

FY2013 Q3
Quarterly Report for the Period Apr. 1st – Jun. 30th, 2013
Center for the Advancement of Science in Space

Cooperative Agreement Number:	NNH11CD70A
Name:	Center for the Advancement of Science in Space, Inc.
Date Submitted:	26 July 2013
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Section I: GENERAL STATUS REPORT

Board of Directors:

The Board continued weekly special meetings throughout the quarter and also conducted its quarterly meeting on June 3, near Johnson Space Center (JSC) in Houston, Texas. The quarterly meeting included attendance by management of the ISS Program Office and discussions with Mr. Mike Suffredini, Mr. Joel Montelbano, Dr. Julie Robinson, Mr. Mike Read, and Mrs. Marybeth Edeen. In addition, CASIS and NASA leadership conducted a networking meeting with members of the Baylor College of Medicine to discuss a partnership approach to high-throughput omics research on ISS. The next in-person meeting is scheduled for October 27-28 in Washington, DC.

Highlights of the major activities performed by the Board during Q3 include:

- Final interviews and down-select of candidates for the Executive Director position. A final candidate selection is expected to be made near the beginning of Q4 in July.
- Approved and released the CASIS Strategic Plan. The plan formalizes the organization's vision, mission, challenges, strategic goals and objectives for innovation, new capabilities, outreach and operational strategies. It was submitted to NASA for comment.
- The Board Science Committee held a collaborative call with panel experts titled, "Technologies Using the ISS as a Platform", and will continue research on other options and technology-based projects.
- Approved release of the RFP providing an opportunity for Stem Cell Research on ISS.
- Approved additional staff member positions in business development, contracts, and communication, along with a need to align proportional staffing with the goals of the organization.
- Approved response to the Office of the Inspector General draft report regarding ISS utilization.

Business Development:

Major activities focused on the deployment of a business and partnership ecosystem in Houston, Texas. The ecosystem model enables access to academic institutions, research-specific organizations, philanthropic entities, and industry partners localized due to the region's targeted economy and market concentration that have the potential to benefit from use of the International Space Station (ISS) U.S. National Laboratory in areas of research and

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technology development.

Targeted development activities included leveraging the existing strong ties to the space program, the Houston medical research center, and the oil and natural gas industry to generate business opportunities that cut across each of our major research and technology development pathways. Significant education on the benefits and value of ISS utilization were cornerstone in all of the business development activities.

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CASIS activity as a platinum level partner of the MASS Challenge project in Boston ramped up this quarter with the preliminary down select of business proposals that will be fully evaluated for flight consideration. CASIS obligated additional funds for the accelerator project based on the early evaluation of several opportunities that may prove to provide immediate and impactful value in concert with CASIS' mission. Additional efforts in the Boston ecosystem included further utilization of the MIT Industrial liaison project to gain entrée in all major engineering and technology departments and to establish a formal research partnership with the Broad Institute. During this quarter, CASIS also formalized its partnership with the Museum of Science by obligating startup funds for the development of a series of exhibits and associated education material that will begin development in the fourth quarter of this fiscal year.

CASIS partnered with Novartis Pharmaceuticals to participate in and provide proof of concept verification science on the initial rodent habitat flight on SpaceX-4. In conjunction with NASA, CASIS operations personnel have coordinated the validation plans for the hardware and crew time to include dissection and appropriate preservation of tissues for valuable muscle wasting research demonstration by the pharmaceutical company. Additional planning is in work for a multi-flight plan for cancer research using the rodent model as well as possible wound healing research in partnership with the DoD.

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Planning has begun for a similar Ecosystem deployment in the Denver Colorado area science and academic research community in late June and July 2013. Early coordination with key organizations in California for the deployment of an additional West Coast Ecosystem have been completed. Strategic planning for the month of August and September is being completed and will identify our approach for West Coast efforts and ecosystem roll-out.

