

## CASIS Valuation and Prioritization Framework

Proposals to utilize the ISS National Lab (“NL”) fall into two categories: **Solicited and Unsolicited**. Solicited proposals are responses to CASIS RFP releases driven by portfolio objectives and research pathways approved by the CASIS Board of Directors (“BOD”). Unsolicited proposals are a result of promotion of the ISS NL and focused CASIS outreach led by the CASIS Business Development (“BD”) team. These outreach efforts allow both academic and commercial investigators to realize that CASIS can facilitate access to the microgravity environment provided by the ISS NL.

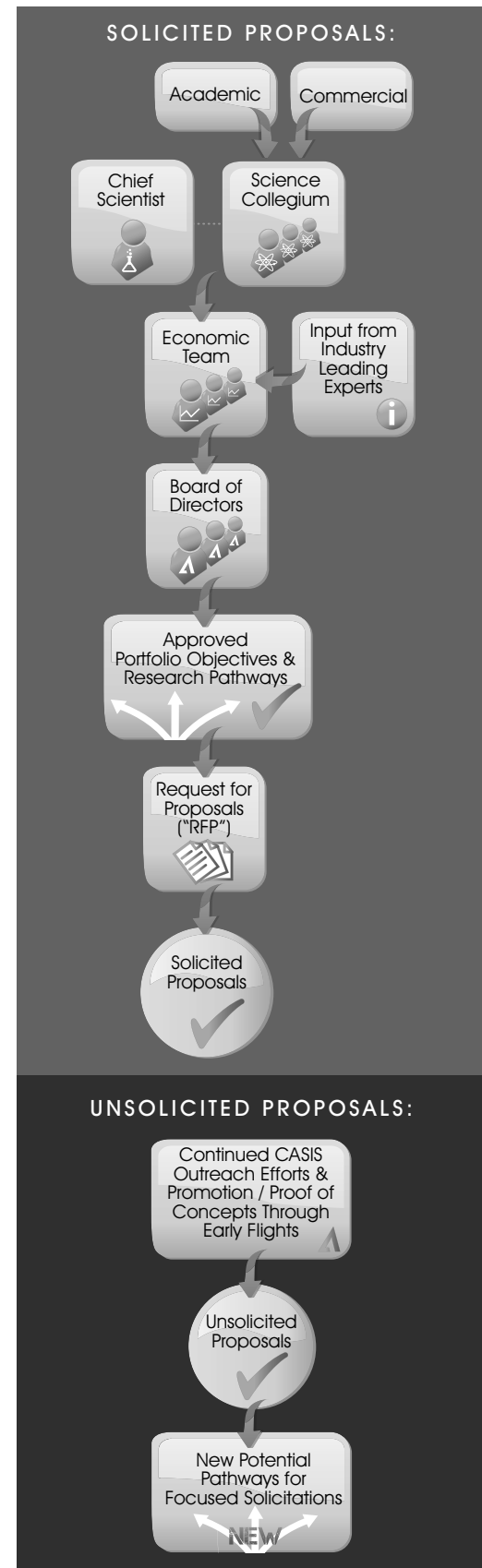
### Solicited Proposal Valuation and Prioritization Process:

1. Chief Scientist (“CS”) and the Science Collegium (“SC”) will first develop overall portfolio objectives (basic research vs. applied research) and suggest research pathways (biosciences vs. materials science vs. earth observation, etc.). The SC will consist of various academic and commercial experts in their respective fields.
2. The CASIS Economic team reviews the portfolio objectives and research pathways identified by the CS and SC. The Economic team may utilize relationships with industry-leading external consultants depending on the industry (e.g. McKinsey & Co., Bain & Co., Boston Consulting Group, etc.) to recommend changes to the portfolio objectives and/or research pathways if appropriate. Some key areas of consideration include (i) market size, (ii) time to translation of benefits to American taxpayers, (iii) potential customer feedback, and (iv) scientific merit as determined by the SC.
3. Chief Economist (“CE”) and CS sign off on research pathways and portfolio objectives. It is the responsibility of the CE and CS to present research and portfolio objectives to the CASIS Board of Directors (“BOD”). The BOD will then either approve or disapprove these objectives and pathways. In addition, the BOD may suggest changes to render pathways consistent with the CASIS mission.
4. Upon BOD approval, execution takes place through the CASIS Business Development (“BD”) team. BD develops a tactical execution plan for each defined vertical market segment, using the Board members as well as the economic team, scientific team, communications team, and external consultants to help stimulate demand. The execution plan may include attending industry conferences, communicating directly to industry associations, potential commercial customers and key researchers in a given field, and releasing focused solicitations.

