Input to *Understanding the Role of Institutions in the PI-Led Mission Proposal Process*

For the NASEM Committee on Increasing Diversity and Inclusion in the Leadership of Competed Space Missions

Deborah Amato, GSFC New Opportunities Office

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PI Qualifications/Traits

- Recognition in the scientific community/scientific expertise (e.g., published scientific work)
- Good communicator
- Good team member/team builder
- Leadership skills
- Management skills
- Spaceflight systems development knowledge
- Mission experience
  - Deputy PI, Project Scientist/DPS, Co-I, Instrument Lead/Deputy
- Increasingly responsible positions/experiences:
  - Technology development (PICASSO-Planetary Instrument Concepts for the Advancement of Solar System Observations, IIP-Instrument Incubator Program, APRA-Astrophysics Research and Analysis, H-TIDeS-Heliophysics Technology and Instrument Development for Science, IRAD-Internal Research and Development)
  - Suborbital experience (balloon, sounding rocket, airborne campaigns)
  - PI for smaller programs like Astro Pioneers, H-FORT-Heliophysics Flight Opportunities for Research and Technology, SIMPLEx-Small Innovative Missions for Planetary Exploration, InVEST-In-space Validation of Earth Science Technologies
- Entrepreneurial/Intrapreneurial nature – Champion of their concept
  - "Intrapreneurs are self-motivated, proactive, and action-oriented"; "A person within [an organization] who takes direct responsibility for turning an idea into a profitable finished product through assertive risk-taking and innovation;

Supporting PI Development

- Development opportunities
  - Multiple training opportunities: Mission Concept Development Workshop, Goddard Technical Managers Training, Leadership training, proposal writing, HQ PI Launchpad
  - Formalizing a Goddard PI Development Program
  - Mentoring – informal and formal program
  - Science and Engineering Collaboration Program – rotations to engineering
  - Proactively promoting opportunities for gaining increasingly responsible mission experience:
    - PI experiences on smaller efforts: IRAD, R&A proposals, tech development (PICASSO, IIP, H-TIDeS, etc.), and sounding rocket, balloon, and airborne experiments
    - Deputy PI and PS experience
- Proposal development support
  - Proposal Manager, Project Formulation Manager, cost estimation and validation support, proposal production, “New Business Leads,” LOB Management Teams

Steps in Science Mission/Instrument Competition

- LOB issues Call for Concepts
- Concepts vetted against multiple strategic and tactical factors

- Assessments:
  - Science concept/STM
  - Technical feasibility
  - Schedule/cost feasibility and risk

- Independent reviews:
  - Blue Team - strategy
  - Pink Team - storyboard (recommended)
  - Red Team
  - Gold Team (optional)
- Executive Review - organization approval and commitment

- Step 1: Proposal team must respond to Potential Major Weaknesses
- Step 2: Proposal team still actively engaged preparing for Site Visit/ PI Briefing to Selection Official

Monthly (or bi-monthly) status reviews during development

Concept Evaluation

- Following NASA HQ proposal evaluation:
- Science (weighting ~40%):
  - Compelling
  - Addresses/Complements/Augments Decadal Survey priorities
  - Provides "firsts" for NASA. (innovative, transformational science)
  - Addresses documented high priority science question(s)
  - Societal Benefit
- Science implementation (weighting ~30%):
  - Feasibility: achievable, low risk, maturity, complexity, probability of success
- Cost (weighting ~30%):
  - Cost credibility of proposed concept within the cap