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6111

3.2 SIGNIFICANT SHIPS

DOKDO CLASS ASSAULT SHIPS

SOUTH KOREA'S LPX-1 DESIGN

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Since its initial foundation in 1948, the Republic of Korea Navy (ROKN) has seen a steady growth in size and capability. Initially equipped with surplus US Navy vessels, the navy saw the first indigenous-built units inducted into the fleet during the 1970s. The next decade saw the arrival of locally-constructed major surface combatants in the form of the *Ulsan* class frigates and the *Dong Hae* and *Po Hang* class corvettes, which that were largely equipped with 'off the shelf ' US and European equipment. By the 1990s, progressively larger domestically-constructed surface combatants were joining the fleet, accompanied by efforts to grow an indigenous equipment industry. It was also during the 1990s that the ROKN's twentieth Commanderin-Chief, Admiral Ahn Byoung-Tae, achieved the necessary political support to develop the navy into a regional 'blue water' force, an ambition set out in his document *Navy Vision 2020*.[1] A key element of this vision was the strategic mobile concept: the creation of a 'high end' flotilla of ships capable of flexible, independent operations on the high seas. The need to maintain strong coastal forces to counter potential North Korean aggression has acted as something of a restraint on the extent to which vision has been achieved. Nevertheless, the ROKN has successfully transitioned into a powerful regional navy, fully capable of international deployment and with highly sophisticated vessels that include Aegis destroyers and AIP-equipped submarines. Also prominent amongst these new warships are the *Dokdo* class amphibious assault ships, amongst the most potent of the type in the region.

Two images of the Republic of Korea Navy's amphibious assault ship *Dokdo* operating in company with the US Navy's *Wasp* class LHD *Bonhomme Richard* (LHD-6) and other amphibious ships on 27 March 2014. The origins of the *Dokdo* class can be traced to the achievement of political support during the 1990s to develop the Republic of Korea Navy's capabilities through the creation of strategic mobile forces capable of 'blue water' deployment throughout the Asian region. The centrepiece of these forces would be small aviation-capable ships. In practice, however, *Dokdo* was heavily influenced by amphibious requirements and is formally assigned to the navy's amphibious squadron. *(US Navy)*

GENESIS

One of the elements of the strategic mobile fleet concept was the construction of aviation-capable ships that could act as flagships for the fleet's deployed task groups. However – probably due to the ongoing threat from South Korea's northern neighbour and the need to maintain powerful littoral warfare capabilities to act as a deterrent – the ships that ultimately emerged were also heavily influenced by amphibious requirements. These requirements called for a platform capable of carrying an expeditionary force (including tanks, vehicles and support elements), as well as rotorcraft and landing craft for use in an amphibious assault. The design also needed to be configured to provide command and control capabilities across both the maritime and land domains, as well as having the ability to transport considerable volumes of containerised supplies and provide medical support during non-combat operations. The resultant LPX (Landing Platform Experimental) programme took tangible form in October 2002, when a contract

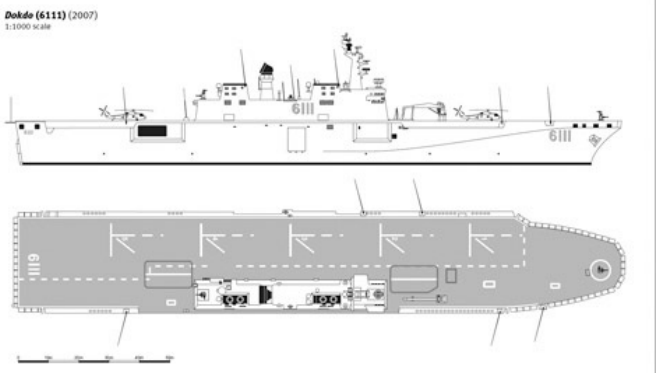
was signed with Busan-based Hanjin Heavy Industries & Construction to construct the first of a planned total of three ships following receipt of formal cabinet approval.[2]

Table 3.2.1.