### CASIS will use funds to:

- ▶ (i) offer grants through solicitations,
- ▶ (ii) match investigator funding and
- ▶ (iii) create enhancements to current ISS NL capacity and ground capabilities.

## STIMULATING DEMAND



5. After receiving proposals that aim to achieve the established portfolio objectives and research pathways, CASIS will utilize a valuation and prioritization framework for grading each individual proposal. The valuation and prioritization process for solicited proposals will include five steps:

- ▶ **a.** Expedited review by the CASIS Operations team to determine technical feasibility of the proposed project and the achievability of the estimated budget and timeline
- ▶ **b.** Evaluation by the Scientific Project Selection Panel ("PSP"), an external panel of subject matter experts, to score the proposal for scientific merit and potential commercial/social impact
- ▶ **c.** A two-pronged economic evaluation process by the Economic PSP, managed by the CASIS economic team, to score potential commercial and intangible value
- ▶ **d.** Review by the CASIS Compliance team of regulatory and legal risks
- ▶ **e.** A final prioritization and award determination by the CASIS Executive Director ("ED"), CE and CS on the basis of recommendations from the PSPs and CASIS staff, as appropriate

**Further details on each step of the process are:**

**OPERATIONS:** Technical feasibility of proposals is performed to ensure the viability and readiness for flight. The review is performed by the CASIS Operations team, which will consult as needed with NASA and outside technical experts to determine overall feasibility. This review is an unscored, pass–fail initial screening; however, CASIS may consider an interview with the investigator(s) to clarify technical elements of the proposal as well as the proposed budget and schedule in order to make its determination. Specifically, the technical feasibility review considers the following elements:

**Logistics:** Proposed resources including implementation partner support, facility needs for ground testing and flight operations support, use of ISS crew for research support, power and data requirements, weight and any known hazards

**Hardware:** Availability, limitations, appropriate planned use, alternatively the costs and feasibility of proposed new hardware development

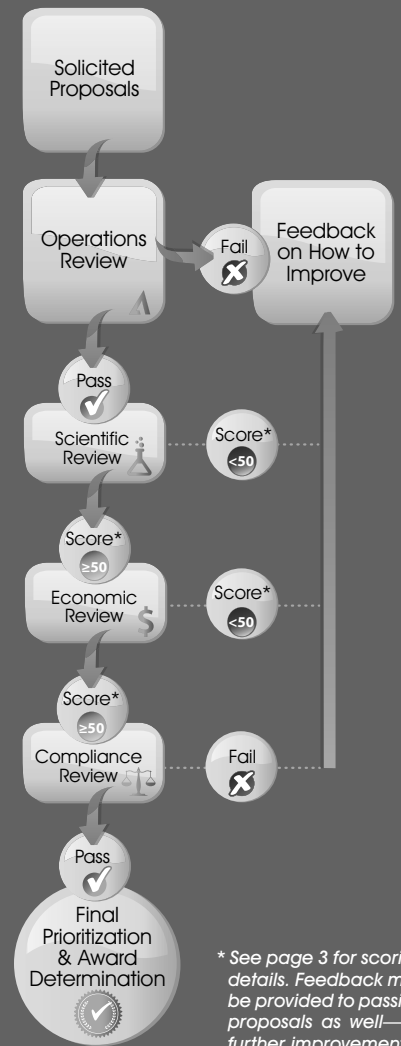
**Projected Budget and Timeframe:** Preflight development and testing considerations, time to flight and time to completion

**Hazards:** Procedures, situations and materials that could potentially be hazardous and a plan to mitigate any identified issues

**Questions:** Follow-up questions for the investigator(s), including as appropriate—

- ▶ Revised methods/analyses, and how results will be collected, analyzed and interpreted
- ▶ Awareness of potential barriers and ideas about alternative approaches

**SOLICITED PROPOSAL EVALUATION & PRIORITIZATION:**



The Operations team will organize its comments into an Operations Appendix to the proposal. The Appendix will provide crucial input for prioritization (e.g., time frame and budget) and will identify logistical challenges in the proposals in areas where new-to-space investigators will potentially be deficient. This function serves to support the new space investigator so that appropriate considerations are made in their proposals, as well as to prevent experienced space investigators from scoring higher in the later rounds of review (thereby supporting the CASIS goal to attract new users).

Only proposals that demonstrate operational feasibility will pass this round of review and advance to scientific evaluation. The decision of the Operations review is final and not subject to appeal.

