In the Light of New Developments, Potential Roles and Missions of Submarines and XLUUVs/UUVs in the Seabed Warfare

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Towards “Operation Ivy Bells 2.0”

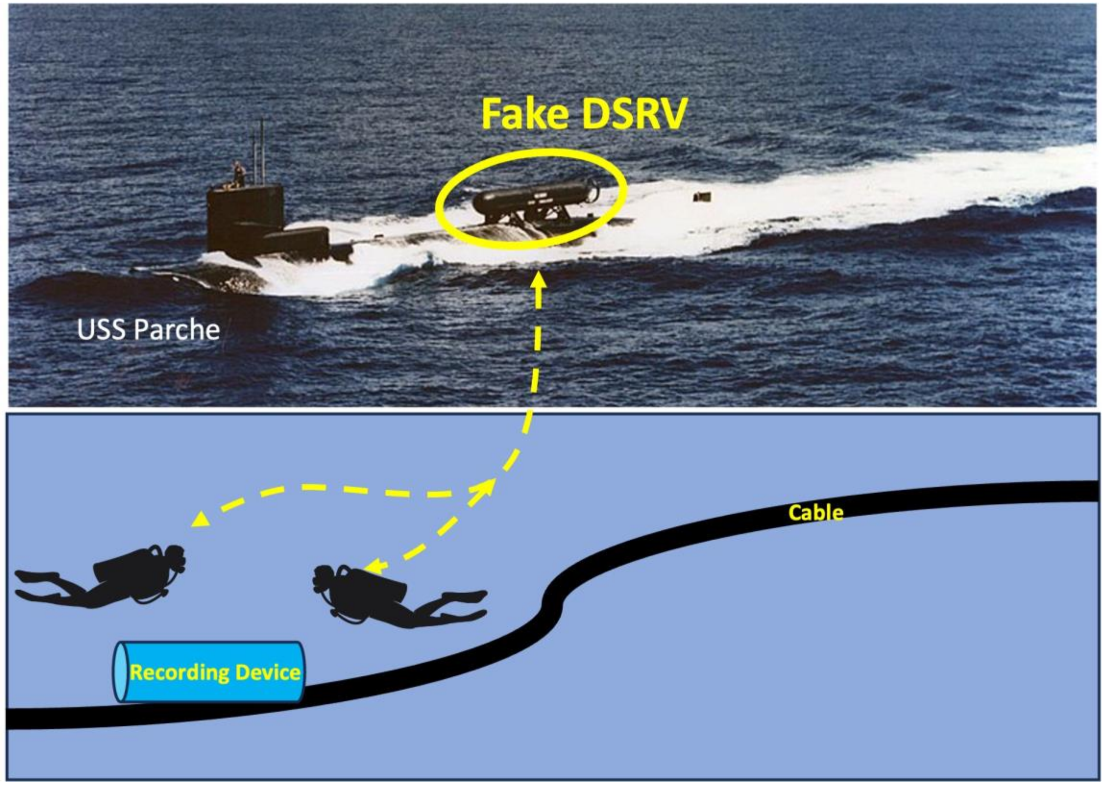
Bülent TURAN
Rear Admiral (Ret), TUR N

Outline

- Underwater Cable Taps During the Cold War
  - "Operation Ivy Bells"
- What changed since the Ivy Bells?
  - Submarines
  - UUVs
  - Usage of the Seabed
- Potential Roles of the Submarines and UUVs in the Seabed Warfare

Underwater Cable Taps During the Cold War

Operation Ivy Bells



Operation Ivy Bells - Summary:

Aim: Tap the Soviet undersea communications cable in the Sea of Okhotsk to gather intelligence.

