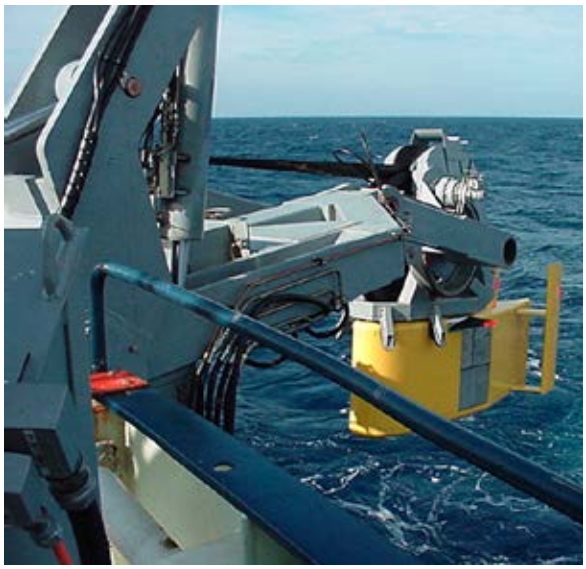
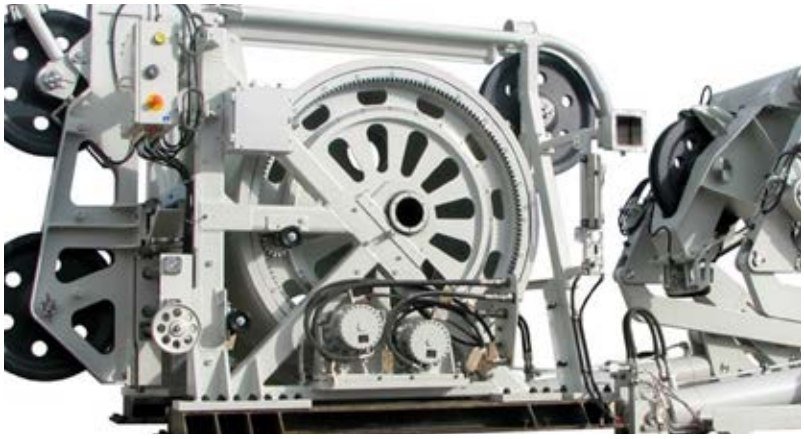




Naval handling systems

Custom naval handling systems for challenging payloads

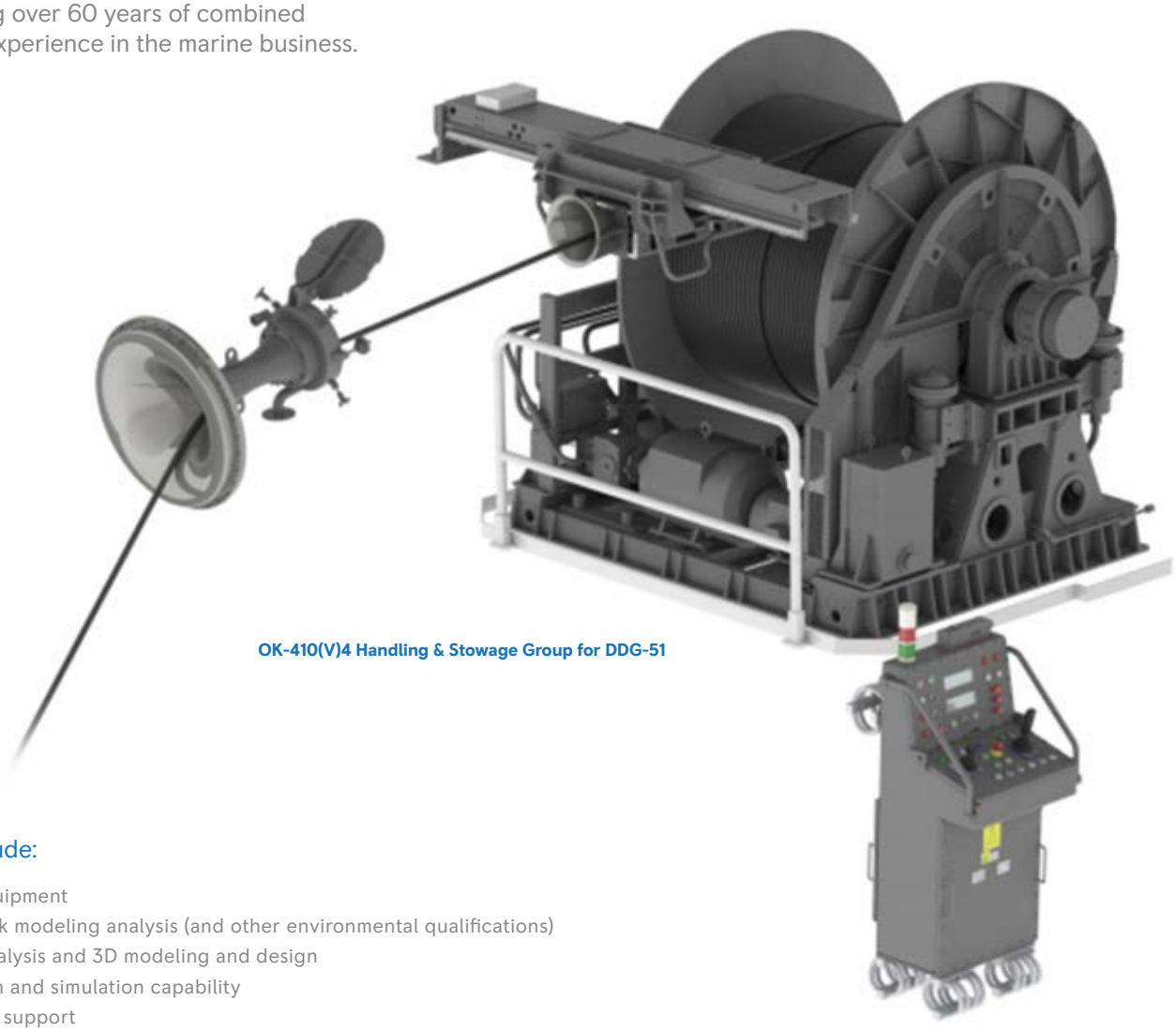
Rolls-Royce is the global leader in specialized naval sensor handling systems