**SCIENTIFIC EVALUATION:** Using the scoring rubric below, an external panel of subject matter experts in the RFP target field, assembled by CASIS, will evaluate proposals which passed the Operations review. Their evaluation will consider both the original proposal and any additional information provided in the Operations Appendix.

SCORE	DESCRIPTIVE FEATURES	POTENTIAL FOR SELECTION
90–100	<b>EXCELLENT:</b> A thorough, comprehensive and compelling proposal of exceptional merit that fully responds to the objectives of the RFP, as documented by several major strengths; no major weaknesses and only very minor weaknesses, if any.	Top priority for selection.
80–89	<b>VERY GOOD:</b> A competent proposal of high merit that fully responds to the objectives of the RFP, as documented by one or more major strengths and no major weaknesses; strengths substantially outweigh any minor weaknesses.	Second priority for selection, barring issues of funding availability or programmatic priorities.
70–79	<b>GOOD:</b> A competent proposal that represents a credible response to the RFP, as documented by no major weaknesses; strengths and weaknesses on the whole are in balance, but strengths somewhat outweigh weaknesses.	May be selected as funds permit according to programmatic priorities.
50–69	<b>FAIR:</b> A proposal that nominally responds to the RFP, in which one or more major weaknesses, in combination with any minor weaknesses, clearly outbalance any strengths.	May be selected after revisions as funds permit according to programmatic priorities.
0–49	<b>POOR:</b> A proposal with several major weaknesses or weaknesses that constitute fatal flaws.	Not selectable regardless of programmatic priorities or availability of funds.

*Minor weakness: an easily addressable weakness that does not substantially lessen merit/impact.*

*Major weakness: a weakness that severely limits merit/impact.*

0-49

50-69

70-79

80-89

90-100



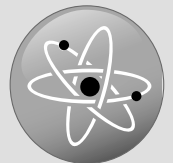
▶ FAIL



▶ PASS

**Reviewers will score the following categories on a 0-100 scale and will average individual scores to produce an overall merit/impact score:**

- ▶ **Significance** - DESCRIPTORS/CRITERIA: If successful, the results will have rapid scientific, commercial and humanitarian impact and significant scientific, commercial and humanitarian potential. The results could yield a new line of space research with strong scientific, commercial and humanitarian potential or build on prior successful research produced on the International Space Station. If successful, the results will advance the leading edge of the field. Negative results will have significant impact within the research area. If successful, the results will influence broad fields of study. The research builds on a foundation of existing space or ground research to bring the pathway closer to commercial application.
- ▶ **Investigators** - DESCRIPTORS/CRITERIA: The investigator(s) has the financial stability to complete a project. The investigator(s) has documented success in the field of study (as demonstrated by strong publication record, commercial success, patents or technology implementation resulting from R&D). The investigator(s) has a strong publication record or demonstrated success in R&D (as measured by commercial success, patents or technology implementation resulting from scientific research). If the applicant is a new investigator(s), or one in the early stages of an independent career, the investigator(s) has appropriate experience and training or has partnered with a qualified coinvestigator. If the project is collaborative (e.g., multiple institutions or coinvestigators), the investigators have complementary and integrated expertise; their leadership approach, governance and organizational structure are appropriate for the project.
- ▶ **Innovation** - DESCRIPTORS/CRITERIA: The project is innovative with respect to multidisciplinary integration and novelty of topic or approach. The project's results, if successful, will challenge current research or commercial practice paradigms. The project's concepts, approaches, instrumentation or interventions are new to more than one field of research. The project improves or suggests a new application of theoretical concepts or approaches.
- ▶ **Approach** - DESCRIPTORS/CRITERIA: The scientific merit of the proposal is sound. The proposed project fits the CASIS mission, satisfying the overall objective of the RFP and both the short- and long-term objectives of CASIS. The proposal explains the hypotheses or the required elements of the proposed technology demonstration, including well-defined ground controls. The project requires the space environment for advancement with respect to time and/or capability. The project's potential problems, alternative strategies and benchmarks for success are presented (may refer to Operations Appendix).
- ▶ **Environment** - DESCRIPTORS/CRITERIA: The investigator(s) has access to crucial ground technology and experience necessary for preflight work and ground controls. The proposal contains compelling and well-developed preliminary work. The project will benefit from the space environment. The investigator(s) has demonstrated understanding of how data collection, analysis and interpretation must be approached on the basis of the unique conditions of the space environment (may refer to Operations Appendix).





