Discovery 2010 Announcement of Opportunity Q&A
Updated March 31, 2010

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http://discovery.larc.nasa.gov/discovery

The Discovery Program Library (DPL) may be found by selecting "Program Library" at
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Other questions may be addressed to Michael New, Discovery Program Scientist, michael.h.new@nasa.gov. Questions (which may be abridged for brevity and paraphrased to ensure anonymity) and answers will be posted at the above URL twice a week, sorted by category and entered into the change log below.

Note: When an answer is revised, the number of the question will be listed in a blue, bold, italicized font in the log.

Categories of Questions

Science (S)
Technology (T)
Management (M)
Proposals (P)
Launch Vehicles and Secondary Payloads (LV)
International Participation (I)
ASRGs and RHUs (AR)
Telecommunications (C)
Other (O)

Log of Questions

May 21: AR-1
June 12: AR-2, AR-3, AR-4, O-1, O-2
March 31: ***AR-4***, AR-5, AR-6, AR-7, AR-8, AR-9, AR-10, AR-11, AR-12, AR-13, AR-14, AR-15, AR-16, AR-17, AR-18, C-1, C-2, C-3, C-4, C-5, C-6, C-7, C-8, C-9, C-10, I-1, I-2, LV-1, LV-2, LV-3, LV-4, LV-5, M-1, M-2, ***O-1, O-2,*** O-3, O-4, O-5, O-6, O-7, O-8, P-1, P-2, P-3, P-4, P-5, P-6, P-7, P-8, P-9, P-10, P-11, P-12, P-13, P-14, P-15, P-16, P-17, P-18, P-19, P-20, P-21, P-22, P-23, S-1, T-1, T-2, T-3, T-4, T-5, T-6, T-7, T-8

Science

S-1 ***On Page B-27, item 6b of Requirement B-64 of the Draft AO states that "The [sample] plan shall demonstrate that at least 75% of the returned sample shall be preserved for future studies." It is assumed that "future studies" pertains to any studies conducted beyond the preliminary examination by the science team. In the case of certain types of a non-standard or fragile sample (for example, a gaseous or volatile-rich sample), it may be desirable to make a major portion of this sample available to the broader scientific community for analyses soon after sample return since long-term storage would likely compromise its integrity. Does Requirement B-64 allow for an early release of all or most of such a sample to the broader scientific community, i.e., essentially concurrent with the preliminary examination phase?***

Part of the sample plan is a description of plans to maintain the integrity of any returned samples while in curation. If it could be demonstrated that maintaining sample integrity was impossible, then proposer's might propose an early release strategy which would then be negotiated with the Astromaterials Curator and NASA HQ after selection.

Technology

T-1 ***Regarding the new technology elements, such as NEXT, it was stated in the proposers conference charts that the associated credit to the proposers was approximately 1/2 of the total development costs for that technology. The question is: development to what level? TRL 6 or to flight ready?***

Estimates of the costs for development to flight readiness were used.

T-2 ***Can NASA explicitly define the aerocapture provision; specifically, to differentiate it from aerobraking by stating the maximum number of passes through the atmosphere that can be undertaken, and whether it applies to just the initial capture orbit or if it requires reaching the final operational orbit? (For example, if a proposer proposes using aerocapture to establish an initial, highly elliptical orbit, and then uses aerobraking and/or propulsive methods to move into a closer orbit, would they still qualify for the $20M subsidy?)***

This is clarified in the Program Library document entitled *In-Space Propulsion Technologies Minimum Demonstration Requirements.*

T-3 ***Does infusion of NASA developed technology within the proposal give a proposer additional credit during any part of the review and/or selection process?***

None other than those described in the AO: cost cap incentives and the assumption, by NASA, of the development risk.

T-4 ***Please clarify the cost cap allocation for use of the NASA-developed technology. For example, if a project baselines the AMBR engine with another engine as back-up and then later in Phase A or Phase B switches to the back-up engine, is the project's cost cap reduced by $5M? And similarly, if a project baselines another engine, but plans a trade study in Phase A to further evaluate the AMBR engine, and then switches their baseline to the AMBR engine in either Phase A or Phase B, does the project's cost cap receive an increase of $5M?***

Use of NASA-developed technology must be proposed in the initial, Step 1, proposal in order to qualify for the cost cap increase. Descoping a NASA-developed technology after selection will result in the loss of any associated cost cap increases.

