

Naval Information Warfare Center (NIWC) Atlantic

Rapid Capabilities Cell (RCC)

Commercial Solutions Opening (CSO)

N65236-26-S-0001

Prototype Title: Resilient Airborne Free-Space Optical Communications Turret

Area of Interest (AOI) Number: 27-A001

Command Focus Area: Battlespace Connectivity

Problem Statement:

The advent of high-threat Electronic Warfare (EW) and Global Positioning System (GPS) or Radio Frequency (RF)-denied operational domains poses an immediate risk to Department of Navy (DoN), Marine Corps, and joint aerial and maritime fleet operations. Modern tactical concepts—such as Distributed Maritime Operations (DMO) and Joint All-Domain Command and Control (JADC2)—demand ultra-high-bandwidth communications and high-precision timing synchronization across dynamic, multi-domain nodes without reliance on vulnerable RF spectra or satellite navigation. Precision optical clock synchronization and free-space optical communications (FSOC) offer timing holdover improvements and superior timing synchronization in GPS-denied environments, and high-speed low-probability-of-intercept/low-probability-of-detection communication links.

However, transitioning optical time transfer and FSOC from benign ground laboratories to high-dynamic flight environments presents severe aero-optical and mechanical barriers. Dynamic aircraft boundary layers, trans-sonic shock structures, aero-optical phase aberrations, base-motion jitter, and stringent airframe size, weight, power (SWaP), and aerodynamic drag constraints disrupt beam coherence and line-of-sight tracking. Furthermore, existing commercial optical gimbals lack the structural airworthiness certifications, thermal/pressure shock resilience, fine pointing, acquisition, and tracking/PAT (PAT) closed-loop rejection required for host aircraft integration. NIWC Atlantic seeks to prototype and demonstrate a flight-certified, aero-optically resilient dual-turret optical communications and optical time-transfer system operable across ground, littoral, and multi-altitude airborne regimes.

This project employs an agile, multi-agency collaborative engineering and iterative prototyping approach uniting NIWC Atlantic, NASA Glenn Research Center, and advanced aero-optics and aerospace engineering prototype research and development with a non-traditional defense contractor. The program is an integrated 16-month, single phase effort with prototype deliverables at 12 months and flight-testing support from 12-16 months.

Iterative sprints will transition capabilities across synchronized phases:

- Aerodynamic design and Computational Fluid Dynamics (CFD) modeling
- Dual-hardware fabrication and integration
- Structural Finite Element Analysis (FEA) and mechanical stress qualification
- Environmental ground-loop testing and motion-platform stabilization
- Multi-altitude airborne flight demonstrations aboard NASA research assets
- FAA airworthiness certification

Seamless digital engineering practices, including secure collaboration platforms for CAD and software, will ensure rapid alignment across flight safety boards, payload boundaries, and field deployments. Project progress will be tracked and organized through bi-weekly sync meetings with government partners.

Desired Solution:

NIWC Atlantic is seeking comprehensive technology solutions for two Lines of Effort. Interested entities can submit solutions to one individual line of effort or submit solutions to both lines of effort.

Line of Effort 1 – Airborne Optical Terminal and Gimbal System

This line of effort is seeking technology solutions for an FAA-certified, ruggedized, airborne-compatible optical terminal and gimbal system. Solutions must address the following core objectives:

