

# ARCHIVED REPORT

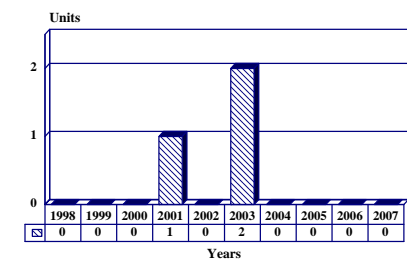
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## Principe de Asturias Class - Archived 3/99

### Outlook

- Near-sister sold to Thailand
- An attractive design for many up-and-coming naval powers
- Electronics and weaponry to be custom-fitted by client
- Follow-on ship, if materialized, will be of modified design
- Lucrative for amphibious, littoral, power projection missions

10 Year Unit Production Forecast  
 1998 - 2007



### Orientation

**Description.** Air-capable ship (aircraft carrier) primarily designed for ASW operations but being capable of conducting limited strike operations using V/STOL aircraft.

**Sponsor**

Ministerio De Marina  
 Madrid  
 Spain

**Contractor**

Empresa Naçional Bazan  
 Paseo de la Castellana 55  
 E-28046 Madrid  
 Spain  
 Tel: +34 1 335 84 00  
 Fax: +34 1 441 50 90

**Licensees.** No production licenses have been granted.

**Status.** Production and service.

**Total Produced.** One ship has been built for the Spanish navy and a second, of a modified design, for Thailand.

**Pennant List**

<u>Name</u>	<u>Builder</u>	<u>Launch Date</u>	<u>Commissioned</u>
R11 <i>Principe de Asturias</i>	Bazán, El Ferrol shipyard	5/82	5/88
911 <i>Chakkrinareubet</i>	Bazán, El Ferrol shipyard	1/96	7/97

**Mission.** The Spanish *ARE Principe De Asturias* is tasked with anti-submarine warfare (ASW) and surface

strike functions. It is also designed to provide flagship facilities for naval task forces. - The Royal Thai Navy's

HTMS *Chakkrinareubet* is designed to provide primarily fleet command and control through flagship facilities. Other critical functions include AAW, ASuW, ASW and helicopter or S/TOVL assault capabilities for amphibious operations. In peacetime, its missions include providing a coordination platform for disaster

relief, search and rescue, emergency evacuation, law enforcement at sea, environmental protection and the protection of national interests.

**Price Range.** The contract price for *HTMS Chakkrinareubet* is US\$285 million (in 1993 dollars).

## Technical Data

### Specifications

<i>Speed, maximum:</i>	26 kts
<i>Speed, cruise:</i>	20 kts
<i>Range:</i>	6,500 nm at 20 kts
<i>Crew:</i>	96 officers, 680 enlisted (not including air group)

	<u>Metric</u>	<u>US</u>
<i>Length, overall:</i>	195.1 m	640 ft
<i>Length, flight deck:</i>	175.3 m	575 ft
<i>Beam, overall:</i>	24.4 m	80 ft
<i>Beam, flight deck:</i>	30.0 m	98.5 ft
<i>Draft:</i>	6.7 m	22 ft
<i>Displacement, full load:</i>		16,200 tons

### Armament

	<u>Type</u>	<u>Quantity</u>
<i>Guns:</i>	Meroka CIWS	4
<i>Aircraft:</i>	V/STOL aircraft	8
	Helicopters	12

### Electronics

	<u>Type</u>	<u>Quantity</u>
<b>Radars:</b>		
<i>Long-range search:</i>	SPS-52C	1
<i>Medium-range search:</i>	SPS-55	1
<i>Navigation:</i>	SPS-64	1
<i>Flight control:</i>	SPN-35A	1
<i>Fire control:</i>	RAN-11 L/X	1
<i>Meroka FCS:</i>	VPS-2	4
<b>Electronic Warfare:</b>		
<i>ESM/ECM:</i>	Nettunel	1
<i>Decoy launcher:</i>	Mk.36 Mod 2 SRBOC	6
<i>Torpedo decoys:</i>	SLQ-25 Nixie	1
<i>Silencing:</i>	Prairie/Masker	
<b>Command and Control:</b>		
<i>Command System:</i>	Tritan	1
<i>TACAN:</i>	URN-25	1
<i>IFF:</i>	UPX-25	1
	UPX-28	1
<i>Navigation:</i>	Sperry HK SINS	2
	MX1105	1

