2023 Heliophysics Space Weather Vigil Focused Mission of Opportunity (Vigil FMO)

Pre-Proposal Conference

July 13, 2023

The Pre-Proposal Conference has been scheduled from 10:00 AM to 2:30 PM Eastern Daylight Time (EDT/UTC-04:00) on Thursday, July 13, 2023. Participation will be via Webex (presentation materials, audio, and text and verbal questions) and teleconference (audio and verbal questions). No travel is required to attend the conference as it will be completely virtual.

Potential proposers to the Vigil FMO Announcement of Opportunity (AO) are encouraged to participate in this Pre-Proposal Conference. Information will be presented by NASA and ESA officials. Participants will have the opportunity to pose questions regarding the AO.

Notes

Dr. Jim Spann, Vigil FMO Program Scientist, brought the meeting to order, and introduced Ms. Peg Luce, Acting Director for the Heliophysics Division (HPD), who along with acting Deputy Division Director, Dr. Therese Moretto, conveyed NASA's enthusiasm about the important collaboration that Vigil represents, and its contribution to the growth of NASA's Space Weather (SW) Program (SWxP). With this Announcement of Opportunity, HPD hopes to be ready to be off and running with its ESA colleagues, and is anxious to make a selection.

HPD SWxP Vigil FMO Solicitation

Dr. Spann explained the purpose of conference, which is to address questions about the process for the Vigil Focused Mission of Opportunity (FMO) AO; offer overviews of the AO, review and selection process; and to give proposers an opportunity to have questions answered, and answer previously submitted questions. He noted that the conference cannot be recorded by attendees, but that a notetaker would document the meeting with notes to be published later. Attendees have been asked to write questions via chat or to verbalize questions over the teleconference line. NASA will focus on AO questions, and the European Space Agency (ESA) representatives will focus on mission questions. All presentations and a Q&A section will be posted to the Vigil FMO Homepage. Elements of note for the agenda include contributions by participants, science review forms, and the Technical, Management, and Cost (TMC) review clarification process, followed by an extended Q&A period at end of day.

Primary contacts for the AO are Dr. Spann [jim.spann@nasa.gov] and Mr. Washito Sasamoto [washito.a.sasamoto@nasa.gov], Vigil FMO Acquisition Manager. Mr. Omar Torres serves as backup to Mr. Sasamoto, and Mr. Jaime Favors is the Program Executive (PE).

All questions to Dr. Spann and Mr. Sasamoto MUST have "Vigil FMO AO questions" in the subject line.

Dr. Spann gave an overview of the SWxP at NASA, a new program established in response to the recognition that SWxP is becoming more of an issue as society becomes more space-faring, which requires a deeper understanding of the environment in which robots and humans operate. The SWxP represents the applications aspect of Heliophysics science at NASA, and it plays a vital role in the US and global SW enterprise. The ESA Vigil mission is a perfect example of international collaboration in the global SW mission.

The roles and responsibilities of NASA in the SWxP are described in the PROSWIFT act, among other federal and legislative acts. The SWxP is carried out through research missions, but all of these missions have some applied aspect of SW understanding, in that the program is striving for better awareness and predictive capabilities for SW events, such as monitoring of coronal mass ejections (CMEs). Through HPD, the SWxP is actively engaged in the Artemis program, the Heliophysics Environmental and Radiation Measurement Experiment Suite (HERMES), and Gateway in cis-lunar space. HPD also has competed research lines that give rise to new theories and modeling activities, carried out through the Small Business Innovative Research (SBIR), Research to Operations to Research (R2O2R), and Space Weather Pipeline Instruments programs (the latter is a program that has yet to be implemented). Currently, NASA has a Request for Information (RFI) out for a Space Weather and Science Agile Platforms (SWAPS) project. There is much international participation, and leading the list is the Vigil mission. NASA is working with the Canadians on AOM and SPORT, the Koreans on SW-relevant CubeSat missions, and is participating with the Indian space agency (ISRO) on their Lagrange Point-1 (L1) spacecraft, Aditya. All of these efforts will aid in keeping human crew safe from space weather phenomena.

