NASA Strategic Plan 2022

NASA inspires the world through exploration and discovery, leading scientific and technological advancements that benefit Americans and all humanity. Our efforts in space help to further the national economy, including through innovative commercial partnerships with American businesses. With the increasing threat of climate change, NASA's efforts to study and understand the Earth are of critical global significance. In addition, NASA's partnerships with academic institutions support a robust Science, Technology, Engineering, and Mathematics (STEM) workforce and promote diversity, equity, and inclusion in the fields of science and technology.

We embrace the challenge of furthering global scientific and technological achievement and expanding the realm of what is possible in aeronautics and space. This challenge is our passion, our purpose, and is reflected in our Vision and Mission.

Contents

National Aeronautics and Space Administration (NASA)

Stakeholder(s):

Bill Nelson
Role: NASA Administrator

Aeronautics Research Mission Directorate

Role: Research

The Aeronautics Research Mission Directorate (ARMD) conducts research to advance the safety, capacity, and efficiency of the air transportation system, reduce emissions, and sustain U.S. technological leadership in the aviation industry.

Space Technology Mission Directorate

Role: Transformational Technology Investment

The Space Technology Mission Directorate (STMD) invests in transformational technologies that help offset future mission risk, reduce cost, advance capabilities that enable NASA's missions, and support space industry growth and high-quality job creation. STMD identifies and promotes research and technology development, demonstrates applicability, and supports the infusion of these technologies into NASA's exploration and science missions as well as commercial space activities.

Science Mission Directorate

Role: Scientific Exploration

The Science Mission Directorate (SMD) conducts scientific exploration enabled by observatories that view Earth from space, observe, and visit other bodies in the solar system, and gaze out into the galaxy and beyond. NASA's science programs focus on three interdisciplinary objectives: discovering the secrets of the universe, searching for life in the solar system and beyond, and safeguarding and improving life on Earth.

Exploration Systems Development Mission Directorate

Role: Systems Development

The Exploration Systems Development Mission Directorate (ESDMD) defines and manages the systems development for programs critical to the Artemis lunar exploration initiatives. ESDMD is responsible for developing the Space Launch System, the Orion spacecraft, and Exploration Ground Systems. ESDMD also is responsible for developing technologies and capabilities to support sustainable human deep space exploration.

Space Operations Mission Directorate

Role: Launch & Space Operations

The Space Operations Mission Directorate (SOMD) focuses on launch and space operations, including launch services, space communications and navigation, and eventually, sustaining operations on and around the Moon. SOMD also manages the International Space Station (ISS) and commercial space capability development and on-going operations, such as commercial crew and cargo flights and the program to develop the commercial space stations that will replace the ISS.

Mission Support Directorate

Role: Management

The Mission Support Directorate (MSD) enables the Agency's missions by managing institutional services, capabilities, and critical mission support resources. MSD is actively reducing institutional risk to NASA's current and future missions by improving processes, stimulating efficiency, and providing consistency and uniformity across institutional standards and practices.

Vision

Exploring the secrets of the universe for the benefit of all.

Mission

To explore the unknown in air and space, innovates for the benefit of humanity, and inspires the world through discovery.

Values

Safety: NASA's constant attention to safety is the cornerstone upon which we build mission success.

Integrity: NASA is committed to maintaining an environment of trust, built upon honesty, ethical behavior, respect, and candor.

Inclusion: NASA is committed to a culture of diversity, inclusion, and equity, where all employees feel welcome, respected, and engaged.

Teamwork: NASA's most powerful asset for achieving mission success is a multidisciplinary team of diverse, talented people across all NASA Centers.

Excellence: To achieve the highest standards in engineering, research, operations, and management in support of mission success, NASA is committed to nurturing an organizational culture in which individuals make full use of their time, talent, and opportunities to pursue excellence in conducting all Agency efforts.

1. Discovery

Expand human knowledge through new scientific discoveries

Stakeholder(s)

Armstrong Flight Research Center (AFRC)

Role: Aircraft & Capabilities
AFRC provides specialized aircraft and capabilities to observe Earth's physical processes, test new observing technologies, and calibrate and validate Earth-observing satellites worldwide. AFRC enables improved understanding of our planet and ensures the success of the Science Mission Directorate's (SMD's) Earth Science research—particularly for its Airborne Science Program.

Ames Research Center (ARC)

Role: R&D
ARC conducts research and technology development in aeronautics, astrobiology, astrophysics, and planetary, biological, and Earth sciences.

Role: Mars, Earth, Life & Biosciences
ARC hosts the NASA's Mars Climate Modeling Center, the NASA Earth Exchange, the Center for Life Detection, and the Space Biosciences Collaborative.

Role: Aeronautics & Science Activity
ARC also leads a combined aeronautics and science activity focusing on research, detection, prediction, and mitigation of wildfires.

Role: Autonomy & Robotics
ARC's core expertise in autonomy and robotics plays an integral role in the exploration of planetary bodies.

Role: Volatiles Investigating Polar Exploration Rover
ARC leads the development of the Volatiles Investigating Polar Exploration Rover, which will prospect for resources in the lunar South Pole region.

Role: Vertical Lift Aircraft
ARC develops and tests vertical lift aircraft concepts, such as the Mars helicopter carried on the Mars 2020 Perseverance Rover mission, for operation in different planetary atmospheres.

Role: Small Spacecraft & Earth Science
ARC also manages the Small Spacecraft Technology Program and the Earth Science Project Office for airborne science investigations.

Role: Biological Systems
ARC develops, builds, and flies space missions and payloads to study the effects of the space environment on biological systems.

Role: Imaging
The Center has further expertise in infrared, ultraviolet, and visible imaging, neutron spectrometers, X-ray diffraction and fluorescence instruments, biofluidic systems, exoplanet imaging technologies, airborne Earth science instruments, and environmental life support systems.

Role: Supercomputing
ARC hosts the Agency's advanced supercomputing capability and systems, including leading disruptive technologies and data mining systems, with many scientific applications.

Role: Planetary Scientific Discovery
ARC enables planetary scientific discovery through its aerothermodynamics, thermal protection materials, and arc jet testing capabilities.

Glenn Research Center (GRC)

Role: Power, Propulsion, Materials & Structures
GRC's contributions to power and propulsion systems, materials and structures, and space environment research ensure that NASA maximizes the scientific knowledge gained from robotic missions and advances new capabilities for future exploration.

Role: Radioisotope Power & Electric Propulsion
GRC provides radioisotope power and electric propulsion systems, including the development of a next-generation radioisotope thermal generator, to ensure the success of current and future robotic planetary science missions.

Role: Materials & Structures
The Center's expertise in materials and structures, as well as unique space environment test facilities, are applied to develop and test electronics, scientific instruments, and other payloads for operation in the extreme environments of space.

Role: Microgravity Research
As a global leader in microgravity research, GRC collaborates with academia, other Government agencies, and industry to drive research in microgravity combustion, fluid physics, and soft matter dynamics. This research spans new concepts, testing in unique environmental test facilities, and conducting experiments on the ISS.

Goddard Space Flight Center (GSFC)

Role: Science Research
GSFC enables and conducts science research from space. The Center's measurements, modeling, and theoretical investigations in the areas of Earth science, planetary and lunar science, heliophysics, and astrophysics expand knowledge, national capability, and opportunities for collaboration on a variety of flight missions and field campaigns.

Role: Instruments
GSFC teams work with other NASA Centers, academia, and industry to conceptualize, design, build, test, integrate, and operate space-based, airborne, and ground-based missions, spacecraft, and state-of-the-art instruments.

Role: Requirements
The Center's renowned, in-house space and Earth scientists work closely with the engineers, project managers, and safety and mission assurance professionals to develop and refine scientific requirements for missions; provide

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Stakeholders (continued)

operations for those missions; and collect and disseminate mission data to partners and the public.

Role: Models
Using data from Center-led and partner missions, GSFC creates and hosts authoritative models of Earth and space phenomena used by scientists worldwide for analysis and advancement of the understanding of Earth and space science phenomena, including climate, weather, space weather, and star and galaxy formation.

Jet Propulsion Laboratory (JPL)

Role: Robotic Missions
Scientific discovery is a driving force for humankind. JPL develops and operates robotic missions that contribute to the scope of human knowledge and improve the human condition.

Role: Industries & Connections
JPL enhances technology, creates new industries, and fosters peaceful connections with other nations.

Role: Scientific Knowledge
JPL continues to create opportunities and missions that contribute to the expansion of scientific knowledge.

Role: Climate
Earth science missions, built by JPL for NASA, reveal the dynamic interactions between natural and human components to manage Earth's changing climate.

