

Autonomy Research Pilot Initiative (ARPI)

Invitation for Proposals

November 2012

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I. OBJECTIVE AND BACKGROUND INFORMATION

A. Objective and Framework of the Autonomy Research Pilot Initiative

The Autonomy Research Pilot Initiative (ARPI) seeks to promote the development of innovative, cross-cutting science and technology for autonomous systems able to meet future DOD system and mission requirements. The focus is on those projects with the potential to radically advance capabilities 5, 10 or more years in the future in important warfare areas. Envisioned technology will allow military systems to complete complex military missions in dynamic environments with the right balance of warfighter involvement. The ARPI is a pilot test of an OSD-sponsored innovation program, directed by ASD (R&E), and executed by the Services, with support from the DOD Priority Steering Council (PSC) for Autonomy.

In May 2012, ASD(R&E) tasked the Autonomy PSC to inventory current DOD science and technology (S&T) investments in autonomy. The PSC, leveraging previous analyses within the DOD Autonomy Community of Interest, identified four key S&T technical challenge areas. These four technical challenge areas (summarized in Section I(B), below) focus on critical technology gaps that must be addressed in order for DOD to develop and field autonomous systems capable of carrying out complex military missions. This Invitation for Proposals (IFP) is aimed at funding technology development efforts that address the PSC-identified technical challenges.

Figure 1 illustrates how ARPI relates to other DOD autonomy research development activities. ARPI's primary focus is on advancing innovative high risk/high payoff, cross-cutting concepts that will potentially lead to game-changing transition opportunities. Service-specific innovative ideas that promise truly high payoff but are too high risk to be undertaken within the normal service S&T efforts are also of interest. Additionally, ideas that represent incremental efforts yet also address significant cross-cutting issues are applicable as well.

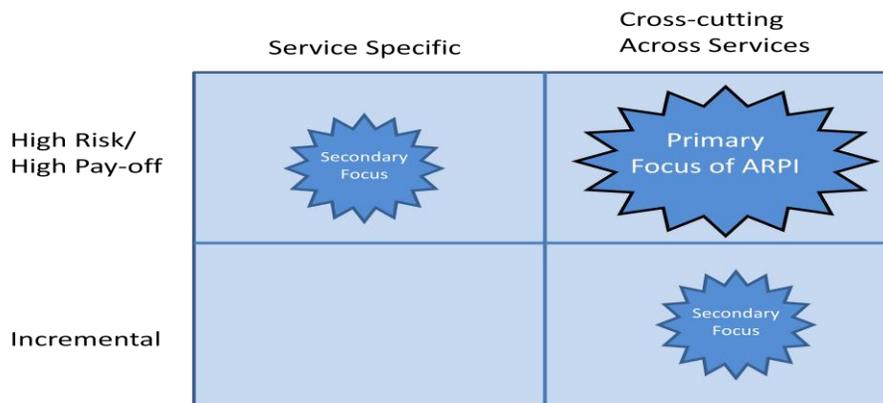


Figure 1. Focus of Autonomy Research Pilot Initiative

B. Background

In the past decade, unmanned systems have significantly impacted warfare worldwide. They have extended human reach via unlimited persistent capabilities, offering warfighters more options and flexibility to access hazardous environments, and the ability to react at speeds and scales beyond human capability. That said, current unmanned systems operate with little or no autonomy. Human operators, sometimes from a few feet to thousands of miles away, must make the majority of operational decisions for control responses. To truly meet warfighter needs, unmanned systems must reduce the cognitive load currently placed on their operators/supervisors, thereby freeing human operators to focus on more complex decision-making tasks. As unmanned systems become more autonomous, machines (agents) will be delegated increased decision making authority by their human operators. In some operational settings, an autonomous system may act in a peer-to-peer relationship with the warfighter, needing to interact naturally with the warfighter at full operational tempo. As autonomous technologies are fielded, their operational acceptance and success will largely depend upon calibrated operator trust, rigorous verification and validation of computer models and algorithms, operationally relevant test and evaluation criteria, and effective training regimens for the human teammates.

