

ARCHIVED REPORT

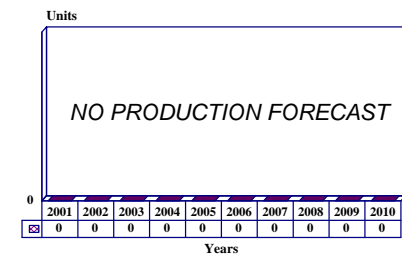
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Ula Class - Archived 3/2002

Outlook

- No further construction probable
- MSI-90U command system being upgraded
- Design now too aged to appeal to export market
- Any successor will be from Project Viking

10 Year Unit Production Forecast
2001-2010



Orientation

Description. Diesel-electric attack submarines.

Sponsor

Royal Norwegian Navy Material Command
 Haakonsvein
 N-5078
 Norway

Contractors

Kongsberg AS
 PO Box 103
 N-3601 Kongsberg
 Norway
 Telephone: +47 3 738250
 Telefax: +47 3 738586
 (Combat systems)

Kværner Brug

Oslo
 Norway

(Prime; pressure hulls for all but the first of class)

Thales Radar Defence Systems Limited

Davis Road
 Chessington
 Surrey KT9 1TB
 United Kingdom
 Tel: +44 181 397 5281
 Telex: 28748
 (ESM system)

Thyssen Nordseewerke

Emden
 Germany
 (Final assembly)

Licensees. No production licenses have been granted.

Status. In service, with electronic systems being upgraded and modernized as improved versions become available.

Total Produced. Six

Pennant List

<u>Ship</u>	<u>Builder</u>	<u>Launched</u>	<u>Commissioned</u>
S300 <i>Ula</i>	Thyssen Nordseewerke	7/1988	4/1989
S305 <i>Uredd</i>	Thyssen Nordseewerke	9/1989	5/1990
S303 <i>Utvaer</i>	Thyssen Nordseewerke	4/1990	11/1990
S304 <i>Uthaug</i>	Thyssen Nordseewerke	10/1990	5/1991
S302 <i>Utstein</i>	Thyssen Nordseewerke	4/1991	10/1991

<u>Ship</u>	<u>Builder</u>	<u>Launched</u>	<u>Commissioned</u>
S301 <i>Utsira</i>	Thyssen Nordseewerke	11/1991	4/1992

Mission. This class of submarines is designed for coastal anti-ship and anti-submarine warfare. It can also conduct patrol and surveillance operations.

Price Range. The first-of-class cost US\$250 million, with the remaining five members of the Ula class costing an equivalent of US\$82 million each. This results in an average cost of around US\$110 million each.

Technical Data

Specifications

	<u>Metric</u>	<u>US</u>
Dimensions		
Length:	59 m	193.6 ft
Beam:	5.4 m	17.7 ft
Draft:	4.6 m	15.1 ft
Diving Depth:	250 m	820 ft
Displacement		
Standard:	940 tonnes	
Surface:	1,040 tonnes	
Submerged:	1,150 tonnes	
Performance		
Speed — Surface:	20 km/h	11 kn
Speed — Submerged:	42 km/h	23 kn
Range:	9,260 km at 15 km/h	5,000 nm at 8 knots
Fuel Load:	100 tonnes	
Endurance:	40 days	
Crew:	3 Officers, 15 - 17 Enlisted	
Armament		
	<u>Type</u>	<u>Number</u>
Torpedo Tubes:	21 in (53 cm)	8
Torpedoes:	DM2A3; wire guided	14
Electronics		
Sonars:	CSU-83	1
	Thomson-CSF PVDF flank arrays	2
Radars:	Type 1007	1
EW	Racal Sea Lion ESM	1
Periscope:	Zeiss SERO-14	1
	Zeiss SERO-15	1
Tactical Combat System:	NFT MSI-90U	1
Propulsion		
Diesel Engines:	MTU 16V652 TB91 1,260 hp each	2
Generator Sets:	3-phase NEBB, 870 kW each	2
Electric Motor:	Siemens, 6000 shp	1
Battery:	Hagen/Varta	
Propeller:	Fixed pitch	1

Design Features. The Type 210 Ula class represents the prototypes (and smallest versions) of the latest generation German submarine designs. These are intended to replace the Type 209 on the international marketplace over the next decade or so. Larger derivatives of this design include the Israeli Dolphin class and the new German Type 212, as well as the recently announced Type 214 variant.

