

INITIAL DRAFT - 28 Oct 2019

Surface and Underwater Research Facility (SURF) Fleet Vessel Requirements

The USNA Weapons, Robotics, and Control Engineering Department will be gaining access to the SURF test facility (36'x43.5'x16' deep) for the conduct of underwater, water's surface, and aerial vehicles autonomy and control research and testing. Curriculum development and research into surface vessel autonomy and control will benefit from acquiring a fleet (approximately 15-25) of vessels that meet the following minimum requirements.

Mechanical Specifications		
Property	Requirement	Reason
Length	< 0.5m	Allows for 25 boat lengths of travel for testing
Min beam	NEED SPECIFICATION	Allow for payload volume
Max beam	NEED SPECIFICATION	Allow for land storage
Max overall height	NEED SPECIFICATION	Allow for land storage
Max ahead speed	At least 2 m/s	Vessels can move ahead at jogging pace (cover length of SURF in 6.5 s)
Max astern speed	At least 0.5 m/s	Provide adequate maneuvering capability
Minimum speed with holonomic motion	At least 0.25 m/s	Allow station keeping (position and heading) in SURF with wakes/filter return currents
Weight (Fully loaded with payload)	Less than 16 kg	Within limits for a single person to lift, ~35 lbs
Payload Weight/Reserve buoyancy	At least 3 kg	Allow for sensor expansion over vessel service life
Splash-proof internal payload volume	NEED SPECIFICATION	Area in hull to place future electronic modifications
Reserve metacentric height	NEED SPECIFICATION	Ability to place sensors on top of superstructure
Control surface configuration	Include Rudder(s)	Provide ability to emulate traditional ship control system in addition to holonomic capability.
Hull superstructure appearance	Adaptable	Allow for simulation of warships and commercial vessels for collision avoidance/target discrimination

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Electrical Specifications		
Property	Requirement	Reason
Battery	Operate for at least 4 hours on a single battery charge	Allow support of morning labs without battery swap-out when starting with full charge
Battery	Be able to swap out battery in less than 2 minutes	Supports lab instruction if vessels commence lab without full charge
Battery Size	Commercially available form factor	Allow for replacement of batteries over fleet lifetime
Available payload power	At least XX Amps, with XX AH available	Expandable platform for future research
WiFi Connectivity	802.11ac or later (802.11ax)	Connection with motion capture system and ability to transfer video from each vessel
Remote Control	Spektrum Version?	Allow for manual maneuvering of boats as necessary
Roll/Pitch/Yaw sensor	Provide within +/- 1 deg	Needed for setting up lab scenarios
Camera(s)	Minimum 1080p video, 8MP still	Provide sensor input for computer vision processing and recording vehicle interactions

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