Umikagami Subsurface Operations Suite

First introduced in YE 44 for the 1C revision of the Misha-Class Explorer, it is anticipated that utilization of the *Umikagami* Subsurface Operations Suite will begin to see further expansion as Yugumo Corporation continues to explore surface and subsurface marine operations. In Yamataigo, *umikagami*（海鏡) means “sea mirror,” evoking the evening clouds reflected in the ocean at sunset, and referencing that it is a marine-operations extension of KAIMON's Kagami Integrated Sensor System.

Year of Creation	YE 44
Designer	Yugumo Fleetworks, KAIMON/Ascendant
Nomenclature	See: Nomenclature Catalog
Alt. Nomenclature	N/A
Manufacturer	Yugumo Corporation
Fielded by	Yugumo Corporation
Availability	Mass Production
Price	Varies

History

The development of the 1C revision of the Misha-Class Explorer came with a mandate for surface and subsurface planetary marine operational capability. To meet these requirements, sensor, navigation, communications, and propulsion systems needed to be developed alongside the ship. The systems are standardized and packaged to be able to be scaled to different classes and sizes of ships.

Description

The Umikagami suite has the hardware for sonar and other subsurface sensors, pump-jet thrusters, other marine utility systems, and an additional software upgrade for KAIMON. These software upgrades allow the magnetohydrodynamic systems of the Hoshi III Series Multi-stage Turbo Plasma Drives to function as underwater propulsion.

On a Misha-Class Bridge, the “guest station” is replaced by an aquatic steering and navigation that has primary control over these systems. However, all other stations are enhanced with additional functionality as well.

For power armor, such as the hardpoints, it takes up essentially every hard point: both shoulder and both waist hardpoints, the dorsal hardpoint, and the leg pods hardpoint. The system cannot be installed in anything smaller than personal power armor (Tier 4, Light Armor) if occupied by a humanoid pilot. Unmanned drones with the system installed may be smaller.

Compatibility

A plaform must have KAIMON, Hoshi III Series Multi-stage Turbo Plasma Drives and a Plasma Projection System or comparable plasma thruster drive and maneuver system[1)], some form of anti-gravity system, and some form of shielding appropriate for the supercavitating steerable shield system as prerequisites for compatibility.

Cost

The Umikagami Subsurface Operations Suite has cost that varies by application:

Tier Group	Factory Cost	Retrofit Cost
Personnel (1-3)	**6400 KS + 7200 KS/Tier**	**7500 KS + 7200 KS/Tier**
Armor (4-6)	**8000 KS + 12000 KS/Tier**	**9600 KS + 16000 KS/Tier**
Mecha (7-9)	**10000 KS + 19200 KS/Tier**	**12000 KS + 24000 KS/Tier**
Starship (10-12)	**16000 KS + 24000 KS/Tier**	**18000 KS + 30000 KS/Tier**
Capital Ship (13-15)	**20000 KS + 32000 KS/Tier**	**30000 KS + 48000 KS/Tier**

Usage

An add-on module for Yugumo Corporation vessels with KAIMON and Hoshi III Series Multi-stage Turbo Plasma Drives, the system is designed to facilitate underwater operations by merging traditional marine systems with spacefaring technology.

Features and Capabilities

The *Umikagami* has a range of features and capabilities pertaining to underwater sensing, navigation, and maneuvering. It adds calibration modes to the ships ambient temperature, pressure, and other atmospheric sensors to account for submersion, as well as many other features.

Ballast and Bilge

Operating both in conjunction with, and also optionally instead of, the ship's antigravity systems, intakes, outlets, pumps, and tanks are distributed around the ship to adjust its buoyancy, and also to collect and expel unwanted accumulated fluid. In both cases there are multiple systems in place to ensure that the collected water is free of oils from the ship's systems, debris and other waste, and organisms both on intake and outflow. There are also multiple, redundant systems to ensure nothing blocks or occludes, or damages any of these systems as well, and ensure everything is self-cleaning. Water may be shunted to other systems rather than collected in the ballast or bilge to be used by other systems, such as the

watermaker.

Ballast

The ballast system can be used to achieve positive, neutral, or negative buoyancy by filling or draining interior ballast tanks with the surrounding fluid to change the ship's density. The tanks are sectioned to allow for asymmetrical buoyancy profiles to change and hold the ship's base attitude without using thrusters or steering to do so.

Bilge

A system of scuppers and drains around parts of the ship exposed to the outside environment ensures fluid cannot build up anywhere, and what does collect is drained off as bilge. It also ensures that in an emergency, such as due to systems failure or other damage, encroaching fluids do not flood the interior of the ship.

