry into service for the MT30 powering the US Navy's first Littoral Combat Ship, USS Freedom. The propulsion system features twin MT30 engines and two diesel engines driving waterjets in a sophisticated combined diesel and gas turbine (CODAG) mechanical arrangement. MT30 has demonstrated excellent performance in service, powering the ship to speeds in excess of 40kts.

MT30 alternator packages provide the power for the US Navy's all-electric Zumwalt class destroyers and the Royal Navy's new aircraft carriers. The Italian Navy's future flagship, the Landing Helicopter Dock, will be powered by two MT30s.

Drawing on the high-power density attributes, single MT30-based hybrid propulsion systems have been chosen for the Republic of Korea Navy's new Daegu class frigates, the Royal Navy's innovative Type 26 City Class and the Royal Australian Navy's new Hunter class following the preferred selection of BAE System's Global Combat Ship Australia design. Japanese Maritime Self Defence Force's new 30FFM frigates will also be powered by MT30 in a single gas turbine CODAG configuration.

Now selected for over seven ship types, MT30 has become the gas turbine of choice for many of the World's advanced naval programmes.



The MT30 entered service in 2008 powering the US Navy's monohull Littoral Combat Ship, giving it a top speed in excess of 40 knots.

Modern, state-of-the-art gas turbine technology for the marine market delivering...

- 36MW or 40MW flat rated to 38°C.
- Excellent performance retention with no power loss between overhauls.
- Member of the aero Trent family providing excellent reliability and optimised spares availability.
- Self-contained, single lift package.
- 40% thermal efficiency.
- Modular design for simplified engine maintenance.



Designed to meet stringent reliability and maintainability goals

Excellent performance retention

Maximum power and efficient fuel consumption throughout life:

- Turbine operates at 70°C below design limits
- Short and robust structure maintains gas path tolerances

Operational flexibility

There are no operational limitations on re-starting of the engine. After normal or emergency shutdowns, the engine can be restarted at any time. The free power turbine allows a wide range of matching of output speed to spool speed. This allows the MT30 to operate a range of cube law power curves and output through a wide range of drive configurations. This also gives excellent speed control characteristics and frequency recovery for sudden load changes in generator applications.

Type approvals

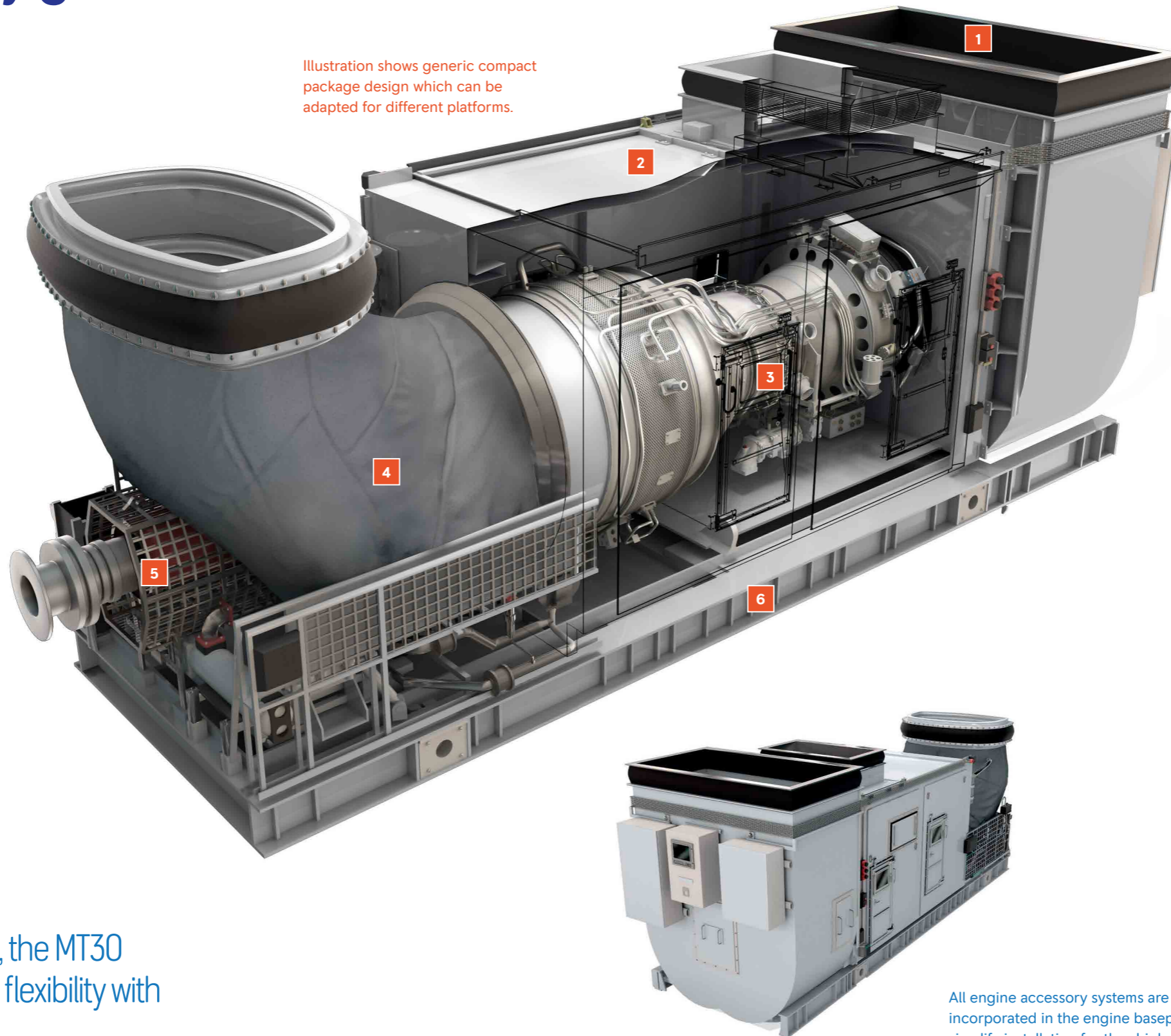
- ABS – Type approved at 36MW and 40MW
- Lloyds Register – Type approved at 36MW and 40MW for ship and naval ships