**Propulsion**

	<u>Type</u>	<u>Quantity</u>
<i>Main:</i>	COGAG: LM-2500 gas turbines	2
<i>Auxiliary:</i>	Electric motors	2x800 shp
<i>Generator sets:</i>	Allison 501-K17	3x2,500 kw
<i>Propeller (main):</i>	Controllable pitch	1
<i>Auxiliary propellers:</i>	Pleuger fixed pitch, retractable	2

**Design Features.** The three current non-US designs for air-capable ships - Britain's *HMS Invincible*, Italy's *RIM Giuseppe Garibaldi*, and Spain's *ARE Principe de Asturias* - each represent very different design philosophies. The British design is a costly but capable ship, designed to full warship standards and intended to deploy and face a full range of military capabilities. The Spanish ship, at the other extreme, is basically built to merchant ship standards and provides a powerful air capability at low cost. The ship itself is highly vulnerable, though, and is dependent on escorts for protection against even low-level threats. The *ARE Principe de Asturias* carries as many aircraft as the other ships, but lacks sophisticated sonar and missile systems, and has only one propeller, which limits its speed and maneuverability.

In spite of its basic simplicity, which should have resulted in speedy and inexpensive construction, building the *ARE Principe de Asturias* took 11 years from placement of the order and nearly nine years after the keel was laid down. Much of the delay was due to design changes and a shortage of funding at various times. The Spanish navy is expected to build a sister ship, but this ship probably will be built to a modified design, since it is not expected to be ordered until the late 1990s.

However, the *ARE Principe de Asturias* design is likely to be an attractive option for a large number of navies. Thailand's neighbors will have noted that the country has acquired a small aircraft carrier with significant sea control and power projection capabilities at a cost less than that of a modern frigate. Manpower requirements are admittedly relatively high, but this is not as significant an issue as among European or American navies. The Thai version of the ship is substantially improved over the Spanish original, featuring twin screws and a more capable point-defense armament. These improvements are so significant - and achieved at relatively little cost - that they are likely to be translated back into the next Spanish ship of this type.

The ship has a 12-degree ski-jump at the bow to assist the AV-8B Matador aircraft in their take-offs. The ship has an unusual reverse angled deck, canted from port to starboard. This is to maximize the available size of the deck park. There are two flight deck elevators, one in the middle of the flight deck, the other at the aft end of

the flight deck. All hangar support services are arranged close to the hangar deck. Ammunition magazines are linked to the hangar and flight decks by ammunition lifts.

The hull form was adopted as a result of extensive Bazan research into the hydrodynamics of hulls of this size. Extensive tank testing was carried out with the aid of the SSPA facilities in Sweden. These indicated that the proposed hull lines were efficient and provided good sea-keeping capabilities. The hull coefficients were selected to provide a good balance between power demands and sea kindness. The block coefficient was kept to a minimum, in order to produce the stability essential for aircraft operations while reducing resistance at cruising speed. The prismatic coefficient was a compromise between the demands of stability and resistance at high speed. To improve the resistance characteristics of the hull form at flank speed, a stern wedge was incorporated.

Internally, the ship is divided into three damage control zones, separated by main watertight bulkheads with fireproof insulation. Each zone is provided with full and independent ventilation and air conditioning, firefighting and emergency power capabilities and is assigned its own damage control sections. The second deck is the damage control deck. Accommodation and service facilities for the crew are arranged in major blocks to facilitate habitability standards and the crew's flow.

The ship's structural configuration combines US Navy style for geometric arrangement with commercial criteria for calculation and surveying. The transverse frame spacing, longitudinal reinforcement and stanchions arrangement all follow US Navy practice, while structural scantlings and detail arrangement all follow Lloyds Register of Shipping specifications for merchant ships. The hull and superstructure are constructed of mild steel but the flight deck is armored with High Tensile Steel.