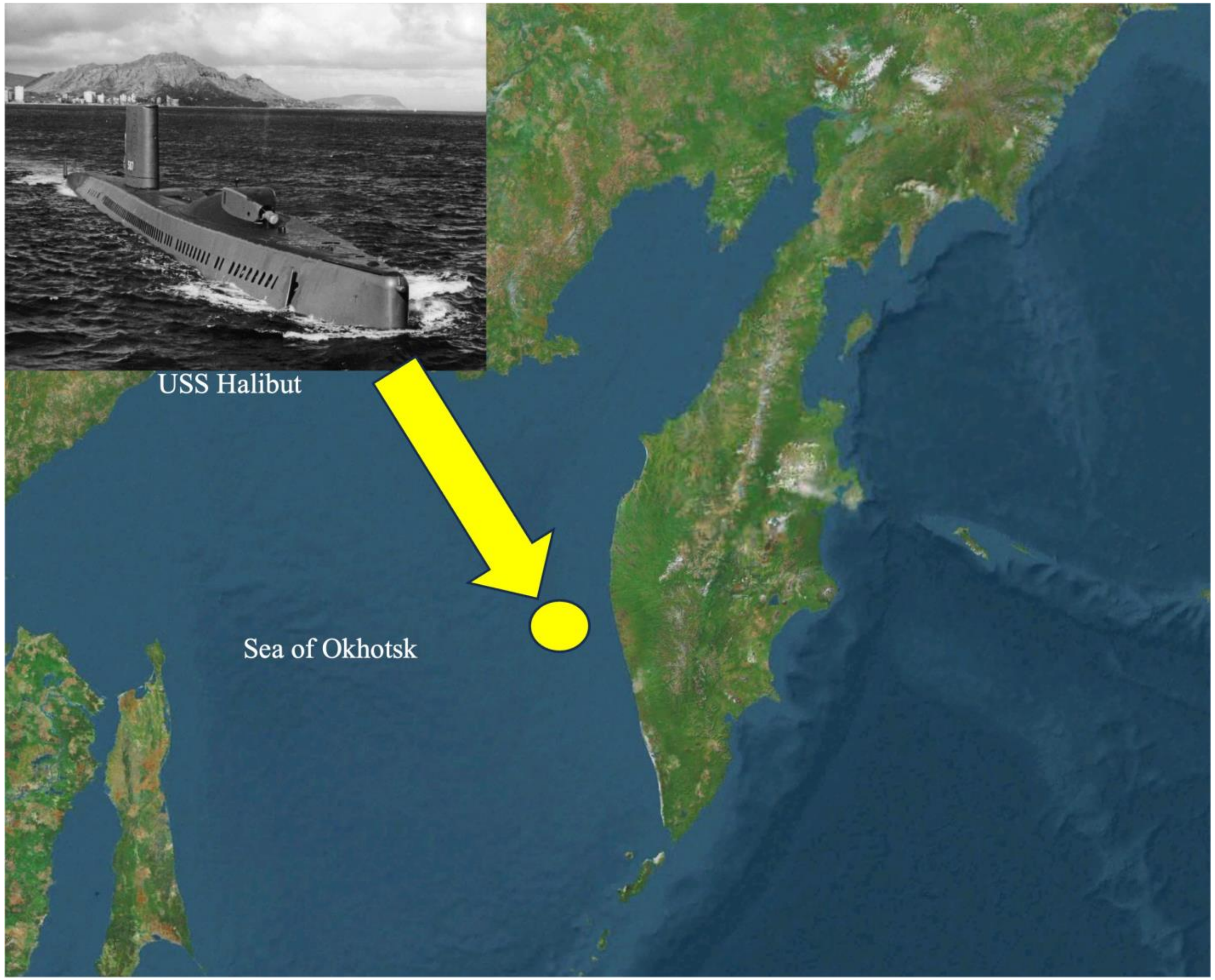
Assets: Specifically modified nuclear submarines, along with divers and intel specialists

Method:

- Divers were working from the submarine through an fake Deep Submergence Rescue Vehicle (DSRV).
- They were attaching a recording device at the cable. Then, they were retrieving the recordings and installing a new set of tapes.
- Intel specialists were analysing the tapes.

Underwater Cable Taps During the Cold War

Operation Ivy Bells

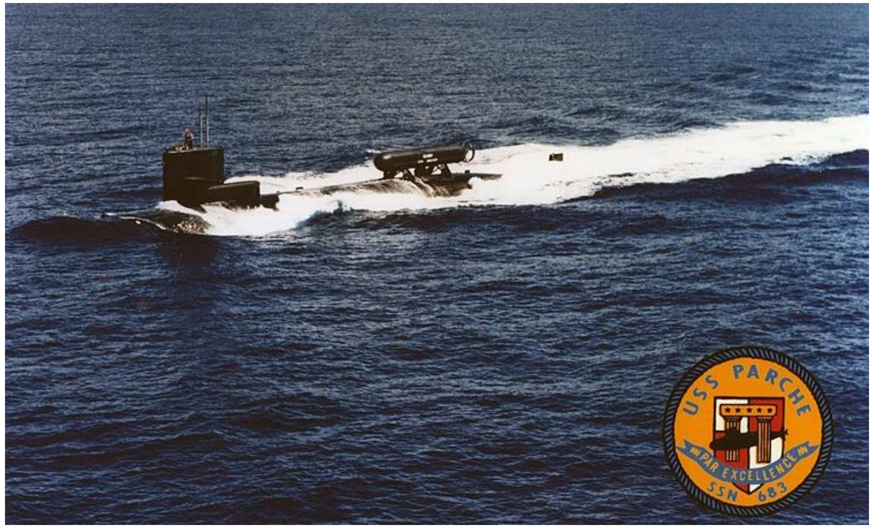


Operation Ivy Bells - Chronology:

- **1972:** Divers from USS Halibut found the Soviet cable in 120m at depth. Listening device attached.
- **1972-1980:** Operation Ivy Bells continued smoothly.
- **1980:** A former NSA employee informed Soviets about the operation.
- **1981:** Soviets recovered the recording device. The operation was terminated.

Underwater Cable Taps During the Cold War

USS Halibut (Image: Wikipedia)



USS Parche (Image: Wikipedia)

During the Cold War, underwater telecommunication cables in the Barents Sea and in the Mediterranean Sea were also tapped by mission-modified US submarines.

These underwater eavesdropping operations;

- provided invaluable information to the US.
- also proved that submarine is a unique and indispensable asset for the seabed warfare.

What changed since the Ivy Bells?

The seabed operational environment drastically changed since the inception of the Operation Ivy Bells.

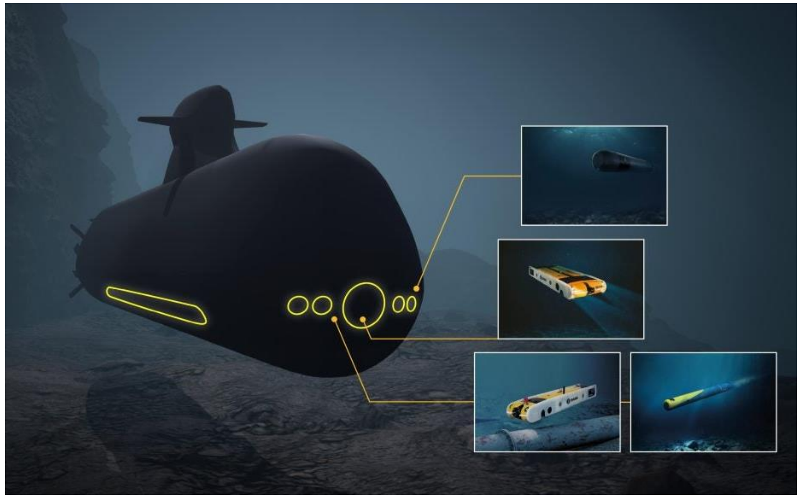
Changes can be categorised into three main areas

- Submarines
- UUVs
- Usage of the Seabed

What changed since the Ivy Bells?

Submarines

USS Jimmy Carter (Image: Wikipedia)



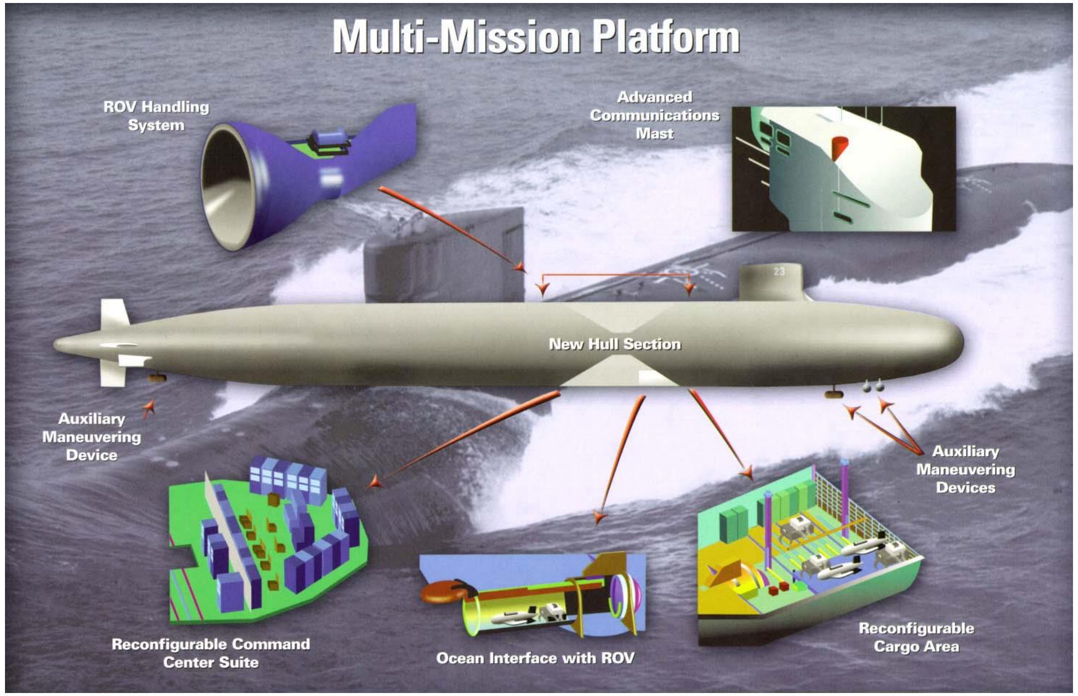
(Image: SAAB)