Many times the terms “autonomy” and “automation” are used interchangeably. These terms do, however, have different meanings; for the purpose of this document each is defined as:

- *Automation*: The system functions with no/little human operator involvement. However, the system performance is limited to the specific actions it has been designed to do. Typically these are well-defined tasks that have predetermined responses, i.e. rule-based responses in reasonably well-known and structured environments.
- *Autonomy*: Systems which have a set of intelligence-based capabilities that allow it to respond within a bounded domain to situations that were not pre-programmed or anticipated in the design (i.e., decision-based responses) for operations in unstructured, dynamic, uncertain, and adversarial environments. Autonomous systems have a degree of self-governance and self-directed behavior and must be adaptive to and/or learn from an ever-changing environment (with the human’s proxy for decisions).

Notionally, automation and autonomy are the two ends of a continuum. In a static environment, with a static mission, automation and autonomy converge. However, where dynamic environments collide with dynamic missions, automation can support only a small fraction of autonomy requirements.

A particular challenge is developing autonomous technologies that enable the military to operate securely with greater interconnectedness, persistence, and expanded operational envelopes, and on shorter timelines. Coordinated cross-platform/machine operations will be necessary to facilitate these missions, as multiple systems must sense, perceive, plan, decide and act together. Future missions will be in contested environments; therefore, we must also anticipate interrupted

and/or intermittent connectivity. All systems must be able to adapt to and/or learn from a highly complex and dynamic environment.

The Autonomy PSC has identified four non-exhaustive technical challenge areas, with subcomponents:

1. Human/Autonomous Systems Interaction and Collaboration:
 - a. Robust Cognitive and Neurological or Other Models that can model human interaction and teaming with autonomous systems beyond fairly narrow applications.
 - b. Integration of Autonomy, Artificial Intelligence and Human Cognitive, or Other Human Models
 - c. Optimized Trust in Automation/Transparency
 - d. Principled Control Station Human Factors Engineering
 - e. Advanced Feedback Interfaces to Maximize Common Perception between Human(s) and Agent(s)
 - f. Secure Communication between Human(s) and Agent(s) and understanding of intent and actions of human team members, adversaries and bystanders.
 - g. Advanced Control System Interfaces
2. Scalable Teaming of Multiple Autonomous Systems:
 - a. Shared Problem Solving/Reasoning between Agents
 - b. Shared Perception between Agents
 - c. System Health Management/Attrition Management
 - d. Secure Communication between Multiple Agents
 - e. Scalable collaboration among heterogeneous teams.
3. Machine Reasoning, Perception, and Intelligence:
 - a. Data-Driven Analytics
 - b. Sensor/Data Decision Models
 - c. Advanced Algorithms to Enable Robust Operations in unstructured environments including machine learning
 - d. Contingency-based Control Strategies
 - e. Adaptive Guidance and Control integration with higher level reasoning, decision-making, learning.
 - f. Domain Management (e.g., Airspace, Waterspace, Surface Traffic) and Mission Control
 - g. Integrated Contextual Decision Making
 - h. Cognitive, intelligent, and adaptive computing paradigm/platform
4. Test, Evaluation, Validation, and Verification:
 - a. Simulation Test Beds for Human-Agent Teaming
 - b. Live Test Beds for Human-Agent Teaming
 - c. Simulation Test Beds for Operation in Complex, Contested Environments

- d. Live Test Beds for Operation in Complex, Contested Environments
- e. Simulation Test Beds for Controlled, Coordinated Actions by Multiple Agents
- f. Live Test Beds for Controlled, Coordinated Actions by Multiple Agents
- g. Methods/Strategy to Test and Evaluate Autonomous Systems/Subsystems
- h. Methods/Strategy to Test and Evaluate Human-Agent Interfaces
- i. Methods/Strategy for Validation and Verification of Computer Models/Logic, Algorithms, and Integrated Software Tools

II. TECHNICAL CHALLENGE AREAS FOR THE ARPI

Successful proposals will address one or more of the Technical Challenges described in Section I(B). The focus is on those initiatives with the potential to radically advance capabilities 5, 10 or more years in the future in important warfare areas. An important assessment criterion is the Heilmeyer question: What difference will it make if this initiative succeeds? Strong proposals will also address one or more (current or future) notional joint operational missions. A few examples of operational missions that may be addressed in proposals are listed below. These examples are meant to be representative, but are not exclusive of the types of mission scenarios that will be considered.