Rolls-Royce designs and delivers custom naval handling systems to successfully meet the challenging demands presented by modern navies around the world.

- Towed active/passive sonar
- Helicopter dipping sonar
- Torpedo defence
- Mine warfare (ship and airborne)
- USV, UUV

Working with Rolls-Royce

Rolls-Royce is a global business providing mission-critical systems for use on land, at sea and in the air. Our systems have been designed and built utilizing over 60 years of combined know-how and experience in the marine business.



OK-410(V)4 Handling & Stowage Group for DDG-51

Capabilities include:

- MIL-hardened equipment
- Test-verified shock modeling analysis (and other environmental qualifications)
- Finite Element Analysis and 3D modeling and design
- Strong automation and simulation capability
- ILS and in-service support
- Lightweight designs with advanced materials for air and shipborne applications
- Winch and handling system designs to fit ISO containers

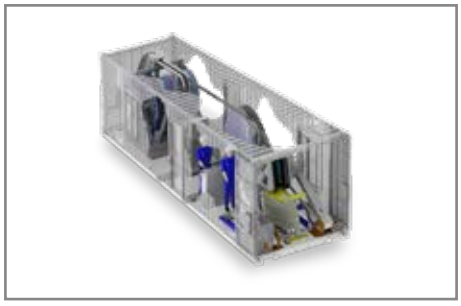
Rolls-Royce has a broad portfolio of field-proven shipborne winch and cable handling products

Navies around the world utilize Rolls-Royce cable handling and stowage systems for their demanding undersea sensor towing applications. This portfolio ranges from full system design and production of an all-electric powered Multi-Functional Towed Array (MFTA) winch and handling system on the U.S. Navy's Zumwalt-class destroyers, to automated electro-hydraulic winch and sonar tow body handling systems on the Singapore Navy's Formidable-class frigates.

Drawing from these experiences, we develop tailored system solutions to suit customer requirements. Our knowledge and capabilities enable us to deliver world class cable handling solutions for the most demanding military shipborne applications.

VDS handling & storage system

A lightweight, automated handling system for safe launch, recovery and stowage of active passive sonar in high sea states. Selected for service by Singapore and Dutch navies.



Containerized handling & storage system

Containerized version of the automated VDS handling and storage system. Designed for rapid deployment.

Surface Ship Torpedo Defence winch

Modular and self-contained winch and level-wind system allowing for simplified installation and removal. Single or dual-drum versions available.

Lightweight Advanced Winch System

A compact, shock-hardened electric winch designed for towed arrays. Significantly lighter than standard naval designs for applications where system weight is critical.

Towed array winch & handling system

Full automation electric winches for the Zumwalt-class destroyers' multi functional towed array.

Rolls-Royce excels in the art and science of towing and dipping of acoustic sensors from helicopters

Rolls-Royce lightweight composite winch solutions meet the unique challenges of airborne applications, which includes the Carriage, Stream, Tow, Recovery System (CSTRS) winch and faired tow cable system for the U.S. Navy's Organic Airborne Mine Counter Measures program on the MH-60S helicopter.

