National Aeronautics and Space Administration

NASA'S

LOW EARTH ORBIT MICROGRAVITY STRATEGY

DRAFT GOALS AND OBJECTIVES

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Contents

Foreword

It is with great excitement and pride that I present to you the draft goals and objectives for NASA's Low Earth Orbit (LEO) Microgravity Strategy. This marks a pivotal moment in our journey as we chart the course for our future human spaceflight endeavors and scientific discovery in low Earth orbit. I express my sincere gratitude to the myriad of contributors who have made this document possible. Their hard work, insights, and vision have been invaluable.

As we stand on the threshold of an unprecedented era in space exploration, the complexity and scope of our ambitions are truly remarkable. Our mission encompasses not just the establishment of sustainable infrastructures in lunar orbit and on the lunar surface, and the bold endeavor of reaching Mars, but also continuing to advance scientific discovery, space technology, and support deep space exploration in low Earth orbit. This multi-faceted approach represents both a monumental challenge and an extraordinary opportunity for humanity.

Our initial draft of the LEO Microgravity Goals and Objectives is based on a vision for the future and the idea of architecting from the right. These goals and objectives for the low Earth orbit microgravity environment will shape the capabilities required to achieve them. We are seeking extensive feedback and innovative ideas from stakeholders and the public. Your responses will help us refine our approach.

As we move forward, these goals and objectives will continue to mature in response to new knowledge, emerging technologies, and the evolving landscape of our partnerships. Our commitment to transparency and collaboration remains steadfast, and we eagerly anticipate the continued engagement of all stakeholders as we advance human exploration.

Thank you for your dedication and enthusiasm in this collective effort. Together, we are shaping the future of space exploration, and I look forward to the exciting journey ahead.

Pam Melroy
NASA Deputy Administrator

NASA is leading the next generation of human presence in low Earth orbit to advance microgravity science, technology, and exploration.

From the very beginning, NASA's flagship human spaceflight programs have built upon each other, expanding our knowledge and experience of humans living and working in space. Mercury, Gemini, and Apollo delivered NASA astronauts to low Earth orbit and then to the Moon. With the space shuttle, NASA regularly put humans in space and learned to conduct research and technology development in microgravity.

In its decades of operations, the International Space Station has been a test bed for long-duration microgravity research and technology development. Today, there are dozens of research facilities within the space station, with capabilities that replicate scientists' terrestrial labs, facilitating research that would not be possible in the gravity environment on Earth. The discoveries derived from this research have, and continue to, benefit humanity.

However, the space station was not designed to last forever, and is planned to be retired at the end of the decade. Meanwhile, the commercial space industry is proposing bold follow-ons. Some companies envision delivering commerical destinations to low Earth orbit, enabling NASA and others to carry on scientific research and technology development under operating models quite different from the space station.

In light of this rapidly evolving environment, NASA must answer this question: what should NASA's goals and objectives be in low Earth orbit to advance future science and space exploration missions? This document outlines the lessons NASA has learned from its past experience, the reasons for pursuing continued activities in low Earth orbit, and the steps NASA is undertaking to develop goals and objectives to guide future work.

Why low Earth orbit?

NASA's Moon to Mars Strategy Objectives Development document, published in April 2023, lays out a blueprint for establishing responsible, sustained human presence throughout the solar system. In it, NASA outlined the benefits to humanity that uniquely accrues from space exploration. The major reasons were to advance unique science, serve as a global science and technology leader, and inspire the next generation.

These same reasons also apply to activities in the low Earth orbit microgravity environment.

Advancement of science and technology is the first and arguably purest reason to continue pursuing activities in low Earth orbit. NASA has learned a great deal from its time operating in the low Earth orbit microgravity environment. However, the recently published National Academies of Sciences, Engineering, and Medicine Decadal Survey on Biological and Physical Sciences Research in Space 2023-2032 emphasizes how much more there is to understand. NASA funds foundational research to meet these decadal priorities, and some scientific questions can only be answered through experimentation in the microgravity environment. Low Earth orbit is generally more cost-effective than sending experiments further into space. A microgravity research ecosystem, encompassing both trained research scientists and research facilities is needed to conduct these experiments.

Similarly, in line with efforts to spur our national posture in space, as stated in the *United States Space Priorities Framework*, "The United States will remain a global leader in science and engineering by pioneering research and technology that propels exploration of the Moon, Mars, and beyond," and "...the United States will continue to leverage civil space activities to foster new commercial space services such as human space transportation and space stations in low Earth orbit." The presence of U.S. astronauts on regular join missions with international partners is one of the most internationally visible and influential examples of U.S. leadership in the world. The systems and subsystems we will build for these endeavors, including human missions to Mars, must be thoroughly tested beforehand. Testing relevant systems in low Earth orbit will be far more cost-effective and less risky than testing them in deep space. In addition, current and prospective international partners have indicated the importance of low Earth orbit as a destination.

