



## REQUEST FOR INFORMATION

General Atomics is seeking potential bidders to perform system engineering and systems integration studies for a lightweight, 150 kW tactical laser weapon system. Based on responses received under this Request for Information (RFI), a Request for Proposal may be distributed to qualified respondents for work beginning in early 2005. A detailed Statement of Work for system engineering support, system integration, and other efforts will be included in the Request for Proposal.

Anticipated Performance Period: March 2005 to Dec 2009

### **Background**

General Atomics, under a contract with the Defense Advanced Research Projects Agency (DARPA), is developing an advanced, diode-pumped, lightweight laser system. This system offers the potential for compact, lightweight laser weapons systems suitable for deployment on a wide range of tactical systems.

The High-Energy, Liquid-Laser Area Defense System (HELLADS) program is currently in the third of five phases. The current phase consists of developing the technology necessary to demonstrate a subscale prototype laser system in the laboratory. This subscale demonstrator shall be constructed in the same geometry and operate with a fluence comparable to that of the final weapon system.

As currently envisioned, the fourth phase shall consist of a ground-based laser weapon system demonstrator with an approximate average power of 150 kW. The laser weapon system demonstrator constructed in this phase shall employ a design and materials which demonstrate the ability of the final weapon to achieve low specific weight (5 kg/kW) and a compact geometry suitable for deployment on tactical systems.

The final phase consists of the engineering, fabrication, integration and demonstration of a complete HELLADS weapon system on a tactical platform. The Government shall specify the platform during Phase 4 of the HELLADS program.

In order to insure a smooth transition from the laboratory laser to a deployable weapon system, it is desired to have the System Integrator participate in various engineering aspects of the HELLADS system during the current laboratory phase. In addition, the successful bidder will be responsible for providing input to the design of the Phase 4 weapon system demonstrator and may be responsible for constructing various elements of the Phase 4 system. In Phase 5, the successful bidder will assist with the engineering fabrication and integration of the weapon system on the tactical platform. These

responsibilities may include target acquisition and tracking, beam control, fire control, and integration of the various subsystems on the tactical platform.

The current HELLADS Program schedule is provided as an attachment to this RFI.

Interested bidders are requested to provide information associated with:

**I) Acquisition, tracking and pointing (ATP)**

The target set of interest includes, but is not limited to: artillery, mortars, rockets, cruise missiles, surface to air missiles and air to air missiles. The ATP system envisioned will include a radar/infrared based target acquisition system which cues a high resolution, laser illuminator based beacon/tracker.

Potential bidders should describe their experience in radar and/or infrared acquisition of the aforementioned targets. The concept for a nominal target acquisition should be described. Simple estimates of the acquisition system size and weight should be provided. Bidders should also describe their experience and concepts for the control system which acquires and identifies the targets and passes location information to the illuminator/tracker.

**II) Fire Control**

For the purpose of responding to this Request for Information, Fire Control contains those elements of the system which serve as the interface between the ATP system and the Beam Control system. In this context, Fire Control is principally concerned with identification of the target, range determination, measurement of atmospheric distortion, generation of wavefront correction matrix, irradiance control to achieve the desired probability of kill and human-machine interface.

Potential bidders should describe their experience in these areas and provide an elementary description of the Fire Control system envisioned.

**III) Beam Control**

Beam Control refers to the entire optical train from the laser to the output aperture of the weapons system. The Beam Control system will contain the necessary optics to combine the illuminator and high power lasers into a common shared aperture, fast steering and deformable mirrors to correct for atmospheric pointing and distortion and a variety of diagnostics. The successful bidder will be responsible for the detailed design and integration of the Beam Control System. However, specific elements are being developed in parallel to the current phase of HELLADS. These elements include advanced laser illuminators and a lightweight beam director. It is expected that the Beam Control system will take advantage of these developments. Either General Atomics or the US Government may elect to contract for these elements independently and provide them to the contractor responsible for Beam Control.