T-5 ***Can you direct me to any briefing documents or other literature that would discuss the general technical readiness and/or design guidelines,* etc*. that would allow us to understand both the costs and benefits of NASA-developed, in-space propulsion technology (AMBR, NEXT, and aerocapture)?***

Reference documents for the three ISPT technologies (Aerocapture, NEXT, and AMBR) have been, or soon will be, posted to the Discovery Program library (http://discovery.larc.nasa.gov/dpl.html). The Aerocapture document on the Discovery program library and the two references below may address a number of your questions related to general technical readiness and benefits.

1. Munk, M. M. and Moon, S. A., "Aerocapture Technology Development Overview." IEEE Aerospace Conference Paper #1447, Big Sky, Montana, March, 2008.
2. Jeffery L. Hall, Muriel A. Noca and Robert W. Bailey, "Cost-Benefit Analysis of the Aerocapture Mission Set", Journal of Spacecraft and Rockets, Vol. 42, No. 2, pp 309-320.

Detailed technical questions or discussions related to use of aerocapture technologies on a particular mission concept should be directed to an Aerocapture POC at NASA LaRC, Jeffrey Herath (jeffrey.a.herath@nasa gov, 757-864-1098)

To assist with design guidelines, the ISPT project has developed the Aerocapture Quicklook tool. The tool provides a capability for rapid and accurate modeling of aerocapture disciplines (geometry, aerodynamics, trajectory, heating, and TPS sizing) at any solar system body with an atmosphere in order to determine aeroshell requirements. An Aerocapture Quicklook Tool reference document has been, or soon will be, posted to the Discovery Program library.

T-6 ***Is it possible to get both the Aerocapture "lander" incentive for using the materials and the Aerocapture "orbiter" incentive for demonstrating the aerocapture maneuver?***

No, it's either one incentive or the other.

T-7 **When does the use of these technologies have to be declared? If they are not part of the baseline in Round 1, can they be declared in Round 2, when more trades have been done?**

See the response to T-4

T-8 ***[Our mission is considering] a carbon-carbon ACC-6 outer shell backed by a Calcarb insulator. This aeroshell design is a self-supporting hot structure (no "cold structure" acreage support internally). Would this qualify for the aerocapture "lander" cost cap incentive?***

This is clarified in the Program Library document entitled *In-Space Propulsion Technologies Minimum Demonstration Requirements.*

Management

M-1 ***Requiring the same 25% unencumbered reserve in Phase E as in Phases B-D does not seem to consider the difference in degree of risk between the development and operations phase, nor variations in the duration for Phase E. Shouldn't this requirement be altered, say to only 15%?***

Recent experience has demonstrated that ground and flight software development are often partially delayed until Phase E in planetary missions. Moreover, recent cost overruns in operating missions have indicated that the community's ability to predict Phase E costs is not as strong as once thought. Therefore, a higher level of reserve has been deemed appropriate and 25% is in line with the recent cost overruns.

M-2 ***Is earned value management required for science operations in Phase E?***

NM 7120-81 does not require earned value management in Phase E.

Proposals

P-1 Where are the appropriate NASA data archive policies and practices documented/stated as referred to in page 11, section 4.4.3 of the Draft AO?

Documentation and tools for NASA Planetary Data System may be found at http://pds.nasa.gov/tools/index.shtml. For other NASA archives, please contact the archive directly.

P-2 What are the definitions and differences among the various science team enhancements referenced —guest observer programs, general [sic] observer programs, participating scientist programs, and interdisciplinary scientist programs?

A "guest observer program" or "general observer program" solicits for proposals from non-team members to utilize the data collected by a mission for objectives different from those of the mission. Guest observers are usually also able to request specific observations. Guest observer programs are solicited after launch. A "participating scientist program" or interdisciplinary scientist program" solicits for new mission science team members, associated with specific mission instruments or specific science investigations, usually to augment the science expertise of the team. Participating scientists and interdisciplinary scientists are full members of the mission science team. Depending on the length of the mission, participating scientists or interdisciplinary scientists can be selected either before a mission launches or during the operational phase. The different terms are used by different communities (*e.g.* planetary science, astrophysics, heliophysics, and Earth science). Note that the AO requires the proposal to define these terms as applied to the proposed investigation.

