March 2022: Poseidon
Oceanic Multipurpose System Status-6, Kanyon

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Poseidon is a submarine-launched uninhabited underwater vehicle (UUV) currently under development by the Russian military with a projected deployment in 2027. Poseidon will be powered by a compact nuclear reactor and will likely be armed with a 2-megaton nuclear warhead, although both a larger nuclear or a conventional warhead are possible.

**Possible Military Roles**

1. A strategic role in securing a second strike capability even if an opponent develops highly sophisticated ballistic missile defenses.
2. A tactical role as an anti-ship weapon to be used against aircraft carrier formations.
3. A testing role for underwater nuclear propulsion systems for future UUVs.

**Key Questions**

- How autonomous is Poseidon? Should Poseidon be understood as a large nuclear-armed torpedo or as a complex UUV that could roam the oceans for months waiting for an order to attack?
- Can Poseidon be recalled after launch?
- Will there be different Poseidons (nuclear, conventional or no payload) and how could this affect inadvertent escalation pathways?
- How large is the potential for accidents?

**Technical Details**

- **Size:** Ca. 25 meters long with a diameter of 1.5 to 2m.
- **Range:** Intercontinental, practically unlimited
- **Depth:** Up to 1000 meters
- **Speed:** Likely 70 knots (110 km/h)
- **Number:** Total of 30 Poseidon systems distributed among four submarines according to Russian media reports.

**Platforms**

- **Belgorod (Project 09852)**
  Specially modified to be able to carry Poseidon systems. Launched in 2019 and currently undergoing sea trials. Will likely carry six Poseidon systems.

- **Khabarovsk (Project 09851)**
  Poseidon’s first designated carrier, still under construction. Will likely carry six Poseidon systems. Launch has been delayed several times.

- **TBA**
  Two more carriers are planned. Likely based on the Khabarovsk.

- **Sarov (Project 20120)**
  Specially modified to act as Poseidon’s main test platform. Possibly modified as far back as 2007.

- **Zvezdochka 600 (Project 20180)**
  Auxiliary vessel possibly involved in Poseidon’s tests.

- **Akademik Aleksandrov (Project 20183)**
  Entered service in 2020, possibly to replace the Zvezdochka 600. Could be used to facilitate a seabed-launched version of Poseidon, sometimes called ‘Skif’. 
What makes Poseidon stand out?

Poseidon is a nuclear-armed, submarine-launched uninhabited underwater vehicle (UUV) powered by a small nuclear reactor, which is currently being developed by the Russian military. While Poseidon is often described as an UUV, it is still unclear how autonomously it could operate once deployed. Is this a single-use weapon or an autonomous underwater vehicle able to traverse the oceans on its own? It is clear that the system’s nuclear-power propulsion would give it practically unlimited range. This includes the possibility of targeting the U.S. coast from Russian waters. Additionally, its nuclear power source makes it faster than almost any existing underwater weapons system, with speeds likely able to reach up to 70 knots (up to 130 km/h). For comparison, U.S. Virginia Class nuclear-powered submarines travel at around 25 knots and conventional torpedoes at 50 knots. As the system is uninhabited, Poseidon can also travel deeper than most crewed submarines at a depth of 1000 meters. Given these characteristics, the proposed system would be very difficult to intercept with traditional anti-submarine measures. In short, if used as a nuclear-armed torpedo, Poseidon would be the world’s only strategic nuclear weapon designed to detonate underwater. If used as a UUV, it would be the world’s first nuclear-armed as well as the first nuclear-powered uninhabited underwater vehicle.

Is Poseidon real?

Given the speculations surrounding Poseidon and its seemingly orchestrated accidental reveal during a 2015 Russian television broadcast, many pundits have wondered whether the weapon system is part of a propaganda scheme. Nevertheless, the current consensus among experts suggests that Poseidon is a real system for which the Russian military has already devoted significant resources, even if many important details are still unknown.