U.S. Navy MH-60S helicopter equipped with a CSTRS

Rolls-Royce also produces the HELRAS (Helicopter Long Range Active Sonar) dipping sonar reeling machines for Canada's new maritime helicopters. Our focus on specialized equipment used in undersea warfare operations, including towed sonar and mine countermeasures, makes Rolls-Royce the clear choice in helicopter-based sensor handling systems.

Support equipment for naval helicopter undersea sensor operations comes in a variety of configurations.

Organic Reeling Cable Assembly (ORCA)

Designed by Rolls-Royce for the U.S. Navy, the innovative ORCA system provides a vital ship or land-based maintenance tool for conductor cable installation and removal in support of the Littoral Combat Ship remote mine-hunting system and the MH-60S helicopter programs.

Helicopter Long Range Active Sonar (HELRAS)

Rolls-Royce is partnered with L3Harris to manufacture HELRAS Reeling Machine systems for Canada's CH-48 Cyclone (H-92) helicopter and international SH-70B naval helicopter programs.

Carriage, Stream, Tow, Recovery System (CSTRS)

A lightweight winch, levelwind and tow sheave system designed for the U.S. Navy's MH-60S Organic Airborne Mine Counter-measures program.

These lightweight and compact winch solutions are ideally suited for naval helicopter operations.

CSTRS deployment

CSTRS winch and tow sheave configuration

Cable installation using ORCA

Mission Bay Handling System

Next-generation surface combatants will carry a variety of manned and unmanned offboard vehicles and modular mission packages. These payloads will require specialized deployment, recovery and stowage equipment.

Mission Bay Handling System

Leveraging over 30 years of experience we can offer an integrated solution for handling and stowing unmanned and manned offboard craft from surface combatants and patrol vessels. In addition, our equipment can move these craft and containerized mission packages on an open deck or inside a mission bay.

Solutions include over-the-side and stern lifting devices as well as a heavy weather, automated stern ramp that is specified by ENI and Statoil for their North Sea standby vessels.

(Photo courtesy BAE Systems)

Contract awarded for Royal Navy's Type 26 Global Combat Ship Mission Bay Handling System

Fairings and Fairleads

TufNose and TufLine Fairing Systems are unique drag-reducing fairing systems that eliminate strumming and decrease ship fuel consumption. Significant drag reduction can be seen on seismic and tow vehicle applications, and tow vehicles can also achieve additional depth. Naval applications provide tighter coupling to ship, eliminating manoeuvring restrictions.

Bare cable towing induces cable vibration known as strumming, which is detrimental to both the life cycle of the cable and the efficiency of the tow operation. Hairy fairings improve this efficiency, but only marginally.

The smooth, hydrodynamic design of the TufLine and TufNose products installed on your existing bare, braided, sheathed or electromechanical cable, seismic tow cables and ropes, drastically reduces the coefficient of drag of the cable, allowing smoother flow through the water and deeper deployment of the towed vehicle. Proprietary components anchor the fairing module segments to the cable while allowing free-swiveling alignment to the water flow.

Each TufLine fairing module includes one cable anchor point (and hardware), one anti-stacking ring and one heat shrink assembly (required for bare armoured cables).

Each TufNose fairing assembly is comprised of a nose piece, a tail piece, an interconnecting link and a fastener set.

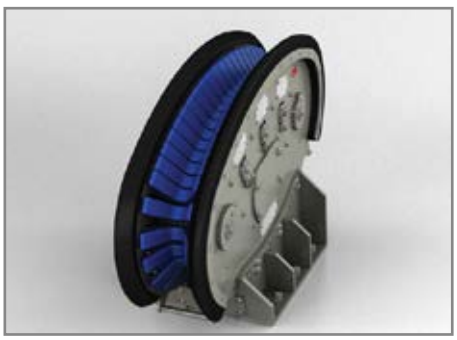
The Rolls-Royce Fairlead has been the standard on multi-streamer seismic vessels for over 15 years, with applications on surface and submarine towed array systems as well as offshore, cablelaying and ROVs.

Proper handling of a marine cable is often underrated, yet vessel downtime and cable replacement resulting from rough handling can be extremely expensive. Whether it is wire rope, complex electro-optical cable or delicate streamer cable, the service life of a cable depends directly on the guidance components of its overboarding system. If these do not address the cable's physical characteristics and limitations, and the nature of its application, rapid deterioration and failure of the cable can result.

Used for both naval and commercial applications.

Provides superior performance and reliability while typically occupying less than 25% of the space required by an equivalent conventional sheave.

Capable of accommodating clamp-on components and cable fairing attachments such as Rolls-Royce TufNose and TufLine Fairing Systems.



Optionally supplied with foot mounts to allow integration into deck-mounted overboarding and winch levelwinding applications.

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