

ARCHIVED REPORT

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Nakhoda Ragam Class

Outlook

- Brunei introducing replacement OPVs into service
- Some reports suggest Algeria might be interested in buying these ships
- Other prospective purchasers include the Philippines, Malaysia, Thailand and the UAE
- Neat, well-designed ships with favorable sea trials reports

Orientation

Description. General-purpose surface combatant tasked with offshore patrol, maritime policing, and general surveillance duties.

Status. Laid up, for sale.

Total Produced. Three completed.

Sponsor. Royal Brunei Armed Forces (RBAF) Ministry of Defense.

Pennant List

<u>Number & Name</u>	<u>Builder</u>	<u>Launch Date</u>	<u>Completion Date(a)</u>
28 <i>Nakhoda Ragam</i>	GEC-Yarrow, Scotstoun	1/2001	6/2003
29 <i>Bendahara Sakam</i>	GEC-Yarrow, Scotstoun	6/2001	12/2003
30 <i>Jerambak</i>	GEC-Yarrow, Scotstoun	6/2002	8/2004

(a) A completion rather than commissioning date is given due to the disputes currently surrounding these ships.

Mission. Carrying out coastal defense, policing, and surveillance operations while maintaining a credible deterrence and projecting a national presence.

Price Range. In 1995, the price of the vessels was pegged at about \$250 million each, with a total contract value of \$750 million. By 1998, the unit cost of these ships had risen to \$323 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
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Subcontractor

EADS France SAS, Division HQ	http://www.eads.com , 37, Boulevard de Montmorency, Paris, 75016 France,
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	Tel: + 33 1 42 24 24 24, Fax: + 33 1 42 24 26 19 (Exocet Missile)
Kelvin Hughes Ltd	http://www.kelvinhughes.info , New North Rd, Hainault, Ilford, 1G6 2UR Essex, United Kingdom, Tel: + 44 20 8502 6887, Fax: + 44 20 8500 0837 (Type 1007)
MAN B&W Diesel AG	http://www.manbw.com , Stadtbachstrass 1, Augsburg, 86153 Germany, Tel: + 49 821 322 0, Fax: + 49 821 322 3382, Email: info@manbw.de (Diesel Engines)
MBDA	http://www.mbda-systems.com , Six Hills Way, Stevenage, SG1 2DA Hertfordshire, United Kingdom, Tel: + 44 1438 312 422, Fax: + 44 1438 753 377, Email: css.MBDA-Group@mbda.net (Seawolf Missile)
Oto Melara SpA	http://www.otomelara.it , Via Valdilocchi 15, La Spezia, 19136 Italy, Tel: + 39 0187 5811 11, Fax: + 39 0187 58266, Email: press-office@otomelara.it (76mm L62 Super Rapid)
Repaircraft plc	http://www.repaircraft.com , The Common, Cranleigh, GU6 8LU Surrey, United Kingdom, Tel: + 44 1483 273536, Fax: + 44 1483 278078, Email: hq@repaircraft.co.uk (Hull Structure Components)
Thales Underwater Systems	http://www.thalesgroup.com/naval , 525 Route des Dolines, BP 157, Sophia Antipolis, 06903 France, Tel: + 33 4 92 96 30 00, Fax: + 33 4 92 96 41 24, Email: TUS@thales-underwater.com (TSM-4130)
Ultra Electronics Command & Control Systems (formerly Radamec Defence Systems Ltd)	http://www.ultra-ccs.com , Knaves Beech, Business Centre, Loudwater, High Wycombe, HP10 9UT Buckinghamshire, United Kingdom, Tel: + 44 44 1628 530000, Fax: + 44 44 1628 524557 (2500 Optical Director)

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Contractors are invited to submit updated information to Editor, International Contractors, Forecast International, 22 Commerce Road, Newtown, CT 06470, USA; rich.pettibone@forecast1.com

