Program Commitment Agreement

Discovery Program

August 2018

It is the responsibility of each of the signing parties to notify the other in the event that a commitment cannot be met and to initiate the timely renegotiations of the terms of this agreement.

Agreements:

Thomas Zurbuchen
Associate Administrator, Science Mission Directorate

Date

Stephen Jurczyk
Associate Administrator

Date

By signing this document, you are certifying that the content herein is acceptable as direction for managing this program and that you will ensure its implementation by those over whom you have authority.

Program Commitment Agreement
Discovery Program

1.0 PROGRAM OBJECTIVES

The Discovery Program is designed to accomplish frequent, highly focused planetary science investigations, using innovative and efficient management approaches. The program's prime objective is to ascertain the content, origin, and evolution of the solar system and the potential for life elsewhere. In the process, it seeks to contain total mission cost and development time, and improve project performance through the use of validated new technology and thorough commitment to and control of design, development, and operations costs. Also, it seeks to enhance public awareness of and appreciation for space exploration and to incorporate educational and communications activities as integral parts of space science investigations.

The goals and objectives outlined in the Science Mission Directorate Science Plan encompass a wide range of scientific questions spanning many scientific disciplines. NASA seeks to address these questions by supporting investigations in several broad categories. However, the Discovery Program solicits only those investigations which lead to flight projects that investigate planetary science. The term "planetary science" encompasses the scientific objectives in the Science Mission Directorate Science Plan that address solar system exploration.

Discovery missions are planetary system(s) science missions intended for exploration of solar system bodies, either by traveling to them or by remote examination from space.

2.0 PROGRAM OVERVIEW

The Discovery Program is a science program of frequent, mid-class spacecraft missions that perform highly focused scientific investigations. The program is composed of a long-term series of space science missions that are independent and uncoupled but share a common funding and management structure. The program emphasizes missions that can be accomplished under the leadership of the planetary science research community. The Program seeks to control total mission life-cycle costs and improve performance through the use of validated new technology, strict control of project element costs, and more efficient management, while maintaining a strong commitment to flight safety. There is a potential that missions may require nuclear powered spacecraft. The Discovery Program provides two classes of projects, Discovery Mission Investigations and Missions of Opportunity (MO) Investigations described in section 6.

3.0 PROGRAM AUTHORITY

The Discovery Program is a multiple-project program, with responsibility for implementation assigned to the Planetary Missions Program Office, located at the Marshall Space Flight Center (MSFC). Program authority is delegated from the Associate Administrator for the Science Mission Directorate (SMD AA), through the Planetary Science Division Director and then through the Discovery Program Director to the Planetary Missions Program Manager at MSFC. Management for SMD of routine Discovery programmatic and technical matters is handled by the Discovery Lead Program Executive, while the scientific matters are handled by the Discovery Lead Program Scientist. Mission level Program Executives and Program Scientists are assigned to each project to handle SMD's interface, monitoring, and review for their assigned missions.

The Planetary Missions Program Manager will operate according to the NASA Space Flight Program and Project Management Requirements (NPR 7120.5). The Discovery Program and its program management process, including the specific responsibilities at each level, are documented in the Planetary Missions Program Plan.

The Agency Program Management Council (PMC) is the governing PMC for the Discovery Program and Category 1 projects, while the Science Mission Directorate PMC (SMD PMC) governs the management of the Category 2 and 3 projects within the program. The SMD AA is the selecting official, and nominally the Decision Authority (DA), for individual projects within the Discovery Program. Discovery missions that utilize nuclear power generation systems are Category 1 missions and the NASA Associate Administrator is the DA.

Program-level requirements for each project are approved by the SMD PMC at the time of project confirmation for the start of project implementation. These approved requirements become an Appendix to the Planetary Missions Program Plan. The Principal Investigator (PI) for each Discovery project is responsible for the overall success of the project and is accountable to the SMD AA for the scientific success and to the Planetary Missions Program Manager for the programmatic success.