P-3 Are NASA-funded contributions restricted to exclude all of SMD efforts, as stated in Section 5.5.6, no matter which program in SMD funded the contribution?

Yes.

P-4 On page ii of the Draft AO, the cost cap is based on $425M in FY10 dollars. However, on page 31, the Phase A cost is capped at $3M in RY dollars. Should the Phase A cost be consistent with the cost cap dollars and all be done in FY10 dollars?

No. The Phase A funding of $3M will be in whatever year is appropriate given the selection date.

P-5 Table B3 in the Draft AO is to be shown in RY dollars per fiscal year/phase. Would you like to see Table B3 in FY10 dollars by fiscal year/phase as well?

For each phase, the table also asks for the FY10 total.

P-6 Can the references to launch date in the Draft AO be updated to remove any ambiguity:

- ***a. Requirement 85 says that we shall propose a "launch readiness date (LRD) no later than 12/31/16".***
- ***b. Section 3 says the "Launch Deadline" in NLT than 12/31/16.***
- ***c. Appendix G Requirements crosswalk for requirement 85 says "Latest primary launch date".***
- ***d. Appendix F Compliance Checklist item 24 says "launch date prior to launch deadline".***

All have been changed to refer to "launch readiness date." See Question O-2.

P-7 Can proposer's use extra/additional pages in any location in the proposal independent of the source of the extra page count?

Extra pages may be used anywhere in Sections D – G up to a total of 10 pages per Table B-2 and its footnotes in the Draft AO.

P-8 The first line of requirement B-40 in the Draft AO refers to "schedule foldout(s)," suggesting the possibility of multiple foldouts. Later in the requirement, two references are made to a "schedule foldout" (singular), as does the Proposal Structure and Page Limits table in requirement B-4. Are multiple schedule foldouts permitted and do they not count against the page limits?

The requirement has been clarified to allow for multiple schedule foldouts as needed. Concision, however, is preferred.

P-9 Are Requirement 76, third paragraph, and Requirement 77 of the Draft AO duplications?

Requirement 76 does not have a third paragraph; it consists only of a single sentence. Requirement 77 is the requirement implied by the paragraph preceding it. All requirements in this AO are marked as such so there may be requirements that appear duplicative of other AO text.

P-10 ***Table 2 on page 31 of the Draft AO lists the "Adjusted Cost Cap" for using various NASA-developed technology, yet for the very first item, "ASRG", it shows the adjusted cost cap to be exactly the same as the regular cost cap. Is this a typo?***

No. As discussed at the Potential Bidders' Conference, this is not an error.

P-11 ***Can a project manager and a project manager alternate be named to more than one proposal?***

Yes, they may be on more than one proposal.

P-12 ***Shouldn't the science investigation address both the NASA strategic goals [2.1] and the Discovery program goals and objectives [2.2]? As now worded, Requirement 4 of the Draft AO refers only to "program science objectives", whereas the NASA goals seem more all-inclusive.***

Indeed, the science investigation should address both NASA's and the Discovery Program's goals.

P-13 ***List of References described in Appendix B of the Draft AO requires that a proposer includes an externally accessible URL to institutional guiding documents such as Flight Project Practices if such documents are cited. In some cases these documents are proprietary and/or export controlled. It is not possible to make such documents available in the open literature. To satisfy this requirement, however, a website could be created which allows a secure log-in from a designated individual, say the NASA Discovery POC, who would then disseminate the document as the POC saw fit, complying of course with any special marking language. All that would be required from NASA would be the name, affiliation, citizenship, and email address of the Discovery POC. Would such an arrangement be acceptable?***

The POCs for the AO are Dr. Michael New and Dr. Carlos Liceaga, PE. Both are US citizens and, as Civil Servants, are bound by their oath of office to protect trade secrets.