Role: Earth Science Observatory
JPL supports implementation of the Earth Science Observatory.

Role: Datasets
JPL collaborates with Federal, state, and commercial organizations to convert datasets into applications to care for our planet. JPL plans to increase access and use of datasets by embracing data technologies, including artificial intelligence, to better enable data-driven science with an increasing emphasis on climate change.

Role: Mars Samples
Beyond Earth, NASA's Perseverance rover caches samples from Mars as the first step of a future Mars Sample Return mission.

Role: Venus
Europa Clipper will begin a new era of exploration through NASA's Ocean Worlds program, while the VERITAS mission (which stands for Venus Emissivity, Radio Science, InSAR [Interferometric Synthetic Aperture Radar], Topography, and Spectroscopy) (VERITAS) mission will unveil Venus to pinpoint future missions to our sister planet.

Role: Exoplanets
JPL is building the coronagraph technology demonstration for the Roman Space Telescope, which will image nearby exoplanets that are a billion times fainter than their stars.

Role: Deep Space Network
Public access to JPL's mission data begins by providing seamless transfer from spacecraft with NASA's Deep Space Network through NASA's Advanced Multi-Mission Operations System to NASA's Planetary Data System.

Role: Archives
JPL also operates multiple mission and science archives to make data accessible and enable new discoveries by researchers.

Johnson Space Center (JSC)

Role: ISS
JSC manages the ISS, which provides long-duration microgravity for continuous and interactive research while revolutionizing technologies and capabilities that will reveal the universe. The ISS is a unique platform for scientists and researchers to monitor climate change, map natural resources, predict and assess natural disasters, monitor urban growth, and support agriculture and wildlife management.

Role: Extraterrestrial Samples
JSC curates all extraterrestrial sample collections, ensuring astromaterials sample integrity and planetary protection.

Role: Orbital Debris
The Center applies orbital debris modeling and risk analysis for human spacecraft systems and robotic satellites.

Role: Lunar Surface
JSC leads NASA's initiative to deliver science and technology to the lunar surface through CLPS, where companies of varying sizes bid on delivering payloads for NASA including integration and operations, launching from Earth and landing on the surface of the Moon.

Kennedy Space Center (KSC)

Role: Commercial Launch Services
KSC procures commercial launch services for NASA's science and robotic missions, ranging from Venture Class for the smallest and lightest CubeSat satellites to Heavy Class for the largest and most massive space telescopes.

Role: Plant Research
The Center also leads plant research and production in a microgravity environment and ...

Role: Biological Sciences
supports biological sciences for NASA's Biological and Physical Sciences Program.

Langley Research Center (LaRC)

Role: Air, Radiation, Climate & Atmosphere
Researchers at LaRC work to understand air quality, radiation and climate, and atmospheric composition.

Role: Remote Sensing
They also develop active remote sensing techniques to boost the quality of atmospheric data. This research balances advanced instrument development, field and space-borne experiments, and data retrieval, analysis, and archival.

Role: Atmospheric Data

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Stakeholders (continued)

LaRC houses the world's most comprehensive collection of atmospheric data in its Atmospheric Science Data Center and provides this data to the global public.

Role: Environmental & Public Policy Issues
Additionally, LaRC hosts the National DEVELOP program that addresses environmental and public policy issues through collaborative research projects connecting NASA data to regional concerns around the globe.

Marshall Space Flight Center (MSFC)

Role: Science & Instruments
MSFC leverages expertise in science, engineering, and project management to conduct scientific missions and develop instruments, leading transformative discovery in core science and technology areas.

Role: Applications & Data Informatics
MSFC's expertise in developing applications and utilizing data informatics from space-based Earth-observing instruments delivers responsive disaster analysis, lightning imaging, and weather forecasting products across the United States, as well as global human benefit through the SERVIR program.

Role: Sun
MSFC scientists study the Sun's dynamics to improve forecasts and study the "X-ray universe" of hot gases and X-rays emitted from objects like black holes with the Chandra and Imaging X-ray Polarimetry Explorer (IXPE) observatories, along with other high-energy instruments.

Role: Optics
MSFC develops state-of-the-art optics and instruments to understand the origins of our universe.

Role: Moon
MSFC planetary scientists support the development of lunar surface processes and the understanding of lunar habitability, as well as developing payloads and instruments for NASA's CLPS program.

Role: Robotic Missions
The Planetary Missions Program Office manages a portfolio of robotic missions canvassing our solar system, from the continuing Lunar Reconnaissance Orbiter to larger missions like Europa Clipper that will help us explore the possibility of life.

Stennis Space Center (SSC)

Role: Remote Sensing
SSC created and continues to enhance the Remote Sensing Toolkit, applying knowledge of remote sensing applications and digital transformation to lower barriers to access NASA's Earth science data and the tools to apply that data to benefit society.

NASA's enduring purpose is scientific discovery and exploration for the benefit of the United States and all of humanity. NASA seeks to discover the secrets of the universe, search for life elsewhere, and protect and improve life on Earth and in space. Finding answers to these profound science questions requires support for national priorities in science and exploration, enhancing new opportunities for cross-disciplinary science, and expanding the societal

benefits of our science programs. It also requires continued progress on the scientific priorities, including those identified by the National Academies of Sciences, Engineering, and Medicine through their decadal surveys.

1.1. Earth & Climate

Understand the Earth system and its climate

Integrate and advance knowledge of Earth as a system to meet the challenges of environmental change, strengthen our Nation, and improve life for all people. | Earth's changing environment impacts every aspect of life on our planet and has profound implications on society and our Nation's well-being. Studying Earth as an integrated, complex system is essential to understanding the causes and consequences of climate change and other global environmental concerns. Based on the increasing body of Earth observation data and corresponding research, we know now that our planet and its climate are profoundly changing. While much remains to be understood about the natural and human-induced processes and the complex coupling at the heart of these changes, one thing is clear: NASA's measurements are critical to their understanding. Climate adaptation and mitigation efforts cannot succeed without these robust climate observations and research. As the impacts of global climate change become more numerous and acute, the demand for accurate, timely, and actionable knowledge about the Earth system is more pressing than ever. NASA is a world leader in the production of data necessary to understand, model, monitor, and ultimately predict climate and environmental change. NASA is the only organization in the world with an integrated end-to-end program in Earth-observing mission development, launch, operations, technology, research, data systems, and applications.

Stakeholder(s):

Science Mission Directorate (SMD) :
Lead Office | Implementation is achieved through a balanced portfolio of programs as articulated in the SMD's Science Strategy, and engages various commercial, interagency, and international partnerships.

Contributing Programs and/or Program Activities

Earth Science Research
Role: Science Projects
NASA Earth Science projects explore our rapidly changing world, where natural and human factors interact, following an interdisciplinary, Earth systems approach that examines the interplay among the atmospheric, ocean, land, and ice systems. Using the recommendations of the National Academies' 2017-2027 decadal survey for Earth science and applications from Space1 as a compass, and informed by Government-wide priorities, NASA Earth Science is developing the observing systems that will answer the most important science and application questions of the next decade across the following focus areas: ■ Atmospheric Composition ■ Weather and Atmospheric Dynamics ■ Climate Variability and Change ■ Water and Energy Cycle ■ Carbon Cycle and Ecosystems ■ Earth Surface and interior

Earth Science Technology

Earth System Explorers

Earth System Science Pathfinder

Earth Systematic Missions

Decision Makers :
NASA's measurements and predictive models provide information for decision makers and organizations that work with communities affected by the impacts of changing climate, including information regarding the efficacy of policies and decisions that help the United States and others adapt and thrive on our changing planet.

International Partners :
NASA also works with international partner satellites; data from airborne, ship-based, and ground network instrumentation; and outputs from operational weather models from National Oceanic and Atmospheric Administration (NOAA) and other meteorological agencies.

Meteorological Agencies

National Oceanic and Atmospheric Administration (NOAA)

Scientists :
NASA integrates and harnesses these disparate data sources, enabling scientists to investigate and solve large questions that cannot be addressed using data from only a single mission or spaceborne instrument.

Role: Investigations & Solutions

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Strategy 1.1.1. Earth

Advance scientific understanding of the Earth

NASA's Earth science activities utilize observations from the vantage points of space, air, and in-situ to advance our scientific understanding of the Earth in service to the United States and the world. We lead the world in the production of data necessary to understand, model, monitor, and ultimately predict climate change, and we are expanding our efforts in the years ahead. In May 2021, NASA announced the implementation of the Earth System Observatory in response to the 2017-2027 Decadal Survey, consisting of a new set of Earth-focused missions to provide key information to understand the Earth's systems and processes, as well as interactions between the processes on the land, ocean, and in the atmosphere. We use our understanding of natural processes and their interactions to provide objective information on changes happening now, as well as estimates of how our environment might evolve in the future.

