Department of the Navy SBIR/STTR Transition Program
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Topic # N111-025
SAFEPASS: Safe Encounter Resolution using Passive Sensing
Scientific Systems Company, Inc

WHO

SYSCOM: ONR

Sponsoring Program: Code 331: Unmanned Surface Vehicle and Small Combatant Craft

Transition Target: PEO USC

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Other Transition Opportunities: This system can be integrated onto both manned and unmanned vessels to provide safe navigation during operations where the use of active sensors such as radar presents a risk. PMS-406 manages several USV programs that could benefit from the technology and present a possible transition path. SAFEPASS software brings exquisite capabilities to off-the-shelf sensors and so low-cost, small USVs are the primary target platforms. For this reason, both traditional ship building primes and many of the small businesses currently making headway into the autonomous ship market present transition opportunities.

Notes: This technology enables a low-cost, off-the-shelf, monocular camera to passively track nearby vessels. It uses three sophisticated algorithms to estimate range and output tracks compatible with systems that interface with maritime radar. The system is prototyped and its functionality verified in on-water tests. Scientific Systems specializes in applying advanced AI solutions to autonomous systems in sea, ground, air, and space. Our goal is to integrate and transition this technology into the government and prime contractors for use on the nation's growing USV fleets.
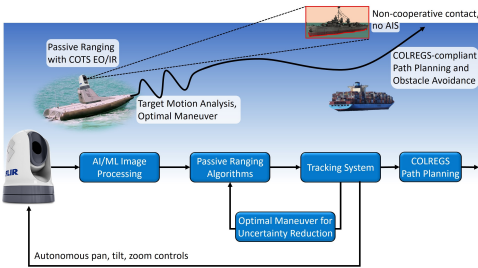

Image courtesy of Scientific Systems Company Inc. 2025

WHAT

Operational Need and Improvement: Recent conflicts around the world have highlighted the importance of autonomous platforms and the Navy is seeking to rapidly increase the size of their unmanned fleet. Small Unmanned Surface Vessels (sUSVs) are especially important as they align with DoD's "Affordable Mass" push to produce capable, low-cost platforms at scale. Naval operations which must be done in Emissions Control (EMCON) environments prohibit USVs from using marine radar to detect obstacles and other vessels. Specialized camera systems (e.g. stereo or multi-sensor) can determine distance to nearby vessels, but are mechanically complex, difficult to source in large numbers, and limited in effective range. SAFEPASS software brings exquisite capabilities to a low-cost platform by enabling an off-the-shelf monocular camera to provide accurate range information out to the horizon.

Specifications Required: This technology can be integrated onto a wide variety of platforms and cameras with no additional hardware requirements. The SAFEPASS system requires input of images and has three outputs. The first output is a list of contact tracks, which can be consumed by external systems designed to consume radar tracks. The second output is a stream of pan, tilt, and zoom controls to be sent to the camera, ensuring that all nearby vessels have their tracks maintained. The third output is a list of waypoints, to be passed to the USV autonomy or operator, which contain a Target Motion Analysis (TMA) maneuver to reduce range uncertainty and a COLREGS-compliant path around obstacles. Output data can be represented in several formats, including the Navy's Unmanned Maritime Autonomy Architecture (UMAA).

Technology Developed: Safe Encounter Resolution Using Passive Sensors (SAFEPASS) is a marine perception and action system specialized to process monocular EO/IR data to determine range to objects. 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.

Warfighter Value: 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.

WHEN

Contract Number: N64267-24-C-0150　　　　**Ending on:** Mar 25, 2026

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Closed-loop sensing algorithm integration of passive ranging, tracking, and path planning complete.	Low	Simulation Testing	4	1st QTR FY25
On-shore dataset processed to produce tracks.	Low	Offline track accuracy	5	3rd QTR FY25
On-water test data processed to produce tracks.	Medium	Live track accuracy	6	4th QTR FY25
If option exercised, fully autonomous closed-loop sensing demonstration including Target Motion Analysis maneuvers.	Medium	Live track accuracy	7	3rd QTR FY26

HOW

Projected Business Model: Scientific Systems delivers high-impact software to autonomous platforms in the ground, air, sea, and space domains. Our history of deploying to a wide variety of platforms has required our tools be flexible to different configurations. For this reason, we are able to provide this technology under three separate business models. First, SAFEPASS can be purchased under a per-unit software license and integrated into platforms with existing autonomy computer and cameras. Second, SAFEPASS can be purchased as a "autonomy in a box" embedded computer, which can be integrated onto any platform with a sufficient camera system. Finally, SAFEPASS can be purchased as a hardware bundle including a capable pan, tilt, zoom camera.

Company Objectives: Scientific Systems has been delivering industry-leading, AI-powered autonomous solutions for almost three decades. In alignment with DoD's recent "Affordable Mass" strategy, we are well positioned to provide software that imbues commercial, off-the-shelf sensors and platforms with exquisite capabilities. Recent conflicts have shown that a large number of capable, low-cost platforms will outperform a small number of flagship platforms in terms of loss-exchange ratios.

Potential Commercial Applications: SAFEPASS has numerous commercial applications. For manned vessels, an automated ranging and tracking system can reduce the manpower required for lookouts by increasing their situational awareness. There is also a clear application to automated inspection or harbor security for the myriad of commercial small USVs hitting the market.

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