The MT30 features

- High-pressure ratio gas generator with free power turbine
- Low vibration unit, resiliently mounted
- Fully Integrated Digital Control and Monitoring system
- Electric or hydraulic start

Designed for 21st century vessels, the MT30 provides maximum maintenance flexibility with minimum shipboard resources

Illustration shows generic compact package design which can be adapted for different platforms.



Key components

1 Air inlet

- Compact low-loss radial design

2 Engine acoustic enclosure

- Permits air inlet of gas turbine change unit
- Integral fire protection system
- Optimised for system accessibility and maintainability
- Maximum external noise is designed to be 85db(A) at 1m

3 Gas turbine

- Derived from the Rolls-Royce Trent engine family developed for today's widebody jets
- Modular construction
- Annular combustor for optimised life
- Robust, four-stage power turbine derived from Trent 800

4 Exhaust collector

- Low-loss design for optimum performance

5 Output shaft

- 3,600 rpm – alternator drive
- 3,300 rpm – mechanical drive

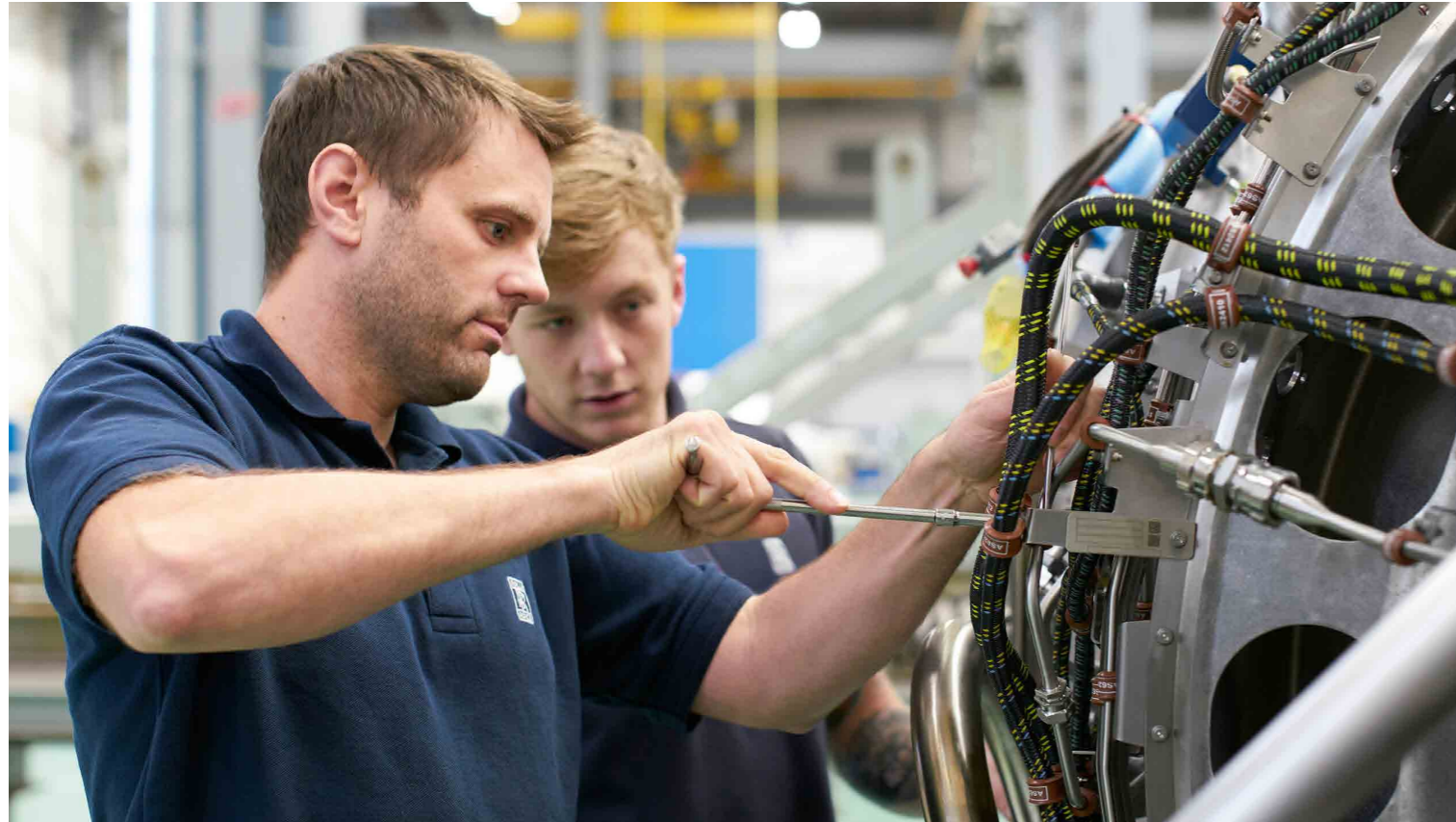
6 Baseplate

- Steel construction, supporting all accessory systems
- Single assembly permits installation of the gas turbine and enclosure in the ship with a single lift.

Integrated Control System

- Provides integrated control and monitoring of the gas turbine and accessory support systems.

All engine accessory systems are incorporated in the engine baseplate to simplify installation for the shipbuilder.



Advanced design proven technology

