

Special Notice N0014-21-S-SN06
Special Program Announcement for Office of Naval Research
Research Opportunity:
“SCREAMING ARROW”

I. INTRODUCTION

This announcement describes a technology area, entitled Hypersonic Aerothermodynamics, High-Speed Propulsion and Materials under the N00014-21-S-B001, Long Range Broad Agency Announcement for Navy and Marine Corps Science and Technology which can be found at <https://www.onr.navy.mil/work-with-us/funding-opportunities/announcements>. The submission of proposals, their evaluation and the placement of contracts will be carried out as described in the above Long Range Broad Agency Announcement.

The purpose of this announcement is to focus attention of the scientific community on (1) the area to be studied, and (2) the planned timetable for the submission of white papers and full proposals.

II. TOPIC DESCRIPTION

The Office of Naval Research (ONR) Department for Aviation, Force Projection and Integrated Defense (Code 35) is soliciting proposals for the development and testing of a hypersonic, air-breathing controlled test vehicle (CTV) that will hereafter be referred to as SCREAMING ARROW. SCREAMING ARROW is to be designed to fulfill a Naval role; therefore, it is intended that in conjunction with its hypersonic, air-breathing characteristics, it must also be both aircraft carrier (CVN) compliant and F/A-18E/F Super Hornet compatible.

A. Background and Objective:

The SCREAMING ARROW Innovative Naval Prototype (INP) program is funded by the Office of Naval Research (ONR) starting in Fiscal Year 2021 (FY21). The objective is to demonstrate an aircraft carrier (CVN) compliant, air-launch, of an air-breathing propulsion controlled test vehicle (CTV) (cruiser, inter stage and booster) that is compatible with an F/A-18E/F Super Hornet. Successful demonstration(s) – likely three CTV launches – will culminate in the CTV captive carriage, CTV air launch separation, CTV controlled flight, CTV-booster ignition, CTV-booster operation, CTV separation (cruiser from booster), cruiser controlled flight, cruiser engine start, cruiser accelerates to cruise condition, cruiser at cruise condition, cruiser turndown, cruiser terminal phase flight trajectory and cruiser flight impact.

The programmatic approach is to leverage previous and current hypersonic air-vehicle/propulsion developments by government agencies and defense industry contractors. The specific technology approach chosen shall be selected based upon cost, schedule, and analysis of meeting a series of maturation criteria, which include key kinematic and physical characteristics, critical component maturity validated through tests, and concept design compatibility with CVN usage.

Taking a broader view of the landscape, this programmatic approach considers other factors. Within both the Navy and OSD there is a desire to field a near term hypersonic weapon system. For the Navy specifically, it is envisioned that Offensive Anti-Surface Warfare (OASuW) Increment Two (Incr 2) weapon be either a hypersonic or near-hypersonic weapon. For OSD, there is broader desire and a Congressional mandate to develop and bring a hypersonic weapon into the U.S. inventory.

The SCREAMING ARROW INP program is properly positioned to align with OASuW Incr 2 either: (1) as a candidate for consideration in an acquisition program, or (2) to directly flow into an acquisition program. This potentiality broadens the scope to consider a strategy and program structure that goes beyond the current mandate of controlled flight vehicle demonstration to the potential of becoming an on-ramp to a follow-on acquisition program of record (POR).