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Tactic 1.1.1.1. Data

Collect data from all parts of the planet

Our pursuit of answers to fundamental science questions about the Earth system benefits humanity in many ways. NASA's unique ability to view Earth from the perspective of space allows for the collection of broad, high-quality data from all parts of the planet. Only from space can we make the observations of the complex Earth system that can illuminate connections between short and long time scales, fine and global spatial scales, and chemical, physical, and biological processes.

Stakeholder(s):

Global Community :
NASA shares this unique knowledge and data freely and openly with the global community, including members of the Government, commercial, and academic communities.

Government Agencies

Commercial Entities

Academic Community

Agriculture Sector :
For example, in the agriculture sector alone, NASA's Earth science observations have proven helpful with crop area estimates, productivity assessments, and yield models across a range of time scales, water planning, and irrigation management. Likewise, NASA observations and models serve many other economic sectors and industries, disaster management, and community planning.

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Tactic 1.1.1.2. Portfolio Management

Manage a diverse portfolio while balancing innovation with successful program execution

To complete innovative Earth science missions, NASA will effectively manage a diverse portfolio while balancing innovation with successful program execution. Specifically, NASA will:

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Task 1.1.1.2.1. Metrics

Measure mission success against clearly written top-level measurement requirements

Stakeholder(s):

Commercial Smallsat Data Acquisition (CSDA) Program :
As an example, NASA's Commercial Smallsat Data Acquisition (CSDA) program evaluates and procures data from commercial vendors that complement NASA's measurements and help advance NASA's Earth science research and applications activities.

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Task 1.1.1.2.2. Criteria

Develop objective criteria to enable unequivocal measurement of success or failure in meeting each requirement

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Task 1.1.1.2.3. Budget

Establish a budget for each new mission that funds the mission's complete lifecycle cost, based on detailed engineering studies and independent cost estimates

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Task 1.1.1.2.4. Advice

Obtain tactical-level community advice on portfolio adjustments via the NASA Advisory Council, Science Committee, and the science advisory committees

Stakeholder(s):

NASA Advisory Council **Science Advisory Committees**

Science Committee

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Task 1.1.1.2.5. Partnerships

Implement effective partnerships—commercial, international, interagency, academic, and others—that leverage NASA resources and extend scientific results

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Tactic 1.1.1.3. Justice

Inform the just treatment and meaningful involvement of all people

NASA's commitment to equity is based on the understanding that the use of NASA data, products, and personnel can and should inform the just treatment and meaningful involvement of all people—regardless of race, color, national origin, income, or ability—with respect to development, implementation, and evaluation of programs, practices, and activities that affect human health and the environment.

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Strategy 1.1.2. Partnerships

Engage and works with partners

How NASA Engages and Works with Partners

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Tactic 1.1.2.1. Forecasting & Decision Support

Improve national capabilities to predict climate, weather, and natural hazards, to manage resources, and to develop environmental policy

NASA improves national capabilities to predict climate, weather, and natural hazards, to manage resources, and to develop environmental policy by leveraging our partnerships with other agencies that maintain forecast and decision support systems, such as NOAA, USGS and EPA. Most notably, NASA develops, builds, tests, and launches weather satellites that are operated by NOAA, as well as Earth observation satellites operated by USGS.

Stakeholder(s):

NOAA

EPA

USGS

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Tactic 1.1.2.2. Earth Observation

Jointly develop or coordinate our Earth observation activities

NASA also works with our international partners to jointly develop or coordinate our Earth observation activities.

Stakeholder(s):

European Space Agency (ESA) :
NASA and the European Space Agency (ESA) have a long and successful history working together to understand our changing planet.

NOAA :
For example, in 2020, NASA, NOAA, and our European partners, launched the Sentinel-6 Michael Freilich satellite, which is collecting the most accurate data yet on global sea level rise. The mission also measures atmospheric temperature and humidity that will help improve climate models and weather forecasts.

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Tactic 1.1.2.3. Climate

Observe Earth and its changing environment

Most recently, NASA and ESA have formed a first-of-its-kind strategic partnership to observe Earth and its changing environment. Recognizing that climate change is an urgent global challenge, the timing is right for NASA and ESA, as partners in space, to join forces to lead and support a global response to climate change. The partnership is an effort to help address and mitigate climate change through monitoring Earth with combined efforts of both agencies in Earth science observations, research, and applications. This partnership was formalized through a joint statement of intent, signed in July 2021, which outlines how the agencies will collaborate to ensure continuity of Earth observations; advance understanding of the Earth system, climate change and application of that knowledge; and collaborate on an open data policy that promotes open sharing of data, information, and knowledge within the scientific community and the wider public.

Stakeholder(s):

ESA

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

1.2. Sun, Solar System & Universe

Understand the Sun, solar system, and universe

Conduct scientific studies of the Sun and solar system, use space as a laboratory, peer out into the vast reaches of the universe, and play a catalyzing role in lunar robotic exploration. These efforts are guided by National priorities and recommendations from the National Academies' decadal surveys and implemented through a balanced portfolio of programs.

Stakeholder(s):

Science Mission Directorate (SMD) :
Lead Office

Contributing Programs and/or Program Activities

Astrophysics Explorer

Astrophysics Research

Cosmic Origins

Exoplanet Exploration

Physics of the Cosmos

Biological and Physical Sciences

Heliophysics Explorer Program

Heliophysics Research

Heliophysics Technology

Living with a Star

Solar Terrestrial Probes

Discovery

Lunar Discovery and Exploration

Mars Exploration

Mars Sample Return

New Frontiers

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Stakeholders (continued)

Outer Planets and Ocean Worlds
Planetary Defense
Planetary Science Research
Radioisotope Power
Space Weather
National Academies

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Strategy 1.2.1. Portfolio Management

Effectively manage a diverse portfolio while balancing innovation with successful program execution

NASA's success in science discovery across these core contexts is based on a balanced program that involves a number of critical and enabling elements: laying the scientific and technical foundation for space-based missions through Research and Development; inventing and using new space-based observing and sampling capabilities; creating the context and capabilities to interpret the resulting data; and maximizing the return on investment in the acquisition of data. SMD's suborbital and ground-based programs are conducted to enable or complement space-based observations and train future mission scientists and engineers. To complete innovative space missions NASA will effectively manage a diverse portfolio while balancing innovation with successful program execution. Like our approach in Strategic Objective 1.1, NASA will [apply the following tactics]. NASA will implement missions only after focused development has matured required technologies. A balanced science program proactively identifies potential technologies required to meet future mission requirements, conduct trade studies, assess development risks, and invest in new technologies well in advance of mission implementation.

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Tactic 1.2.1.1. Metrics

Measure mission success against clearly written top-level measurement requirements

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Tactic 1.2.1.2. Criteria

Develop objective criteria to enable unequivocal measurement of success or failure in meeting each requirement

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Tactic 1.2.1.3. Budget

Establish a budget for each new mission that funds the mission's complete life-cycle cost, based on detailed engineering studies and independent cost estimates

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Tactic 1.2.1.4. Advice

Obtain tactical-level community advice on portfolio adjustments via the NASA Advisory Council, Science Committee, and the science advisory committees

Stakeholder(s):

NASA Advisory Council

Science Committee

Science Advisory Committees :
NASA engages the science advisory committees annually to rate scientific progress.

National Academy of Sciences :
In addition, the National Aeronautics and Space Administration Authorization Act of 2005 directed that the performance of each science division shall be reviewed and assessed by the National Academy of Sciences at five-year intervals.

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Tactic 1.2.1.5. Partnerships

Implement effective partnerships— commercial, international, interagency, academic, and others—that leverage NASA resources and extend scientific results

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Tactic 1.2.1.6. CubeSats & SmallSats

Expand the use of lower-cost CubeSats and SmallSats

NASA is also expanding the use of lower-cost CubeSats and SmallSats to accomplish our science goals.

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Strategy 1.2.2. Life

Search for life elsewhere

Searching for Life Elsewhere ~ The search for life in the solar system and beyond is guided by the ability to understand how life originated on Earth and by the quest to find habitable environments outside of Earth.

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Tactic 1.2.2.1. Detection

Develop tools for detecting life

To improve the knowledge of environmental requirements for habitability, NASA will develop tools for detecting life, develop tools for determining the relative habitability of present or ancient environments, and explore analog environments on Earth.