Section II: PERFORMANCE METRICS

Operations

Support the AAS conference by developing and managing an operation's focused direct dialogue and network event as part of the planned breakout sessions:

CASIS supported the planning, and management of two events to be conducted during the 2013 AAS International Space Station Research and Development Conference in Denver – the Implementation Partner Tradeshow and the New Users' Workshop. The Implementation Partner Tradeshow, will take place during two days of the conference, July 17 – 18. This Tradeshow is the primary forum for our implementation partners to showcase their company, their hardware, and their core competencies. It is also an opportunity for the Partners to network and engage with the science and business community. This year's agenda provides the implementation partners with 2 days of booth display as well as a reception Wednesday night which will be hosted in the display room. Twenty companies confirmed their participation in the Tradeshow.

The New Users' Workshop at the AAS ISS R&D Conference will target new investigators who may not have previously conducted research on the International Space Station an opportunity to learn about its capabilities as a platform, some of the science disciplines currently being studied on the ISS, and how to prepare for an ISS flight project. After an opening presentation given by CASIS, the Workshop will host a panel of experienced investigators representing a variety of experiences and disciplines. The panel will discuss the value generated in ISS research and provide small group discussions. Research sponsors, like the NASA mission directorates and CASIS, will be available to answer questions about flight sponsorship, while implementation partners and other service providers will answer specific questions about ISS science integration.

Payload Development and Integration Updates: The payload development and integration activities for projects scheduled to launch during Increment 37/38 (Sept. 2013 – March 2014) continue on schedule. At this time, all payloads are projected to meet their prescribed turnover dates which are required to support their base lined launch schedules. Furthermore, new payload development and integration activities have been initiated for the following new projects:

- Project "Gumstix", PI Kathleen Morse, Advanced Materials LLC
- Project "Photovoltaic Cell", PI Jud Ready, Georgia Tech
- Project "NanoMaterials", PI Alessandro Grattoni, Methodist Hospital Research Institute
- Project "CASID HDPCG-2", PI Constance Schall, University of Toledo

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During the month of June Payload Verification Tests (PVT's) were initiated at Kennedy Space Center for the Merck "Monoclonal Antibodies" payload as well as the University of Florida "CARA Petri Plant" payload. These tests were designed to insure that the planned experiments can be properly executed in the selected hardware under simulated conditions. The tests were scheduled to run through the early part of Q4.

Research Planning: During Q3 the internal CASIS Payload Priority Ranking List for Increment 39/40 (March 2014 – Sept 2014) was developed and submitted to the ISS Program Science office. The CASIS Priority list has been accepted for inclusion into the Integrated Research Priorities List for this increment.

Planning and development is now underway for Increment 41/42 (Sept. 2014 – March 2015) and the initial CASIS Payload Candidate List were presented to the Research Plan Working Group (RPWG) at JSC. The CASIS Payload Priority Ranking List is also now in development and it will be submitted to the ISS Program Science Office during Q4. Important to note that these lists are a required component of the Program, but are dynamic in nature and subject to modification by CASIS as required.

NASA Update: Our operations management and staff continue to build a strong and cooperative relationship with our colleagues at NASA. In addition to our daily participation in various ISS Program working groups and panels during Q3, CASIS Ops management also continued with weekly telecons and monthly face to face meetings with ISS National Lab managers, ISS Program Science managers, and Payload Integration managers. This proactive approach to relationship management with one of our key stakeholders has proven to be extremely beneficial to both CASIS and NASA, as well as to our sponsored PI's and their investigations.

