# SAFEPASS: Safe Encounter Resolution Using Passive Sensing

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**SYSCOM:** Office of Naval Research (ONR)
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**Other Potential Programs:** PMS 406, SURFDEVRON

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**Projected TRL:** 7 / Q2 2025

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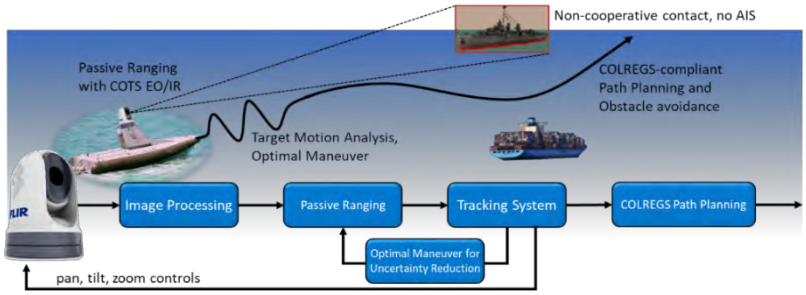


## THE CHALLENGE

Unmanned Surface Vessels must have the capability to perceive, track, and avoid contact vessels and obstacles for safe navigation. Electro-optical sensors are very effective at passively measuring bearing but do not inherently measure range. While stereo- or multi-camera systems offer methods to estimate range, they are mechanically complex and expensive, and offer limited depth perception. A passive ranging system that requires only a single, COTS monocular camera is desired to enable the Navy's growing fleet of USVs to safely navigate without the use of Radar or Lidar.

## THE INNOVATION

SAFEPASS provides passive ranging, tracking, and obstacle/collision avoidance to an autonomous USV with the addition of a low-cost, COTS pan, tilt, zoom camera system. Taking inspiration from history's navigators, SAFEPASS performs passive ranging with a combination of Target Motion Analysis, Rate of Growth, and Stadimeter techniques. Closed-loop perception enables the system to produce optimal maneuvers to reduce uncertainty of contact tracks while still maintaining mission objectives and safe separation. SAFEPASS leverages a long history of computer vision, maritime autonomy, and mission optimization tools developed at Scientific Systems Company, Inc. SAFEPASS is being integrated into the UD-GARC platform, one of the testbeds for the Navy's Unmanned Maritime Autonomy Architecture (UMAA).

## THE NAVY BENEFIT

SAFEPASS offers the Navy a low-cost add on to any vessel, manned or unmanned. For manned vessels, an automated ranging and tracking system can reduce the manpower required for lookouts by increasing their situational awareness. For unmanned vessels, which normally rely on radar for collision avoidance, it enables an otherwise impossible use case of operation. SAFEPASS algorithms are hardware agnostic and can be applied to any camera system, offering easy integration into a wide range of platforms. A series of on-water tests are planned that will demonstrate the passive tracking and safe navigation capability.

## THE FUTURE

SSCI envisions that the capabilities developed in this effort will lead to an at-sea test program using Navy prototype vessels developed in the ACTUV and Ghost Fleet/Overload programs. If successful, the capabilities would then transition to the Medium USV program or other USV programs managed by PMS-406.

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