P-14 ***If a respondee to an AO submitted (within the overall allowable page allocation) an optional instrument or a mission element (e.g., a probe) that was an enhancement to the Baseline but not required to meet the AO baseline science/mission goals and objectives would NASA:***

- ***a. Remove the optional section and evaluate the Baseline proposal only?***
- ***b. Review the Baseline proposal and then the option as a separate, independent submittal?***
- ***c. Evaluate the optional section independently and if selected by NASA consider it as having been competed for any future procurement or addition to the Baseline?***

The Phase A for the option would be funded using a portion of the baseline Phase A funding and used to study and determine the impact on the science and mission resources before evaluating a continuance into later mission phases?

If it is within the cap, then it's a descope-able piece of hardware like any other; no such hardware is allowed to be outside the cost cap.

P-15 ***The Draft AO requires 55 hard copies of the Step 1 proposal as well as electronic copies on CD-ROM. Given the financial and environmental costs of producing so many hardcopies, will NASA consider waiving the requirement for so many hardcopies and instead accept electronic copies only, which could be validated to conform to the ISO PDF/A standard?***

Not at this time. NASA is performing pilot tests of all-electronic AO submissions with the ExoMars Trace Gas Orbiter AO. Once that evaluation is complete and the impacts of all-electronic AO proposals have been assessed, a decision will be made on whether to standardize AO submissions to a new, all-electronic format.

P-16 ***Is it possible to retain the same page count for the various sections used in the final New Frontiers AO for the Discovery AO?***

No.

P-17 ***Should the ITA support of the Project Systems Engineer and Chief S&MA Officer be shown as contributed costs in Table B3?***

The ITA function is funded independently of projects (and independently of programs for that matter), so proposals should not report the costs for ITA support in Table B3, at all. . ITA is part of NASA's cost of managing the project.

P-18 Could example science and mission traceability matrices (B1 and B2 in the Draft AO) be shown for missions that return samples as well as only data?

Tables B1 and B2 in the Draft AO are generic templates. NASA expects the proposer to modify them as necessary to describe their mission. Proposers are also welcome to include a third matrix if that is what they need to explain their traceability.

P-19 For some types of missions, it is not clear whether some information should be placed in Section E or F. Could guidance be provided as to which types of reviewers evaluate which sections?

All reviewers read the whole proposal and NASA will not give any guidance on the content of Sections E and F.

P-20 Does the 1% minimum for Education/Public Outreach apply to Principal Investigator-managed cost with or without reserves? Or does it actually apply to the PI-managed cost cap, as stated in the AO for student collaborations?

It actually applies to the PI-Managed Mission Cost Cap to prevent recursive calculations. The final AO has been corrected.

P-21 Should leaders for optional student collaboration experiments be listed as co-investigators, collaborators, or "other professionals"?

Section 5.4 of the Draft AO defines the roles of co-investigators and collaborators.

P-22 Is there any advantage to proposing capabilities that could be valuable to future NASA missions, such as adding dosimeters to better understand radiation impact?

No, however contributed investigations supported by non-SMD funding are allowed.

P-23 Requirement B-54 of the Draft AO states that the proposal "shall provide details of the development schedule of the student collaboration." How much detail is required?

In the Step 1 proposal, any SC will be evaluated only for the impact it has on overall mission feasibility to the extent that it is not separable. Sufficient schedule detail should be provided to demonstrate that the SC can be incorporated into the mission on a nonimpact basis and is clearly separable from the rest of the proposed effort.

Launch Vehicles and Secondary Payloads

LV-1 What is meant in Appendix B, Requirement B-31, Page B-14 of the Draft AO, by the phrase "C3, heliocentric and/or declination?"

The phrase "C3, heliocentric and/or declination" are attributes of a mission's launch and are offered as examples of the type of information proposals should contain to demonstrate a mission's compatibility with all available launch vehicle families.

LV-2 If Table 3 is indeed in $RY, please provide a year-by-year profile of the expenditures.

This table will be rewritten and the costs expressed in FY10 dollars.

LV-3 Which launch vehicles families should proposers consider to comply with Requirement 88 of Draft AO?

The Atlas, Delta, and Falcon families are currently on, or on-ramped for, the NASA launch services contract.

LV-4 Would secondary launch opportunities (multiple, small spacecraft on an ESPA-ring, for example) be allowable in the upcoming Discovery round?

At this time, Discovery missions must be primary payloads.