2 The only exception would be a supercavitating torpedo. Edward Geist and Dara Massicot, “Understanding Putin’s Nuclear “Superweapons”,” SAIS Review of International Affairs 39, no. 2 (2019): 107, https://doi.org/10.1353/sais.2019.0019; Such a weapon has only been developed and deployed by the Soviet and later Russian navy. For more information on the 200-knot rocket-propelled VA-111 Shkval torpedo see: Polmar and Moore, Cold War submarines, 303–4.

times. The assessment estimates that Poseidon will enter service in 2027. Russian media reports also refer to 2027 as a possible launch date.

According to analysts, the clearest evidence that the Russian military is developing some version of Poseidon is the visibility of infrastructure necessary to test the system. Since Poseidon greatly outmeasures a regular torpedo, the Russian Navy cannot simply load it onto existing submarines. Rather, they must use specially built or modified submarines to test and eventually field Poseidon. The testing role appears to have fallen to the Sarov (Project 20120) submarine. Originally envisaged as a Kilo class attack submarine in the late 1980s, the Sarov appears to have been heavily modified before she was finally launched in 2007. These modifications appear to allow her to test Poseidon prototypes; tests she may have been carrying out since 2008.

The Russian Navy also appears to be developing a new class of nuclear-powered submarines as carriers for Poseidon: the Khabarovsk (Project 09851) and two additional Khabarovsk-inspired submarines. Each of these submarines will likely hold six Poseidon systems. Since the Khabarovsk’s launch has been repeatedly postponed, the uniquely built Belgorod submarine will be Poseidon’s first operational carrier. Launched in 2019 and scheduled to enter service in 2022, the 184-metres long nuclear-powered Belgorod is the world’s longest and possibly “least understood” submarine. Operated by the secretive “Main Directorate of Deep-Sea Research” (GUGI), the Belgorod appears to fulfil several roles. It will join Russia’s nuclear arsenal by carrying six Poseidon systems. Yet, it will also host a deep-diving nuclear-powered submarine under its hull, carry an autonomous underwater vehicle and engage in spy missions.

7 GUGI operates a number of specialized submarines and surface research ships such as the Yantar. These ships are often associated with Russia’s ‘seabed warfare’ capability: for example, mapping and potentially manipulating (destroying or planting listening devices) underwater communications cables. For more information see: Kathleen H. Hicks et al., “Undersea Warfare in Northern Europe” (CSIS, 2016), https://www.csis.org/analysis/undersea-warfare-northern-europe, 12; Michael Kofman, “Fire Aboard as-31 Losharik: Brief Overview,” Covert Shores (Blog), January 26, 2018, http://www.hisutton.com/Covert-Shores-2018-1184.html.
11 GUGI is a specialist force, which is separate from the Russian Navy and reports directly to the Ministry of Defense. It primarily serves as an intelligence and special mission organization.
There have also been rumors that the Russian military is working on a seabed-launched version of Poseidon, sometimes called ‘Skif’. This would allow Poseidon to operate without a host submarine, which is susceptible to being tracked and destroyed before the system can be launched. If Poseidon is stationed on the seabed, it could wait until receiving an order to launch; however, this would require utilizing special surface ships to retrieve Poseidon on and from the seabed. The special-purpose ship Zvezdochka 600 (Project 20180) has been associated with helping test Poseidon. In 2020, another special-purpose ship, the Akademik Aleksandrov (Project 20183), entered service with further modifications that could facilitate a seabed-launched variant of Poseidon. Poseidon also requires infrastructure on land: satellite images show construction efforts, possibly connected to Poseidon’s development in Severodvinsk, on the White Sea, where the submarines Sarov and the Belgorod are based. The Poseidon launch tubes can be seen on satellite images taken of the Severodvinsk naval base in August 2021. In 2021, CNN also reported that storage bays for Poseidon are being built around Olenya Guba on the Kola Peninsula near Russia’s Northern Fleet headquarters.

