ISS NATIONAL LABORATORY®

ISS National Laboratory Q2FY23 Report

Quarterly Report for the Fiscal Year 2023 Period January 1, 2023 – March 31, 2023

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Q2FY23 Metrics

ISS NATIONAL LAB UTILIZATION AND OPERATIONS TARGET METRICS

TARGET METRICS	FY23 Q1	FY23 Q2	FY23 Q3	FY23 Q4	YTD FY23 Total	FY23 Target	FY23 Stretch
FUNDAMENTAL SCIENCE							
1) Fundamental Science projects selected	0	0			**0**	**10**	**15**
2) External funding supporting Fundamental Science users of the ISS National Lab	$0	$0			**$0**	**$4M**	**N/A**
APPLIED RESEARCH & DEVELOPMENT							
3) Applied Research & Development projects selected	0	1			**1**	**8**	**N/A**
4) Ratio of external funding to CASIS funding (self-reported) supporting Applied Research & Development users of the ISS National Lab (cumulative)	0	0			**0**	**1:1**	**2:1**
TECHNOLOGY DEMONSTRATION							
5) Technology Demonstration projects selected	1	4			**5**	**12**	**15**
6) Ratio of external funding to CASIS funding (self-reported) supporting Technology Demonstration users of the ISS National Lab (cumulative)	4:1	4:1			**4:1**	**4:1**	**6:1**
EDUCATION & OUTREACH							
7) Education & Outreach projects selected	0	0			**0**	**7**	**9**
8) Total individuals participating in ISS National Lab Education & Outreach programs and projects (self-reported)	1,820,222	2,660,096			**4,480,318**	**2M**	**4M**
9) Total individual users of ISS National Lab online education products (self-reported)	5,656,397	8,129,366			**13,785,763**	**5M**	**8M**
PROPOSAL MANAGEMENT							
10) Time from solicitation close to selection/nonselection notification (cumulative)	68	67			**67**	**≤65 days**	**N/A**

ISS NATIONAL LAB UTILIZATION AND OPERATIONS TRACKING METRICS

The following metrics have no target for FY23 but will be tracked internally and discussed in face-to-face meetings with NASA.

TRACKING METRICS	FY23 Q1	FY23 Q2	FY23 Q3	FY23 Q4	YTD FY23 Total
1) Commercial Service Provider Facility Utilization payloads delivered	27	9			**36**
(a) Percentage of Commercial Service Provider Facility Utilization payloads flown that meet the minimum research objectives (previous fiscal year quarter) [a]	92%	100%			**N/A**
(b) Percentage of Commercial Service Provider Facility Utilization payloads flown that meet the payload integration expectations	22%	TBD			**N/A**
2) Education & Outreach payloads delivered	0	1			**1**
3) Fundamental Science payloads delivered	9	4			**13**
(a) Percentage of Fundamental Science payloads flown that meet the minimum research objectives (previous fiscal year quarter) [a]	50%	N/A			**N/A**
(b) Percentage of Fundamental Science payloads flown that meet the payload integration expectations	67%	TBD			**N/A**
4) Applied Research & Development payloads delivered	4	1			**5**
(a) Percentage of Applied Research & Development payloads flown that meet the payload integration expectations	25%	TBD			**N/A**
5) Technology Demonstration payloads delivered	2	4			**6**
(a) Percentage of Technology Demonstration payloads flown that meet the minimum research objectives (previous fiscal year quarter) [a]	100%	80%			**N/A**
(b) Percentage of Technology Demonstration payloads flown that meet the payload integration expectations	0%	TBD			**N/A**
6) Total ISS National Lab-sponsored payloads delivered	42	19			**61**
7) Total external funding committed	$464,548	$3,964,798			**$4,429,346**