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Tactic 1.2.2.2. Habitability

Develop tools for determining the relative habitability of present or ancient environments

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Tactic 1.2.2.3. Analog Environments

Explore analog environments on Earth

This will facilitate target selection for further robotic, and ultimately human, exploration. Observations from SMD's astrophysics missions have made it clear that habitable planets exist around stars other than the Sun and that such planets are plentiful. Improving techniques and ideas for discovering and characterizing habitable and/or inhabited environments on these planets, coupled with an understanding of the potential false positives for habitability or life, will enable prioritization of exoplanets for targeted follow-up observations. In the coming decades, this will help to push frontiers of discovery and enable the search for signs of life on worlds that may be capable of harboring life, both within our own solar system and within the galaxy.

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Tactic 1.2.2.4. Lessons Learned

Apply the lessons learned about the origin, evolution, and distribution of life on Earth to other bodies in our solar system and beyond

NASA's strategy relies on applying the lessons learned about the origin, evolution, and distribution of life on Earth to other bodies in our solar system and beyond. There is no single measurement or experiment that will definitively reveal the presence of extant or past life on a body in our solar system or a planet around another star. NASA will utilize many measurement results in a "Ladder of Life Detection" that will inform any certainty of the discovery of past or present life elsewhere.

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Strategy 1.2.3. Partnerships

Engage and work with partners

How NASA Engages and Works with Partners

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Tactic 1.2.3.1. Extension

Extend partnerships domestically and internationally

NASA will extend partnerships domestically and internationally. Science is a broad national and international enterprise and SMD partners with U.S. Federal agencies and more than 60 nations and international research organizations to leverage ideas, capabilities, and resources. NASA's constellation of Sun, Earth, solar system, and distant universe spacecraft and observatories are models of international and interagency cooperation and serve to further common scientific interests; about two-thirds of all of NASA's science missions have at least one international partner, and many missions have multiple interagency or international partners.

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Tactic 1.2.3.2. Content & Expertise

Transfer content and expertise

NASA's science is uniquely positioned among Federal agencies to transfer content and expertise to an informative environment to support learning across all age groups. Data are accessible through multiple channels, which allows NASA to benefit from partners actively engaged in learning communities and emerging citizen-based science.

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

1.3. Science Data

Ensure NASA's science data are accessible to all and produce practical benefits to society

In order to ensure NASA's science data are accessible to all and produce practical benefits to society, SMD plans to undertake investments and initiatives that will accelerate the accessibility and use of SMD data by its user community by investing in the following: 1) capabilities to enable open-source science; 2) continuous evolution of data and computing systems; and 3) community and strategic partnerships for innovation.

Stakeholder(s):

Science Mission Directorate (SMD) :
Lead Office

Contributing Programs and/or Program Activities

Earth Science Data Systems

Applied Sciences

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Strategy 1.3.1. Data & Information

Collect, store, manage, analyze, and distribute data and information

SMD's missions and research activities inspire curiosity and increase the understanding of our planet, the solar system, and the universe. One of our core capabilities is the ability to collect, store, manage, analyze, and distribute data and information for scientists, international partners, learners of all ages, decision-makers, and industry to further science, improve modeling, increase knowledge, and spur economic innovation.

Stakeholder(s):

Scientists

Decision-Makers

International Partners

Industry

Learners :
of all ages

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Tactic 1.3.1.1. Archives

Increase the size of data archives

Stakeholder(s):

SMD Science Divisions :
The science divisions within SMD generate, analyze, activate, and archive large amounts of data to support science objectives and deliver data and scientific results to users around the world. Over the next 5 years, SMD divisions will substantially increase the size of data archives as the volume of data generated by new missions increases from approximately 10 petabytes per year today to over 100 petabytes per year in 2026. This growth of NASA's science archives presents unique opportunities for new scientific discovery and partnerships, as well as significant challenges for data management, curation, access, analysis, computing, and computational modeling.

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Tactic 1.3.1.2. Investments & Initiatives

Undertake investments and initiatives that will accelerate the accessibility and use of SMD data

As part of this effort, we plan to undertake investments and initiatives that will accelerate the accessibility and use of SMD data by its existing and new user communities. NASA's data initiatives are focused on making

actionable data accessible to other Federal agencies, relevant decision-makers, stakeholders, and the public. This will be done by investments in three key areas:

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Task 1.3.1.2.1. Open-Source Science

Invest in capabilities to enable open-source science

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Task 1.3.1.2.2. Data & Computing Systems

Invest in continuous evolution of data and computing systems

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Task 1.3.1.2.3. Community & Partnerships

Invest in community and strategic partnerships for innovation

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Strategy 1.3.2. Partnerships

Engage and work with partners

How NASA Engages and Works with Partners

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Tactic 1.3.2.1. Climate

Further understanding of climate and its impacts

NASA works with a broad range of users and stakeholders in furthering our understanding of climate and its impacts through the collected data, analysis, and modeling; these communities include all levels of government (Federal, state, and local), international governments, domestic and international consortia, think tanks and philanthropies, academia, and industry. Using Earth observation data, we work with a number of state and local agencies in responses to disasters from wildfires to hurricanes. NASA has also partnered with local government entities to help plan for climate change and sea level rise in urban environments.

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Tactic 1.3.2.2. Interagency Community

Partner with members of the interagency community

NASA also partners with members of the interagency community, through agreements with specific agencies, as well as interagency working groups, to further the use of relevant data. Internationally, NASA partners with space agencies across the world to develop, build, launch, and maintain platforms and instruments for long-term climate data, including satellite altimetry. Likewise, NASA partners with organizations around the world to provide data to support sustainable, climate-resilient decision-making.

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

2. Exploration

Extend human presence to the Moon and on towards Mars for sustainable long-term exploration, development, and utilization

Stakeholder(s)

Armstrong Flight Research Center (AFRC)

Role: Risk Management
AFRC tailors its risk-based integration, test, airworthiness, and flight safety processes to developmental space exploration projects for NASA in partnership with other Government agencies and industry.

Role: Commercial Crews
Using this process to assess, accept, and communicate the residual risk associated with atmospheric flight research, AFRC is participating in an assessment of suborbital flight providers for the Commercial Crew program.

Role: CST-100 Starliner
AFRC is also working on landing support of the CST-100 Starliner.

Role: Human Landing Systems
AFRC participated in the Human Landing System (HLS) commercial source selection and supports the NASA Crew Office evaluation of HLS training requirements.

Ames Research Center (ARC)

Role: Moon & Mars
ARC's work in life, lunar, and planetary sciences, entry systems technologies, and robotic prospecting missions is crucial to NASA's effort to send humans back to the Moon and on towards Mars.

Role: Microbiological Science
ARC incorporates microbiological science with space-flight engineering for SmallSats and other missions to the International Space Station (ISS) and beyond.

Role: Space Travel & Presence
ARC supports life away from Earth and develops technologies to sustain astronauts on long-duration space travel and presence on the Moon or Mars.

Role: Solar System
ARC hosts NASA's Solar System Exploration Research Virtual Institute, which engages the scientific community in studying the Moon and other potential destinations.

Role: Heatshields & Spacecraft
ARC operates the NASA Arc Jet Complex, the largest and primary facility to test heatshield materials and spacecraft structures in hypervelocity flight conditions, supporting the safety of astronauts in flight.

Role: Vertical Motion Simulation
ARC operates the world's largest human-in-the loop motion simulator, the Vertical Motion Simulator, to evaluate handling quality and development of human landing systems.

Role: Data Integration & Mission Planning
ARC leads Data Systems Integration for Artemis and delivers mission planning systems for current and next-generation Mars surface missions.

Role: Robotics Software
ARC provides testbeds for developing and validating robotics software that enables increasingly autonomous capabilities for crew support and uncrewed station-keeping and maintenance.

Role: Fault Detection & Recovery
ARC fault detection and recovery technologies should help improve the safety of the Space Launch System and Orion.

Glenn Research Center (GRC)

Role: Electric Propulsion & Power
GRC leads the development of electric propulsion and power systems technology for exploration of the Moon and on towards Mars, including the Power and Propulsion Element, a key component of the Gateway, which will serve as a multi-purpose outpost for Lunar exploration.

Role: European Service Module
GRC is also leading the integration of the European Service Module, the primary power and propulsion component for the Orion crew vehicle, to ensure the success of Artemis missions.

Role: Sustained Exploration
GRC is also developing technologies that will enable sustained exploration of the Lunar surface, human missions to Mars, and other deep space destinations.

Role: Nuclear Power
Space nuclear power is one essential capability, including nuclear electric propulsion for in-space transportation, and fission surface power technology for operation on the surface of the Moon and Mars.

Role: Satellite Communications
The Center is also leading NASA efforts to evaluate and integrate commercially provided satellite communications capabilities for future missions in low Earth orbit and beyond.