Potential bidders should provide information on their prior experience with Beam Control systems relevant to tactical laser weapons. A notional design of a Beam Control system for the HELLADS weapon system on a tactical aircraft should be provided which identifies all elements and includes a description of the function of elements and their integrated operation.

#### **IV) Beam Quality**

The System Integrator may be required to work with General Atomics on the development of an integrated wavefront sensor/adaptive optics package. The overall objective of the system is to achieve high irradiance on target. This will require correction for atmospheric distortion and may require pre-correction within the laser resonator. *It is envisioned that HELLADS will develop an integrated adaptive optics system which divides the principle distortions between an external cavity fast steering mirror, and adaptive optics which may be intra or extra-cavity to produce an optimized wavefront control package.*

#### **V) Laser Lethality**

While the HELLADS laser can operate in both pulsed and continuous modes, it can be assumed that majority of engagements against the target class described previously will be continuous. The successful bidder will work closely with General Atomics and potentially other subcontractors to provide lethality estimates and analysis for the HELLADS weapons system.

Potential bidders should describe their experience in modeling and simulation of laser-target interactions and their methodology for estimating probability of kill. Validation of these models by comparison to the experimental data base maintained by the Government is desirable.

#### **VI) System Engineering & Integration**

General Atomics is responsible for the Laser, Thermal Management, Power and Control subsystems for the laser weapon as part of the system package. However, these subsystems must themselves be integrated with mechanical, power, heat transfer and control systems on-board the tactical platform. In addition, the Beam Control/Fire Control and ATP subsystems must be designed for integration on the tactical platform. In order to facilitate platform integration and interface control, it is desired to have the System Integrator participate in various system engineering aspects of the HELLADS system during the current laboratory phase. The successful bidder will be responsible for providing input to the design of the Phase 4 demonstrator and may be responsible for constructing various elements of the demonstrator. In Phase 5, the successful bidder may have responsibility for the design and integration of the weapon system on the platform.

Potential bidders should provide a description of their experience on laser weapon or illuminator experience on tactical systems. Experience with the integration of conventional weapon systems which utilize elements of the ATP system is desired and should be described.

## **PROPRIETARY INFORMATION**

All companies providing information of a proprietary nature shall mark the information as such. This information shall be protected under the terms and conditions of non-disclosure agreements executed between the responding corporation and General Atomics. Respondents acknowledge that information that they provide in response to this RFI may be forwarded to DARPA and/or DARPA SETA contractors. Such information will be protected as proprietary and business sensitive by DARPA and its SETA contractors.

## **BASIS FOR SELECTION**

The selection of the system integrator shall be based principally upon the degree to which the offeror reduces the risk of meeting program objectives for the Phase 4 HEL Weapon System Demonstrator and the Phase 5 Tactical System Demonstrator. More detailed selection criteria shall accompany any Request for Proposal distributed to respondents of this RFI.

## **TIME OF RESPONSE**

Respondents shall have 30 calendar days to respond to this RFI. All responses should be received at General Atomics by December 10, 2004.

## **FORMAT**

Responses shall be limited to a maximum of forty pages (40) including all figures, tables, etc.. Respondents are welcome to include examples of prior activity in the general area and company information which relates to the ability of the corporation to perform the desired services. Responses should be in Microsoft Word or in PDF format.

Five (5) printed copies (color) and two electronic copies on compact disk of the response should be submitted to:

GENERAL ATOMICS  
3550 General Atomics Court  
San Diego, CA 92121  
Attn: Mr. Andres Lara

## **QUESTIONS**

All respondents are encouraged to seek clarification or additional information as required. Questions of a technical or programmatic nature may be submitted via e-mail to:

Dr. Michael D. Perry  
michael.perry@ga.com

Questions of a contractual nature may be submitted via e-mail to:

Mr. Andres Lara  
Andres.Lara@ga.com

Information which is determined to be of a general nature that might aid other respondents in preparation of a submittal shall be distributed via e-mail and/or posted on the GA web-site. The address of this website is:

[http://photonics.ga.com/high\\_power\\_lasers](http://photonics.ga.com/high_power_lasers)

