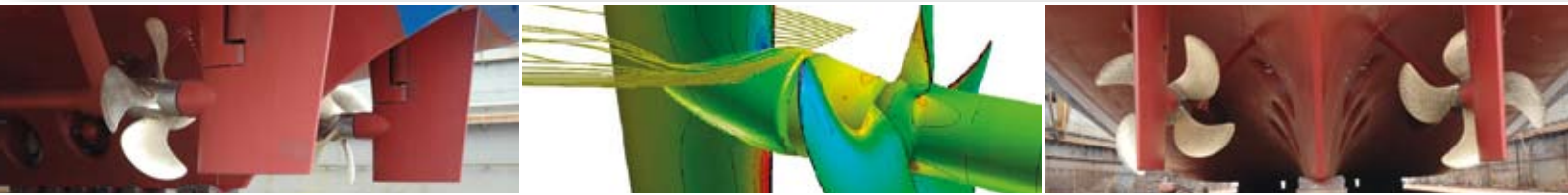




**Rolls-Royce**

## **Promas Lite**

The ultimate propeller/rudder system upgrade for improved efficiency



## The efficient solution

### Promas Lite is not just a propeller upgrade – rudder performance is optimised as well

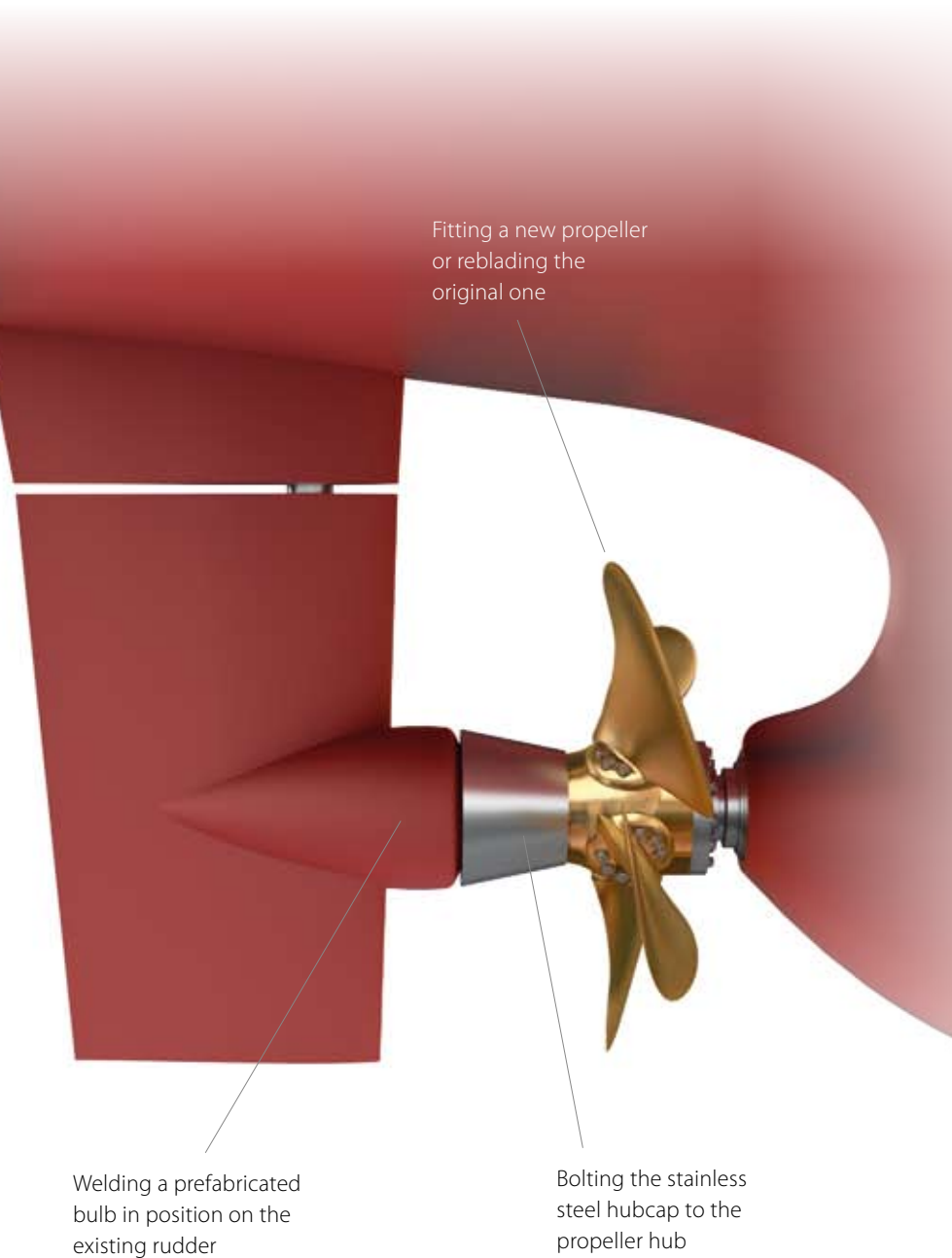
Promas Lite is a version of the successful Rolls-Royce PROMAS integrated propeller and rudder system, designed specifically for vessels already in service. With the advances in propeller design, it is well known that propeller blade changes, or the fitting of new propellers, can have a significant effect on propulsive efficiency, fuel consumption and, therefore, emissions. With Promas Lite these improvements can be maximised, as the propeller and rudder are treated as a complete system – further increases in efficiency can be achieved with improved manoeuvrability for only a small increase in cost.