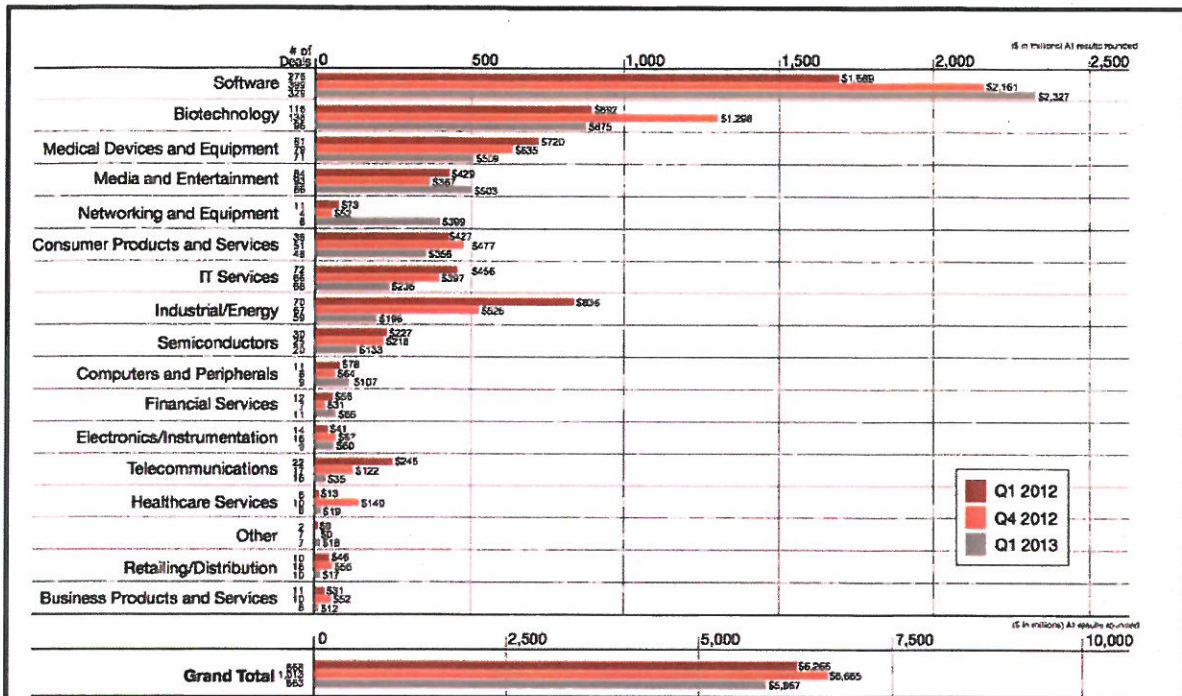
Forecasted needs/challenges: As the CASIS portfolio of payloads and projects continues to grow, there will be a need to address and adjust our project manager and research planning staff accordingly in Q4.

Economic Valuation

Develop criteria and plan for a market-based "environmental scan" mapping new trends in technology investment with potential need for space-based platforms:

The economic team continued to follow the trends of early-stage venture and seed investing by utilizing reports from the National Venture Capital Association (NVCA; www.nvca.org/), European Private Equity and Venture Capital Association (EVCA; www.evca.eu/), and PricewaterhouseCoopers (PWC; www.pwcmoneytree.com/) coupled with information through historical relationships with senior management at private equity and venture capital funds. Trends were analyzed using a number of deals in sectors as well as dollars invested. An example of U.S. venture capital investment trends can be seen below.

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This data, in addition to input from the CASIS Chief Scientist, Science and Technology Advisory Board, and Board of Directors Science Committee, will be used to inform the technology development research strategy of CASIS by using the aforementioned data as a proxy for possible space-based technology development investment.

Science & Technology

No Specific Deliverables identified this quarter

The top priority in this department focused on Portfolio Management ("PM") and the CASIS Request For Proposals ("RFP") titled "The Impact of Microgravity on Fundamental Stem Cell Properties: A Call for Spaceflight and Ground-Based Experiments." This RFP was drafted utilizing the information resulting from last quarter's stem cell culture hardware request for information as well as input from our stem cell subject matter expert, Chief Scientist, and Board of Directors Science Committee. The RFP is seeking to identify projects studying the effects of microgravity on non-embryonic mammalian stem cells for one of two research emphasis areas: (1) rapid turn-around spaceflight experiments to be performed on the National Lab and/or (2) ground-based research that facilitate future spaceflight experiments. CASIS will support selected projects through grant funding, facilitation of service provider partnerships, and flight coordination to and from the ISS.

