

ARCHIVED REPORT

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Ocean Class LPH - Archived 8/2007

Outlook

- Any chance of a second ship in this class has finally been eliminated
- Replacement of HMS *Ocean* will not take place until 2018 at the earliest, and may be delayed for some years beyond that
- The Invincible class carriers may provide extra assault capability, if required
- Export prospects for LPH type ships mostly absorbed by French BIP/Mistral class and by a through-deck derivative of the Enforcer class

Orientation

Description. Helicopter carrier (LPH).

Status. In service.

Sponsor

Ministry of Defence (Procurement Executive)
CB/Admin 3
St. George's Court
14 New Oxford St
London WC1A 1EJ
United Kingdom
Tel: + 44 171 632 5555

Total Produced. One

Pennant List

<u>Number & Name</u>	<u>Builder</u>	<u>Launch Date</u>	<u>Commissioning</u>
L12 <i>HMS Ocean</i>	VSEL/Kvaerner Govan	10/11/1995	9/30/1998

Mission. HMS *Ocean* provides full capabilities for rapid embarkation, support, and operation of helicopters and other aircraft, as part of the Royal Navy amphibious mission. She serves as a transport and a rear-area

operating base, using the two Albion class LPDs as forward-staging bases.

Price Range. The contracted cost of HMS *Ocean* is \$245 million.

Contractors

Prime

BAE Systems plc	http://www.baesystems.com , 6 Carlton Gardens, London, SW1Y 5AD United Kingdom, Tel: + 44 1252 373232, Fax: + 44 1252 383991, Prime
BAE Systems Naval Ships	1048 Govan Road, Glasgow, G51 4XP Clydeside, United Kingdom, Tel: + 44 141 445 8000, Fax: + 44 141 445 4978, Second Prime

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Subcontractor

Bainbridge International	8, Flanders Park, Hedge End, Southampton, SO30 2FZ Hampshire, United Kingdom (Flame Retardant Protection Systems)
Broady Valves Ltd	English Street, Kingston-Upon-Hull, HU3 2DU East Yorkshire, United Kingdom (Valves and fittings)
Brown Brothers & Co Ltd	The Sales Department, Broughton Rd, Edinburgh, EH7 4LF United Kingdom (Stabilizers)
Duramax Marine LLC	17990 Great Lakes Pkwy, Hiram, OH 44234 United States, Tel: + 1 (440) 834-5400, Fax: + 1 (440) 834-4950 (Shaft Sealing)
Filtronic Components Ltd	Airedale House, Acom Park, Shipley, BD17 7SW Bradford, United Kingdom (RF Components)
Frazer-Nash Defence Systems Div	111 Windmill Rd, Sunbury-On-Thames, TW16 7EF Middlesex, United Kingdom, Tel: + 44 932765822, Fax: + 44 932761098 (Cargo handling systems)
Gresham Power Electronics Ltd	http://www.greshampower.com , Telford Rd, Salisbury, SP2 7PH Wiltshire, United Kingdom, Tel: + 44 01722 413060, Fax: + 44 01722 413034, Email: enquiries@greshampower.com (Power handling systems)
MacGREGOR RoRo Ship Division	PO Box 4113, Gothenburg, S-40040 Sweden (Hotel services)
Parkburn Precision Handling Systems	http://www.parkburn-phs.com/ , Wobaston Road, Wolverhampton, WV9 5EW West Midlands, United Kingdom, Tel: + 44 1902 575600, Fax: + 44 1902 575655 (Boat deployment and recovery)
Railko Ltd Uk	Loudwater, High Wycombe, HP10 9QU Buckinghamshire, United Kingdom (Bearings)
Repaircraft plc	http://www.repaircraft.com , The Common, Cranleigh, GU6 8LU United Kingdom, Tel: + 44 1483 273536, Fax: + 44 1483 278078, Email: hq@repaircraft.co.uk (Hull Structure Components)
Thales Navigation	http://www.thales-navigation.com , 471 El Camino Real, Santa Clara, CA 95050-4300 United States, Tel: + 1 (408) 615-5100, Fax: + 1 (408) 615-5200 (Navigation & Communication Equipment)
Varivane Industries Ltd	http://www.varivane.com/ , William Road, Nursteed Industrial Estate, Devizes, SN10 3EW Wiltshire, United Kingdom, Tel: + 44 1380 723624, Fax: + 44 1380 728367 (Furniture)