The bilge tank is at the bottommost of the ship, where excess water or other fluids naturally drain and collect. In addition to the standard operating bilge pumps, there are emergency high-flow ones with their own redundant backup 24-hour power supplies to stave off flooding.

Magnetohydrodynamic Propulsion

As plasma is an electricaly-conductive fluid just like salt water, the same principles of Magnetohydrodynamics apply to inducing movement with magnetic fields. The magnetoplasmadynamic and pulsed inductive thrusters of the Hoshi III Series Multi-stage Turbo Plasma Drives and Plasma Projection System have all the necessary physical systems in place for propulsion and maneuvering in any electrically-conductive fluid, needing only to compensate for differences among fluids in software.

Subsurface MHD propulsion is exceptionally quiet, given there are no moving parts and very little wake, and therefore have nearly no sonar signature. This is not only useful for signature reduction, stealth, and minimizing environmental disturbance, it also reduces baffles, nearly eliminating the sonar blind zone in the direction of thrust.

Just as in aerospace operations, ships' primary propulsion engines provide locomotion and the maneuvering and verniers provide attitude adjustment and off-axis motion.

Pump-Jet Propulsion

Since fresh water is not electrically conductive, freshwater propulsion is accomplished by a more traditional Pump-jet propulsion system using centrifugal pump arrays. The ship handles more like a traditional Jetboat using these. As each jet may be operated in both forward and reverse, the openings at both ends serve as intakes and independently steerable exhaust nozzles. A quartet of on-axis

thrusters are the primary propulsion method, and may be operated in forward or reverse independently of each other for steering. Lateral thrusters, both top and bottom, and vertical thrusters, both port and starboard, are paired fore and aft, allowing precise control of pitch, roll, and yaw, as well as off-axis movement laterally and vertically. The pumps also play a role in separation of suspended substances from water for collection and use by other systems. The intake/exhaust ports, piping, and pumps have multiple, redundant systems to ensure they stay clean, free of blockages, and protected from damage.

Supercavitating Steerable Shield System

Shield systems traditionally maximize aerodynamic efficiency and performance by forming an eccentric spheroidal bubble to coefficient of drag. Many of these same principles are generalizable to hydrodynamics with little alteration. Going beyond this, the *Umikagami's* SSSS updates the shield geometry controllers to allow them to induce Supercavitation, pushing the fluid aside to create a drag-free vacuum bubble ahead of the ship to pull it along as it collapses behind. Changing the geometry of the shield to introduce asymmetry curves the bubble and thus changes the direction of the ship[2)]. The effect of this is to allow the ship to achieve very high subsurface velocities it would otherwise be unable to achieve due to drag and the speed of sound in the surrounding dense fluid. The system is still somewhat useful in atmospheric flight, but the effect is much, much less pronounced due to the lower density of gases, and is most effective as a means of controlling supersonic boom.

Sonar Systems

Being underwater or under the surface of another dense fluid poses the two-pronged effect of vastly increasing the attenuation of electromagnetic propagation in both the RF and visible light spectra, as well as significantly raising the speed of sound. This makes Sonar a much more viable primary sensor system than either radar or visual ones. Multiple sonar systems, both active and passive give any *Umikagami*-equipped ship a robust sensor platform, especially in conjunction with KAIMON's Kagami gravimetric, neutrino, and mass sensors. If the ship has the ability to launch towed or remotely operating independent sonar sensors or countermeasures, such as variable-depth sonar buoys, *Umikagami* can interface with them, sending and receiving data and control codes. Super-arrays of quad-crystal polyphonic Crystalline Audio Sensor Array provide unparalleled sensitivity, resolution, and audio source location-finding abilities.

- Video Synthetic Aperture Sonar (VISAS), for detailed, long-range, along-track imaging.
- Side-scan sonar for quick, efficient, detailed seafloor imaging and mapping.
- Parametric sonar for broad-bandwidth, narrow-beamwidth, lobe-free precision scanning.
- Echo sounding for naïve, fast depth detection.
- Intercept sonar to locate and engage hostile sonar sources.
- Sonar transponders for underwater acoustic communications and data.
- Acoustic doppler current profiler to measure the speed of the fluid medium.
- Fishfinder for locating marine life.
- Upward looking sonar for sensing above the ship and determining surface conditions from depth.
- Obstacle, hazard, and collision avoidance sonar information processing and analysis.

Subsurface Electromagnetic System

The challenges of underwater sensing, navigation, and communications led Yugumo Fleetworks engineers to look to nature, examining marine life for potential solutions[3]. Specifically electroreception, electrogenesis and the closely related phenomenon, Magnetoreception.