TRACKING METRICS (Continued)	FY23 Q1	FY23 Q2	FY23 Q3	FY23 Q4	YTD FY23 Total
8) Multiplier on CASIS grant funding committed (cumulative)	4:1	4:1			**4:1**
9) Funds raised post award and postflight by startup companies with ISS National Lab-sponsored flight projects					
(a) Funds raised postflight	$93.0M	$10.0M			**$103.0M**
(b) Funds raised post award	$93.0M	$12.7M			**$105.7M**
10) Users by new/returning					
(a) ISS National Lab return users	0	2			**2**
(b) ISS National Lab new users	1	4			**5**
11) Users by type					
(a) Commercial	1	5			**6**
(b) Academic/nonprofit	0	1			**1**
(c) Government agency	0	0			**0**
12) ISS National Lab concepts received	13	143			**156**
13) ISS National Lab proposals received	28	55			**83**
13.1) ISS National Lab proposals reviewed	26	5			**31**
(a) Total reviewed proposals rated very good or excellent	4	1			**5**
(b) Total reviewed proposals rated very good or excellent and not selected	0	0			**0**
14) ISS National Lab projects selected	1	6			**7**
15) Active solicitations	4	3			**7**
16) Time from selection notification to agreement draft sent to principal investigator (cumulative)	69	60			**60**
17) New commercial facilities added	0	0			**0**
18) Commercial facilities (cumulative)	24	23			**23**
19) New Umbrella User Agreements executed	0	0			**0**
20) Percentage of Commercial Service Providers that have an active Umbrella User Agreement	100%	100%			**100%**
21) Crew time (actual vs. increment pair – 3 months allocation)					

TRACKING METRICS (Continued)	FY23 Q1	FY23 Q2	FY23 Q3	FY23 Q4	YTD FY23 Total
(a) Ascent flight resources					
Upmass	155%	108%			**N/A**
Cold stowage	31%	73%			**N/A**
Big bags	50%	13%			**N/A**
Powered lockers	60%	46%			**N/A**
(b) Facility resources (reported in Q2 and Q4)					
Commercial facilities	45%				**N/A**
JEM airlock	166%				**N/A**
Life Sciences Glovebox	100%				**N/A**
Microgravity Science Glovebox	100%				**N/A**
22) Number of payloads that did not turnover per the nominal delivery schedule	6	TBD			**6**
Principal investigators	0	TBD			**0**
Implementation Partners	6	TBD			**6**
CASIS	0	TBD			**0**
NASA	0	TBD			**0**
23) Number of reflight experiments flown	3	1			**4**
Fundamental Science	1	1			**2**
Applied Research & Development	0	0			**0**
Technology Demonstration	0	0			**0**
Education and Outreach	0	0			**0**
Commercial Service Provider Utilization	2	0			**2**
24) Number of payloads ready to fly that were left on the ground due to limited resources (upmass, crewtime, cold stowage, etc.)	5	2			**7**
25) Number of payloads removed from the manifest after the freeze date because the principal investigator/payload could not make the flight	1	2			**3**

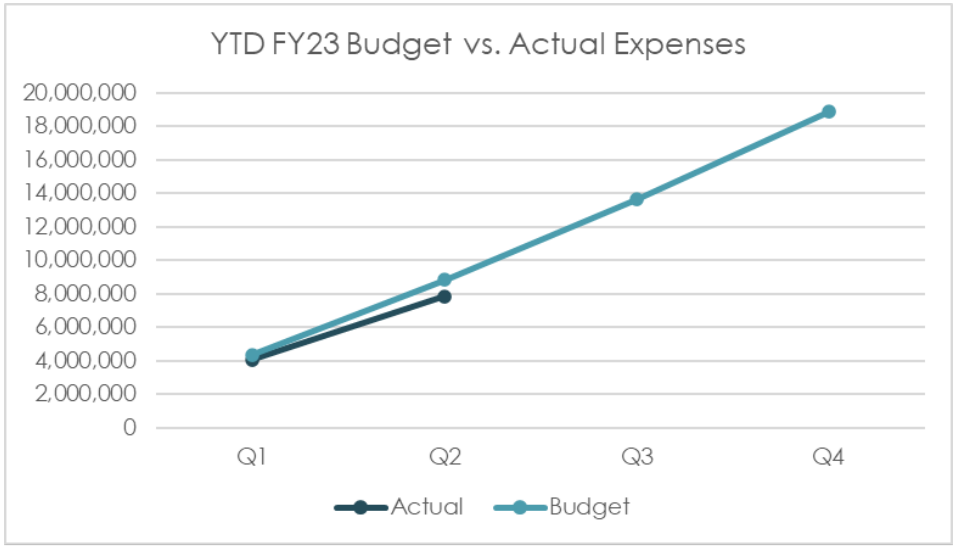
a. Data is from previous fiscal year quarter. Determination of whether a payload met research objectives often cannot be determined until the payload has been returned to the investigator and review of initial data has taken place.