Role: Commercialization
To support the growing commercial space economy, GRC collaborates with industry, academia, and other Government agencies to commercialize NASA technology and form public-private partnerships for mutual benefit.

Role: Systems Development
Unique, full-scale space environment test facilities at Lewis Field and Armstrong Test Facility are supporting both Government and commercial systems development.

Goddard Space Flight Center (GSFC)

Role: Space Presence
GSFC supports NASA's goal of extending humanity's presence in space in several ways.

Role: Communications

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Stakeholders (continued)

The GSFC-managed Space and Near-Earth Networks provide space communications for all human spaceflight programs as well as other Agency programs.

Role: ISS Resupply
The Center's launch range, vehicle processing, and payload processing capabilities at Wallops Flight Facility resupplies the ISS with experiments and life support.

Role: Safety
GSFC also develops technology that improves crew safety today and enables the exploration concepts of tomorrow, such as advanced robotic and in-space assembly systems.

Role: Exploration
The Center enhances exploration by identifying and guiding scientifically significant research activities, training explorers in scientific techniques, developing models of observed phenomena, and conducting research that characterizes the exploration locales, identifying threats to explorers and their support systems.

Jet Propulsion Laboratory (JPL)

Role: Moon
JPL advances technologies for communications, navigation, and surface operations at and around the Moon designed to ensure robust operations in cislunar space. To prepare for future landed exploration, Lunar Trailblazer will investigate water on the Moon and characterize resources. In addition, the Farside Seismic Suite, which will receive a ride to the lunar surface as part of the Commercial Lunar Payload Services (CLPS) initiative, will reveal the interior structure of the Moon and demonstrate the capability to survive the night for long-term operations.

Role: Deep Space
JPL also develops capabilities for advanced commercial deep space communication and navigation.

Role: Innovators & Startups
JPL works directly with a range of startup and innovative small businesses to guide their development, supplying direction and objectives for NASA needs. These businesses will be well positioned to contribute to the emerging space economy as suppliers of unique, innovative, and cost-effective products that serve NASA and the broader community.

Role: Navigation, Communication & Security
JPL enables enhanced access to space by providing and developing advanced navigation, communication, and security capabilities to ensure that crewed spacecraft, and their robotic precursors, can reach their exploration targets and robustly communicate with Earth.

Johnson Space Center (JSC)

Role: Crewed Missions
JSC leads mission design, development, and execution for crewed exploration missions, sending humans into the solar system faster and farther. The ISS provides innovative ways to fly and test hardware that will be required for deep space exploration, including advanced environmental control and life support systems that will be tested using streamlined processes for flight hardware development.

Role: Technology Experiments
JSC's advanced technology experiments on the ISS, such as the sensing of hurricanes, advanced medical diagnostic techniques, and pharmaceutical investigations, improve life on Earth.

Role: Partnerships
JSC expands partnerships with entities outside the aerospace sector to increase space flight expertise and innovation capabilities.

Role: Gateway
JSC leads development of Gateway, a crew-tended spaceport in lunar orbit that will serve as a multipurpose outpost orbiting the Moon and a staging area for deep space exploration.

Role: Extravehicular Activities
JSC is standing up the extravehicular activities (EVA) and Human Surface Mobility Program that includes ISS EVA support, exploration EVA development, and the Lunar Terrain Vehicle.

Role: Architecture & Mission Planning
The Center also maintains architecture and mission planning capabilities.

Role: Human Research
JSC is the home to the Human Research Program, which develops advanced life science capabilities to protect the health, safety, and performance of astronauts as well as provide benefits to medical science on Earth.

Role: Orion
Orion is equipped with advanced technologies and backup capabilities to ensure its mission performance is safe, reliable, and successful. JSC expands frontiers by leading development of future deep space missions on Orion. This crew vehicle will support deep space missions to the Moon and eventually towards Mars.

Role: Hazardous Materials & Rocket Propulsion
White Sands Test Facility, managed by JSC, serves as a preeminent resource for testing and evaluating hazardous materials and rocket propulsion systems.

Role: Humanity & Productivity
JSC continues to explore space to benefit humanity and maintains a focus on solving challenges that both advance human productivity in space and unite the Center with partners from other agencies, industry, and academia to complete bold missions.

Kennedy Space Center (KSC)

Role: Program & Project Management
KSC provides program and project management support for NASA's exploration missions in several ways.

Role: Payload & Flight Science Experiments
The Center leads processing, assembly, integration, and test of payload and flight science experiments bound for the ISS and low Earth orbit.

Role: Commercial Crews

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Stakeholders (continued)

KSC's Commercial Crew Program acquires and manages commercial transportation services, including development and human certification of integrated commercial crew systems and flight certification for each crew transportation mission to and from the ISS.

Role: Launch Services
KSC's Launch Services Program acquires and manages commercial launch services, including certification and technical insight and approval on commercial launch vehicles for NASA's science and robotic small, medium, and large class missions.

Role: Flight Systems
The Center designs, develops, operates, sustains, integrates, and tests flight systems and ground systems, and support infrastructure, including lander ground operations.

Role: Ground Systems
KSC's Exploration Ground Systems Program leads launch processing for the integrated launch vehicle and spacecraft to advance human exploration. This includes vehicle and spacecraft processing, servicing, maintenance, command, control, and telemetry; launch, landing and recovery; and crew support. KSC's Deep Space Logistics provides the logistics services capabilities for NASA's deep space exploration plan supporting the Space Launch System (SLS), HLS, and Orion.

Role: Partnership Development
KSC leads partnership development strategies and operations for the Nation's pre-eminent multi-user spaceport, supporting Government and commercial operations.

Role: Commercial Services
KSC offers commercial services for ground operations and services that can accommodate different vehicles, systems, and commercial launch providers.

Role: Spaceport
It operates and maintains a multiuser spaceport with infrastructure, systems, and processes to support flight and ground hardware for crewed and uncrewed launch vehicles and payloads.

Role: Capabilities & Affordability
KSC enables NASA mission success and makes the space enterprises of NASA, other Government agencies, and the commercial sector more capable and affordable.

Langley Research Center (LaRC) :

Role: Human Presence in Space
LaRC develops concepts and tools to extend human presence in space, particularly innovations needed to safely live and work on the Moon and Mars. LaRC designs architecture solutions for humans and equipment to reach the Moon and Mars; leads development of new high-mass entry, descent, and landing (EDL) technologies to allow precision landing of needed equipment and vehicles; and develops tools and innovations for the autonomous construction, assembly, deployment, and manufacturing of structures need for long duration space missions.

Role: Human Landing Systems
LaRC is committed to supporting partners with EDL technologies for Human Landing Systems, such as Navigational Doppler Lidar.

Role: Space Structures
Partnering with MSFC and GSFC, LaRC provides assembly expertise for the Agency's initiatives, which will lead to precision-assembled space structures.

Role: Lunar Surface Construction
After arriving on the Moon, LaRC will contribute to lunar surface construction efforts with insights on landing pads and advanced berms, vertical solar arrays, lunar surface manipulator systems, and safe-haven habitats.

Marshall Space Flight Center (MSFC)

Role: Manufacturing & Space Transportation
MSFC serves as the space transportation design, development, and manufacturing leader for NASA.

Role: Moon & Mars
MSFC leverages its expertise with large-scale, complex systems to develop the vital capabilities that will enable humanity to return to the Moon to stay and explore on toward Mars.

Role: Engineering & Integration
MSFC's systems engineering and integration expertise plays an important role in bringing together the work of the Agency and industry.

Role: SLS
MSFC is responsible for the SLS and its continued evolution to serve as a cornerstone for human deep space exploration for decades to come.

Role: Landing Transportation Systems
MSFC also manages NASA's human and large cargo landing transportation systems, working with commercial partners to provide sustained access to the lunar surface.

Role: Life Support & Research Hardware
Additionally, MSFC deploys new technologies on the ISS that will inform next-generation life support and research hardware for Artemis.

Role: Lunar Habitat
MSFC also partners with industry to develop concepts for the lunar habitat for a sustained human presence on the Moon's surface and a transit habitat for the journey to Mars.

Role: Communication & Coordination
MSFC's Payload Operations Center coordinates all U.S., European, Japanese, and Canadian scientific and commercial experiments aboard the ISS, synchronizes payload activities of international partners, and directs communications between crew members and researchers from around the world who have onboard experiments.

Role: Payload & Mission Operations
Drawing on more than two decades of experience serving as "Science Central" for the ISS, MSFC will provide payload and mission operations support for a new generation of human spaceflight and scientific exploration at the Moon and beyond.