**ECONOMIC EVALUATION:** The Economic Evaluation process will be twofold, with each branch of the process (Commercial and Intangibles) using a 0–100 scale and the same scoring rubric as the Scientific Evaluation process. The weighting of the intangible score in the final combined score will range from 0 to 50%, depending on what part of the research pathway the proposal affects (higher weighting for affecting later points in the pathway closer to commercial product application).

Similar to the Scientific Evaluation process, CASIS will assemble an external panel of subject matter experts to evaluate the proposals. These experts will most likely come from industry-leading consulting firms including McKinsey & Co., Bain & Co., Boston Consulting Group, etc.

Reviewers will evaluate commercial letters of support during this stage, which may impact multiple scoring categories.

#### COMMERCIAL EVALUATION:

##### *Reviewers will score the following categories:*

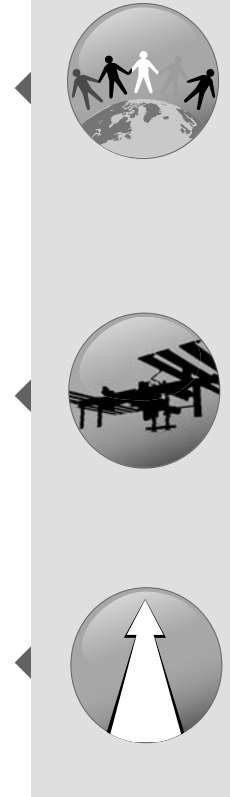
- ▶ **Management and Key Employees** - DESCRIPTORS/CRITERIA: The current management team is qualified to and can execute the project. The team has prior successful experience working together. The team or PI has prior experience in similar capacities (however, cannot fault for lack of space experience) and has demonstrated high likelihood of future success in the field of interest. The project lists necessary, relevant and qualified key collaborators.
- ▶ **Market(s) and Competition** - DESCRIPTORS/CRITERIA: The current size and forecast growth rate of the relevant market(s) is noted and addressed, and these data support potential market impact of successful results. The proposal addresses both barriers to entry and market competition. The team can either commercialize products or partner with companies with established commercial success. A customer base exists for potential products (i.e., new innovation vs. advancing something existing or solving a problem).
- ▶ **Products/Services and Technologies** - DESCRIPTORS/CRITERIA: The products/services/key technologies that will benefit from successful results are clearly defined, feasible and unique. The resulting product/service will provide specific and significant benefits to the U.S. economy or population. Customers will easily understand the benefits/products resulting from successful results. Product/service development plan, timing and costs are feasible and realistic. Technology risk assessment, if applicable, has been performed and/or is not likely to pose a problem. Patents, trade secrets or copyright protection, if available for the products/technologies/services, will increase likelihood of market impact and commercial success.
- ▶ **Business and Operating Plan** - DESCRIPTORS/CRITERIA: The proposal coherently states project mission, strategy and implementation. The competitive environment and CASIS objectives are clearly understood. Required resources (e.g., human, capital) are described and understood. The description of commercial application is adequate, and the forecast results are reasonable. Contingency plans are in place and reasonable.
- ▶ **Customers and Suppliers** - DESCRIPTORS/CRITERIA: Customer opinion about the field/market/competition is favorable to market entry and success. Key suppliers are stable and reliable/high quality. Single-source components or technologies are unlikely or are acceptable where applicable. Investigators are aware of companies interested in commercializing the product(s) resulting from the research.



## INTANGIBLES EVALUATION:

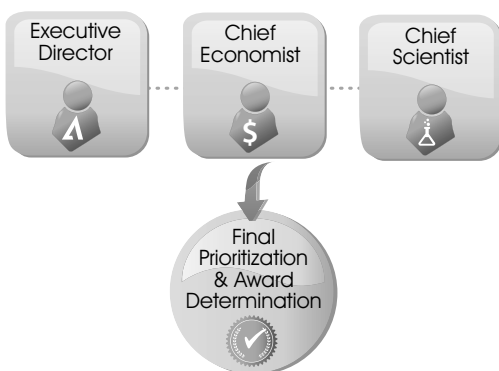
### Reviewers will evaluate three key categories:

- ▶ **Greater Good to Society** - DESCRIPTORS/CRITERIA: The overall potential for impact on the U.S. society is of significant value. The project advances discovery and understanding while promoting teaching, training and learning. The proposed project broadens the participation of underrepresented groups. The project increases throughput of the supply chain—innovations affecting humans, animals, plants, climate and resources now or in the future (e.g., fewer deaths, fewer sicknesses, healthier livestock, a more abundant food supply, the protection of endangered plant or animal species, reduced pollution, improved ground energy efficiency). Project success will beget future projects of intangible or tangible value. The project addresses an important problem or a critical barrier to progress in the field.
- ▶ **U.S. Leadership in Space** - DESCRIPTORS/CRITERIA: The success of the project will change the concepts, methods, technologies, treatments, services or interventions that drive the relevant field. Potential exists for significant international impact. The project advances the CASIS mission to balance a diverse portfolio of research disciplines and stages. The project enhances awareness among potential International Space Station constituency groups regarding the advantages of performing science in space (i.e., it will promote interest in using the National Lab). The project shows how space station technology contributes to products and services revenue and related tax revenue from profits (i.e., it demonstrates value to the public).
- ▶ **Economic and Human Capital Development** - DESCRIPTORS/CRITERIA: The benefits of the proposed project to society include job and wealth creation, as well as improved quality of life, knowledge, skill sets and sustainability. The project bridges basic science with industrial R&D applications. Project success will enhance the infrastructure for space-based research and education (e.g., facilities, instrumentation, networks and partnerships). The results will be disseminated broadly to enhance scientific and technological understanding, enabling developments in science by allowing researchers to build on each other's work and providing content for educational curricula.



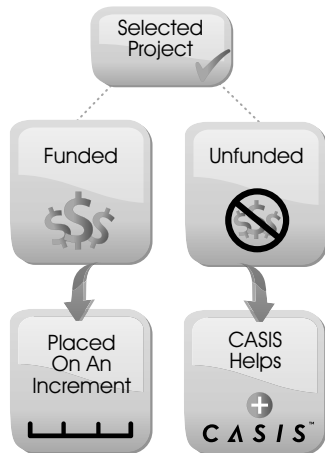
**REGULATORY REVIEW:** After the economic evaluation, the CASIS Compliance team will review meritorious projects, providing notes regarding potential problems for the following areas: data integrity, risk liability, ethics and research integrity, regulatory compliance and conflicts of interest.

**PRIORITIZATION AND AWARD DETERMINATION:** The ED, CE and CS will perform the final prioritization and award determination, initiating discussions with members of the Project Selection Panels and CASIS management-level staff as necessary.

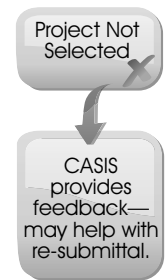


The ED, CE and CS will meet and review the eligible projects, relative to the entire NL research portfolio, on the basis of **scientific merit, scientific value, economic value, technology advancement and educational value**. They will consider estimated cost and timeline alongside scores and comments from all review steps.

The ED, CE and CS will analyze the Operations Appendix to proposals to ensure sufficient facility capacity and on-board resources in the given increment. Based on the facility and resource requirements known at the time of prioritization, they will categorize and organize payloads accordingly, consulting CASIS Operations staff as necessary for clarification. If all eligible projects fall within the available CASIS resources and facility capacity, then prioritization, for this purpose, would not be necessary. If unforeseen changes to available resources occur, CASIS will reprioritize the payloads.



All projects must meet minimum eligibility requirements such as readiness for an increment, secured funding (including CASIS grant funding) and an agreement with an implementation partner. Prioritized proposals with sufficient funding will advance to the CASIS Operations team for preflight activity and project management. CASIS Operations staff will participate in NASA research processes to support established strategic and tactical planning.



For projects without sufficient funding to advance to Operations, CASIS will assist with finding potential funding sources including reaching out to the investor community.

Lower priority proposers will be notified that their project needs improvement with feedback on its weaknesses, and they will be invited to re-submit at a later date and/or post an advertisement seeking financial or research support on the CASIS Innovative Marketplace Exchange Forum.

