

OFFICE OF THE DIRECTOR OF NATIONAL INTELLIGENCE



SHARP Proposers' Day

Office of Smart Collection

Intelligence Advanced Research Projects Activity

L E A D I N G I N T E L L I G E N C E I N T E G R A T I O N

Dr. Adam Russell
April 2, 2013



Disclaimer

- This presentation is provided solely for information and planning purposes
- The Proposers' Day does not constitute a formal solicitation for proposals or proposal abstracts
- Nothing said at Proposers' Day changes the requirements set forth in a BAA
- A BAA supersedes anything presented or said by IARPA at the Proposers' Day



Goals

Familiarize participants with IARPA's interest in SHARP –
Please ask questions & provide feedback; this is your
chance to alter the course of events.

Foster discussion of complementary capabilities among
potential program participants, AKA teaming. Take a
chance, someone might have a missing piece of your
puzzle.



Questions

During this session, questions should be recorded on note cards. They will then be answered for everyone's benefit during the Q&A period

If/when a BAA is released, questions can only be submitted to the email address provided in the BAA and will only be answered in writing on the program website



SHARP Program Proposers' Day Agenda

9:00am – 9:15am	IARPA Overview and Remarks	Dr. Edward Baranoski Smart Collections Office Director		Grand Ballroom
9:15am – 10:00am	SHARP Program Overview	Dr. Adam Russell Program Manager		
10:00am – 10:30am	Doing Business with IARPA	Mr. Tarek Abboushi IARPA Acquisition		
10:30 am – 10:45 am	SHARP Program Question & Answer Period	Dr. Adam Russell Program Manager		
10:45am – 11:15 am	BREAK			
11:15 am – 1:00 pm	Proposers' 5-minute Capability Presentations	<ul style="list-style-type: none"> Center For Applied Rationality CENTRA Charles River Analytics Cultural Logic Design Interactive Florida State University George Mason Georgetown University Honeywell ICF International Innovative Decisions 	<ul style="list-style-type: none"> New York University PDRi Siemens Corporation SRI Temple University United Technologies Research Center University of New Mexico University of Pittsburgh University of Southern California 	Grand Ballroom
1:00 pm – 1:30 pm	LUNCH			
1:30pm – 3:00pm	Proposers' Networking and Teaming Discussions	Attendees (No Government)		Grand Ballroom



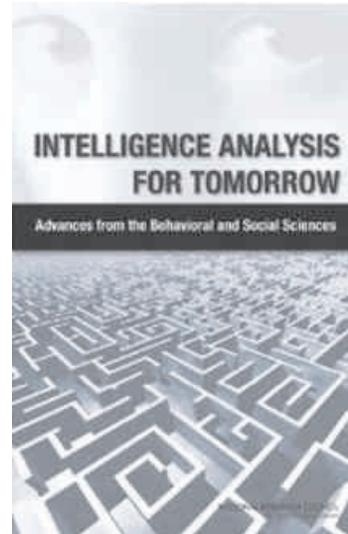
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L E A D I N G I N T E L L I G E N C E I N T E G R A T I O N

Program Background and Goals



Background



“Use Scientific Methods for Workforce Development”

“The committee’s third recommendation calls on the DNI to ensure that IC agencies use evidence-based methods to recruit, select, train, motivate, and retain an adaptive workforce able to achieve the performance levels required by IC missions.”

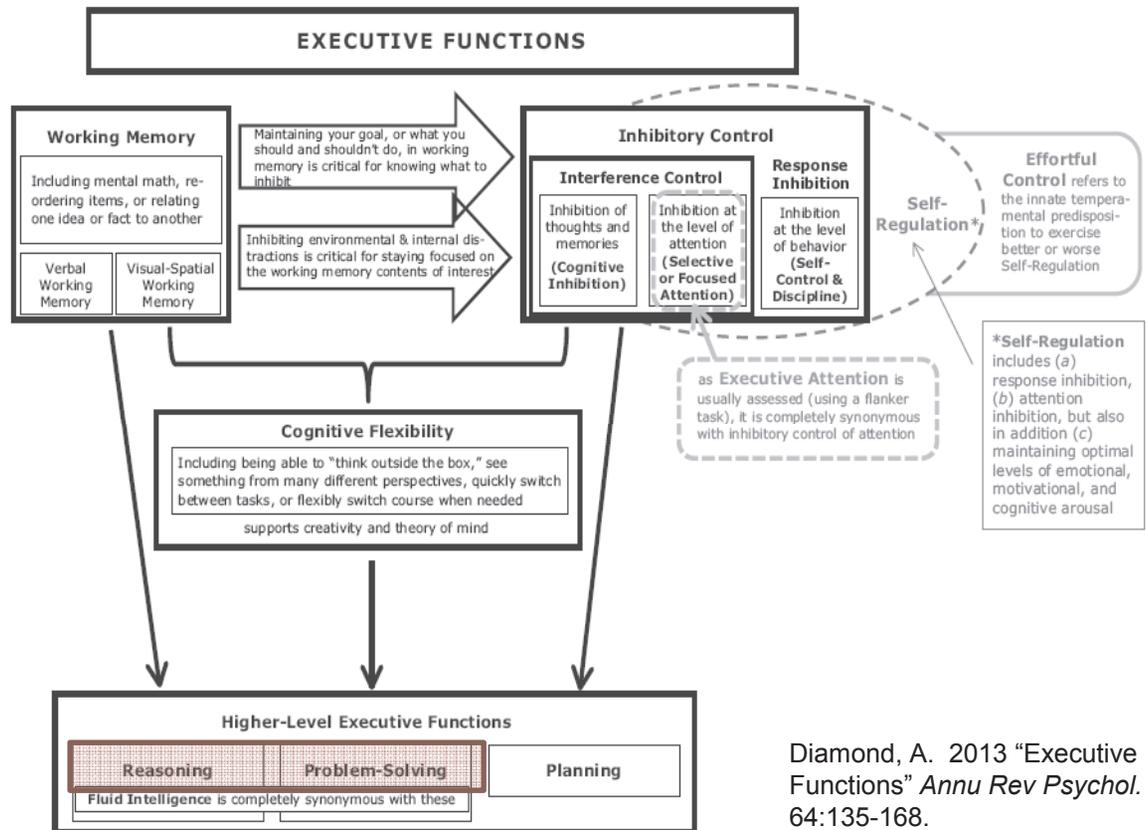
-Intelligence Analysis for Tomorrow, National Academies Press, 2008
http://www.nap.edu/openbook.php?record_id=13040&page=3