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Stakeholders (continued)

Stennis Space Center (SSC)

Role: Complex Systems
SSC leverages expertise in the design, development, operation, and sustainment of large-scale, complex systems to provide unique facilities and expertise that enable research and development of current and emerging propulsion systems and launch vehicles.

Role: Testing
SSC tests the RS-25 engine and SLS Exploration Upper Stage for NASA, as well as propulsion system components, engines, and stages for industry, to enable the exploration and commercialization of space.

Role: Deep-Space & Ground Operations
SSC develops innovative and transformational technologies that enable efficient, safe, deep-space exploration and ground operations, and adapts commercial technology to enhance propulsion testing.

Role: Autonomous Systems
SSC creates intelligent, autonomous systems supporting the development of Gateway, lunar surface systems, in-situ resource utilization, space suits, and small satellites.

NASA's rich history of human spaceflight provides the foundation for today's exploration vision: to maintain U.S. leadership in space, establish a lasting presence on and around the Moon, and pave the way forward to Mars and beyond. This strategy begins with the Artemis, a series of missions that will land the first woman and the first person of color on the lunar surface, marking the first time in nearly 50 years that humans have landed on the Moon. Along the way, we will develop and inspire a diverse national science, technology, engineering, and mathematics (STEM) workforce, and inspire new generations to join our ranks.

2.1. Moon & Deep Space

Explore the surface of the Moon and deep space

Extend human presence into cis-lunar space to allow for sustained operations on the lunar surface and then on towards Mars to unlock mysteries of the universe.

Stakeholder(s):

Exploration Systems Development Mission Directorate (ESDMD) :
Lead Office

Contributing Programs and/or Program Activities

Exploration Capabilities

Exploration Operations :
NASA's Exploration Ground Systems team develops and operates the systems and facilities needed to process and launch rockets and spacecraft during assembly transport and launch.

Space Launch System (SLS) :
The Space Launch System will send crew via Orion, as well as supplies to the Gateway space station around the Moon.

Orion :
The Orion spacecraft will carry humans beyond low Earth orbit, provide emergency capability, sustain the crew in transit, and provide safe re-entry from deep space.

Orion Production & Sustainment

Exploration Ground Systems (EGS)

Advanced Cislunar and Surface Capabilities (ACSC)

Gateway

Human Landing System (HLS) :
The Human Landing System (HLS) will be the first commercially developed vehicle to transport humans to and from the surface of the Moon. NASA is encouraging innovation through competition to find the best possible systems for taking astronauts to the Moon on increasingly frequent and longer duration missions.

xEVA and Human Surface Mobility Program

Moon & Mars Architecture

Artemis Missions :
Artemis missions, and future human exploration of Mars, will expand opportunities for Americans, increase our global standing, and inspire the next generation of leaders in STEM.

NASA will develop an Artemis Base Camp near the Moon's South Pole. The base camp is envisioned to include an unpressurized rover, a pressurized rover, a fixed surface habitat and a surface power system to keep the elements powered during the lunar night and dormant periods.

Artemis missions will be driven by scientific objectives like collecting new information on planetary processes and the character and origin of volatiles.

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Stakeholders (continued)

NASA will uncover the history of our Earth-Moon system and new information about our Sun. The human data collected as mission durations increase will make future work in deep space safer and more efficient. What we learn will also help us protect our home planet and improve daily life for people around the world.

International Partners :
NASA will work closely with international partners to achieve Artemis objectives and grow the global space economy. These relationships will reinforce America's position as the global leader in space exploration and provide new avenues for partnership with nations around the world. NASA's deep space exploration efforts will continue to act as a beacon of peace and scientific partnership around the globe.

STEM Leaders :
Long-term exploration and scientific utilization present unique opportunities for major discoveries impacting critical fields like medicine, energy, and manufacturing that will benefit society worldwide.

Medical Sector

Energy Sector

Manufacturing Sector

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Strategy 2.1.1. Beyond Earth Orbit

Explore beyond low Earth orbit

Exploring beyond low Earth orbit requires a space transportation system that can safely transport crew and cargo to deep space. Artemis includes a crew vehicle, heavy-lift launch vehicle, the Gateway in lunar orbit with logistics resupply, Human Landing Systems, and lunar surface systems to support astronaut expeditions, as well as supporting Earth-based ground facilities and systems.

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Tactic 2.1.1. Infrastructure

Establishes infrastructure at the Moon

As NASA establishes infrastructure at the Moon, a long-term orbiting platform will be necessary to support increasingly lengthy surface expeditions. The Gateway will also host some science experiments and provide additional data on the impacts of deep space flights on humans and systems. NASA and its partners are preparing for a robust human return to the Moon, with an incremental buildup of capabilities in orbit and on the surface that will help prepare for the first human missions to Mars. Viewed as a deep space planetary laboratory, the Moon offers many opportunities to unlock new discoveries about the Earth-Moon system origins and the deep history of our solar system. Artemis systems have dual purposes, to explore the Moon and to demonstrate key capabilities for Mars.

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Tactic 2.1.2. Surface Exploration

Make surface exploration safer and more effective

The rovers and power systems on the surface, HLS hazard avoidance and navigation systems, and even ascent capabilities could have direct applications to human missions to Mars. The orbit-to-surface operations involving astronauts ferrying between gravity fields will explore new challenges and techniques to mitigate them. Increasing surface duration stays and extravehicular activities on a planetary surface will provide crucial data in making surface exploration safer and more effective.

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Strategy 2.1.2. Partnerships

Engage and work with partners

How NASA Engages and Works with Partners

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Tactic 2.1.2.1. Moon & Mars

Establish human presence on the Moon and conduct a human mission to the surface of Mars

Establishing a sustained human presence on the Moon and conducting the first human mission to the surface of Mars will be among the most challenging endeavors in human history.

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Tactic 2.1.2.2. Interagency Collaboration

Engage with other Government agencies for collaborative efforts

Stakeholder(s):

Government Agencies :
NASA will engage with other Government agencies for collaborative efforts (e.g., Department of Energy, Department of Commerce, National Science Foundation, United States Geological Survey), and to ensure compliance with national and international policies and obligations (e.g., Federal Aviation Administration, Department of State).

Department of Energy

Department of Commerce

National Science Foundation

United States Geological Survey

Federal Aviation Administration

Department of State

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Tactic 2.1.2.3. International Partners

Collaborate with international partners

International partners are critical to Artemis and the Moon towards Mars plan. The Artemis Accords established in 2020 set common principles for the peaceful exploration and use of outer space. The Accords are grounded in the Outer Space Treaty of 1967. To date, more than a dozen countries have signed the Artemis Accords, including both established and new partners, and NASA anticipates many more to join in the months and years ahead. The NASA-led Gateway, that will be located in lunar orbit, is a multinational collaboration with many of our established partners in low Earth orbit.

Stakeholder(s):

International Partners :
We have already signed agreements with three partners to provide modules and critical capabilities ... ESA and JAXA will also contribute early Gateway science instrument suites that will study the deep space radiation environment.

Canadian Space Agency (CSA)

European Space Agency (ESA)

Japan Aerospace Exploration Agency (JAXA)

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Tactic 2.1.2.4. Commercial Services

Acquire HLS, logistics deliveries to the Moon, and advanced spacesuits for ISS and Artemis as services

Following success with NASA's Commercial Crew Program in low Earth orbit, NASA is acquiring HLS, logistics deliveries to the Moon, and advanced spacesuits for ISS and Artemis as services.

Stakeholder(s):

NASA Service Providers :
A services approach allows companies to engage other customers in addition to NASA and introduce new revenue streams into their business models.

NASA Workforce :
Competition leads to innovation, and these partnerships will ease the financial burden on NASA so our highly skilled workforce can focus on advanced technology development and research while solving the future challenges of exploration.

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

2.2. Human Spaceflight

Develop a human spaceflight economy enabled by a commercial market

Expand the space economy by leveraging the ISS and stimulating the growth of human spaceflight commercial activities. | A robust human spaceflight economy ensures national interests for research and development in space are fulfilled while allowing NASA to focus Government resources on the challenges of deep space exploration through Artemis. NASA will maintain access to a human-rated platform in low Earth orbit (LEO) to continue U.S. human presence and expand the American foothold in space. The continuous operation of a research and technology demonstration platform in space is critical to achieving NASA's and the Nation's goals in science, technology, and human space flight. As such, we are investing resources to foster a robust human spaceflight economy. Since its inception, industry, academia, and our international partners have used the International Space Station (ISS) as a testbed for research and the development and maturation of state-of-the-art systems that increase access to space. NASA is supporting new space stations from which we and other customers can purchase services and stimulate the growth of commercial human spaceflight activities. As commercial LEO destinations become available, we intend to implement an orderly transition from current ISS operations to these new commercial destinations.

