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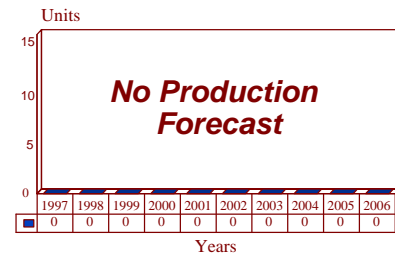
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Type 1500/1700 - Archived 8/97

Outlook

- No further production anticipated

10 Year Unit Production Forecast
1997 - 2006



Orientation

Description. Diesel-electric torpedo attack submarines tasked with anti-surface warfare (ASuW) and patrol operations.

Sponsor

Howaldtswerke Deutsche Werft
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Germany
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Argentine Naval Procurement Executive
Jefatura IV - Logistics (EMGE)
Azopardo 250
Buenos Aires
Argentina

Contractors

Thyssen Nordseewerke
Emden
Germany

Howaldtswerke Deutsche Werft
PO Box 146309
D-2300 Kiel 14
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Tel: +49 431 7000
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Licensee

Astilleros Domecq Garcia
Tandanor
Buenos Aires
Argentina

Status. In service.

Total Produced. A total of four Type 1500 and two Type 1700 submarines are in service.

Application. The Type 1500 and 1700 submarines are designed to conduct long-range patrol operations, conducting both anti-ship and anti-submarine warfare.

Price Range. The original price was estimated to be between US\$200 and US\$225 million.

Technical Data

Characteristics

Speed (surface):	11 knots
Speed (snorting):	8 knots
Speed (submerged):	22 knots
Range surfaced:	13,000 nm at 10 kts
Range submerged:	460 nm at 6 kts submerged
Design diving depth:	260 m (853 ft)
Patrol length:	50 days
Crew:	8 officers and 32 enlisted

Dimensions

Length:	64.4 m	211.2 ft
Beam:	6.5 m	21.3 ft
Draft:	6.0 m	19.7 ft
Displacement, surface:		1,655 tons
Displacement, submerged:		1,810 tons

Armament

	<u>Type</u>	<u>Quantity</u>
Torpedo tubes:	21 in (533 mm) bow tubes	8
Torpedoes:	STN Atlas Elektronik SUT	22
Mines:	Strap-on external pods	24

Electronics

	<u>Type</u>	<u>Quantity</u>
Sonars:		
Integrated bow suite	CSU-83	1
Passive rangefinder	DUUX-5	1
Radar:	Thomson-CSF Calypso II	1
ESM:	ARGO Phoenix II	1
Periscope:		
Search and attack	Kollmorgen Model 76	1
Command System:	Singer Libroscope	I

Propulsion

	<u>Type</u>	<u>Quantity</u>
Diesels:	MTU 16V493 TY60	4x800 shp
Electric motors:	Siemens	1x6,600 kW
Batteries:	132-cell Varta	4

Design Features. The Type 1500 class submarine is designed so the electronics, weapons systems and engineering systems can be changed to suit the needs of a particular client. The characteristics given above apply to submarines in Indian service. The hull is built to a double compartment standard and includes a Gabler escape sphere to provide emergency exit facilities.

The ships are being modified post-delivery with updated systems. These include the replacement of the Varta batteries with British Chloride equivalents, supplanting the TY60 diesels with the AZ80 version and, according to

some accounts, replacing the Thomson-CSF Calypso radar with the Kelvin-Hughes Type 1007.

Operational Characteristics. The primary armament is torpedoes. There are eight 21-inch torpedo tubes using the German SUT wire-guided torpedo. It has speed/range ratios of 18 kts to 28 km, 23 kts to 18 km or 35 kts to 13 km. The submarine has a maximum capacity of 22 torpedoes with eight in the tubes and 14 reloads, although the tubes are not normally carried loaded in Indian service. The Indian Type 1500 submarines can also carry minelaying pods which hold up to 20 mines externally.

Variants/Upgrades

Type 1500 Mod. The two additional Type 1500 submarines requested for the Indian navy were to be equipped with modernized systems as compared with the older four ships. This was to include upgraded sonars and diesels.

Type 1700. The Type 1700 has a Krupp-Atlas CSU 3-4 active/passive sonar and a French DUUX 2A passive sonar, manufactured by Thomson-CSF. The French Calypso II navigation radar can also be used to give target bearing and range when the submarine is running at periscope depth. The Type 1700 has a Kollmorgen Model 76 search and attack periscope, which has electronic range-finding and can be fitted with a still or television camera.

Command and control is handled by a Hollandse Signaalapparaten Submarine Integrated Battle and Data System (SINBADS). It presents data from all the ship's sensors, on three displays: a graphic display for target evaluation, a plan position indicator for weapon control, and an electronics data presentation for alphanumeric display of various data. One operator can track five targets

simultaneously and control three torpedoes with the system.