LV-5 Requirement 87 of the Draft AO states that launch delay costs as a result of spacecraft or payload delays are not a standard launch service and must be funded out of the PI-managed mission cost. Who pays for a delay caused by the NEPA process?

The project must pay the costs.

International Participation

I-1 NASA describes in the Draft AO non-US contribution and PI/Co-I participation; are there any financial restrictions for a US hardware developer that is licensed to sell foreign-built hardware in the US? An example: Acme USA, Inc. owns the exclusive license to sell a road runner detector, designed and built by Verminator, GmbH of Germany This hardware, while built in Germany, is a product of a US company; what are the limitations, if any (does this fall into the 1/3 cap)?

If the hardware is being purchased from a company — foreign or domestic — then the contribution limit does not apply. If a non-US entity is providing the hardware free of charge to NASA, then it constitutes a contribution and the 1/3 limit applies.

I-2 Could a contributed element be considered a Science Enhancement Opportunity (SEO)?

Yes.

ASRGs and RHUs

AR-1 When is the ASRG fueled relative to its integration with the spacecraft or launch vehicle? Are there any special safety concerns?

The ASRG will be fueled at the Idaho National Laboratory, tested, and then shipped to the launch site. Once fueled, an ASRG controller must be continuously connected to the ASRG and fully functioning. The fueled (and operating) ASRG will be integrated with the spacecraft at the launch site. Please see the Space Radioisotope Power Systems: Advanced Stirling Radioisotope Generator and the Space Radioisotope Power Systems: Safety Fact Sheets in the Program Library.

AR-2 Will qualification of the ASRG to the selected project requirements be part of the GFE or does the project have to cost a yet unknown qualification or delta qualification for flight?

The ASRG will be qualified to the requirements contained in Interface Control Document and Characterization Data for the Advanced Stirling Radioisotope Generator (see Program Library). The CDR for the ASRG is well before any possible PDR for a mission selected under this AO so proposers will not be able to propose modifications or alternate qualifications beyond those described in the Program Library document.

AR-3 What is the sparing philosophy for the ASRG given that two units will be available for flight? If both units are flown in the proposed mission configuration, is there a 3rd flight spare provided by NASA as GFE?

NASA and DOE will provide two fueled and qualified ASRGs by no later than March 2014. It is up to the proposer to choose whether to use one as a flight spare or to fly both. If both are used as flight units, a third flight spare will not be produced.

AR-4 ***Will the Nuclear Launch Safety Approval (NLSA) or National Environmental Protection Act (NEPA) costs be paid for by NASA as services or does the project pay for this?***

It is currently expected that the project will have to pay for those parts of NEPA and NLSA documentation and analyses that require specific information regarding mission and spacecraft design. In particular, the following will have to be developed by, or with the input of the project:

- Mission/Spacecraft Alternative Studies for the NEPA process.
- Mission/Spacecraft Trade Studies to evaluate potential nuclear safety-related design changes
- Mission and Spacecraft Design Information for Databook(s)
- Mission sub-orbital and out-of-orbit radiological contingency plans
- Project participation in developing and implementing a risk communications plan for the mission

NASA will pay for the non-mission specific portions as well as the preparation of the NEPA documents, databooks, safety analyses, launch site contingency plans, and risk communication products.

AR-5 ***Are engineering models and simulators of ASRG interfaces included in the list of GFE items and if so, when will they be available?***

Three physical models/simulators will be supplied as GFE. They include and static mass model with representative center of gravity and moment of inertia, a thermal simulator with both conductive ASRG/SC attachment point and radiative properties and an electrical interface. Their design is intentionally held until later in the program to allow for interaction with the S/C designer to assure that the correct level of detail, commensurate with the intended use is designed into each of the models.

AR-6 ***At the Potential Bidders Conference, the NEPA Officer from NASA, Ms. Callister, presented that the costs associated with NEPA was $1-5M, yet the Draft AO specifies ASRG-enabled mission must allocate $17M for NEPA in their costs. Why are these values significantly different?***

The $1-5M was for NEPA compliance only. The $17M in the AO is for both NEPA and PD/NSC-25 compliance. This latter number may change in the final AO.