DOKDO (6111) PRINCIPAL PARTICULARS

Building Information:	
Fabrication Commenced:	February 2003
Launched:	12 July 2005
Commissioned:	3 July 2007
Builders:	Hanjin Heavy Industries & Construction Co. Ltd., Busan, Republic of Korea
Dimensions:	
Displacement:	c. 14,000 tons standard displacement, 18,860 tons full load displacement.
Overall Hull Dimensions:	199.5m x 31.5m x 6.5m.
Equipment:	
Aircraft:	Typical air group of up to 10 medium-sized helicopters. There are five operating spots on the flight deck, one for heavy helicopters.
Missiles:	1 x 21-cell Mk 49 RAM launch system for RIM-116B Block 1 surface-to-air missiles.
Guns:	2 x Thales Goalkeeper 30mm CIWS.
Countermeasures:	Nes-1 Future-SLQ-200(V) Sonata electronic warfare suite. 2 x Dagaie Mk 2 decoy launchers.1
Principal Sensors:	Thales SMART-L long-range search radar, Thales MW-08 search and target-indication radar, GECO Engineering SPS-95K search and navigation radar, Selex Galileo SPN-720 approach radar, navigation radar.
Combat System:	Thales TACTICOS-derived combat management system. UNIMO Technology communications system includes Links 11 and 16.
Propulsion Systems:	
Machinery:	CODAD. 4 x Doosan Heavy Industries/MAN Diesel 16 PC 2.5 STC diesel engines each rated at c. 7.65MW deliver 41,615shp through two shafts. 1 x bow thruster.
Speed:	Designed maximum speed is 23 knots. Range is 10,000nm at 12 knots.
Other Details:	
Complement:	A typical crew comprises c. 265. Accommodation is provided for c. 420 plus embarked forces.
Military Lift:	Can accommodate c. 720 troops (c. 1,000 in overload conditions). Significant vehicle and cargo-carrying capacity. Space in well deck for 2 x LSF-II LCAC, with alternative LCM, LCU and AAV loadouts.
Class:	*Dokdo* (6111). A second unit – *Marado* – which will incorporate improvements is under construction.

Notes:
1 Many sources state *Dokdo* is equipped with the SLQ-260X TACM torpedo countermeasures system but its presence is not clear from published images of the ship.



(Drawings © John Jordan, 2016)

The new ship was the largest amphibious warship ordered from an Asian yard at that time. The design incorporated a large flight deck, a well deck and sufficient accommodation for a battalion of marines. There was also space for a mix of helicopters, tanks/armoured vehicles and wheeled vehicles, as well as an appropriate level of self-sufficiency in terms of ammunition, fuel, water, provisioning and logistic support. Given a lack of previous local experience in designing ships of this type, specialist assistance was sought from the US naval architecture and engineering group John J McMullen Associates (now part of Alion Science & Technology). This company provided design support in the areas of electromagnetic compatibility, topside structures, flight-deck and aviation facilities, and the stern well deck. This may account for *Dokdo*'s *s*uperficial resemblance to the US Navy's much larger *Wasp* (LHD-1) class amphibious assault ships.

Dokdo pictured at the Hanjin Heavy Industries & Construction shipyard in Pusan at the time of her official naming ceremony on 12 July 2005. The Thales SMART-L radar on her mainmast was a wooden mock-up. *(Republic of Korea Navy)*

The keel of the new ship was laid in February 2003. Named *Dokdo*, her launch was celebrated on 12 July 2005.[3] She was subsequently commissioned on 3 July 2007 at the naval base of Jinhae (also anglicised as Chinhae), taking the pennant number 6111. On her maiden deployment, the new ship took part in the biannual maritime defence exhibition LIMA 2007, held on Langkawi Island in Malaysia. Subsequently, on 1 January 2008, *Dokdo* was declared fully operational. It was originally hoped that a second ship would follow by c. 2010, with a third being completed later in the decade. However, this plan was significantly delayed. Consequently, it was only in December 2014 that the follow-on ship, named *Marado*, was ordered.

An image of *Dokdo* at the LIMA 2007 defence exhibition at Langkawi Island in Malaysia. *Dokdo* attended this exhibition soon after commissioning in July 2007. *(Guy Toremans)*

OVERALL DESIGN

Dokdo is a steel-built mono-hull ship with a length of c. 199.5m, a beam of c. 31.5m, a draught of c. 6.5m and a full load displacement of 18.860 tons. Full technical details are provided in Table 3.2.1.

Although the ROKN has been reluctant to release precise details on the ship's technical characteristics, payload and performance, it is understood that *Dokdo*'s military lift capability is built around a requirement to embark, transport, deploy and support an expeditionary force of around 720 troops and their equipment. This capacity can be increased to a force of around 1,000 personnel in 'overload' conditions. However, *Dokdo*'s capabilities go beyond this core specification, as she is effectively designed to deliver four capabilities from a single hull, acting as:

- An amphibious platform.
- An aviation support vessel.
- A joint command platform.
- A disaster-relief and hospital facility.

The need to support these varying capabilities has driven a polyvalent design, which has considerable ability to be 'flexed' between missions. This is reflected in an internal arrangement focused on a number of payload areas encompassing (i) the flight deck, (ii) a hangar and garage facilities, including a linked well deck and (iii) accommodation both for the ship's crew and the forces that may need to be embarked for any given mission.

The flight deck provides five landing spots and is capable of operating all helicopters currently in the South Korean Armed Forces' inventory. The aftermost landing spot has greater clearances than the others and can be used by larger rotorcraft such as the CH-53 Sea Stallion series or the MV-22 Osprey. Some sources suggest the flight deck is strengthened and coated with special urethane to resist heat generated from aircraft, thus allowing operation by vertical/short take-off and landing (V/STOL) aircraft should the need arise. The ship's island is located amidships on the starboard side and houses a roomy navigation bridge, an admiral's staff bridge and a flight control centre with an excellent view of the flight deck. The majority of the ship's sensors and communications equipment are mounted on top of the island superstructure.