HERMES will be the first science payload for Gateway. In addition, ESA Radiation Sensors Array (ERSA) is being provided by ESA, and there is an international internal dosimetry array in development for the Gateway station. ESA, JAXA, the Canadian Space Agency (CSA), and NASA are the four major contributors to Gateway. Other lunar activities are also paving the way for deep space exploration at Mars, filling observational gaps that currently limit the ability to monitor and predict space weather conditions at Mars.

Program Office Overview

Mr. Mike Delmont, Deputy Program Manager, for the Living with a Star (LWS) Program, presented. The LWS Program represents a broad team of system engineering support, and other subject matter experts (SMEs) as needed, and is responsible for financial organization, ITA (independent technical authority) representation, and Launch Vehicle liaison responsibilities (NASA will not be providing a launch vehicle for Vigil). Currently LWS is supporting three missions, including Vigil. Overall, NASA will be providing oversight, project review process, and technical authority for the Vigil FMO. The Principal Investigator (PI) will be responsible for Level 1 and Level 2 science requirements; technical, cost, and schedule performance; and peer reviews.

The Program Office is responsible for assessing the performance of the mission in all its phases (support to Independent Review Boards, audits conducted by NASA and external agencies, etc.), and in phase A, the Program Office supports Headquarters in preparation for

domestic and foreign agreements, as applicable, and in receiving feedback from the selection team. In Phase B (formulation), the Program Office approves the Project Plan. In Phase C/D/E, and through implementation, the Program Office works with the PM to achieve milestones, and to oversee budget and project work.

Points of Contact for the LWS Program Office POCs:

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Responding to a chat question: "Are the Program Office responsibilities changed for Vigil, since there is no downselect after phase A?", Mr. Delmont said he didn't think this was the case, and that overall the responsibilities are the same. Mr. Sasamoto added that there are a few things being pushed forward; things like the international agreements, as there is no competitive phase A.

Vigil Mission Overview (ESA)

Dr. Spann turned the meeting over to Dr. Juha-Pekka Luntama ("Jussi"), Head of the ESA Space Weather Office, to explain how ESA is structured, and how it participates in the Space Weather Monitoring System. The Space Weather Office is a customer of the Vigil Project Office at ESA. ESA is building a system in the near-Earth space and cis-lunar environment, for SW monitoring from both L1 and L5 points. ESA also have plans for implementing missions in this framework. The main motivation for Vigil is to monitor the solar disk from the Earth side, in order to detect developing CMEs. Vigil will fill a gap to monitor the onset of CMEs and their propagation, extending the vision of the solar disk to allow better prediction, and will also provide *in-situ* observations at L5 that will yield more data on solar wind.

Vigil mission objectives include improved observation of CME motion and density, measure vector components of the Interplanetary Magnetic Field (IMF), determine the characteristics of solar wind features rotating toward Earth, and enable assessment of developing solar activity through the monitoring. Dr. Luntama noted that an ESA Vigil Mission Advisory Group strongly recommended that Vigil carry an EUV imager for bonus science and support of mission objectives, which subsequently led to the rationale for NASA's contribution to the Vigil mission. Vigil data will flow to the Space Weather Payload Data Centre and will be correlated with ground-based observations.

Dr. Luntama gave the floor to Vigil Program Manager, Mr. Giuseppe Mandorlo. Mr. Mandorlo reviewed the science objectives, pointing out that Vigil is an operational mission with low-latency data. He briefly reviewed the mission architecture: Vigil will launch into GTO, on a shared launch vehicle, in the first quarter of 2031, a date that may yet change, but

that is fairly firm. The spacecraft will cruise to L1/L2 and do a near-Earth commissioning; at the 8-month mark additional commissioning will be carried out, followed by cruise to L5. Vigil will have enough fuel to push out eventually, to dispose of the satellite at end-of-mission (EOM). For the ground segment, the PDC will process data to Level 1, with further processing to be done in many SW Centres around Europe and the world. Each core instrument has two distinct data streams operating within a data priority concept: 20 kb/s for priority 1 (P1) data and 33 kb/s for Priority 2 (P2) data - further details on slide. Vigil will have a straightforward, standard avionics platform that has been adapted for deep space systems (i.e. it will possess robustness against severe SW events). Mr. Mandorlo pointed out that the PUS-C/CCSDS underlying the TM/TC protocol will be using file-based operations, a relatively new approach that will allow re-transmission of any lost packets.