- Electrolocation, both active and passive, to identify and locate even very small lifeforms and other electrical activity sources such as electronics and machinery.
- Electrocommunication allows data exchange between *Umikagami*-equipped vessels, and possible communications with some forms of undersea life.
- Magnetoreception gives not only a very precise magnetometer and compass, but the ability to determine location by a planet's magnetic field and detect, locate, and identify other sources of magnetism concentrations of ferromagnetic minerals or electromagnets.

Inertial Navigation

The *Umikagami* has multiple, redundant multi-axis inertial navigation systems, across the range of digital, optical, analog, and gravimetric means, using a range of accelerometers, gyroscopes, magnetometers, and gravitometers. Not only is this useful for dead reckoning navigation, it also supports the vessel's quantum compass. Also included is a very powerful and sensitive Gyrocompass.

Multifunction Extendable Mast

Extendable up to 20 meters (66 feet) from the top of the ship[4], the Multifunction Extendable Mast has a payload package that allows interaction with the surface while the ship remains submerged.

Periscope

A binocular periscope gives a 3D view of what's above the surface. The periscope features both mirrors for an analog view with 1-10x optical maginification, Omnihue adjustable tint, and adjustable-diameter apertures, as well as high-definition dual cameras capable of low-light, IR, UV, and thermographic vision, with 1-30x optical and digital zoom and wide-angle modes. The cameras feature binaural microphones for 3D sound, a long-range acoustic hailing device for audio communication, laser, radar, and ultrasonic rangefinders, and an RGB/UV/IR light/laser combo, with high-power, narrow/spot, and wide-flood modes for the light, for visual signaling and illuminating the view through the scope. The camera output and view screen are connected to the ship's computer systems for data gathering and information overlay. The periscope may be operated and aimed both remotely and manually.

Snorkel

For collecting breathable atmosphere or other atmospheric gases, the snorkel is durable and protected,

with multiple, redundant failsafes to avoid taking in fluid and safely expelling any that it has accumulated. The ships normal environmental and life support systems are used to scrub breathable atmosphere of hazards and impurities, but it has its own system for detecting, collecting, and storing non-breathable atmospheric intake for further processing by other systems.

Antenna Array

To allow communications with above surface RF methods, the mast has multiple antennae that unfold from their protective covers when engaged. This facilitates surface communication that would otherwise be impossible do the the attenuation of RF and other EM signals in dense fluids, without the ship having to expose itself above the surface.

Watermaker

Being surrounded by undrinkable water can present a serious problem in an emergency. The ship's life support systems are augmented with a watermaker that desalinates water, then filters and purifies it through multiple methods so that it is rendered safe, sterile, and potable. Organic and volatile chemicals, minerals, and salts dissolved or suspended in the water that are removed by filtration are separated and stored for later use.

Unmanned drones still have this system in order to be used as emergency survival resources.

Electrolysis

The water treatment system has a multistage electrolysis subsystem that can be engaged to harvest chlorine (from salt water), hydrogen, and oxygen for use for other purposes.

Star Army Subsurface Operations Package, Type 44

The Star Army of Yamatai variant of the *Umikagami* features a a few restricted systems not available to the public:

- PANTHEON compatibility and integration.
- SACNES Interface
- Deeper SPINE integration.
- THOUGHT Software Package.
- THOUGHT Immersion System.

Nomenclature Catalog

Catalog of Standard Product Nomenclature System.

Misha-Class Explorer	Yu-Y1-E4401
Taka-Class Shuttle	Yu-T1-E4401
Mōkin-Class Patrol Craft	Yu-V1-E4401
Amatsubame-Class Runabout	Yu-T2-E4401
Mozu-Class Starfighter	Yu-V2-E4401
Sagi-class Heavy Lift Transport	Yu-T3-E4401
Washi-class Cutter	Yu-V3-E4401
Tanya-Class Expeditionary Heavy Cruiser	Yu-C1-E4401

OOC Notes

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Products & Items Database	
Product Categories	subsystems
Product Name	Umikagami Subsurface Operations Suite
Nomenclature	See Nomenclature List
Manufacturer	Yugumo Corporation, Star Army of Yamatai
Year Released	YE 44

1)
such as Multi-Stage Aether Drive
2)
see the Superkavitierender Unterwasserlaufkörper for an example of a steerable supercavitating geometry
3)
This feature is dedicated to Andrew's passion for marine biology
4)
in starship-sized implementations, less in smaller ones