Russian Submarine Belgorod (Image: Wikimediacommons)

- The US and Russia have seabed warfare capable submarines in their inventory.
- Some nations consider seabed warfare capability for their future submarine projects.
- Some others plan to incorporate seabed warfare capabilities into their existing submarines.
- Some nations have crewed scientific submersibles capable to dive into the great depths and operate on the seabed.

Submarines – The US

USS Jimmy Carter (Image: Wikipedia)



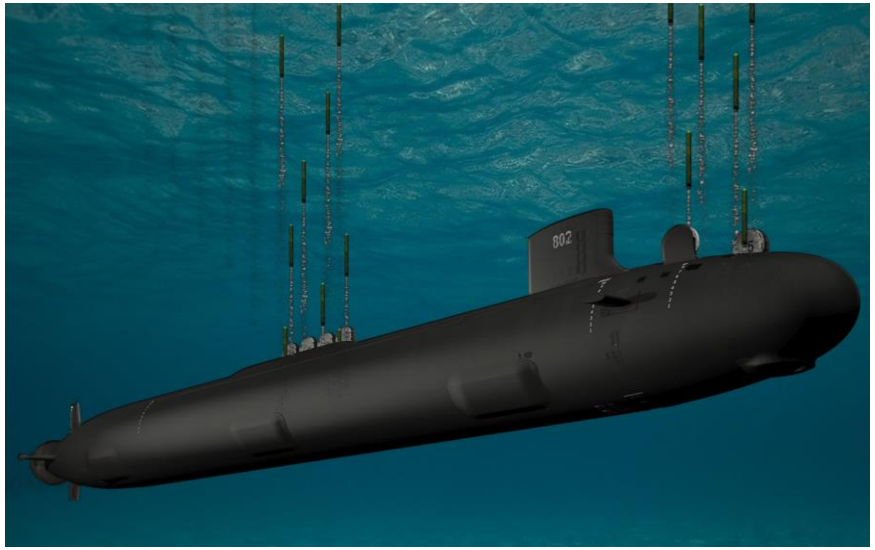
USS Jimmy Carter (Image: GD Electric Boat)

The USS *Jimmy Carter* (SSN 23)

- the U.S. Navy's principal seabed warfare submarine,
- has a 100-foot hull extension - the Multi-Mission Platform (MMP),
- MMP provides for additional payloads to carry out classified research and development,
- has "Auxiliary Maneuvering Devices" as well as an Advanced Communications Mast (ACM).

Submarines – The US

Future Projects



Virginia Class (Image: GD Electric Boat)

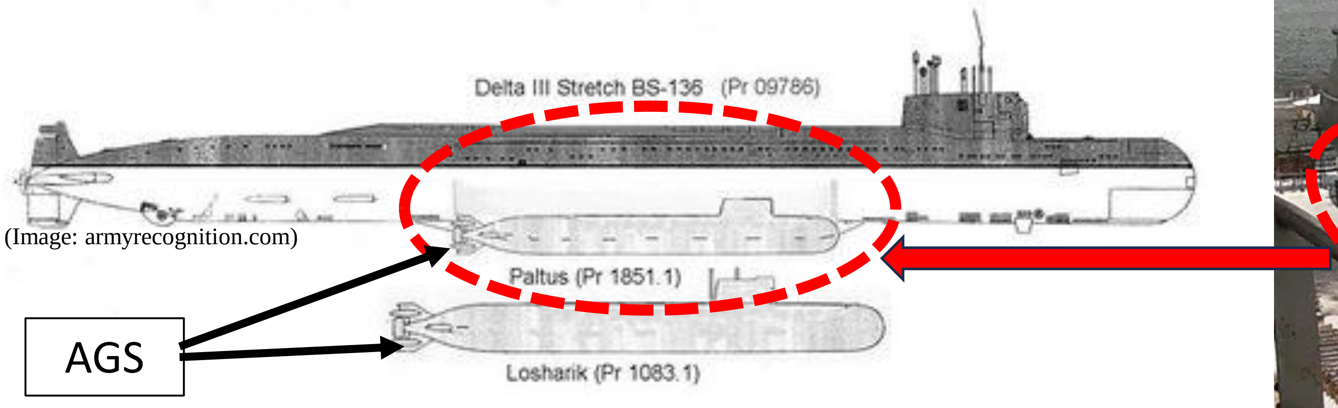
- **Virginia Class Mod VA SSW (Modified Virginia, Subsea and Seabed Warfare):** One Mod VA SSW is planned. She is expected to replace USS Jimmy Carter.
- **The Next- Generation Attack Submarine or SSN(X):** would be the successor to the Virginia-class SSN. SSN(X) will retain and improve multi-mission capability including the Subsea Seabed Warfare (SSW).

