FY17 Q2 REPORT

Quarterly Report for the Period January 1 – March 31, 2017

CENTER FOR THE ADVANCEMENT OF SCIENCE IN SPACE (CASIS)

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EXECUTIVE SUMMARY

The second fiscal quarter (Q2) of 2017 (FY17) brought forward meaningful progress for the International Space Station (ISS) U.S. National Laboratory and demonstrated signals of opportunity for future space science platforms. From a big picture perspective, key developments in commercial space outside of the ISS National Lab are noteworthy for our stakeholder community. In March, SpaceX achieved a historic milestone on the road to reusability in space transportation with the world's first reflight of an orbital class rocket. This achievement in reusability signals the tangible progress that the industry is making toward lowering the cost of transportation, a well-established barrier for space research and development. In addition to this milestone, commercial companies publicly announced this quarter intent to develop standalone, privately funded space stations within the decade. Finally, Congress' actions to pass the NASA Transition Authorization Act of 2017 provide a firm foundation for continuity of progress toward America's leadership in commercial space. These developments are encouraging to both traditional and nontraditional users of the ISS National Lab as our nation looks to develop long-term research initiatives in space. Adding to this renewed excitement in commercial space, momentum with space research development on the ISS National Lab continues to accelerate and expand.

KEY HIGHLIGHTS FROM Q2 FY17:

- **Public meeting showcases progress** – In January, the CASIS Board of Directors and executive leadership held the first CASIS Public Board Meeting. The event was available via live-stream and provided stakeholders, media, and interested members of the space community with an overview of successes over the past fiscal year and future opportunities and goals, while also speaking to the overall progress of CASIS and NASA in the joint effort to fully utilize the ISS. CASIS plans to host a similar public meeting each year to inform the public on continued progress of the ISS National Lab.
- **High throughput of ISS National Lab science delivered and returned** – More than 35 separate ISS National Lab projects were delivered, spanning a variety of scientific disciplines. Payloads included a rodent research investigation in partnership with the Department of Defense and a Merck Research Laboratories protein crystal growth investigation seeking insight into the production and delivery methods of its FDA-approved cancer therapeutic, KEYTRUDA®. Additionally, more than 20 student investigations were delivered to the ISS in partnership with NanoRacks, LLC and the Student Spaceflight Experiments Program.
- **High visibility news coverage of ISS National Lab science** – One of the payloads launched during Q2—the predictive pathogen mutation investigation led by Dr. Anita Goel from Nanobiosym—attracted major media attention. This investigation was featured in Forbes, CNN, Huffington Post, U.S. News World Report, Wired, and many other major publications, showcasing the remarkable capacity for inquiry utilizing our nation's orbiting laboratory.
- **TangoLab facility opening new research channels** – Q2 marked the first opportunity for researchers to leverage the new TangoLab-1 facility on the ISS. TangoLab-1, operated by commercial partner Space Tango, Inc., is a general research platform that enables a broad range of studies. The first payloads to use the facility were delivered in Q2, with investigations ranging from plant biology research and cell culture studies to student-led experiments.
- **Education summit gathers thought leaders** – For the third consecutive year, CASIS hosted a STEM Education Partner Workshop bringing together experts within the education community in an effort to make greater impacts through STEM opportunities and curriculum. This year's summit focused on leveraging fundraising efforts for STEM initiatives that could be enhanced through the ISS National Lab.

Finally, with an eye toward the future, CASIS, NASA, and the American Astronautical Society announced in Q2 that NASA Astronaut Kate Rubins and SpaceX CEO and Lead Designer Elon Musk would serve as keynote speakers for the upcoming 2017 ISS Research and Development (ISSR&D) Conference (July 17-20, Washington, D.C.), marking the first of many major announcements to promote ISSR&D.

ISS NATIONAL LAB PORTFOLIO

MAXIMIZE UTILIZATION AND DEMONSTRATE MEASURABLE IMPACT

NEWLY SELECTED PROJECTS

Life Sciences

Three life sciences projects were awarded in Q2, all from academic institutions. Two projects from Scripps Translational Science Institute will study human biology in space to gain insights into aging and the human virome, and a project from the National Jewish Health medical research facility will study the underlying molecular mechanisms involved in cartilage loss, as it relates to degenerative joint disease.

Technology Development

Three additional projects were awarded in Q2 in the area of technology development, all from commercial entities. A project from Honeywell International aims to improve carbon dioxide "scrubbing" technology, such as that used in passenger aircraft, submarines, and the oil industry. Another project from Airbus Defence and Space seeks to improve radiation detection technology, and a third project from Space Systems, Inc. aims to improve space debris removal approaches.

Education

Two education projects were also awarded in Q2: One to an academic institution, the Technical Education Research Centers, which seeks to create a series of videos showcasing Earth from space; and one to Magnitude.io, Inc., an Education Management corporation, which will integrate ISS STEM curriculum into schools throughout the U.S.

For additional information on Q2 awarded projects, see the Awarded Projects table on page 12.

OPERATIONAL UPDATE

The SpaceX Dragon commercial resupply services vehicle for the SpX-10 mission launched on February 19, 2017, delivering more than 35 separate ISS National Lab sponsored investigations. Highlights from the SpX-10 investigations include:

- **Rodent Research-4**, which will evaluate bone regeneration in spaceflight mice exposed to two candidate treatments. *Principal Investigator (PI): Dr. Rasha Hammamieh, U.S. Army Medical Research and Material Command, U.S. Army Center for Environmental Health Research (Department of Defense). Payload Developer: MEI Technologies, Inc.*

- **Proof-of-Concept for Gene-RADAR® Predictive Pathogen Mutation Study**, which seeks to improve predictive modeling for antibiotic-resistant pathogen mutations, which will be of significant value to antibiotic drug development. To learn more about this project, view the SpX-10 ISS National Lab science overview video: https://www.youtube.com/watch?v=mjmEyEkGSUM&t=78s. *PI: Dr. Anita Goel, Nanobiosym, Cambridge, MA. Payload Developer: Bioserve Space Technologies, Inc.*
- **Microgravity Growth of Crystalline Monoclonal Antibodies for Pharmaceutical Applications**, which will crystallize a human monoclonal antibody that is currently undergoing clinical trials for the treatment of immunological disease. The results from this investigation have the potential to improve the way monoclonal antibody treatments are administered on Earth—enabling methods for large-scale delivery through injections rather than intravenously—and improve methods for long-term storage. *PI: Paul Reichert, Merck Pharmaceuticals, Whitehouse Station, NJ. Payload Developer: CASIS.*
- **FIT-Charge Injection Device NREP Insert**, which will test how the harsh space environment affects a new type of charge injection device sensor placed onboard the NanoRacks External Platform (NREP). Future commercial use of this sensor for Earth and space imaging could serve purposes from astronomy initiatives to Earth environmental monitoring and defense interests. *PI: Dr. Daniel Batcheldor, Florida Institute of Technology, Melbourne, FL. Payload Developer: NanoRacks, LLC.*
- **SABL-ACM**, an Atmosphere Control Module (ACM) that will create a controlled gas environment within the Space Automated Bioproduct Lab (SABL) to support research on mammalian and other model-organism, cell-based, and tissue-culture systems. *PI: Dr. Louis Stodieck, Payload Developer: Bioserve Space Technologies, Inc.*

In addition, Q2 encompassed the following activities for spaceflight commercial facility operators:

- Space Tango operates the TangoLab-1 facility on the ISS, and SpX-10 represents the first opportunity for researchers to leverage this new hardware facility. The first investigations to utilize the facility range from plant biology investigations to cell culture design and student-led experiments. For example, one student experiment, from Craft Academy in conjunction with Morehead State University, will use and evaluate rat aorta smooth muscle cells to test theories about muscle contraction in the absence of gravity. To learn more about the TangoLab-1 facility, view the SpX-10 ISS National Lab science overview video: https://www.youtube.com/watch?v=mjmEyEkGSUM&t=78s.
- Commercial service provider NanoRacks, LLC announced in February that it has partnered with Boeing to develop the first privately funded commercial airlock for the ISS, which may enable the U.S. to triple the number of small satellites it can deploy during a single airlock cycle. The NanoRacks Airlock Module, which is planned for launch and installation in 2019, will increase the capability of transferring equipment, payloads, and deployable satellites from inside the ISS to outside, significantly increasing utilization of the ISS. Payloads deployed via the airlock will be coordinated through the ISS National Lab. For more information, see the NASA feature article: https://www.nasa.gov/feature/progress-underway-for-first-commercial-airlock-on-space-station/

STIMULATING AND CULTIVATING DEMAND FOR ISS AND BEYOND

EXPAND THE ISS NATIONAL LAB NETWORK AND DRIVE COMMERCIAL UTILIZATION

OPEN AND UPCOMING OPPORTUNITIES

Q2 marked the official start of the 2017 MassChallenge Accelerator Program in Boston, MA. MassChallenge is the largest-ever startup accelerator and the first to support high-impact, early-stage entrepreneurs without taking any equity. Its four-month accelerator program offers world-class mentorship, free office space, $1 million in cash awards, and up to $10 million through in-kind support. To date, MassChallenge alumni have raised more than $1.8 billion and created more than 60,000 jobs. For the fifth year in a row, the ISS National Lab is supporting a Sponsored Program for a "Technology in Space" prize associated with the MassChallenge Program. For the fourth year in a row, Boeing will be a co-sponsor with CASIS for this prize, which will provide funding to technical, out-of-the-box concepts for research on the ISS National Lab.

