Unmanned Vehicles

The **Subsurface Autonomous Mapping System (SAMS)** is a free-swimming, programmable and redirectable Autonomous Underwater Vehicle (AUV) capable of preprogrammed independent operations from a host platform or shore facility. It is a full-ocean-depth (6000-meter) AUV with integrated physical oceanography and bottom-mapping sensors.

Developed for the Naval Oceanographic Office (NAVOCEANO) by the Woods Hole Oceanographic Institution Ocean Systems Laboratory, SAMS is a new NAVOCEANO capability for deep-sea oceanographic data collection.

The SAMS vehicle is designed to conduct two types of missions: independent physical oceanographic data collections and side-scan sonar bottom-mapping surveys. It has a suite of full-ocean-depth-rated oceanographic and bottom survey sensors. SAMS can collect 10-12 hours of side-scan and oceanographic data or up to 16 hours of oceanographic data with the side-scan sonar disabled. Cruising at 4 knots, the vehicle can survey more than 40 nautical miles during mapping missions and nearly 65 nautical miles during oceanography missions. The vehicle's range, its ability to conduct preprogrammed and redirected missions and its multipurpose sensor suite allow NAVOCEANO to conduct large-scale, deep-water, oceanographic and ocean bottom feature exploration efficiently and flexibly.

Two rechargeable lithium-ion battery assemblies supplying 8 kWh at 25 V power the SAMS vehicle and can sustain vehicle operations for at least 12 hours. After vehicle recovery the batteries can be changed within 2 hours or completely recharged within 8 hours. SAMS is a roll-on/roll-off survey tool that augments the capabilities of NAVOCEANO's ships while providing an efficient means of collecting relevant data.

SAMS Primary Characteristics

Diameter	24 inches
Length	13 feet, 7.2 inches
Range	40-65 nmi@4 knots
Power Source (initial)	2 rechargeable lithium-ion battery assemblies (8 kWh, 25 V)
Launch and Recovery	LARS, stern launched and recovered
Fixed Buoyancy	Neutral buoyant
Trim Control	Fixed ballast
Communications	Acoustic pulse
Control	Preloaded in survey, redirectable during mission
Control Surfaces	horizontal and vertical fins
Drive Motor	Electric
Propulsion	24-inch Carbon fiber propeller

SAMS Instrumentation

Side-Scan Sonar	Marine Sonics 300-kHz system
GPS	Preloaded with mission parameters
CTD	Sea-Bird Electronics
Pressure	Paroscientific Precision Pressure Sensor
OBS	Sea Tek
ADCP	RD Instruments

Unmanned Vehicles

The **SEAHORSE-Class Autonomous Underwater Vehicle (AUV)** is an untethered, unmanned, underwater robotic vehicle, capable of preprogrammed independent operations from a host platform or shore facility. The AUV is currently powered with alkaline batteries and can operate for 72 hours at 4 knots for a nominal range of 300 nautical miles before requiring battery replenishment. Typical littoral zone AUV area characterization surveys can be conducted at operational depths of 30 to 300 meters.

The SEAHORSE AUV was designed to collect high-quality, precision-located environmental data in the littoral regions of the world. The driving design considerations were reliability, ease of maintenance and cost effectiveness. Operational factors of major concern were portability to world-wide survey locations, operations from T-AGS 60 class oceanographic vessels as well as other vessels of opportunity or shore-side facilities, ability to conduct a variety of preprogrammed search and survey patterns and reconfigurability to accommodate additional sensors or new requirements.

Seahorse I Characteristics

Diameter	38 inches
Length	27 feet, 10 inches
Displacement	10,000 pounds
Range	Minimum 300 nautical miles at 4 knots
Payload Volume	10 cubic feet, approximately
Power Source (initial)	9216 alkaline batteries
Launch and Recovery	Tilting slide bed launch and recovery system
Fixed Buoyancy	18.8 lbf/ft3 Divinycell HCP70 structural foam
Trim Control	Fore and aft toroidal variable SW ballast tanks
Communications	RF (freewave and 80211B), limited acoustics
Control	3 CPUs: vehicle and mission controllers, ERG Prototype intelligent Controller architecture
Control Surfaces	4-fin "X" stern, MK50 electrical actuators
Drive Motor	5 HP Lynx Motion synchronous electric motor, Advanced Digital System 3-phase inverter
Propulsor	Ducted pumpjet, 3 rotor blades, nominal 255 RPM, cavitation-free at all depths

Seahorse II Instrumentation

Side-Scan Sonar	Benthos SIS-1500 AUV; 200-kHz Chirp
Multibeam (2005)	Kongsberg Simrad EM3000D; 300 kHz
CTD	Sea-Bird SBE-37
Pressure	Paroscientific Precision Pressure Sensor
INS aided	Kearfott KN 5053 SEANAV Ring Laser Gyro
GPS	Trimble TASMIN GPS Receiver
ADCP	RDI Acoustic Doppler Current Profiler
Modem	LinkQuest UWM3000
Acoustics	Edgetech Acoustic Transponders
Tracking	Paradigm System (WHOI)