A detailed execution plan was laid out by the PM team to draft an effective RFP and improve outreach resulting in increased participation by researchers. This was highly successful as CASIS received more than three times as many Letter Of Intent (LOI) submissions as the

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previous RFP and four times as many as the RFP before that. The LOIs are from commercial and academic entities across the country. Full proposals are due in late July and reviews will commence immediately thereafter.

Other key PM updates to note from the last quarter:

- The PM team held its first Science and Technology Advisory Board (“SAB”) meeting. As mentioned in our previous quarterly update, the SAB will serve as a dynamic group of subject matter experts that can review unsolicited proposals, propose areas of research that CASIS may issue grant opportunities for, and advise the Chief Scientist on promising research pathways that may benefit from research conducted on ISS. The SAB is intended to expand and contract as needed and provides as needed access to a diverse set of expertise, in essence expanding the qualified resources of the organization within the current operating budget. This first meeting focused on CASIS orientation, and the next meeting will focus on development of new potential research pathways.
- As suggested by the SAB, the PM team is currently crafting a crowdsourcing initiative focused on generating innovative ideas from the public for utilizing the unique environment of the ISS National Laboratory for the improvement of life on Earth. This includes ideas for scientific research or technology development that exploit the space environment toward the advancement of understanding ground phenomena and basic science as well as commercial applications. The SAB has asked to play the role of reviewers of these short-form responses. CASIS is currently contemplating offering a cash prize for the best ideas as judged by the SAB, CASIS staff, and other outside reviewers as deemed appropriate by CASIS.
- CASIS announced the funding of an unsolicited proposal in the field of nanofluidics. Drs. Alessandro Grattoni and Mauro Ferrari at The Methodist Hospital Research Institute^{(b) (4)} which seeks to determine the physical phenomena involved in nanofluidics. Past research has shown that fluid transport through extremely small channels (at the nanoscale, where fluid molecules highly interact with pore walls) occurs differently than in larger-sized systems—and these differences must be better understood to improve the use of nanofluidics for clinical medicine and diagnosis, including the engineering of drug delivery systems and biological imaging agents. The awarded project will examine the feasibility of modeling nanofluidics by studying slightly larger (microscale) systems of fluid transport in space, which will allow greater control of the experimental system.
- CASIS announced an additional protein crystallization grant award^{(b) (4)}
^{(b) (4)} Dr. Constance Schall, from the University of Toledo, is the newest investigator to have a protein crystal growth proposal funded by CASIS. Dr. Schall seeks to use the space environment to grow crystals of sufficient size for neutron diffraction (a type of crystal analysis)—examining the effects of various experimental conditions on three proteins to optimize growth of quality crystals. Potential Earth benefits from the investigation may include a better understanding of protein function and improved structure-based drug design.
- CASIS announced the funding of an unsolicited proposal with the Department of Veterans Affairs^{(b) (4)} to utilize the ISS discovery platform to evaluate known and novel anti-cancer drug therapies. Through this funding, Dr. Timothy

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Hammond of the Department of Veterans Affairs seeks to investigate a yeast-based assay that is used in developing drug therapies on the ground. Previous investigations on the U.S. Space Shuttle showed changes in this assay in space. Hammond seeks to demonstrate that these changes can be used for discovery and evaluation of drugs such as cancer therapeutics. Initial experiments studying existing drugs may reveal new uses for these drugs--while optimizing the experimental methodology and paving the way for future experiments. This announcement marks the first official research proposal agreement between CASIS and a government agency.

- As a result of the HICO request for information, CASIS invited two principal investigators to submit a full proposal for use of the underutilized on-orbit instrument. One of these proposals has recently passed review and is in the contracting phase of the award process. The other is nearing award, and its final external economic review should be complete in the next 1-2 weeks.