Dr. Cristina Bramanti covered details of the Vigil instrument suite: a PMI to study the evolving magnetic field; a coronagraph with Heliospheric Imager (HI) that will give a nowcasting capability for the evolution and propagation of CMEs. A PLA and MAG will provide solar wind monitoring. Vigil's CCOR, a compact coronagraph, will use heritage from prior missions. The Heliospheric Imager has heritage from the EUCLID/STEREO HI, and provides a field of view of 4-50 degrees, giving it a greatly enhanced ability to track CMEs from L5. Vigil will have a Photospheric Magnetic Field Imager that has heritage from the SOLO solar orbiter. The Magnetometer has full heritage from JMAG JUICE, and has two identical flux sensors. Vigil's Plasma Analyser, an instrument with heritage from SOLO, is now undergoing testing. Dr. Bramanti felt fortunate that NASA is willing to be part of Vigil, to provide the 6th instrument, the EUV imager.

Mr. Mandorlo said that key satellite design drivers are a relatively high bandwidth, with a 20kb/s average rate for the P1 data, and 33kb/s for P2, assuming 24/7 link operations. A Spacewire link can run at Mb/s levels. Vigil will have finite storage capabilities that are expected to be easily managed. Proposers are welcome to submit burst or campaign modes. In terms of contamination aspects, Vigil has very strict cleanliness requirements, and the mission requests that decontamination requirements be declared. Magnetic cleanliness is also a priority, and will have an impact on material selection. There is also an NDA that needs to be filled in to meet increased cybersecurity requirements. NASA will distribute the NDA to the bidders.

Key personnel for NIO (slide 14). Satellite schedule: EM Q3 2026; FM Q4 2027. There is some limited flexibility on dates, but Mr. Mandorlo urged proposers to keep to the schedule unless there is some more substantial instrument on offer.

Responding to questions on launch dates for the purposes of costing, Mr. Mandorlo said to assume the previously presented launch date of 2031, Q1, but noted that ESA is still negotiating with Airbus. [Note that the Nov-29 date in the *Vigil NIO Requirements Document* was subsequently reasserted in Q&A 10.]

In response to the question "How long to stay in GTO?", Mr. Mandorlo said that it would ne 2-3 days maximum, given that the total dose environment is pretty harsh.

Asked “Will there be a high-cadence mode for core instruments?”, Mr. Mandorlo answered yes. Also depends on overall P1/P2 data requirements.

There was a Chat question on project phases, which was deferred to a Q&A.

A chat question asked “No measurement of particles?”. Mr. Mandorlo answered that it is an operational mission, not a science mission, so there is no need for a particle detector.

Overview of Solicitation Process

Dr. Spann addressed the AO and solicitation process from the NASA perspective. NASA’s primary purpose is to get good science from the Vigil mission and explained how the AO is put together, and what to expect from proposers. The Vigil evaluation organization has three panels: the evaluation panel, science evaluation panel, and the TMC evaluation panel. It is required that proposers provide a set of focused, fully achievable science objectives. What is NOT required is a science enhancement option, but these options are encouraged. Science enhancements such as Citizen Science are encouraged, but Citizen Science may only be included for the anticipated science results the proposal would actually produce. The primary objectives of the NASA Vigil FMO are to advance the research goals of the NASA SWxP, advance the understanding of solar variability, and enable the development of advanced methods (much of this based on Decadal Survey science), and make effective use of Vigil instrument data in the proposed investigation.

Vigil-Complementary Observational Objectives

Dr. Spann provided an overview of the solicitation process: the Vigil AO is a one-step process, with a mandatory notice of intent (NOI) to be filed by August 9, 2023, followed by proposal submission through NSPIRES by September 27, 2023. The selection process will allow comments and clarifications between evaluation milestones and panel meetings, which will allow opportunities for augmented proposals.

Level 1 science and Vigil-Complementary operations requirements and Level 2 project requirements will be required as part of proposals, upfront (in contrast to the 2-step process). The PI must be employed by a US institution in order to lead a proposal. The proposal MUST include a mitigation plan for failure of the funding or contribution to materialize. A class-D payload has certain requirements (slide), space protection standard etc. Student collaboration is not being solicited, and Citizen Science is being solicited, as previously noted (Slide). Data Management Plan details, Software Management Plan. Diversity and Inclusion is a NASA core value, so proposal must include such a plan. NASA will convene Categorization and Steering Committees to review proposals, and the selection decision will be made by the Science Mission Directorate Associate Administrator. This is a standard process for such missions.