Background

- Adaptive Reasoning and Problem-solving (ARP):**

For the purposes of the SHARP Program, ARP refers to a person’s capacity to appropriately deploy inductive and/or deductive reasoning skills to generate accurate conclusions and effective solutions to **complex, ambiguous, and novel problems.**



Diamond, A. 2013 "Executive Functions" *Annu Rev Psychol.* 64:135-168.

The importance of adaptive reasoning and problem-solving (ARP) for successful job performance has been documented for a variety of professions – and the more complex the job, the more important ARP



Program Goals

Propose and test innovative and safe interventions to strengthen individual ARP:

- Each team proposes and tests candidate interventions for enhancing ARP
- Researchers must demonstrate a staged improvement in ARP in high-performing subjects
- Interventions are capped at the amount of active engagement required by subjects (30 minutes)
- Teams will develop evidence-based system dynamics models to test strategies for tailoring interventions for individual differences in Phase 2 (if appropriate)

Demonstrate convergent validity using methodologically-rigorous approaches with strong theoretical foundations:

- Performers must demonstrate between-subject improvements (intervention compared to best-performing control groups), controlled for pre- to post-intervention changes
- Results are compared across teams by using:
 - **Metric 1:** T&E developed and delivered pre-/post-measures ARP
 - **Metric 2a:** Performer proposed changes in one or more underlying neurobiological mechanisms
 - **Metric 2b:** Performer proposed and justified measures of ARP
 - **Metric 2c:** Performer proposed and justified IC-face valid ARP measures



State of the Current

- Limitations of studies to date:
 - Most studies employ different outcome measures and slight modifications to interventions, so it is difficult to evaluate one against the other
 - Single outcome measures that are very specific and don't show meaningful transfer to real world outcomes
 - “One size fits all” approaches
 - Small number of studies that have looked at sub-groups, modifiers, and/or endophenotypes, but are underpowered or subdivide groups post-hoc
 - Black box approaches with no demonstrated or plausible mechanism for observed behavioral outcomes

Possible Interventions Described in SHARP RFI Responses
Cognitive training (WM and beyond)
Articulating Analytic Reasoning/ Externalizing mental models / Making implicit explicit
Neural stimulation
Exercise / Physical Activity
Mindfulness Training
Game-Based and/or Immersive Simulation
Neurofeedback
Nutraceuticals
Pharmaceuticals
Enriched environment
Sleep
Optimize Trait/State Variables
Deliberate practice



Desired Research

SHARP is expected to seek innovation in the following areas:

1. Developing and testing the effectiveness of intervention(s) to improve ARP as measured by a battery of tests;
2. Measuring the neurobiological mechanisms proposed to underlie such improvements, and;
3. Developing evidence-based system dynamics models, which will both advance the theoretical bases for the proposed intervention(s) as well as assist in tailoring the proposed intervention(s) for individuals in order to optimize benefits in Phase 2.



Program Structure, Milestones, and Metrics



Program Phases

- Two Phases Spanning 42 Months
 - Phase 1a Base Period: 12 Months
 - Phase 1b Option Period: 12 Months
 - Phase 2 Option Period: 18 Months
- A SHARP BAA is expected to solicit proposals for all Phases: Phase 1a, 1b, & 2
- Funding for both Option Periods is expected to be contingent on performance during prior Period(s), program requirements, funding availability, and IARPA priorities.