To deliver the ultimate efficiency improvements, Rolls-Royce propeller and rudder designers have combined their world-leading experience. This team effort is the key that has unlocked the money-saving potential. Each Promas Lite system is custom engineered to an individual vessel and its specified operating profile.

#### Which vessels can be upgraded?

Promas Lite is suitable for both twin and single screw vessels.

The best results are achieved on bulky single screw vessels with a high block coefficient. Promas Lite has been installed on a twin screw passenger vessel with



#### What's involved in a PROMAS upgrade?

The installation is simple and straightforward, with only three areas of modification, as illustrated above. The upgrade can normally be completed within a week.

considerable success. Vessels which have changed their operating profile for which they were designed have most to gain.

Trial results indicate that improvements in efficiency of between 5-13 per cent can be achieved, giving a payback period of well under two years.

**Each Promas Lite system is custom engineered to an individual vessel and its specified operating profile, using our extensive in-house CFD (computational fluid dynamics) capabilities.**

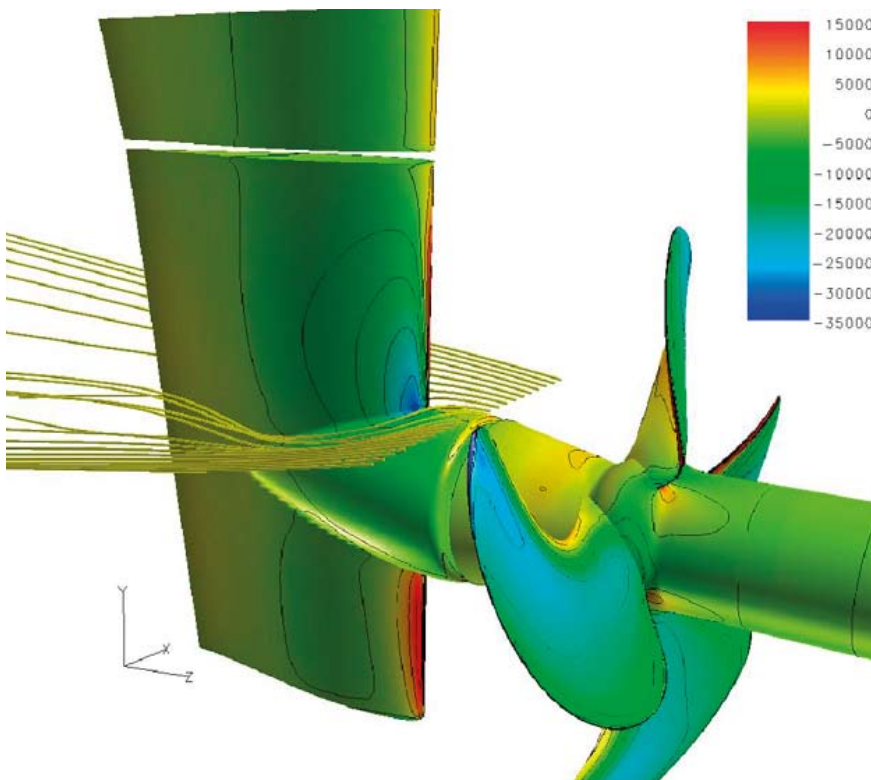
## Why is Promas Lite so efficient?