4.0 TECHNICAL PERFORMANCE COMMITMENT

The Discovery Program performance commitment includes the following:

a) The Discovery Program has an objective to launch a flight mission an average of one every 36 months, with a goal of one every 24 months, commensurate with the availability of adequate funding.
b) For each mission, the primary planned launch date shall be within the time period specified by the associated Announcement of Opportunity (AO), typically 35 months from the start of project implementation.
c) Discovery Projects shall either use a cost-effective, domestic, flight-proven Expendable Launch Vehicle (ELV), or a foreign launch vehicle if contributed by the foreign organization (on a no-exchange-of-funds basis). Each Discovery AO

describes the details of available launch options. Although SMD provides access to space and funding for launch vehicles, the cost of launch services will be considered an element in the mission's total cost to NASA. Discovery missions containing nuclear power sources are prohibited from launching on non-U.S. launch services of any kind.

d) Non-U.S. nuclear power sources are prohibited.
e) The sum of foreign contributions of any kind to the entirety of the flight hardware for a Discovery Mission investigation may not exceed one third (1/3) of the estimated total cost in U.S. dollars for that hardware.
f) All missions shall adhere to the current NPR 7120.5 in order to receive approval for implementation.

There will be no period of proprietary data rights for Discovery investigations. Mission teams will be allowed a brief validation period (nominally six months, unless further justified and approved by SMD AA) for collecting the scientific, engineering, and ancillary data and validating the scientific data prior to depositing it in the appropriate space science data archival system, nominally NASA's Planetary Data System (PDS) unless otherwise justified in the project plan.

5.0 SCHEDULE COMMITMENT

The Discovery Program includes multiple projects. The following table reflects the current active projects.

Projects	Start of Formulation	Start of Implementation	Launch Date	End of Prime Mission	End of Extended Mission
Missions					
Dawn	1/2001	9/2003	9/2007	7/2016	9/2018
InSight	9/2012	12/2013	5/2018	11/2020	
Lucy	1/2017	12/2018	10/2021	2/2034	
Psyche	1/2017	5/2019	8/2022	8/2028	
Missions of Opportunity					
Strofio	5/2009	5/2010	10/2018	12/2026	
LunaH-Map[1]	10/2015	N/A	12/2019	4/2021	
Q-PACE	12/2015	N/A	10/2018	10/2021	
MEGANE	11/2017	7/2019	9/2024	7/2029	

Key program-controlled milestones (launch window date, encounter date, etc.) are identified as appropriate for each mission during the Discovery selection process. These milestones

[1] Both LunaH-Map and Q-PACE were awarded as grants and were not required to have standard life cycle reviews.

are then documented in a Program-Level Requirements Appendix to the Planetary Missions Program Plan for the mission, which is approved by the SMD. The active milestone schedule for project implementation is documented in the mission project plan, which is approved by the Planetary Missions Program Office.

6.0 COST COMMITMENT

Discovery Program

The cost commitment for the Discovery Program is reflected in the most recent President's Budget and available publicly at http://www.nasa.gov/news/budget/index.html.

Discovery Projects

The Discovery Program provides the following two classes of projects:

Discovery Mission Investigations - These PI-led projects are complete, stand-alone, and uncoupled SMD flight missions. PI proposals for new Discovery missions have a not-to-exceed development cost cap of $500M in Fiscal Year (FY) 2019 dollars (in the 2019 AO), not including the cost of a standard launch vehicle (LV), mission operations and data analysis, or any external contributions. Life-cycle costs for the PI-managed content, not to be exceeded for each mission, are established during the Discovery selection process. A mission cost cap, including launch vehicle and Headquarters' reserves, is then established at project confirmation and documented in the project's Program-Level Requirements Appendix to the Planetary Missions Program Plan, which is maintained by the Planetary Missions Program Office and approved by the SMD. The cost-phasing for project implementation is documented in the mission project plan, which is approved by the Planetary Missions Program Office.

Missions of Opportunity (MO) Investigations - Historically PI-led, these projects are characterized by being an element of another non-Discovery mission of any size or reusing existing NASA space assets in Phase E. MOs are conducted on a no-exchange-of-funds basis with the organization sponsoring the mission. MO investigations are solicited through the Stand Alone Mission of Opportunity Notice (SALMON) AO. The not-to-exceed total cost to NASA for a MO is defined in the Program Element Appendix (PEA) as an amendment to the SALMON AO. Competed PI-led SmallSats and CubeSats missions will be included in the Discovery Program as MOs.