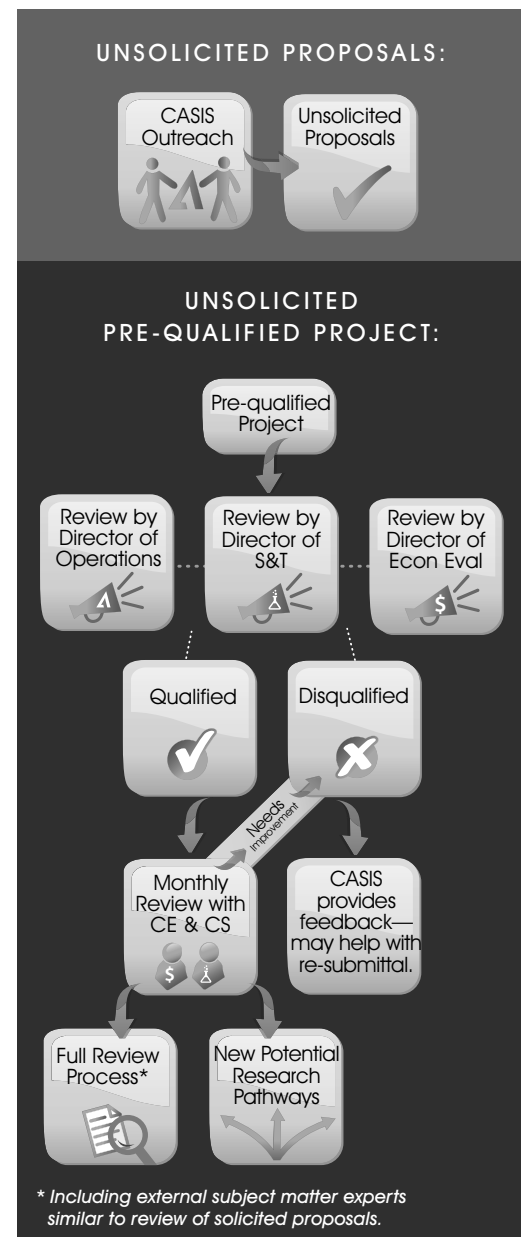
### Unsolicited Proposal Valuation and Prioritization Process

Through promotion of the research opportunities available on the ISS NL, CASIS has and will continue to receive many unsolicited proposals from investigators hoping to utilize the ISS NL and are asking what it would take to get there. This unsolicited interest has caused the CASIS approach to evolve so that we do not disenfranchise potential users of the station. History has shown that people have unique and powerful ideas, and

CASIS has created a process that will capture, evaluate and prioritize all unsolicited commercial and academic proposals to conduct science on the ISS NL.

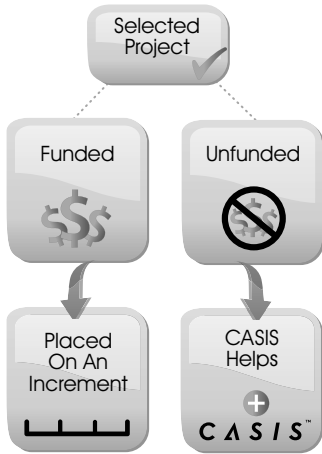
Upon receipt, all unsolicited proposals or leads will be forwarded to the Business Development (“BD”) team. If a full proposal is delivered to CASIS (rather than a verbal description), the proposal will then be logged into the CASIS database as a “pre-qualified” project. The BD team will alert the Director of Operations, Director of Science and Technology, and Director of Economic Evaluation of all new projects that require a review for qualification. Upon notice, the respective directors and their teams will, in parallel, evaluate each proposal to see if (a) it has potential to fly and warrants further investigation or (b) it has obvious deficiencies and does not warrant further investigation. For those that are disqualified, feedback is provided to proposers on potential enhancements that might improve their chances of moving forward.

All qualified unsolicited opportunities will be discussed in a monthly review with the CS and CE. During this monthly review, the CS and CE will receive a flash report of qualified proposals, and each project’s details and merits will be discussed. The CS and CE will provide feedback on specific projects. Additionally during this monthly review, the CS and CE may identify and develop new research pathway opportunities for BOD consideration.



\* Including external subject matter experts similar to review of solicited proposals.

Specific projects the CS and CE identify as qualified opportunities fall into the same review process as proposals that are submitted through traditional solicitations, including (i) an Operations Evaluation, (ii) Scientific Evaluation with external review panel, (iii) Economic Evaluation with external review panel, and (iv) the final selection panel consisting of the ED, CS, and CE.



All unsolicited projects must meet minimum eligibility requirements such as (i) readiness for an increment, (ii) secured funding (including CASIS grant funding), and (iii) an agreement with an implementation partner. Prioritized proposals with sufficient funding will advance to the CASIS Operations team for preflight activity and project management. CASIS Operations staff will participate in NASA research processes to support established strategic and tactical planning.

For qualified projects that lack the necessary funding for advancement, CASIS will assist in creating relationships with the investor community for potential financial partnerships.

Lower priority proposers will be notified that their project needs improvement with specific feedback on weaknesses, and they will be invited to re-submit at a later date and/or post an ad on the CASIS innovative marketplace exchange forum. ▲

