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Science in Space**

**Testimony before the U.S. Senate Committee on Commerce, Science, and Transportation**

**“The International Space Station: A Platform for Research, Collaboration, and Discovery”**

**July 25, 2012**

**Introduction**

Good morning. It’s a privilege to be here before you this morning and I want to thank the Committee for this opportunity to update the American people about the performance and accomplishments of the Center for the Advancement of Science in Space, better known as CASIS, and its role as the manager of the International Space Station National Laboratory (ISS NL).

The entire CASIS organization is working diligently to establish procedures for outreach, business development, operations, education and fundraising that will ensure we successfully enable companies, academic researchers, students and federal agencies to conduct research and development on board Station. These efforts will produce breakthroughs in science, technology, materials and pharmaceutical drugs which will provide American taxpayers with a positive return on their investment while benefitting all humanity.

Because of its unique mission and mandate, CASIS has greater flexibility and can conduct activities far different than NASA. As Congress intended, CASIS’ status as an independent and non-profit organization allows for the development of partnerships, funding sources, endorsements, and other opportunities that NASA cannot pursue. CASIS can raise money, advertise, and innovate in ways that open new opportunities for ISS utilization.

The CASIS staff shares the Committee’s sense of urgency with regards to maximizing use of the ISS NL. In the following testimony, I will discuss how CASIS is developing and pursuing innovative, forward-leaning, and broad strategies to attract a wide-range of users to ISS NL.

**Foundation and organizational structure**

During its standup phase, CASIS has developed an organizational structure faithful to our proposal, Cooperative Agreement with NASA, and original Reference Model, but one which is also responsive to the practicalities of implementation and the realities of the marketplace.

We currently have 27 full-time employees. Staff members bring with them an array of skills and extensive experience with NASA and the aerospace industry, R&D, venture capital, media, commercialization, management, and operations. Our staff has worked with urgency to establish CASIS’ essential functions: business development, marketing, education, and operations. We have worked and partnered with industry, academia and others to ensure that the CASIS organization can be responsive to the needs of potential users of the ISS NL. We have conducted extensive outreach activities. All work undertaken thus far has been in an effort to move the organization forward in an efficient, timely and practical manner in step with efforts to establish

a permanent Board of Directors and executive leadership. We are confident that the steps taken so far to identify initial research pathways while raising awareness and developing partnerships satisfy our mandate and will be approved by a permanent Board of Directors.

The Board of Directors selection process began several months ago when the Interim Board contracted with a well-respected executive search firm, Korn/Ferry International, to conduct an independent, verifiable search for qualified candidates. Stakeholders, including the leadership of this Committee and its House counterpart, NASA, and other science-focused federal agencies, had the opportunity to submit names of Board candidates. Through a series of evaluations, interviews, and down-selects, the Interim Board has identified the first group of permanent Board of Directors candidates, all of whom represent the best American minds in the fields of scientific research and management from academia, government, and industry. An announcement of the first set of Board members will be made shortly, with the remaining 15-member Board finalized soon thereafter. As envisioned by Congress and the ISS NL Reference Model, the permanent Board will be made up of world-class scientists and leaders who will provide CASIS with guidance, expertise, and credibility. They will serve as ambassadors for CASIS and the ISS NL, reaching new users and supporters through their various networks. Additionally, the initial permanent Board members will appoint the permanent Executive Director.

While awaiting the appointment of a permanent board, CASIS has taken steps to establish a path toward effective utilization in line with Congressional intent, our Cooperative Agreement with NASA, and other guiding documents. This includes the appointment early this year of a world-class Interim Chief Scientist and an Interim Science Collegium comprised of renowned experts to review past life sciences research conducted in space in order to identify initial research pathways. Their effort resulted in our first solicitation for research in the area of protein crystallization. This is a well-established area of interest for researchers, but in need of a more systematic approach than has been taken in the past. The validity of the collegium's approach is supported by a recent National Academy of Sciences' study highlighting the importance of studying crystal growth without gravitational bias. Protein crystallization in microgravity can validate its scientific worth and unlock the potential for countless discoveries.

### **State of Valuation and Prioritization Process**

CASIS' valuation model has been developed in order to best respond to the specific needs of the ISS NL as well as to meet the requirements of our charter. Designed to be a transparent process, it incorporates standard business model elements with regards to project evaluation and prioritization and has evolved into a robust methodology, taking into account scientific merit, economic value, readiness, and operational feasibility.