7.0 ACQUISITION STRATEGY

The Discovery Program has established an acquisition strategy that competitively acquires whole missions (concept through delivery of the science data and analysis). Discovery investigations will be selected through the AO process, where multiple investigations are first selected from the pool of submitted proposals for Phase A Concept Studies, with a competitive final down select to proceed to the Phase B part of Formulation. Investigations will typically be selected to proceed from one phase to the next through execution of contract

options based on successful technical, cost, and schedule performance in the previous phases. A Confirmation Review (CR) with the SMD PMC will be held at the end of Formulation, soon after the Preliminary Design Review (PDR), to determine whether to confirm the mission to enter Implementation with established cost cap and launch readiness schedule parameters. The NASA DA will make all final decisions to proceed to follow-on phases.

In addition to missions, the Discovery Program funds research opportunities that result from specific Discovery missions through the annual Research Opportunities in Space and Earth Sciences (ROSES) solicitation. The Discovery Program may also identify and fund instrument or spacecraft technologies that have the potential to enable future competitive Discovery missions. These technologies may have been identified during an AO solicitation or in working with other NASA technology programs. Research and technology projects are funded and managed by the Planetary Science Division.

8.0 HIGH-RISK AREAS

Each Discovery mission involves the inherent risks associated with planetary missions conducting innovative science. While pushing the boundaries of planetary exploration, there is also the potential for new technology to be implemented as well as the potential for use of new suppliers, both of which involve additional inherent risks. The degree of NASA program-level insight required to manage these risk areas will be determined based on assessment of the individual risks.

Technical, programmatic, and monetary risks for each Discovery investigation will be carefully examined as part of the selection process. All risks will be reviewed as part of the project CR, conducted during the PDR timeframe, to assure the risks have been mitigated to an acceptable level prior to entering detailed design and development.

Discovery projects may include Radioisotope Heater Units (RHUs) or Radioisotope Power Systems (RPSs) as permitted in the AO. Although the capabilities that these units provide can be essential to the performance of the mission, the launch of nuclear materials imposes special risks.

9.0 INTERNAL AGENCY AGREEMENTS

Launch Services

Discovery mission investigations are typically launched as a primary payload on an ELV. ELVs may either be provided by NASA with NASA funding or by the proposer as a contribution under a cooperative agreement. Each Discovery AO describes the launch vehicle appropriate for the mission classes included in the announcement.

NASA-procured standard ELV launch services are included as specified in the applicable AO. The Kennedy Space Center (KSC) has been designated as the lead Center for the acquisition and management of ELV launch services.

Space Communications

Use of NASA's Near-Earth Network (NEN), Space Network (SN), or Deep Space Network (DSN) may be proposed as appropriate for Discovery missions. The NASA Space Communications and Navigation (SCaN) Office manages and directs the above three tracking networks to provide services for different types of missions. Most spacecraft operating in deep space will require use of the DSN, managed by the Jet Propulsion Laboratory (JPL), for navigation, tracking, control, and/or communication services.

Langley Research Center

The Langley Research Center (LaRC) Science Office for Mission Assessment (SOMA) performs the following functions for the Discovery Program:

- Assist SMD with the preparation and issuance of AOs.
- Support the evaluation of proposals by conducting reviews of technical, management, cost and other programmatic factors.
- Conduct independent assessments of ongoing missions, when requested; and
- Conduct confirmation assessment reviews, when requested.

NASA Technology Development Centers

Innovative technology solutions developed by NASA Centers either for Planetary Science or for other Agency technology programs may be made available for use by individual Discovery projects if they enable or enhance their proposed mission. Select new technology solutions identified in a specific AO may be offered as Government-Furnished Equipment (GFE) by NASA. The costs of any GFE devices specified in the AO that are required to enable the mission will be included as part of the overall mission costs to NASA/SMD, usually as an element separate from the PI-led mission costs.

Johnson Space Center

The NASA Astromaterials Curatorial Facility, located at NASA's Johnson Space Center (JSC), provides curation for any samples of extraterrestrial materials returned by Discovery missions. Investigation teams are responsible for all aspects of the delivery of such materials to this facility, and this facility is responsible for providing for the physical security, inventory accountability, environmental preservation, and distribution of the samples in support of scientific research programs organized around each mission, including sample processing in support of the mission science team. NASA is responsible for maintaining (including funding) the remainder of the sample(s) not provided to the science team or international partners. In addition, any exposed space hardware returned by Discovery missions, such as a sample return container, is provided to the facility at JSC for analysis and storage.

