Doubling up on redundancy

While double hulls, the most basic form of redundancy on a tanker, is now the accepted industry standard, the concept of redundant propulsion systems has not, as yet, made much of an inroad among tanker owners.
However, in the aftermath of the Erika sinking a heightened awareness on the part of the major oil company charterers of the need to ensure trouble-free tanker operations has led to a growing level of interest in backup power systems. This is particularly true if the ship in question is trading to or within the US, due to the rigorous oil spill enforcement and liability regimes in force in that country.
Redundant propulsion systems have also been specified on ships such as shuttle tankers where the costs associated with shutting down offshore oil production due to a lack of suitable vessels with specialist cargo loading facilities can severely disrupt the economics of a project. Having more than one engine can also be advantageous onboard coastal tankers which, due to the nature of the distributive trades, spend a comparatively large amount of time in port. Power requirements onboard ship during the time in port can vary widely, especially with a number of cargo pumps operating simultaneously.
At its highest level, propulsion system redundancy takes the form of twin engine rooms, propellers and rudders and secondary sets of key components. Many of these features are to be found on the new tankers currently being built to carry Alaska North Slope crude oil to US domestic markets, i.e. the Polar tankers at Avondale and the series of ships NASSCO is building for BP. In addition, the design of the new generation of US Gulf shuttle tankers planned by Conoco features full propulsion system redundancy.
Stena Bulk has been a strong promoter of the concept in recent years, first with its pair of shallow-draft V-Max crude oil tankers which are used to deliver crude oil to the Chesapeake Bay on the US East Coast and, more recently, through two sophisticated, 10,000 dwt, diesel-electric, C-Max product tankers serving in the Caribbean under a long-term charter with ChevronTexaco Eastern Caribbean Ltd. Like the much larger V-Max design, the product tankers combine a wide-beam, shallow-draft hull configuration with exceptional manoeuvrability and enhanced operational safety and flexibility. The diesel-electric propulsion system on the C-Maxes features four main engines supplying power to two independent azimuth thrusters which can be rotated through 360 °.
The shallow draft and wide beam enable the C-Max ships to deliver large volumes of cargo to ports with restricted water depths. In fact, the ships are able to outlift all existing tankers serving the eastern Caribbean. Delivered by the Gdynia yard in Poland this past summer, the new vessels have 16 coated cargo tanks, each fitted with a Framo deepwell cargo pump and offering double-valve segregation. The C-Maxes are also fitted with two deck tanks, of 640 cu m each, for the carriage of LPG.
In other recent applications Laurin Maritime has specified an element of propulsion system backup for its recent series of six Tarantella-class 47,500 dwt chemical/product tankers under construction in Croatia at the Trogir yard. Each of these ships is fitted with two medium-speed diesel engines, which are connected through a reduction gear to a single Kamewa controllable pitch propeller. Although not a fully redundant propulsion system, the twin engine arrangement is a strong feature which will no doubt find favour amongst Laurin's customers shipping cargoes to and from the US. The single Becker rudder on the Tarantella-class ships reinforces their high degree of manoeuvrability and performance.
Proof that the tanker industry-led drive for increased levels of propulsion system redundancy is not limited to ships with US trading links is given by the recent order by Crescent Tankships for two 3,500 dwt chemical/product tankers, plus options, from the Rousse Shipyard in Bulgaria. Earmarked for coastal trading in UK and

Northern European waters on delivery in late 2003, the UK-flag ships will have twin engines, twin screws, twin rudders and a high degree of operational redundancy. Some in the industry are questioning whether the drive for redundancy and the zero-spill tanker is creating an over-specified ship which is not necessarily an optimised ship. Yet so high are the stakes, especially in some trading regions where public opprobrium in the aftermath of a tanker accident could create a severe backlash, that more and more participants believe propulsion system redundancy is a useful pre-emptive measure.

Doubling up on equipment also takes eases the burden of relying too heavily on the STCW Convention and the ISM Code as instant panaceas. Introduced to tackle the human element's contribution to maritime accidents, STCW and ISM are longer-term programmes rather than overnight solutions.

Dr Donald Liu, ABS executive vice president, has said that the best way for the industry to delay or diffuse the inevitability of redundancy is by taking a proactive approach to self-regulation. One of the best tools it has at its disposal in this respect is the risk management methodology of the type used in the preparation of safety cases and formal safety assessments (FSAs).

"After determining event sequences using this methodology, they can then be ranked by frequency and consequence to allow resources to be focused in the most appropriate areas," states Dr Liu. "For example, results from our tanker risk management study indicate

that in a dual engine room a single component in the cooling water system in each engine room, with appropriate crossovers, is as safe as having dual components. "Allowing alternate system designs such as this provides owners with greater flexibility, and possible cost savings."