Activities Within Phases 1 and 2

- **Development**
 - IRB protocol is submitted, reviewed, and approved by appropriate IRB
 - Ends when set-up of testing procedures and facilities are completed
- **Testing**
 - Subjects are screened, enrolled, and tested
 - All Offeror-defined outcome measures are collected and analyzed from Performer's "Internal Cohort"
- **Evaluation**
 - T&E administers, collects, and analyzes data on "T&E Cohort"
 - IARPA reviews and assesses progress against Milestones, Waypoints, and Metrics



Proposals Should Describe and Justify In Advance...

- Intervention(s)
- Proposed Neurobiological Mechanism(s)
- Offeror-Defined Outcome Measures
- System dynamics model(s)
- Experimental Methodology
 - Study Population
 - Study Design
 - Testing Protocol
- Data Analysis

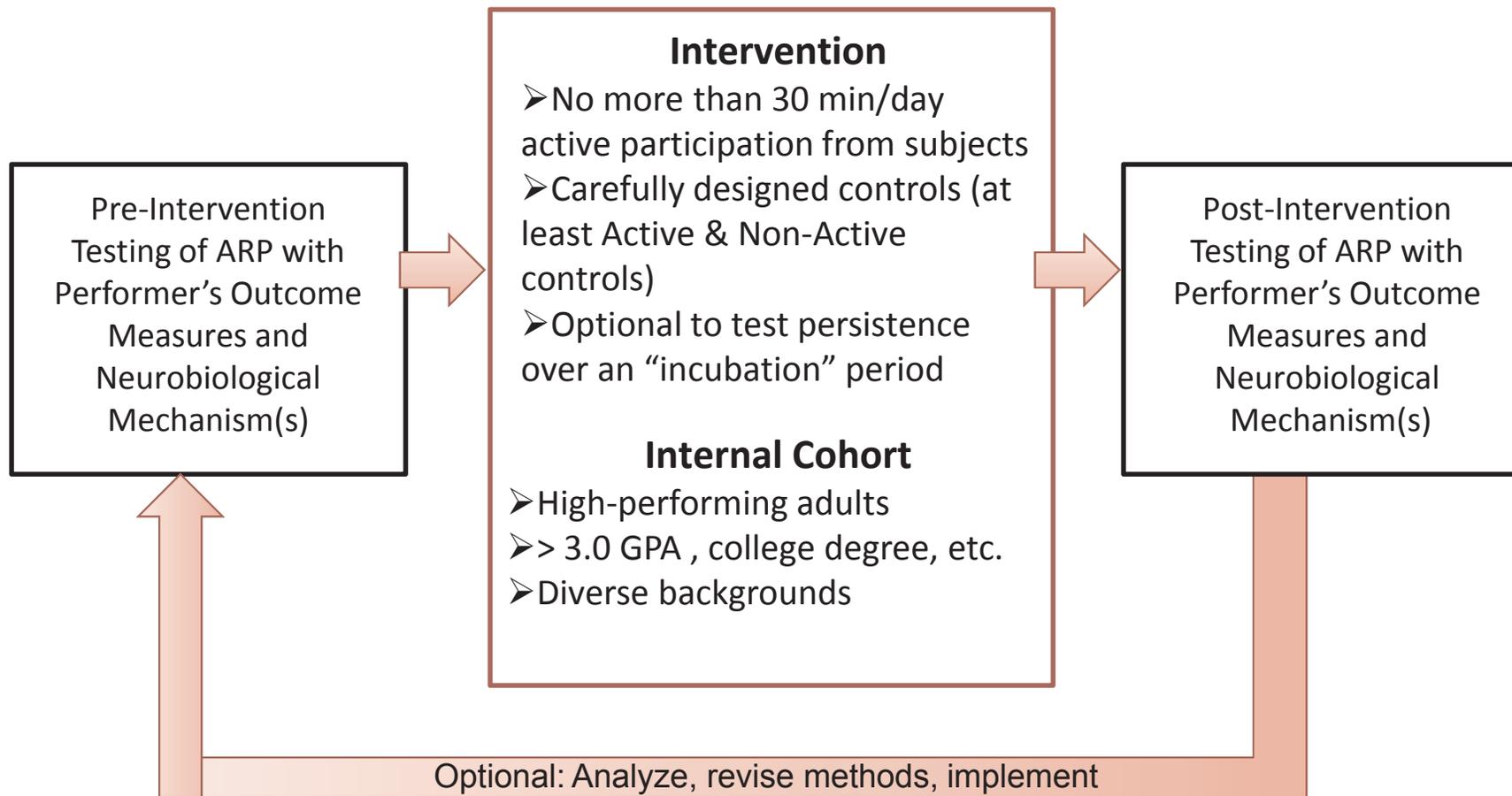


Subjects

- **High-performing adults:** The results of this program are intended to be relevant for analysts in the Intelligence Community (IC) who vary widely in age, education, and training.
 - 1- 30 years on the job experience
 - Degrees ranging from Bachelors to PhDs
 - Likely to score above population means on standardized tests and/or have >3.0 GPA in post-secondary education
 - Range of disciplinary backgrounds including history, linguistics, law, international policy, science, mathematics, and engineering
- **Cohort:** A collection of subjects who have been sampled from a larger population.
 - Cohorts will be sub-divided into different experimental conditions, with subjects in a cohort being randomly assigned to, for example, one or more intervention groups or a control group
 - 2 Types of Cohorts selected and enrolled by each Performer
 - “**Internal cohort**” will refer to the Performer’s subjects who will only be tested using the Offeror-defined outcome measures
 - “**T&E cohort**” will refer to a Performer’s subjects who will only be tested using the USG-provided SHARP T&E measures