Submarines – Russia

The Main Directorate of Deep Sea Research.
GUGI, (Glavnoye Upravleniye Glubokovodnykh Issledovaniy).

Olenya Bay

Submarines – Russia



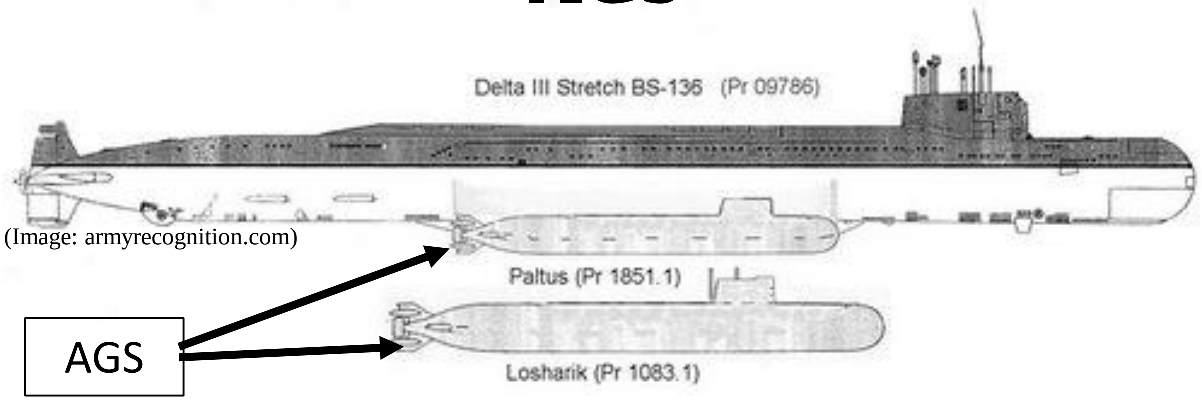
(Image: armyrecognition.com)


Orenburg (Image: armyrecognition.com)

Russia has practice of converting SSBNs to carry special deep-diving nuclear powered submersibles *("Deep Water Station" or AGS)*.

- AGS Host Submarines:
  - Delta III Stretch Submarine: *BS 136 Orenburg* Commissioned 1981; Conversation to carry AGS: 2002
  - Delta IV Stretch Submarine: *BS-64 Podmoskovye* Commissioned 1986; Conversation to carry AGS: 2002
  - Oscar II Submarine: *K-329 Belgorod* Laid down: 1992; Re-laid down: 2012; Commissioned 2022