In response to a question about the last bullet of slide 8, Mr. Sasamoto clarified that the *NASA Instrument of Opportunity (NIO) Interface Requirements Document*’s specification of 20 kb/s remains the data rate for the Priority 1 operational aspect for Vigil-Complementary objectives, as does the 5-minute cadence requirement. The Priority 2 allocation for the science data is

33kb/s. There is no latency requirement on that. Investigations might generate a giant image and take their time downloading it.

Dr. Spann highlighted some details of the review structure: the science evaluation panel looks at the proposal, primarily. The science review and TMC review are conducted independently, however there can be limited, informational exchanges between the reviews, documented in writing, but these exchanges are not evaluative. The Program Scientist is responsible for managing the science evaluators. Science evaluators are selected based on proposal content, and with an eye to avoiding any conflicts of interest. Anonymity of panels is also upheld.

Evaluation criteria are mutually exclusive of one another. Form A (subdivided into Factors) is concerned with scientific Vigil-Complementary (VC) operational merit, and with elucidating the compelling nature and scientific priority of the proposed investigation's science goals and objectives. Secondarily, (Factor A-2) addresses the programmatic value of the proposed investigation, which includes the unique value of the investigation to make scientific and VC operational progress in the context of Vigil, as well as other ongoing and planned missions. Factor A-3 addresses the likelihood of scientific and VC operational success, Factor A-4 addresses the scientific and VC operational value of the Threshold Investigation. Form B addresses the merit of the instrument and investigation design, and the probability of technical success (Factor B-2). Factor B-3 addresses the merit of the Open Science Data Management Plan. Factor B-4 addresses both developmental and operational resiliency. Factor B-5 addresses probability of team success, and B-6 the merit of the diversity and inclusion plan. Factor B-7 addresses maturity of the Level 1 science and VC operations requirements, and Level 2 project requirements.

Export Control

Mr. Michael Tu presented issues surrounding Export Control (EC) and the impact it might have on the pre-proposal process. Compliance with export control is a central part of the NASA mission, as it must be consistent with national security and foreign policy objectives advanced by export controls. It is the personal responsibility of each NASA employee/contractor/subcontractor to be aware of and adhere to export control regulations. An "export" is defined but not limited to an actual shipment or transmission (tangible or intangible) out of the US. An export can involve a commodity, software, technical data, technology, and/or the provision of a defense service or technical assistance to a foreign person or destination. "Export" is explicitly defined within the US Export Control Laws and Regulations. The goal of these laws and regulations is to protect the national security and policy interests of the US. Both the International Trafficking in Arms Regulations (ITAR) and Export Administration Regulations (EAR) include criminal and civil penalties for export control violations that can result in monetary penalties, imprisonment, or both.

EAR maintains a Commerce Control List (CCL), and ITAR maintains a United States Munitions List (USML). The US also works with other countries to determine what items the Missile Technology Control Regime controls; these items will appear on both the USML and CCL. If an item is listed on the USML or the CCL, an export authorization determination is required. Such items may include launch vehicles, guided missiles, aircraft and related articles,

gas turbines, etc. Most relevant are categories 11, 12, 15 of the USML: military electronics, fire control, range finder, optical and guidance and control equipment. On the CCL, categories 3-7, and 9 are most relevant to the Vigil AO: electronics, computers, telecom and information security, lasers and sensors, navigations and avionics, and propulsion systems, space vehicles, and related equipment.

The Department of State has specific definitions of technical data and defense services in the ITAR: technical data is information Technical data is *information that is required for the design, development, production, manufacture, assembly, operation, repair, testing, maintenance or modification of an export-controlled item and must be protected in accordance with export control regulations (ITAR).* Defense service is *the furnishing of assistance (including training) to foreign persons, whether in the United States or abroad in the design, development, engineering, manufacture, production, assembly, testing, repair, maintenance, modification, operation, demilitarization, destruction, processing or use of defense articles (ITAR)*. In parallel, the EAR uses a specific Department of Commerce definition of "technology": *Information necessary for the "development," "production," "use," operation, installation, maintenance, repair, overhaul, or refurbishing (or other terms specified in ECCNs on the CCL that control "technology");* these can be blueprints, drawings, photographs; this also includes modifications of the design of existing items.