An interim process was used on multiple test cases, starting with an operational review to gauge the feasibility of proposals. The Interim Chief Scientist and his team reviewed projects for scientific merit and impact. The Chief Economist and his team then assessed projects for value and potential return to the U.S. taxpayer. Our compliance team scrutinized the legal implications and challenges. Final decisions were made by the Interim Executive Director with Interim Board approval.

Once a permanent Board of Directors is in place and selects a permanent Executive Director, the final CASIS Evaluation and Prioritization Framework will be used on solicited and unsolicited proposals. Under the final methodology, the interim process expands to include the evaluation of projects by the scientific collegium and outside industry experts who will score and help prioritize projects using a standardized set of metrics for the scientific and economic reviews. These metrics will be posted publicly on the CASIS website. Taking into account the scoring results, the CASIS science and economic teams will deliver the final recommendations to the Executive Director, Chief Scientist and Chief Economist, who will then make the final award and funding decisions. The methodology is designed to adapt to new and ever-changing market demands. The Framework in its entirety is spelled out in Appendix iii.

## **Outreach Efforts**

The vast majority of Americans, including business leaders and leading scientific researchers, simply do not know that the ISS NL exists and is open to them for research. To fully realize the potential of the ISS NL, there must be aggressive outreach and education activities to raise awareness of Station and its capabilities. This has become a top priority for CASIS. Over the last 11 months, we have set out to establish and develop relationships with new and previous researchers, commercial entities, entrepreneurs, financial partners, philanthropic organizations, educators, students, and citizen scientists. Since March, CASIS staff has met representatives from over 165 organizations from coast to coast to inform them about the numerous opportunities to use the ISS NL.

In addition, CASIS has supported the *Destination Station* outreach programs by participating with NASA on several research panels, Twitter Town Halls, University presentations, and informational exhibit booths.

Last month, CASIS, in conjunction with the American Astronautical Society (AAS), was a co-sponsor and active participant in the First Annual ISS Research and Development Conference conducted in Denver, CO. During this conference, CASIS also successfully produced and coordinated the first-ever Implementation Partner Tradeshow, which included over 20 implementation partners exhibiting their capabilities. This provided a cutting-edge venue for the over 400 attendees, who could be potential users of the ISS National Lab, to collaborate with established payload implementation and integration partners, allowing them the opportunity to gain an understanding of the capabilities available to ensure the success of science missions.

Over the last six months, CASIS has reached out to hardware providers, flight and integration specialists and others to create a consolidated directory of implementation partners to assist ISS NL users to efficiently and effectively get their research into space. The ever-expanding resource is the first of its kind and is available in hard copy or as a PDF via the CASIS website. It provides technical and contact information useful for ISS NL users and currently lists more than 35 specialized companies and organizations. The objective is to match users with integration and hardware partners and in doing so stimulate new investigators and researchers by making it easier and more cost-effective for to prepare their research for flight.

In June, CASIS announced the creation of the “Space Is In It” seal which the organization will bestow upon companies that successfully develop commercial products based on research and

development, testing or use on the ISS NL. Through the “Space Is In It” endorsement, CASIS positions Station in the forefront of the general public’s understanding of our space program. This seal adds marketing value to the ISS and allows non-traditional users the opportunity to understand the benefits of science in space. The goal of the seal is to connect Station and the ISS NL research with consumers, fix ISS awareness more strongly in people’s minds and in pop culture, and to entice U.S. companies to look more carefully at the value of developing and researching products on Station. Last month, CASIS announced it would award the “Space Is In It” seal to any products developed by COBRA PUMA Golf from investigations on the ISS NL, after the golf manufacturer declared its intention to conduct materials research on Station with the hopes of creating revolutionary sporting goods for consumers.

### **Education Initiatives**

While the overlying mission of CASIS is to effectively and fully utilize the ISS, educating the future engineers and technical professionals of tomorrow about Station and careers in space are paramount to maximizing our nation’s investment. The CASIS Education Program seeks to use the research CASIS brokers on Station as a springboard to increase STEM literacy for all students from Kindergarten to higher education; excite students about STEM careers; support teachers in improving STEM education; and promote the ISS as a STEM learning platform..

CASIS will work with commercial and academic National Lab users to develop curricula around their payloads in cases where it makes sense for educational purposes. This aspect of our education mission holds great potential for raising awareness about the ISS, supporting teachers, and teaching students about the practical uses of space-based research. This will be an on-going focus for CASIS staff. CASIS will also play a key role in ISS advocacy by developing curricula to excite younger children about Station science in general.

