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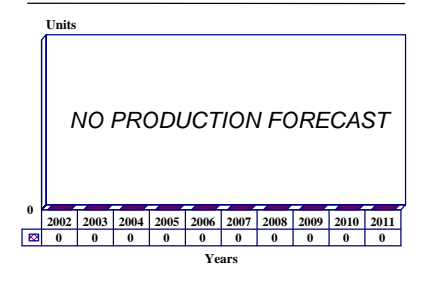
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DM2A3 Seehecht Torpedo – Archived 2/2003

Outlook

- Production concluded
- Demand for the DM2A3 has been slowly declining. No further new orders are anticipated
- The A3 model is being superseded by the DM2A4
- Navies interested in procuring German-made torpedoes are expected to purchase the new DM2A4
- DM2A4 has entered production

10 Year Unit Production Forecast
2002 - 2011



Orientation

Description. Dual-use heavyweight torpedo.

Sponsor. Bundesamt für Wehrtechnik und Beschaffung, Koblenz, Germany.

Contractors. STN-Atlas Elektronik, Bremer-Vulkan GmbH, Hamburg, Germany.

Licensee. Lockheed Martin Tactical Defense Systems, Akron, Ohio (OH), USA.

Status. Production has been concluded.

Total Produced. Approximately 500 predecessor DM1 and DM2A1 torpedoes had been delivered when

production ceased. Approximately 230 DM2A3s were manufactured through the end of 2001.

Application. The DM2A3 torpedo can be used against both surface ship and submarine targets.

Price Range. The price of this torpedo has fluctuated over the years. An earlier sale to Norway includes a per unit price of \$500,000. However, this was part of a major arms procurement package. When only the torpedo is purchased the price is more comparable with that of the SUT torpedo, around \$1.8 million to \$2 million.

Technical Data

	<u>Metric</u>	<u>US</u>
Dimensions		
Length ^(a) :	6,08 m	20 ft
Diameter:	533 mm	21 in
Weight:	1.370 kg	3,014 lb
Weight, warhead:	260 kg	573 lb
Performance		
Range at 35 kt:	20 km	22,000 yd
Range at 23 kt:	28 km	31,000 yd
Maximum Depth:	300 m	1,000 ft

^(a) The wire reel adds 47 cm (18.5 inches) to the overall length of the torpedo.

Propulsion. The propulsion system of the DM2A3 remains unchanged from that of the older torpedoes. The electrical drive system uses silver-zinc batteries to power a motor driving counter-rotating propellers. In the DM2A3, sound signature is reduced by designing the propellers with skewed fiberglass blades and by rafting the motor by means of elastic suspension. Other noise-reducing technologies have been reported as well but not confirmed.

Control & Guidance. A multistage guidance concept is built in, featuring highly intelligent internal guidance programs for the torpedo. These involve the use of the homing head with PFB technology, covering a wide panorama of vision.

The internal design of the electronic systems features the latest in computer technologies in microprocessors linked via MIL-BUS connecting system and fiber optic conductors. The torpedo also includes extensive Built-In Test Equipment (BITE) features.

Launcher Mode. The DM2A3 can engage both surface vessels and submarines. The Norwegian Ula class and German Type 206A and Type 212 submarines carry this torpedo.

Warhead. The DM2A3 carries a 260 kilogram warhead.

Variants/Upgrades

Germany is a premier torpedo developing nation. As part of this program, the following torpedoes were developed:

DM1 Seeschlange. A wire-guided anti-submarine torpedo with two-way datalink and active/passive sonar.

DM2 Seal. A wire-guided anti-ship torpedo with two-way datalink using passive sonar homing.

DM2A1. An improved and longer model of the DM2.

DM2A3. A dual-purpose system capable of undertaking both ASW and ASuW roles.

DM2A4. This model was largely based on the DM2A3's export model, called the Seahake, but with new electric propulsion.

Seahake. A derivative of the DM2A3, intended for export to non-NATO countries.

Seehecht. Alternative name for the DM2A3.

Program Review

Background. The Federal German Navy began considering new torpedo designs in the late 1950s and early 1960s. At that time the German Navy was using the American Mark 37 torpedo (designated the DM3), and it wanted a domestically produced weapon that would be optimized for its own needs. The initial design studies for the DM2 Seal torpedo were a collaborative effort between the German Navy and AEG Telefunken, which had designed many of Germany's World War II torpedoes. The prototype trials of the Seal were held in the mid-1960s. While the Seal was being developed, the Germans saw the need for a dedicated anti-submarine version and began developing a modified version of the Seal, designated the DM1 Seeschlange.