Another image of *Dokdo* at the LIMA 2007 defence exhibition at Langkawi Island in Malaysia. Nearly 200m in length and displacing some 18,860 tons at full load displacement, her design is significantly flexible to facilitate the performance of a variety of roles. *(Guy Toremans)*

Accommodation facilities – many on gallery decks to either side of the main garage/hangar space – provide the crew with comfortable, noiseprotected cabins, as well as recreation and living spaces, toilets, messes, a galley and offices. Working and accommodation areas are arranged in a logical structure to provide easy access and the passageways and stairways inside the ship are wide enough to allow fully-loaded combat troops to move to their assault launch points without difficulty. The ship's permanent complement numbers c. 245 crew but total accommodation is provided for c. 420. This would allow, for example, a command staff of around 150 personnel to be embarked. Senior officers have single cabins while other officers share either double or quadruple cabins; petty officers are accommodated in four- to six-berth cabins, whilst

junior ratings share twelve-berth facilities. There is additional berthing for the 720 troops that comprise the normal expeditionary force. Having several hundred troops onboard puts a premium on maximising usable internal volume, cargo space and accommodation quarters and the embarked troops' quarters are inevitably more austere than those provided for the normal crew.

A distinguishing feature of *Dokdo* is a flexible garage/hangar which – including the well deck – runs for most of the ship's length. It can be accessed by elevator from the flight deck, from a side vehicle ramp or from the well deck itself. This view is taken forwards, looking aft towards the well deck. *(Guy Toremans)*

A distinguishing feature of the ship is the large hangar/garage and well deck area, which runs for most of the ship's length. The stern well deck is around 800m^2 and can be operated in either dry or wet status to accept either two landing craft air cushion (LCAC) or other LCM and LCU landing craft load-outs.[4] Ballasting the well dock is controlled from the ship's control room and can be executed automatically or manually. The dock can be flooded in 90 minutes to a depth of up to 3m and it is operable up to Sea State 4. If landing craft are not embarked, the dock can serve as a bay for additional tanks or other vehicles. The hangar/garage areas can be used for other payloads such as containerised accommodation, palletised stores, medical equipment or even as space for evacuated non-combatants.

Vehicle and cargo handling is carried out through a combination of lifts, cranes and access doors. There are two 19-ton elevators, one located forward of the superstructure on the starboard side and one located closer to the centreline aft. A 5-ton ammunition lift

brings ordnance up to the flight deck from a deep magazine. For embarkation and offload alongside, the ship is fitted with a lateral starboard ramp door giving access to the main garage area. A 20-ton crane situated in front of the island structure can also be used to load and unload equipment from the quayside.

A truck being lowered by *Dokdo*'s forward elevator, which is located in front of the forward island. The hangar and garage areas can be accessed by means of the two aircraft/vehicle lifts. *(Republic of Korea Navy)*

The designers have put great emphasis on the vessel's survivability. The ship is divided into several independent damage control (DC) zones separated by watertight bulkheads that incorporate fireproof insulation. Each zone features its own fire-fighting capabilities, ventilation systems, air-conditioning modules, electrical power distribution panels and chemical (NBC) filtration systems. Damage control co-ordination is supported by an integrated battledamage monitoring and control system (IBDCS) centred in the machinery control room and widely accessible from a network of combat consoles distributed onboard. A large number of automated detectors, sensors and cameras linked to the ship's CCTV system are fitted throughout the ship, ensuring early warning of any damage that might occur. The system records, processes and reports specific information, thus enabling accurate identification of the ship's platform status at all times. The ship is built to support operations without any significant damage up to Sea State 7 and with flight operations possible up to Sea State 5 by using a fin stabiliser system.

A starboard view of *Dokdo*, showing both the side vehicle ramp and 20-ton crane. These can be used for loading and unloading purposes when a quayside is available. *(Guy Toremans)*

PLATFORM SYSTEMS

The functionality of the damage-control system mentioned above is achieved by means of an integrated platform management system (IPMS) supplied by Canadian company CAE marine controls division (now part of L-3 MAPPS). It has been based on experience gained with similar systems developed, for example, for Germany's *Sachsen* class and the Royal Netherlands Navy's *De Zeven Provinciën* class air-defence frigates. The comprehensive system monitors and controls the ship's hull, propulsion, electrical and mechanical devices, thus ensuring permanent status identification and control of all internal technical components. The IPMS is equipped with a comprehensive range of user interfaces, with its various subsystems connected to a dual-redundant main internet data bus. There is provision for interface and information exchange with both the integrated bridge system (IBS) and the combat management system.

The integrated bridge system was supplied by L-3 MAPPS/Samsung. It includes all navigation sensors, an automated identification systems (AIS) to help locate and identify other ships, and a warship electronic chart display and information system (WECDIS).