- *The burden of processing, exploitation and dissemination (PED) Overload:* Today's battlespace is creating an unprecedented increase in intelligence, surveillance, and reconnaissance (ISR) data. The PED analyst can become overwhelmed in trying to integrate and analyze these various data inputs (imagery, video, communication and human ISR data) while also trying to track targets, infer sources and provide analysis feedback (in real-time or post-analysis). By increasing the level of machine perception, reasoning and intelligence on ISR platforms themselves, a more efficient workload balance can be achieved. This includes the management and closed loop control of ISR assets to adapt to their environments and mission circumstances to collect appropriate and relevant data.
- *Battle Damage Assessment (BDA):* Across all domains, BDA is a critical tool for operational decision makers. Advancing the capability for semi-autonomous analysis and assessment, autonomous image and video understanding, and natural, trustworthy cognitively compatible human-machine interaction will enhance the capacity to obtain actionable intelligence in near real-time. As well, assets collecting data for BDA may need to balance that with other mission objectives and constraints.
- *Cooperative Engagement:* Current and future military operations are moving toward greater interoperability and reduced timelines, while dealing with the proliferation of technologies across the world. For example, the shift in DOD's focus toward operations in highly contested, anti-access, area denial (A2AD) environments will require, among other things, reliance on autonomous systems to manage the speed, complexity and uncertainty inherent within these environments. It is anticipated that autonomous capabilities will enable cross-platform interactions and/or coordination, allowing the military to operate within an adversary's planning/decision/action

timeline. This may include mission role management, coordinated time on target engagement, and sharing information about land-based and maritime targets within layered defenses.

- *Anti-Access/Area Denial*: U.S. Forces must be able to attain access to denied areas, including penetrating and operating in hazardous areas where others cannot, in order to hold at risk anti-access targets and deny sanctuary to adversaries. To support this, autonomous systems will need to be able to adapt to and exploit many aspects of highly dynamic, harsh, and adversarial environments. Development of adaptive, distributed, and long-duration autonomous capabilities can support this through capabilities such as rapid detection, classification, location, and tracking of threats over challenging areas.
- *Cooperative/collaborative operations involving Soldiers, Sailors, Airmen, or Marines together with unmanned systems as part of a small unit*: Examples of this include shipboard damage control, route clearance, logistics support/unburdening warfighters in the field, casualty evacuation, and unmanned systems that can act as a “wingman” for dismounted warfighters. Critical to success will be systems that are appropriate teammates for warfighters and act in ways that are helpful, appropriate, trustworthy, and non-intrusive with human teammates who may have limited training and skills with the operation of autonomous systems.

Successful proposals will focus on Budget Activity (BA)1 (6.1) - BA3 (6.3) efforts. Funding will be available to support efforts regardless of targeted technology readiness level and proposals should indicate the starting BA activity level (or TRL) and the anticipated end-of-program level.

For Basic Research (BA1/6.1 and early BA2/6.2-like efforts), the proposal should include a discussion of potential relevance and contribution of the effort to DOD’s autonomy R&D mission. For Applied Research and Advanced Technology Development (BA2/6.2 and BA3/6.3 efforts), the proposal should provide either (1) a description of the concept of operation for the new capabilities to be delivered and the expected operational performance improvements or (2) a plan for demonstrating and evaluating the operational effectiveness of the offeror’s proposed products or processes in field experiments and/or tests in a simulated environment. Proposals should indicate an end-of-program transition path—either to an ongoing laboratory S&T effort or to a new or existing program of record—and identify a point in the proposed effort (milestone deliverable) when the anticipated transition path will be identified and plans to accomplish this transition will commence. Another alternative is to indicate how the proposal offers a significant tech push, thereby enhancing the DOD lab enterprise’s knowledge base.

III. GENERAL INFORMATION ON THE PILOT STUDY

A. Agency Name

Office of the Assistant Secretary of Defense for Research and Engineering
(OASD(R&E))
Room 3C759
The Pentagon
Washington, DC 20301-3030

Proposals should be submitted to the Defense Innovation Marketplace website (see address in section III(D), Points of Contact).