Stakeholder(s):

Space Operations Mission Directorate (SOMD) :
Lead Office

Contributing Programs and/or Program Activities

Commercial LEO Development Program

International Space Station :
The ISS is the prime example of American leadership in global space exploration, enabling a U.S.-led multinational partnership to advance shared goals in space.

Commercial Facilities :
The ISS supports a robust commercial marketplace, with more than 20 commercial facilities operating and generating revenue, including in-space manufacturing facilities and a commercial airlock.

Companies :
As NASA increases the opportunities for business on the ISS, the number and types of companies taking advantage of those opportunities will likely increase, which will in turn create more demand.

Commercial Crew Program

Crew and Cargo Program

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Strategy 2.2.1. Supply & Demand

Develop both the supply side of the future human spaceflight economy and the demand side

NASA is committed to the development of both the supply side of the future human spaceflight economy (i.e., future platforms providing services for a fee) and the demand side (i.e., need for on-orbit services for Government requirements or to produce products of commercial value).

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Tactic 2.2.1. Supply

Enable the supply side of the human spaceflight economy

NASA pursues several avenues to enable the supply side of the human spaceflight economy. The ISS has entered an era of robust commercial use, taking advantage of our capacity to develop the technologies that industry needs to move from being dependent on NASA for access to space to providing the access we need to continue our mission in LEO after the lifetime of the ISS. These avenues include offering the use of an ISS port to a private company to deploy a new commercial element on the ISS; supporting the development and use of free-flying commercial LEO destinations; and offering the use of the ISS for private astronaut missions. NASA's expectation is that one or more of these development and demonstration efforts will prove commercially viable, allowing U.S. and international customers to purchase human spaceflight services in LEO while also providing us with the platforms and capabilities we require in LEO.

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Tactic 2.2.2. Demand Side

Develop the demand for capabilities to bring businesses and people into space

Creating a robust human spaceflight economy depends on bringing many new businesses and people into space and requires the development of not only the supply of services, but also the demand for those capabilities. NASA will soon see the first private astronaut mission to the ISS. Private astronaut missions are dedicated missions that are privately funded, fully commercial spaceflights on commercial launch vehicles for a variety of potential commercial purposes utilizing ISS.

Stakeholder(s):

Commercial LEO Development and ISS Program :
Simultaneously, NASA's Commercial LEO Development and ISS programs are developing and maturing the demand side of the human spaceflight economy. NASA issued a preliminary "LEO Demand Forecast," which describes NASA's long-term needs for microgravity services. NASA also provides support for sustained demand focus areas, such as industrial biomedicine and manufacturing.

ISS Program

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Tactic 2.2.3. Advertising & Marketing

Offer marketing and advertising opportunities aboard ISS

NASA also offers marketing and advertising opportunities aboard ISS on a fully reimbursable basis.

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Tactic 2.2.4. Spacecraft & Launch Systems

Demonstrates that companies can develop and operate the next generation of spacecraft and launch systems to serve the ISS

Stakeholder(s):

Commercial Resupply Services and Commercial Crew Program :
Through the successful implementation of similar commercialization strategies, such as the Commercial Resupply Services and Commercial Crew Program, NASA demonstrates that companies can develop and operate the next generation of spacecraft and launch systems to serve the ISS.

ISS

Commercial Launch Industry :
This success brought the commercial launch industry back to the United States, demonstrating that U.S. industry is more than capable of competing on the global stage. This commercial capability also fuels the growing U.S. share of the global launch market and provides expanded utility, additional research time, and broader opportunities for discovery and space exploration. An important goal of this commercialization strategy is to encourage the development of new industry capabilities, enabling these

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Stakeholders (continued)

companies to sell future services to all customers, not just NASA.

Commercial Crew Services :
Today, commercial crew and cargo transportation services provide a vital lifeline from Earth to the ISS for technology demonstrations. There are 21 commercial facilities operating onboard ISS today, including a 3-D printer, a bioprinter, and an airlock, which are available for use by both NASA and other paying customers.

Cargo Transportation Services

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Tactic 2.2.5. LEO

Provide the necessary platforms and services in LEO

NASA is committed to using the ISS and its capabilities to aid in the development of the U.S. industry's ability to provide the necessary platforms and services in LEO.

Stakeholder(s):

LEO :
NASA is also committed to continued Government utilization of LEO beyond the ISS for basic research and development, Earth and deep space observations, and astronaut training.

Private Industry :
Our commitment includes providing Government funding to private industry via contracts and partnerships to ensure that future capabilities fulfill Government requirements.

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Tactic 2.2.6. Economic Growth

Create new opportunities for economic growth through new markets and industries in LEO

These partnerships will enable private industry to assume roles that have been traditionally Government-only by creating new opportunities for economic growth through new markets and industries in LEO. They will potentially yield long-term cost savings to the Government by leveraging industry innovation and commercial market incentives. These activities will create a market environment in which commercial LEO destination services are available to both Government and private-sector customers. Commercial LEO destinations, along with commercial launch services, will provide the backbone of that the human spaceflight economy after the life of ISS.

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Strategy 2.2.2. Partnerships

Engage and works with partners

How NASA Engages and Works with Partners

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Tactic 2.2.2.1. Moon

Return to the Moon

When NASA returns to the Moon, we will go in a way that reflects the world today, with Government, industry, and international partners working together in a global effort to build and test the sustainable systems needed for successfully executing challenging missions on towards Mars . The advent of a robust commercial space economy has introduced new partners to the world of human space exploration and shifted the way we do business. To remain the world leader in human space exploration, we will continue to evolve.

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Tactic 2.2.2.2. Definition & Creation

Engage industry and academia early to build trusted relationships during the program definition and solution creation process

The emphasis on public-private partnerships as the preferred program acquisition approach to extend human presence deeper into space will continue to change, with a new focus on embedded teams with mutually agreed upon support and outcomes. We continue to engage industry and academia early to build trusted relationships during the program definition and solution creation process, providing NASA competencies through people, processes, tools, and facilities to help in the management of risks encountered during the execution of our partner's proposed approach.

Stakeholder(s):

Industry **Academia**

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Tactic 2.2.2.3. Well-Being

Ensure the well-being of future space explorers and support existing and future space operations

NASA relies on partnerships with academia and industry where we are developing American-led space infrastructure enabled by a commercial market, enhancing space access for both Government and commercial entities. These activities are catalysts for economic development, including those related to space tourism. Together, NASA and our partners will help ensure the well-being of future space explorers and support existing and future space operations for both NASA and non-NASA missions.

Stakeholder(s):

Space Explorers

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

2.3. Safety

Develop capabilities and perform research to safeguard explorers

Provide enhanced capabilities, maintain crew health and performance, and conduct research to ensure safe space exploration. | Humans worked briefly on the Moon 50 years ago and have pioneered technological advances in low Earth orbit for the past 40 years. The activities that NASA leads that will return humans to the Moon, and from there on towards Mars, are focused on “buying down” risk through research and the development of tools and techniques to protect humans during deep space exploration. NASA is working to overcome radiation, crew isolation, and deep space communications delays, as well as food, medicines, and shelf-life constraints. Each of these challenges must be solved to ensure crew members are safe and healthy as we move beyond low Earth orbit. NASA is pursuing new technologies that will help manage the effects of extended stays in space on human health and performance. Each advance in our knowledge can provide basic human needs, including oxygen and water, along with the ability to maintain and repair critical systems. NASA will demonstrate the performance of emergent technologies in an environment where the risk to the safety of human or vehicle operations can validate the performance of the technology without risking the crew or mission, and prior to their use in an operational environment. NASA emphasizes partnering with industry and academia to develop new technologies that will enable future space travel that is less reliant on resupply and communications from Earth. The resultant reduction in logistics costs and increase in system capabilities and reliability are designed to safeguard humans on missions beyond low Earth orbit. The knowledge gained though research on the effects of reduced gravity on the systems in the body—including studying research areas that are unique to the Moon, Mars, and other destinations—will help quantify the best methods and technologies to support safe and productive human missions in deep space.

Stakeholder(s):

Space Operations Mission Directorate (SOMD) :
Lead Office

Contributing Programs and/or Program Activities

Human Research Program

Human Space Flight Operations

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Strategy 2.3.1. Capabilities, Countermeasures & Technologies

Develop capabilities, countermeasures, and technologies in support of human space exploration

NASA is developing capabilities, necessary countermeasures, and technologies in support of human space exploration, focusing on those capabilities that will mitigate the highest risks to crew health and performance. Some of these technologies will reduce medical and environmental risks and ensure effective human-system integration with the exploration mission systems necessary to safely explore in deep space.