Finally, just as the Mercury, Gemini, Apollo, and space shuttle programs inspired generations of space explorers, scientists, and engineers, the space station has brought the wonders of space exploration to a new generation, showing that people from many nations can live and work together in space to achieve common goals. NASA activities in low Earth orbit provide everyday opportunities for government astronauts to engage and inspire the general public, educators, and students. We have seen NASA's public engagement activities inspire the general public, educators, and the next generation of science, technology, engineering, and mathematics (STEM) workers and innovators who, if born after the year 2000, have never known a world without a human in space. Inspiring the next generation – the workforce of tomorrow – to pursue careers not only in STEM fields, but also critical support roles for space exploration endeavors, ensures we progress as a society and ultimately improve the world for future generations.

What NASA has gleaned from low Earth orbit activities informs future deep space exploration.

Over decades of its human spaceflight programs, NASA and the industry supporting it have amassed a wealth of expertise in living and working in the low Earth orbit microgravity environment. The key categories of experiences and expertise are addressed below. NASA must draw on all that it has learned in low Earth orbit to determine what should come next, particularly as NASA prepares to implement its Moon to Mars blueprint.

Science

Scientific research conducted aboard the space station has yielded benefits to those of us on Earth, including drug development to treat diseases such as cancer and muscular dystrophy, improved medical imaging, and a new field of fuel-efficient combustion. This work has also improved our understanding of plant growth in space and fluid behavior in microgravity. External platforms on the space station have hosted Earth- and space-observing payloads and technology demonstrations.

Through 70 long-duration expedition missions, NASA has also accumulated a vast body of knowledge about the human body and the changes it undergoes in microgravity. This information will be critical to future deep space exploration missions and mitigating as many as 20 health risks astronauts will face. NASA must draw on its experience and expertise to design future scientific investigations appropriately done in the microgravity environment, including the development of physiological countermeasures and systems to protect astronauts for exploration missions to the Moon and beyond.

Exploration-Enabling Research and Technology Development

Deep space exploration to Mars will likely require crews to operate in microgravity for six to nine months. Through its proximity in low Earth orbit, the space station has enabled engineers to demonstrate technologies in the microgravity environment, learn lessons, and evolve designs enabling deep space exploration based on these demonstrations. The space station's Environmental Control and Life Support System (ECLSS), for example, is designed to be both microgravity-compatible and regenerative, i.e., it reduces the amount of consumables needed for longer-duration crewed missions. By testing this system in microgravity on the continuously-crewed space station, NASA has developed a critical capability that will be needed on spacecraft conducting long-duration transits to deep space. Such capabilities are crucial to reducing the logistics burden and associated costs for current and future deep space exploration missions. NASA must consider low Earth orbit as the proving ground for technologies critical to deep space exploration.

Operational Skills

Living and working in the microgravity environment requires a wide range of unique skills, not just in orbit. NASA has developed this expertise throughout its flagship human spaceflight programs, including the space station. The transition from space shuttle operations to space station operations required required NASA to move from from short-duration missions (lasting 16 days or less) to long-duration missions (lasting months to a year and more. To date, the space station has hosted over 160 U.S. astronauts for missions of varying durations. This also meant a significant shift in NASA training and mission planning.

U.S. microgravity operations are not just limited to government astronauts and the NASA workforce. Today, space station activities involve the private sector and academic institutions. To achieve its future exploration goals, NASA and U.S. industry must retain their critical operational skills for both short and long duration missions. As we move towards exploration of the lunar surface and eventually Mars, this experience will be crucial to designing and implementing successful deep space exploration missions, much of which will be conducted in microgravity. NASA must also understand which competencies and skills are not relevant to deep space operations, so that we can divest ourselves of them or hand those over to industry.

Commercial Low Earth Orbit Infrastructure

Over its two decades of operations, the space station has enabled the growth of the commercial space industry, which has had billions of dollars in national economic impact across the United States. NASA recognizes the role it has played in spurring low Earth orbit commercialization and development of space technologies and capabilities through programs like Commercial Resupply Services, Commercial Crew, and our partnership with the International Space Station National Lab. The impacts include not just technologies and their spin-offs, but also quality, high-paying jobs across the country. Commercial space activity has also positively impacted other industries such as agriculture, maritime, energy, and homeland security, which in turn have produced their own ripple effects throughout the economy. As the microgravity research performed on the space station has unlocked the potential for improving our lives here on Earth, it has unleashed billions of dollars of capital investment in emerging technologies. In its next phase of endeavor in low Earth orbit, NASA must make best use of commercial partnerships to field modern and efficient platforms, noting that NASA is likely to be the anchor tenant in one or more of these platforms. NASA must also be willing to transfer to industry those space activities that can be more efficiently performed by commercial partners and unlock the economic potential that this may hold for the nation as a whole.