Important best practices for proposers are: clearly identify and mark export-controlled and proprietary information in proposals; identify all foreign partners and participants; and understand all responsibilities under the US EC regulations and articulate EC plans. Mr. Tu also stressed that a NASA international agreement *does not* supersede an Export Control license or compliance regulation, and that NASA contractors and their subcontractors are responsible for export compliance, including obtaining any required export authorization determinations.

Best practices for NASA and contractors are: obtain early coordination between the NASA Program/Project Managers, Contractor(s), and NASA Headquarters or Center Export Administrator (understand what is controlled, identify international parties involved, etc.); mark/determine the export jurisdiction of data/hardware when created or acquired; and include recordkeeping for up to 5 years.

Important links:

The Department of State is the regulatory authority for defense articles and defense services: [[http://www.pmddtc.state.gov/]]

The Department of Commerce is the regulatory authority for dual-use items: [[http://www.bis.doc.gov/]]

The NASA Export Control Program is at [[https://www.nasa.gov/oiir/export-control]]

Mr. Tu directed any further questions to Mr. Juan Santos or to himself:

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Safety and Mission Assurance

Dr. Jesse Leitner presented details of SMD Class D standard Mission Assurance Requirements (MAR) relevant to the Vigil AO. In order to help push the boundaries for moderate-risk/high-payoff missions, a NASA agency team has reviewed numerous approaches to Class D and developed new principles, given that NASA will have to implement a "true Class D" for the new wave of highly resource-constrained missions that are emerging. Hence, the team has developed some important Dos and Don'ts: Don't ignore risk! Don't reduce reliability efforts. Don't assume that nonconforming means unacceptable or risky. Don't blindly eliminate processes.

Significant departures from common practices include an inherited items process, which allows a holistic, risk-based process based on prior history, and represents a change from previous practices. There are no predefined GMIPs; instead a proposer may use an upfront negotiation considering such things as assessment of developer's own inspection points, developer-identified risks, and project-identified risks. Dr. Leitner noted that changing processes for proven products is likely to degrade the product, and it is often not possible to do so, thus inserting GMIPs into a standard build only cause a distraction from the standard build process and should only be attempted if there is a history of quality escapes that have entailed mission risk that GMIPs have caught for the product.

In this regime, common approaches for addressing radiation are: avoidance, going dormant in high-stress regions; making an instrument rad-hard by design; traditional parts-centric; modern parts-centric; radiation-tolerant design; and using a risk-based approach combining past on-orbit experiences in similar environments.

In considering whether the use of commercial off-the-shelf (COTS) components could cause a radiation nightmare, Dr. Leitner noted that no matter whether you use COTS, MIL-SPEC or "special drawing" parts, radiation should be addressed in the same way, as it will always be necessary to think about radiation mitigation in different ways because parts with RHA will almost always be multiple generations behind.

Acceptable risks for Class D include those tied to compressed schedules and tight development constraints; the use of new innovative development approaches; the use of yet to be established or COTS components (in this latter case, acknowledge and describe how the risks will be mitigated). In response to a question about component alerts, Dr. Leitner said there would be no requirement to act on ESA component alerts, but if the proposer is aware, he or she should of course make use of them.

International Cooperation at NASA

Ms. Betsy Goldemen gave an overview of NASA's 65 years of history in international cooperation. Since 1958, NASA has held 6500 agreements with 169 nations and international organizations. Currently NASA has 650 active international agreements with 138 partners; four countries constitute 1/3 of the agreements—Japan, Germany, UK and France. Every Mission Directorate has international partnerships, and 2/3 of these agreements are for NASA science missions. Benefits of international cooperation are many: they help leverage financial, scientific and technological resources; provide access to foreign capabilities or geography; and promote US foreign policy interests. Current guidelines for international cooperation include: partners are generally government agencies; agreements involve no exchange of funds (contributions need not be equivalent); cooperation must have scientific/technical merit and demonstrate specific benefits; joint projects must be within the known capabilities of each partner. Collaborations must have clearly defined interfaces to minimize complexity and protect against unwarranted technology transfer, and the cooperation must be consistent with the foreign policy objectives of each partner. Generally, international partnerships do not involve joint development of technology nor do they involve products or processes that have potential near-term commercial value. Ms. Goldemen noted that NASA is very forward-leaning on Open Data, and that NASA has a requirement to open this data to the public as soon as it is available. Recognizing that data policies differ internationally, potential partners are encouraged to have exploratory discussions, also within export control limitations. Early discussions of this nature are confined to "public domain" information. Projects are documented in legally binding documents, working closely with the Department of State.