Technical Data

	<u>Metric</u>	<u>U.S.</u>
Dimensions		
Length (overall)	95.0 m	311.7 ft
Length (waterline)	89.9 m	294.9 ft
Beam (overall)	12.8 m	42.0 ft
Draft (hull only)	3.6 m	11.8 ft
Draft (max, with sonar)	4.5 m	14.7 ft
Displacement		
Standard		1,500 tonnes
Full Load		1,940 tonnes
Performance		
Speed	55 kmph	30 kt
Range	9,200 km at 22 kmph	5,000 nm at 12 kt
Endurance	14 days minimum	
Crew	8 officers, 54 enlisted	
Additional (Temporary) Berthing Capacity	24 (five days)	
Weaponry		
Missiles – SSM	Exocet MM40 Block II	2x 4
– SAM	BAE Seawolf	16
Launchers	BAE VLS cell	1x 16
Guns (dual purpose)	76mm L62 Oto Melara Super Rapid	1
	MSI 30mm L75	2
Torpedoes	Marconi 324mm	6 (2x 3 tubes)
Helicopter	Platform for medium-duty unit (S-70)	1
	<u>Type</u>	<u>Number</u>

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	<u>Type</u>	<u>Number</u>
	Black Hawk)	
Electronics		
Radar – Air/Surface Search	Siemens AWS-9 (E/F-band)	1
– Surface Search	Kelvin Hughes Type 1007 (I-band)	1
– Fire Control	Marconi 1802 SW (I/J-band)	2
– Navigation	Thales Scout	1
Countermeasures – Decoys	Super Barricade	2
ESM	Marconi Falcon intercept	1
Combat Data System	Nautis Mk 2 with Link Y	1
Weapons Control	Rademac 2500 EO tracker	1
Sonar	Thales TSM-4130C1	1
Machinery		
Diesels	MAN 20RK270	4
Power Generation	Diesel engine generator sets	4
Rudders	Underslung	2
Propellers	CP; on 2 shafts	2

Design Features. The design submitted by Yarrow to Brunei for this requirement was a scaled-down version of the 2,270-tonne Lekiu sold to Malaysia, without the helicopter hangar and the aft mast of its Malaysian half-sister. The ship was designed primarily for surface warfare operations, with eight Exocet anti-ship missiles. Significant anti-air self-defense capability is provided by a 16-cell vertical launcher for British Aerospace Seawolf missiles backed up by a 76mm L62 Oto Melara Super Rapid gun on the foredeck and one MSI 30mm L75 on each side of the main mast. The VLS (vertical launch system) is located between the main gun and the superstructure, and the rear area is covered by the helicopter platform, with the fire control radar overlooking it on a pedestal. An unusually large funnel provides an access path to the engine room. Adjacent to the engine room is the RIB (rigid inflatable boat) on a davit ready to launch on short notice.

The helicopter platform can house a medium-duty aircraft such as a Sikorsky S-70 Black Hawk or a Bell 212. The program definition required provisions for such a helicopter with no handling system but with night landing facilities and a refueling system having HIFR (helicopter in-flight refueling) capability. The overriding idea is to provide prolonged operations capability at sea with more effective armament and greater range than offered by the 37-meter Waspada class.

The original requirements for these ships specified a displacement of 1,200 to 1,500 tonnes, with a length of no more than 85 meters. Draft was specified as a maximum of 4.5 meters at the lowest point of the hull, sonar dome, or propellers.

One or two high-speed turbocharged and intercooled diesel engines, preferably by MTU, were specified as a requirement, coupled to one or two reduction gearboxes

with flex couplings and controllable clutches. The alternative would have been a diesel-electric propulsion system. The ship has an automatic machinery control system, two main machinery rooms, and two underslung rudders for steering.

The hull itself was specified as having a set of non-retractable (fixed) fin stabilizers because of the anticipated operating conditions. The power generation capability with four diesel engine-driven generators was specified at three times the action load so that a single generator would be able to meet the normal cruising load (triple redundancy).

The ASW capability of the proposed design is primarily self-defense, although the combination of a capable bow sonar and the ability to handle a helicopter does provide a basis for a more significant level of performance. However, a serious ASW design would have a hangar rather than simply an operating deck for the embarked helicopter.