Marketing & Communications

Develop key performance indicators for strategic communications initiatives and projects as appropriate and in alignment with objectives and metrics defined in the CASIS strategic plan:

Strategic Communications:

During this quarter the Executive Director and strategic communications staff initiated the effort to reach out to all new and existing congressional member offices on authorizing and appropriating committees with jurisdiction over NASA. The House Science, Space, and Technology Committee has been of particular focus, as over half of its membership consists of newly elected representatives. Outreach efforts included the distribution of news announcements, newsletters, and the 2012 Annual Report, to inform stakeholders of the CASIS mission and progress to date. CASIS has also proposed coordinating with member offices to promote the National Lab: for example, potentially hosting educational events in their districts, announcing opportunities in member newsletters, and participating in the newly formed National Lab Caucus.

Other outreach and education activities included:

- CASIS representatives from strategic communications and operations participated in the Science and Technology Working Group's Congressional Visit Day Exhibit and Reception.
- CASIS sponsored the participation of a student grant recipient to participate in the American Institute of Aeronautics and Astronautics' Congressional Visit Day. The student researcher along with CASIS' strategic communications staff met with staff in several offices to describe the experience of utilizing the National Lab.
- The Chief Operating Officer provided a panel presentation at the annual University Space Research Association and Space Policy Institute meeting on the topic of commercial uses of the ISS. The panel topic focused on commercial utilization of the ISS National Lab. The Chief Operating Officer and strategic communications staff conducted a meeting at NASA Headquarters with representatives from other government agencies, including NIST, NIH, and NOAA, to discuss strategic partnership opportunities. Follow-on meetings are planned to establish Memorandums of Agreement (MOAs) and next steps.

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- On April 12, CASIS live streamed the 1st Annual Space, Cancer and Personalized Medicine Conference hosted by the Gibbs Cancer and Research Institute in Spartanburg, SC. After the conference was complete, CASIS supplied a full broadcast of this event to its website and YouTube pages. From this event, CASIS received positive feedback from Emory University (contact made from Destination Station, Atlanta) to where the School of Medicine has an interest in hosting a similar event targeted on general ISS research. The itinerary for this event would include past research on the ISS, what is presently taking place and a look to the future with potential guests to include key NASA personnel, astronaut support, CASIS senior leadership. Participation from local universities on their research platforms such as Georgia Tech and the University of Georgia will also be included. This event would take place later in the Fall should an agreement come to fruition.
- CASIS supported two NASA Destination Station events (Atlanta and Seattle) presenting to a series of interested researchers on the capabilities of the National Lab, why and how to submit proposals to send investigations to station. From these events, multiple Letters of Intent were received in response to the CASIS stem cell RFP. Additionally, there have been follow up conversations with investigators on possible unsolicited proposals to access the National Lab.
- Upon the departure of astronaut Chris Hadfield from the ISS, CASIS capitalized on his celebrity by participating in a series of worldwide interviews in both radio and print to discuss the future of the ISS. Interviews took place from news organizations such as BBC Canada's Globe and Mail.
- The Marketing and Communication department orchestrated a targeted media campaign to promote the CASIS stem cell RFP released to the public in late May. Partnerships were struck with key scientific online sites such as science.org and cell.com to alert their high viewership of stem cell research opportunities onboard the ISS. E-blasts and newsletter sponsorships also accompanied these partnerships. Additionally, CASIS and Cell Journal collaborated to create a full page web advertisement that was housed in Cell Journal issue supplied directly to 5,000 stem cell investigators who attended the International Society for Stem Cell Research. CASIS also contributed guest blog pieces to organizations like the California Institute for Regenerative Medicine outlining the potential benefits of stem cell research in space.
- In coordinating promotion of the stem cell RFP, CASIS began online banner promotion of the AAS ISS Research and Development conference in Denver, CO, July 16-18. Banner ads and e-blasts were part of this targeted promotion.
- CASIS and its media partner, Engadget held a two day contest for interested viewers to win one of 2 autographed ARK1 mission patches from designed, Shepard Fairey. Over 4,200 entries were submitted for an autographed mission patch. CASIS will hold additional contests with Engadget as ARK1 approaches.
- CASIS joined representatives from NASA at Johnson Space Center for the NASA Social, meeting with science writers and bloggers on the capabilities of the National Lab and the role CASIS plays in brokering research to utilize the ISS.
- In June, CASIS released its Quarterly Newsletter to key stakeholders and members of the organization outlining its recent successes and plans for the future.