Challenges to international cooperation include issues with aligning schedules, budgets, capabilities, critical path items, management complexities, language barriers, time change, and budgetary risks on either side. The benefits of international agreements can be enhanced by clarifying the responsibilities of partners, confirming commitments and terms, documenting the benefits to each partner, protecting investments and interests (technical and IP rights, allocation of risk), allowing import/export of technical goods/data; and confirming arrangements to meet obligations, such as approaches used in the UN Registration Convention. International agreements are drafted after final selections are made, and are not required for proposals of Concept Study Reports. Proposers should bear in mind that it can take a year or more to get an international agreement in place.

Mr. Sasamoto, responding to a question, confirmed that a selection would initiate the international agreement drafting. Dr. Spann fielded a question, noting that it could be that early on, there may be some adjustment in who is doing what, and this would need to be accommodated as the agreement is put together. Ms. Goldemen noted that for a one-step selection, KDP-C is probably a good time to have a finalized international agreement in place.

TMC Evaluation Overview

Mr. Sasamoto reviewed notable AO questions and answers; sections; and requirements, followed by an overview of the TMC Evaluation process.

Regarding Q6, he noted that the proposers are not expected to design to a 7.5 year Phase E duration; he suggested proposers assume 3-years, split into a year between the 32.3 degree

separation from Earth with respect to the Sun and L5; followed by 2 years at SEL5. In addition, proposers should assume for a checkout period of one month, during the time between 30 and 32.3 degrees separation.

Regarding Q5 that asked, given that the FMO is for an instrument whether DRAFT AO Requirement 30 on the Project Protection Plan should be considered not applicable, he answered that NASA-STD-1006A *4.1.1b* provides suggested tailoring regarding instrument command stack protection. He noted that if the proposer includes a plan that aligns with these the two bullets in *4.1.1b*, the TMC panel will accept it. Mr. Giuseppe asked, "Will decryption functionality be provided to ESA for the command stack?". Mr. Sasamoto answered that if the choice was made to encrypt, he would expect so. A comment was made about the potential use of a Public Key Infrastructure.

Under Notable AO Sections and Requirements, Mr. Sasamoto discussed the Earned Value Management (EVM) Plan (AO Section 4.6.2). For government entities, the EVM requirements are listed in NPR 7120.5F. For Class D payloads with an estimated Real Year LCC below $150M, cost or fixed-price incentive contracts with a value of at least $20M are granted a deviation from the FAR and NFS 1834.201.

5.6.6 Contributions; Requirement 63: If a proposal includes US or non-US contributions that are essential to the success of the proposed investigation or critical path, Mr. Sasamoto emphasized that the proposal shall include: (iv) mitigation plans for the failure of funding or contribution to materialize, to include holding fully encumbered reserves to develop the contribution directly.

5.2.9 Engineering Model and *5.2.10 Structural-Thermal Model*. An Engineering Model (EM) representing the mechanical and electrical functionality of each proposed instrument must be delivered to the spacecraft manufacturer no later than Q3 2026. For 5.2.10 Structural Thermal Model, Mr. Sasamoto confirmed that structural-thermal model (S-TM) of each proposed instrument must be delivered to the spacecraft manufacturer no later than Q4 2027.

7.1.1 Evaluation Process. Mr. Sasamoto explained how clarifications may include text, tables, and figures to address the Potential Major Weaknesses (PMWs) to provide additional information. Further requirements and constraints of the clarification process will be addressed in the Evaluation Plan that will be located on the Acquisition Homepage (Section 6.1.4).

PIs whose proposals have no PMWs will be informed that no PMWs have been identified.

All PIs are allowed the same number of pages for clarifications, including those who have no PMWs.

The full set of clarification responses to the factors above will be considered by the Science and VC Operations panel, and the TMC panel. Only the responses will be provided to the other panel. Proposers will have at least 48 hours to respond.