International Cooperation

International partnerships have been another hallmark of the space station program, bringing together a cadre of explorers, scientists, and engineers from across the world and demonstrating that together we can achieve feats that might not be possible otherwise. We recognize international cooperation is foundational to space exploration, and cooperation in the the microgravity environment has proven to be a fertile ground for strengthening and expanding our relationships with foreign partner and international space agencies.

Workforce and Engagement

People power the agency's missions, including the space station, and ensuring there is a skilled and competent workforce has been a key to success for NASA's human spaceflight endeavors. As we move towards exploration of the lunar surface and eventually Mars, engaging, developing, and retaining these skills and experience will be crucial to designing and implementing successful missions. NASA has deployed its astronauts in orbit aboard the space station to engage with the science community, commercial and international partners, and the general public extensively throughout the space station's lifecycle. These have advanced science, reinforced the cooperative nature of U.S. spaceflight, and inspired new generations of space enthusiasts. NASA must consider these experiences as it thinks ahead to the next phase of low Earth orbit activities.

As NASA looks to the next chapter in U.S. human space exploration, we have the opportunity to shape the agency's future in the low Earth orbit microgravity environment.

The United States endeavors to continue to lead in the advancement of science and the exploration of space in the microgravity environment. We must inspire the next generation of explorers, scientists, engineers, innovators. We must maintain skills relevant to our future missions that NASA and its industry partners have developed over the course of decades to operate in the microgravity environment even after the end of the space station's mission.

In early 2024, the agency began an effort to develop and document an objectives-based strategy toward its sustained exploration of low Earth orbit, as we transition from the space station to commercial destinations in low Earth orbit. This process is designed to identify what we want to achieve in low Earth orbit before resolving how we achieve these objectives.

Senior leaders and staff from NASA's mission directorates and support offices have developed the draft set of objectives we believe define NASA's human-enabled low Earth orbit microgravity strategy. These are divided into six main categories:

- Science
- Exploration-Enabling Research and Technology Development
- Commercial Low Earth Orbit Infrastructure
- Operations
- International Cooperation
- Workforce and Engagement

The methodology for developing this strategy is guided by principles first applied to develop NASA's Moon to Mars Strategy:

Articulate a Clear Vision

Effectively communicate what NASA hopes to achieve in the low Earth orbit microgravity environment.

Take An Objectives-Based Approach

Focus on achieving specific goals and outcomes as the primary guide for decision-making.

Architect from the Right

Use clear goals and objectives to determine needs and capabilities, functions, and use cases.

While maintaining our focus on mission success for the space station and commercial platforms, the agency's objectives ensure NASA has a comprehensive framework in place that supports our science, technology, and exploration goals in the future. To ensure alignment with our evolving goals, NASA will regularly assess and update the strategy based on progress and advancements. Ultimately, this approach provides a clear, objectives-based roadmap for advancing human exploration and scientific discovery in space, adapting as needed to the shifting frontiers of our space exploration endeavors.

SCIENCE

Biological Science

Goal	Advance understanding of how biology responds to the unique environment of low Earth orbit.
BS-1	Understand the effects of short- and long-duration exposure to the microgravity environment on living systems.
BS-2	Identify alterations in biological mechanisms required for organisms to survive the transition and adapt to living in space, and understand the changes required to re-acclimate to life on Earth.
BS-3	Investigate how genetic diversity and life history influence physiological adaptation to the space environment.
BS-4	Discover how communication between cells, tissues, and organisms is affected by spaceflight.