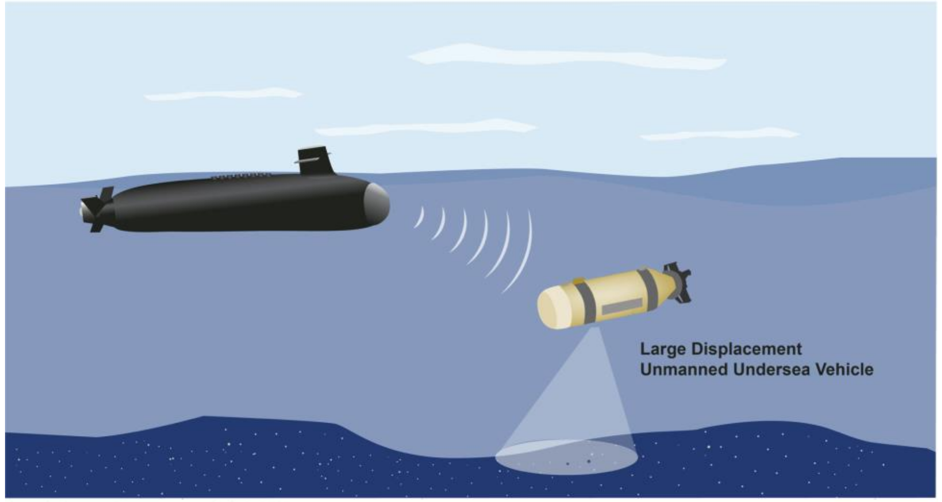
Submarines – Russia
AGS



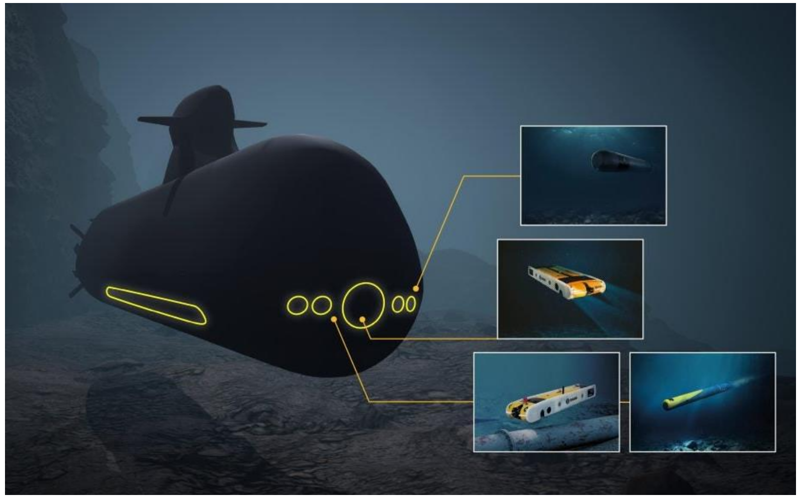
(Image: armyrecognition.com)

Kashalot (Uniform-class) (AS-13, AS-15)	Paltus (X-ray-class) (AS-23, AS-21 and AS-35)	Losharik (AS-31)
• titanium hull; nuclear-powered; • displacement:1,580 tons • commissioned 1986, 1991; • operating depth 1000 meters • Belgorod might host.	• titanium hull; nuclear-powered; • displacement:1,000 tons • commissioned: AS 23 (X-ray) 1983; AS 21 and AS 35 (Paltus) mid-1990s • operating depth 1000 meters • carried by a host submarine.	• titanium hull; nuclear-powered; • displacement: < 1,000 tons • commissioned: 1997 • operating depth 1000 meters • after a fire in 2019-under repair • carried by a host submarine.

Other Submarine Projects



Source: GAO analysis of Navy documents. | GAO-22-104567



(Image: SAAB)

- Other projects aim to incorporate some seabed warfare capabilities into the submarines.
- Mostly, aim is to improve seabed warfare capabilities of the submarines through tethered ROVs and/or UUVs/AUVs.
- This implies the Manned-Unmanned Teaming (MUM-T) concept.

UUVs

(Image: GD Mission Systems)

Bluefin 21 UUV

Unmanned Undersea Vehicles (UUVs)*

Manta Ray XL Glider (Image: Northrop Grumman)

Self-propelled

- Extra Large UUVs (XLUUVs)
- Large UUVs (LUUVs)
- Medium UUVs (MUUVs)
- Small UUVs (SUUVs)

Environmentally powered (Gliders) (**)

- buoyancy gliders
- wave gliders

(*) Depending on their autonomy level UUVs sometimes referred to as Autonomous Undersea Vehicles (AUVs). On this study, the term UUV refers both UUVs and AUVs in general.

(**) Beyond the scope of this study.

UUVs

- **Extra Large UUVs (XLUUVs):**
  - diameter: larger than 84 inches (2.1336 metres)
  - shore or ship launched.
  - ‘pier-to-pier’ operations.
  - long range/endurance
    - for ex. Echo Voyager’s range: 6,500 nm
  - store and deploy smaller UUVs and sensors.
- **Large UUVs (LUUVs):**
  - diameter: 21 to 84 inches (53.34 cm. to 2.1336 m.)
  - shore or ship launched.
  - may also deploy smaller UUVs and sensors.
- **Medium UUVs (MUUVs):**
  - diameter: 10 to 21 inches (25.4 to 53.34 cm.)
  - launched from submarines (usually via torpedo tubes) and other platforms.
- **Small UUVs (SUUVs):**
  - diameter: 3 to 10 inches (7.62 to 25.4 cm).
  - man portable and may be deployed from a variety of platforms including larger UUVs and USVs.

