

# NRL tests robotic fueling of unmanned surface vessels

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Positioned alongside a stationary platform, under simulated sea conditions, the USV Sea Fox receives fuel from a robotic fluids transfer arm via magnetic refueling fitting (shown here mounted in the forward bow section of the vessel). Credit: US Naval Research Laboratory

Engineers from the NRL Spacecraft Engineering Department (SED) successfully demonstrate the robotic fluids transfer from a stationary platform to an Unmanned Surface Vehicle (USV) in wave heights greater than three feet. The Rapid Autonomous Fuel Transfer (RAFT) project exhibits the ability to track the motion of a Sea Fox naval vessel, safely emplace a magnetic refueling fitting to an on-board refueling receptacle and successfully complete fluids transfer.

Under current circumstance, USV refueling demands that a grappled

connection, usually by hand, be made between the USV and the refueling vessel.

"Refueling a USV at sea, particularly in adverse weather or in high sea states, can prove difficult and often dangerous," said Dr. Glen Henshaw, [Attitude Control](#) Section, SED Control Systems Branch. "Transferring our extensive knowledge and proven success of [robotic spacecraft](#) servicing can prove equally successful in reducing risks at sea."

Providing the host ship the capability to refuel USVs without the need to bring them aboard ship enhances mission efficiency and reduces host ship exposure. This works to improve the effectiveness of naval USV missions and decrease risks to personnel and potential damage to vessels and equipment.

Experimenting with both fully autonomous and human-controlled operations at the U.S. Army Aberdeen Test Center wave simulator facility, NRL engineers completed approximately 60 trial refueling attempts at sea states ranging from zero, or calm seas, to 3.25, or maximum [wave heights](#) in excess of three feet, with a demonstrated high rate of success.

Funded by the [Defense Advanced Research Projects Agency](#) (DARPA), the Rapid Autonomous Fuel Transfer (RAFT) project teamed NRL with Clemson University, Science Applications International Corporation (SAIC) and Space and Naval Warfare Systems Command (SPAWAR). NRL was the lead robotics integrator and designed the [robotics system](#).

Further robotic transfer tests will possibly include land-based autonomous HMMV (High-Mobility Multipurpose Wheeled Vehicle) applications without the need to stop driving and on-air Unmanned Aerial Vehicle (UAV) refueling.

The USV Sea Fox was developed for Navy missions to provide force protection with more flexibility in Enhanced Maritime Interdiction Operations and safer Intelligence, Surveillance and Reconnaissance (ISR) gathering to aid in threat assessment, decision-making, and situational awareness, prior to escalation to lethal actions.

Provided by Naval Research Laboratory

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