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DARPA-SN-24-109

**Request for Information
DARPA-SN-24-109**

**Cost Efficient Cargo
Defense Advanced Research Projects Agency
Tactical Technology Office**

Responses due 20 December 2024 by 4:00 PM ET.

This Request for Information (RFI) from the Defense Advanced Research Projects Agency (DARPA)'s Tactical Technology Office (TTO) seeks innovative and revolutionary concepts for heavy lift Uncrewed Aerial Systems (UAS) that are capable of lifting a 70,000lb payload utilizing current Commercial Off The Shelf (COTS) engines and drive train technology.

Responses to this RFI may be used to inform and explore future programs that will seek to build and test such concepts at scale.

The Government will comply with data rights assertions.

BACKGROUND:

The DoD has identified the need to solve the "ship to shore" and "wide gap crossing" problem. There are significant challenges in amphibious operations and land maneuvers, where armed forces must move troops, vehicles, and supplies from naval vessels to a beachhead and then across natural or man-made obstacles. These operations are complicated by the need for landing craft and amphibious vehicles to navigate shallow waters, avoid obstacles, and contend with enemy defenses. The speed of movement is a critical operational need; any delays in offloading personnel and equipment during both the ship to shore phase and on shore wide gap crossings can expose forces to enemy fire and hinder the establishment of a secure foothold. Additionally, weather and sea conditions can severely impact the safety and efficiency of landings, while enemy defenses, including mines, artillery, and entrenched infantry, pose significant risks. Once a foothold is secured, forces often encounter wide gaps, such as rivers, ravines, or destroyed bridges, that hinder the movement of heavy equipment. These obstacles require engineering solutions such as pontoon bridges or amphibious vehicles, but such operations are time-consuming, giving the enemy time to prepare.

Heavy lift UAS could offer innovative solutions to these challenges by providing a means to rapidly transport equipment, supplies, and large platforms. They can operate in various weather conditions and avoid enemy defenses more effectively, exploiting the latest intelligence while being responsive to changing battlefield conditions to deliver essential resources directly to where they are needed most. By using heavy lift UAS, forces can maintain operational speed, reduce vulnerability to attack, and ensure continuous logistical support, thereby enhancing the overall effectiveness of amphibious and land operations.

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The Sikorsky CH-53K King Stallion is currently the American helicopter with the highest payload capacity at 36,000lbs and serves as the U.S. Marine Corps' primary heavy-lift helicopter. The development of crewed helicopters with greater lifting capacity is limited due to factors such as rotor design, power-to-weight ratio, airframe strength, vibration and stress, development costs, operational costs, and crewed safety considerations. UAS offer a potential solution to some of the technical challenges faced by these crewed helicopters. Primarily, UAS can be designed with different priorities, offering innovation in design and greater mission profile flexibility, without the cost of crewed safety considerations, and minimized training and certification time for pilots.

DESCRIPTION:

This RFI is looking for breakthrough concepts that fundamentally change the current paradigm. Responses that are incremental improvements on current concepts are not desired. Submissions for designs or derivatives of standard helicopter, multirotor copters, tail sitters, or jump platforms with wing kits are not of interest. There are no restrictions on internal vs external cargo.

The bottom line is that the U.S. needs to move large and heavy cargo cheaply. Examples are moving a 40ft ISO container off a container ship 10 miles out at sea onto land, or a Bradley fighting vehicle from one side of a canyon to the other. DARPA is requesting information regarding novel UAS concepts capable of lifting a 70,000lb payload utilizing currently available COTS engines/motors and energy sources (batteries/fuel). Additionally, DARPA is interested in identification of design insights and key risks that can be addressed within a scaled down form to further substantiate DoD investment in heavy lift systems and challenge the paradigm of current UAS design as a whole.

REQUESTED INFORMATION:

DARPA is interested in responses that provide information and insights related to all of the following key challenges:

- **Design and Maneuverability:**
 - a. This RFI seeks a novel design
 - b. COTS components highly encouraged. (Engines, Generators, Batteries, Rotors, etc.) No information on next generation components is requested.
 - c. Sustainment expectations
 - d. Autonomous functions are expected but not the focus of this RFI
- **Notional Mission Profile:**
 - a. Fly from a prepared base to the payload location attach/obtain 70,000lb payload, traverse 25mi at 500ft, detach payload, return to base 25mi.
 - b. Calculations for the mission profile are not required but submissions including the following metrics would be of interest to DARPA:
 - i. Lift Calculations
 - ii. Weight and Balance: Gross Weight & Center of Gravity