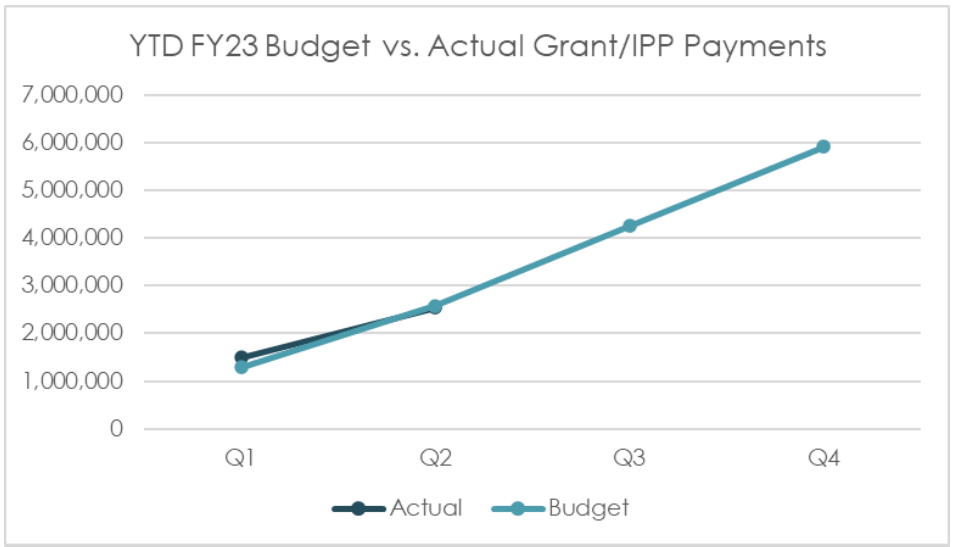
FINANCIALS

Business Status Report (unaudited)

Expenses	Q2 Actuals	Q2 Budget	Variance	Actual YTD FY23	Budget YTD FY23	Variance YTD FY23
Direct Labor	$1,912,931	$2,151,297	($238,366)	$3,848,625	$4,106,408	$(257,783)[a]
Subcontracts	$330,534	$388,074	($57,540)	$545,691	$736,798	$(191,107)[b]
Other Direct	$274,412	$383,490	($109,078)	$499,372	$828,538	$(329,166)[c]
Travel	$145,924	$172,570	($26,646)	$250,015	$379,522	$(129,507)[d]
Office Supplies and Equipment	$70,081	$72,128	($2,047)	$151,102	$208,650	$(57,548)
Grants & Mission-Based Costs	$1,041,216	$1,290,019	($248,803)	$2,540,720	$2,580,039	$(39,319)
Total Expenses	**$3,775,098**	**$4,457,578**	**($682,480)**	**$7,835,525**	**$8,839,955**	**$(1,004,430)**

a. Salaries: Timing of new hires, 59 headcount budgeted as of 1/1 vs 54 at 3/31.
b. Subcontracts: Timing of fees related to branding and mission statements as well as some timing and permanent savings of professional memberships and other consulting we are not engaging.
c. Other Direct: Timing related to advertising spend and when trade shows occur.
d. Travel: Running under budget as management further scrutinizes what events to attend and which personnel should be present.