COMMAND AND CONTROL

The ship is equipped with a Samsung Thales Corporation combat management system (CMS), which is based on the popular Thales Nederland TACTICOS series. It benefits from a fully modular hardware and software, providing the ship with digital C4ISTAR (command, control, intelligence, surveillance, targeting, acquisition and reconnaissance functions).

From a hardware perspective, the CMS is comprised of double- and triple-screen high resolution LCD multi-function operator consoles, incorporating a keyboard with roller-ball and joystick. There are also two large-screen tactical displays. The CMS's concept is based on providing the operator with all the information, data and controls necessary to perform allocated operational tasks. All consoles and workstations are connected by means of a redundant fibre-optic data transmission system, which also handles signals from the IPMS

Three starboard views of *Dokdo*'s island superstructure showing the layout of key sensors and other equipment. A bulbous Selex Galileo SPN-720 precision approach array is mounted on a platform to the rear of the island, with a Goalkeeper CIWS located on the deck aft of the second funnel. The main SMART-L search radar is mounted on top of the mainmast between the two funnels, whilst a Dagaie Mk 2 launcher protrudes from a platform just forward of this mast. A TACAN beacon can be seen to the top rear of the forward mast, with cylindrical 'pots' for the ESM components of the SLQ-200(V) Sonata system located at the head of and on platforms either side of this mast. The MW-08 target-indication radar is mounted high on the forward part of the

mast, with the SPS-95K search and navigation radar on a platform somewhat further down. The starboard jammer that forms a key part of the Sonata system's ECM capabilities is at the base of the foremast, with the Mk 49 launcher for the RAM system above the bridge. *(Guy Toremans)*

The CMS provides situational awareness across the air, land, surface and sub-surface environments by assimilating and associating multi-source information from both organic (shipboard) sensors and non-organic (external) information feeds. For example, Link 11 and Link 16 tactical data links allow interface with other national and allied units. The system controls and manages the ship's weapons and processes, as well as exchanging tactical information with the combat systems of other units. It also supports the planning and decision-making process, not least through its capacity to generate and sustain a recognised maritime picture. All this makes the ship well suited to act as a command platform for joint and amphibious operations.

Dokdo's principal defensive armament is a RAM Mk 31 Mod 1 Guided Missile Weapon System (GMWS), which includes a 21-cell Mk 49 launching system and RIM-116 Rolling Airframe Missiles. This picture shows the launcher on top of *Dokdo's* bridge. Two Goalkeeper CIWS also provide last-ditch defence. *(Guy Toremans)*

SENSORS: THE SHIP'S EYES AND EARS

Dokdo's sensor suite makes an interesting comparison with similar European vessels such as the *Mistral* and *Juan Carlos I* classes, being comparatively more elaborate. It

includes the sophisticated Thales SMART-L 3D volume search radar that is found on many 'high end' air-defence classes, as well as a Thales MW-08 surface/target-indication radar. Other systems installed include a GECO Engineering SPS-95K surface-search/navigation radar and a Selex Galileo SPN-720 precision approach-control radar.

Thales SMART-L Volume-Search Radar: Designed to provide long-range air/surface surveillance and target designation the SMART-L radar permits the early detection and tracking of even very small aircraft and missiles. Operating in the NATO 1,000–2,000 MHz D band (US Navy L Band), it provides very long-range coverage, reportedly being able to detect a low observable target at 35nm (65km), a fighter at 120nm (220km), and a maritime patrol aircraft at over 215nm (400km). Its tracking file can handle up to 1,000 aircraft or 100 surface targets simultaneously. The antenna is electronically stabilised against ship movement, up to the extent of a 30° roll and a 15° pitch. The information SMARTL provides makes an essential contribution to the threat evaluation process – especially in multiple attack scenarios – and allows the weapon control system to lock-on rapidly to potential targets.[5]

Thales MW-08 Target Indication Radar: Operating in the NATO 4,000–6,000 MHz G band (US Navy C band), MW-08 is used for surveillance and target indication at ranges out to c. 80nm (150km) and can also be used to provide gun fire control.

GECO Engineering SPS-95K Search/Navigation Radar: This is composed of a transceiver, a remote control unit and a reflector with omni IFF antenna. It has an instrumental range of c. 107nm (200km).

Selex Galileo SPN-720 Shipborne Precision Approach Radar: This is designed to assist the rapid take-off and recovery of aircraft in both day and night-time conditions, including during adverse weather. The radar system is able to control two aircraft simultaneously and provides final approach and deck landing guidance. The system employs a Doppler radar that uses monopulse tracking out to a range of 15nm (28km). SPN-720 can be operated as a stand-alone system or integrated with a ship's combat management system.