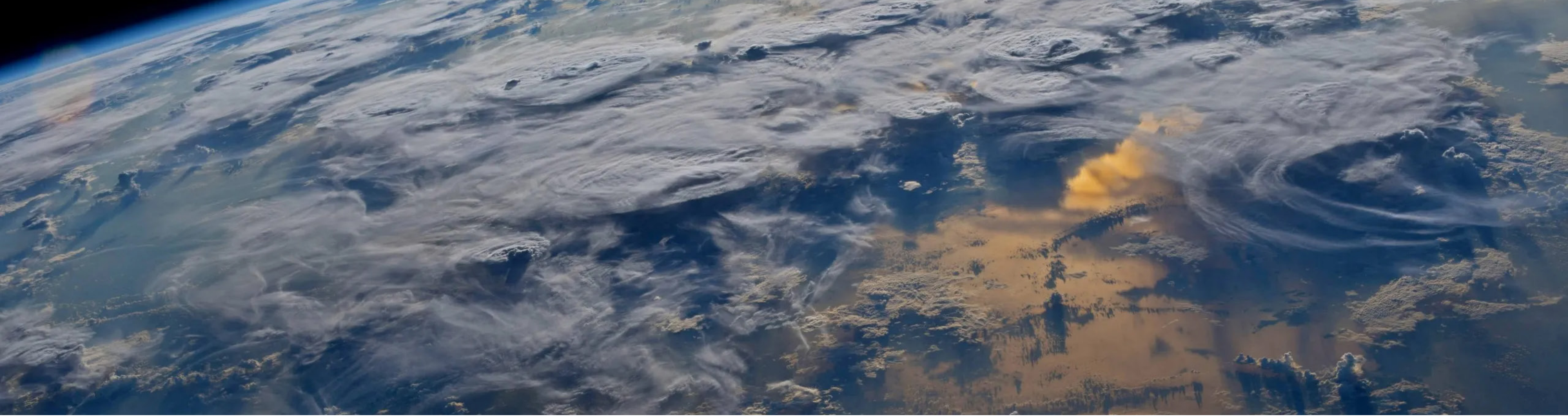
Rationale:
Life has evolved and persisted on Earth while under the constant influence and selective pressures from Earth's physical environment. Biological systems, from DNA and cells to plants and animals, are affected by being in space. Using model organisms, human micro-physiological systems, and plants, research in space-related biological sciences aims to reveal how the unique space environment of microgravity, exposure to space radiation, and an altered living environment due to the closed habitat modifies biological systems. Humans, animals, plants, and microbes interact with each other, forming unique ecosystems on Earth and in the spacecraft environment. It is critical therefore that space-life science focused research helps us gain better understanding of how these exploration-based ecosystems are established, how they change over time, and how they can be monitored, controlled, and kept in equilibrium. Understanding the fundamental mechanisms that drive changes to model systems during spaceflight allows us to aid in identification of human health risks associated with space exploration and to develop the best methods for growing plants in space.

SCIENCE

Physical Science

Goal	Use the unique environment of low Earth orbit to probe phenomena hidden by gravity or terrestrial limitations.
PS-1	Understand the fundamental principles that organize the structure and functionality of materials, including soft and active matter.
PS-2	Investigate the fundamental laws that govern the behavior of systems that are far from equilibrium.
PS-3	Advance understanding of the mission-relevant chemical and physical properties and phenomena that govern the behavior of fluids and combustion in space environments.
PS-4	Seek new discoveries in physics, including particle physics, general relativity, and quantum mechanics, that can only be discovered by experiments carried out in space.

Rationale:
Outstanding questions in physics and the physical sciences remain. What are dark matter and dark energy? How can the standard model of particle physics be unified with general relativity? Important questions about the physical world, including quantum phenomena, can be answered only in the space environment, leveraging unique conditions such as microgravity. Key interactions in many experiments are hidden by effects of Earth's gravity. Access to the space environment enables not just elegant but otherwise impossible research that opens up new insights. Physical sciences also concern the search for precise understanding of what happens to physical systems and processes in the space environment and how to use both Earth-based and off-Earth materials effectively in space. Such knowledge of how to design, process, and use the solid, liquid, and gaseous materials that define the built environment of space travel and habitation is critical for sustaining long-term space exploration.

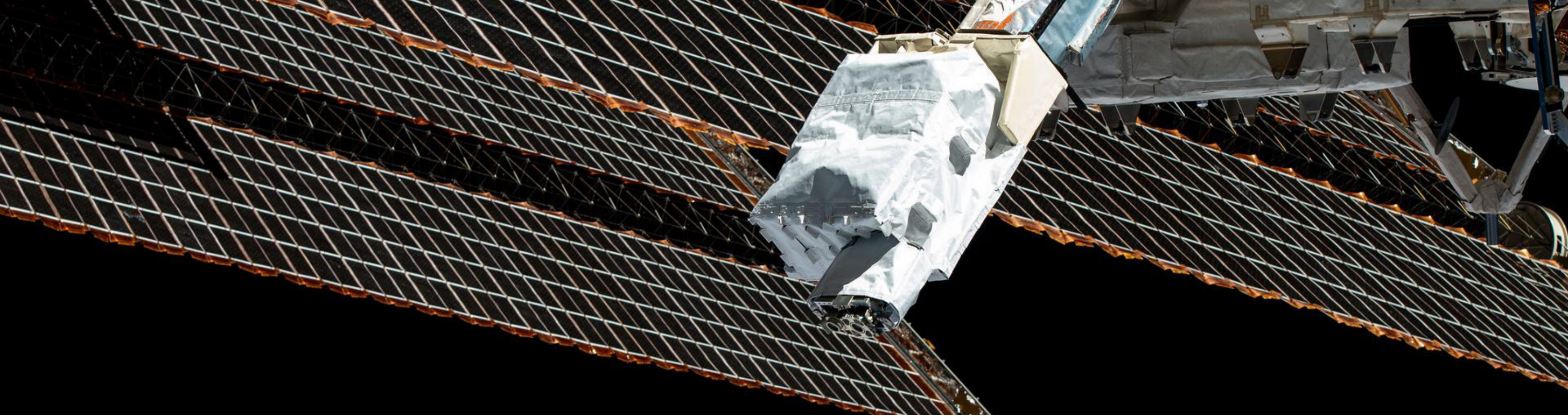


SCIENCE

Space and Earth Science

Goal	Leverage opportunities provided by human-enabled platforms to address high priority space and Earth science questions.
SES-1	Perform science and technology demonstration projects (in space and Earth science) best accomplished by leveraging the capabilities of human-enabled platforms.
SES-2	Enable and enhance space and Earth science projects by leveraging crew capabilities, including Earth observations or payload deployment and repair, where advantageous or when practical.