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Fundraising & Development

Validate that CASIS is prepared for fundraising campaign, to include integration of all relevant areas (communications, education, finance, Board status, etc.):

Validation of CASIS' preparation to successfully conduct a fundraising campaign in support of ISS NL projects/priorities proceeded with vigor in Q3. Evidence of progress in this area included:

- Successful transition of the priority focus of development/fundraising efforts away from a small gift membership model toward a major gift/institutional partnership model. Examples of major gifts/commitments secured or in process are listed in the following section. The success of this shift in focus can be found in the following comparison: during all of FY 12, CASIS raised a total of \$3,400 through the membership fundraising model; during the second and third quarters of FY 13, CASIS has finalized or is close to finalizing approximately \$2 million worth of commitments in support of various CASIS initiatives (this includes cash gifts or pledges directly to CASIS; in-kind commitments directly supporting CASIS projects; matching commitments against CASIS grants; and commitments of support that will remain in the various ecosystems, but in support of CASIS science and STEM initiatives. The major gift/institutional partnership model works across a variety of financial sources to "move" funding in support of the CASIS/ISS mission, regardless of the source of these commitments.
- Partnerships started with a focus on or inclusive of development/fundraising, (including matching gifts, in-kind commitments, and institutional funds devoted in support of CASIS-sponsored projects) included, but are not limited to, the following institutions: MIT, Baylor College of Medicine, The Methodist Hospital Research Institute, Nagel Foundation, Institute for Collaboration in Health, University of Denver/Morgridge College of Education, and Awty International School. Additional partnerships to drive funding for CASIS/ISS projects are in discussion with the Boston Foundation, the Denver Foundation, the Houston Community Foundation, the Harris Foundation, and the California Institute for Regenerative Medicine, among others.
- Robust working relationships between CASIS' development/institutional partnerships area and the organization's areas supporting communications/marketing, education, finance, operations, and business development have been implemented, and are working well.
- Work to engage the board in fundraising/institutional partnerships has yet to be undertaken, and likely will not be implemented until the arrival of a permanent executive director.

Begin implementation of fundraising campaign:

Implementation of CASIS' fundraising/development plan proceeded robustly in Q3, with an emphasis on securing major gifts to drive flight projects and promote CASIS' awareness in the ecosystems of Boston, Houston, and Colorado. A key focus of these efforts is on building institutional partnerships to energize fundraising in support of science and STEM projects to flight.

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STEM Education

Begin development of internal assessment process for review of STEM initiatives consistent with objectives in the CASIS strategic plan:

The CASIS education team is utilizing a weighted evaluation worksheet to conduct formal internal assessments of STEM initiatives as well as STEM related proposal submissions. The evaluation and scoring criteria applied during the internal assessment process is designed to support and enable the implementation of CASIS sponsored STEM initiatives and educational outreach activities that are consistent with the goals and objectives outlined in the CASIS strategic plan.

Other outreach and education activities included:

- National Design Challenge (NDC) – the NDC Pilot program provides educators and their students the opportunity to design and implement an authentic research experiment on the ISS. Six educators from three Houston schools have been selected to participate in the program that begins in the summer of 2013 and runs through the 2013-14 schoolyear.
- The CASIS Education Fellows Program – five educator volunteers were selected to communicate the CASIS mission and information about recent research conducted

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onboard the ISS. In addition, the Fellows provide a base group of educators who will pilot-test materials, serve as a focus group, and provide training to their local community on CASIS Education programs.