The powerplant is a diesel-electric system that allows the submarines to patrol for 40 days. The engines for surface propulsion and running the gensets are two MTU 16V652 TB91 diesels, at 1,260 horsepower each (some sources list the main powerplant as being two MTU 16V396 SB83 diesels, with a sustained output of 2,700 hp or 1.98 MW). The submarines have a maximum surface speed of 11 knots. The undersea propulsion system consists of one 4.41 MW (6,000 shp) Siemens electric motor, using Hagen/Varta batteries. The snorkeling speed is 8 knots, while the maximum underwater speed is 23 knots. The class has a range of 5,000 nautical miles at 8 knots. The maximum operating depth is 820 feet, with a never-exceed depth of 1,000 feet. Normal safety factors suggest a crush depth of around 1,500 feet.

The electronics suite consists of a mixture of sensors providing the navigation and fire control information required by the submarine to complete its assigned mission. The sonar is the Atlas Elektronik CSU-83. This is a fully integrated system, and includes an active bow array and passive flank arrays. The latter are provided by the Thomson-CSF group and utilize piezo-electric/PVDF technology to reduce flow noise. The Carl Zeiss SERO-14 and SERO-15 periscopes are advanced versions of the periscope carried by most other German and Norwegian submarines. The surface navigation radar is the Thomson-CSF Calypso III, which gives target bearing and range when the submarine is running at periscope depth.

Information from ship sensors is integrated by the NFT MSI-90U tactical command system. This can track 12 contacts simultaneously while controlling eight torpedoes. The four consoles each have two side-by-side CRT (cathode ray tube) displays that give true or

relative bearing. A time bearing recorder is provided for long-term plotting. KS 900F microprocessors are located within each console for system redundancy and simplification. The system performs target classification and identification, target motion analysis, threat evaluation, engageability analysis, torpedo and sensor control and guidance, tactical navigation, sound path analysis, data recording, and simulation for training. This command system was also "obtained" by the Russian Navy for the Project 671RTMK (Victor III) and the Project 877EKM (Kilo) class submarines.

The Ula is equipped with Phontech's digital UVB fiber-optic intercommunication system. The system provides 32 positions, four operations modes, seven different conference groups, selective calls, and an emergency all-call feature. In addition, the system can be outfitted with power loudspeakers, a magnetic loop system, and custom headphones.

Operational Characteristics. The torpedo tube arrangement is similar to that of the Type 209: eight tubes and 14 torpedoes with no provisions for mines or missiles. The submarines carry the German DM2A3 wire-guided torpedoes. The torpedoes have an active/passive sonar homing head and a maximum range of 23 nautical miles at 35 knots. Norwegian sources have suggested that the Swedish Tp-62 heavyweight torpedo may be acquired for these submarines. The choice of weaponry also plays a role in the future decision of Ula's successor.

The torpedoes are fired using the "swim out" method. It is quieter and requires less equipment than the water pulse or pneumatic ram methods used in active ejection, but does not allow the submarine to carry any mines or missiles in its tubes. Any mines must be carried in external racks. The discrepancy between the number of tubes (eight) and number of reloads (six) suggests that two torpedo-sized decoys are also carried.

The Ula class submarine crews include both male and female members, although no physically separate accommodation facilities are provided. Such provision would not be technically feasible in a submarine of this size.



KNM Utsira, outboard of British Upholder class submarine HMS Ursula.

This picture highlights the small size of the Norwegian Ula class

Source: Forecast International

Variants/Upgrades

Modernization. It was reported in 1997 that the Royal Norwegian Navy was still in the process of completing the procurement program for the six Ulas. A reference was made to the installation of a logistics system, operation trainer, and new torpedoes in relation to these submarines, suggesting either that the boats were not finished until well after they had been put into use, or that plans were being made to update the said component areas on the submarines in the future. Replacement plans for the four Kobbens were also being prepared at the time (Viking), which in this context could indicate that the above components were indeed part of a plan to keep the Ulas up-to-date until the replacements arrive.

The MSI-90U submarine combat direction system is installed on the Ulas. It makes these boats one of the forerunner platforms for this family of software and hardware. The same system will be also fitted on the upcoming German and Italian Type 212s.

Deliveries of the Ula class are expected between 2002 and 2008.

According to the Navy, the land-based tactical trainer at the submarine school will be also modernized accordingly to correspond to the command system update.