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- iii. Power Requirements: Output, Hover, Cruise, Climb, Margin
- iv. Blade and Disk Loading Calculations
- v. Drag Calculation: Parasitic, Inducted, Total
- vi. Performance: Ceiling, Range, Endurance, Efficiency
- vii. Stability and Control Analysis: Dynamic Stability, Control Authority
- viii. Vibration and Aeroelasticity
- ix. Structural Integrity: Stress/Strain, potential Fatigue Life
- **Cost:** Full-size concept description to support a cost of <\$30M for the first unit.
- **Scalability:**
 - a. Ability to scale to different missions, payload sizes, and ranges to include:
 - Payload: 10,000lb, 30,000lb, 45,000lb
 - Range: 10mi, 25mi, 50mi, 100mi.
 - b. Inexpensive, technically acceptable small scalable version that proves out the novel concept with a general timeline (i.e. x size, x dollars, x time)

SUBMISSION FORMAT:

This announcement contains all information required to submit a response. No additional forms, kits, or other materials are needed.

Submissions of white papers in response to the RFI should be concise. Responders should submit a single integrated response addressing the areas described above. DARPA will only review responses submitted in a Microsoft Word (.doc or .docx) file or unprotected Adobe Acrobat (.pdf) file. Each response is limited to not more than 10 pages using 12-point font and 1-inch margins on 8.5-inch by 11-inch paper. Effective responses that can be provided in fewer than 5 pages are encouraged.

Cover Sheet (1 page, not included in page count): Provide the following information:

- a. Response Title
- b. Technical point of contact name, organization, telephone number and email address
- c. Indicate classification level if selected to present (Unclassified, Unclassified/CUI, Secret Collateral)

Technical Description (no more than 10 pages). Graphics within the technical descriptions are encouraged to the extent that they aid in succinctly describing the concepts.

Bibliography/References (no more than 2 pages, not included in page count)

Graphic Overview Slide (1 page, optional, not included in page count): If desired, include a single PowerPoint slide that graphically depicts the main ideas of the response.

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The contact information should include the respondent's technical and/or administrative points of contact (names, addresses, phone numbers, fax numbers, and e-mail addresses) to enable potential clarification discussions.

All technical and administrative correspondence and questions regarding this announcement and how to respond to this RFI should be sent to DARPA-SN-24-109@darpa.mil. E-mails pertaining to this RFI that are sent directly to individual DARPA program managers will not receive a response. No telephone inquiries will be accepted.

ELIGIBILITY

DARPA invites white paper submissions from all those engaged in related research activities and appreciates responses from all capable and qualified sources, including, but not limited to, universities, university-affiliated research centers (UARCs), not-for-profit research centers, Federally-Funded Research and Development Centers (FFRDCs), private or public companies, individuals, and Government-sponsored research laboratories.

DISCLAIMERS AND IMPORTANT NOTES:

This is an RFI issued solely for information and program planning purposes; this RFI does not constitute a formal solicitation for proposals or proposal abstracts. In accordance with FAR 15.201(e), responses to this notice are not offers and cannot be accepted by the Government to form a binding contract. Submission of a response is strictly voluntary and is not required to propose to subsequent Broad Agency Announcements (if any) or research solicitations (if any) on this topic. No solicitation exists; therefore, do not request a copy of the solicitation. If a solicitation is released, it will be synopsisized on the SAM.gov website. It is the responsibility of any potential offerors/bidders to monitor this site for the release of any solicitation or synopsis.

DARPA will not provide reimbursement for costs incurred in responding to this RFI or participating in any subsequent workshop pertaining to this RFI.

If a response is classified, it should be coordinated with DARPA prior to submission. Responders wishing to provide a classified response should send an e-mail to the Special Notice (SN) mailbox as soon as possible with the subject line "Classified Coordination Requested" to allow time for proper coordination. **NO CLASSIFIED INFORMATION SHOULD BE INCLUDED IN THE RFI RESPONSE SENT TO DARPA-SN-24-109@darpa.mil.**

To the maximum extent possible, please submit non-proprietary information. If proprietary information is submitted, it must be appropriately and specifically marked. It is the submitter's responsibility to clearly define to the Government what is considered proprietary data. Any proprietary information should clearly be labeled as "Proprietary." DARPA will not publicly disclose proprietary information obtained as a result of the RFI.

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To the full extent that it is protected pursuant to the Freedom of Information Act and other laws and regulations, information identified by a respondent as "Proprietary" will be appropriately controlled. Submissions may be reviewed by Government personnel and support contractors bound by appropriate non-disclosure agreements. Responses to this RFI will not be returned.

Respondents are advised that DARPA is under no obligation to acknowledge receipt of the information received or provide feedback to respondents with respect to any information submitted under this RFI. Responses to this RFI do not bind DARPA to any further actions.

Point of Contact:

DARPA/TTO

DARPA-SN-24-109@darpa.mil