Also a partnership between Boeing and the ISS National Lab, the Genes in Space 3rd annual competition opened in February 2017. Through this national education competition to design spaceflight DNA experiments, 7th–12th grade students will solve real-world challenges in space exploration. The competition is sponsored by Boeing, CASIS, miniPCR, Math for America, and New England Biolabs, Inc. Finalist teams will present their ideas at the ISSR&D Conference in Q4, and the winning experiment will be conducted on the ISS.

With respect to current and future R&D opportunities and competitions, in Q2 CASIS released a revision to the ISS National Lab Proposal Guidelines that requires new inputs to support Value Impact scoring, an updated budget template to clarify total project costs, and forms to pre-qualify entities for contracts with CASIS. View the guidelines at http://www.iss-casis.org/Opportunities/Proposals.aspx and http://www.spacestationresearch.com/research-on-station/proposal-process/.

STRATEGIC AREAS OF FOCUS

Industry Outreach

CASIS executed 19 meetings and presentations in Q2 with Fortune 500 companies considering R&D and educational initiatives onboard the ISS National Lab and/or partnerships to support such activities. Outreach in the Silicon Valley region of California was particularly extensive in Q2, with highlights including:

- A CASIS-sponsored salon gathering of thought leaders including Fortune 500 companies, universities, NASA representatives, and venture capitalists to discuss ISS National Lab opportunities.
- Invited participation in the GE Digital Expanding Horizons speaker series, in which GE invites distinguished leaders from industry and academia to give presentations on a broad range of topics including machine learning, big data, astrophysics, environmental science, etc.
- Participation in the AbbVie Partnering Day event, hosted by California Life Sciences Association. AbbVie is a global, research-based biopharmaceutical company formed in 2013 following separation from Abbott Laboratories, Inc., and its partnerships are dedicated to developing innovative new medicines that will deliver tangible impact on quality of life.

LEO Commercialization

As previously reported, the CASIS Request for Proposals *Support Services for the Macromolecular Crystallization Program* was finalized in Q1FY17 with the selection of five preferred partners to support payload development and implementation for flight. The preferred partners were notified in Q2, and subcontracts were completed and finalized with the following:

- The Bionetics Corporation
- JAMMS America, Inc.
- Techshot, Inc.
- Teledyne Brown Engineering
- University of Alabama at Birmingham

Working in partnership with CASIS, these preferred implementation partners will provide a platform on the ISS National Lab for discovery to users across many communities—commercial, other government agencies, academia, and private research—while also supporting future LEO commercialization efforts. A website portal is in the final design phase and will be released in Q3, enabling customers the opportunity to access services available through the ISS National Lab preferred providers. Additionally, under the recently executed subcontracts, a task order to redesign the commercially available MiTeGen Crystallization Plate has been issued with the Bionetics Corporation. The redesign will optimize the plate to take advantage of microgravity fluid dynamics while maintaining the plate's current utility for ground-based applications (sample loading and adaptability for in-plate robotic imaging). See http://www.mitegen.com/mic_catalog.php?c=insituplates for more details.

In additional Q2 activities to support priority areas for LEO commercialization, CASIS participated in several conferences related to remote sensing and satellite technology development, served as a group lead for a microgravity subcommittee working group for the New Organ Alliance Research Coordination Network, and entered the final stages of planning for an ISS National Lab workshop on 3D bioprinting, currently scheduled for May 1, 2017.

Building Sustainability

Total projected awardee contributions toward Q2-awarded projects tops $6 million, with three commercial projects requiring no CASIS funding.

PARTNERSHIPS AND COLLABORATIONS

As part of the ISS National Lab partnership with the Challenger Learning Center of Colorado, the Center received in Q2 an ISS Virtual Tour learning experience digital display, which provides immersive views of the interior and exterior of the ISS in 6K resolution. The learning center is part of a global network reaching hundreds of thousands of students and tens of thousands of educators each year.

Continued progress in partnerships with other government agencies continues, as several co-sponsored research opportunities progress through their respective cycles:

- Last quarter (Q1FY17), CASIS released a joint solicitation with the National Science Foundation (NSF) to support investigations on the ISS National Lab in the fields of fundamental combustion science and thermal transport. Following an ISS National Lab feasibility assessment in Q2, submitted applications were down-selected, and 13 projects were invited to submit full proposals. This final proposal due date closed on March 10, 2017. NSF is committing up to $1.8 million in grant funding toward the suite of ISS National Lab flight projects that will be selected in response to this solicitation, and award announcements are expected to occur in Q4.
- CASIS and the National Center for Advancing Translational Sciences (NCATS), one of 27 institutes and centers of the National Institutes of Health (NIH), released a Funding Opportunity Announcement (FOA) in Q4 FY16 to solicit applications through the NCATS Tissue Chip for Drug Screening program. This announcement is part of a four-year collaboration through which NCATS will provide up to $12 million in funding to use tissue chip technology (also known as microphysiological systems or "organs-on-chips") onboard the ISS National Lab for translational research to benefit human health on Earth. This FOA closed during Q1FY17, and the NCATS Scientific Merit Review of all received proposals was completed during Q2, with funding announcements anticipated by Q4.

Additional conversations with NIH, NSF, and other government agencies (e.g., the Defense Advanced Research Projects Agency, or DARPA) are also underway to discuss potential future collaborations.

Investor Network

Thirteen introductions were made between CASIS Investment Network members and early-stage commercial space companies in Q2, for a total of 35 introductions this fiscal year. Total investment in companies introduced to investors by the ISS National Lab has exceeded $1 million since CASIS began forming the network in early 2016, and these numbers are expected to grow as the number of network members and company introductions increases over time.

In addition, 14 new investors were added to the growing investor network in Q2, with half of the overall network located in the Silicon Valley/California. Members of this network will be invited to participate in the Investor Network Session at the 2017 ISSR&D Conference in Washington, D.C. This session will be formatted in a similar way as the 2016 inaugural session that garnered excellent participant feedback and resulted in investments.

OUTREACH AND EDUCATION

PROMOTE THE VALUE OF THE ISS AS A LEADING ENVIRONMENT FOR R&D AND STEM EDUCATION

INCREASING AWARENESS AND POSITIVE PERCEPTION

In January, the CASIS Board of Directors and executive leadership held a first-of-its-kind public board meeting to discuss the FY2016 Annual Report and review the organization's progress and future goals as manager of the ISS National Lab. During the meeting, which was open to both online and in-persona attendees, the board addressed stakeholder questions received in advance and also heard public comments from in-person attendees.

Outreach in Q2 included an ISS National Lab exhibit at the American Association for the Advancement of Science (AAAS) Annual Meeting, the largest gathering of general scientists in the world. More than 10,000 scientists, engineers, educators, policymakers, and journalists attended the conference to hear the most recent developments in multidisciplinary research and technology. Each year, CASIS makes a pronounced effort to meet with researchers, companies, and organizations attending AAAS to promote the benefits of microgravity research. Also in Q2, CASIS was invited to present at the National Academy of Sciences ad hoc Decadal Update. CASIS discussed how the ISS National Lab fits into the overall picture of microgravity research, particularly with respect to the questions in the Decadal task statement. Finally, CASIS was invited to present to the American Institute for Medical and Biological Engineering (AIMBE) College of Fellows at the National Academies of Sciences in Arlington, VA. CASIS discussed benefits of conducting research on the ISS National Lab, key results, and collaboration opportunities.

Significant progress was made in preparing for the upcoming 2017 ISSR&D Conference (July 17-20 in Washington, D.C.; http://www.issconference.org/)—the yearly conference that showcases the latest in microgravity achievement and discovery onboard the ISS. This year's theme is "Innovation Beyond Boundaries," and in Q2, NASA Astronaut Kate Rubins was announced as a keynote speaker for the event. Additionally, Elon Musk (CEO and lead designer at SpaceX; co-founder, CEO, and product architect of Tesla; co-founder and chairman of SolarCity, and co-founder and chairman of OpenAI) will reprise his role as keynote speaker at this year's conference, following his first keynote address at the 2015 ISSR&D conference. Over the coming weeks and months, announcements of additional luminary figures and transformative speakers are expected and will bring further excitement for this upcoming conference.

SpX-10 launched to the ISS this quarter, carrying several ISS National Lab payloads that generated significant media interest. Media outlets demonstrated particular interest in a rodent research investigation conducted in partnership with the Department of Defense and a Merck Research Laboratories experiment evaluating microgravity's effect on the crystallization of monoclonal antibodies to potentially enhance its FDA-approved cancer therapy, KEYTRUDA. A third payload that gained mainstream attention, the Nanobiosym project (cosponsored in conjunction with the Massachusetts Life Sciences Center through the Galactic Grant competition), is observing pathogenic bacterial strains on the ISS. This project garnered media placement on outlets such as CNN, Forbes, CBS News, and many others, bringing heightened visibility to the ISS National Lab.