P6071. The program was redesignated P6071 when it became Norwegian-only in the mid-1970s, having until then been developed as a bi-national project with Germany. This is now the official designation of the program within the Royal Norwegian Navy.

Type 210. This class was designated as Type 210 by the manufacturer in Germany. This program was terminated in 1977 by the German Navy but certain elements of it were continued in Norway under P6071.

In Germany, the program was redesignated Type 211 and developed further from the concept originally begun in Norway. Type 211 was then terminated in 1987, followed by its successor, Type 212.

The Israeli Dolphin class is an offshoot of this same design family, preceding Type 214.

Program Review

Background. Norway built a fairly large submarine force in the mid-1960s. The backbone of this force was the Type 207 Kobben class, a derivative of the World War II German Type XXIII. In the 1970s the Norwegian Navy realized that these submarines would reach the end of their effective lives in the late 1990s. Norway and Germany began holding design discussions

in early 1974. As a result the Type 210, developed by Germany for use in the North Sea, was transferred to Norwegian management. The program was redesignated the P6071 or Ula.

In mid-1975, the development talks were joined by Denmark, which wanted to modernize its submarine fleet. The three navies chose the Norwegian plans as

the basis for their requirements and issued a request for bids in 1975. The primary bidder was Ingenieurkontor Lübeck (IKL), the designer of all German and Norwegian submarines since World War II.

IKL presented its design to the three navies in 1976 and questions immediately arose, causing Germany to pursue its own submarine program. Germany wanted a ship of approximately 500 tons for operations in the Baltic and on North Sea coastal patrols. Norway wanted a submarine of about 1,000 tons for protracted operations in the North Sea and North Atlantic. Denmark chose the German design, quoting the cost of the Norwegian design as a primary reason.

During the summer of 1978, the Norwegians officially awarded the design contract for Project 6071 to IKL. In March 1979, Germany and Norway signed a Memorandum of Understanding on the use of common components and technology for the P6071 and Type 211 submarines. In mid-1980, IKL gave the Norwegians the design specifications and drawings. Norway signed a contract with Thyssen Nordseewerke in September 1982 for six P6071 submarines, with an option for two more. Thyssen Nordseewerke had built all of Norway's Type 207 class submarines, and half of Germany's Type 206s. Denmark left the discussions in mid-1983, citing budgetary constraints. In September 1983, Germany and Norway signed a contract for the joint production of 18 submarines. This agreement also envisioned Germany acquiring eight Type 211 submarines from Howaldtswerke Deutsche Werft and four from Thyssen Nordseewerke.

The two countries also agreed to share the systems aboard the submarines, with Norway supplying the command and control/fire control systems, and Germany supplying the sonars, torpedoes, and engines. Germany's agreement to coproduce the submarine with Norway stemmed from two factors. The first was a revision in defense strategy, whereby German submarines would see duty in the North Sea and North Cape rather than just the Baltic. The second was that financial constraints caused Germany to delay plans for the Type 212 "independent fuel source submarine" which would not require external oxygen.

The Norwegian Navy canceled its option for a seventh and eighth submarine in mid-1985, citing budgetary difficulties which were delaying research and development of the new Kongsberg MSI-90U fire control system. These budgetary problems forced Norway to delay the keel-laying of its first submarine. Thyssen Nordseewerke and Howaldtswerke Deutsche Werft ordered long lead materials in 1986 for the Norwegian and the German submarine programs.

On January 29, 1987, Thyssen Nordseewerke laid the keel for the first Ula. The Royal Norwegian Navy and Thyssen Nordseewerke affirmed their agreement that the first submarine would be delivered by February 1989, with the last submarine entering service in April 1992. While the Norwegians were confirming their program, the Germans were suspending theirs. In early 1987 the German government announced cutbacks in defense spending. The German Navy decided to cancel the Type 211 submarine program in favor of Type 212, which will have an air-independent fuel cell engine.

The keel for the second Ula class submarine, KNM *Uredd*, was laid on June 23, 1988. KNM *Ula* was delivered to the Royal Norwegian Navy for preliminary sea trials in early 1989. Sea trials lasted for almost an entire year. On November 11, 1989, while still on sea trials, it was hit by a practice torpedo and sustained minor damage. The submarine was formally commissioned in April 1990. All six boats in the class have since entered service.