Echo Voyager XLUUV (Image: Boeing)

UUVs

Benefits

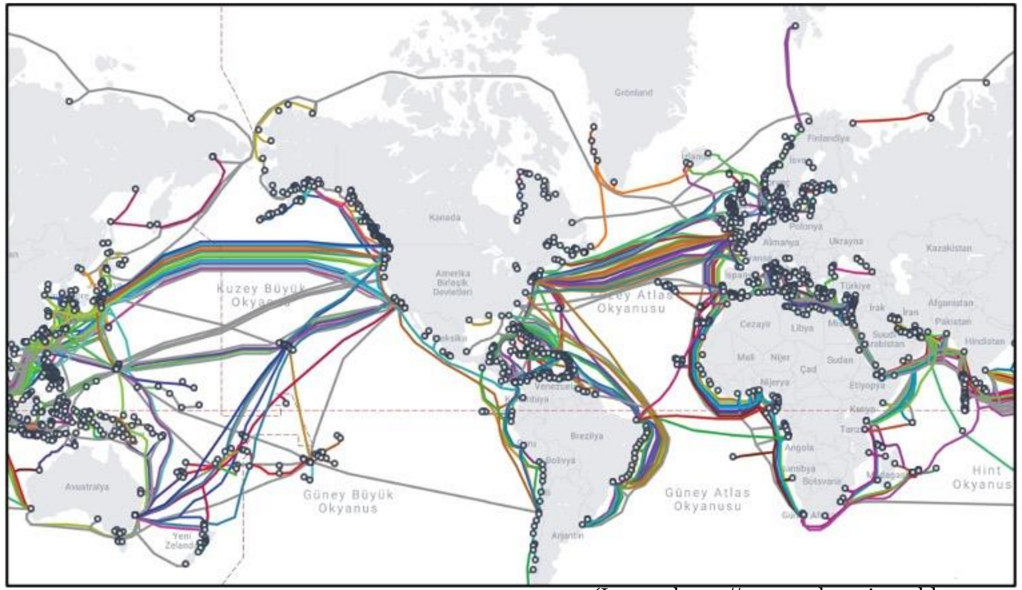
- Modular design and payload diversity
- Sophisticated sensors
- Operate at great depths
  - Ex. Rus Harpsichord-2P-PM LUUV Op.D.: 6000m.
- Operate in extreme environments *(such as arctic)*
- Dual purpose use *(civilian/military)*
- No risk for human life
- Relatively cheaper
- Covertness *(depends on some factors such as transportation means, host platform, comms between C2 platform, dependency to external data for accurate navigation)*

Limitations

- Limited endurance and range
- Limited payload capacity
- Need/Dependence on Host Platforms *(Except XLUUVs)*
- Limited communication capability *(Important drawback to overcome for Submarine-UUV integrated ops.)*
- Navigation Safety
- Limited mobility *(Particularly in areas with strong currents or complex terrain.)*
- High-Tech *(Developing and operating UUVs requires advanced technical expertise.)*

What changed since the Ivy Bells?

The Usage of the Seabed



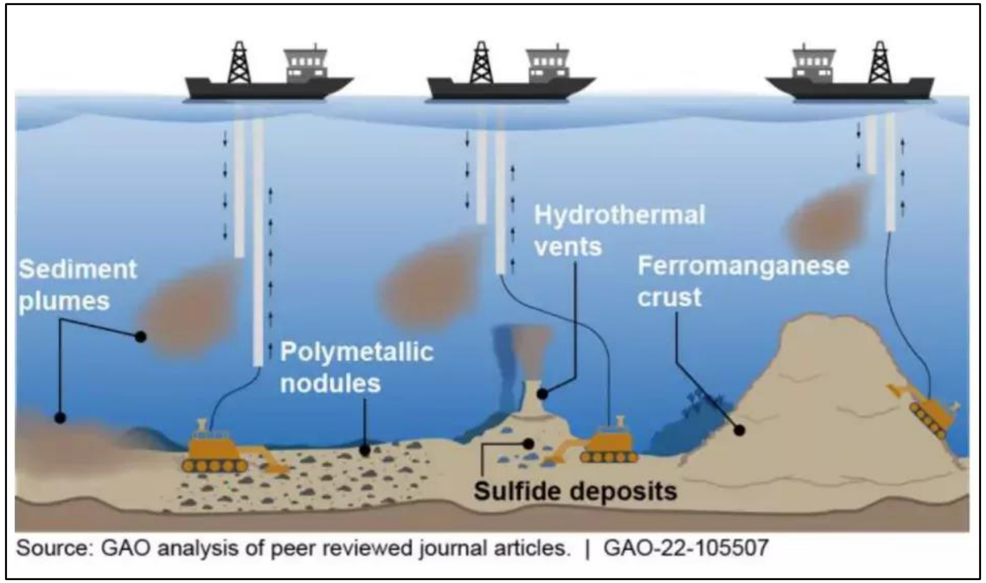
(Image: https://www.submarinecablemap.com)

The advent of modern technologies has increased the usage of the undersea pipelines, optical fibres and power cables. Today, Critical Undersea Infrastructure (CUI) is more important than ever.