The DM2 Seal became operational in 1969, followed by the DM1 Seeschlange in late 1972. The DM2 Seal was soon superseded by an improved and longer model, designated the DM2A1.

AEG Telefunken produced the Seeschlange at a steady rate through the 1970s. The Seeschlange production

began declining when the SST-3, SST-4 and the SUT torpedoes entered service in the late 1970s. After introducing the new torpedoes, AEG Telefunken and the German Navy began a modification and upgrade program to improve Seeschlange's guidance and propulsion systems. This program continued through 1988. No modified designation was applied to the modified torpedo.

Torpedo Models. The following provides information on the various torpedoes developed by Germany under this program.

DM1 Seeschlange. This was a wire-guided anti-submarine torpedo with two-way datalink and active/passive sonar. The torpedo is released from the submarine using the swim-out method, and data are transmitted over the trailing guide wire. Like the Seal, the wire-guide technology was adopted specifically to suit the tactical environment prevalent in the Baltic Sea.

DM2 Seal. A wire-guided anti-ship torpedo with two-way datalink using passive sonar homing. This

torpedo was released from the submarine using the swim-out method; for surface launch, it was launched over the stern of the ship to avoid fouling guidance wires. In both cases, data transmission took place over the trailing guide wire.

DM2A3. The DM2A3 is a progressive development of the earlier DM1 and DM2 torpedoes, and draws upon the experience gained with the SUT torpedo. The DM1 and DM2 were single-purpose weapons, tasked with ASW and ASuW roles, respectively. In contrast to those, the DM2A3 is a dual-purpose system capable of undertaking both roles. This is achieved by the use of a new 3D panoramic sonar homing head designed as a joint venture between Alenia and STN-Atlas Elektronik.

The key features of this torpedo include an unusually long guiding distance, silent running, impact and improved magnetic proximity fuze, improved communications system, and extended volume of data transmission. The long guidance distance with guidance wire assists in more accurate target determination, translating to higher kill probability. The improved quietness has been achieved through substantially enhanced propeller design combined with other special (proprietary) measures.

Operation in active and passive modes can be selected in several different frequency bands. The weapon is capable of handling multiple target situations using a number of different features that have the capability to identify or suppress jammers and decoys.

The improved fuze technology contributes to the weapon's lethality impact and boosts its ECCM capability to a higher level of performance. The long wire running distance aids results in better two-way communications at a higher data volume. This includes the complete acoustic panorama and noise samples gathered from the operating environment.

DM2A3 is especially suitable for the new combat environments, featuring a stabilization system with highly accurate sensors and regulator systems that have been optimized for multiple operational requirements.

In 1996, Germany decided to use an electrical motor in the DM2A4 and subsequent versions. The same

propulsion unit, using a 275 kW permanent magnetic motor with aluminum-silver oxide battery, will reportedly be retrofitted on the DM2A3s as well. Prior to this decision, Germany and its two partners had been investigating the feasibility of thermal propulsion concepts using either the Wankel-type rotating-piston engine or a turbine engine. According to Germany, a decision had to be made in order to ensure a timely service-entry date for the weapon by 2003, to coincide with the introduction of the Type 212 submarine as well.

DM2A4. The new DM2A4 will be largely based on the DM2A3's export model, called the Seahake. The German Navy wants to have the DM2A4 available for its new Type 212 submarine entering service in 2004. It is feasible that eventually all DM2A3s will be upgraded to DM2A4 once the latter becomes fully operational.

For further information, please see separate "DM2A4 Torpedo" report.

Seahake. Seahake is a derivative of the DM2A3, intended for export to non-NATO countries. It is generally very similar to the DM2A3, with differences in some aspects of the seeker system. No exact information on these changes is available, but they likely involve alterations to the countermeasures software. Differences in hardware are also believed to be included vis-à-vis the DM2A3.

The time schedule of the new Seahake development is unclear, but it appears that the torpedo will become available presently. In June 1995, Israel's Electric Fuel Corporation won a contract to develop the first phase of a new torpedo battery, based on zinc oxygen technology. This technology should provide the torpedo with the desired increases in both speed and range, and may be the key element of the planned DM2A4 upgrades. The current torpedoes use silver/zinc batteries.