AR-7 ***Section 2.2 of the ASRG Information Summary document in the Program Library states that the Radio-isotope Power Systems Program Office (RPSPO) "will assist proposers in determining ASRG performance for specific sites on Mars and other destinations". We would like to solicit that assistance for our specific mission scenario. In addition to assessing ASRG power output, can the RPSPO provide an ASRG thermal model for incorporation into our detailed spacecraft thermal model so that configuration effects can be properly accounted for?***

Yes, the RPSPO will provide a thermal model upon request (due to export control requirements) and will be able to assist you. Please contact Robert Cataldo, at NASA's Glenn Research Center (Telephone: 216.977.7082; E-mail: Robert.L.Cataldo@nasa.gov) as described in Section 5.9.3 of the Draft AO.

AR-8 ***The first paragraph of Section 2.2 of the* ASRG Information Summary *in the Program Library document states that "Proposers should use…a system mass of 25 kg for planning purposes…" Using the definitions of Requirement B-34 on page B-16, should the 25 kg identified for the ASRG mass be used for the "current best estimate" or the "max expected?"***

The updated current best estimate (CBE) with design margin is 28.0 kg. The mass has grown due to additional levied requirements by NASA. The Program is holding a 5% reserve on the 28 kg, thus 29.5 kg should be used for planning purposes. This reserve will be released as the ASRG design gates PDR and CDR are achieved.

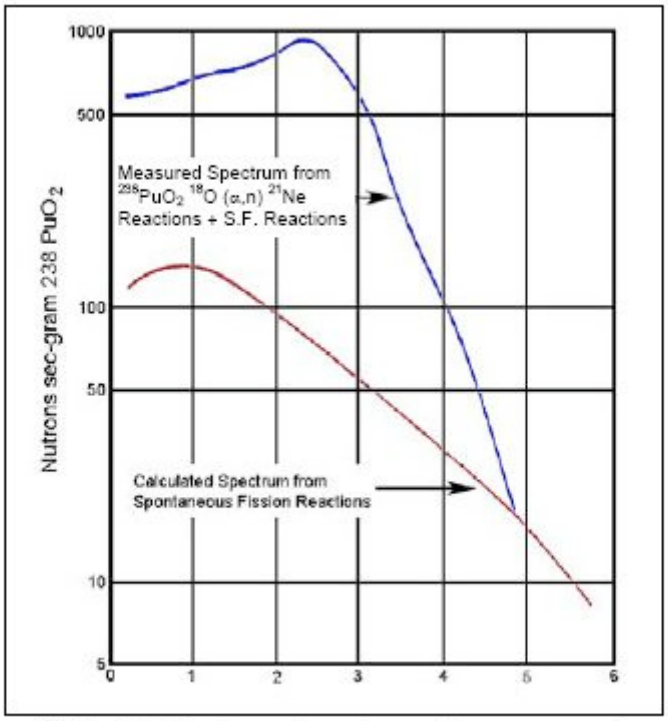
Margin is defined here to accommodate design known unknowns and reserve is for accommodating unknown unknowns. The masses for the ASRG to spacecraft (S/C) mounting plate and controller cable are not included since these items are mission or S/C specific.

AR-9 ***Are the costs in Table 4 for NEPA/NLSA compliance in FY 2010 dollars?***

Yes, the table is indeed in FY10 dollars.

AR-10 Is information available regarding the neutron flux energy spectrum produced by a fueled ASRG so that one could model the effects of neutrons interacting with the spacecraft?

The average neutron spectrum information for Pu-238 fuel used in radioisotope power systems is shown below. It is for the fuel only, and does not include shielding effects of the GPHS module or the generator itself. The reason this is described as "average" information is that it will vary somewhat with the composition and age of the fuel used. The actual heat sources that would be used in the ASRGs have not yet been manufactured. It should be used only for general spectral distribution information. The total neutron production rate is likely to be on the order of 6000 neutrons/sec-g Pu-238.



$^{238}PuO_2$ Neutron Spectrum Components

AR-11 ***The updated ASRG functional description document mentions we can interface directly with a manifold and use our own external pump system for thermal management. In that case, can the fins be removed?***

Yes, the fins could be removed in the ASRG flight configuration, however this method of cooling will be required for all phases of the ASRG, *i.e.,* ground operations, fueling process, qualification testing, spacecraft integration, *etc*. A new Concept of Operations will be needed to accommodate this feature. Adequate time and resources to plan for a complex spacecraft integration process and to develop the Concept of Operations to maintain ground cooling without the fins will need to be included in any proposal.