All command and control spaces are arranged inside the island. The command and control suite is based around the Spanish navy standard Tritan command system and includes standard NATO Link 11 and Link 14 data links. These permit the ship to operate as a fully integrated unit in NATO and United States/Spanish naval exercises. An UYK-7 computer handles

information processing and display. The ship's CIC is fitted with OJ-194 and OJ-197 NTDS display consoles. The Tritan system handles command, control and communications within the ship. It processes all shipboard data and routes it throughout the ship along two integrated digital data bus systems. Other combat system spaces are distributed throughout the ship, assigned to the weapons and sensors which they support.

Machinery spaces are located in the aft part of the ship with intakes and uptakes being routed through the island. The ship's power train consists of a main and an emergency propulsion system. The main propulsion system comprises two LM 2500 gas turbines, giving a total output of 46,400 shp. These propel a single controllable pitch propeller. For emergencies, the ship has two 800 shp electric motors, each driving a Pleuger small retractable propeller mounted on the port and starboard sides of the keel, amidships. The power train is monitored by a Platform Control and Monitoring System (PCMS) which provides full control over all aspects of power train operations.

The ship's electrical needs are handled by three gas turbine-driven 2,500 kW electric generators. Distribution systems make use of the radial distribution concept, with the main switchboard as starting point for individual feeders supplying load centers, power panels and individual consumers. There are ten load centers distributed throughout the ship. Each consists of three sections, one for vital users (connected to two main switchboards via automatic bus transfer switches) and two for nonvital users (connected to only a single switchboard).

There are two pairs of Denny-Brown fin stabilizers and span bilge keels. The ship has two spade rudders with a total area of 26.4 m<sup>2</sup>. The appendage configuration consists of a conventional open shaft arrangement with intermediate shaft brackets to minimize resistance and noise generation and to improve inflow conditions to

the propeller. Dedicated flight deck vibration studies were conducted to ensure that propeller induced forces over the whole range of ship speeds did not impede aircraft operations.

**Operational Characteristics.** The only gun systems aboard the Principe de Asturias are four Meroka close-in weapons systems. The Meroka has a firing rate of 3,600 rounds per minute and is controlled by a Selenia RAN-12L search and a Lockheed PVS-2 Sharpshooter I/J-band tracker radar.

The ship's primary search radar is the SPS-52C three-dimensional air search radar, which has a range of over 240 nautical miles. The SPS-55 radar is the primary surface search and navigational set. The SPN-35A is the aircraft approach radar. The Spanish navy chose the Italian Nettunel intercept system for the electronic warfare suite. The Nettunel is both a passive electronic intercept system for electronic support and a jammer for electronic countermeasures. The ship also carries six Mk 36 Super Rapid Bloom Off-Board Countermeasures launchers. A URN-25 TACAN provides aircraft homing and control.

The ship is designed to operate up to 15 SH-3D helicopters or 12 AV-8B plus S/TOVL aircraft (or a mixture thereof) under normal conditions, although usually only eight aircraft and 12 helicopters are embarked. In common with all air-capable ships, this total can be increased spectacularly by the institution of a deck park. The reverse angled deck is a successful innovation in this respect, permitting the institution of a large deck park, bringing the maximum capacity of the ship to 37 aircraft.

The hangar area is divided into two zones by means of a fire curtain amidships, with a hangar control station positioned to provide coverage of both sides of the curtain. Two magazines located in different compartments are provided with capacity to stow 100 tonnes of munitions each.