Other sensors fitted include a Thales TACAN tactical air navigation system and the Sagem Vampir (*Veille Air Mer Panoramique Infra Rouge*) IR tracking system. The latter provides 360° passive panoramic surveillance coverage through a high-performance camera system, detecting, tracking and reporting threats that could range from sea-skimming antiship missiles through to fast incoming attack craft or even jet-skis. Detection ranges, dependent on the target, can extend to around 15nm (27.5km) or more.

In addition to its powerful suite of sensors, *Dokdo* also benefits from effective electronic warfare and physical countermeasure capabilities. Although details are somewhat sketchy, it appears that both electronic countermeasures (ECM) and electronic support measures (ESM) are provided by an indigenous Nex I Future SLQ-200(V) Sonata system, which is similar to that installed in a number of South Korean surface escorts. A Korean SLQ-260X TACM (torpedo acoustic countermeasures) torpedo-defence system can also be used to launch decoys to deflect incoming torpedoes.[6] There are also two French Dagaie Mk 2 chaff launchers.

COMMUNICATIONS SUITE

An integrated communications suite (ICS), delivered by UNIMO Technology, provides the necessary means for the digital management of both the internal and external onboard communications. The system operates across the full radio frequency spectrum and provides Link 11, Link 16 and civil and military satellite communications. It supports a message processing system, high speed data transmission, and a maritime tactical wide-area network.

A picture of *Dokdo* at speed during sea trials in February 2007. A CODAD propulsion system provides speeds of up to 23 knots, appropriate for the ship's amphibious role but less suitable for mobile task force operations. *(Republic of Korea Navy)*

WEAPONS SYSTEMS

Given the nature of her envisaged roles, *Dokdo* mounts only limited self-defence capabilities, as she would inevitably sail in consort with supporting escorts in higher-threat scenarios.

The ship's weapon suite includes a 21-cell Raytheon Mk.49 launch system for the RIM-116B Block I Rolling Airframe Missile (RAM). The Block 1 system configuration

features upgraded infrared homing surface-to-air missiles that carry a blast fragmentation warhead. They travel at a speed of Mach 2 and have a reported range of nearly 5nm (9km). The system is primarily intended to provide closepoint defence against incoming missiles. The RAM is scheduled to be replaced by the Korean Surfaceto-Air Anti-Missile (K-SAAM) system in 2018. Housed in a four-cell VLS the 2.07m-long K-SAAM employs inertial mid-course guidance and an infrared seeker for terminal guidance.

Dokdo also mounts two seven-barrelled Thales Goalkeeper 30mm Close-In-Weapon Systems (CIWS), capable of firing 4,200 rounds a minute out to a maximum range of 2,000m. The Goalkeeper is a fully automatic system with a fast 'switch-over to the next-priority' target, assuring the timely detection and engagement of small and supersonic targets, even in dense clutter and jamming environments.

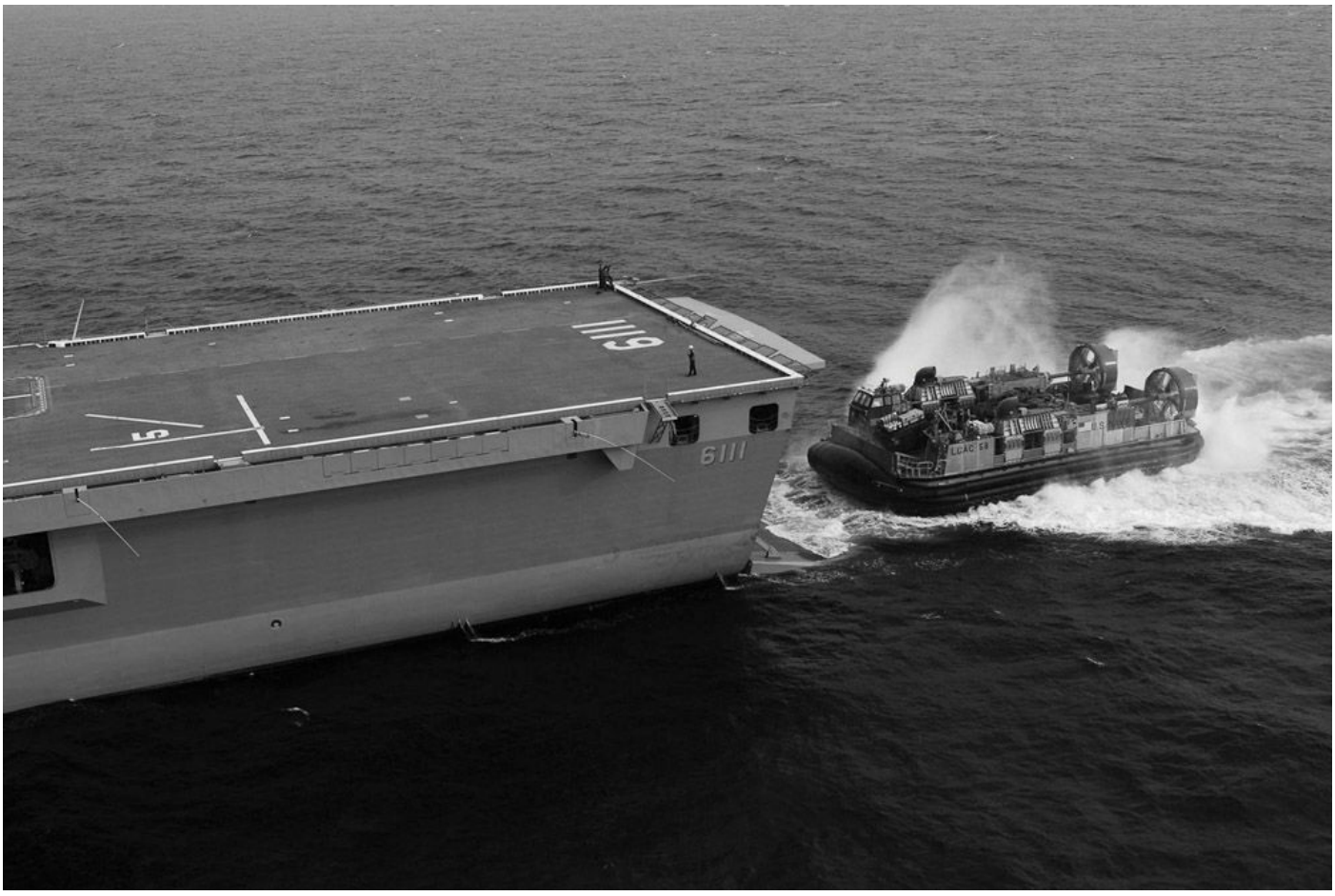
Although not featuring any inherent anti-surface warfare or anti-submarine warfare capabilities, specialised sea-control helicopters could be embarked to provide these capabilities.