Volume 2, issue 1 of *Upward*—the quarterly magazine of the ISS National Lab—was published in February, covering the latest R&D results and achievements from ISS National Lab experiments. This issue featured recently published results from an ISS National Lab investigation focused on microgravity's effect on bacteria and the resulting changes in bacterial behavior in space, as well as a trio of outward looking projects seeking to better understand the cosmos. Additional highlights included the role of the ISS National Lab in regenerative medicine research and the Amateur Radio on the ISS (ARISS) education program, which has conducted more than 1,000 contacts between students on the ground and crew members onboard the ISS.

STEM INITIATIVES

In February, CASIS hosted its annual STEM Education Partner Workshop attended by 30 key leaders in education, the space industry, philanthropy, and fundraising. The workshop was led by CASIS Board member and Education Committee Chair Dr. Ioannis Miaoulis and featured input from CASIS Board Chairman General James Abrahamson and CASIS Executive Director Gregory Johnson. The focus areas of the event included education consortium building, identifying programmatic challenges and opportunities, and planning strategies aimed at developing resources to support the growth and reach of the Space Station Explorers consortium and its partner members. The goals and objectives of the workshop were achieved, and the CASIS education team is now implementing the recommended actions that resulted from the workshop activities, with the goal of reaching 2 million students and educators by year end 2020.

In ongoing ISS National Lab education activities, the Space Station Explorers (SSE) program continues to provide visibility and significant student engagement through outreach program initiatives and workshop, conference, and event attendance and collaboration—even becoming a trademarked brand in Q2. With respect to such outreach this quarter, the CASIS education team participated in several key events to excite and engage both students and educators. This marks the third year CASIS has participated in AAAS Family Science Days, held in conjunction with the AAAS Annual Meeting. More than 5,000 K-12 students and family members attended the event, in which a broad range of scientists engaged the public in current science topics. This year, CASIS collaborated with former NASA astronaut Cady Coleman, who delivered a keynote address to students and parents, highlighting her experiences in space and the steps it took for her to become an astronaut. Families also explored the SSE interactive science booth and learned about SSE programs like Zero Robotics and Windows on Earth. Additionally, the SSE program reached more than 10,000 administrators, educators, and education technology field experts at the Future Education Technology Conference, and more than 500 educators learned about the SSE program at the Space Exploration Educators Conference.

Partner Program Progress

In Q2, the Tomatosphere™ education program provided 156,000 students with microgravity-exposed tomato seeds to be used for classroom experiments aimed at understanding how the space environment affects tomato plant growth. The seeds were launched to the ISS National Lab on SpX-9 last July. Tomatosphere™ is a hands-on student research experience with a standards-based curriculum guide that provides students the opportunity to investigate, create, test, and evaluate a solution for a real world case study. The program has evolved into a regular component of the science curriculum in schools, engaging more than 3 million students across the United States and Canada since its inception in 2001. Additional seeds to support the 2018 program will be launched to the ISS National Lab on SpX-11 next quarter.

Also in Q2, Zero Robotics held its annual High School competition, drawing the highest participation to date—approximately 1,900 students from 23 states and 17 countries. Zero Robotics is a national competition that teaches students about programming, engineering, and spaceflight.

Twenty-one education radio contacts occurred in Q2 as part of the Amateur Radio on the International Space Station (ARISS) program, an ISS National Lab partner program in which students worldwide experience the excitement of talking directly with crew members on the ISS. Since the ISS was first occupied in December 2000, ARISS has supported 1,089 educational radio contacts in all but four of the U.S. states, in two U.S. territories, and in 53 different countries. In addition to schools and education groups (such as scout jamborees) that have had ARISS contacts, in Q2 ARISS supported radio contacts with students at the Space Exploration Educators Conference in Houston, TX, and with students from underrepresented schools in Los Angeles at the Council of State Science Supervisors annual meeting—as well as at activities at other events outside the U.S. The ARISS program was also highlighted during Q2 in *Upward*, the quarterly magazine of the ISS National Lab.

Finally, the children's book "I, Humanity" by Jeffery Bennett, which has been featured in the Story Time from Space program (in which astronauts onboard the ISS read storybooks and conduct science experiments to engage students across the world in STEM), received a 2017 Outstanding Science Trade Book Award from the National Science Teachers Association (NSTA). Since 1973, the NSTA, in cooperation with the Children's Book Council, has selected a yearly list of such outstanding children's science trade books.

Q2 FY17 METRICS

SECURE STRATEGIC FLIGHT PROJECTS: Generate stimulated significant, impactful, and measurable demand from customers willing to cover their costs and therefore recognize the value of the ISS as an innovation platform.

	Q1 FY17	Q2 FY17	Q3 FY17	Q4 FY17	FY17 TOTAL TO DATE	TARGETS FY17
ISS National Lab payloads manifested	18	16			**34**	**100**
ISS National Lab payloads delivered	8	14			**22**	**100**
Solicitations / Competitions	1	2			**3**	**4**
Project proposals generated	31	53			**84**	**100**
Projects awarded	16	8			**24**	**40**
ISS National Lab return customers	4	4			**8**	**20**
ISS National Lab new customers	12	4			**16**	**20**
Total Value of CASIS Grants Awarded*	$1,986,869	$701,879			**$2,688,748**	**$5,000,000**
CASIS seed funding toward total project cost	29%	33%			**29.3%**	**20%**
Peer-reviewed scientific journal publications	4	0			**4**	**As they occur**
Products or services created/enhanced	1	0			**1**	**As they occur**

*Grants include awards to both projects and programs

SECURE INDEPENDENT FUNDING: Leverage external funding through Sponsored Programs to support ISS National Lab projects.

	Q1 FY17	Q2 FY17	Q3 FY17	Q4 FY17	FY17 TOTAL TO DATE	TARGETS FY17
Sponsored Program/external funding for grants	$1,800,000	$500,000			**$2,300,000**	**$5,000,000**

BUILD REACH IN STEM: Create STEM programs, educational partnerships, and educational outreach initiatives using ISS National Lab-related content.

	Q1 FY17	Q2 FY17	Q3 FY17	Q4 FY17	FY17 TOTAL TO DATE	TARGETS FY17
STEM programs (active)	17	18			**18**	**15**
Number of students, educators, and other participants engaged in STEM initiatives	71,523	244,562			**316,085**	**500,000**
Total value of CASIS STEM grants awarded**	$205,656	$50,000			**$255,656**	**$402,000**

** Total STEM grants awarded included in the Total Value of CASIS Grants Awarded figure above

INCREASE AWARENESS: Build positive perception of the ISS National Lab within key audience communities.

	Q1 FY17	Q2 FY17	Q3 FY17	Q4 FY17	FY17 TOTAL TO DATE	TARGETS FY17
Outreach events						
Conferences and industry event sponsorships	7	2			**9**	**12**
Speaking engagements	29	17			**46**	**68**
Subject matter expert workshops	1	0			**1**	**4**
Total media impact						
Thought leadership publications (white papers, trade articles, etc.)	0	0			**0**	**5**
News mentions (clips, blogs)	616	968			**1,584**	**5,000**
*Twitter followers^*	103,426	106,703			**106,703**	**114,000**
Website visitors	22,358	32,788			**55,146**	**129,000**
Social media engagement (Facebook, Twitter, and Instagram)	150,842	178,796			**329,638**	**180,000**

^ Cumulative

MAXIMIZE UTILIZATION: CASIS to use 50% of U.S. allocation onboard the ISS.

INCREMENT	UPMASS (KG)	DOWNMASS (KG)	CREWTIME (HRS)			
	ACTUALS	ACTUALS	ALLOCATION*	ACTUALS ^	RESERVE	USAGE**
Inc 37/38 (Sep 2013-Mar 2014)	334.7	7.9	427	78.42	-	18%
Inc 39/40 (Mar 2014-Sep 2014)	389.1	197.8	386	70.75	-	18%
Inc 41/42 (Sep 2014-Mar 2015)	716	705.5	346	130.29	-	38%
Inc 43/44 (Mar 2015-Sep 2015)*	538.3	165.93	229	223.33	-	98%
Inc 45/46 (Sept 2015-Mar 2016)	384.6	0	293	125.75	-	43%
Inc 47/48 (Mar 2016-Sept 2016)	760.9	313.54	356	314.25	-	88%
Inc 49/50 (Sept 2016-Mar 2017)	392	83	402.63	311.58	-	77%
Inc 51/52 (Mar 2017-Sept 2017)	***1585***	***354***	***330.87***	***330.95***	***166.93***	***100%***

Data through 4/12/2017

* *"Allocation"* is defined as the baselined number of crew time hours allocated by NASA at increment minus 3 months to the ISS National Lab for prioritized utilization to directly support in-orbit ISS NL payload utilization operations.

^ *"Actuals"* are defined as the definite and verified number of crew time hours that were utilized to support in-orbit ISS NL payload utilization operations. This data is collected reported and verified by NASA after the actual in-orbit operations have been completed.

** *"Usage"* is defined as the percentage of ISS National Lab allocated crew time hours that were actually utilized during a given increment pair.