In 1993, reports emerged within the submarine community that the Ulas were suffering from serious, but unspecified, operational shortcomings. The US Naval Institute reference book *Combat Fleets of the World 1995* identified the problems as being excessively noisy machinery and weapons systems control deficiencies. Other reports suggest that these problems are not related to the known difficulties with the command system or torpedoes and "are not susceptible to easy rectification." This would imply a construction problem. During 1996, other sources suggested that at least some of the problems were attributable to the propellers. Finally, in 1996, the Norwegian Navy confirmed that it was having systems integration problems with the Ula class.

The Norwegian government maintained a submarine force of 15 ships from the mid-1960s until only a few years ago. During that time, it comprised six Ula class, six modernized Kobben class, and three unmodernized Kobben class submarines. The unmodernized Kobben class boats were decommissioned as the Ula class entered service, reducing total force levels to 12. Only four Type 207 modernized Kobben class submarines are now in service and they will be retired by 2006. They are to be replaced by the Norwegian part of the Norwegian-Swedish-Danish Project Viking joint submarine program. In the event this program fails, the consensus is that the Kobbens will not be replaced and the Norwegian submarine force will be restricted to the six Ula class boats.

Funding

This submarine development program is funded by Royal Norwegian Navy Material Command.

The development of an improved version of the MSI-90U command and weapons control system, also to be used on the German 212 class, is shared equally between Germany and the Norwegian company NFT (Norsk Forsvarsteknologi) A/S. This deal, worth NKr250 million, was agreed upon in the summer of 1994.

Recent Contracts

<u>Contractor</u>	<u>Award (\$ millions)</u>	<u>Date/Description</u>
NFT	N/A	1991 – Production of the MSI-90U command and control system.
NFT	39	Summer 1994 – Development of improved version of MSI-90U for retrofit on the Ulas and new-installation on the German 212s.
N/A	N/A	Summer 1999 – Request for potential bidders to deliver main battery assemblies for the Ulas between 2002-2008.

Timetable

<u>Month</u>	<u>Year</u>	<u>Major Development</u>
	1973	Germany and Norway hold design discussions
	1975	Denmark joins Norwegian/German talks
	1978	Norway awards design contract to IKL
Mar	1979	Norwegian/German Memorandum of Understanding
Sep	1982	Norway orders six submarines from Thyssen
Sep	1983	Norway and Germany sign an agreement to build 18 submarines
Jan	1987	Keel laid for KNM <i>Ula</i>
Jun	1987	Germany withdraws from the program
Apr	1989	KNM <i>Ula</i> commissioned
Apr	1992	Last of class commissioned
Jun	1994	Submarine 2000 program eliminates any plans to build additional Ula class boats

Worldwide Distribution

Norway. 6

Forecast Rationale

The Ula class are the prototypes for the entire modern generation of submarines, the Dolphin, Type 212 and Type 214 classes, being built by the German Submarine Consortium. They mark the breakaway from the classical Type 205/6/9 line of development that dominated German submarine construction up until the mid-1980s.

The problem that this class faces is that it is indeed a prototype. Later designs have built upon its features, corrected its deficiencies and enhanced its merits. As a result, time has passed the Ula class by. No more of the

Ulas will be built. Its successor, the joint Danish/Norwegian/Swedish submarine development program Project Viking, has been struggling with financial problems through most of its existence. Although the three governments regularly reconfirm their commitment to the program, their statements are always qualified by concerns over the potential cost of the project. The Norwegian part of Viking remains set at four submarines. There is an outside chance that if Viking collapses, these submarines will be built as a derivative of the Ula class but this appears unlikely. It is generally thought to be more probable that the

Kobbens will not be replaced and the Norwegian submarine fleet will be restricted to the six Ula class boats.

Any export market for the Ula class has now evaporated. Potential purchasers have other, more advanced designs to select. The Ula lacks the AIP propulsion system now considered obligatory for new submarine construction. In addition, it is too small to be suited to the demands of modern conditions. This is ironic, since the Ula itself arose from a perception that

the originally proposed German-Norwegian design was itself too small to meet Norwegian requirements.

The Ula class is scheduled to remain in service up to 2015-2020, with modernization and upgrading of the MSI-90U command system being the main activity. This will represent the full extent of activity in this program. As a result, unless there is a major development in this program over the next year, this report will be archived next year.

Ten-Year Outlook

No new production of this series is projected – only modernization and upgrade activity of the onboard systems will continue throughout the forecasting period; the forecast chart is therefore omitted.

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