IPP = Implementation Partner Payments

Breakout of ISS National Lab Grants Payments

	Q1FY23	Q2FY23	Q3FY23	Q4FY23	FY23 YTD Total
Academic	$480,951	$386,002			$866,953
Commercial	$1,018,553	$649,380			$1,667,933
Other Government Agency	-	$5,834			$5,834
Total	**$1,499,504**	**$1,041,216**			**$2,540,720**

Total Value of Grants Awarded *(i.e., funds committed toward future projects)*

	ACTUAL Q1	ACTUAL Q2	ACTUAL Q3	ACTUAL Q4	ACTUAL FY23
Total value of grants awarded[a]	$107,100	$1,600,256			

a. Grants include awards to projects and programs as well as modifications and extensions. The ability to award new grants will be dependent on the availability of additional funding for the ISS National Lab.

Breakout of Cooperative Agreement Funding

	Q1FY23	Q2FY23	Q3FY23	Q4FY23	FY23 YTD Total
Direct	41%	47%	%	%	44%
Indirect	22%	25%	%	%	24%
Grants	37%	28%	%	%	32%

IN-ORBIT ACTIVITIES

- SpaceX's 27th Commercial Resupply Services (CRS) mission delivered several ISS National Lab-sponsored payloads, including the following (complete details on the SpaceX CRS-27 launch page):
  - Two tissue chip investigations funded by the National Institutes of Health (NIH), one from Johns Hopkins University and one from Stanford University, are studying microgravity's effects on engineered heart muscle tissue, and results could lead to new heart disease treatments.
  - Pharmaceutical company Bristol Myers Squibb is studying the crystallization of biotherapeutic compounds in microgravity to help refine drug screening.
  - Biomedical startup MakerHealth is exploring ways to optimize its modular biochemical manufacturing platform (AmpliRX), which could significantly reduce the cost of drug manufacturing.
  - The upgraded Redwire Space Biofabrication Facility is producing a human meniscus (knee cartilage) using materials launched on this mission.
  - L3Harris Technologies is using Aegis' MISSE Flight Facility to test 3D printed materials for satellite manufacturing.
- SpaceX launched its sixth crewed mission, bringing four astronauts to the ISS, where they will perform dozens of ISS National Lab-sponsored investigations during their six-month expedition.

R&D PROGRESS AND SUCCESSES

- Two new peer-reviewed journal articles were published in Q2 (view a full list of peer-reviewed journal publications related to the ISS National Lab at www.ISSNationalLab.org/publications):
  - Shishkina V, Kostin A, Volodkin A, et al. The Remodeling of Dermal Collagen Fibrous Structures in Mice under Zero Gravity: The Role of Mast Cells. Int J Mol Sci. 2023;24(3):1939.
  - Vagelli V, Graziani M. The AMS-02 detector on the ISS - Status and highlights after 11 years on orbit. J Phys Conf Series. 2023; 2429:012002.
- Micro-gRx filed a patent for a tissue chip system that cultures and electrically stimulates human skeletal muscle cells, which was developed as part of an ISS National Lab-sponsored investigation funded by NIH through the Tissue Chips in Space initiative.

LEO ECONOMY

Demand

- Six projects were selected in Q2:
  - Four were selected through NLRA 2022-5: Technology Advancement and Applied Research Leveraging the ISS National Lab: CisLunar Industries USA will demonstrate its in-space foundry technology, GEOJump Inc. will validate algorithms to advance the development of autonomous spacecraft for in-orbit servicing, Lunasonde will demonstrate the capabilities of a low-frequency radar system for its small satellite under development, and Orbit Fab will build on its previous ISS National Lab-sponsored research to advance its in-orbit refueling technology.
  - One was selected through a NASA Research Announcement entitled Research Opportunities for ISS Utilization, Special Focus Area 1A: Wake Forest University will build on its previous ISS National Lab-sponsored research to evaluate methods of producing vascularized liver tissue constructs.
  - One was a Commercial Service Provider partnership with Blue Origin that will allow the company to de-risk technologies before the operation of Orbital Reef.
- Three solicitations opened in Q2:
  - NLRA 2023-6: In-Space Production Applications: Advanced Materials and Manufacturing
  - NLRA 2023-7: Applied Research, Translational Science, and Technology Development, Cycle 2

- NASA Research Announcement entitled Research Opportunities for ISS Utilization, Special Focus Area 1A, seeking flight projects in the area of in-space production applications for tissue engineering and biomanufacturing

Supply

- Voyager Space acquired ISS National Lab Commercial Service Provider ZIN Technologies Inc.
- Northrup Grumman's Cygnus spacecraft will no longer be able to support post-ISS mission operations because the ISS Program is now utilizing all available contingency propellant on Cygnus to perform ISS reboosts while the spacecraft is berthed. This has resulted in the loss of capability to support the SlingShot small satellite deployer system operated by Commercial Service Provider SEOPS, LLC.