Operating Characteristics. While the offshore patrol vessel (OPV) project was originally criticized as having been rather obviously written around the Vosper specifications, the contractor eventually favored was the rival Yarrow Shipyard. More to the point, the frigate specified in the requirements by the Navy resulted in a ship well suited for the Brunei Navy's need for endurance, firepower, and self-defense capability.

The RBAF set out to procure a multimission vessel capable of maintaining a credible deterrence and projecting its presence in the regional waters. The foreseen roles of such a ship thus included patrolling and policing the country's continental shelf area, which includes oil platforms, as well as other portions of the Brunei exclusive economic zone (EEZ). Another function for this ship class is the prevention of piracy, which is a pervasive problem in the waters around the

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islands of Brunei. These vessels are expected to operate primarily in a stand-alone mode.

Furthermore, the relatively low number of crew required to operate the ship should give the Navy the capability to fulfill its self-imposed missions while stepping up

operational readiness. These missions include helicopter night landings and refueling on 2,000-tonne ships in up to Sea State 4. The operational endurance of the ship is stated as the requirement-specified 14 days, with a range of up to 5,000 miles at a speed of 12 knots.



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Source: BAE Systems

Variants/Upgrades

Lekiu. The design offered to Brunei evolved from the Lekiu class frigates previously sold to Malaysia. The version being proposed is a downsized variant of the Lekiu, minus the aft mast and helicopter hangar. The Nakhoda Ragam class have only a landing facility for a medium-size helicopter, which is located on the aft deck. The weapons choices are similar to those of the Malaysian ships, and the displacement of the OPVs was increased from the originally projected 1,200-1,500 tonnes to about 2,000 tonnes. Also, the ships' combat management system is based on the Nautis-F, which was used on the Lekius.

The similarities in the designs of the two ship types are understandable because they operate in similar conditions. The primary difference between the two ships is the addition of ASW capability on the Brunei ships, which means that sonar and lightweight torpedoes are incorporated.

Vigilance. This was the name of the original winning design by Yarrow, in 1989. However, that design is believed to have been substantially different from the current plans, since the total price of the first contract was valued at no more than \$480 million (GBP300 million) at the time.

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Program Review

Background. The limited naval capability of the Royal Brunei Armed Forces (RBAF) was based around three Waspada-class fast attack craft with missiles. Those 37-meter boats, built by Vosper-QAF in Singapore in the late 1970s, were modernized in the early 1990s with new electronic warfare systems, and received new radars and electro-optical fire control systems in 1998. They were, however, fast approaching the end of their hull lives and were clearly inadequate to patrol this oil-rich nation's coastal areas. The Brunei Navy perceived a requirement for a more capable class of ship to protect territorial waters against unwanted infringement, to police sovereign areas, and to establish a credible national defense capability.

The Brunei OPV Program

The RBAF had already begun seeking interested bidders for a potential three-ship program of offshore patrol vessels or corvettes in 1987. Bids for these vessels were formally requested in 1988; in 1989, Vosper Thornycroft's Vigilance design was selected. This design was a 77.7-meter blue water offshore patrol vessel with a displacement of 1,135 tonnes. Unexpectedly, however, the deal on the Vigilances was canceled, and no contract was ever signed with Vosper. By late 1990, the Brunei Navy was reported to have reopened the bidding for the construction of three to five corvettes or large OPVs.

In December 1994, a Memorandum of Understanding on defense equipment and infrastructure was signed between the U.K. and Brunei governments. The MoU provided a framework for a revival of the Brunei light frigate requirement. Accordingly, the RBAF issued a new Request for Tenders (RFT) on April 28, 1995, this time for three ships. By then, the initial list of 20 potential bidders had been narrowed down to nine shipyards by the RBAF's Project Steering Committee. At the time, the RFT appeared to have been written around the specifications of an 83-meter Vosper Thornycroft corvette, with a displacement of 1,200-1,500 tonnes. The tenders were received from seven bidders in June 1995. From the U.K., these included both Vosper and the Scottish GEC-Marine Yarrow Shipbuilders. A contract was expected to be issued by March 1996. At the time, the target in-service date for the first-of-class was January 2000, with the second and third unit following at one-year intervals.