Dokdo practicing an amphibious assault during a ceremony in September 2015 to commemorate the 65th anniversary of the landings at Incheon during the Korean War. The image also shows a LSF-II hovercraft, the ship's main waterborne assault vehicle, and other amphibious vessels used to prosecute Dokdo's primary amphibious role. *(US Navy)*

PROPULSION SYSTEM

The ship's propulsion system is based on a combined diesel and diesel (CODAD) plant, made up of four Doosan Heavy Industries/MAN Diesel SA 16 PC2.5 STC medium-speed engines. These can deliver up to 41,615shp (30.6MW). The engines, equipped

with a sequential turbo charging (STC) system, are fitted on 'resilient' mountings and drive two shafts fitted with two variable-pitch propellers. The four engines are divided into two paired groups, separated by two auxiliary compartments, to improve survivability. The propulsion plant provides *Dokdo* with a maximum speed of c. 23 knots and an operational range of 11,000nm at 15 knots. Due to her high superstructure, wind conditions can have a significant effect on *Dokdo*'s manoeuvrability. A bow thruster has therefore been fitted to compensate for this effect and to enhance control during low speeds. The main propulsion system and auxiliary diesel generators and associated switchboards are monitored from the machinery control room/ship control centre by means of the power management and surveillance functionality of the IPMS.



A US Navy LCAC undertaking trials of *Dokdo*'s well deck soon after the ship was first commissioned in 2007. The LCAC's high speed allows supporting ships to be located further from an assault area than might otherwise be the case. *(US Navy)*

CAPABILITY AND MISSION PROFILE

Without any doubt, *Dokdo* gives the South Korean Navy an important quantitative and qualitative leap in capabilities. The ship's advanced logistic features, the presence of the well deck and flight deck, coupled with extensive medical facilities, give her great flexibility of employment in both national and multinational environments. *Dokdo* is symbolic of a profound shift in ROKN thinking towards conducting expeditionary operations at extended range and endurance. It is an example of a technologically

advanced, multi-purpose maritime platform able to operate in a joint/combined environment and adapt to any one of her four assigned mission profiles.

Amphibious Capabilities: *Dokdo*'s most obvious – and primary – task is to participate in amphibious operations, essentially the transportation, disembarkation and recovery of the 720-strong marine battalion and supporting equipment and provisions she is able to embark. The ship is able to support this capability for up to 45 days and can embark and support additional troops, notably by setting-up billet containers in the hangar/garage.

As for all amphibious assault ships, deployment of the embarked force can be carried out by airborne assault utilising troop-carrying helicopters operating from the flight deck or by means of landing craft carried in the well deck. The Republic of Korea Armed Forces operate both UH-60 Black Hawk and UH-1H Iroquois utility transport helicopters and the domestic KAI KUH-1 Surion is under development. Although indigenous LSF-II LCACs are the type most commonly operated from the well deck, the dock can accommodate a variety of landing craft types, as well as AAV-7 amphibious assault vehicles.[7]

An image of a Korean LSF II LCAC. Built indigenously by Hanjin Heavy Industries, the design clearly owes much to similar US Navy craft. *(Guy Toremans)*

Aviation Support Capabilities: In addition to being able to operate utility transport helicopters in the amphibious assault role, *Dokdo*'s aviation facilities are sufficiently flexible to support a wide range of aviation assets. Nominal helicopter capacity is commonly quoted as being ten helicopters, although this would inevitably be dependent

on helicopter size and also other equipment embarked. The strengthened flight deck is capable of handling heavy types, up to and including the United States' MV-22B Osprey. This capacity was proven on 26 March 2015 when two US Marine Corps aircraft from *Bonhomme Richard* (LHD-6) performed touch-andgo landings onboard *Dokdo* for the first time.