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Technical Data

	Metric	U.S.
Dimensions		
Length (overall)	203.4 m	667.3 ft
Length (waterline)	198.8 m	652.2 ft
Beam (max)	36.1 m	118.3 ft
Beam (waterline)	28.5 m	94.3 ft
Draft	6.5 m	21.3 ft
Depth to Weather Deck	21.2 m	69.5 ft
Flight Deck	170x32.6 m	557x107 ft
Displacement		
Standard	20,800 tonnes	20,500 tons

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	<u>Metric</u>	<u>U.S.</u>
Performance		
Speed (max)	33 kmph	18 kt
Range	14,800 km at 28 kmph	8,000 mi at 15 kt
Crew	255 + 180 air crew + 480 Marines	
	<u>Type</u>	<u>Quantity</u>
Weaponry		
Guns – CIWS	Mk 15 Phalanx	3
	Oerlikon/BMARC 20mm GAM-BO3	4x 2
Aircraft – Hangar	Sea King or EH101	12
Aircraft – Deck Park	Sea King/Lynx/Harrier	18
Electronics		
Radars – Air/Surface Search	Type 996	1
Radars – Surface Search/Aircraft Control	Type 1007	2
Electronic Warfare – ESM	Outfit UAT	1
Electronic Warfare – COMINT	SSQ-108(V)2	1
Electronic Warfare – Decoy Launchers	Outfit DLJ	4
	Replica	4x 8
Command and Control		
Combat Data System	ADAWS-2000	1
Datalinks	Links 11/14/16	
Satellite Comms	SCOT for Skynet IV/V	2
Machinery		
Diesels	Crossley-Pielstick 12PC2.6V400	2x 11,952 shp
Power Generation	Ruston 12RCKZ diesels, Hyundai genset	4x 2,800 kW
Propellers	Kamewa CP, on two shafts	2
Emergency Power	Paxman Vega; 890 kW Newage generator	1+1
Maneuvering Thruster	Bow thruster	1
Gearboxes	GEC-Alstom RG1000D single reduction	2

Design Features. The LPH design employs the basic hull lines of the Invincible class air-capable ships, built to mercantile standards modified to maintain Navy requirements on safety, ship strength, watertight integrity, and firefighting. Kvaerner Govan (now called BAE Naval Systems Glasgow) built the hull to appropriate Naval Engineering Standards and Classification Society Rules, installed the propulsion machinery and navigation systems, and partially outfitted the ship. After launch, HMS *Ocean* was delivered to VSEL under her own power to be fitted with weapons, sensors, and communications equipment.

The design is recognizably a derivative of the Invincible class air-capable ships, with a very long superstructure running more than half the ship's length on the starboard side. The flight deck runs uninterrupted from bow to stern without the open forecastle, Sea Dart missile launcher, or ski jump featured in the Invincible design. The ship is powered by diesel engines, rather than gas turbines, and features a single funnel rather than the two on the Invincible. The use of a single funnel eases constraints on hangar deck capacity, which

is restricted on the Invincible by the space required for the gas turbine air intakes and exhausts.

The flight deck with six operational pads is 170 meters long and 32.6 meters wide, and features two aircraft lifts. Four vehicles and/or personnel landing craft are fitted on davits. The ship can carry up to 40 vehicles, but is not intended for heavy tanks.

Operational Characteristics. The ship's primary role is to facilitate the rapid landing of an assault force by helicopter and landing craft. The ship carries a crew of 255, an aircrew of 206, and 480 Marines. It can accommodate 320 Marines in a short-term emergency. A military force of up to 800 men equipped with artillery, vehicles, and stores can be carried and sustained on board.