B. Research Opportunity Title

Cross-Cutting Initiatives for the Autonomy Research Pilot Initiative

C. Response Dates

White Papers may be submitted until January 18, 2013. A limited number of White Papers will be selected and requests for detailed proposals will be sent to the proposal PIs on or about February 8, 2013. Detailed proposals may be submitted until March 22, 2013.

D. Points of Contact

For a copy of this document, a list of the lead POCs for autonomy, to post questions, and to submit proposals, refer to the Defense Innovation Marketplace website: <http://www.defenseinnovationmarketplace.mil>. Technical questions may also be posed directly to your organization's autonomy POC, whose contact information is listed on the website.

IV. AWARD INFORMATION

A. Amount and Period of Performance

For this Pilot Study, OASD(R&E) will make available up to \$15 million in FY13 funds, pending budget authorization. It is planned that additional funding will be available to the Pilot Study in FY14 and FY15 funds as well, with the specific level yet to be determined. The technical challenge areas, described in Sections I and II above, were approved by ASD(R&E) in November 2012. Proposals may address single or multiple technical challenge areas. Selection will be based upon highest scored proposals per evaluation criteria and not based upon any predetermined distribution across the four Tech Challenge Areas. It is expected that no project would exceed \$5M/year. Project schedules should be phased with some notable results scheduled to be accomplished in a 12 – 18 month timeframe, at which time they will be evaluated. Continuation of the effort will depend on a positive evaluation and on the availability of funds.

It is anticipated that approved projects would receive up to a maximum of three (3) years of OASD(R&E) funding support. During this period, assuming the project is successfully meeting identified milestones and will require additional funding beyond three years, the lead DOD laboratory will work in conjunction with OASD(R&E) to transition to funding by the appropriate MILDEP(s) beginning no later than FY16. This does not mean that a new Program of Record (POR) would have to be created. It is equally plausible that the results of a project can be incorporated into, and make a significant contribution to, an on-going programmed S&T effort or existing POR. Alternatively, if additional funding beyond 3 years is not required or if the project does not succeed in meeting its milestones, no MILDEP funding would be required.

B. Execution Oversight

Once a project has been approved, OASD(R&E) will utilize peer reviewers from Government agencies and other subject matter experts drawn, as appropriate, from Federally Funded Research & Development Centers (FFRDCs), academia, and/or industry to assist in annual appraisals of project performance. Such periodic performance reviews monitor the cost, schedule, and technical performance of the funded efforts. The reviews, conducted together with the appropriate Military Department(s), are used in part to assess whether the project is meeting the specified milestones and therefore will receive continued OASD(R&E) funding. Peer reviewers who are not U.S. Government employees must sign nondisclosure agreements before reviewing full or partial copies of proposals and reports submitted by the performers. Proposals may include travel costs for the Principal Investigator (PI) to attend the peer review(s).

V. ELIGIBILITY INFORMATION

A. Eligible Applicants

All DOD laboratories, with the exception of medical laboratories, are eligible to submit proposals. For the purposes of this pilot study, “laboratories” are defined as the MILDEP organizations which are variously called “laboratories,” “technical directorates,” “engineering centers,” and “warfare centers.” Other agencies and organizations may participate as partners (as described below in “other programmatic guidance”), but the lead organization submitting the proposal must be a DOD laboratory.

B. Cost Sharing or Matching

Because the nature of funding for individual DOD laboratories varies and the desire is to have this pilot study serve as a competition of ideas open to all DOD labs (as noted in “eligible applicants” description, above) cost sharing or matching is not required, nor will it be part of the evaluation criteria. This does not rule out the possibility that labs could offer cost sharing as part

of their proposals, but this contribution will not be considered in the 100-point evaluation criteria (described in section VII(A)).

C. Other Programmatic Guidance

The overall intent of this pilot study is to foster innovative and cross-cutting work that would not otherwise be funded by an individual Service. Thus, while it is not *required* that all proposals involve work for labs from more than one Service, the proposals must address a challenge affecting more than just one Service. Moreover, proposals that demonstrate collaboration across the Services will be given greater weight than those that do not. Of 100 points that each project evaluation is eligible to receive, 10 points will be awarded to those that demonstrate viable collaboration between at least two Services' labs.

