PRINCIPAL INVESTIGATOR-LED MISSIONS

AO Proposal Selection Process

An **Announcement of Opportunity (AO)** for Principal Investigator (PI)-led missions is a call for proposals that is typically released on a 2-5 year cycle depending on the program and availability of funding.

Required Proposal Elements

Proposed mission concepts are expected to describe the duration of each and all phases (Phase A-F). These may have constraints based on the AO requirements of a given PI-led program. The AO proposal requirements can test the limits of some organizations' capabilities. The necessary information demands a significant amount of research, consultation, and negotiation.

Technical Planning

AOs ask for a large amount of **organization**, **scientific**, and **technical detail** within a strict page limit (typically 40 pages for the main body of the proposals). The following list briefly outlines the required information.

- Science goals
- Team structure & responsibilities
- Management approach (including risk management and quality assurance)
- Spacecraft
- Payload integration plans
- Launch vehicle
- Mission operations
- Data processing, archiving, and analysis plans
- Public engagement plan

Instrument, spacecraft, and subsystem descriptions must be sufficiently comprehensive to allow in-depth technical review by a panel of experts to assess whether the concept can be developed at the proposed cost and on the proposed schedule.

Risk Management

Risk management and **mitigation strategies** should incorporate a credible "descope" plan if one is possible.

- A descope plan outlines the systems, instruments, or spacecraft components, mission operations, and schedule elements that could be dropped from a mission if there are significant cost or schedule problems.
- The goal of the descope plan is to identify instruments or other elements of the mission that could be eliminated without impacting the mission's ability to fulfill minimum acceptable science requirements.

Budgets

Depending on the AO requirements and maximum allowed cost cap, the proposals must also provide the following **cost information** or **inclusions**. (These estimates must be sufficiently accurate such that they will not increase by more than 20% of the proposed cost by the end of a Phase A study, while still within the maximum cost cap.)

- Involvement for a small business, a minority institution, and (optional) a guest investigator or similar post-launch science activity.
- A work breakdown structure (WBS), or a set of budgetary spreadsheets showing all planned expenditures according to a proposed schedule for all phases of mission development.
- An all-inclusive bottom-line budget for the mission.
- Budgetary reserves, usually 25% of the remaining mission costs at confirmation (now a standard requirement for PI-led missions).
- In addition to the flight system, all ground systems and data retrieval, processing, and dissemination must be fully scheduled and budgeted.

The requirements for these elements are generally given in the AOs, and they require formal approval from all of the participating institutions, which demands intensive interaction at administration levels of these institutions.

Agreements & Approval

Before submission, the full proposal package (including subcontractor and teaming agreements, domestic and international) **must be approved** by the PI's institution.

- International contributors must submit proof of commitment in the form of signed letters from officials.

Mission Selection Process

After the AO has been released, **proposals are submitted** for a Step 1 selection process. The goal is to produce a short list of proposed concepts for a Step 2 competition (the equivalent of a Phase A study).

Step 1 proposal deadlines are typically preceded by a program-sponsored **preproposal conference** at which prospective proposers (e.g., PIs and teaming institutions) can obtain clarifications on the AO and program requirements.

For the majority of PI-led programs, many Step 1 proposals are submitted, but usually only **2-4** make the short list of Step 2 concepts. The probability of having one's proposal succeed is usually **5-10%** at the outset.

STEP 1 Proposal Review & Selection

The **Step 1** down selection involves two NASA-appointed review panels:

1. The **first panel** is organized by the Science Support Office (SSO) at Langley, which reviews the AOs for all NASA missions, including those for core mission programs and Earth space missions.
   - This panel tends to focus on the technical, management, cost, and other (TMCO) parts of the proposed mission concept. A primary concern for the panel is risk assessment on all fronts: leadership, organization, technical readiness level, and schedule and cost.
   - Proposals are evaluated in terms of their major strengths, major weaknesses, minor strengths, and minor weaknesses in the area of TMCO.
   - The SSO evaluation of Step 1 proposals typically takes several months.
2. The **second review panel** comprises 20-30 scientists drawn from the non-proposing community and is managed by NASA Headquarters.
   - The science evaluation tasks are left to this panel.

After the results are announced, proposers whose concepts were **not selected** are given oral debriefings and written records of the panel's technical, management, cost, and science analyses.

STEP 2 Competition (Phase A Study)

Step 2 is still a competitive process, for which the Step 1 selectees must come up with a more refined and reliable implementation plan, with even more accurate cost and schedule estimates for the final TMCO analysis.

- The second TMCO review is often conducted by a subset of the same panelists who carried out the Step 1 Review.

Selectees are funded at <1% of mission cost to carry out a **Step 2 review** (equivalent to a Phase A study) in about 6-12 months.

A Step 2/Phase A **concept study report** (CSR) (~150 pages) is generated for a second comprehensive TMCO review.

The review panel, along with the program and NASA Headquarters representatives, **visits** one of the primary teaming institutions.

- One purpose of the site visit is to evaluate the adequacy of the project personnel, physical plant, and support infrastructure.
- Another purpose is to give the proposing team an opportunity to answer questions posed by the panel.

At the conclusion of this process, one or two missions are finally chosen for developing for flight!

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