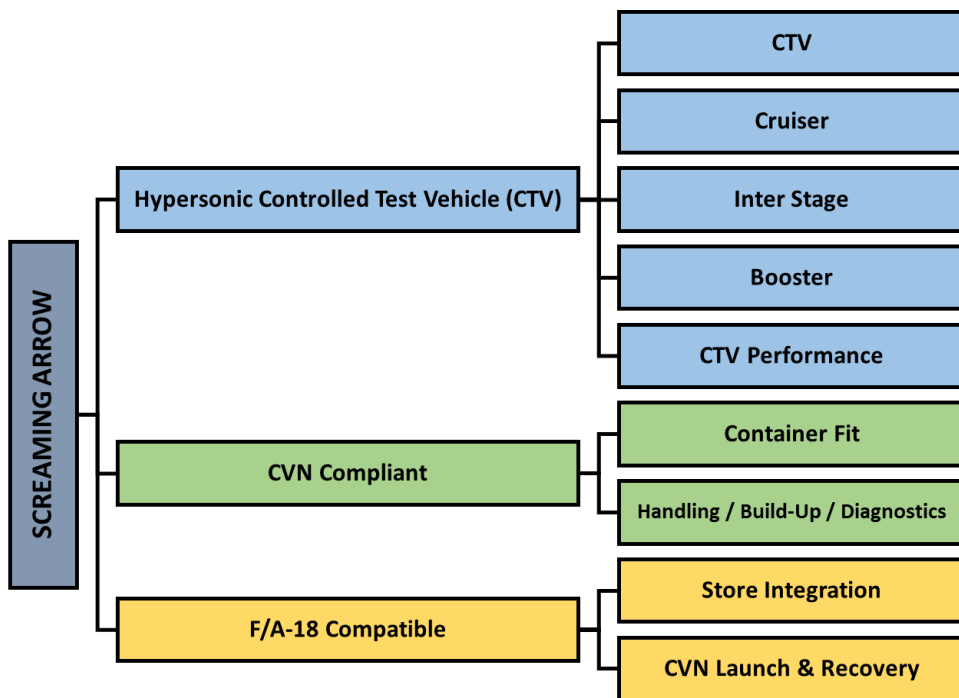
B. Technical Description:

1. Technical Goals: The prescribed technical goals of SCREAMING ARROW are as follows:
 - a. Leverage previous and current hypersonic air-vehicle/propulsion developed cruiser with limited design changes culminating in a final TRL6 demonstration (land-based flight tests), which will be used to determine the technical success of the INP.
 - Demonstration shall consist of an air-launch of a CVN compliant-CTV, which shall consist of three main parts: (1) cruiser hypersonic vehicle integrated with near tactical (2) inter-stage and (3) booster motor assemblies.
 - While design of the CTV shall meet requirements for CVN compliance and carrier launch and recovery operations, the demonstration flights shall be land-based.
 - b. The following operational capability will be shown in the final demonstration:
 - Release of All Up Round (AUR), free-flight separation dynamics
 - Free-flight booster motor operation to accelerate AUR to scramjet transition conditions
 - Free-flight transition from booster motor to scramjet engine operation
 - Free-flight scramjet engine operation to accelerate to “cruise” condition
 - Free-flight scramjet engine operation during “cruise” conditions
 - Free-flight scramjet engine operations during “turndown” conditions
 - Free-flight cruiser operational environments throughout flight
2. Requirements Summary: The specific use case of SCREAMING ARROW is Offensive Anti-Surface Warfare (OASuW). The threshold target set includes, but is

not limited to, surface combatants and capital ships. The need for SCREAMING ARROW technologies arises from a capability gap in propulsion solutions for servicing adversary targets at range within a compressed time of flight, which is not achievable with today’s sub-hypersonic weapon approaches.

- a. ONR expects offerors to consider three primary elements for the design of SCREAMING ARROW: (1) the Hypersonic Controlled Test Vehicle (CTV) design itself, (2) the need to be CVN compliant, and (3) the need to be F/A-18 compatible¹. Details of those three elements are further broken down below in Figure (1) and Table (1).

Figure (1): SCREAMING ARROW Design Elements



¹ Although the SCREAMING ARROW design must ensure CVN compliance and F/A-18 compatibility, flight testing will be land based, and the actual launch platform for testing is to be determined.

Table (1): SCREAMING ARROW Design Element Specifications (notional)²

Element	Sub Element	Description	Metrics
Hypersonic Controlled Test Vehicle (CTV)	CTV	Shall include navigation/ autopilot/ control sufficient to perform flight demonstration	None
		Shall include minimum capability control actuator system (CAS) and flight computer sufficient to perform flight demo	None
		Shall include telemetry system (TM) sufficient to perform flight demo	None
		Shall include flight termination system (FTS) sufficient to perform flight demo	None
		Shall include attachments to support the CTV on the objective aircraft, interfacing with existing hardware and/or launchers	Notionally F/A-18 E/F stations 3/4/8/9
		Shall meet range safety requirements	TBD
	Cruiser	Shall apportion nominal size, weight and performance (SWaP) for future seeker/sensor	TBD
		Shall apportion nominal SWaP for future communication/antennas	TBD
		Shall apportion nominal SWaP for future warhead/fuzing (two warheads types are being considered)	TBD
		Shall apportion nominal SWaP for future inlet closure(s)	As required by design
	Inter Stage	Shall include cruiser/booster separation system for flight demo	None
	Booster	Shall include sufficient total impulse (IT)/impulse profile to achieve cruiser takeover (i.e., altitude & velocity)	As required
	CTV Performance based on launch conditions: (a) 30K ft., 0.8 Mach, 10 degrees nose up; and (b) 40K ft., 0.8 Mach, straight/level	Minimum Range Desired	TBD
		Minimum Altitude for Cruise	TBD
		Maximum Time of Flight/ Maximum Time to Target	TBD
		Terminal Phase: Turn Down Initiation – Range to Target	TBD
		Terminal Phase: Turn Down Angle – Angle of Approach to Target	TBD
		Terminal Phase: Minimum Velocity to Target	TBD