Teaming with others (not in the DOD labs) is allowed, but the “intellectual” work should be *largely* done within the DOD labs. There is not a set amount of funding that must remain in-house; rather, weight is given to the fact that the *overwhelming majority* of the intellectual work should be conducted in-house. Enlisting external support to execute the work is acceptable; relying on external support to conduct most of the substantive work is not. In-house personnel would include IPAs, SETA personnel, or other on-site contractors who are integral parts of a government lab research team. External participants, to the extent they are needed in this support function, may be drawn from industry, universities, etc.

It is expected that all proposals will rely primarily on existing lab facilities and infrastructure and not require establishment of significant new research capabilities. If funding would be needed to purchase a piece of equipment or make some other improvements to equipment in support of specific experiments, these would be acceptable and could be included (and so identified) in the cost of the proposal.

VI. APPLICATION AND SUBMISSION INFORMATION

A. Application and Submission Process

The proposal submission process is in two stages, an initial white paper followed by full, detailed proposals for selected white papers. Personnel from all eligible DOD labs are encouraged to submit White Papers. White Papers and Detailed Proposals received after the stated due date will not be considered for funding under this pilot study. This Invitation for Proposals may be accessed at the Defense Innovation Marketplace website. Proposals should be submitted through this website (see Section III(D) for contact details). All documentation for one project should be sent as one PDF.

White Papers will be reviewed by the first week of February 2013. The Technical Advisory Group (TAG), as described in Section VII(B), will recommend to the PSC Chair, Dr. Morley Stone, those White Papers which it believes merit development into Detailed Proposals, based on the evaluation criteria (see Section VII(A)). Dr. Stone will, in turn, review these recommendations with designated staff from OASD(R&E). In the event OSD and TAG inputs differ, OSD and Dr. Stone will work to resolve these differences.

For those proposals which are identified through the evaluation process as being of “particular value” to this cross-cutting pilot study, the offerors will be notified by email and encouraged to submit detailed technical and cost proposals. While submission of the detailed proposal does not assure a subsequent award of funding, it is anticipated that the majority of detailed proposals will be funded. The specific number funded will depend on the overall quality of the final proposals and the availability of funds. Taking into consideration these recommendations and input from the R&E EXCOM, ASD(R&E) will formally approve specific projects. The offerors will then be notified by email and official letter of these decisions. Proposals exceeding the page limit may not be evaluated.

B. Content and Format of White Papers

As noted in Section III(D), the due date for White Papers is January 18, 2013. The White Paper Format should be as follows:

- Paper Size – 8.5 x 11 inch paper
- Margins – 1 inch
- Spacing –single-spaced
- Font – Times New Roman, 12 point

The White Paper Content (maximum 5 pages, including cover page and technical concept, but not including personnel or budget) should be as follows:

Cover Page (1 page): The Cover Page shall be labeled “WHITE PAPER” and shall include; proposed title, technical points of contact, telephone number, facsimile number, and e-mail address.

Technical Concept (2-4 pages not counting personnel or budget): Provide a description of the technology innovation and technical risk areas. Generally, it should include a discussion of the proposal’s scientific research objective, its approach, relationship to similar research, and anticipated results. Use Appendix A as a suggested guide for the types of questions the research plan should address.

For Basic Research (BA1 & early BA2-like efforts):

A description of potential relevance and contributions of the effort to DOD’s autonomy R&D mission.

For Applied Research and Advanced Technology Development(6.2-6.3-like efforts):

- Either a description of the project objectives, the concept of operation for the new capabilities to be delivered, and the expected operational performance improvements; or
- A plan for demonstrating and evaluating the operational effectiveness of the offeror's proposed products or processes in field experiments and/or tests in a simulated environment.

Personnel:

Contact information: List POCs and contact information for each investigator participating in the initiative. Designate personnel as either government (G), in-house contractor (IH KTR), or external contractor (EX KTR). While key on-site contractors can and may be expected to contribute strongly to the proposal, the Virtual Central Laboratory concept, for which this IFP represents the pilot study, envisions a team with strong, government-led thought leadership.

Qualification information: Include brief descriptions of key personnel, including experience in applicable fields of research and published work relating to the initiative. Use no more than one page per key person.

S&E Time Commitment- Provide a table listing the fraction of time that each in-house S&E will commit to the initiative and a letter or email signed by proposer's (and any collaborator's) management endorsing the proposer's participation in the proposed effort.