Yarrow Win

Yarrow was announced the winner in December 1995, with a deal valued at GBP600 million (not confirmed by

Yarrow). Nevertheless, the contract signing was once again delayed, this time because of the Navy's indecision about the weapons and sensor fit on the ships. The open items were reported to include the VL SAM (vertical-launch surface-to-air missile) system as well as the command system. The Brunei Navy reportedly chose Nautis and VL Seawolf conditionally in mid-1996 but delayed confirmation until it was satisfied that the problems with the Malaysian Navy's combat systems had been resolved.

In September 1996, Brunei sought to purchase 48 Harpoon anti-ship missiles made by McDonnell Douglas and an unspecified number of SeaSparrow surface-to-air missiles made by Raytheon of the U.S. These contracts were never confirmed, however. Later, the Seawolfs and Exocets were indicated to still be the missile choices for the ships.

Delays in Signing

In February 1997, the Brunei Navy was said to be ready to sign a contract for three corvettes, and a spokesman for Yarrow said all contract documentation was expected to be completed by the middle of the year. Detail design was expected to take about a year, with construction to begin in 1998. If that had been the case, the first ship would have been delivered in 2001.

At this point, the situation became exceptionally unclear. It was first reported that the final contract for these ships had been signed in June 1997; then it was reported that the final government-to-government contract had been signed in January 1998. Those reports were definitive in stating that construction was expected to begin in 1999, with the first of the series to be delivered to the Brunei Navy in 2002. This would probably mean launching the craft in 2001, while the other two would follow at one-year intervals. However, this apparently authoritative report was thrown into doubt by the apparent failure of the Brunei government to sign the requisite contracts. As of September 1999, there still was no movement on this issue, and there were reports that the entire program might be reopened to bids.

In early 2000 it was reported that the entire Brunei warship program might be canceled and rebid on the basis of a larger and more capable ship. The reported problems with the Malaysian Lekiu class might have had a bearing on these rumors; these ships were delivered three years late due to systems integration difficulties. It was reported that the preferred contender for any new program would be the German MEKO-A

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design. However, the credibility of such reports was questionable.

Construction Under Way

Fortunately, events during 2001 allowed most of these doubts to be resolved. It appears that the actual contract was not signed until January 14, 1998, due to delays in selecting the weapons system and weapons-control package. Information released in early 2002 confirmed what most naval engineers had already assumed, that the design was a reduced version of the Lekiu class built for Malaysia. At the same time, it was stated that the unit cost of these ships was about \$323 million. The first of the three ships was launched in January 2001, and the second followed in July. Working backwards from that data suggests that construction started in 1999. Again, this was confirmed when the official lay-down dates for the first two ships were confirmed as being March and November of that year. The third of the class was laid down at Yarrow's Scotstoun Yard in July 2001. The first ship started to run sea trials in January 2002, and the second-of-class started machinery trials in June 2002. That month also saw the launch of the third and last ship in this class. The Bendahara Sakam started sea trials at the end of August 2002.

By August 2004, the last of the three ships had been "delivered" to the Brunei Navy in the sense that the ships had been completed and had finished their builder's trials. However, the Brunei Navy refused to accept the ships, allegedly because they did not meet its standard requirements for acceptance. Brunei also refused to make the final payment on these ships. BAE Systems responded by taking the Sultan of Brunei to court over the issue. From that point, the matter went to international arbitration, where it resided for more than two years.

Funding

This program is funded by the RBAF through the national defense budget. The first contract proposal for three ships, in 1989, stipulated a cost of about \$100 million each. When the renewed round of Requests for Proposals was issued in 1995, it was estimated that each ship would cost \$250 million. By 1997-1998 it was believed that the entire contract was worth about GBP600 million, or \$980 million based on current exchange rates. The final contract terms were reported to be the equivalent of \$323 million per ship.