Generally, the ship is characterized by a high degree of flexibility in its operational characteristics. The hangar deck (below flight deck) has a capacity for 12 large troop-carrying Chinook HC4, Sea King Commando, or Merlin HC2 helicopters. Under normal circumstances, these will be the standard deployed air group. If required, a deck park can be instituted with capacity for

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up to 18 additional aircraft. Aircraft could include a maximum of six more troop-carrying helicopters, six Lynx or Apache AH.1 attack helicopters, and six Harrier GR.7 or Sea Harrier FA.2 vertical/short takeoff and landing (V/STOL) aircraft (refueled but not supported); there is also a holding place for 20 more helicopters.

A wave of six helicopters can be taken from the hangar and launched in less than 40 minutes. In a non-military role, *Ocean* has the capability to transport up to 250 aid vehicles to an emergency zone and provides helicopter support far inland.



HMS Ocean

Source: Royal Navy

Variants/Upgrades

C2 Upgrade. HMS *Ocean* received an extensive C⁴I upgrade prior to taking on the role of flagship for the U.K.'s Maritime Task Group in May 2002. While *Ocean* wasn't originally designed as a flagship, she had progressively taken on more of that role during her first commission. The designation required a significant enhancement of her strategic communications capability, achieved by modifications to her SCOT satellite communications system and a greater use of her combat support system. A number of systems were taken from the Permanent Joint Headquarters and installed in a Joint Force Headquarters, which featured a fiber-optic local area network for plugging in additional equipment as necessary.

Blister Installation. Engineers at Devonport Dockyard Ltd discovered that modifications were needed to protect tenders and landing craft endangered by turbulence as they came alongside HMS *Ocean*. To

that end, QinetiQ hydrodynamics engineers quickly produced a computer model of the ship and started to calculate the water flow measurements around the vessel. It took 10 hours of number crunching on a supercomputer, but the results provided a quick and accurate solution. As a result, in late 2002, HMS *Ocean* was modified with two 150-foot-long blisters to the aft quarters of the ship to provide protection and greater safety during LCU Mk 5 operations. The bulges were installed above the waterline. Other work performed at that time included refurbishment of the ship's side ramp and accommodation, and installation of additional fresh water storage.

Joint Casualty Treatment Ship. The JCTS differs from a hospital ship in that it operates as part of a maritime task force, and is not subject to the kinds of restrictions that the Geneva Convention traditionally places on a hospital ship. The JCTS requirement is expected to include up to eight operating tables and at

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least 150 beds, together with a full range of intensive care and other facilities that one would expect to find in a shore-based public hospital. A modified version of HMS *Ocean* could be used for this purpose.

LPH(R). In 2003, the Royal Navy started preliminary (pre-concept) studies investigating replacements for HMS *Ocean* in her primary LPH role, starting in 2018. A relatively low-cost, medium displacement (20,000-

30,000 tonnes) Landing Platform Helicopter (LPH) or Landing Platform Helicopter and Dock (LHD) is the most likely candidate. A cooperative project with another European country such as the Netherlands is an option if requirements and timescales can be coordinated.

Program Review

Background. The British Royal Marines pioneered the use of helicopter carriers for amphibious operations shortly after World War II. The imperial policing role placed a premium on landing small numbers of troops relatively quickly, and helicopter deployment seemed the ideal solution. The Royal Navy was fortunate to have large numbers of light fleet aircraft carriers available that could be converted for this new role.

The first of these conversions was an earlier HMS *Ocean*, which saw action during the Suez intervention of 1956. This operation marked the first time that vertical envelopment amphibious warfare tactics had been used during actual combat. During the 1960s and 1970s, a succession of aircraft carriers was assigned to this role. The last of the breed, HMS *Hermes*, was withdrawn from service in 1985 and sold to India.