Budget (ROM): provide a breakout of how funds are expected to be used, including research hours, material costs, and travel. If appropriate, indicate both existing funds for on-going research to be incorporated into the initiative and requested new funds from other sources for the initiative (matching funds). Provide a table listing each investigator's share of the funding by fiscal year. If appropriate, show investigator funding for individual research thrusts.

C. Format and Content of Detailed Proposals

As noted in Section III(D), the due date for Detailed Proposals is March 22, 2013. The Detailed Proposal format should be as follows:

- Paper Size – 8.5 x 11 inch paper
- Margins – 1 inch
- Spacing – single spaced
- Font – Times New Roman, 12 point

The content of the detailed proposals should be comprised of two volumes: the technical proposal and cost information. The content of each is described below.

Volume 1: Technical Proposal (maximum 12 pages, including cover page but not including references or personnel)

Cover Page: This should include the following:

- 1) Title of Proposal;
- 2) Name of PI and organization proposing effort and complete list of names or collaborating investigators & organizations, if applicable;
- 4) Technical contact (name, address, phone/fax, electronic mail address)
- 5) Administrative/business contact (name, address, phone/fax, electronic mail address)
- 6) Proposed Budgets per fiscal year,
- 7) Proposed period of performance
- 8) Abstract (100-200 words covering concise statement of work (scientific objectives), basic approaches to be used, and significance of the proposed effort)
- 9) Overall level of classification (if not unclassified)

Technical Approach and Justification: The major portion of the proposal should consist of a clear description of the technical approach being proposed. This discussion should provide the technical foundation/justification for pursuing this particular approach and why one would expect it to enable the objectives of the proposal to be met. Use Appendix A as a suggested guide to reference the types of questions the research plan should address.

1. Provide introductory background and problem statement(s)
2. Provide a brief overview of your research plan and your objectives (specific aims)
3. For each objective/aim, provide a section with the following:
 - a. State the objective/aim.
 - b. Describe the scientific hypotheses to be tested or technical concepts to be demonstrated to achieve the objective/aim.
 - c. Discuss the methods, materials, facilities, protocols to be employed, and techniques for analyzing data and validating results as appropriate.
 - d. Offer a critical comparison of your proposed approach with the latest published work and explain how your project would advance the state of the art and influence its field of research. Begin with the “big picture” and funnel the reader to the significance of the specific problem addressed in the proposal.
 1. For BA1 or early BA2 efforts include a description of potential relevance and contributions of the effort to the proposing agency’s specific mission(s).
 2. For BA2-BA3 efforts include one of the following:
 1. A description of the project objectives, the concept of operation for the new capabilities to be delivered, and the expected operational performance improvements.
 2. A plan for demonstrating and evaluating the operational effectiveness of the offeror’s proposed products or processes in field experiments and/or tests in a simulated environment
4. Describe the nature and extent of the expected results and their impact (e.g., fundamental breakthroughs, enabling technologies).

Schedule and Milestones: Provide a list of mid-term deliverables and deliverables at completion. Clearly describe the before and after states, i.e., what will DOD have after X dollars and Y years.

References: (not included in page limit) Cite a concise set of relevant literature that supports the scientific/technical significance of your project and the innovativeness of your proposed methodologies.

Personnel (not included in page limit)

Contact information: List contact information for each investigator participating in the initiative. Designate personnel as either government (G), in-house contractor (IH KTR), or external contractor (EX KTR). While key on-site contractors can and may be expected to contribute strongly to the proposal, the Virtual Central Lab concept, for which this request for proposals represents the pilot study, envisions a team with strong, government-led thought leadership

Qualification information: Include descriptions of key personnel, including experience in applicable fields of research and published work relating to the initiative. Use no more than one page per key person.

S&E Time Commitment: Provide a table listing the fraction of time that each S&E will commit to the initiative and an official transmittal letter signed by proposer's (and any collaborator's) management endorsing the proposer's participation in the proposed effort.

Volume 2: Cost Proposal

The itemized budget must include the following

Labor: Fully burdened Direct Labor costs for all government and in-house contractor S&Es and any Administrative /Clerical Labor cost.