Seahake Mod 1. This is the export version of the DM2A4 torpedo.

Seehecht. This is an alternative name for the DM2A3 torpedo.

Funding

The entire development, procurement, and upgrading program for these torpedoes is funded by Bundesamt für Wehrtechnik und Beschaffung (BWB) for the German Navy.

Recent Contracts

<u>Contractor</u>	<u>Award (\$ millions)</u>	<u>Date/Description</u>
AEG Telefunken/Marine	N/A	May 1989 – Trials production of 10 DM2A3 torpedoes for the German Navy.
AEG Telefunken/Marine	50	June 1989 – Production of 100 DM2A3 torpedoes for Norway.
Electric Fuel Corp	N/A	June 1995 – STN-Atlas Elektronik contract for the first phase development of ZnO ₂ battery for new torpedo power source.
Euroatlas	N/A	Late 1997 – DC/DC converters for the DM2A3 program.
FRIWO Silberkraft Gesellschaft für Batterietechnik mbH	N/A	August 1998 – Contract by BWB for the supply of 20 torpedo battery groups, for powering the propulsion and ancillaries of DM2A3.
Lockheed Martin Tactical Defense Systems	65.0	February 1999 – Order for 30 DM2A3 torpedoes to be funded by the US Foreign Military Sales (FMS) program.

Timetable

<u>Month</u>	<u>Year</u>	<u>Major Development</u>
Late	1950s	Design studies for Seal and Seeschlange begin
	1963	Fabrication of DM2 Seal prototypes begins
	1965	Sea tests of DM2 Seal started
Late	1960s	Development and fabrication of DM1 Seeschlange
	1968	Start of sea tests of DM1 Seeschlange, serial production of the DM2 Seal
Sep	1969	DM2 Seal operational in the German Navy
	1972	Serial production of the DM1 Seeschlange initiated
Early	1970s	DM2A1 version of Seal enters production
Mid	1986	Development of DM2A3 Seehecht begins
Aug	1992	DM2A3 service trials begin
	1994	Service entry reported
Feb	1995	Germany completes integration of DM2A3 on Type 206A submarines
	1997	Last German DM2A3 delivered
Feb	1999	Israel orders DM2A3 from Lockheed Martin
	2002	Production of the DM2A3 concluded

Worldwide Distribution

Germany was the original operator of the DM2A3. Severe development problems wreaked havoc on the operational trials program. First test launches of the DM2A3 took place in August 1992, and full service entry did not take place until mid-1994. In February 1995, the German Navy completed the integration of the DM2A3 on board its Type 206A submarines.

In 1989, the **Royal Norwegian Navy** ordered 100 DM2A3 torpedoes for the new Ula class submarines. Delivery of these weapons reportedly took place over a prolonged period. Some sources even claimed that initial deliveries had still not been completed by mid-1994.

In 1999, **Israel** ordered some 30 DM2A3s for its new submarines which were being built by Germany. **Turkey** has also selected the DM2A3 for its latest Type 209 submarines.

User Countries. The initial operator of this torpedo was **Germany** (100 torpedoes delivered). This was followed by an order from **Norway** (100 torpedoes), a purchase by **Israel** (30 torpedoes), and another by **Turkey** (quantities uncertain). **Argentina** is also said to have acquired the DM2A3 torpedo.

Forecast Rationale

The DM2A3 has been superseded by the newer DM2A4 heavyweight torpedo. Demand for the DM2A3 has been slowly declining with the advent of the DM2A4.

Delays with the development of the DM2A4 did help to keep this older torpedo in production longer than once anticipated. However, STN-Atlas Elektronik has

confirmed that production of the DM2A3 has been concluded.

Note: There was speculation that, due to the similarities between these torpedo models, an upgrade package could be offered for the A3 to bring it close to A4 status.

Ten-Year Outlook

ESTIMATED CALENDAR YEAR PRODUCTION

Missile	(Engine)	thru 01	High Confidence Level				Good Confidence Level			Speculative		Total 02-11
			02	03	04	05	06	07	08	09	10	
STN-ATLAS												
DM2A3	UNSPECIFIED	230	0	0	0	0	0	0	0	0	0	0
Total Production		230	0	0	0	0	0	0	0	0	0	0