## Variants/Upgrades

**R11 Chakkrinareubet.** The only derivative of the ARE *Principe de Asturias* is the offshore patrol helicopter carrier *HTMS Chakkrinareubet*. This has been reduced in size from the Spanish lead ship in the following respect:

Specifications	<i>Principe de Asturias</i>	<i>Chakkrinareubet</i>
<i>Length, overall:</i>	195.1 m	182.6 m
<i>Length, flight deck:</i>	175.3 m	174.6 m
<i>Beam, overall:</i>	24.4 m	22.5 m
<i>Flight deck width:</i>	29.0 m	27.5 m
<i>Draft:</i>	6.7 m	6.1 m
<i>Displacement:</i>	15,150 tons	11,485 tonnes
<i>Speed, maximum:</i>	26 kts	26.6 kts
<i>Speed, cruise:</i>	20 kts	16.7 kts

The original single-shaft gas turbine propulsion system has been replaced by a Combined Diesel or Gas turbine (CODOG) arrangement driving a pair of controllable-pitch propellers through twin shafts. This encompasses two LM2500 gas turbine engines and two diesel engines type MTU 16V1163 TB 83. As a result, the operational radius has increased from 6,500 to 10,000 nautical miles at a speed of 12 knots. The number of diesel electric generators has also been stepped up to four.

In ammunition, the *HTMS Chakkrinareubet* carries three Vulcan Phalanx CIWS in place of the four Merokas. It also has four Sea Sparrow point defense missile batteries in VLS systems, in short Mark 41 silos. The ship's electronic fit differs from the Spanish original; for navigation the Thai version uses satellite navigation MX 1105 Transit/GPS Omega, in combination with satellite ship's position reckoning

equipment and Raytheon Anschutz MINS Inertial Navigation System as well as a Kelvin Hughes navigation radar.

The *Chakkrinareubet* carries a peacetime air group of four SH-60B Seahawk ASW helicopters and six UH-60K Blackhawk troop transport helicopters or ten AV-8S Harrier S/TOVL aircraft. In times of crisis this will be strengthened by four more UH-60s, two AEW helicopters and six Harriers. The island design of the carrier is modified to allow for the different uptake requirements of the CODOG power train. The island also accommodates staterooms for use by the Thai royal family, and a suite for the admiral of the navy. The ship also carries two rigid inflatable boats (RIBs), has a special hospital facility, and for environmental control operations is equipped with a physical-chemical type water treatment plant and a system for oil spill cleaner.

## Program Review

**Background.** The *ARE Principe de Asturias* is basically a modified version of the Sea Control Ship proposed by US Chief of Naval Operations, Admiral Elmo Zumwalt, in the early 1970s. The ship's principal weapon is its contingent of 8 aircraft and 12 helicopters which can be increased to 37 in an emergency. These aircraft include the SH-3D Sea King, SH-60B Sea Hawk and AB-212 antisubmarine helicopters, which carry sonobuoys and Mk.44 or Mk.46 torpedoes. The SH-3D and the AB-212 also have dipping sonar. The ship also carries the EAV-8B Matador, the Spanish version of the AV-8B Harrier vertical/short take-off and landing attack fighter.

The US Navy considered the need for a sea control ship during the late 1960s. One ship was included in the FY75 budget, but it was defeated by proponents of large nuclear-powered aircraft carriers. While the US Navy and Congress were debating the sea control ship's fate, the Spanish navy was planning to replace the carrier *ARE Dedalo*, which the USN commissioned in 1943 as the *USS Cabot* and loaned to Spain in 1967.

In 1975, the Spanish government contacted Gibbs & Cox, the American naval architects who had designed the Sea Control Ship; the United States shipyard Bath Iron Works; and Empresa Nacional Bazan, the primary shipyard in Spain. On June 30, 1977, the Spanish navy ordered one Sea Control Ship and three FFG-7 Perry class guided-missile frigates from Bazan Shipyards, Ferrol. The United States Department of Defense gave the Spaniards a great deal of assistance. In 1979, the Department of Defense loaned the Spanish navy US\$150 million to help build the new carrier. The US

Department of Defense and Sperry Corporation (then Unisys and now part of Loral) also established a Spanish navy Test and Integration Facility in Ronkonkoma, New York, to train Spanish personnel in the carrier and frigate combat systems.

The keel for the carrier, originally named *Almirante Carrero Blanco*, was laid on October 8, 1979. Construction proceeded slowly due to a strike at the Empresa Nacional Bazan facility and budgetary problems, which caused Gibbs & Cox to stop working on the project until they had been paid. The *ARE Principe de Asturias* was launched in May 1981. The ship was to have commissioned in late 1984. Because of shipyard and design problems, this slipped back to a revised date of June 1986. In late 1985, this date was again moved back to February/March 1987.