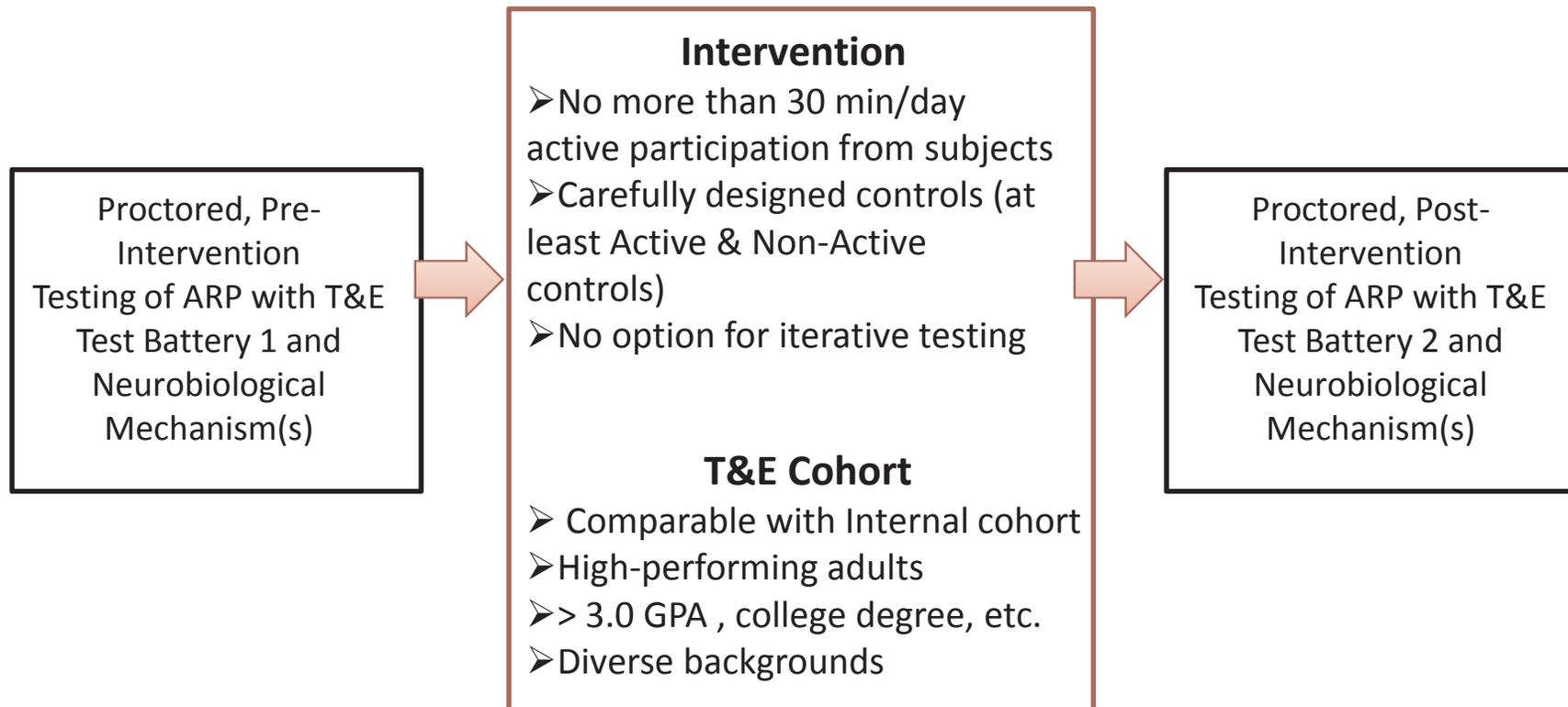


General Structure of Performer Research with Internal Cohort



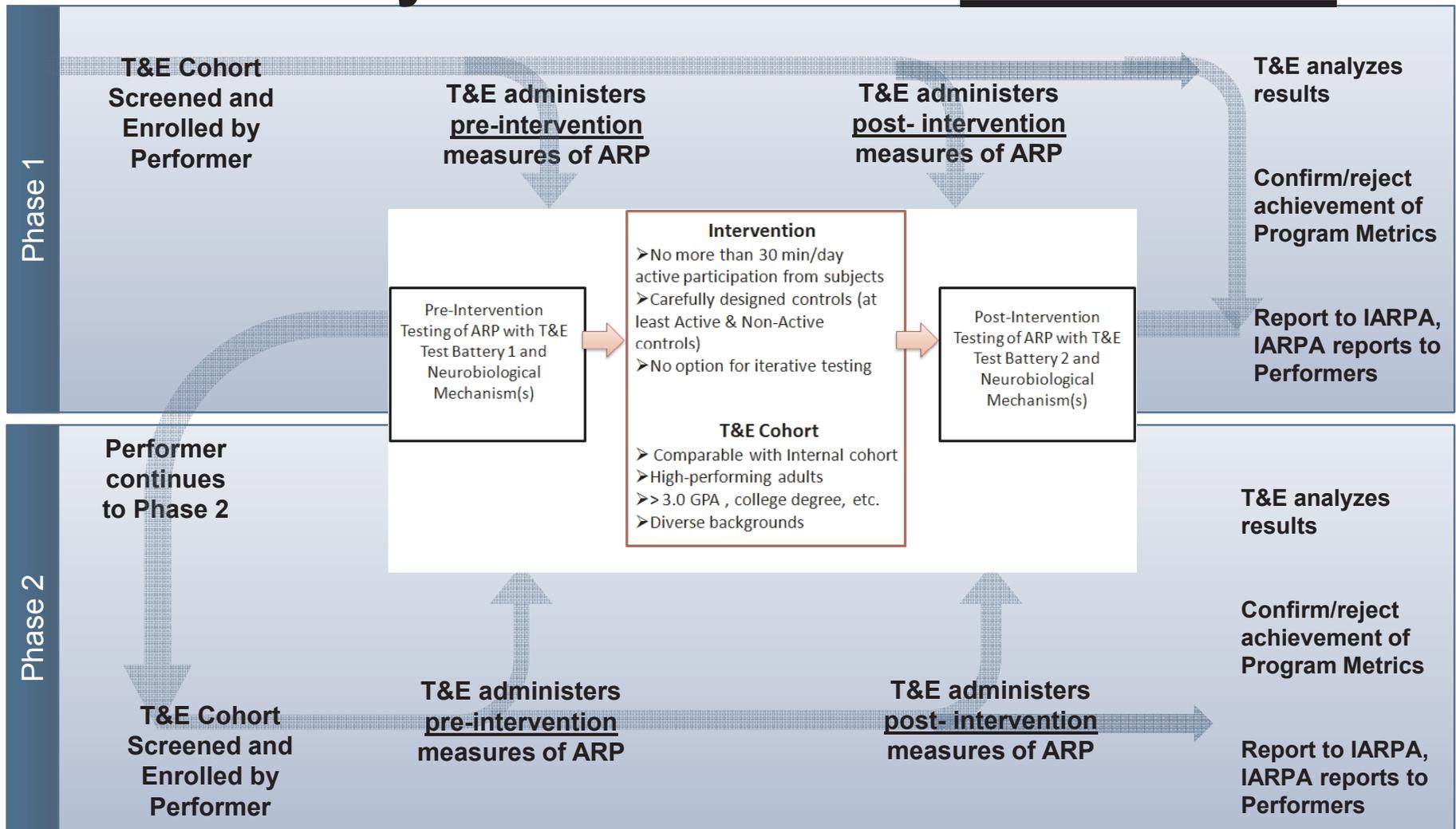


General Structure of Performer Research with T&E Cohort





Summary of T&E Plan for *T&E Cohort*





Milestones & Metrics

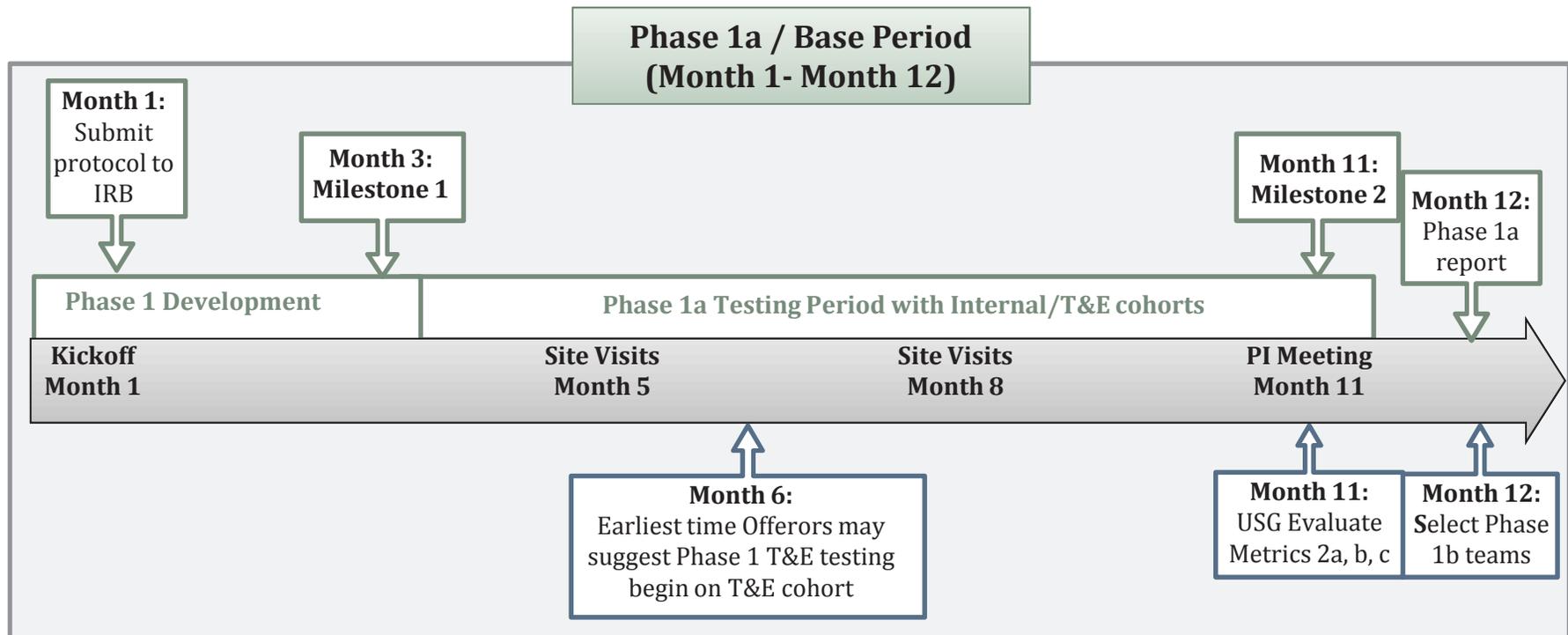
Milestones						
	Milestone 1 Phase 1a Month 3	Milestone 2 Phase 1a Month 11	Milestone 3 Phase 1b Month 22	Milestone 4 Phase 2 Month 26	Milestone 5 Phase 2 Month 33	Milestone 6 Phase 2 Month 40
IRB Approval: Attain approval from Performer's IRB	Receipt and documentation of all IRB approvals			Receipt and documentation of all IRB approvals		
Metric 1: Metric for USG / T&E Outcome Measures						
Metric 1: Scores on T&E test battery			+0.5-SD* improvement			+1.0-SD* Improvement
Metric 2: Metrics for Offeror-Proposed Measures						
Metric 2a: Change in neuro-biological mechanism(s)		Statistically significant **	Statistically significant **		Statistically significant **	Statistically significant **
Metric 2b: Scores on Offerors' measures of ARP		+0.25-SD* improvement			+0.75-SD* improvement	
Metric 2c: Scores on Offerors' IC-face valid measure		Statistically significant **			Statistically significant **	

* +X-SD improvement in intervention group(s) relative to best-performing control group(s) on post-intervention measures, demonstrate statistical significance