Potential Military Roles

Why would Russian leadership develop such a system? While expert consensus purports that this weapon appears to secure preemptively Russia’s second-strike capability should an opponent develop a highly sophisticated missile defense system, Russian media reports and official MOD statements have described Poseidon as a multi-purpose system, thereby indicating additional roles. A key question, that will ultimately shape Poseidon’s potential role(s) is how autonomous the system can operate. Does Poseidon operate like a single-use weapon that is launched from a submarine and then travels directly to a pre-programmed city without any further communication with Russian headquarters? Or can Poseidon operate like an autonomous underwater vehicle able to travel around the oceans on its own while in regular contact with Russian command until it gets the order to attack?

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18 See this tweet from H. I. Sutton: https://twitter.com/covertshores/status/1441684022522830857?lang=en
19 Walsh, "Russia is amassing unprecedented military might in the Arctic."
20 For an alternative view that Poseidon might be a first strike weapon, see an analysis by Lieutenant Commander Joshua M. M. Portzer of the U.S. navy who makes the argument that Poseidon could be used in a surprise attack against a U.S. naval base, such as Norfolk or San Diego, which would “catastrophically cripple” the U.S. navy. Joshua M. M. Portzer, “Kanyon’s Reach: Rethinking the Nuclear Triad in the Autonomous Age,” U.S. Naval Institute, July 2020, https://www.usni.org/magazines/proceedings/2020/july/kanyons-reach-rethinking-nuclear-triad-autonomous-age.
A strategic role as a second-strike weapon

When Putin introduced Poseidon alongside other new nuclear delivery systems in March 2018, he spoke at length about how U.S. missile defense systems will eventually “result in the complete devaluation of Russia’s nuclear potential”. He then presented the new weapon systems as Russia’s response to U.S. missile defenses. Rather than trying to defeat existing missile defense systems, Poseidon circumvents them altogether by travelling underwater.

However, as a strategic weapon, Poseidon has certain weaknesses. First, the destructive effect of an airburst nuclear missile would likely be greater than an underwater Poseidon explosion. Second, Poseidon can only target coastal cities and not, for example, ICBM (intercontinental ballistic missile) fields further inland. Third, while Poseidon is very fast for an underwater vehicle, it is very slow compared to other nuclear delivery methods. An ICBM takes about 40 minutes to reach the U.S. when fired from Russia. Poseidon would need days to reach the U.S. coast when launched from Russian waters. Additionally, Poseidon may attempt to minimize noise and avoid detection by declining to move at its top speed, thus increasing its travel time. It could arrive days after an initial nuclear exchange has already ended. This is why some analysts describe Poseidon as a deep-second-strike or third-strike weapon. Unsuited for damage limitation or de-escalation, it does not offer much strategic value. Instead, it offers revenge. Should the U.S. manage to destroy most of Russia’s nuclear arsenal, develop a sophisticated missile defense system to intercept remaining Russian weapons, disable Russian satellites and decapitate the Russian leadership, Poseidon might still be on its way to U.S. cities.

Does the Russian military need such a strategic weapon to inflict great damage on the U.S.? In 2018, then-U.S. Defense Secretary James Mattis told reporters that Poseidon would not change the strategic nuclear balance since Russia already has the capability to target U.S. cities with nuclear-armed missiles.
However, experts have pointed out that Poseidon might be a “hedge”\(^{30}\) against future U.S. missile defenses or an “underwater insurance policy”.\(^{31}\) Still, improving existing systems would have been “infinitely cheaper” writes Michael Kofman.\(^{32}\) As a result, there seem to be additional factors, which help explain the support for developing such an expensive system: for example, a potential use against naval formations.\(^{33}\)