Surface propulsion comes from four MTU 16-cylinder 16V652 MB80 diesel engines each developing 600 shp for a maximum surface speed of 13 kts. Underwater, eight 120-cell Varta Hagen CSM (Copper Stretch Metal) batteries power a Siemens 6,600 kW motor, giving a maximum underwater speed of 25 kts. The Type 1700 has a range of 15,000 nm at 5 kts, a patrol time of 70 days, and a test depth of 870 feet.

The primary armament is torpedoes. There are six 21-inch torpedo tubes. The Argentine Type 1700 submarines use the German SST-4 wire-guided active/passive homing torpedo. It has speed/range ratios of 35 kts to 12 km, 28 kts to 22 km and 23 kts to 40,000 km. The submarine holds 22 torpedoes with six in the tubes and 16 reloads.

Dolphin. Two updated variants of the Type 1500 design with a more modern equipment fit are being built for the Israeli navy. These are covered by a separate report.

Program Review

Background. The Type 1500 submarine was developed with the aim of providing a long-range complement to the Type 209 coastal submarine. The latter had established a strong market position and an enviable reputation for cost-efficiency and technical capability. It was, as are all coastal submarines, restricted in operational endurance, weapons load-out, tactical flexibility, and sophistication. Rather than compete directly with the Type 209, Thyssen saw a market developing for a larger version of the design that would correct these limitations while retaining a substantial degree of commonality with the smaller design.

Thyssen, therefore, took the parameters of the largest member of the Type 209 family, the Type 209-1400, and designed a new hull to extend the operational radius, provide greater weapons stowage and generally upgrade the design technology. These included the provision of a central watertight bulkhead (thus providing two-compartment safety margins as opposed to the Type 209 single compartment) and a Gabler escape sphere. The torpedo room forward was doubled in size, effectively allowing for an extra set of reloads, but the Type 209 system of loading torpedoes by sliding them down the torpedo tubes was retained. Also, the use of swim-out tubes was continued, restricting the weapons flexibility of the design.

This design did not initially meet with the hoped-for success. The breakthrough came when Argentina

perceived a requirement for longer-range submarines to supplement the existing two Type 209-1200 boats. While these had proved satisfactory, their limited tactical radius precluded extended operations off the Falklands islands and South Georgia. This requirement was filled in 1977 when the Argentine navy ordered two Type 209-1400 boats to be built in Germany and four Type 1500 boats to be built in Argentine yards with German assistance.

The keel for the first submarine, *Santa Cruz*, was laid in November 1980. In 1982, the Falklands Campaign took place and dramatically altered Argentine perceptions of their requirements. The need for long-range operations had been confirmed, but attempts to engage the British task force had shown that the Type 209-1200 (and thus, by implication, the Type 209-1400 boats under construction) were too slow to make successful interceptions on the fast-moving carriers.

Following the Falklands Campaign, the contract was renegotiated and major changes were made to the design. All six boats were to be built to a common standard featuring a lengthened hull, a new command system, and a reconfigured power train. This had double the battery power of the earlier configuration but reduced diesel charging capacity. The effect of this change was to markedly increase the underwater speed of the boat at a cost of greatly increased charging times once the batteries were discharged. Thus the boats could make their attacks

at high speeds to intercept the British carriers, then creep away while the ASW hunt took place around them. This modified Type 1500 design was designated the Type 1700 and is the fastest diesel-electric submarine in operational service.

The first Argentine Type 1700 was commissioned in October 1984. The second submarine, *San Juan*, was commissioned in September 1985. The keel for the first Argentine-built submarine was laid in October 1983, and the second keel was laid in November 1985. Work on these two submarines progressed at a very slow pace through 1988, due to a lack of submarine construction experience and cuts in Argentina's defense budget. Assembly of long-lead materials for the fifth Type 1700 began in mid-1986, but due to construction and budget problems, the decision was made to indefinitely postpone construction of the sixth submarine.

In 1986, due to its financial problems, Argentina began looking for a foreign buyer for the domestically built submarines. In June 1986 Argentina and Germany nearly reached an agreement to sell the first two submarines, *Santa Cruz* and *San Juan*, but Germany, which had provided some Type 1700 program funding, decided against such a sale.

While the Argentine program was under way, Germany continued marketing the basic Type 1500 design to other navies. This, and the Type 1700, were submitted to Australia, Canada, and Saudi Arabia for their respective submarine programs. None of these navies chose either variant or put it on their short list of alternatives. Eventually, in 1981, India ordered an initial batch of four Type 1500 submarines, two to be built in Germany and two at Mazagon Dockyard in Bombay. The two German-built boats were laid down in 1982 and completed in 1986, while the two Indian-built boats were both laid down in 1984. The first of these two later boats was severely delayed when it was found that every single weld in the pressure hull was faulty and leaking. Following repairs, this boat, the *Shalki*, commissioned in February 1992.