Rationale:
Space offers a unique vantage point for conducting space and Earth science research. Whether observing Earth below, the universe above, or the local space environment, measurements from space are essential for advancing NASA's space and Earth sciences. The use of human-enabled platforms for space and Earth science represents a cost-benefit trade against other alternatives, including NASA-developed missions and commercial data buys. There can be significant net benefits to demonstrating new technologies and making long-term observations from human-enabled platforms, including reduced cost, simplified development and deployment, and human-enabled servicing.



EXPLORATION-ENABLING RESEARCH AND TECHNOLOGY DEVELOPMENT

Exploration Technology

Goal	Leverage the unique environment of low Earth orbit to advance technologies that enable future human exploration on and around the Moon and Mars.
ET-1	Demonstrate and validate robotic and autonomous systems that maximize crew time available for science and engineering activities.
ET-2	Test and demonstrate the performance of materials through long duration exposure to the space environment and inform materials selections for future missions.
ET-3	Demonstrate advanced manufacturing techniques and non-destructive evaluation in microgravity.
ET-4	Demonstrate in-space assembly of structures to enable increasingly complex mission concepts.
ET-5	Demonstrate in-space performance of exploration environmental control and life support systems.
ET-6	Demonstrate crew habitation, health, and performance technologies and systems in preparation for exploration missions.

Rationale:
Establishing a sustained presence on the Moon and ultimately human presence throughout the solar system requires advanced technologies and capabilities. Low Earth orbit provides a relevant, more accessible environment to progressively demonstrate, test, and validate critical exploration-enabling technologies that cannot be fully tested on Earth.

EXPLORATION-ENABLING RESEARCH AND TECHNOLOGY DEVELOPMENT

Applied Research

Goal	Advance understanding of how to sustain human health and performance using relevant exploration analog environments in low Earth orbit to reduce risks and inform Moon, Mars, and deep space missions.
AR-1	Understand the effects of short- and long-duration exposure to microgravity and other spaceflight conditions on human health and performance.
AR-2	Evaluate and validate the efficacy of progressively Earth-independent health and performance countermeasures, systems, and operations for crew, with environments and durations representative of exploration missions.
AR-3	Characterize and evaluate the interaction between crew and exploration systems in the space environment and effects on human health and performance.

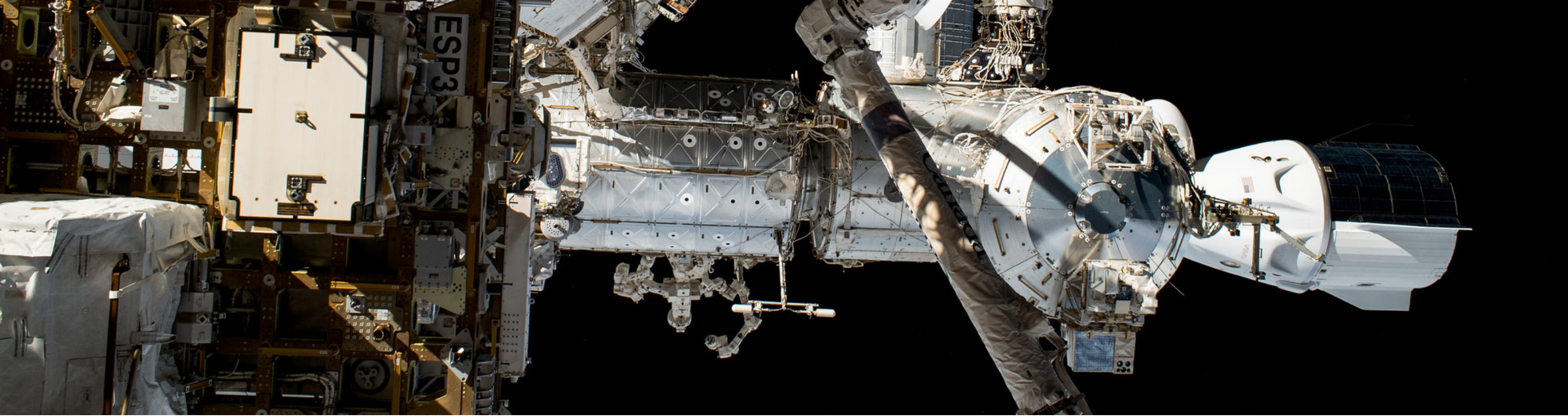
Rationale:
As human exploration extends beyond low Earth orbit, it is important to progressively demonstrate the ability to safely and effectively live and work in the lunar and Martian environments for extended durations. While some studies can be conducted on Earth, platforms in low Earth orbit provide more accessible opportunities to perform intermediate, integrated applied research on crew health and performance, countermeasures, systems, and operations, and to expand available data on a diverse population, prior to implementation in the lunar or Martian vicinity.