The compact and lightweight MT30 is a twin-spool, high-pressure ratio gas generator with a free power turbine, an eight stage variable geometry intermediate pressure compressor and a six-stage corrosion protected high pressure compressor. Three stages of variable vanes and blow off valves are provided for compressor handling purposes and a continuous flow of IP delivery air is taken for bearing sealing and cooling purposes.

The four-stage free power turbine is derived from the Industrial Trent and Trent 800 and is supported on a robust bearing structure for optimum reliability. Proven components, incorporating the latest blade cooling technologies are employed throughout. Key components are protectively coated for service in the marine environment to reduce maintenance and deliver long service life. Using commercially available fuels MT30 meets all current and anticipated legislation on emissions and smoke without modification.



With the gas turbine change unit (including power turbine) weighing 6,500kg and the total module weight including enclosure and ancillary components in the order of 30,000 kg (dependent upon options) the MT30 offers a highly competitive power-to-weight ratio. To simplify installation the entire module can be installed on the base plate for a single lift, saving time and money.

Reliability Centred Maintenance studies were a feature of the engine design which together with an inherently low maintenance design has resulted in a condition based maintenance philosophy with scheduled on-board maintenance limited to less than two hours per week – a significant advantage in meeting modern navies' lean crew requirements. The acoustic engine enclosure design optimises on-board maintenance procedures, providing space and access for ships staff to complete more complex maintenance tasks without removing the engine.