AR-12 ***At the Potential Bidders Conference, it was mentioned that the ASRG controller will be separate from the ASRG. What is the maximum distance that the controller can be separated from the ASRG, and how might this affect the overall integration flow?***

The maximum distance is ~1.8 m (6 ft) from the ASRG mounting location to the controller mounting location as measured along a distance on the spacecraft surface where the cable is attached. Addition cable length will accommodate connections to the ASRG and the controller. The cable mass estimate is 1.7 kg/m including margin.

AR-13 ***Are the ASRG NEPA and launch support costs shown in the draft AO independent of any other mission-specific parameters such as schedule, trajectory type, etc?***

No. While the costs were based on consideration of the range of mission-specific parameters involved with previous RPS/RHU missions, certain parameters such as trajectory type, timing of PDR/CDR and timing for integrating the spacecraft with the ASRG at the launch site can affect ASRG NEPA and launch approval/support costs.

AR-14 ***Do the stated costs for NEPA and NLSA include project management overhead and reserves?***

They include project management overhead but not reserves; however, reserves for NEPA and launch approval costs under the control of the Program Executive are held at NASA HQ.

AR-15 ***For the DSMCE studies, it was stated that ASRG risks would not downgrade the technical, management and cost evaluation, but this did not appear to be stated in the draft AO. Is that still the policy, and can more detail be provided on this policy?***

The appropriate use of the ASRG and planning for NEPA and NLSA compliance will be evaluated. Risks associated with the ASRG technology, itself, will not be.

AR-16 ***What, if any, are the costs for non-standard launch services associated with radioactive calibration sources for instruments, where the A2 mission multiple is less than 10? Are these sources within the scope of NASA Routine Payment Environmental Assessment?***

The NASA Routine Payload Environmental Assessment allows for the use of radioactive calibration sources for instruments where the A2 mission multiple is less than 10.

AR-17 ***Can you provide additional technical information on the electrical system of the ASRG?***

We are in the early conceptual design phase with new requirements, and the current description of the system and operation concept is in the AO Library, ASRG Functional Description dated December 2009. Additional detailed information should be available for the Step 2 proposal process.

AR-18 ***Can you estimate the performance of the ASRG on the surface of Titan?***

The ASRG is chemically compatible with the constituents in the Titan atmosphere. The internal volume is vented and will be immersed in the 1500 mbar, mostly nitrogen atmosphere at -178 C. Heat is rejected primarily by convection instead of by radiating as in a vacuum. The thermal analysis is rather involved, but the power estimate, with all things considered, would be in the range of 110-125 We. Some thermal insulation would be required to raise the rejection temperature and also some heat needs to be provided to the controller.

Telecommunications

C-1 Does NASA's stated desire to use only one 34m DSN antenna mean:

a. One antenna at one site only (e.g. at Goldstone) with 30-40% coverage per day, or

b. One antenna at each of the three DSN sites – potentially 100% coverage during key mission times – if only using one antenna at a time (i.e. no overlapping coverage from different sites)?

One antenna means "one at a time." So antennae at multiple sites can be used singly (except during hand-offs) to provide 100% coverage per day.

C-2 If accommodating Ka-band communication requires modification to payload design, considerable additional costs, and will not significantly increase science data return, does this justify using X-band communications with a payload already designed for this?

No.

C-3 Does the exception for non-normal operations apply to 70m as well as arrayed 34m antennas? For example, can a project propose using arrayed 34m antennas for critical operations or science data downlink if the need is demonstrated?

Yes, the rule applies to arrays of 34m telescopes.

C-4 Is there any substantive difference intended between the use of the two terms science data return and science telemetry as used in Section 5.2.5 and Requirement 35 of the Draft AO?

There is no difference between the meanings of the terms intended.

C-5 Is it correct that radiometric tracking data collected for navigation and for radio science is not considered "science telemetry?"

Yes, that is correct.

C-6 Is it correct that a flight system may use X-band for non-science-telemetry purposes in place of Ka-band?

Yes, that is correct. TT&C data may be transmitted using X-band.