Although *Dokdo* has the theoretical capacity to operate V/STOL aircraft this has never been practically demonstrated. The lack of a ski-jump – installation of which seems to have been considered – would, in any event, have a significant impact on take-off with a useful weapons payload.

One of *Dokdo*'s most important features is her full-length flight deck, which provides five operating spots. This pictures shows Korean UH-1H Iroquois and UH-60 Black Hawk helicopters operating from the four forward spots. The fifth spot has greater clearances and can support operation by a medium helicopter. The two elevators, both offset to starboard, can also be seen. *(US Navy)*

Command Platform/Flagship: *Dokdo* possess an embarked force command support infrastructure, comprising extensive command, control and communications (C3) capabilities, anddedicated staff planning facilities, as well as office spaces. All of these have direct access to the ship's combat management centre. These facilities would provide working space for a command staff of up to 150 people, which could be

increased to 200 for surge roles. The facilities are sufficiently flexible to allow the ship to control a three-dimensional joint amphibious operation or a fleet deployment, for example of a strategic mobile fleet division comprising KDX-11 and Aegis-equipped KDX-III destroyers and submarines.

Dokdo seen operating with the US Navy *Nimitz* class aircraft carrier *George Washington* (CVN-73) in July 2010. Although much smaller than the US Navy ship, *Dokdo* is equipped with considerable command and control facilities that would allow here to lead an amphibious operation or fleet deployment. *(US Navy)*

Humanitarian Relief Vessel: When dealing with non-combatant operations such as disaster relief or humanitarian aid, the ship can rely on extensive medical facilities, giving her the capability to take up the role of a primary casualty receiving ship. These medical facilities include a fully-equipped hospital area incorporating two operating theatres, a triage area, an X-ray room, sterilisation area, laboratory, an isolation room, an intensive care unit (ICU), a postoperative room, a quarantine cabin, a pharmacy and a consulting room. There are good connections to the flight deck, garage area and well deck. During normal operations *Dokdo* typically carries two doctors and four nursing officers. However, when deployed in support of humanitarian missions, this medical team would be augmented by additional personnel. If necessary modular field hospital units can also be taken onboard and stored in the garage areas.

Large numbers of members of the public can be seen on *Dokdo*'s flight deck as she sails in company with the KDX-II type destroyer *Choe Yeong* during an event to mark the anniversary of the Korean War in October 2015. The image demonstrates something of *Dokdo*'s capacity for humanitarian relief and civilian rescue operations, an important secondary role. *(Republic of Korea Navy)*

Dokdo is also sufficiently flexible to undertake a variety of other roles, include transportation of army or air force equipment, the provision of support to a mine-countermeasures operation or deployment as a training ship.[8]

A Korean K1 series tank in *Dokdo*'s well deck. Note the sheathing on the dock's walls, which is intended to limit damage from landing craft berthing operations. . As well as conducting amphibious operations, *Dokdo* is sufficiently flexible to be used to transport large quantities or army and air force equipment. *(Guy Toremans)*

AFTER *DOKDO*: THE WAY AHEAD

The commissioning of *Dokdo* marked only the first stage in the recapitalisation of South Korea's amphibious forces and the process is still ongoing. Certainly, events of the last few years have demonstrated the need for mobile and versatile forces that are able to react quickly to crisis and conflict scenarios. This is leading to the ROKN to look at more advanced amphibious platforms that can be used to meet both local security requirements and expeditionary ambitions.[9]

A view of *Dokdo*'s island showing the two-level bridge – the lower being a staff bridge – and the flight-control centre. The second vessel in the class – *Marado* – is likely to expand the aviation capabilities inherent in the *Dokdo* design. *(Guy Toremans)*

A major development has been confirmation of the long-awaited order for a second member of the class, *Marado*, again from Hanjin Heavy Industries & Construction, in December 2014. Launch is expected within the next twelve months and it is likely that the new ship will be fully operational by 2020. The press release announcing the contract for the second ship suggested that the design would upgrade the capabilities deployed by the current *Dokdo* '… through the adoption of the latest technology and advanced equipment'. There has been considerable speculation as to what this may mean in practice. Much of this has inevitably featured on *Marado*'s aviation facilities, including potential for V/STOL operations through incorporation of a skijump and other flight-deck modifications. The ability to support fast jet operations would provide the ROKN with significant additional flexibility to deal with low- and medium-intensity combat operations. It is also noteworthy that the land-based F-35A variant of the Lockheed Martin Lightning II Joint Strike Fighter has also been selected for the air force's requirements, facilitating a F-35B acquisition. Other speculation surrounding *Marado* has concerned the ship's size – she may be somewhat longer and have a higher displacement to support a larger air group – and propulsion system. For example, the selection of a high-powered CODOG (combined diesel or gas) of CODAG (combined diesel and gas) would provide a higher maximum speed and, thus, greater synergies with the surface vessels forming the strategic mobile task groups.