- **Dual-Platform Turret Fabrication & Mechanical Design:** Design, machine, and assemble a complete flight-worthy optical turret gimbal tailored to NASA GRC's Pilatus PC-12 research aircraft.
- **High-Bandwidth PAT Control & Jitter Suppression:** Transition and implement a government-off-the-shelf Pointing, Acquisition, and Tracking (PAT) software, embedded sensors, and closed-loop motor drivers capable of rejecting platform vibration, angular base motion, and high-frequency aero-optical beam jitter in dynamic flight regimes.
- **Aero-Optical Modeling & Aerodynamic Window Optimization:** Deliver comprehensive aero-optic characterizations, including Computational Fluid Dynamics (CFD) modeling (RANS/LES), boundary layer wake evaluations, and flat versus conformal optical window trade studies. Technology solutions must be validated via wind tunnel testing up to transonic flight speeds.
- **Structural Airworthiness & Flight Safety Certification:** Perform complete structural FEA under static/dynamic limit loads, aerodynamic drag/lift/moment calculations at Never-Exceed airspeed (V_{NE}), window destructive pressure evaluations, and generate comprehensive documentation meeting NASA Airworthiness Review Board (ARB) standards.

- **Ground, Littoral, & Multi-Altitude Flight Validation:** Validate end-to-end link acquisition and optical time transfer across stationary Laser Test Range baselines (650 m to 2 km), dynamic ground-to-vehicle mobile platforms (0–30 mph) in GPS/RF-denied environments, over-water littoral links (1.6 km), and multi-altitude flight operations.
- **Adaptive Optics** – Multi-spectral adaptive optics system development to support simultaneous multi-wavelength propagation in turbulent environments. Solutions must include a combination of hardware and modeling and simulation to inform performance requirements in different flight profiles for air-to-air and ground-to-air scenarios.

Line of Effort – 2: Air-qualified optical transceiver Telescope

This Line of Effort is seeking technology solutions for a monostatic optical transceiver telescope. The solutions must be self-contained units that can be integrated into the line of effort 1 hemispherical optical turrets with standard single-mode fiber, power-over-ethernet, or other military standardized connections for electrical power, analog, and digital interfaces.

- Wavelength: Optical C-Band
- Maximum Transit Power: 5W
- Optical Interface: Single-mode fiber
- Tracking Systems: Solutions must include a multi-axis fast steering mirror (FSM) for fine pointing and tracking of the opposing optical transceiver with threshold bandwidth of 1kHz and an objective bandwidth of 10kHz. The FSM should include a feedback system for maintaining optical alignment in dynamic and turbulent environments. System interfaces for the FSM and feedback control system should have well-defined application interfaces for integration into the line of effort 1 coarse tracking system and government command and control software.
- Shock, Vibe, Thermal: Commercial flight in a PC-12 aircraft housed in the line of effort 1 optical turret. The line of effort 1 optical turret will be sealed but the internal air is exposed to changes in thermal and pressure changes during flight. Solutions should demonstrate MIL-STD certifications were applicable.
- Volume: 145mm x 145mm cross section centered on primary aperture and 254mm in length
- Primary Aperture: 80mm to 125mm in clear aperture. Aperture size should support demonstration distances of up to 30km.

Primary Attributes (Highly desired):

- **Flight-Proven Aero-Optic Testing Pedigree:** Demonstrated institutional expertise and existing facility infrastructure in airborne optical tests to de-risk aero-optical phase distortion prior to flight campaigns.
- **Wind Tunnel Verification & Validation:** Demonstrated expertise and facilities to conduct wind tunnel tests in a 3'x3' cross-sectional area up to transonic speeds

- **Direct NASA/DoD Flight Integration & Airworthiness Experience:** Demonstrated capability to interface directly with NASA Flight Operations and DoD safety review boards to achieve formal Airworthiness Flight Releases on airborne flight assets.
- **Dual-Use Quantum & FSOC Modularity:** Turret optical head and terminal control architecture capable of supporting both classical high-bandwidth optical data backhauls and precision optical time transfer/clock synchronization protocols.
- **DIL & GPS-Denied Operational Resilience:** System software and tracking control loops demonstrating stable link acquisition and re-acquisition in disconnected, intermittently connected, and low-bandwidth (DIL) conditions without dependence on external GPS/RF positioning data.