10.0 EXTERNAL AGREEMENTS

The Department of Energy (DOE) will be responsible for the provision, safety analysis, safety and emergency response at the launch site, related to any RHU's and/or RPS's on Discovery missions.

Individual projects may require external agreements with respect to other U.S. agencies and foreign participation in the project. These external agreements for all Discovery projects will be generated and negotiated, when necessary and approved by NASA HQ, and referenced in the mission's Program-Level Requirements Appendix to the Planetary Missions Program Plan.

11.0 REVIEWS

The Discovery Program completed its program-level Non-Advocate Review (NAR) and is now in Implementation. The Agency PMC will perform program oversight during Implementation by means of Program Implementation Reviews (PIRs). A program-level Standing Review Board (SRB) will periodically conduct a PIR at the direction of the DA. This determination is made on an annual basis. The most recent PIR was held in August 2016.

The Program Office will perform risk-based insight of the Discovery projects, chartering independent assessments as needed, throughout the life cycle of the mission. The SMD PMC evaluates all programs and projects executed within the Directorate and provides input to the SMD AA. For programs and Category 1 projects, the SMD AA carries forward the SMD PMC findings and recommendations to the Agency PMC. For Category 2 and 3 projects, the SMD PMC serves as the governing PMC and recommends approval or disapproval to the DA regarding entry to the next phase. For Category 3 projects, the DA may designate a division within the SMD or a Program Office as the governing authority.

In addition, each mission will have an SRB, formed according to the NPR 7120.5 requirements and the guidelines in the SRB Handbook, to conduct life-cycle reviews during their development and implementation. MOs will have an SRB or an Independent Review Board (IRB), dependent on their size and complexity.

Since Discovery projects are selected through a competitive proposal process and firm mission cost caps are established upon confirmation, if at any time during implementation of a project the estimated cost-to-complete exceeds the firm cost cap, the project can be subjected to a termination review. Cost increases that are completely beyond the control of the PI and project management may be an exception that could result in an increase to the cost cap. Such increases would be documented in the appropriate Program Plan appendix.

12.0 OUTCOMES

The Discovery Program directly supports the Agency's Vision and Strategic Plan by producing outcomes to support the goals articulated in the SMD Science Plan. The

Discovery Program is focused on the Planetary Science discipline of the Science Plan and its goal of seeking answers to fundamental science questions that guide NASA's solar system exploration:

- Explore and observe the objects in the solar system to understand how they formed and evolve.
- Advance the understanding of how the chemical and physical processes in our solar system operate, interact, and evolve.
- Explore and find locations where life could have existed or could exist today.
- Improve our understanding of the origin and evolution of life on Earth to guide our search for life elsewhere.
- Identify and characterize objects in the solar system that pose threats to Earth or offer resources for human exploration.

In addition, the Discovery Program strives to produce the following outcomes:

- Advancement in scientific knowledge and exploration of the elements of planetary systems.
- Addition of scientific data, maps, and other products to the Planetary Data System archive for all scientists to access.
- Announcement of scientific progress and results in the peer-reviewed literature, popular media, scholastic curricula, and materials that can be used to inspire and motivate students to pursue careers in science, technology, engineering, and mathematics.
- Expansion of the pool of well-qualified Principal Investigators and Project Managers for implementation of future missions in Discovery and other programs, through current involvement as co-investigators and other team members.
- Implementation of technology advancements proven in related programs.

13.0 WAIVERS

None

14.0 PCA ACTIVITIES LOG

Date	Event	Change	Adden-dum	Cancel-lation Review Req'd?	MDAA Signature	Deputy Administrator and Associate Administrator Signature
2/21/03	Updated to reflect 7120.58	Entire Document		No	E. Weiler	F. Gregory
3/01/05	Annual Update	Multiple Updates		No	A. Diaz	F. Gregory
04/2008	Annual update and reflect NPR 7120.5D	Editorial changes		No	E. Weiler	C. Scolese
09/2012	Updated to reflect mission changes, launch rate, internal agreements, and a general editorial cleanup.	Multiple Updates		No	J. Grunsfeld	R. Lightfoot
2/2015	Updated to reflect Program Office restructure, 2014 AO, and new Science Plan.	Multiple Updates		No	J. Grunsfeld	R. Lightfoot
8/2018	Updated to reflect mission changes, signators, and addition of SmallSats.	Multiple Updates		No	T. Zurbuchen	S. Jurczyk