Capability Gap Perceived

The sale of the HMS *Hermes* left a serious gap in the Royal Navy capability. A new helicopter carrier, then designated the Aviation Support Ship, was proposed but immediately became the subject of budgetary pressures and sparked political infighting. Treasury officials claimed that the helicopter training ship HMS *Argus* and merchant ships, especially car ferries, taken up from trade could fill the gap. The Royal Air Force claimed that amphibious ships were completely unnecessary, and that aircraft could undertake the required transport and deployment functions. As a result, planning for the Aviation Support Ship was minimal until 1991.

Meanwhile, the deployment of British troops to Saudi Arabia answered a lot of questions. The use of civilian ships to transport heavy armor proved to be impractical; it was reported that the decks of one ship actually collapsed under the weight of a Challenger tank. Although HMS *Argus* was deployed to the Gulf, so many demands were placed on its unique capabilities that it was not available for transport purposes. The deployment also revealed that transport aircraft could not substitute for sea-borne movements; 90 percent of materiel for Operation Desert Shield/Desert Storm was transported by sea.

Started and Canceled

As a result, the Royal Navy won the battle for its aviation support ship. The project's name was hastily changed to LPH (for Amphibious Transport Personnel Helicopter). The Royal Navy awarded project definition contracts for the command system and restructured its amphibious forces to fully exploit the capabilities of the new ship.

However, further defense cuts endangered the program. The Royal Air Force was still determined to kill any Royal Navy ship with a flight deck, and the Army was suggesting that it could take over the amphibious function without using specialized ships. In a cash-strapped environment these arguments prevailed, and the LPH program was canceled on January 25, 1993.

This decision forced the Royal Navy to look at other possibilities to fulfill the LPH role. One proposal was the conversion of HMS *Illustrious*, then undergoing her first mid-life upgrade. However, this turned out to be impractical – British involvement in Bosnia was escalating, heavily underscoring the importance of the LPH function. Neither of the two air-capable ships deployed in the area (HMS *Argus* and HMS *Ark Royal*) could provide the support functions required, while the dangers of relying on air transport were sharply illustrated by the downing of an Italian Air Force G-222 and the firing of several shots at RAF Hercules C-4 transports.

Started Again

In February 1993, the cancellation of the LPH requirement was formally reversed, and the program was given high priority instead. The Royal Navy solicited bids from VSEL and the Swan Hunter shipyards for an order scheduled for October 1993. Finally, on May 11, 1993, the contract was awarded to VSEL, in partnership with Kvaerner Govan, after a tightly fought contest with the rival Swan Hunter yard. The deciding factor in awarding the \$245 million order to the VSEL Consortium plc for the new Royal Navy

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LPH was that its bid was some \$75 million lower than Swan Hunter's proposal. The bid was so attractive, in fact, that the time allowed to evaluate the bids was drastically reduced, and the ship was ordered some six months earlier than originally intended.

The VSEL/Kvaerner Govan bid was also more compliant with Royal Navy specifications. Its design used the basic hull form of the Invincible class carriers, but it was actually built to merchant ship standards, with a design that effectively mimicked a large merchant ship with the addition of a flight deck and naval features. The Swan Hunter's proposal called for a ship built to warship standards. While this would have limited its internal capacity, the ship would have been more robust and (at least theoretically) more battle worthy.

Immediately after the order was placed, the Royal Navy announced that the new LPH would be named HMS *Ocean* in honor of the world's first operational LPH. Operational doctrine featured the new HMS *Ocean* as a rear-area base ship, holding a pattern some 100 miles from the scene of operations. The two new LPD type vessels would be deployed nearer the scene of the farthest engagement and act as forward staging posts for helicopters and aircraft from the LPH. Invitations to tender for these LPD orders were issued in 1994, with the expectation that orders would be placed by late 1995.

To Build Another?

In April 1994, the Ministry of Defence announced that a second Ocean class LPH might be built. This news represented a testing of the waters to determine the political and economic implications of such a follow-on order. The 1995 long-term costs for the Royal Navy showed no provision for a second LPH in funding, however. The suggestion of a second LPH probably stemmed from the fact that funds for the construction of a sister-ship were already available, since the cost of HMS *Ocean* was far below budget.