C-7 Suppose that non-Ka band GFE telecom hardware resides at a NASA Center. If a proposal can make use of this GFE, at significant cost savings to the proposed mission, with no reduction in science data returned, does this qualify as a justification for non-Ka-band communications?

No.

C-8 Understanding that the availability of Mars orbiters cannot be guaranteed, is there a reason that MAVEN was not included as a potential relay asset in Section 5.9.3 of the Draft AO?

No, that was an oversight.

C-9 Is a Letter of Support needed from the National Radio Astronomy Observatory (NRAO) since NASA funds the use of NRAO's resources (e.g., VLBA) for missions that require them?

NASA no longer has an agreement with NRAO to provide navigation and tracking services with the VLBA (or any other NRAO facility). NASA has established that the DSN is sufficient to meet NASA's known requirements. NRAO services have been removed from the DRAFT Space Communications and Navigation (SCAN) document that is posted in the Discovery AO Library. Those services are no longer being offered by NASA as GFE.

Should a proposer require navigation or communications services beyond those offered by NASA and described in the SCAN document in the Discovery AO Library, she will need to propose those services as a partnering, contributed, or procured arrangement within her proposal. Like any other non-GFE contributed or purchased service that one proposes, the proposer will need to work out arrangements with that provider and describe them in the proposal.

C-10 Can arrays of 34m antennae, as described in the Decadal Survey Whitepaper "Future Plans for the Deep Space Network," be employed for non-emergency science data downlink?

No. The single 34m antenna rule for non-emergency data downlink applies in this case.

Other

O-1 Since it does not seem likely that the draft AO will be released in June as announced, will the release date of the final AO also slip?

The Draft AO was released on 7 December 2009. The current target for the release of the Final AO is June 2010.

O-2 Must both the primary and backup launch dates for a proposed investigation occur before December 31, 2016?

Only the primary launch date must be before December 31, 2016. Proposed investigations will be evaluated based on their proposed primary launch date. In the final AO it is made clear that the launch readiness date (LRD) must occur before the specified date.

O-3 In the Draft AO's description of potential Mars relay assets, the MAVEN mission was not listed. Was this an oversight?

Yes, this was an oversight and has been corrected in the final AO. Details of the Mars UHF relay network are found in Mars Relay Description for Discovery 2010 Proposals in the Program Library.

O-4 Please define what you mean by "essential insight" on page 5 of the Draft AO.

NASA will require that all missions conform to the reporting and review requirements of NPR 7120.5, *etc.*

O-5 Please define "passivation" as used in the discussion of spacecraft disposal.

In this context, "passivation" means the complete removal of any stored energy on board a spacecraft including residual propellants (by venting or burning), residual pressurants (by venting), electrical energy (by discharge or disconnection of batteries), kinetic energy (by unloading or de-spinning momentum wheels or gyros), and the disabling of range safety explosives.

O-6 The 2003 Decadal Survey document is not mentioned anywhere in the draft AO. Shall we conclude that its science priorities have been superseded by the* SMD Strategic Plan of 2006 and The Science Plan for NASA's Science Mission Directorate (2007-2016)*?

The priorities of the Decadal Study are reflected in the SMD Strategic Plan and the Science Plan. Proposers, however, are free to reference the Decadal Study if they feel that its priorities are part of the merit argument for their proposal.

O-7 ***Comparison of this AO to past Discovery AOs indicates that the duration between final AO release and selection of mission to proceed into Phase-B has increased from 19 months to 25 months due to a combination of longer review cycles and a longer Phase A. Could NASA remove some of the extra review cycle time (Step-1 and Step-2) to enable earlier launch dates?***

NASA will endeavor to provide the most expeditious review possible. However, the fairness and thoroughness of the review is the highest priority. . The review and selection schedule for both Step 1 and Step 2 in the final AO should be used to prepare your proposed project plan.

O-8 ***In §4.1.1, Page 5 of the Draft AO the end of Phase D is defined as "Launch (extending through in-orbit checkout)." Is Phase D still defined as ending at "Launch + 30 days"?***

The end of the “in-orbit” checkout for planetary missions generally occurs 30 to 90 days after launch. Phase D formally ends with the Post Launch Assessment Review (PLAR).