Plans to build four more Type 1500 submarines in India were abandoned in 1989 following comparative trials between the lead boat, *Shishumar*, and *Sindhugosh*, the first of India's eight Russian-built Kilo (Project 877EM)

class submarines. These demonstrated substantial superiority in many areas over the German-designed boats. The Type 1500 submarines also proved to be very expensive and difficult to maintain. Production of Type 1500 boats was, therefore, planned to cease when the last hull was delivered.

In July 1992, naval sources in Argentina reported that only three of the four remaining Type 1700 submarines would be completed. The *Santa Fe* was 50 percent complete at that time, the *Santiago del Estero* was 30 percent complete, but work on S45 had only just commenced with the ship less than five percent completed. The materials assembled for S46 had been utilized for the other three ships while mechanical components had been used to keep the two in-service boats running. In late 1993, this announcement was followed by a decision to suspend construction of the S45 and to use the components assembled for it to complete the first two boats. Finally, in February 1996, the Argentine Government admitted defeat and stated that no further work was to be attempted on the incomplete boats. The submarine construction yard was already being converted to other roles and the parts for the incomplete submarines would be sold or scrapped.

The Indian plans to end construction of the Type 1500 in favor of the Russian Kilo received a serious blow with the collapse of the Soviet Union. This placed the supportability of India's Russian-built fleet in grave doubt. One response was to plan an order for an extra pair of Type 1500 submarines to replace the last of the Foxtrot (Project 641E) class boats. These elderly submarines were perceived as being the most likely to suffer from any impending spares famine. The two new Type 1500s were also seen as continuing a useful diversification of supply and were to be built to an improved equipment standard. In the event, the order was apparently not ratified by the Indian government and no formal plans to acquire these submarines are in place. In mid-1994, the Indian navy placed orders for six ship-sets of the TSM-2233 Eledone integrated sonar system. These are reported to be for the Type 1500s but a more logical explanation would be that they are intended as retrofit equipment for the Kilo class submarines. These are already receiving Western ESM systems.

Funding

Development of the Type 1500 submarine was undertaken as a private venture by HDW. Procurement was funded by the appropriate government, often with extensive financial assistance from the German Government.

Recent Contracts

No contractual information has been released.

Timetable

	1970s	Initial requirements raised
	1975	Proposals requested by Argentine navy
Nov	1977	Contract signed with Thyssen Nordseewerke
Nov	1980	First keel laid
Nov	1981	Indians order Type 1500
May	1982	Argentine navy changes order structure
Oct	1983	First Argentine-built submarine keel laid
	1986	First Indian submarines enter service
	1987	Type 1700 program encountered financial difficulties
	1988	Argentine submarines offered for sale
	1990	Argentine program placed on indefinite hold
	1991	All Argentine hulls offered for sale
	1992	Construction of Argentine submarines resumed. Sixth Argentine hull canceled
	1993	Fifth Argentine hull canceled
Dec	1994	Two additional Type 1500s requested by India navy
Feb	1996	Remaining incomplete Argentine submarines abandoned

Worldwide Distribution

Argentina: Two Type 1700

India: Four Type 1500

Forecast Rationale

No matter how good a basic design is, there are limits to how far that design can be developed. Once those limits have been reached, further advances can only be achieved by starting a new design family; further exploitation of the existing design will not lead to satisfactory design solutions. The Type 1500 is an archetypal example of this principle. Its basis, the Type 209 coastal submarine, is one of the classically great warship designs, but the Type 1500 and its Type 1700 cousin do not come close to this achievement. On their size and tonnage, a far superior product could have been produced and their market acceptability has suffered accordingly.

The results of the Indian comparative trials of the Type 1500 and the Kilo are illuminating. These trials were carried out in a highly professional and objective manner and their results showed that the Russian design was far better conceived and thought through than its German

rival. It is now becoming obvious just how excellent a basic design the Kilo class is. Although, as always, costs were a major factor in the Indian decision to halt Type 1500 procurement in favor of additional Kilo class boats, this reflects very high operational costs of the German submarines, not very low costs for the Russian equivalent.

Argentina formally canceled the remainder of its submarine order. This action was taken early in 1995, but was not announced until February 1996. By that time, the construction yard had been demolished prior to conversion. The incomplete submarines and the accumulated spares are for sale but all are reported to have deteriorated beyond redemption. With the arrival of the Type 212 submarine and its export derivatives, it is difficult to see a market for the Type 1500 or the Type 1700.

Ten-Year Outlook

No construction is forecast.

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