EXPLORATION-ENABLING RESEARCH AND TECHNOLOGY DEVELOPMENT

Exploration Operations

Goal	Demonstrate crewed mission operations in low Earth orbit as part of a build-up approach to living and working in environments relevant to Moon and Mars exploration.
EO-1	Evaluate the effects of extended mission durations on crew and systems performance, reduce risk, and shorten the timeframe for readiness validation prior to an exploration campaign.
EO-2	Simulate interactions between Earth, crew members in space, and a Martian surface team, considering communication delays, autonomy levels, and time required for an early return to Earth.
EO-3	Evaluate, understand, and mitigate the impacts on crew health and performance of an extended duration deep space mission and transition to gravity surface operations by conducting mission operations that simulate key parameters.

Rationale:
Low Earth orbit provides an opportunity to progressively work through operational aspects that can only be simulated with crew in space, including the ability of crew to effectively function in a gravity environment immediately following extended time in microgravity. Crewed low Earth orbit platforms also enable simulation of exploration operations and interactions between personnel on Earth and flight crew in a relevant environment.



COMMERCIAL LOW EARTH ORBIT INFRASTRUCTURE

Transportation and Habitation

Goal	Enable and leverage commercial low Earth Orbit infrastructure to support NASA's mission.
THI-1	Enable the commercial sector to build and deliver safe, reliable, and sustainable destinations in low Earth orbit that support NASA activities.
THI-2	Enable the use of sustainable, commercially-owned-and-operated cargo and crew transportation capabilities.
THI-3	Enable interoperability of systems, where required and beneficial, to streamline transition between the International Space Station and commercial low Earth orbit destinations and facilitate transportation and user flexibility.

Rationale:
NASA envisions being one of many customers for transportation and operations in low Earth orbit, purchasing services from commercial providers to meet the agency's needs. To enable this future, NASA recognizes it must facilitate the development of safe and reliable destinations in low Earth orbit that support NASA activities (including scientific advancement, technology development and testing, human research, and crew accommodation), while also encouraging the broad investment in, and use of, commercial services that support the agency's activities in low Earth orbit.

COMMERCIAL LOW EARTH ORBIT INFRASTRUCTURE

National Research and Development

Goal	Enable infrastructure to support research and development in low Earth orbit to provide benefits to the nation.
RD-1	Facilitate broad use of commercial low Earth orbit destinations for government-sponsored microgravity research and development.
RD-2	Promote in-space applications for terrestrial use that leverage the unique environment of low Earth orbit.

Rationale:
The Center for the Advancement of Science in Space, the current organization which flies non-NASA science to the International Space Station and manages the International Space Station National Lab, has been successful in facilitating and growing research and development in space since its creation in 2005. The continuity of infrastructure to coalesce government efforts to utilize space for research, technology development, and innovation as we transition from the International Space Station to commercial low Earth orbit destinations will continue to reap benefits to humanity.

Operations

Goal	Conduct human missions in low Earth orbit that provide the capability for the U.S. government to develop and maintain proficiency in operating in the microgravity environment to support NASA's human deep space exploration missions, which will operate for extended durations in microgravity.
OPS-1	Enable capability for U.S. government astronauts to develop skills and maintain proficiency in microgravity.
OPS-2	Enable capability for U.S. ground-based workforce to develop skills and maintain proficiency in designing systems, preparing science for use in microgravity, and implementing successful deep space exploration missions.
OPS-3	Enable and organize joint missions with international partners to maintain proficiency in joint mission planning and integration.

Rationale:
Living and working in the microgravity environment requires a wide range of unique skills. Through its flagship human spaceflight programs, including the International Space Station, NASA has developed this operational expertise across its astronaut corps and the agency's ground-based workforce. Likewise, through the International Space Station program, NASA has developed institutional knowledge and expertise in jointly planning for and executing missions with both international and commercial partners. As we move towards exploration of the lunar surface and eventually Mars, this experience will be an important part of designing and implementing successful deep space exploration missions, which will include extended operations in microgravity, and some with international and commercial partners.