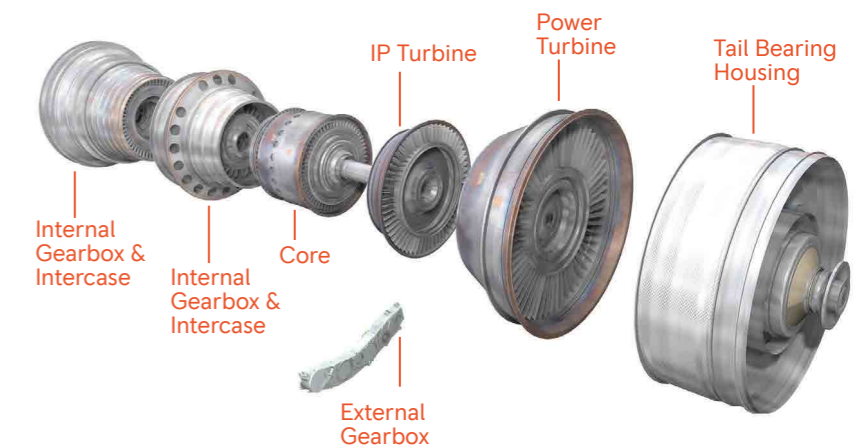
In the event that engine removal is required it can be achieved by removal through either the air intake or via the side of the enclosure, depending upon customer requirements. Both methods employ a removable rail system to safely guide the engine which can be installed inside the package when required. The engine removal system is designed to achieve complete engine exchange in less than 48 hours, however in practice the exchange has been carried out successfully in less than 36 hours.

The engine successfully completed its 1,500 hours ABS endurance test in 2005 taking less than 6 months. This was achieved at 38°C or above for the entire duration of the test. This is the first gas turbine to have successfully completed this arduous test programme in these actual conditions, reinforcing confidence that the MT30 will deliver world-leading times between overhaul.



MT30 can be removed either via the enclosure side or air inlet using a removable rail system. Optimised package and tooling design allows for complete engine removal and replacement within 36 hours.

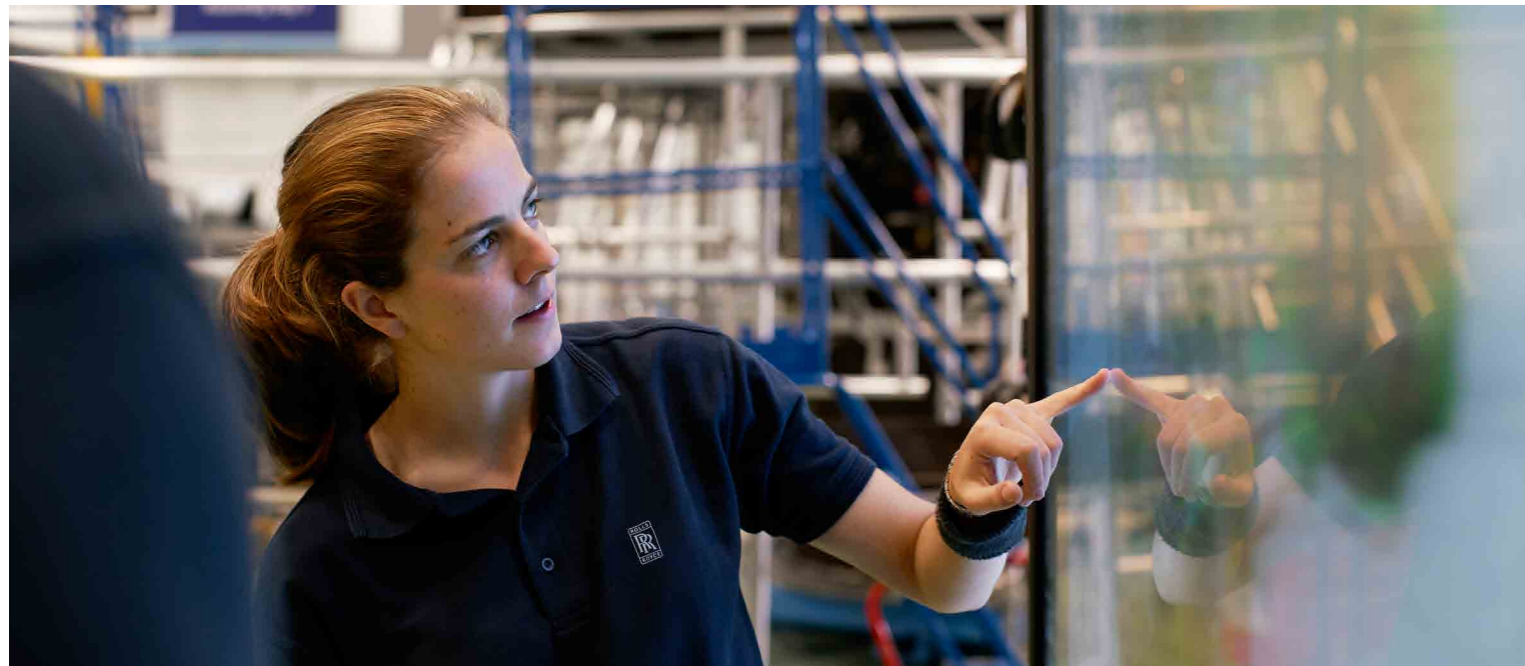
System modularity for increased availability and low cost of ownership