During mid- and late 1986, the Spanish navy ordered several design changes in the ship's command and control facilities. Intended to help in the ship's role as flagship of the Spanish navy, these changes came when the ship was in the final stages of being fitted out. Because of the timing and complexity of these changes, the planned commissioning date for the *ARE Principe de Asturias* again slipped by one year. The *ARE Principe de Asturias* began sea trials in November 1987.

The ship commissioned on May 30, 1988, and is now an active unit of the navy. The Spanish navy returned the *ARE Dedalo* to the US in January of 1990. Original plans were for the construction of two ships of this class, enabling one to be ready for service at all times.

Since there is a funding shortage and the Spanish navy had other shipbuilding plans through 1996, the order for a second ship of the class is expected sometime this year (1997), if at all. This new ship would be substantially larger than the *Principe de Asturias*. One option being examined is a sister ship to the British *HMS Ocean*, with the hull being built at Kvaerner Govan and sailed to Bazan for outfitting.

In July 1992 the Royal Thai Navy ordered a derivative of the *ARE Principe de Asturias*, to fulfill its requirement for an air-capable ship to support amphibious operations by the Royal Thai Marine Corps as well as to conduct offshore patrol and policing operations. This project was first floated in 1988 but was immediately dismissed as being unrealistic and unacceptable by the country's army and air force. By late 1990, the political situation had changed radically and both services had lost a lot of their political influence. The navy had, by then, recast its plans to include two LPDs with helicopter-operating capability. These were ordered from the German Bremer-Vulkan yard. However, delays over contract terms and export clearance allowed Bazan to enter the bidding as well, with a much less expensive project based on the *ARE Principe de Asturias*. This offered substantially more capability than the German design and Bazan won the contract.

The new air-capable ship, *HTMS Chakkrinareubet*, was officially commissioned in August 1997, calling the Sattahip Naval Base its homeport. The plans were earlier for a sister ship to be ordered in 1995, for completion by the end of the century. In 1994, this was delayed by about four years, partly due to financial pressures but also to obtain operating experience with the first of class. Thai sources have suggested that the second ship, if it still happens, may be larger and faster than the first, and more emphasis on fixed-wing aircraft than helicopter operation will be given. For the purpose of this report, however, at least for now all these LPDs are being treated as part of the same class.

The *Chakkrinareubet* is optimized for amphibious warfare and power projection rather than ASW, and has full fleet flagship command capabilities. After a prolonged assessment, the Sikorsky S-70B was selected as the basis for the rotary-wing portion of the airgroup, beating the Bell 212 family, the Westland-built Sea King, and Russian bids from Kamov and Mil. The Thai Navy also plans to acquire AV-8B aircraft from Spain, with Spain using the funds so obtained to buy itself more advanced AV-8B+ aircraft.

The question of the second of class for Spain was reopened in 1995 when rumors began to circulate within the naval industry that the UK had approached Italy and Spain with a suggestion that they join the British CVSG(R) program. These unofficial and unsupported accounts suggest that the Spanish would build one CVSG(R) to supplement the *Principe de Asturias* followed by a second at the end of the production run to replace the older ship. The Italians were supposed to buy one ship to supplement the *Guiseppe Garibaldi*, followed by another later to replace the earlier carrier. Finally, the British would buy three ships between the initial and final Spanish-Italian purchases. This would more than double the CVSG(R) production run, significantly reducing unit costs. No confirmation to those plans has been obtained yet, but it is conceivable that new versions of this ship be sold to other European nations besides Spain, as well as to Latin America (most likely Chile) and Southeast Asian countries.

Momentarily, though, the Spanish navy is so cash-strapped that a new procurement is not expected until a couple of years' time. The only factor possibly speeding this process would be the fact that Bazan has finished the Thai version of the ship as well, and in order to keep the lines open, i.e., maintain a certain level of employment – especially when the country is suffering from massive unemployment in general – would mean that a new order would be dearly welcomed. Whether a new order becomes possible with the assistance of NATO, through an export order or one from the Spanish navy, is not certain at this point. Nevertheless, it is very possible that this design will still sell.