Travel: travel cost (including travel costs to attend reviews) should include the following for each trip: the purpose of the trip, origin and destination if known, approximate duration, the number of travelers, and the estimated cost per trip. These estimates must be based on applicable Federal cost principles.

Subawards: describe the work to be performed by any subrecipient. For each subaward, a detailed cost proposal is required to be submitted by the subrecipient(s).

Consultants: a breakdown of consultant hours, hourly rate proposed, any other proposed consultant costs, a copy of the signed Consulting Agreement or other documentation supporting the proposed consultant rate/cost, and a copy of the consultant's proposed statement of work if it is not already separately identified in the proposal.

Materials and Supplies: an itemized list of all proposed materials and supplies including quantities, unit prices, and the basis for the estimate (e.g., quotes, prior purchases, catalog price lists).

Recipient Acquired Equipment: While facilities and infrastructure are to be furnished, if acquisition of equipment is proposed, a justification for the purchase of the items must include an itemized list of all equipment costs and the basis for the estimate (e.g., quotes, prior purchases, catalog price lists). Allowable items normally are limited to research equipment not already available for the project.

Other Direct Costs: Provide an itemized list of all other proposed other direct costs such as report and publication costs, and the basis for the estimate (e.g., quotes, prior purchases, catalog price lists).

D. Significant Dates and Times

The following are the planned schedule of events for the submission, review, and initial funding under this pilot study:

Event	Date	Time (EST)
Submission of questions - White Papers	9 Jan 2013	2:00pm
White Papers Due Date	18 Jan 2013	2:00pm
TAG and OSD Evaluations of White Papers; OSD-PSC resolution of differences	4-7 Feb 2013	
Notification of White Paper Evaluations (only a portion of White Papers will be selected to prepare Detailed Proposals)	8 Feb 2013	
Submission of questions – Detailed Proposals	15 Mar 2013	2:00pm
Detailed Proposal Due Date	22 Mar 2013	2:00pm
TAG and OSD Evaluations of Detailed Proposals	1-4 Apr 2013	
MILDEPs notified of TAG and OSD recommendations	4-17 Apr 2013	
PSC Chair briefing to S&T Steering Committee of the R&E EXCOM and ASD(R&E) decision on selection for funding	17 Apr 2013*	
Notification of selection for funding	18 Apr 2013*	
Funding process initiated by OASD(R&E), pending budget authorization	1 May 2013*	

*These dates are estimates as of the date of this announcement.

VII. EVALUATION INFORMATION

A. Evaluation Criteria

White Papers will be evaluated to assess whether the proposed research is likely to meet the objectives of the relevant technical challenge area(s), and thus whether to request the submission of a detailed proposal. The assessment will focus primarily on scientific and technical merit, but will also take into account the qualifications of identified participants and cost. ARPI's primary focus is on advancing innovative high risk/high payoff, cross-cutting concepts. However, either Service-specific innovative ideas that promise truly high payoff but are too high risk to be undertaken within the normal service S&T efforts or ideas that represent more incremental efforts but address significant cross-cutting issues are also of interest.

The following (weighted) criteria will be used in evaluating both the White Papers and the Detailed Proposals:

Criteria	Points
Scientific and Technical Merit	50
Quality	
- Will the proposal result in significant technical advancement?	
- Is the approach feasible? Is the methodology appropriate?	
- Are the objectives clear?	
-Are the technical approach and level of innovation appropriate?	
Originality	
-How innovative is the approach? In which box in Figure 1 (of this document) does the proposal fit?	
- Does it incorporate the current state-of the art?	
Value of the Initiative	20
How significant is the anticipated impact for DOD?	
What is the potential contribution of the proposal vis-à-vis on-going projects supported by the MILDEPs?	

Does it align with autonomy thrust priorities (4 Working Group areas)?

Cross-Service Aspect

10

Will the proposal contribute to cross-lab collaboration? Are at least two Services' labs participating?

Project Team Qualifications

10

Are the qualifications, capabilities, and experience of all key personnel appropriate and sufficient?

Project Costs and Work Plan

10

Is there alignment between the proposed work and budget? (Are proposed costs realistic and reasonable?)

Is the funding level appropriate to the project's complexity, team composition and schedule?

Is the proposed schedule timely and realistic?

Is the work plan clear and complete?