The MT30's modular design enables selected modules to be either overhauled or 'parked' to avoid unnecessary costs. Modularity also provides options to exchange modules between engines to reduce turnaround times.

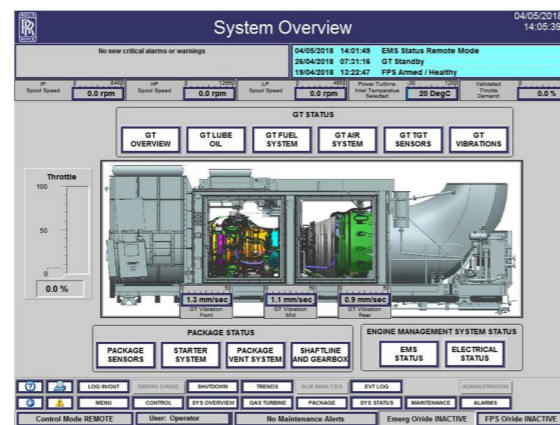
Lowest maintenance costs – less than two manhours scheduled maintenance per week

Fully Integrated Control System



The MT30 control system provides fully integrated alarm, monitoring and control functions for the packaged gas turbine, including overspeed protection. An integral back-up power supply is an option. A distributed processing architecture uses modern databus technology to provide improved reliability through simplified wiring and a reduced number of connectors, with main processors and power supplies located on the outside of the package enclosure. The system supports unmanned operation by making engine control and monitoring available over dual redundant databus and hard-wired signals for full integration into the platform control system. It can also be set to log predetermined engine/package data for optional off-board engine health monitoring and logistical support. A local control panel is provided to display all necessary engine and package parameters and enabling control of engine functions, maintenance and calibration activities.

The local control panel displays all engine parameters, enables local control and supports calibration and maintenance activities



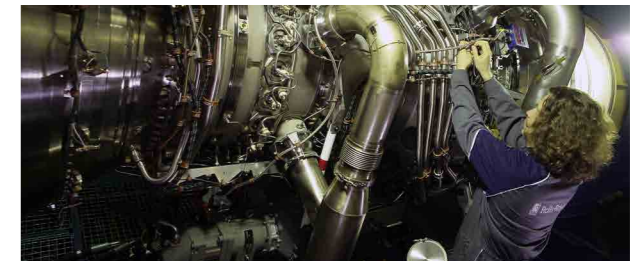
Select from a range of support options that optimise engine availability and reduce through-life costs

A compact packaged module - simplified

The MT30 design incorporates all engine accessory systems on the baseplate, simplifying installation for the shipbuilder, which is limited to providing the starter energy, plus fuel, water and electrical connections.

Engineered as a modular package the MT30 permits installation in a single lift and capable of integrating with a range of ship intake and exhaust configurations. This concept ensures the unit arrives on site with the engine, factory tested and ready for quick, low risk installation and commissioning.

The fully packaged module can be supplied for direct drive or power generation - complete with alternator and its own acoustic enclosure. The enclosure is configured to meet customer machinery space noise specifications.



Support you can count on

Comprehensive support options are available for every Rolls-Royce marine gas turbine installation. We provide customers with service alternatives designed to maximise engine availability with the lowest through-life costs and manage the technical and financial risks. Our engine support programmes range from event or termbased maintenance to TotalCare packages with activities selected from a menu of support options.