The ROKN retains a long-standing requirement for a third aviation support ship. Some sources suggest that this ship will be ordered before the end of the decade and commission before 2025. The name *Baengnyeongdo* has already been provisionally allocated to the ship.[10] If constructed, it would seem likely that the new ship would be built to an enlarged design and a significant step on the way towards an ambition to field a true aircraft carrier capability.

A MV-22 Osprey from the US Marine Corps pictured operating with *Dokdo* on 26 March 2015, the first time the type had landed on the ship. *Dokdo* benefits from considerable flexibility in terms of the range of rotary-wing aircraft she can deploy but she has yet to embark fast jets. However, there has been speculation that the flight deck of *Marado*, the second member of the class that is currently under construction, will be modified to support F-35B operations *(US Marine Corps)*

Notes

1. See ROKN Headquarters' *Navy Vision 2020* (Gyeryongdae: Republic of Korea Navy, 1999). The document has subsequently been refreshed by *Navy Vision* 2030, published in 2008.

2. Published reports on the LPX programme have often been rather sketchy and sometimes contradictory, with some sources suggesting a requirement for a fourth ship. However, the strategic mobile fleet construct developed by Admiral Ahn Byoung-Tae was based on three task groups and this seems to have been reflected in the number of ships formally planned. Further insight into the ROKN's thinking at this time is contained in Ian Bowers' thesis, *The Creation of the Modern Republic of Korea Navy* (London: King' College London, 2013) which can currently be downloaded by searching: https://kclpure.kcl.ac.uk/portal/

3. Dokdo, also known as the Liancourt Rocks or as Takeshima in Japanese, comprises

a group of small islets in the Sea of Japan. Sovereignty of the group is disputed between South Korea, which controls the islets, and Japan. The use of the name on the ROKN's largest ship therefore carries considerable national significance.

4. Two South Korean-designed LSF-II hovercraft manufactured by Hanjin Heavy Industries are normally embarked. Displacing around 150 tons in full load condition, they are 26.8m long and 14.3m wide. Capable of carrying up to twenty-three troops or 55 tons of vehicles and equipment at speeds of up to 40 knots in Sea State 2, the craft bear a strong resemblance to the US Navy's LCAC.

5. It is worth noting that when *Dokdo* was launched, a wooden mock-up version of the SMART-L radar system had been installed because the actual system was still being tested at Thales Nederland's headquarters in Hengelo.

6. Although the installation of TACM is mentioned in several sources, there is no conclusive evidence the system has actually been installed on the ship.

7. The AAV-7 is a fully-tracked amphibious vehicle that provides an over-the-beach capability for up to eighteen troops and their equipment. It is the only vehicle in the world capable of operating in rough seas and plunging surf conditions.

8. Although *Dokdo* is undoubtedly a capable and flexible ship, there has been some criticism of the design, perhaps reflected in the amount of time between her delivery and the order for a second ship of the type. One particular problem appears to have been a limited maximum speed in the order of 23 knots. This has restricted her value in the planned role as flagship of one of the strategic mobile groups, which otherwise include faster surface escorts of the KDX-II and KDX-III types. It is interesting to note that she has been assigned to amphibious squadron rather than Maritime Task Flotilla Seven structure established to further the strategic mobile concept. One commentator has even gone so far as to say, 'Up to this point, the ship has been a failure and until a more concrete role has been found the ROKN will struggle to utilise it effectively.' – Ian Bowers, *The Creation of the Modern Republic of Korea Navy*, op. cit., p.142.

9. In addition to amphibious assault ship types represented by *Dokdo*, the ROKN is also constructing a new class of *Cheon Wang Bong* tank landing ships. At nearly 5,000 tons standard displacement, these ships resemble small amphibious transport docks and are intended for operations in both national waters as well as overseas. The first of the class entered service in December 2014 and a total of four are planned.

10. Continuing a trend of controversial names, *Baengnyeongdo* will be named after Baengnyeongdo Island, which is the most remote part of the South Korean territory facing North Korea across the Northern Limit Line – the de facto maritime boundary between the two countries – in the Yellow Sea. It is the spot closest to the 38th Parallel on the southern side and the location of significant combat, both during the Korean War and more recently. By way of contrast, Marado Island is not a disputed territory, simply representing the southernmost point of Korean territory.