PROJECTS AWARDED IN Q2 FY17

Title: Multi-purpose Active-target Particle Telescope on the ISS (MAPT-I) **Principal Investigator:** Hans-Juergen Zachrau **Affiliation:** AIRBUS DS Space Systems, Inc. **Location:** Webster, TX	**Description:** This project will utilize the unique radiation profile of the ISS to test a novel radiation detection technology that offers the capability to monitor radiation levels from all directions and in real time. **Earth Benefit:** Improved radiation detection technology is of potential relevance to the medical industry, where proton beam therapy is used to treat cancer, and has direct application to radiation monitoring for spacecraft. The proton therapy world market is projected to reach between $3.5 billion and $6.6 billion by 2030, with 1,200 to 1,800 particle therapy treatment rooms open to patients worldwide. Currently, radiation detection devices are large and cannot be placed in the patient area, which introduces uncertainties that can reduce therapy effectiveness. MAPT-I's main advantage is that it is small and portable, and can thus be placed right where the patient would normally be.
Title: SPHERES Tether – SLOSH **Principal Investigator:** Hans-Juergen Zachrau **Affiliation:** AIRBUS DS Space Systems, Inc. **Location:** Webster, TX	**Description:** This project will use existing SPHERES hardware to examine active steering of a passive body which contains liquid in space. **Earth Benefit:** The small satellite market is projected to be valued at $5.32 billion by 2021. Analysis software that models the dynamics of attaching to and moving passive satellites in orbit will enable satellite servicing markets for the maintenance or removal of orbital objects in LEO. The presence of liquids provides a source of disturbance and unbalance that is exacerbated in microgravity due to changes in the liquid's center of gravity during movement. Reliable prediction of the behavior of fluid-containing bodies in space is relevant to space debris removal.
Title: Ionic Liquid CO_2 Scrubber and Liquid Containment in Microgravity **Principal Investigator:** Phoebe Henson **Affiliation:** Honeywell International **Location:** Glendale, AZ	**Description:** The goal of this project is to show CO_2 absorption by ionic liquid in a spray scrubber and demonstrate the ability to separate the air-liquid mixture in microgravity. This liquid system utilizes spray scrubbing to achieve high surface area between the gaseous CO_2 and the liquid absorbent. **Earth Benefit:** Removal of CO_2 is important to many applications, such as passenger aircraft, submarines, and the oil industry. Liquid-based CO_2 removal systems are reusable, energy efficient, and currently used in submarines and the petroleum industry. This research could lead to wider applications, such as for commercial airliners, which could save $1 billion in fuel per year and reduce carbon emissions.
Title: Classrooms in Space **Principal Investigator:** Ted Tagami **Affiliation:** Magnitude.io **Location:** Berkeley, CA	**Description:** This project will run individual experiments onboard the ISS while participating classrooms simultaneously run Earth-based versions of the same experiment. The classroom-based ground portion is driven by Magnitude.io's plant growth chamber hardware, which emulates the space-based experience of Space Tango's TangoLab onboard the ISS. **Earth Benefit:** The student experiment program is aligned with the Next Generation Science Standards (NGSS), with the goal of integrating the ISS as a part of STEM curriculum in K–12 schools throughout the U.S. and the world.

Title: The Effects of Microgravity on Synovial Fluid Volume and Composition **Principal Investigator:** Dr. Richard Meehan **Affiliation:** National Jewish Health **Location:** Denver, CO	**Description:** This project will demonstrate the use of a novel patented pneumatic compressive device, the KneeTap™, which simplifies and improves the quantitative collection of synovial fluid for analysis. The crew samples will be used to conduct a comparative study between ISS crew members, healthy subjects, and patients with a spinal cord injury in order to develop circulating biomarkers of cartilage health. **Earth Benefit:** More than two-thirds of Americans experience some form of degenerative joint disease. Approximately 700,000 knee replacements are performed yearly at a cost of $39 billion, and the market size is projected to increase to 3.4 million knee replacements annually by 2030. If successful, the device and subsequently identified biomarkers may improve the standard of medical care for patients suffering from degenerative joint disease.
Title: Stability of the Human Virome During Space Flight **Principal Investigator:** Dr. Kristian Andersen **Affiliation:** Scripps Translational Science Institute **Location:** La Jolla, CA	**Description:** This project seeks to study the human virome (the collection of all the viruses in the human body) from spaceflight astronaut samples. **Earth Benefit:** The human virome, comparable to the human microbiome, is the collection of viruses associated with the human body. Our susceptibility to diseases such as asthma, type-1 diabetes, and cancer is influenced by our virome. This research may lead to therapies that specifically influence the growth and maintenance of viruses making up a healthy virome, potentially providing a source of new products in the field of personalized medicine.
Title: The Influence of Spaceflight on Biological Age **Principal Investigator:** Dr. Ali Torkamani **Affiliation:** Scripps Translational Science Institute **Location:** La Jolla, CA	**Description:** This experiment seeks to utilize state-of-the-art genomic methodologies to understand the influence of spaceflight on DNA damage and biological aging and reveal the potential of microgravity as it relates to the advancement of human aging research and the reduction of age-related diseases. **Earth Benefit:** The results of this study could lead to commercialization of a simple, minimally invasive blood screening test which could have a dramatic impact on age-related disease research, cancer, and cellular health. Estimates of the size of the cancer diagnostics market range from $30 billion to $100 billion by 2020.
Title: Windows on Earth **Principal Investigator:** David Libby **Affiliation:** TERC **Location:** Cambridge, MA	**Description:** This project seeks to create a series of videos showcasing Earth from space that will be integrated into multiple online platforms and channels to support STEM education programming to help students and the public learn about Earth from this unique orbital perspective. **Earth Benefit:** In this initiative, a STEM education program will help students and the public at large use the images and videos from the ISS to learn about Earth from an orbital perspective. Interactive learning activities using the videos and images will be developed and deployed, and will engage students in a program to review, geo-tag, and promote large-scale use of this imagery.

Q2 FY17 PROJECT PIPELINE

VALIDATION STUDIES AND GROUND TESTING

PROJECT	PRINCIPAL INVESTIGATOR	AFFILIATION	CITY	STATE
3D Neural Microphysiological System	Dr. Michael Moore	AxoSim Technologies	New Orleans	LA
BCM-Dept. of Molecular & Cellular Biology OMICS	Dr. Clifford Dacso	Baylor College of Medicine	Houston	TX
Longitudinal Assessment of Intracranial Pressure During Prolonged Spaceflight	Dr. Clifford Dacso	Baylor College of Medicine	Houston	TX
Optimizing Jammable Granular Assemblies in a Microgravity Environment	Jason Hill	Benevolent Technologies for Health	Cambridge	MA
NDC-4: Space Station STEM Challenge	Mathew Weaver	Collins Middle School	Salem	MA
Spacecraft-on-a-Chip Experiment Platform	Dr. Mason Peck	Cornell University	Ithaca	NY
Generation of Cardiomyocytes from Human iPS Cell-derived Cardiac Progenitors	Dr. Chunhui Xu	Emory University	Atlanta	GA
Remote Controlled Nanochannel Implant for Tunable Drug Delivery	Dr. Alessandro Grattoni	Houston Methodist Research Institute	Houston	TX
Rodent Research-4 Validation Study	Dr. Melissa Kacena and Dr. Rasha Hammamieh	Indiana University Research	Indianapolis	IN
Improving Astronaut Performance of National Lab Research Tasks	Dr. Jayfus Doswell	Juxtopia, LLC	Baltimore	MD
Interrogating the Protein Response in Microgravity-induced Osteoporosis	Dr. Imran Mungrue	Louisiana State University Health Sciences Center	New Orleans	LA
Viral Infection Dynamics and Inhibition by the Vecoy Nanotechnology	Dr. Drew Cawthon	Lovelace Respiratory Research Institute	Albuquerque	NM
Classrooms in Space	Ted Tagami	Magnitude.io	Berkeley	CA
Great Lakes Specific HICO Water Quality Algorithms	Dr. Robert Shuchman	Michigan Technological University	Houghton	MI
Orion's Quest-Student Research on the ISS	Peter Lawrie	Orions Quest	Canton	MI
Microbead Fabrication using Rational Design Engineering	Dr. Brian Plouffe	Quad Technologies	Beverly	MA
High Data Rate Polarization Modulated Laser Communication System	Dr. Eric Wiswell	Schafer Corporation	Huntsville	AL
Combined Evaluation of Mouse Musculoskeletal Data	Dr. Virginia Ferguson	University of Colorado Boulder	Boulder	CO
Faraday Waves and Instability-Earth and Low G Experiments	Dr. Ranga Narayanan	University of Florida Board of Trustees	Gainesville	FL
Generation of Mesendoderm Stem Cell Progenitors in the ISS-National Laboratory	Dr. Robert Schwartz	University of Houston System	Houston	TX
Hyperspectral Remote Sensing of Terrestrial Ecosystem Carbon Fluxes	Fred Huemmrich	University of Maryland Baltimore County	Baltimore	MD
3D Organotypic Culture System	Dr. Rocky S. Tuan	University of Pittsburgh	Pittsburgh	PA
HICO Identification of Harmful Algal Blooms	Dr. Richard Becker	University of Toledo	Toledo	OH