International Cooperation

Goal	Champion broad and aspirational international participation in low Earth orbit by a diverse set of providers and users (government and non-government) to foster innovation, achieve NASA science and exploration goals, and maintain a strong, U.S.-led international presence in low Earth orbit.
IC-1	Define new pathways to partnership in low Earth orbit: government-to-government, industry-to-industry, and government-to-industry, and ensure these pathways are adaptable as low Earth orbit activities evolve over time.
IC-2	Cultivate mutually beneficial government-to-government international partnerships that enhance the effectiveness of NASA programs and advance U.S. national interests.
IC-3	Drive the creation of robust low Earth orbit capabilities by encouraging international governments, industry, and research organizations to engage with U.S. industry.
IC-4	Inform the development of laws and regulations in the U.S. and support global legal and regulatory harmonization to enable safe and sustainable collaboration in low Earth orbit.

Rationale:
Our history of operations on the International Space Station exemplifies our commitment to international cooperation in low Earth orbit. Our aim is to continue that tradition of cooperation by enabling new paradigms for partnerships that will expand the global base of users. As participation in low Earth orbit expands, the international community will also need to drive towards a safe, sustainable, and peaceful environment through the development of harmonized global legal and regulatory regimes. By expanding opportunities for cooperation, defining new pathways for that cooperation, continuing to partner with our foreign counterparts, and supporting the development of a harmonized global legal and regulatory environment, we will ensure that low Earth orbit remains a frequent, accessible, and safe destination for science and exploration in the years to come.

WORKFORCE AND ENGAGEMENT

Workforce Development and STEM Engagement

Goal	Engage, develop, and retain the U.S. workforce needed to conduct future NASA missions by leveraging authentic connections to human space operations in low Earth orbit.
WSE-1	Leverage the knowledge, skills, and experience of the incumbent workforce supporting human space exploration to develop a workforce optimized for future science and space exploration missions.
WSE-2	Provide opportunities for post-secondary students to conduct research and technology development in microgravity.
WSE-3	Leverage human-enabled low Earth orbit activities to build a pipeline of early career talent through career awareness and work experience opportunities.
WSE-4	Inspire, engage, and contribute to K-12 students' STEM education through programming that provides connections to humans living and working in space.
WSE-5	Incorporate STEM engagement programming in onboard operations on a routine and recurring basis.
WSE-6	Leverage ground support and payload team personnel in STEM engagement programming.

Rationale:
Future space exploration, whether in low Earth orbit or on and around the Moon and Mars, requires a skilled workforce, broadly educated in STEM fields and specifically skilled in space operations and in-space scientific research and technology development. To ensure a steady pipeline of workers, today and in the future, we must engage students from the earliest grades through high school, undergraduate, and graduate study, involving them in authentic learning experiences and evidence-based programs designed to spark and maintain interest in STEM and space exploration, and grow requisite skills. Likewise, it is critical to engage and retain the existing microgravity workforce to avoid a loss of expertise and creation of a gap in workforce availability as we envision our future in low Earth orbit. The proximity of low Earth orbit provides routine access to the microgravity environment, enabling opportunities to engage the next generation of explorers, as well as to develop and retain the workforce needed to meet NASA's future needs.