### Why is Promas Lite so efficient?

Promas Lite integrates the propeller and the rudder into a single system. Behind a normal propeller hub there is a strong low pressure vortex (hub vortex) that acts on the propeller hub, increasing drag and reducing propeller thrust. A special hubcap is fitted to the propeller which streamlines the flow onto a bulb that is added to the rudder, effectively reducing flow separation immediately after the propeller. The result is an increase in propeller thrust, as

previously wasted energy is recovered from the flow.

The addition, the bulb on the rudder also streamlines the flow aft of the rudder, further reducing drag. The hubcap is mounted outside of the propeller hub and acts purely as a hydrodynamic fairing. No special hub design is needed, thus cost and technical complexity is kept to a minimum. Adopting the twisted rudder design of the Promas system can yield further improvements in efficiency and manoeuvrability.



CFD analysis highlights the much improved flow aft of the propeller, which yields the efficiency gains.

### Benefits

- **Reduced fuel consumption**
  - improvements of between 5-13% can be expected, depending on the vessel's operating profile
- **Reduced environmental impact** – corresponding reduction in emissions with lower emission taxes
- **Short payback period**
  - depends on vessel operating profile, but normally less than two years
- **Increased propulsive efficiency** – integrated rudder and propeller design, reduced pressure pulses for improved comfort
- **Simple and quick installation**
  - can be normally fitted within a week
- **Lower maintenance costs**
  - reduced engine loads means less oil consumption and potentially reduced engine wear

## Case study

### Carnival Cruise Lines selects the upgrade that gives the best return on investment



The selection of Promas Lite by Carnival Cruise Lines for the cruise ship *Carnival Glory* came as the result of close cooperation between the Carnival Technical Operations team in Miami and Rolls-Royce. Extensive laboratory testing at the Rolls-Royce Hydrodynamic Research Centre in Sweden. It resulted in a tailored solution matched to the hull and operating

profile of *Carnival Glory*. A twin 5.8m Promas Lite propulsion system was installed during the vessels regular dry-docking at Grand Bahama shipyard in early 2010. The Promas Lite system replaced the ships original five bladed monoblock propellers with modern four bladed Kamewa propellers with bolted blades. Prefabricated

bulbs were welded to the existing rudders and stainless steel hubcabs fitted to the propeller hubs. Extensive testing before and after installation confirmed propulsive efficiency had been significantly increased. The measured improvement was considered a success as fuel consumption and emissions were both reduced.



Before installation.



Installation complete – Prefabricated bulbs welded to the existing rudders.

**The biggest factor in a vessel's operating costs is the cost of fuel. A vessel's propulsive efficiency is determined by a number of factors, the main component being the effective integration of the propulsion system and rudder with the hull. All Promas Lite designs take these factors into account to derive the most energy-efficient solution.**

For more information on Promas Lite, please contact your nearest Rolls-Royce service centre.



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