PREFLIGHT

PROJECT	PRINCIPAL INVESTIGATOR	AFFILIATION	PLANNED LAUNCH VEHICLE	ESTIMATED LAUNCH DATE	CITY	STATE
Genes in Space-3	Dr. Sebastian Kraves	Amplyus LLC	OA-7	4/18/17	Cambridge	MA
SG100 Cloud Computing Payload	Trent Martin	Business Integra	OA-7	4/18/17	Houston	TX
NDC-2 Centaurus	Brian Thomas	Centaurus High School	OA-7	4/18/17	Lafayette	CO
Detached Melt and Vapor Growth of Indium Iodide in SUBSA Hardware	Dr. Aleksandar Ostrogorsky	Illinois Institute of Technology	OA-7	4/18/17	Chicago	IL
Magnetic 3D Cell Culture for Biological Research in Microgravity	Dr. Glauco Souza	Nano3D Biosciences, Inc.	OA-7	4/18/17	Houston	TX
Efficacy & Metabolism of Azonafide Antibody-Drug Conjugates (ADCs)	Sourav Sinha	Oncolinx Pharmaceuticals LLC	OA-7	4/18/17	Boston	MA
Crystal Growth of Cs2LiYCl6:Ce Scintillators in Microgravity	Dr. Alexei Churilov	Radiation Monitoring Devices, Inc.	OA-7	4/18/17	Watertown	MA
Genes in Space-2	Julian Rubinfien	The Boeing Company	OA-7	4/18/17	Chicago	IL
NDC-2 Bell	Shanna Atzmiller	Bell Middle School	SpX-11	5/15/17	Golden	CO
NDC-2 Chatfield	Joel Bertelsen	Chatfield Senior High School	SpX-11	5/15/17	Littleton	CO
Tomatosphere	Ann Jorss	First the Seed Foundation	SpX-11	5/15/17	Alexandria	VA
The Effect of Microgravity on Stem Cell Mediated Recellularization	Dr. Alessandro Grattoni	Houston Methodist Research Institute	SpX-11	5/15/17	Houston	TX
Functional Effects of Spaceflight on Cardiovascular Stem Cells	Dr. Mary Kearns-Jonker	Loma Linda University	SpX-11	5/15/17	Loma Linda	CA
Neutron Crystallographic Studies of Human Acetylcholinesterase for the Design	Andrey Kovalevsky	Oak Ridge National Lab	SpX-11	5/15/17	Oak Ridge	TN
Advanced Colloids Experiment-Temperature Controlled-6 (ACE-T-6)	Dr. Matthew Lynch	Procter and Gamble Company	SpX-11	5/15/17	West Chester	OH
MUSES Imaging Platform	Bill Corley	Teledyne Brown Engineering	SpX-11	5/15/17	Huntsville	AL
Systemic Therapy of NELL-1 for Osteoporosis (RR-5)	Dr. Chia Soo	University of California, Los Angeles	SpX-11	5/15/17	Los Angeles	CA
NDC-3: Chicagoland Boy Scouts and Explorers	Dr. Sandra Rogers	Boy Scouts of America	SpX-12	8/1/17	Chicago	IL
NDC-3: Chicagoland Boy Scouts and Explorers	Norman McFarland	Boy Scouts of America	SpX-12	8/1/17	Chicago	IL
Eli Lilly Lyophilization	Jeremy Hinds	Eli Lilly and Company	SpX-12	8/1/17	Indianapolis	IN
Spaceborne Computer	David Petersen	Hewlett Packard	SpX-12	8/1/17	Milpitas	CA
Assessing Osteoblast Response to Tetranite (TM)	Dr. Nikolaos Tapinos	LaunchPad Medical	SpX-12	8/1/17	Boston	MA
Optical Fiber Production in Microgravity (OFPIM) Experiment	Michael Snyder	Made In Space, Inc.	SpX-12	8/1/17	Moffett Field	CA
Crystallization of LRRK2 under Microgravity Conditions	Dr. Marco Baptista	Michael J. Fox Foundation	SpX-12	8/1/17	New York	NY
TangoLab-1.1	Twyman Clements	Space Tango, Inc.	SpX-12	8/1/17	Lexington	KY
STaARS-1 Research Facility	Dr. Heath Mills	Space Technology and Advanced Research Systems Inc. (STaARS)	SpX-12	8/1/17	Houston	TX
Story Time from Space - 4	Patricia Tribe	T2 Science and Math Education Consultants	SpX-12	8/1/17	Penticton	BC

PROJECT	PRINCIPAL INVESTIGATOR	AFFILIATION	PLANNED LAUNCH VEHICLE	ESTIMATED LAUNCH DATE	CITY	STATE
Characterizing Arabidopsis Root Attractions (CARA) grant extension request	Dr. Anna-Lisa Paul	University of Florida Board of Trustees	SpX-12	8/1/17	Gainesville	FL
Conversion of Adipogenic Mesenchymal Stem Cells into Mature Cardiac Myocytes	Dr. Robert Schwartz	University of Houston System	SpX-12	8/1/17	Houston	TX
Materials ISS Experiment Flight Facility	LD Stevenson	Alpha Space	SpX-13	11/1/17	Houston	TX
Implantable Nanochannel System for Delivery of Therapeutics for Muscle Atrophy	Dr. Alessandro Grattoni	Houston Methodist Research Institute	SpX-13	11/1/17	Houston	TX
Microgravity Crystal Growth for Improvement in Neutron Diffraction	Dr. Timothy Mueser	University of Toledo	SpX-13	11/1/17	Toledo	OH
Capillary-Driven Microfluidics in Space	Dr. Luc Gervais	1Drop Diagnostics US, Inc.	TBD	TBD	Boston	MA
Comparative Real-time Aetabolic Activity Tracking	Dr. Gary Sayler	490 Biotech	TBD	TBD	Knoxville	TN
Corrosion Inhibitor Exposed to the Extreme Environments in Space	Lauren Thompson Miller	A-76 Technologies, LLC	TBD	TBD	Houston	TX
SiC Microgravity Enhanced Electrical Performance (MEEP)	Rich Glover	ACME Advanced Materials	TBD	TBD	Albuquerque	NM
Multi-purpose Active-target Particle Telescope on the ISS (MAPT-I)	Hans-Juergen Zachrau	AIRBUS DS Space Systems, Inc.	TBD	TBD	Webster	TX
SPHERES Tether – SLOSH	Hans-Juergen Zachrau	AIRBUS DS Space Systems, Inc.	TBD	TBD	Webster	TX
Endothelial Cells In Microgravity for Evaluation of Cancer Therapy Toxicity	Dr. Shou-Ching Jaminet	Angiex	TBD	TBD	Cambridge	MA
The Universal Manufacture of Next Generation Electronics	Dr. Supriya Jaiswal	Astrileux Corporation	TBD	TBD	La Jolla	CA
Implantable Glucose Biosensors	Dr. Michail Kastellorizios	Biorasis, Inc.	TBD	TBD	Storrs/ Mansfield	CT
Cranial Bone Marrow Stem Cell Culture in Space	Dr. Yang D. Teng	Brigham and Women's Hospital	TBD	TBD	Boston	MA
Electrolytic Gas Evolution under Microgravity	Larry Alberts	Cam Med, LLC	TBD	TBD	West Newton	MA
Unmasking Contact-line Mobility for Inertial Spreading using Drop Vibration	Dr. Paul Steen	Cornell University	TBD	TBD	Ithaca	NY
Inertial Spreading and Imbibition of a Liquid Drop Through a Porous Surface	Dr. Michel Louge	Cornell University	TBD	TBD	Ithaca	NY
Space Development Acceleration Capability (SDAC)	Philip Bryden	Craig Technologies	TBD	TBD	Cape Canaveral	FL
Providing Spherical Video Tours of ISS	David Gump	Deep Space Industries	TBD	TBD	Moffett Field	CA
Droplet Formation Studies in Microgravity	Paul Patton	Delta Faucet	TBD	TBD	Indianapolis	IN
Rodent Research-Wound Healing	Dr. Rasha Hammamieh	Department of Defense	TBD	TBD	Fort Detrick	MD
DexMat CNT Cable Project	Dr. Alberto Goenaga	DexMat	TBD	TBD	Houston	TX
Microgravity Crystalization of Glycogen Synthase-Glycogenin Protein Complex	Dr. David S. Chung	Dover Lifesciences	TBD	TBD	Dover	MA
Survivability of Variable Emissivity Devices for Thermal Control Applications	Dr. Hulya Demiryont	Eclipse Energy Systems, Inc.	TBD	TBD	St. Petersburg	FL