- Undersea cables carry an estimated USD 10 trillion in transfers every day;
- Two thirds of the world's oil and gas is either extracted at sea or transported by sea;
- Around 95 per cent of global data flows are transmitted through undersea cables. (NATO)

The Usage of the Seabed

Chinese Underwater Data Centre Tests (Image: CGTN)



- Innovative projects like underwater data centres.(*)
- Climate change: Arctic is more accessible to build Critical Undersea Infrastructure (CUI)
- Deep-sea mining for critical minerals becomes more doable.

(*) Microsoft's Project Natick, Chinese Highlander's facility in the sea near Hainan Island, China.

Potential Roles of the Submarines and UUVs in the Seabed Warfare

Some potential roles for the submarines and UUVs in the seabed warfare

Defensive

- Mapping and monitoring the CUI
- Supporting the maintenance of the CUI
- A2/AD and protecting the CUI

Offensive

- Tapping data/communication cables
- Damaging and attacking the CUI
- Underwater false-flag operations

Due to their covert nature and operational capabilities beneath the waves, submarines, together with highly capable deep diving UUVs, can play significant roles in the seabed warfare.

Defensive Roles

- **Mapping and monitoring the CUI**
  - Submarines, AGSs and UUVs can be tasked
  - Peacetime:
    - Any available means as host and transport to UUVs.
    - Rotational patrols for XLUUVs for continuous and an accurate mapping.
  - Crisis:
    - For the secrecy - transport and deploy UUVs via submarine.
    - Individual or hosted transport for XLUUVs.

- **Supporting the maintenance of the CUI**
  - Locate the fault or malfunction
    - UUVs can be very useful - sophisticated sensors and operating at great depths,
  - Fix the Problem
    - XLUUVs - very useful to transfer necessary equipment, spare parts and support maintenance

Defensive Roles

- **A2/AD and Protecting the CUI**
  - Aim: to prevent an opposing forces from entering a designated 3D undersea area.
  - Submarines and UUVs are effective combination to handle the task.
  - Threats must be detected and denied from all directions before their entrance into the designated area.
  - Task requires multiple underwater assets to ensure 3D undersea coverage.
  - Challenges:
    - The bigger and the deeper A2/AD area, the more underwater assets. So, the more complexity.
    - Centralised C2 is required for the mission effectiveness and prevention of the mutual interference.
    - Reliable and continuous communication must be established.

Offensive Roles

- **Tapping data/communication cables**
  - Submarines, AGSs, and/or UUVs can be tasked.
  - UUVs may have some advantages over submarines. UUVs operate at
    - far deeper areas than submarines – more covert, less I&W, inflict damage harder to repair
    - extreme underwater environment without risking human life
  - Challenges:
    - Today's undersea cables are fibre-optic. They have very high and fast data transfer capacity.
    - Tapping fibre-optic cables(*) is much harder than that of the Cold War era cables.
    - Even if tapped, the gathered data would be enormous for transferring, storing and analysing.

(*) Fibre-optic cable translates digital data into beams of light to travel through a single strand of glass as thin as a human hair. Most undersea cables now typically contain eight such strands and surrounded by special protection.

Offensive Roles

- **Damaging and attacking the CUI**
  - Damaging and attacking the CUI by submarines, AGSs, and/or UUVs;
    - is covert,
    - gives no any indication and warning,
    - may cause confusion on the actual reason of the malfunction,
    - can be conducted at great depths, far from the shore, and extreme underwater environments,
    - localisation and repair of the inflicted damage would be extremely hard and costly.

Offensive Roles

- **Underwater False-Flag Operations**
  - A false-flag operation is an act to disguise the actual source of responsibility and to blame on another party.
  - Any successful false-flag operation to the CUI, may have a great return to the its originator.
  - To execute a successful underwater false-flag operations, at least these three things are required:
    - highly capable underwater assets (special submarines/submersibles, AGSs, UUVs),
    - covertness,
    - information warfare tools/tactics.

Thank You