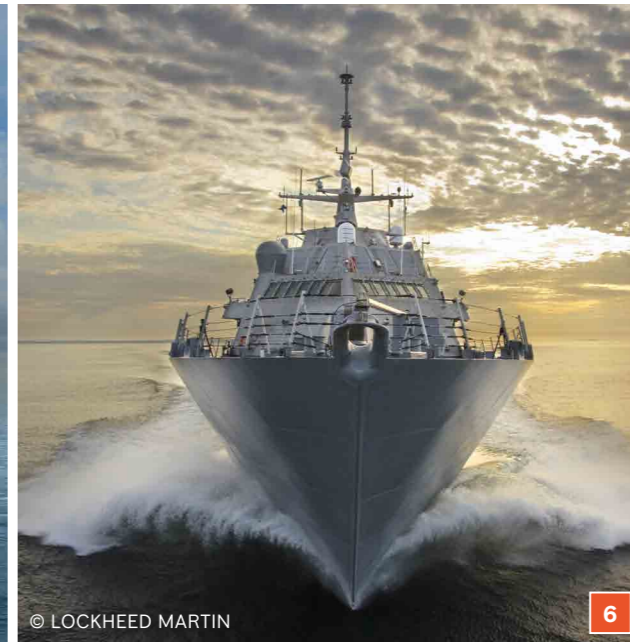
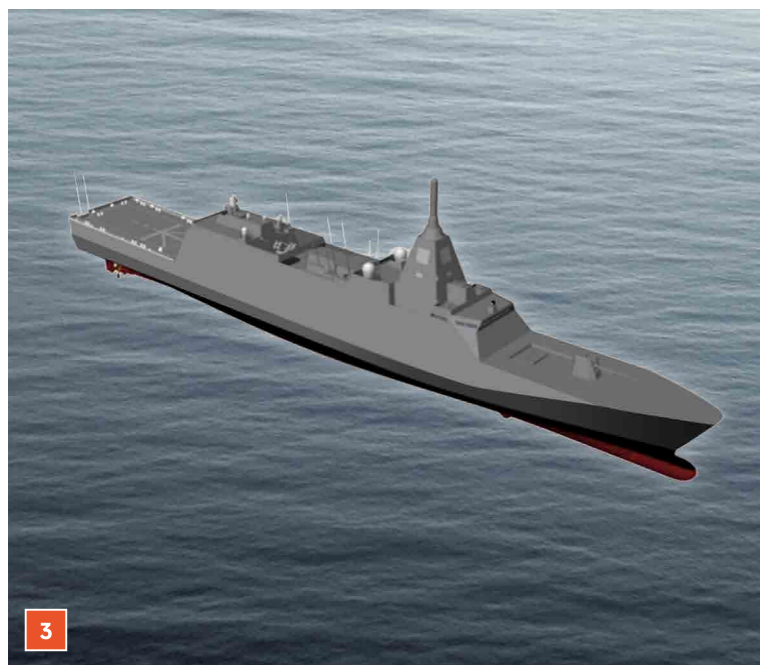
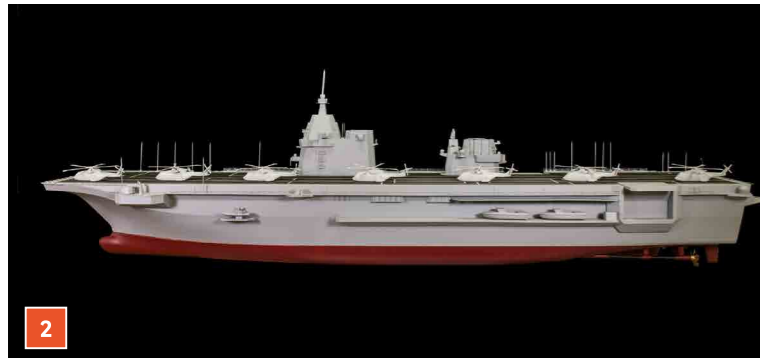
A typical support package could include:

- Spares provisioning
- Customer training
- Equipment health monitoring
- 24 hour help desk
- Worldwide support teams
- Shipboard maintenance and trouble shooting assistance
- Shore based spare parts availability, replenishment and inventory management
- Engine overhaul
- Spare engine management



The MT30 alternator packages will power the Royal Navy's Queen Elizabeth class aircraft carriers and the US Navy's DDG 1000 destroyers.





1. Royal Australian Navy's Hunter Class, Type 26 Global Combat Ship – Australia (preferred design)
2. Italian Navy's Landing Helicopter Dock
3. JMSDF 30FFM Frigate
4. Royal Navy's City Class - Type 26 Global Combat Ship
5. US Navy's USS Zumwalt Class Destroyer
6. US Navy's USS Freedom Littoral Combat Ship
7. Republic of Korea Navy's Daegu Class Frigate
8. Royal Navy's HMS Queen Elizabeth Aircraft Carrier



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