PROJECT	PRINCIPAL INVESTIGATOR	AFFILIATION	PLANNED LAUNCH VEHICLE	ESTIMATED LAUNCH DATE	CITY	STATE
Fiber Optics Manufacturing in Space (FOMS)	Dr. Dmitry Starodubov	FOMS Inc.	TBD	TBD	San Diego	CA
Ultra-Portable Remote-Controlled Microfluidics Microscopy Microenvironment	Dan O'Connell	HNu Photonics	TBD	TBD	Wailuku	HI
Influence of Microgravity on T-Cell Dysfunction and Neurogenesis	Dr. Caitlin O'Connell-Rodwell	HNu Photonics	TBD	TBD	Wailuku	HI
Ionic Liquid CO2 Scrubber and Liquid Containment in Microgravity	Phoebe Henson	Honeywell International	TBD	TBD	Glendale	AZ
Intuitive Machines-ISS Terrestrial Return Vehicle (TRV)	Steve Altemus	Intuitive Machines	TBD	TBD	Houston	TX
Global Receive Antenna and Signal Processor (GRASP)	Robert Carlson	JAMSS America, Inc.	TBD	TBD	Houston	TX
Enhancement of Performance and Longevity of a Protein-Based Retinal Implant	Dr. Nicole L. Wagner	LambdaVision	TBD	TBD	Farmington	CT
SPHERES Zero Robotics Middle School	Dr. Alvar Saenz Otero	Massachusetts Institute of Technology	TBD	TBD	Cambridge	MA
SPHERES Zero Robotics High School	Dr. Alvar Saenz Otero	Massachusetts Institute of Technology	TBD	TBD	Cambridge	MA
Development and Validation of a Microfluidic Lab-on-a-chip	Dr. Siobhan Malany	Micro-gRx, Inc.	TBD	TBD	Orlando	FL
The Effects of Microgravity on Synovial Fluid Volume and Composition	Dr. Richard Meehan	National Jewish Health	TBD	TBD	Denver	CO
Nemak Alloy Solidification Experiments	Dr. Glenn Byczynski	NEMAK	TBD	TBD	Southfield	MI
Map the Penetration Profile of a Contact-Free Transdermal Drug Delivery System	Dr. Robert Applegate	Novopyxis	TBD	TBD	Boston	MA
Microgravity Investigation of Cement Solidification (MICS)	Dr. Aleksandra Radlinska	Penn State University	TBD	TBD	University Park	PA
Constrained Vapor Bubbles of Ideal Mixtures	Dr. Joel Plawsky	Rensselaer Polytechnic Institute	TBD	TBD	Troy	NY
The Influence of Spaceflight on Biological Age	Dr. Ali Torkamani	Scripps Translational Science Institute	TBD	TBD	LaJolla	CA
Stability of the Human Virome during Space Flight	Dr. Kristian Andersen	Scripps Translational Science Institute	TBD	TBD	LaJolla	CA
Intraterrestrial Fungus Grown in Space (iFunGIS)	Dr. Heath Mills	Space Technology and Advanced Research Systems Inc. (STaARS)	TBD	TBD	Houston	TX
Windows on Earth	David Libby	T E R C	TBD	TBD	Cambridge	MA
ISS Bioprinter Facility	Dr. Eugene Boland	Techshot, Inc.	TBD	TBD	Greenville	IN
Genes in Space - 4	Alia Almansoori	The Boeing Company	TBD	TBD	Chicago	IL
Tympanogen, LLC- Wound Healing	Dr. Elaine Horn-Ranney	Tympanogen, LLC	TBD	TBD	Norfolk	VA
Quantifying Cohesive Sediment Dynamics for Advanced Environmental Modeling	Dr. Paolo Luzzatto-Fegiz	University of California, Santa Barbara	TBD	TBD	Santa Barbara	CA
Kinetics of Nanoparticle Self-assembly in Directing Fields	Dr. Eric Furst	University of Delaware	TBD	TBD	Newark	DE
An ISS Experiment on Electrodeposition	Dr. Kirk Ziegler	University of Florida	TBD	TBD	Gainesville	FL

PROJECT	PRINCIPAL INVESTIGATOR	AFFILIATION	PLANNED LAUNCH VEHICLE	ESTIMATED LAUNCH DATE	CITY	STATE
Spaceflight Effects on Vascular Endothelial and Smooth Muscle Cell Processes	Dr. Josephine Allen	University of Florida	TBD	TBD	Gainesville	FL
Domesticating Algae for Sustainable Production of Feedstocks in Space	Dr. Mark Settles	University of Florida	TBD	TBD	Gainesville	FL
Crystal Growth STEM 2017	Ilia Guzei	University of Wisconsin - Madison	TBD	TBD	Madison	WI
Space Based Optical Tracker	Dr. John Stryjewski	Vision Engineering Solutions	TBD	TBD	Orlando	FL

IN ORBIT

PROJECT	PRINCIPAL INVESTIGATOR	AFFILIATION	LAUNCH VEHICLE	LAUNCH DATE	CITY	STATE
Development and Deployment of Charge Injection Device Imagers	Dr. Daniel Batcheldor	Florida Institute of Technology	SpX-10	2/19/17	Melbourne	FL
Growth Rate Dispersion as a Predictive Indicator for Biological Crystal Samples	Dr. Edward Snell	Hauptman Woodward Medical Research Institute, Inc.	SpX-10	2/19/17	Buffalo	NY
Honeywell/Morehead-DM Payload Processor	Dr. Benjamin Malphrus	Honeywell/Morehead State University	HTV6	12/9/16	Morehead	KY
Controlled Dynamics Locker for Microgravity Experiments on ISS	Dr. Scott A. Green	Controlled Dynamics Inc.	OA-5	10/16/16	Huntington Beach	CA
Materials Testing - Earth Abundant Textured Thin Film Photovoltaics	Dr. Jud Ready	Georgia Institute of Technology	SpX-9	7/18/16	Atlanta	GA
GLASS AIS TransponderGlobal AIS on Space Station (GLASS)	Robert Carlson	JAMSS America, Inc.	SpX-9	7/18/16	Houston	TX
MultiLab: Research Server for the ISS	Twyman Clements	Space Tango, Inc.	SpX-9	7/18/16	Lexington	KY
Story Time from Space - 2	Patricia Tribe	T2 Science and Math Education Consultants	SpX-9	7/18/16	Penticton	BC
NIH-Osteo	Dr. Bruce Hammer	University of Minnesota	SpX-9	7/18/16	Minneapolis	MN
Materials Testing: The Evaluation of Gumstix™ Modules in Low Earth Orbit	Dr. Kathleen Morse	Yosemite Space	SpX-9	7/18/16	Groveland	CA
Additive Manufacturing Operations Program	Michael Snyder	Made In Space, Inc.	OA-6	3/23/16	Moffett Field	CA
Project Meteor	Michael Fortenberry	Southwest Research Institute	OA-6	3/23/16	Boulder	CO
Zero-G Characterization & OnOrbit Assembly for Cellularized Satellite Tech	Talbot Jaeger	NovaWurks, Inc	Orb-4	12/6/15	Los Alamitos	CA
NanoRacks External Platform	Michael Johnson	Nanoracks, LLC	HTV5	8/16/15	Houston	TX
Bone Densitometer	John Vellinger	Techshot, Inc.	SpX-4	9/21/14	Greenville	IN
National Lab Project: AMS	Dr. Samuel Ting	Massachusetts Institute of Technology	STS-134	5/16/11	Cambridge	MA
ARISS (Amateur Radio from ISS)	Frank Bauer	AMSAT (Radio Amateur Satellite Corporation)	N/A	N/A	Kensington	MD
Cyclone Intensity Measurements from the International Space Station (CIMISS)	Dr. Paul Joss	Visidyne, Inc.	N/A	N/A	Burlington	MA
Windows On Earth	Dan Barstow	T E R C	N/A	N/A	Cambridge	MA
Street View Imagery Collect on ISS	Ann Kapusta	ThinkSpace	N/A	N/A	Mountain View	CA

POSTFLIGHT/COMPLETE

PROJECT	PRINCIPAL INVESTIGATOR	AFFILIATION	CITY	STATE
Collaborative Project–Protein Crystal Growth to Enable Therapeutic Discovery	Dr. Matt Clifton	Beryllium Discovery Corp.	Bedford	MA
Commercial Space-borne Hyperspectral Harmful Algal Bloom (HAB) Products	Dr. Ruhul Amin	BioOptoSense, LLC	Metairie	LA
Ants in Space, CSI-06	Stefanie Countryman	BioServe Space Technologies	Boulder	CO
Osteocyte Response to Mechanical Forces	Dr. Paola Divieti Pajevic	Boston University	Boston	MA
Cobra Puma Golf Microgravity Electrodeposition Experiment	Mike Yagley	Cobra Puma Golf	Carlsbad	CA
HUNCH Extreme Science-3	David Schlichting	Eaglecrest High School	Centennial	CO
Testing TiSi2 Nanonet Based Lithium Ion Batteries for Safety in Outer Space	Emily Fannon	EnerLeap	Newton	MA
Architecture to Transfer Remote Sensing Algorithms from Research to Operations	Dr. James Goodman	HySpeed Computing	Miami	FL
Espresso Cup	Dr. Mark Weislogel	IRPI LLC	Wilsonville	OR
PCG - IPPase Crystal Growth in Microgravity	Dr. Joseph Ng	iXpressGenes, Inc.	Huntsville	AL
Molecules Produced in Microgravity from the Chernobyl Nuclear Accident	Dr. Kasthuri Venkateswaran	Jet Propulsion Laboratory/ Caltech	Pasadena	CA
Omega Hydrofuge Plant Growth Chamber - Hunch Extreme Science - Lakewood	Matthew Brown	Lakewood High School	Lakewood	CO
Merck PCG-1	Dr. Paul Reichert	Merck Pharmaceuticals	Whitehouse Station	NJ
Milliken:Vertical Burn	Dr. Jeff Strahan	Milliken	Spartanburg	SC
SSEP5b - Falcon II	Dr. Jeff Goldstein	NCESSE/Tides Center	Capitol Heights	MD
SSEP5a - Falcon I	Dr. Jeff Goldstein	NCESSE/Tides Center	Capitol Heights	MD
SSEP10 - Kitty Hawk	Dr. Jeff Goldstein	NCESSE/Tides Center	Capitol Heights	MD
SSEP7 - Charlie Brown	Dr. Jeff Goldstein	NCESSE/Tides Center	Capitol Heights	MD
SSEP8 - Yankee Clipper	Dr. Jeff Goldstein	NCESSE/Tides Center	Capitol Heights	MD
SSEP6 - Orion	Dr. Jeff Goldstein	NCESSE/Tides Center	Capitol Heights	MD
Impact of Increased Venous Pressure on Cerebral Blood Flow Velocity Morphology	Dr. Robert Hamilton	Neural Analytics	Los Angeles	CA
T-Cell Activation in Aging-1	Dr. Millie Hughes-Fulford	Northern California Institute for Research and Education, Inc.	San Francisco	CA
T-Cell Activation in Aging-2	Dr. Millie Hughes-Fulford	Northern California Institute for Research and Education, Inc.	San Francisco	CA
Utilize ISS Energy Systems Data for Microgrid Design and Operation	Nicholas Kurlas	Raja Systems	Boston	MA
Reducing Signal Interruption from Cosmic Ray Background in Neutron Detectors	Dr. Andrew Inglis	Silverside Detectors	Boston	MA
Hyperspectral Mapping of Iron-bearing Minerals	Dr. William H. Farrand	Space Science Institute	Boulder	CO
Effects of Microgravity on Stem Cell-Derived Heart Cells	Dr. Joseph Wu	Stanford University	San Francisco	CA
Mutualistic Plant/Microbe Interactions	Dr. Gary W. Stutte	SyNRGE, LLC	Titusville	FL
Examine Bone Tumor and Host Tissue Interactions Using Micro-Gravity Bioreactors	Dr. Carl Gregory	Texas A&M Health Science Center	College Station	TX
Antibiotic Effectiveness in Space-1 (AES-1)	Dr. David Klaus	University of Colorado Boulder	Boulder	CO
Molecular Biology of Plant Development (Petri Plants)	Dr. Anna-Lisa Paul	University of Florida	Gainesville	FL
Effects of Simulated Microgravity on Cardiac Stem Cells	Dr. Joshua Hare	University of Miami	Miami	FL
Protein Crystal Growth for Determination of Enzyme Mechanisims	Dr. Constance Schall	University of Toledo	Toledo	OH