## Funding

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This program has been funded by the Spanish Department of the Navy.

## Recent Contracts

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<u>Contractor</u>	<u>Award (\$ millions)</u>	<u>Date/Description</u>
Bazan, El Ferrol	285.0	July 1992 - Royal Thai Navy order for a derivative of the <i>ARE Principe de Asturias</i>
Bazan/FABA	N/A	Oct 1995 - C <sup>2</sup> and support systems for HTMS <i>Chakkrinareubet</i>
Sikorsky Aircraft	N/A	June 1997 - Deliveries of six S-70B Seahawk helicopters completed

## Timetable

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	1975	US Navy offers Sea Control Ship design to Spain
	1976	Spain signs design contract with Gibbs & Cox
Jun	1977	<i>Principe de Asturias</i> ordered
Oct	1979	<i>Principe de Asturias</i> keel laid
May	1988	<i>Principe de Asturias</i> commissioned
	1990	Modifications made to the port side, to make more space
Jul	1992	Royal Thai Navy orders air-capable ship from Bazan
Nov	1993	First metal cut on HTMS <i>Chakkrinareubet</i>
Jan	1996	HTMS <i>Chakkrinareubet</i> launched
Apr	1997	Completion of sea trials; aviation work-up with Spanish navy, while preparing for delivery to Thailand
Aug	1997	Official commissioning to service in RTN

## Worldwide Distribution

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**Spain** (1)

**Thailand** (1)

## Forecast Rationale

Countries with potentially major interest for this design include Indonesia, Malaysia and South Korea. Other possible sales targets include Argentina, Brazil and Chile. In all cases, Bazan will be competing against German, British and French designs, but has the advantage that its design is proven, already has export successes, and can claim US ancestry – which is an important factor in the aircraft carrier sector. In all these cases finance will be the dominating factor, especially among the navies that are in the process of boosting their submarine capabilities. However, the relatively low construction costs of the Spanish design, compared to other, rival programs, might weigh heavily in winning any possible sales.

Spain itself is in the middle of an economic dire, with available funding being the key problem when

speculating a possible follow-up unit to the *Principe de Asturias*. The country's unemployment is approaching 20 percent in 1998, and the Thai ship has been launched and delivered. If Bazan does not begin construction of a new ship in that dock, further layoffs would seem inevitable. There is therefore probably a fair amount of political pressure to order a new project from the shipbuilder, in order to keep the workers employed and the skill levels at a par with the current developments, because if the gap between the last ship and the next possible sale becomes too large the design becomes outdated.

Spain is also a new member in the NATO, making it safe to say that the country needs to gear up in its defense capabilities in order to meet its new responsibilities for the group. Whether new

procurement is done with direct help of the organization, or whether possible orders from other member countries would be obtained to keep this production alive, or finally, whether Spain simply has to buckle down and place its own order independently, remains to be seen. At any rate, it seems feasible that a

new order for one more helicopter carrier will be received in 1997 or '98. Delivery date would thus be after the turn of the century, in around 2002-2003.

In addition to this order, one or a maximum of two 'outside' orders could be won in the long term.

## Ten-Year Outlook

ESTIMATED CALENDAR YEAR PRODUCTION													
Designation	Application	thru 97	High Confidence Level				Good Confidence Level				Speculative		Total 98-07
			98	99	00	01	02	03	04	05	06	07	
PRINCIPE DE ASTURIAS	ANTI-AIR & SUBMARINE WARFARE (SPANISH NAVY)	1	0	0	0	0	0	1	0	0	0	0	1
PRINCIPE DE ASTURIAS	ASW/ASUW/AA WARFARE (VARIOUS)	0	0	0	0	1	0	1	0	0	0	0	2
PRINCIPE DE ASTURIAS	Prior Prod'n:	1	0	0	0	0	0	0	0	0	0	0	0
Total Production		2	0	0	0	1	0	2	0	0	0	0	3