² Most design element specifications are notional or undefined at the time of this special notice release. Some specifications might not be identified until a date later than the award of this contract. ONR expects that offerors will apply practical understanding of U.S. Naval weapons systems and platforms to their designs.

Element	Sub Element	Description	Metrics
		Terminal Phase: Minimum Maneuvers (g's) to Target	TBD
CVN Compliant	Container Fit Container Fitment (for Shipping/ Stowage) – This is the primary driver for maximum <u>SIZE/LENGTH</u> of the weapon.	Fully or near-fully assembled CTV must be in compliance with NAVSEASYS COM Itr Ser 05Z/143 dtd 08 May 14, Revised Shipboard Weapons Containers & Pallet Size Limitations	Length 180", Width 40", Height 45"
	Handling / Build-Up / Diagnostics	Uses existing Yellow Gear Will be compatible-integrate with the Common Munitions BIT/Reprogramming Equipment (CMBRE)	None CMBRE Compatible
F/A-18 Compatible	Store Integration	Hardware: Will be compatible with existing stores carriage/release mechanism	As required by launch platform
		Software: – Will interface with store carriage – Will interface with store release	As required by launch platform
	CVN Launch & Recovery This is the primary driver for maximum <u>WEIGHT</u> of the weapon.	Weapon weight at Launch must consider: – Up to four (4) weapons, at station locations 3, 4, 8, 9; no additional stores – Four (4) weapons plus launcher weight shall not exceed:	TBD
		Weapon weight at Recovery must consider two (2) scenarios: – Two (2) weapon recovery – Zero (0) weapon recovery	See above

- b. Future Classified Annex: It is anticipated that specific classified metrics for the above parameters might be released at a date after this special notice release. Based upon that possible condition, a classified annex will be made available to offerors upon request. Procedures to request the classified annex are as follows:
- The request shall be on company letterhead and shall include the company name, company Cage Code, company mailing address, and current Department of Defense contract number along with the government point of contact (POC) for that contract and the contract information for the Joint Certification Program POC. ONR will use this information to verify eligibility to receive information associated with Security Classification Guidance.
 - The request shall be sent to Mr. James Farnsworth (contracting officer) at james.farnsworth@navy.mil with a copy sent to Mr. Kenneth Heeke and Mr. Jerome Kong at kenneth.heeke@navy.mil and jerome.kong@navy.mil, respectively.

- The deadline to request the Government Furnished Information (GFI) is 10 March 2021 at 5 PM Eastern Standard Time (EDT).

C. Notional Program Outline:

1. Base Contract (7 months): Base Contract phase shall focus on deriving system requirements and developing a preliminary design of the all-up-round and shall adopt a model-based systems engineering (MBSE) methodology. This phase will likely conclude with an S&T-tailored preliminary design review (PDR).
 - Tasks, milestones, and/or events in this phase are envisioned to include:
 - S&T-tailored Systems Requirement Review (SRR)
 - S&T-tailored Preliminary Design Review (PDR)
 - Tailored Master Plan
 - During the Base Contract performance period, the Offeror(s) shall be required to provide the following deliverables:
 - S&T-tailored SRR design document
 - S&T-tailored PDR data package
 - Detailed program plan from PDR to an S&T-tailored Critical Design Review (CDR)
 - Initial program plan of Contract Options 2/3 (from CDR to CTV deliveries)
2. Contract Option One (7 months): The Contract Option 1 phase shall focus on developing a critical design of the all-up-round and shall adopt a model-based systems engineering (MBSE) methodology. The Contract Option 1 phase will likely conclude with an S&T-tailored CDR.
 - Tasks, milestones, and/or events in this phase are envisioned to include:
 - S&T-tailored CDR
 - During the Contract Option 1 performance period, the Offeror shall be required to provide the following deliverables:
 - Tailored master plan document
 - Component/subsystem/system level test plans
 - Tailored component/subsystem/system level test data package
 - S&T-tailored CDR data package
 - Detailed program plan from CDR to CTV deliveries
 - Initial program plan for Contract Option 3
3. Contract Option Two (15 months): The Contract Option Two (2) phase shall focus on all-up-round component/subcomponent fabrication and integration. The Contract Option 2 will likely conclude with material assessment of all-up-round.
 - Tasks, milestones, and/or events in this phase are envisioned to include:
 - Component/System Integration Tests
 - Inert/Live Cruiser/AUR Buildup
 - Test Readiness Review (TRR)
 - During the Contract Option 2 performance period, the Offeror shall be required to provide the following deliverables:

- Tailored cruiser/booster/AUR/platform TRR data packages
 - Special Test Equipment with associated technical manuals/procedures/certifications
 - Special handling equipment with associated technical manuals/procedures/certifications
 - AUR shipping container with associated technical manuals/procedures/certifications
4. Contract Option Three (13 months): The Contract Option Three (3) phase shall focus on all-up-round integration with the launch platform and flight testing. The Contract Option 3 will likely conclude with flight testing of all-up-round. Flight testing will be the graduation exercises for this program.
- Tasks, milestones, and/or events in this phase are envisioned to include:
 - Captive Carry/Drop Test 1
 - Fully Functional Captive Carry Test 2
 - Controlled Test Vehicle Demo 1
 - Controlled Test Vehicle Demo 2
 - Controlled Test Vehicle Demo 3
 - During the Contract Option 3 performance period, the Offeror shall be required to provide the following deliverables:
 - Technical Data Packages (TDPs)
 - Final Review / Final Report

III. DISTRIBUTION OF GOVERNMENT FURNISHED INFORMATION – WORKSHOP - INDUSTRY DAY

ONR does not plan to hold any workshops, industry days, webinars, etc. in support of this announcement.

IV. WHITE PAPER SUBMISSION

This Special Notice will not consider White Papers. Offerors are requested to submit full proposals only.

V. FULL PROPOSAL SUBMISSION AND AWARD INFORMATION

Full proposals should be submitted under N00014-21-S-B001 by **08 APR 2021 1700 Eastern Daylight Time**. Full Proposals received after that date will be considered as time and availability of funding permit.

ONR anticipates that contracts will be issued for this effort.

Full proposals for contracts should be submitted in accordance with the Appendix 2 of the N00014-21-S-B001.

ONR plans to fund three (3) individual awards

The period of performance for projects (including options) may be from SEP 2021 through FEB 2025 (42 months).

Although ONR expects the above described program plan to be executed, ONR reserves the right to make changes.

Funding decisions should be made by 01 MAY 2021. Selected projects will have an estimated award date of 01 SEP 2021.

VI. SIGNIFICANT DATES AND TIMES

Event	Date	Time
Recommended Full Proposal Submission	08 April 2021	1700 EDT
Notification of Selection: Full Proposals*	01 May 2021	
Awards*	01 September 2021	

Note: * These are approximate dates.

VII. POINTS OF CONTACT

In addition to the points of contact listed in N0014-21-S-B0001 the specific points of contact for this announcement are listed below:

Technical Points of Contact:

Mr. Kenneth Heeke

ONR 35 FNC Director

kenneth.heeke@navy.mil

Mr. Jerome Kong

ONR 35 Program Officer

jerome.kong@navy.mil

Business Point of Contact/Contracting Officer:

Mr. James Farnsworth

Office of Naval Research

james.farnsworth@navy.mil

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Distribution A

VIII. SUBMISSION OF QUESTIONS

Any questions regarding this announcement must be provided to the Technical Points of Contact and/or the Business Point of Contact listed above. All questions shall be submitted in writing by electronic mail.

Answers to questions submitted in response to this Special Notice will be addressed in the form of an Amendment and will be posted to the following web pages:

- Beta.sam.gov Webpage –Contract Opportunities – <https://beta.sam.gov/>
- Grants.gov Webpage – <http://www.grants.gov/>
- ONR Special Notice Webpage - <http://www.onr.navy.mil/Contracts-Grants/Funding-Opportunities/Special-Notices.aspx>

Questions regarding **Full Proposals** should be submitted NLT two weeks before the dates recommended for receipt of Full Proposals. Questions after this date may not be answered.