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DRDO's UFOSS: An Underwater Shield for the Indian Ocean

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SECURITY & DEFENCE

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DRDO's UFOSS: An Underwater Shield for the Indian Ocean

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WHY IN NEWS

Reports on July 6, 2026 revealed that the Defence Research and Development Organisation (DRDO) is developing the Underwater Fibre Optic Sensing System (UFOSS), a seabed acoustic surveillance network to detect and track hostile submarines in the Indian Ocean Region.

The undersea domain has become the new frontier of maritime security. As China's People's Liberation Army Navy (PLA Navy) makes deeper forays into the Indian Ocean Region (IOR) and Pakistan induces air-independent-propulsion submarines, India is moving to plug a critical gap: persistent, round-the-clock awareness of what moves beneath the waves. UFOSS is India's answer, an indigenous fixed sensor grid on the ocean floor that promises to make the deep sea far less opaque.

WHAT IS UFOSS?

The Underwater Fibre Optic Sensing System (UFOSS) is a planned network of acoustic sensor nodes laid on the seabed and connected to shore-based monitoring stations through fibre-optic cables. The sensors continuously "listen" to the ocean, capturing the faint acoustic and electromagnetic signatures of passing submarines and relaying real-time data back to a shore station for analysis.

The project is led by the **Naval Physical and Oceanographic Laboratory (NPOL), Kochi**, a Kochi-based DRDO laboratory that is India's premier institution for underwater sensors, sonar and acoustics.

The Expression of Interest

On **June 20, 2026**, DRDO issued an Expression of Interest (EoI) inviting Indian industry to partner on the system, with a submission deadline of **September 1, 2026**. The scope covers the development, supply, transportation, deployment and commissioning of fibre-optic cables integrated with sensor nodes, and the

establishment of a linked coastal **shore station at Kochi, Kerala.**

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FEATURE	DETAIL
Full name	Underwater Fibre Optic Sensing System (UFOSS)
Lead agency	Naval Physical and Oceanographic Laboratory (NPOL), Kochi, a DRDO lab
EOI issued	June 20, 2026 (submission deadline September 1, 2026)
Shore station	Kochi, Kerala
Core technology	Fibre-optic cables with acoustic sensors and SQUIDS
Primary role	Anti-Submarine Warfare (ASW) and maritime domain awareness
Focus zones	Ninety East Ridge, Andaman and Nicobar Islands, Bay of Bengal

THE TECHNOLOGY: FIBRE OPTICS AND SQUIDS

UFOSS combines two sensing principles. The **fibre-optic cables** double as acoustic sensors: pressure waves from a moving submarine subtly disturb the light travelling through the fibre, and these disturbances are decoded to locate and track the vessel. This is the principle behind distributed acoustic sensing.

The system also deploys **Superconducting** (<https://ujiyari.com/vocab/superconducting/>) **Quantum Interference Devices (SQUIDS)**, among the most sensitive magnetometers known. Even a “silent” submarine running on batteries carries a large mass of steel that distorts the local magnetic field. SQUIDS can pick up these extremely faint electromagnetic signatures, complementing the acoustic detection and reducing the chance that a quiet submarine slips through undetected.

How UFOSS Fits into Anti-Submarine Warfare

Anti-Submarine Warfare (ASW) traditionally relies on ships, submarines, maritime patrol aircraft such as the P-8I, and helicopter-dropped sonobuoys. These assets are powerful but episodic: they cover an area only while on station. A fixed seabed grid like UFOSS provides **persistent cueing**: it continuously watches key chokepoints and, on detecting an intruder, directs mobile ASW forces to the exact area, acting as a force multiplier.

THE GLOBAL PARALLEL: THE US SOSUS NETWORK

UFOSS invites comparison with the United States’ **Sound Surveillance System (SOSUS)**, begun in 1954 under the codename Project Caesar. SOSUS laid vast arrays of hydrophones on the Atlantic and Pacific seabeds to track Soviet submarines by their acoustic signatures and was a decisive Cold War advantage. It

later evolved into the **Integrated Undersea Surveillance System (IUSS)**. UFOSS reflects the same strategic logic applied to the Indian Ocean, but built on newer fibre-optic and quantum-sensing technology and, crucially, developed indigenously.