Investment

- In the environment of a broader economic slowdown and the rising cost of capital, recent bank failures have affected startup ecosystems and future credit availability, and the volume of exit transactions for venture capital investments remained at the lowest levels in more than a decade. This has led to a further slowing of broader venture capital investment activity in the U.S. over the last quarter. Not surprisingly, capital-raising activity by early-stage companies in the ISS National Lab ecosystem also slowed, with government grant funding contributing an increasing share of the resources acquired. Based on publicly available data, $10 million of private and public capital and grant funding was raised in Q2 by startups that have completed a flight project with the ISS National Lab. To date, more than $1.9 billion of such startup funding has been raised post ISS National Lab flight projects.
  - Companies in the ISS National Lab ecosystem that secured funding in Q2 include Kall Morris Inc., Lonestar Data Holdings, Orbit Fab, Orbital Sidekick, and others.
- The ISS National Lab Investor Network continues to expand, reaching 283 members in Q2. CASIS has facilitated more than 1,200 capital introductions between startups and investors in the ISS National Lab ecosystem.

EDUCATION OUTREACH AND ENGAGEMENT

- The ISS gained one new STEM education partner program in Q2: Club for the Future, Blue Origin's educational foundation.
- The Space Station Ambassador program continued to expand, with 175 new members in Q2.
- The ISS National Lab collaborated with Space Station Explorers partner programs ISS-Above, Orion's Quest, and Higher Orbits to exhibit at the National Science Teachers Association Conference and with ISS-Above and Orion's Quest to exhibit at the Future of Education Technology Conference.
- The ISS National Lab STEM Education team participated in several additional conferences, including the Collier County Public Schools STEAM Conference, the Beyond School Hours Conference, the Space Exploration Educators Conference, and the National Afterschool Association Convention.
- The ISS National Lab Education Program Director traveled to Washington, D.C., to represent the ISS National Lab at the National Council of Space Grant Directors.

OUTREACH AND STAKEHOLDER ENGAGEMENT

- CASIS released the ISS National Lab Annual Report for Fiscal Year 2022, highlighting the successes achieved during FY22 to advance the ISS National Lab's mission to return value to the nation and enable a sustainable economy in low Earth orbit.

- A new issue of *Upward*, official magazine of the ISS National Lab, was released, showcasing successful results from three investigations: Orbit Fab's in-space refueling technology demonstration, the Mighty Mice investigation that could lead to new treatments for bone and muscle loss, and the Frederick National Lab project to improve protein crystal growth to advance cancer research.
- ISS National Lab public relations outreach for SpaceX CRS-27 earned media coverage in outlets such as CardiacVascularNews and Fierce Biotech.
- The ISS National Lab and NASA hosted a live downlink at the Consumer Electronics Show (CES), the largest technology conference in the world. The ISS National Lab also facilitated a panel session moderated by CNN's Jackie Wattles that included Commercial Service Provider Redwire Space and ISS National Lab user Procter & Gamble.
- ISS National Lab staff presented at the Workshop on Semiconductor Manufacturing in the Space Domain at Stanford University and the NASA Human Research Program Investigators Workshop.
- ISS National Lab staff participated in several additional speaking engagements, including the Health From Space Conference, Space Summit Europe 2023, SATELLITE Conference 2023, the Next-Generation Suborbital Researchers Conference, the National Academies Space Science Week 2023, the NASA Commercial Space Lecture Series, and the NASA Spaceflight Technology Applications and Research Program.

Full Project Pipeline Details

- Visit our project pipeline database for a complete list of ISS National Lab-sponsored projects and programs, including flight status.