The final design review was completed in January 1995. A few changes were made, the most significant being a 1-meter increase in the waterline beam – presumably to improve stability – and some detail changes portside. Since HMS *Ocean* is built in a modular manner, the traditional laying-down date is of little importance. The first hull module was erected on the slipway on March 30, 1995. By May 1995, three of the eight hull modules and 75 percent of the steel fabrication had been completed, including the complete bow section and 1,400 tons of the stern. In addition, the first of the two main diesel engines was delivered, all the diesel generators installed, and the stern ramps fitted.

But a series of embarrassing events marred the November 1995 launch of the new LPH. It appeared that the supports under the hull collapsed during the launch, causing the hull to get stuck halfway down the slipway. After the hull was dislodged, it hurtled down the slipway out of control. The leaking hull was eventually dry-docked for repairs in December 1995. The repairs were completed by the end of February 1996, suggesting that the damage was not as severe as had been feared. This incident delayed ship completion by about three months.

Steelwork repairs were completed in September 1996, and final testing of the diesel generators was scheduled to follow immediately. Final outfitting began at Barrow-in-Furness on November 27, 1996. Two days earlier, Kvaerner Govan had handed over the ship to main contractor VSEL. Before that, she underwent five days of contractor's trials. Subsequently, she performed an additional series of trials, including measured mile runs, during the two-day journey to Barrow-in-Furness for the ceremony.

However, Kvaerner was unable to finish all the work contracted, and the ship was delivered with unspecified work not completed. Around March 1997, it was reported that VSEL had agreed to carry out the additional work needed on *Ocean*. This included installation of a Mk 15 Phalanx and four BMARC twin 30mm small-caliber guns, as well as unspecified improvements in facilities for embarked troops. Kvaerner had shipped the aircraft lift platforms to VSEL, although decks number four and below were still technically Kvaerner's responsibility in February, when 140 compartments were due for inspection.

During the dockyard trials in Scotland in April 1998, the ship's portside propeller fouled a shore line, resulting in damage to the propeller, shaft, and reduction gearing. Consequently, the ship had to return to port using only her starboard propeller. The incident meant another delay in the commissioning of this ship while she was docked for repairs in the south of England. The ship was finally commissioned on September 30, 1998.

A Successful Ship

This appeared to change the ship's luck. During her commissioning cruise, the ship was close enough to enable the crew to provide disaster relief in the West Indies following a particularly devastating hurricane, and gained much valuable publicity in the process. Later, she was instrumental in restoring order to Sierra Leone, and supported British operations there. Since that time, she has been engaged in numerous other operations and exercises and has proved to be a well-designed and valuable asset. She was deployed to the

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Indian Ocean to provide amphibious support to U.S. operations in Afghanistan against the Taliban and the terrorists they sheltered. On her return, she entered dockyard hands for a much-needed overhaul. This entailed substantial improvements to the ship's C⁴I installation and some structural improvements.

Following completion of her refit, HMS *Ocean* set sail on January 16 from Plymouth, carrying 300 Royal Marines from the Taunton-based 40 Commando and 400 aircrew. The British amphibious task group grew considerably with the arrival of many auxiliary-support/troop carrying consortships, eventually forming the largest U.K. amphibious task group since the Falklands campaign. During the conflict in Iraq, she was a platform for 22 military helicopters that formed a major component of the assault on Southern Iraq (and particularly the Al Faw peninsula) in the first three days of Operation Iraqi Freedom. Once the initial landings were completed, HMS *Ocean* continued to provide vital support to Allied ground forces ashore in Iraq. Inextricably linked to the land campaign through the helicopter squadrons and Assault Squadron Royal Marines that had already embarked, the ship maintained a 24/7 presence in the Northern Gulf. The ability to

conduct flying operations around the clock was demonstrated, while her embarked landing craft patrolled the rivers in the south of Iraq.