SYSTEM	COUNTRY	PURPOSE
UFOSS	India	Detect and track submarines in the IOR (under development, 2026)
SOSUS / IUSS	United States	Cold War era hydrophone grid, now upgraded for modern threats

THE STRATEGIC CONTEXT

India's move responds to a shifting undersea threat. China's expanding submarine deployments in the IOR, part of what analysts term the "**String of Pearls**" posture, and Pakistan's induction of Chinese-built **Hangor-class submarines** with air-independent propulsion (allowing longer submerged patrols) have sharpened the need for persistent detection. India's official position is that the Indian Ocean is central to its security and economic interests, and India, as a net security provider in the region under its **SAGAR (Security and Growth for All in the Region)** vision, is committed to safeguarding sea lanes and its maritime frontiers. UFOSS is both a shield for these waters and a statement of intent on indigenising critical sensor technology.

ANALYSIS AND WAY FORWARD

UFOSS is a strategically sound step, but seabed grids are expensive, technically demanding and take years to deploy and validate. The way forward lies in phased deployment across priority chokepoints, robust data-fusion with satellite, aerial and surface ASW assets, and hardening the network against tampering or destruction in conflict. Sustained **indigenisation** (<https://ujyari.com/vocab/indigenisation/>) through NPOL and Indian industry will be key to avoiding import dependence on such sensitive technology. Combined with the P-8I fleet, indigenous sonars and the growing submarine arm, UFOSS can help convert India's geographic advantage in the IOR into genuine undersea dominance.

UPSC RELEVANCE

GS Paper 3: Defence technology and indigenisation; developments in science and technology (fibre optics, SQUIDs, distributed acoustic sensing); internal and external security challenges through the maritime domain; role of DRDO.

Prelims pointers:

- **UFOSS** is developed by **NPOL, Kochi**, a DRDO laboratory; shore station at Kochi.

- **SQUIDS** are superconducting quantum interference devices, extremely sensitive magnetometers used to detect faint electromagnetic signals.
- **SOSUS** was the US Cold War seabed hydrophone network; it evolved into **IUSS**.
- **ASW** = Anti-Submarine Warfare; India's maritime patrol aircraft is the **P-8I**.
- India's maritime vision for the region is **SAGAR**.

Mains question: "Undersea domain awareness is emerging as the decisive edge in maritime security." In this light, examine the significance of DRDO's UFOSS project for India's anti-submarine warfare capability and strategy in the Indian Ocean Region. (15 marks, 250 words)

FACTS CORNER

FACTS CORNER, KNOWLEDGEPEDIA

UFOSS (Underwater Fibre Optic Sensing System): A DRDO seabed acoustic surveillance network to detect and track submarines in the Indian Ocean Region; EoI issued June 20, 2026.

NPOL, Kochi: The Naval Physical and Oceanographic Laboratory, a DRDO lab and India's lead centre for underwater sensors and sonar; it leads UFOSS, with the shore station at Kochi.

SQUIDS: Superconducting Quantum Interference Devices, ultra-sensitive magnetometers that detect the faint magnetic signature of a submarine's steel hull.

Distributed acoustic sensing: Technique that turns a fibre-optic cable itself into a chain of acoustic sensors by reading disturbances in the light it carries.

SOSUS / IUSS: The US Sound Surveillance System (from 1954), a seabed hydrophone grid to track Soviet submarines, later folded into the Integrated Undersea Surveillance System.

ASW (Anti-Submarine Warfare): Detecting and countering enemy submarines using ships, submarines, aircraft (P-8I) and fixed sensors.

Focus zones for UFOSS: Ninety East Ridge, Andaman and Nicobar Islands, and the Bay of Bengal.

SAGAR: Security and Growth for All in the Region, India's Indian Ocean maritime vision.

Sources: *The Hindu* (<https://www.thehindu.com>), *Indian Express* (<https://indianexpress.com>), *PIB* (<https://pib.gov.in>), *DRDO* (<https://www.drdo.gov.in>)

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