PROJECT	PRINCIPAL INVESTIGATOR	AFFILIATION	CITY	STATE
Drug Development and Human Biology: Use of Microgravity for Drug Development	Dr. Timothy Hammond	Veterans Administration Medical Center	Durham	NC
CyMISS Grant Proposal for the 2015 Tropical Cyclone Season	Dr. Paul Joss	Visidyne, Inc.	Burlington	MA
Demonstration and TRL Raising of the Net Capture System on the ISS	Ron Dunklee	AIRBUS DS Space Systems, Inc.	Webster	TX
PCG-Crystallization of Huntington Exon-1 Using Microgravity	Dr. Pamela Bjorkman	California Institute of Technology	Pasadena	CA
NDC-1: Pilot Program	Rev. Brian Reedy	Cristo Rey Jesuit College Preparatory of Houston	Houston	TX
National Lab Project: ISERV	Burgess Howell	Disaster Relief Charter; NASA Marshall Space Flight Center	Huntsville	AL
NDC-1: Pilot Program	Kathy Duquesnay	Duchesne Academy of the Sacred Heart	Houston	TX
NDC-1: Pilot Program	Susan Knizner	Duchesne Academy of the Sacred Heart	Houston	TX
Eli Lilly-RR3 Myostatin	Dr. Rosamund Smith	Eli Lilly and Company	Indianapolis	IN
Eli Lilly_Dissolution of Hard to Wet Solids	Dr. Richard Cope, Dr. Alison Campbell, and Dr. Kenneth Savin	Eli Lilly and Company	Indianapolis	IN
Eli Lilly PCG	Kristofer R. Gonzalez-DeWhitt and Michael Hickey	Eli Lilly and Company	Indianapolis	IN
Tomatosphere	Ann Jorss	First the Seed Foundation	Alexandria	VA
Exploiting On-orbit Crystal Properties for Medical and Economic Targets	Dr. Edward Snell	Hauptman Woodward Medical Research Institute, Inc.	Buffalo	NY
Decoupling Diffusive Transport Phenomena in Microgravity	Dr. Alessandro Grattoni	Houston Methodist Research Institute	Houston	TX
Kentucky Space/Exomedicine Lab - Flatworm	Dr. Mahendra Jain	Kentucky Space, LLC	Lexington	KY
Application of Microgravity Expanded Stem Cells in Regenerative Medicine	Dr. Abba Zubair	Mayo Clinic	Rochester	MN
Merck PCG-3	Dr. Paul Reichert	Merck Pharmaceuticals	Whitehouse Station	NJ
Merck PCG-2	Dr. Paul Reichert	Merck Pharmaceuticals	Whitehouse Station	NJ
Nanobiosym-Galactic Grant	Dr. Anita Goel	Nanobiosym	Cambridge	MA
Validation of WetLab-2 System for qRT-PCR capability on ISS	Julie Schonfeld	NASA ARC	Moffett Field	CA
SSEP9 - Odyssey	Dr. Jeff Goldstein	NCESSE/Tides Center	Capitol Heights	MD
SSEP11 - Endeavor	Dr. Jeff Goldstein	NCESSE/Tides Center	Capitol Heights	MD
Novartis Rodent Research	Dr. David Glass	Novartis Institute for Biomedical Research	Cambridge	MA
Novartis Rodent Research-2	Dr. David Glass	Novartis Institute for Biomedical Research	Cambridge	MA
Binary Colloidal Alloy Test – Low Gravity Phase Kinetics Platform	Dr. Matthew Lynch	Procter and Gamble Company	West Chester	OH
Collaborative Project – Protein Grystal Growth to Enable Therapeutic Discovery	Dr. Cory Gerdts	Protein BioSolutions	Gaithersburg	MD
Synthetic Muscle: Resistance to Radiation	Dr. Lenore Rasmussen	Ras Labs	Hingham	MA
HUNCH Chlorella/Billings Central Catholic High	Dr. Florence Gold	Rocky Mountain College	Billings	MT
PCG - Crystallization of Medically Relevant Proteins Using Microgravity	Dr. Sergey Korolev	Saint Louis University	Saint Louis	MO
Story Time from Space -1	Patricia Tribe	T2 Science and Math Education Consultants	Penticton	BC
Story Time from Space - 3	Patricia Tribe	T2 Science and Math Education Consultants	Penticton	BC

POSTFLIGHT/COMPLETE

PROJECT	PRINCIPAL INVESTIGATOR	AFFILIATION	CITY	STATE
NDC-1: Pilot Program	Angela Glidwell	The Awty International School	Houston	TX
NDC-1: Pilot Program	Jessika Smith	The Awty International School	Houston	TX
Genes In Space	Anna-Sophia Boguraev	The Boeing Company	Chicago	IL
PCG - Crystallization of Human Membrane Proteins in Microgravity	Dr. Stephen Aller	University of Alabama at Birmingham	Birmingham	AL
The Effect of Macromolecular Transport on Microgravity PCG	Dr. Lawrence DeLucas	University of Alabama at Birmingham	Birmingham	AL

CONFERENCES AND EVENTS IN Q2 FY17

CONFERENCE AND INDUSTRY EVENT SPONSORSHIPS

EVENT	LOCATION	DATE	AUDIENCE	DESCRIPTION
American Association for the Advancement of Science (AAAS) Annual Meeting	Boston, MA	2/17/17-2/19/17	Scientists, engineers, educators, policymakers, and journalists	CASIS exhibited at the AAAS Annual Meeting, which hosts nearly 10,000 attendees from the United States and territories and more than 50 countries. CASIS discussed the countless research investigations possible onboard the ISS and the station's role in revolutionizing and commercializing low Earth orbit.
AAAS Family Science Days	Boston, MA	2/18/17-2/19/17	Students, family members, general public, AAAS attendees	Nearly 6,000 K-12 students, family members, and AAAS Annual Meeting attendees attended Family Science Days hosted by AAAS in partnership with the Cambridge Science Festival. In its exhibit booth, CASIS engaged youth and educators in interactive science exhibits and conversations with space experts. CASIS also sponsored a "Meet the Astronaut" presentation featuring NASA Astronaut Cady Coleman.