The JCTS

The capabilities of HMS *Ocean* demonstrated during Operation Iraqi Freedom continued speculation that the construction of a sister ship was desirable. In April 2004, there were reports that the proposed Afloat Primary Casualty Receiving Capability (British term for a hospital ship) would emerge as a significantly modified derivative of the basic *Ocean* design. If this route were followed, the ship would retain the ability for emergency use as a second LPH. Partly as a result of this possibility, the proposed ship was renamed the JCTS (Joint Casualty Treatment Ship).

However, in April 2005 it was revealed that adequate funding for the JCTS would not be available within the foreseeable future. Without that commitment, it would be impossible to determine a project schedule or establish a "main gate." Consequently, the project was discontinued in its current form. This appears to end any possibility of the Royal Navy procuring a second Ocean class LPH.

Significant News

Landing Platform Helicopter (Replacement) - LPH(R) – In 2003, the Royal Navy started some preliminary studies investigating options for a replacement for the Invincible class CVS's and in particular HMS Ark Royal in her secondary LPH role from late 2013, and HMS *Ocean* in her primary LPH role from 2018. A relatively low-cost, medium displacement (20-30,000 tonnes) LPH is the most likely outcome, assuming that the new aircraft carriers are built. A cooperative project with another European country would be an option if requirements and timescales could be coordinated – although this seems unlikely as no other country currently has similar requirements in a similar timescale. (FI, 5/06)

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Funding

This program was funded by the U.K. MoD for the Royal Navy.

Contracts / Orders & Options

<u>Contractor</u>	<u>Award (\$ millions)</u>	<u>Date/Description</u>
BAE Systems	48	Apr 1999 – Two contracts to enhance the performance and operational availability of T996 radar systems on a number of Royal Navy ships, including HMS <i>Ocean</i> (contract value total for all ships).
Isola Composites	N/A	Nov 2002 – Order for gun deck safety nets and ancillary equipment for HMS <i>Ocean</i> .

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Timetable

<u>Month</u>	<u>Year</u>	<u>Major Development</u>
Jan	1993	LPH program canceled
Feb	1993	LPH program revived
May	1993	Order placed for HMS Ocean
Oct	1995	HMS Ocean launched, resulting in damage
Nov	1996	Kvaerner hands ship over to VSEL; fitting continued
Spring	1998	Acceptance trials begun
Sep	1998	Officially commissioned into U.K. Royal Navy service
Nov	1998	Tropical trials in the West Indies begun
Spring	1999	Full-service entry
	2002	First major refit
Jan	2003	Deployed to Gulf for participation in Operation Iraqi Freedom

Worldwide Distribution / Inventories

U.K. One ship.

Forecast Rationale

There is now no chance of the Royal Navy procuring a second LPH of the Ocean class, a situation that has ended years of speculation. Indeed, building another ship of this class would be difficult and expensive; the design is almost 20 years old, and many of the components have been replaced with equivalents that are more modern. Furthermore, adapting the design to meet new requirements and use modern systems would amount to a complete redesign.

During 2005, it was made clear that the new Queen Elizabeth class aircraft carriers will, like the current Invincible class, have a secondary LPH and “Commando ship” role. Near-term and long-term (post 2015) force levels are currently envisioned as two aircraft carriers capable of a secondary amphibious role,

plus a dedicated LPH. This eradicates any need to proceed quickly with the development of a new LPH type unit to replace HMS *Ark Royal*, and provides some flexibility in the 2018 date for replacing HMS *Ocean*. A study regarding the viability and cost-effectiveness of extending the service life of HMS *Ocean* can be expected during an LPH(R) Concept Phase, prior to any “initial gate” approval.

In the export market, the French BIP design appears to be moving smartly into the available openings, primarily due to its combination of a full-length flight deck and flooding well deck. Consequently, no further production is currently foreseen for the Ocean class. This report will be archived next year.

Ten-Year Outlook

No new production of this series is projected. Only modernization and upgrade activity of the onboard systems will continue throughout the forecast period. Therefore, the forecast chart has been omitted.

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