Contracts/Orders & Options

<u>Contractor</u>	<u>Award (\$ millions)</u>	<u>Date/Description</u>
Datel Defense		Apr 1999 – Supplier management services for the Brunei OPV combat system program.
GEC Marine Yarrow Shipbuilders	980	Jan 14, 1998 – Final contract signed for three ships (contract sum unofficial estimate).

Ships for Sale

Eventually, the international arbitration court ruled entirely in favor of BAE Systems, essentially stating that the complaint and objections made by Brunei were specious and without foundation. The court ordered Brunei to pay for the ships in full (presumably, though not explicitly stated, including the costs of maintaining the ships during the two years they were laid up) and to take delivery of them. This ruling was set aside while BAE Systems and Brunei negotiated a private agreement under which the cost of the ships was paid and they were removed to Lürssen Werft for sale. This concluded the Nakhoda Ragam program.

Despite many rumors, the only solid interest in these ships that emerged during the 2007/2008 period was a reported approach from the United Arab Emirates. Other possible purchasers reportedly included Malaysia and the Philippines, but these are purely speculative. In late 2007, the ships were towed from their construction yard near Glasgow to be berthed near Barrow-in-Furness. This move was simply to get them out of the way and free up their berths for more productive use.

In September 2009 it was reported that the Algerian Navy was interested in the purchase of the three Nakhoda Ragam class frigates as replacements for their collection of old Russian-built patrol craft. Unfortunately, this report was picked up as being a definite sale by a number of Internet sources (most notably Wikipedia) and is often now quoted as such. In reality, the original report remains unconfirmed. Other than this largely illusory activity, there is no indication at this time that a sale is likely.

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Timetable

<u>Month</u>	<u>Year</u>	<u>Major Development</u>
Late	1987	Royal Brunei armed forces begin seeking bidders for OPV/corvette
	1988	Formal procurement process launched
Late	1989	Vosper Vigilance design selected; procurement canceled prior to signing of contract
Dec	1994	U.K., Brunei sign memo on defense equipment, infrastructure procurement
Mar	1995	Original target date for contract announcement
Apr	1995	Renewed Request for Tenders
Jun	1995	Proposals submitted by seven bidders
Aug	1995	Yarrow announced as prime choice for new package
Dec	1995	Official contract award to Yarrow
	1996	Detail design completed
Sep	1996	Harpoon missiles sought from the U.S.
Feb	1997	U.K. solution led by Yarrow confirmed as Brunei's preferred selection
Jan	1998	Final contract reportedly signed
	1999	Estimated construction start
Jan	2001	First ship launched
Jul	2001	Second ship launched
Jun	2002	Third ship launched
Aug	2004	Last ship "delivered" to Brunei Navy
Jun	2007	International arbitration rules in favor of BAE Systems. Ships offered for sale

Worldwide Distribution/Inventories

Brunei. Three completed. For sale.

Forecast Rationale

Despite widespread reports that the Nakhoda Ragam class had been purchased by the Algerian Navy, this potential sale remains unconfirmed. All the existing reports derive from a single story that the Algerians were "interested" in the purchase of these three ships. This story was then taken up by a variety of Internet sites, during which process an "interest" somehow became misread as an "order." The fact of the matter is there has been no further development in this possible sale since the original story appeared in October 2009.

In fact, candidates for the purchase of these ships are limited. Algeria, Thailand, Malaysia, the Philippines and the UAE have all been mentioned as prospective

buyers, but none of these reports appear to be more than speculation. The problem is that these ships are no longer new. They are more than six years old, and that has to figure in their price. Their onboard systems are aging and drifting into obsolescence. Finally, the ships do not have aviation facilities, and that is a critical limitation in today's environment.

At this time, it is hard to see a potential purchaser for the Nakhoda Ragam class unless the ships are virtually given away. That being the case, no forecast for additional construction can be made. This report will be archived next year.

Ten-Year Outlook

In the absence of any projected orders for ships of this class, the forecast chart has been deleted.

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