Mr. Sasamoto noted that Clarification is a one-shot deal for this acquisition.

TMC Evaluation criteria. Mr. Sasamoto noted that there is no formula that gets applied, but that the proposer should try to avoid a high-risk rating. There is a high probability that during some part of the mission, higher bandwidth will be available, so the AO is asking for thresholds and assumptions for what can be done with higher bandwidth for SEOs, so that informed discussions about allocations can be had. It's the TMC's job to evaluate whether a proposal will deliver within the cost box. A proposer can propose more than one instrument, as long as they remain within the IRD's constraints.

TMC path in the AO Flow: Mr. Sasamoto clarified that while both panels will see all the responses, that the communication between the TMC and science panels is tightly controlled, effectively stovepiping the panels.

TMC evaluation: Factor C-3 (Adequacy and robustness of the flight systems) is *not* a consideration for this opportunity.

What is evaluated? Only the implementation risks count for a TMC panel (these are risks that are associated with the adequacy of planning, management, development, etc.). What is *not* included are the inherent risks or programmatic risks associated with the mission.

TMC evaluation basic principle: The proposer's task is to demonstrate that the investigation implementation is Low Risk; the TMC's task is to validate the proposer's assertion of Low Risk.

TMC Evaluation findings: Only the "majors" will influence the evaluation. These are major strengths: A facet of the implementation response that is judged to be well above expectations and can substantially contribute to the ability of the project to meet its technical requirements on schedule and within cost. And major weaknesses: A deficiency or set of deficiencies taken together that are judged to substantially weaken the project's ability to meet its technical objectives on schedule and within cost.

Cost analysis: One or more cost models will be used to validate the proposed cost, and implementation threats are identified for all Major Weaknesses. Once Cost Threats are generated, they are used to assess the proposed unencumbered reserves. The entire panel participates in the cost analysis.

Cost threat matrix: This is a 5x5 matrix that assesses the likelihood and cost impact, if any, of each weakness, which is stated as "This finding represents a cost threat assessed to have a Unlikely/Possible/Likely/Very Likely/Almost Certain likelihood of a Minimal/Limited/Moderate/Significant/Very Significant cost impact being realized during development and/or operations." The minimum cost threat threshold is $400K for Phases B/C/D and $250K for Phase E. Unquantified cost threats may also be assessed.

TMC Evaluation risk ratings: This is an "envelope" concept; if the proposal has no major weaknesses, it is in effect a Low Risk proposal.

Program Library: The Program Library will be updated, with a reference included in the associated change log. Questions to Jim Spann may be submitted until September 13 (14 days before the electronic proposal due date).

NDA: Mr. Sasamoto noted that the discussions about the NDA are happening in real time, and the intent is to not have everybody sign it, particularly as civil servants are highly discouraged from signing NDAs; it could be that only a subset of the team will have to sign it. A potential solution to is to provide additional page allocations in the Appendix for NDA signatories; this will also be clarified in the Q&A section. Dan Moses commented on the higher-risk/higher-reward philosophy that is employed in the Explorers program, in terms of getting most science for the buck. Explorers uses a 2-step process in which the proposer gets to refine the proposal in Phase A for an additional TMC evaluation. In the Vigil FMO opportunity, there is no Step 2, and therefore no opportunity to make big refinements to risks outlined in the original proposal. Dr. Moses felt it was worth noting in the Q&A that the Vigil FMO AO is operating under a different set of assumptions. Mr. Sasamoto said that much of the current AO Template philosophy came from Thomas Zurbuchen, and that the new AA may have a new approach. Dr. Spann said he was encouraging folks to use the SEO aspect in this proposal approach. Mr. Sasamoto, responding to a launch date clarification question, said that he duly noted that an update may be made in this regard [subsequently addressed as Q&A 10].

Wrap-up and Adjournment

Dr. Spann reiterated NASA's excitement at having this opportunity and encouraged proposers to go to the Vigil FMO AO website for the repository of information. He thanked all the speakers and looked forward to receiving all the NOIs. Dr. Luntama (Jussi) thanked NASA, and said he was looking forward to working with the instrument team to improve SW capability and monitoring. Mr. Mandorlo and Dr. Bramanti similarly thanked the participants.