In June, CASIS has signed an agreement with the Student Spaceflight Experiments Program (SSEP), spearheaded by the National Center for Earth and Space Education (NCESSC), to sponsor student science projects on Station. In 2013, SSEP could reach thousands of students and hundreds of communities nationwide. CASIS will work with NCESSC to enhance the program to expand its outreach.

In another example of the innovative, multi-layer deals CASIS can make, the organization this year established a partnership with the PGA of America. By leveraging PGA's immense network of players, professionals, fans and sponsors, CASIS can bring attention and relevance to both Station and the space program by reaching a whole new audience of children, educators, companies, and decision makers. The first prong of this strategic cooperation constituted a pilot PGA STEM Enrichment Camp in June at the PGA Center for Golf and Learning. Over five days, in classroom settings and on a golf course, underprivileged children received instruction in more than just golf; they learned science, math, and engineering and about the ISS and the kinds of research that could take place there. They learned about the physics of golf and how the same principles are used by engineers and astronauts every day. The event was so successful that the PGA is considering rolling out the program nationally, initially expanding the program to 50 sites next year, then to 250 the following year and up to 750 in its third year. This pilot program is model that can be adapted and used by other established organizations to reach the maximum number of students in the shortest period of time.

Other initiatives that CASIS has put into motion with regard to educational endeavors include ‘Story Time From Space’, in which a well-known science children’s author will write a series of books designed to create awareness about Station, which will be read by astronauts in front of video cameras on the ISS NL, exciting young readers about the world in space. . The videos will be posted on the CASIS website and social media platforms. ‘Story Time From Space’ will reach a previously underserved demographic and connect literacy with STEM concepts. CASIS is working to finalize this deal by the end of the year.

## **Operations**

The CASIS Operations Director was hired in 2011, and project management staff positions were filled beginning in January of this year. It is completely staffed, with six members. All team members have extensive project management and flight hardware experience from time at space centers, the aerospace industry, and the transportation sector. Operations staff members are responsible for working with their clients from project conception to completion. They will use their knowledge and skills to develop, integrate, and operate projects in order to accomplish the goals of users and to ensure alignment with the CASIS mission.

The operations directorate has assumed responsibility for all National Lab projects and payloads scheduled by NASA for current and future ISS Expedition increments. This includes all research, planning and sponsorship efforts. In particular, CASIS has sponsored research plan updates, assisted with the development of science missions, and assembled the entire ISS NL research plan for September 2013–March 2014, which has been approved by NASA. CASIS Operations is also managing flight opportunities in September 2012–September 2013 for unsolicited projects and the upcoming series of RFPs promoting the utilization of existing ISS facilities in earth observation and microgravity science.

With regards to fulfilling future increments as required by our Cooperative Agreement, we are ahead of schedule. CASIS has identified and developed payloads that will be flown on Increment 37/38, well ahead of the Increment 39/40 timeframe set in our Annual Performance Plan (APP). During Increment 37/38, we are working towards flying 5 to 6 payloads consisting of unsolicited projects that are currently being vetted through our evaluation process. Additionally, we plan to deliver the Windows on Earth software at the end of this year during Increment 35/36. These missions will serve to validate CASIS’ processes and capabilities, as required by the APP.

The operations division has also worked with NASA to transition all National Lab projects to CASIS, with the exception of two due to extenuating circumstances. As part of this effort, CASIS adopted the commitments of the existing Space Act Agreements and entered into new Memorandums of Agreement with existing National Lab partners to ensure a continuation of project support and other commitments within CASIS’s ability to support.

Under a MOA signed with Bioserve, CASIS has tasked the company with developing a commercial rodent research model in cooperation with NASA Ames and Professor Ted Bateman, a leader in the field of space-based rodent research. Our goal of flying a proof-of-concept mission in the Fall 2013 cuts in half the time it would normally take to develop and deploy such a concept. Along with establishing ground and on-orbit processes, this initiative will include the

demonstration of on-orbit analysis capability, which has never been available to researchers before. Pursuant to this case, we will fly an off-the shelf bone density scanner, which is being hardened for use in space, to develop new means for future osteoporosis research.