Secondary Attributes:

- **Conformal Window Integration Readiness:** Tooling and supplier pathways for optical-grade conformal window fabrication that minimize aerodynamic drag while preserving transmitted wavefront quality and link budget margins.
- **Low SWaP-C Airborne Architecture:** Optimized electrical power conversion, integrated battery backup, and mass-reduction engineering satisfying strict airframe weight limitations and electrical power bus boundaries.
- **Multi-Axis Maritime Motion Simulation:** Hardware-in-the-loop validation of terminal stabilization on a 6-DOF controlled motion table simulating maritime dynamic environments (sea states 1 through 6).

Prior Demonstration and Experience:

Preference may be given to entities that can provide evidence of mature optical tracking, gimbal control, and aero-optical mitigation technologies with a minimum Technology Readiness Level (TRL) of 6/7. Offerors are encouraged to highlight prior experience in airborne instrumentation design, finite element flight load analysis, high-speed optical beam steering, and outdoor laser range testing.

Security Classification:

The contractor shall be capable of receiving and storing Controlled Unclassified Information (CUI) to perform under this AOI. There is no facility clearance level requirement associated with this AOI.

Solution Briefs:

Interested companies shall submit a solution brief (maximum 15 slide powerpoint or 5 page) within the vulcan platform (Vulcan-sof.com) no later than 2359 Eastern Daylight Time (EDT) October 15, 2026. Companies are encouraged to propose to one or both lines of effort, but the lines of effort must be clearly articulated in the submission. Solution briefs shall not contain CUI and shall meet the requirements specified in CSO N65236-26-S-0001 paragraph 7.2. In addition,

the solution brief shall detail how the nontraditional business participation as defined in CSO N65236-26-S-0001 paragraph 6.2 will be met. If proposing a teaming partner to meet nontraditional requirements, that teaming partner must be identified by name in the solution brief and their cage code provided for verification. If an offeror is proposing to meet the requirements by providing a cost share, this must be explicitly stated in the solution brief.

Late submissions will not be considered.

The Government reserves the right to limit the number of entities invited to pitch based on the evaluation consideration in accordance with CSO N65236-26-S-0001 paragraph 7.2.2. Solution Briefs that are selected for the Phase 2 Pitch will be notified in writing as soon as practicable.

Pitch:

The Government anticipates hosting virtual pitches for this AOI.

Tentative dates for the pitches will be 29 and 30 October 2026. Solution Briefs that are chosen for the Phase 2 Pitch will be notified in writing as soon as practicable. The pitch session should focus on the following:

1. **Solution Overview:** The pitch must begin with a brief Solution Overview providing a Bottom Line Up Front (BLUF) of capabilities, direct relevance to the AOI, an overview of the collaborative division of labor (detailing the multi-agency consortium framework), and a top-level cost breakdown.
2. **Technical Briefing:** Following the overview, the vendor/team is expected to present a technical briefing of their hardware/software subsystems executing a representative tracking, PAT stabilization, or aero-optic data ingestion scenario. During this demonstration, the team is expected to showcase solutions for real-time telemetry processing, line-of-sight stabilization under simulated disturbance, and physical proof of the core capabilities outlined in this AOI.
3. **Execution Roadmap:** The pitch must present a complete solution and outline a credible pathway to full flight demonstration.

Point of Contact:

Questions related to this AOI can be submitted to Jessie Rehwoldt: jessie.m.rehwoldt.civ@us.navy.mil. Solutions Briefs emailed directly to Jessie Rehwoldt will not be accepted for this AOI. Solutions briefs must be submitted via the Vulcan platform to be evaluated.

Potential for Follow-On Production Contract:

Companies are advised that any prototype other transaction agreement awarded in response to this AOI may result in the direct award of a follow-on production agreement without the use of further competitive procedures.

Public Announcements:

No press releases or public announcements regarding AOI 27-A001 can be made ahead of notification from the Government regarding down select to Phase II pitches. Non-compliance with this policy may result in potential exclusion from further consideration in the AOI evaluation.