ADDITIONAL CONFERENCE AND EVENT PARTICIPATION

EVENT	LOCATION	DATE	AUDIENCE	DESCRIPTION
CASIS Public Board Meeting	Orlando, FL	1/23/2017	General public	The CASIS board of directors and executive leadership held a public meeting to present the organization's annual report for fiscal year 2016. Additionally, the group reviewed its progress and future goals as managers of the ISS U.S. National Lab. During the meeting, the board addressed stakeholder questions received in advance and heard public comments from meeting attendees.
Future of Education Technology Conference (FETC)	Orlando, FL	1/24/17-1/27/17	Educators, administrators, technology representatives, and media	The CASIS Education Team exhibited at The Future of Education Technology Conference—the nation's largest U.S. independent education technology conference, annually attracting thousands of education and technology leaders. CASIS introduced attendees to the Space Station Explorers program and its many interactive activities and resources for learners of all ages.
Commercial Spaceflight Federation Members Meeting	Washington, DC	2/7/17	Commercial flight developers, operators, spaceports, suppliers and service providers	CASIS representatives presented information on CASIS and commercial space activities at the semi-annual meeting of the Commercial Spaceflight Federation. The organization preserves American leadership in aerospace through technology innovation and inspiring youth to pursue careers in science and engineering.
General Electric (GE) Expanding Horizons Series	San Ramon, CA	2/7/17	Corporate senior leadership and GE staff	CASIS Executive Director Greg Johnson presented at Expanding Horizons, GE's ongoing speaker series featuring distinguished leaders from industry and academia. The interactive forum, attended by nearly 100 of the company's senior leadership and staff, endeavors to spark new ideas and innovation. Johnson presented perspectives on the space commerce movement and the capabilities of the ISS National Lab, opening conversations for future collaboration.
National Academies of Sciences, Engineering, and Medicine	Washington, DC	2/7/17-2/8/17	Scientists, engineers, and researchers	At the invitation of the National Academies of Sciences, Engineering, and Medicine, Deputy Chief Scientist Dr. Michael Roberts participated in an ad-hoc committee meeting and presented the role of CASIS in managing the ISS U.S. National Lab. Roberts gave a historical perspective on the development of CASIS, its current portfolio, and initiatives for advancing the U.S. microgravity science enterprise.

EVENT	LOCATION	DATE	AUDIENCE	DESCRIPTION
National Academies of Sciences Ad Hoc Decadal Meeting	Washington, DC	2/8/17	National Academies of Sciences members	Deputy Chief Scientist Dr. Michael Roberts presented the current CASIS portfolio in relation to the Decadal report, "Recapturing a Future for Space Exploration: Life and Physical Sciences Research for a New Era" research priorities. The presentation was given to ad-hoc members of the National Academies of Sciences who are developing a mid-term Decadal report.
Space Exploration Educators Conference	Houston, TX	2/10/17	K-12 educators from 41 states and 6 countries	The CASIS Education Team exhibited and presented at the Space Exploration Educators Conference, conducting multiple activities for engaging educators and K-12 students in space. CASIS featured its Space Station Explorers program and hosted its partner, ARISS, in conducting a live amateur radio communication with NASA Astronaut Thomas Pesquet onboard the ISS.
Catholic Charities Science Supervisors	West Palm Beach, FL	2/21/17	Science supervisors and teachers	CASIS representatives spoke to a group of lead science teachers and superintendents from the Florida Catholic archdiocese. The 25 attendees learned about the Space Station Explorers program and the opportunities to leverage the ISS as a teaching platform.
Youth Recognition Dinner	Chicago, IL	2/25/17	Eagle Scouts and other youth award recipients	CASIS Executive Director Greg Johnson was a keynote speaker at the Youth Recognition Dinner hosted by The Boy Scouts of America Pathway to Adventure Council. The program recognized youth who attained the highest possible award in their chosen programs in 2016, including 400 Eagle Scout honorees.
Earth Observation Brown Bag	Washington, DC	3/1/17	NASA program managers	CASIS representatives presented ISS capabilities to NASA's Earth Observation Division within NASA's Science Mission Directorate. The discussion focused on current Earth observation research from the station and opportunities to collaborate on future projects.
South by Southwest® (SXSW®) Conference	Austin, TX	3/11/17	General and technology media	CASIS Marketing and Communications Manager Patrick O'Neill joined a panel discussion with representatives from Budweiser at SXSW® Conference. Budweiser discussed its desire to send ingredients to space in the near term, and to someday take beer to Mars. O'Neill presented the capabilities of the ISS U.S. National Lab for discovering how products or ingredients react in space.
Flight Projects Development Program Workshop Series	Cape Canaveral, FL	3/15/17	Executive leadership from NASA, academia, and commerce	CASIS Executive Director Greg Johnson presented to representatives of industry, academia, NASA, and other government agencies as part of the Flight Projects Development Program's Workshop series. In this session, the leadership workshop focused on strategic collaboration in transitions and managing change.
American Institute for Medical and Biological Engineering Annual Meeting	Washington, DC	3/19/17-3/20/17	Policy and scientific community members from medicine and biological engineering fields	CASIS Chief Scientist Dr. C. Randy Giles presented at the American Institute for Medical and Biological Engineering Annual Meeting, an advocacy organization consisting of academic, industrial, professional society councils, and elected fellows. In his presentation, Giles discussed current science being conducted on the ISS National Lab.
National After School Association Conference	Dallas, TX	3/19/17-3/22/17	Program administrators, board of education members, educators, paraprofessionals, non-profit leaders, advocates, community leaders, policymakers, and researchers	The CASIS Education Team exhibited at the National After School Association Conference, a membership association that fosters development, provides education, and encourages advocacy for the out-of-school-time community. CASIS discussed the Space Station Explorers program and its resources for bringing space-based, hands-on activities to youth in after-school settings.
Council of State Science Supervisors	Los Angeles, CA	3/27/17-3/29/17	Science supervisors, students, educators, and administrators	CASIS presented at the annual conference of the Council of State Science Supervisors, which empowers its members to be articulate advocates for quality science education at the local, state, and national levels. The 75 attendees learned how the unique ISS U.S. National Lab creates an extension to the classroom through project-based learning and by inspiring students.
National Academies of Sciences - Space Week	Washington, DC	3/28/17	National Academies committee on Biological and Physical Sciences in Space	CASIS representatives briefed the National Academies of Sciences committee on Biological and Physical Sciences in Space on its value impact process and initial findings. This process leverages best practices from other R&D organizations and independent subject matter experts to evaluate and measure the potential economic, innovation, and humankind/social impacts of the ISS U.S. National Lab portfolio.

International Space Station National Laboratory/CASIS Lunch and Learn	Washington, DC	3/28/17	Representatives of government stakeholder organizations	CASIS Deputy Chief Scientist Dr. Michael Roberts presented "CASIS FY16 Accomplishments and What's Next for FY17 and Beyond" to NASA and other organizations. The sessions increased awareness of the ISS and opened doors for collaboration with numerous organizations, such as the Coalition for Space Exploration and NASA agencies, including the Science Mission Directorate, Human Exploration and Operations Mission Directorate, OIG, Office of Chief Scientist, Office of Chief Financial Officer, Office of International and Interagency Relations, Science and Technology Mission Directorate, and Office of Communications.
Texas Open Innovation Conference	Houston, TX	3/28/17-3/29/17	Academics and industry organization members	A CASIS representative presented “Future Trends: Commercial Innovation on the International Space Station” during the Texas Open Innovation Conference hosted by Lone Star College. The conference was attended by academic and industry organizations and enabled CASIS to raise awareness for sponsored programs involving the ISS U.S. National Lab.
Research in Commercial LEO Symposium, National Academies of Sciences	Washington, DC	3/29/17-30/17	Policy experts for federal agencies	CASIS representatives attended a one-day symposium, "Exploration Systems Interface with Biological and Physical Behaviors" – a public meeting with the National Academies Committee on Biological and Physical Sciences in Space.
National Science Teachers Association Conference	Los Angeles, CA	3/30/17-4/2/17	Science educators	The CASIS Education Team exhibited and presented at the annual National Science Teachers Association Conference, which offers educators the latest in science content, teaching strategy, and research. Visitors to the CASIS booth learned about the ISS U.S. National Lab as a learning platform for inspiring youth in science, technology, engineering, and math.

FINANCIALS

BUSINESS STATUS REPORT (UNAUDITED)

JANUARY 1 TO MARCH 31, 2017	ACTUAL Q2FY17	BUDGET Q2FY17	VARIANCE	ACTUAL YTD FY17	BUDGET YTD FY17	VARIANCE
Direct Labor	$1,549,150	$1,674,373	$(125,223)	$3,009,836	$3,247,061	$(237,225) A
AASubcontracts	$388,413	$551,675	$(163,262)	$598,238	$1,027,460	$(429,222) B
Permanent Equipment	$15,529	$5,000	$10,529	$24,502	$14,000	$10,502
Office Supplies & Equipment	$38,112	$76,676	$(38,564)	$98,517	$149,850	$(51,333)
Travel	$193,060	$289,738	$(96,678)	$426,192	$546,316	$(120,124)
Grants	$1,726,951	$1,764,183	$(37,232)	$2,156,311	$3,684,823	$(1,528,512) C
Other	$419,098	$437,450	$(18,352)	$793,564	$813,544	$(19,980)
Total	**$4,330,313**	**$4,799,095**	**$(468,782)**	**$7,107,160**	**$9,483,054**	**$(2,375,894)**

(A) Headcount Actual 45 vs Budget of 49.
(B) Subcontracts were lower than budget for marketing, science and business development.
(C) Grant recipient milestone payments have shifted to later in FY17 and flight delays.

BREAKOUT OF COOPERATIVE AGREEMENT FUNDING

	Q1 FY17	Q2 FY17	Q3 FY17	Q4 FY17
Direct	55.20%	46.8%		
Indirect	19.50%	13.4%		
Grants	15.30%	39.8%		

BREAKOUT OF CASIS GRANTS

	Q1 FY17	Q2 FY17	Q3 FY17	Q4 FY17
Academic	($88,466)*	334,153		
Commercial	$421,644	1,283,955		
Mission Based costs	$96,181	108,843		

*Negative value due to returned funds from a previous grantee.

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