The importance of developing a long-term, robust animal research platform cannot be underestimated; it was deemed important by a recent decadal survey as well as the CASIS interim science collegium as key to utilization and maximization of return on investment. The brand new opportunities for research this initiative will provide are essential to developing new business for the National Lab; several pharmaceutical companies have expressed serious interest and a willingness to use the ISS NL, and are eagerly awaiting the successful accomplishment of milestones. This project will also benefit NASA, in that it will be able to utilize this innovative method and hardware for exploration focused research.

Moving forward, this effort will greatly expand the ability of NASA and commercial users to conduct life sciences research in ways that have never been done before. This will enable ISS NL users to move from limited fundamental research to applied research, product development, and ultimately, commercial realization.

Another example of the successful transition of projects from NASA to CASIS is the MOA with NanoRacks. Through this agreement, CASIS has reserved space on the first commercial platform available for researchers outside the ISS in the extreme environments of space. CASIS will be issuing a formal solicitation for proposals to use this one-of-a-kind platform for anything from earth observation to materials research and biological sciences.

This opportunity enables NanoRacks, the provider of sophisticated shoe-box sized space research hardware, to begin design and fabrication of the external platform pallet and be ready for flight in early 2013 – almost a year ahead of schedule. By enabling NanoRacks to extend their “NanoLabs” outside Station, CASIS is helping to bring a whole new generation of researchers to the ISS. The deal also fulfills part of the CASIS mission to enhance capabilities of the ISS NL.

## **Challenges**

As a new organization, CASIS recognizes the inherent obstacles encountered in standing up a new and unique entity. Similar operations typically encounter growing pains. CASIS management must endeavor to maintain independence from NASA, while creating a new way of doing business on the ISS NL. In such circumstances it is not uncommon to see management changes and executive turnover. CASIS was no exception in this regard.

In February, 2012, Dr. Jeanne Becker, the CASIS Executive Director, announced her resignation citing the pressures that she felt at the head of the organization. New management stepped in to get the organization on track and to keep it moving forward. Since Dr. Becker’s resignation, CASIS has been developing the initiatives started under Dr. Becker and executing our mandate.

As we have sought to implement the Cooperative Agreement, we have encountered several challenges. As with any engineering project or standup business, there were many issues that Congress, NASA, CASIS and our guiding documents failed to anticipate or address prior to implementation. Given the fact that this concept is brand new and that our mission is to develop and establish innovative ways to promote the ISS NL, challenges were expected.

CASIS is currently working with NASA regarding the handling of Intellectual Property and Data Rights, the resolution of which is essential to securing commitments from commercial users. CASIS continues to work with NASA to find resolutions to these and other critical questions, while understanding our role to establish new pathways and maintain independence from NASA.

How to best capture unsolicited proposals is an area that is continuing to evolve.

Because unsolicited proposals will by their very nature address topics CASIS might not be pursuing through a formal solicitation process, we set out to develop a fair, streamlined process that aligns with overall goals and organizational structure. As with the formal solicitation review process, this method takes into account market realities, resources, and scientific merit. Several unsolicited proposals are currently moving through the pipeline as test cases for CASIS procedures and criteria.

Through significant promotion and outreach efforts, CASIS has and will continue to receive many unsolicited proposals from academic and commercial investigators hoping to utilize the ISS NL. Many have their own funds and are only seeking CASIS' support with transportation, payload integration and/or hardware/experiment design. This unsolicited interest has driven the CASIS Valuation and Prioritization Framework to evolve so that we do not disenfranchise potential users of the ISS NL. 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.

## **Conclusion**

Over the past 11 months, CASIS has seen its share of negative press, in particular, with the resignation of our Executive Director. Since that timeframe however, CASIS has continued to move forward, effectively promoting the ISS NL aggressively and passionately. Through any struggles that might have been perceived, CASIS has continued to meet or surpass all milestones established for the organization during its first year.

CASIS is now moving from its standup phase to become a fully-operational organization. From our first RFP to announcing partnerships with non-traditional users, CASIS has been making tremendous strides towards maximizing the use of the ISS NL. Our staff continues to engage potential users of Station, developing and evolving our processes which will further identify research opportunities, and with our new Board of Directors nearly in place, the future for CASIS and the ISS NL is unquestionably bright.

The entire CASIS team believes Station is the next emerging market and we plan to promote the world's greatest engineering achievement as a mechanism to create beyond what was previously thought possible. Time is quickly passing, and CASIS will continue to be aggressive in our efforts to bring users on board Station, creating breakthroughs that will benefit humankind