- **STEM Golf Camp** – CASIS partnered with the PGA Center for Golf Learning and Performance, COBRA PUMA Golf and the St. Lucie County Schools to bring together science and golf by offering a five-day golf summer camp for 7th and 8th grade underprivileged students. Students were engaged in hands-on activities that teach them fundamental elements of math and physics. CASIS provided guest speakers that included engineers, researcher, microbiologist, and an astronaut.
- **Zero Robotics** – CASIS sponsored the SPHERES (Synchronized Position Hold, Engage, Reorient Experimental Satellites) Zero Robotics Competition, an engaging STEM program for middle school students. Over the 5-week program, beginning in June, participants worked in teams with program staff and industry mentors to learn about programming, robotics and space engineering while gaining hands-on experience working with and programming SPHERES. The program culminated in a tournament where each team's SPHERE will "battle" for spots to operate on the ISS. At the end of the summer, participants will get to see their SPHERES in space via a live feed and conversation with Space Station astronauts.
- **Conferences NSTA** – the CASIS education team presented CASIS education initiatives and launched the CASIS Academy website at the annual NSTA Conference in San Antonio, TX in April.

Administration

The CASIS Board of Directors will review and approve the strategic plan:

The Board completed the development, review and approval of the strategic plan and submitted it to NASA for comment on June 29th. The process began with an analysis of the existing cooperative agreement to understand the goals and objectives that were identified and any approaches that may have been outlined in the document. Stakeholder meetings and interviews were conducted to establish a general sense of expectation of the CASIS mission. Key stakeholders included NASA senior management at Headquarters and within the ISS office, staffers and congress personse involved in policy and appropriations, and ISS National Lab users and suppliers. The board brought in a consultant to assist with information gathering, composition, and guidance on the development of an overarching vision statement, objective mission, goals and metrics that encompassed the CASIS strategic plan.

The plan's vision identifies the need for NASA and CASIS to collaboratively work together in order to realize full utilization of the ISS, and clearly dillineates CASIS specific mission to enable and increase the use of the ISS NL as a unique, dynamic platform for scientific discovery, technology development, and education for the benefit of life on Earth.

The Board identified several goals that address the specific focus of effort to be taken by CASIS in order to recognize the stated mission and vision. First and foremost was a recognition that space-based research is still largely fundamental in nature and has not been targeted toward commercial benefit; therefore it is a primary goal to establish a robust "innovation cycle" where first-class science drives the development of technologies, new intellectual property and commercial opportunities, which in turn drive new ideas and novel first-class science in order to

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recognize application and generation of intellectual property. The Board also recognized the applicable and immediate utilization of ISS as a technology development testbed that will allow for developing new capabilities based on existing proof-of-concept technologies, while allowing time for longer-term scientific and commercial initiatives to develop.

Equally as important, the Board created a third goal to undertake a strong public outreach program to promote the value of the ISS NL to the nation, and establish the ISS NL as a leading laboratory and environment for science, technology, engineering and mathematics (STEM) education.

The strategic plan included an assessment framework that will enable the development of metrics to enable evaluation of plan performance and the ability to mature the CASIS strategies as newfound knowledge of microgravity research is generated. CASIS intends to work with NASA in the fourth quarter to tie these metrics to the Annual Performance Plan.

Quarterly budget and performance review with NASA:

The quarterly budget and performance review was conducted.

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Section III: BUSINESS STATUS REPORT						
June 30, 2013						
	Budget Q3 2013	Actuals Q3 2013	Variance	Budget YTD 2013	Actual YTD 2013	Variance YTD 2013
Direct Labor	\$1,485,831	\$1,126,179	\$(359,652)	\$4,317,314	\$3,153,656	\$(1,163,658)
Grants to be Awarded	\$938,045	\$2,304,722	\$1,366,677	\$5,505,619	\$3,142,981	\$(2,362,638)
Equipment: Permanent > \$5k	\$50,700	\$8,706	\$(41,944)	\$150,600	\$97,463	\$(53,137)
Equipment: Expendable & Supplies	\$19,920	\$32,121	\$12,201	\$64,260	\$134,573	\$70,313
Other Direct Costs	\$250,867	\$152,775	\$(98,092)	\$711,615	\$508,992	\$(202,623)
Subcontract Costs	\$1,733,764	\$823,936	\$(909,828)	\$5,560,193	\$3,335,560	\$(2,224,633)
Travel	\$212,536	\$162,865	\$(49,671)	\$636,752	\$432,961	\$(203,791)