** Statistically significant pre- to post- intervention change in intervention group(s) relative to control groups.

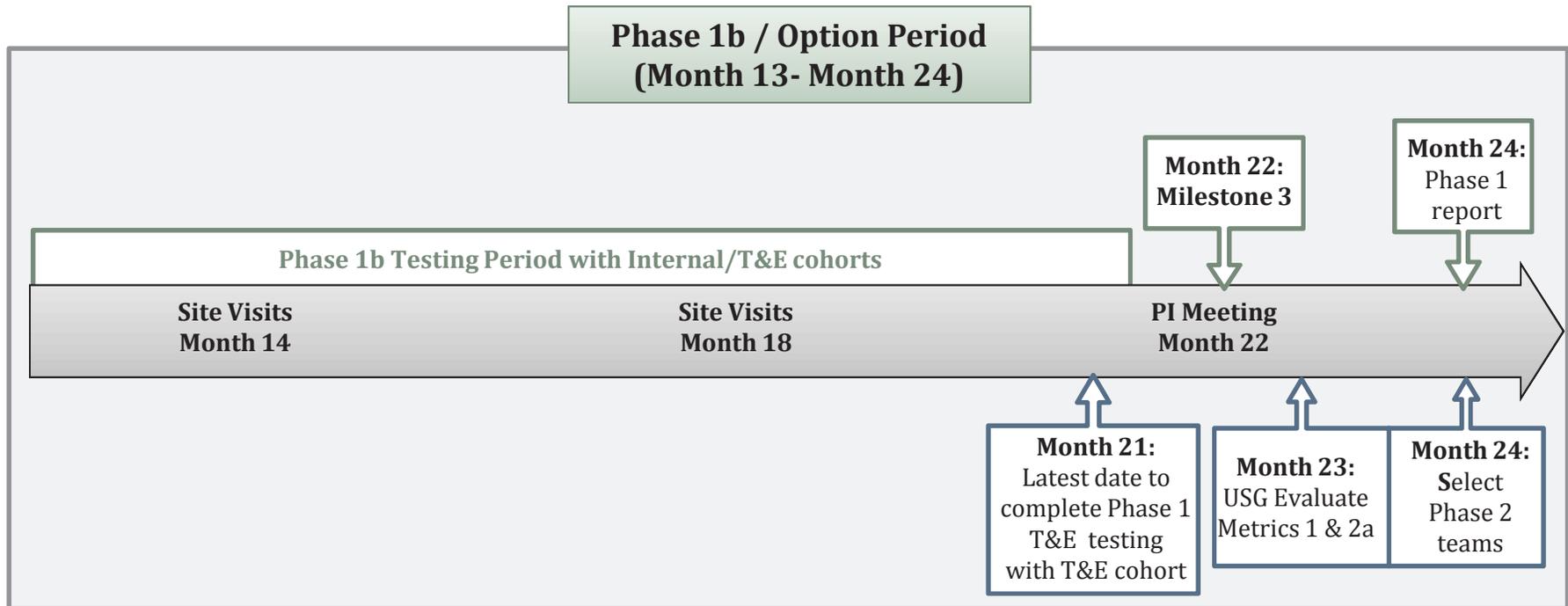


Phase 1a



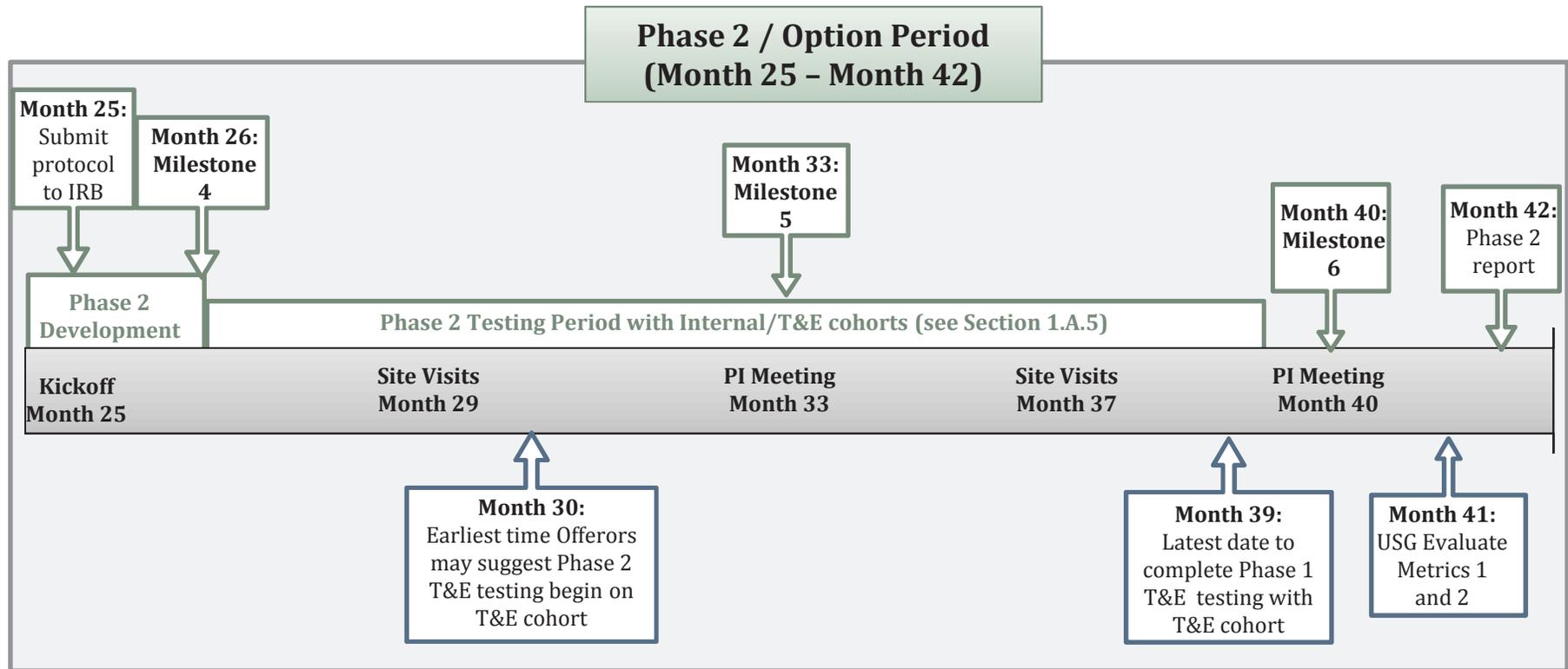


Phase 1b





Phase 2





IRB Milestones 1 & 4 and Additional Waypoints

- In order for the Program to remain on schedule, it is *critical that all IRB approvals (including Government approvals) be obtained **within three months following contract award for Phases 1 and 2, respectively***
- No IARPA funding can be used towards human subjects research until *all approvals are granted*
- To get a head start, all Offerors are required to submit a complete draft IRB protocol as part of their proposal
- Additional logical waypoints may be suggested by Offerors to assist IARPA in assessing a team's progress towards Milestones and Metrics