WORKFORCE AND ENGAGEMENT

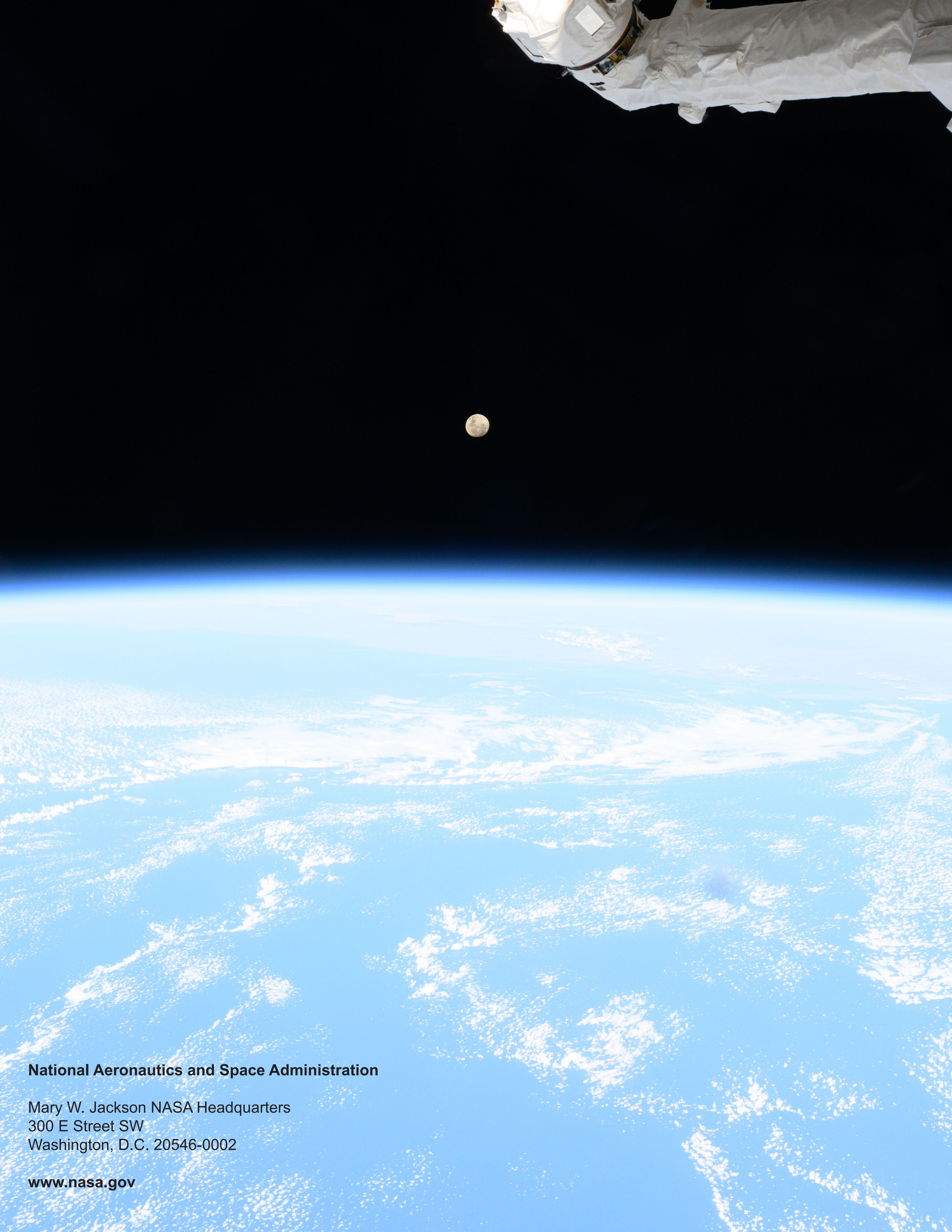
Communications and Public Engagement

Goal	Showcase agency-enabled operations in low Earth orbit to the widest possible extent, highlighting the many benefits gained through science and technology development on human-enabled, orbiting research platforms.
CPE-1	Engage and inspire NASA's many audiences and future generations of explorers via the unique backdrop of real-time space operations.
CPE-2	Increase public and key stakeholder understanding regarding NASA and its partners' activities in low Earth orbit.

Rationale:
NASA has a responsibility to share information to the widest possible and appropriate extent concerning its activities and the results thereof. NASA's operations in low Earth orbit provide a unique opportunity to inform the agency's diverse audiences and inspire the next generation of explorers. Through agency-enabled operations, future commercial destinations, and other activities, NASA will educate and engage its many stakeholders regarding the human operations, science, and technology development efforts in low Earth orbit and the many benefits returned to Earth.

Glossary

Architecture	A set of functional capabilities, their translation into elements, their interrelations, and operations. The architecture enables the implementation of various mission scenarios that achieve a set of given goals and objectives.
Campaign	A series of interrelated missions that together achieve agency goals and objectives.
Demonstrate	Deploy an initial capability to enable system maturation and future industry growth in alignment with architecture objectives.
Develop	Design, build, and deploy a system, ready to be operated by the user, to fully meet architectural objectives.
Extended Duration	Time intervals approaching cumulative cruise, orbit, and return cruise times anticipated for exploration missions to Mars.
Global	Infrastructure and capabilities that support human and robotic operations and utilization across the subject planetary surface.
Ground-based Workforce	Includes space operations ground personnel, including flight control, mission planning, crew training, and engineering support, as well as microgravity research and technology development scientists and engineers.
Human-enabled Platforms	Space vehicles that are certified to support U.S. government astronauts for at least part of the time and serve as long-duration platforms for both tended and un-tended activities.
Incumbent Workforce	Includes NASA, contractor, and commercial partner ground-based workforce supporting current low Earth orbit operations with skills that are relevant for successful future low Earth orbit and deep space missions.
Live	The ability to conduct activities beyond tasks on a schedule. Engage in hobbies, maintain contact with friends and family, and maintain healthy work-life balance.
Long Duration	Time intervals long enough to demonstrate desired performance, with specific interval defined by individual application.
Mission	A major activity required to accomplish an agency goal or to effectively pursue a scientific, technological, or engineering opportunity directly related to an agency goal. Mission needs are independent of any particular system or technological solution.
Routine	Recurring subject operations performed as part of a regular procedure rather than for a unique reason.
Short Duration	Minimum time interval required for scientific analysis, with specific time interval defined by individual research application.
Sustainable	Supported operations over the long-term.
Unique Environment	Gravitational and radiation in the low Earth orbit environment.
Validate	Confirming that a system satisfies its intended use in the intended environment (Did we build the right system?).



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