Each proposal will be evaluated based on all the evaluation criteria rather than against other proposals for research in the same technical challenge area.

B. Review and Selection Process (Technical Advisory Group)

All PSC members will have the opportunity to review the White Papers and Detailed Proposals. The PSC will convene the Technical Advisory Group (TAG), which will be responsible for evaluating and prioritizing the proposals. The TAG is comprised of one representative from each of the following Government entities: Army, Navy, Air Force, the Defense Advanced Research Projects Agency (DARPA), and Defense Threat Reduction Agency (DTRA). A representative from the Office of the Assistant Secretary of Defense for Research and Engineering (OASD(R&E)) will serve as Executive Secretary for the TAG. TAG members will recuse themselves from review of white papers and detailed proposals that clearly link to their laboratory if the TAG member is in the supervisory chain of command for that part of the laboratory participating in the proposal.

The TAG will make its recommendations to Dr. Morley Stone, as head of the Autonomy PSC. Dr. Stone will, in turn, submit his recommendations to the Office of the Assistant Secretary of Defense for Research and Engineering (OASD(R&E)). If OSD representatives should disagree with the recommendations, they will work with Dr. Stone to resolve any differences. Based on

these inputs, as Source Selection Authority, the ASD(R&E) will select the White Papers to be developed into Detailed Proposals.

Those White Papers identified as being of “particular value” to this cross-cutting pilot study will be invited to prepare Detailed Proposals; the number selected will be based on the quality of the proposals and the funding available. While is not guaranteed that all Detailed Proposals will be funded, it is expected that the majority of them would be recommended for funding.

The evaluation process for the Detailed Proposals will be the same as for the White Papers. At the conclusion, Dr. Stone will brief the Science and Technology Steering Committee of the R&E EXCOM. With its input, ASD(R&E) will select the projects approved for funding.

VIII. AWARD ADMINISTRATIVE INFORMATION

A. Award Notices

Once ASD(R&E) has approved specific projects for funding, that office will so inform the PI by email and writing. This process is currently planned to occur on or about April 18, 2013. The anticipated date for funding to be awarded is one month after the signing of the Appropriations Bill.

B. Administrative Procedures and Requirements

OASD(R&E) will work with the recipient organization to determine the preferred vehicle for transmitting funding to ensure as much flexibility as possible. If the project relies on funded non-Government participation, it is the responsibility of the proposing organization to establish the processes and contract(s) for these services.

The number and types of reports will be specified in the award document, but will include as a minimum monthly financial status reports. Reports and briefing materials will also be required as appropriate to document process in meeting identified milestones and accomplishments. A final report that summarizes the project and tasks at the completion of OSD funding will be required at the conclusion of the performance period for the project.

IX. OTHER INFORMATION

A. Security Classification

If it is necessary to furnish classified information for either the White Paper or the Detailed Proposal, please contact Dr. Morley Stone, (937)255-8222, Morley.stone@wpafb.af.mil for instructions.

B. Project Meetings and Reviews

Individual project reviews among OASD(R&E), the appropriate Military Department(s) and the performer(s) will be held as necessary. Such reviews may also be held to provide a forum for reviews of the latest results from experiments and any other incremental progress towards the major demonstrations. Interim meetings may also be accomplished via video teleconferencing, telephone conferences, or other communication tools as available and permitted.

Appendix A

Critical Questions for Research Proposals

As director of the Defense Advanced Research Projects Agency (DARPA) in the 1970s, George H. Heilmeier developed a set of questions that he expected every proposal for a new research program to answer. He referred to them as the "Heilmeier Catechism." These questions still survive at DARPA and provide high-level guidance for what information a proposal should provide. It is important to answer these questions for any individual research project, both for yourself and for communicating to others what you hope to accomplish. These questions are:

1. What are you trying to do? Articulate your objectives using absolutely no jargon. What is the problem? Why is it hard?
2. How is it done today, and what are the limits of current practice?
3. What is new in your approach and why do you think it will be successful?
4. Who cares? What is its potential impact on force capabilities?
5. If you're successful, what difference will it make? What impact will success have? How will it be measured?
6. What are the risks and the payoffs?
7. How much will it cost?
8. How long will it take?
9. What are the midterm and final "exams" to check for success? How will progress be measured?