Out of Scope

- Approaches that propose, or are likely to result in, only incremental improvements over state of the current
- Proposed research that does not have strong theoretical and experimental foundations or plausible scientific support for Offeror's claims to be able to achieve the SHARP Program metrics
- Approaches that focus on the warfighter as the primary end user
- Animal studies
- Approaches that depend on a specific characteristic of a subject pool
- Exclusion criteria that are impracticable for modern work environments or that call into question the external validity of the proposed research (e.g., excluding subjects due to use of caffeine, more than X minutes of use of a computer a day, left-handedness, etc.)
- Interventions selected exclusively for group-level application, such as methods, tools, or software to facilitate communication or collaboration. While group scores may subsequently show benefit due to SHARP intervention(s), proposed approaches are expected to primarily focus on individual ARP



Out of Scope (continued)

- Studies with fewer than two randomized controls, to include at least one appropriate active control group
- Interventions that are unlikely to receive Institutional Review Board (IRB) approval by the Performer IRB within 3 months. This criterion is likely to exclude any intervention that has not previously been tested, documented, and peer-reviewed for efficacy, safety and ethical use in human subjects
- Interventions that require or involve extensive Cognitive Task Analysis for a specific job
- Interventions that would only be effective for a single type of intelligence analysis (e.g., imagery analysis)
- Approaches that rely heavily or exclusively on subject matter experts as evaluators for subject performance
- Interventions that focus on cognitive bias as a primary outcome measure
- Interventions that rely primarily or exclusively on new or modified user interfaces (e.g., 3D Graphical User Interfaces, haptic screens, etc.)
- Proposed approaches that cannot provide one or more testable hypotheses regarding one or more explanatory neurobiological mechanisms for expected effects



Award Information



Award Plan

- 3.5 Year Program
 - Phase 1a – Base Period – 12 months
 - Phase 1b – Option Period – 12 Months
 - Phase 2 – Option Period – 18 months
- Phase 1a performance determines participation in Phase 1b
- Phase 1b performance determines participation in Phase 2
- Multiple awards anticipated, depending upon:
 - Quality of the proposals received
 - Availability of funds



Eligibility Information



Eligible Applicants

- Collaborative efforts/teaming strongly encouraged
 - Content, communications, networking, and team formation are the responsibility of proposers

- Foreign organizations and/or individuals may participate
 - Must comply with Non-Disclosure Agreements, Security Regulations, Export Control Laws, etc., as appropriate, as identified in the BAA



Ineligible Organizations

Other Government Agencies, Federally Funded Research and Development Centers (FFRDCs), University Affiliated Research Centers (UARCs), and any organizations that have a special relationship with the Government, including access to privileged and/or proprietary information, or access to Government equipment or real property, are not eligible to submit proposals under this BAA or participate as team members under proposals submitted by eligible entities.



Organizational Conflict of Interest

If a prospective offeror, or any of its proposed subcontractor teammates, believes that a potential conflict of interest exists or may exist (whether organizational or otherwise), the offeror should promptly raise the issue with IARPA and submit a waiver request by e-mail to the mailbox address for this BAA at dni-iarpa-baa-13-06@iarpa.gov.

A potential conflict of interest includes but is not limited to any instance where an offeror, or any of its proposed subcontractor teammates, is providing either scientific, engineering and technical assistance (SETA) or technical consultation to IARPA. In all cases, the offeror shall identify the contract under which the SETA or consultant support is being provided.

Without a waiver from the IARPA Director, neither an offeror, nor its proposed subcontractor teammates, can simultaneously provide SETA support or technical consultation to IARPA and compete or perform as a Performer under this solicitation.



Application Review Information



Evaluation Criteria

- Overall Scientific and Technical Merit
- Effectiveness of Proposed Work Plan
- Relevance to IARPA Mission and SHARP Program Goals
- Relevant Experience and Expertise
- Cost Realism



Relevant Experience & Expertise

- **Successful teams are expected to be multidisciplinary, with a variety of scientific and technical skills, such as:**
 - Cognitive and behavioral neuroscience;
 - Psychology;
 - Psychometrics;
 - Human physiology and neurophysiology;
 - Structural and functional imaging;
 - Molecular biology and genetics;
 - Human subjects research design, methodology, and regulations;
 - Mathematical statistics and modeling;
 - Data visualization and analytics.



Publications

- Publication of results of the research project in appropriate professional journals is encouraged as an important method of recording and reporting scientific information ***and will be among the required deliverables***
- One courtesy copy of all papers and/or presentations to be presented in any public forum must be submitted to the IARPA Program Manager at least two calendar weeks prior to submission for publication
- Following publication, final copies of published papers and presentations must be submitted to the IARPA Program Manager and Contracting Officer's Representative



Point of Contact

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Program Manager

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