**A tactical role as an anti-ship weapon**

In July 2018, the Russian MOD specified that Poseidon “will enable the Russian Navy to fight carrier-led and surface action groups […] and strike coastal infrastructure facilities at an intercontinental distance”.\(^{34}\) In other words, Poseidon also appears to have an anti-ship role to counter U.S. naval dominance.\(^{35}\) However, targeting moving aircraft carrier groups and/or SSBNs would be more difficult than targeting coastal cities for example.\(^{36}\) If used in this capacity, Poseidon would either need to communicate with Russian command to stay on target or be able to track its mark independently by using passive sonar for example. Both options are not an easy feat without risking detection.\(^{37}\) Consequently, some analysts remain skeptical about Poseidon’s anti-ship capabilities.\(^{38}\) Poseidon might hence not be used as a UUV itself, but it could be used to test miniaturized nuclear reactors that could power UUVs in the future.\(^{39}\)

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\(^{30}\) See for example comments made by Steve Fetter, University of Maryland, and Frank von Hippel, Princeton University: Bergan, “The Weapon That Eradicates Cities by Creating ‘Radioactive Tsunamis’.”

\(^{31}\) Comments by Kingston Reif from the Arms Control Association. See: Axe, “Russia is Building Four Special Submarines To Haul Its Weird Doomsday Drone.”

\(^{32}\) The Russian military is also improving current systems. Kofman, “Emerging Russian Weapons: Welcome to the 2020s (Part 2 – 9M730?, Status-6, Klavesin-2R).”


\(^{35}\) Notte et al., “Russia’s novel weapons systems: military innovation in the post-Soviet period,” 19.

\(^{36}\) For a short analysis of Poseidon’s suitability against moving targets see: Hall, The Russian Poseidon Nuclear AUV; For the argument that Poseidon’s primary purpose is to target U.S., British and French SSBNs see: Peter Pry, “Are U.S. Submarines Vulnerable?,” RealClearDefense, May 30, 2019, https://www.realcleardefense.com/articles/2019/05/30/are_us_submarines_vulnerable_114464.html.


\(^{39}\) Nuclear power could enable UUVs to overcome two major obstacles for UUVs: low speed and low endurance. See: Geist and Massicot, “Understanding Putin’s Nuclear “Superweapons”;” 107-8.
Destructive Effects

Warhead

 Estimates for Poseidon’s yield range from two megatons to 100 megatons.40 Putin stated that Poseidon would carry a “massive nuclear ordnance”.41 In 2018, TASS reported a yield of two megatons.42 In 2019, Christopher A. Ford, then U.S. assistant secretary of state for International Security and Non-Proliferation, claimed that Poseidon could carry a “multi-megaton” warhead.43

- Most experts deem two megatons to be the most realistic estimate although a larger warhead cannot be ruled out. The origins of the 100-megaton reference are unclear.44

Tsunami Effects

- It is unclear whether an exploding Poseidon could trigger tsunamis. Generally, the energy released by a nuclear detonation is “a drop in the bucket” compared to the energy of naturally occurring tsunamis according to Gregg Spriggs, a nuclear-weapons physicist at the Lawrence Livermore Laboratory.45

- U.S. studies that explored explosion-induced waves found a “relatively inefficient wave making potential”.46 A 1996 report by the Defense Nuclear Agency described shallow water explosions as “extremely inefficient with respect to wave generation ability”. Only 5% of the explosion’s energy is translated into waves.47

Environmental Impact

- Unlike an airburst weapon, a detonated Poseidon would produce significant local fallout that could quickly spread depending on wind directions.

- The Poseidon system likely already poses a contamination risk in peacetime. Given the system’s small size, its nuclear reactor is unlikely to have much shielding to absorb radiation coming from the reactor.48 This means that the system is essentially radioactive.49 “We are ecologically worried”, the head of Norwegian intelligence told CNN in 2021, adding that radiological accidents have already occurred.50
Recommended Further Reading

On Poseidon and its possible delivery platforms:

1. **Covert Shores** - a blog focused on open intelligence analysis for everything surrounding underwater warfare run by H.I. Sutton.


Other Russian 'superweapons':


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