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Tactic 2.3.1.1. R&D

Invest in exploration research and development and testing in both terrestrial and space environments

New approaches are necessary to rapidly develop prototype systems, demonstrate key capabilities, and validate operational concepts to safeguard explorers during future human missions beyond low Earth orbit. NASA will continue to invest in exploration research and development and testing in both terrestrial and space environments. Most significantly, we will continue to use the ISS as a steppingstone to expand human presence farther into the solar system. The International Space Station (ISS) continues to expand our knowledge and experience in long-duration spacecraft operations and serves as an irreplaceable testbed for technology demonstrations of new capabilities and upgraded vehicle systems.

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Tactic 2.3.1.2. Health & Performance

Reduce the risks to astronaut health and performance

NASA enables space exploration by reducing the risks to astronaut health and performance using ground research facilities, the ISS, and analog environments. The performance of research in this combination of settings facilitates the development of procedures and furthers research areas that are unique to the Moon, Mars, and other destinations. Our portfolio is built around an architecture that uses evidence to identify a risk to the human system, gaps in our knowledge about characterizing or mitigating the risk, and the activities necessary to produce the knowledge necessary to close the gaps and reduce the risk.

Stakeholder(s):

Astronauts

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Tactic 2.3.1.3. Astronaut Corps

Support the astronaut corps

NASA supports the astronaut corps, space flight readiness training, and the health of crew members before, during, and after each spaceflight mission to the ISS. From Apollo through the Space Shuttle and to the ISS, crew members undergo rigorous preparation, which is critical to mission success. To pave the way to the Moon and onto Mars, NASA will partner with academia and commercial industry to prepare crewmembers for living and working for extended periods in space. Key activities include the identification of new training regimes to prepare crews for extended periods of space travel, including the identification of protocols for medical or technical problems that might arise when returning to Earth will take days, not hours.

Stakeholder(s):

Astronaut Corps

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Strategy 2.3.2. Partnerships

Engage and work with partners

How NASA Engages and Works with Partners

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Tactic 2.3.2.1. Knowledge

Develop knowledge that supports safe and healthy space travel

For decades, NASA has demonstrated world-wide leadership across a broad spectrum of life sciences research communities, where we work with our international partners, other Federal agencies, and the academic and private sector to develop the knowledge that supports safe and healthy space travel. Formal agreements between NASA, other Federal agencies, academia, and our international partners form the basis of decades-long joint research activities on quantifying and mitigating the effects of space travel on humans. The knowledge gained with our partners will continue to inform our design for safer deep-space exploration systems.

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Tactic 2.3.2.2. Preparation

Prepare humans for the stresses of living and working for extended periods in the hostile environment of space

NASA will continue to focus on preparing humans for the stresses of living and working for extended periods in the hostile environment of space. As humans explore further from Earth, many different issues will arise and require investigation. NASA will continue to study multiple human system challenges, including bone and muscle loss, vision, health, and wellness monitoring, and physical and mental function maintenance. These activities have led us to develop an exploration biomedical program focused on several goals: informing human health, performance, and habitability standards; developing countermeasures and risk-mitigation solutions; and advancing habitability and medical-support technologies.

Stakeholder(s):

National Academies of Science, Engineering, and Medicine :
The 2021 report by the National Academies of Science, Engineering, and Medicine for managing cancer risks associated with radiation exposure during crewed space missions will help inform future crew health and safety.

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

2.4. Space Access & Services

Enhance space access and services

Meet the communication, launch service, and strategic capabilities needs of NASA's programs. | The ability to provide cost-effective, mission-essential services provides a stable foundation for America's human and robotic missions. These capabilities range from acquiring launch vehicles for U.S. Government civil sector and robotic missions, to communicating with both crewed missions such as the International Space Station (ISS) in low Earth orbit, the Artemis lunar missions, and uncrewed, scientific missions such as planetary rovers on the surface of Mars. NASA provides safe, reliable, and cost-effective launch services for NASA and NASA-sponsored payloads seeking access to space on U.S. commercial launch vehicles. As the launch agent of the U.S civil space sector, NASA relies on the Launch Services Program (LSP) to certify new commercial

launch vehicles for readiness to fly high-value spacecraft, and direct vital launch mission assurance efforts to ensure the greatest probability of launch mission success. LSP's primary responsibility is to meet the needs of a diverse customer base spanning our Mission Directorates, a wide range of educational organizations, and other customers. LSP is the Agency's recognized expert in all aspects of commercial launch services, including acquisition, certification, and mission management. NASA provides the critical communications and navigation services to our operational missions, and we will continue to invest in critical technologies that will increase reliable communications capabilities. NASA engages with the satellite communications industry to develop communications capabilities that supports U.S. needs, are globally competitive, and advance U.S. leadership in the generation of new markets. Today, commercially provided satellite communications continues to mature, and NASA envisions a commercial communications market where near-Earth customers will have access to suitable commercial services and where NASA is one of many customers. Developing and testing rocket propulsion systems is foundational to spaceflight. Whether the payload is a robotic science experiment or a crewed mission, the propulsion system used to launch it must be safe and reliable. Utilizing unique test facilities, NASA ensures the safe and effective execution of a rigorous engine test program, critical to any rocket propulsion development activity.

Stakeholder(s):

Space Operations Mission Directorate (SOMD) :
Lead Office

Contributing Programs and/or Program Activities

Communications Services Program

Launch Services

Rocket Propulsion Test

Space Communications and Navigation

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Strategy 2.4.1. Advice & Partnerships

Advise and partner with the U.S. commercial launch industry

NASA has an important role as a valued partner and advisor to the U.S. commercial launch industry. To ensure the U.S. launch industry continues to grow and maintain a completive posture, NASA certifies new commercial launch vehicles for readiness to fly high value spacecraft, performs key mission design and launch integration activities, and directs launch mission assurance efforts to ensure the greatest probability of launch mission success.

Stakeholder(s):

U.S. Commercial Launch Industry

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Tactic 2.4.1.1. Commercial Services

Use commercially provided services

The National Space Policy directs that we make use of, rather than duplicate, commercially provided services. NASA has a diverse set of users and communications needs against which commercial capabilities will be evaluated, such as launch vehicle support, visiting vehicles to ISS, human space flight, and science missions in Earth orbit, which range from flagship observatories to SmallSats and CubeSats. NASA will systematically migrate nearEarth missions from communications and navigation services provided by Government-owned networks to commercial networks. NASA will continue to provide support to our users and envisions transitioning future space-relay users to commercial providers over the next decade.

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Tactic 2.4.1.2. Communications & Mission Technology

Investing in technologies that will increase reliable communications capabilities and transform NASA mission technology

NASA is investing in critical technologies that will increase reliable communications capabilities and transform NASA mission technology. Our strategy is guided by the ability to acquire and utilize advanced space capabilities to the maximum extent possible. NASA's efforts in the continued development of communications technologies will enable, improve, and mature available communication and navigation technologies for both ground and space-based use. NASA will continue to leverage investments, experience, and accomplishments in many areas, including optical communications, building the initial technologies and capabilities required for future space-based communications networks.

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Tactic 2.4.1.3. Testing Facilities

Manage testing facilities

NASA manages testing facilities across the Nation, where both our programs and U.S. industry conduct rocket engine and component tests under controlled conditions. Our decades of experience in rocket propulsion testing ensures the delivery of desired outcomes while minimizing test time and costs. NASA has a keen focus on streamlining facility usage and eliminating redundant capabilities that keep this national asset available, as required, by multiple customers and users.

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Strategy 2.4.2. Partnerships

Engage and work with partners

How NASA Engages and Works with Partners

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Tactic 2.4.2.1. Industry & Academia

Work with industry and academia

NASA continues to work with industry and academia through a variety of partnerships, including numerous Space Act Agreements, focusing on rocket propulsion testing, space-based communications, launch system risk reduction, and other strategic capabilities.

Stakeholder(s):

Industry :
For example, executing a robust and proven strategy, NASA achieves assured access to space through a competitive "mixed fleet" approach that utilizes the breadth of U.S. industry's capabilities.

LSP :
LSP provides expertise to NASA payload missions who are using launch services through other Government agencies, the launch industry, or contributed by a foreign partner.

U.S. Space Force :
NASA collaborates extensively with the U.S. Space Force and other agencies in the areas of mission assurance, fleet surveillance, and acquisition strategy, and is an invaluable source of technical expertise and insights across the U.S. commercial space industry.

Commercial Space Industry

Academia

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Tactic 2.4.2.2. Rocket Engine Testing

Manage and sustain expertise and facilities for ground testing of rocket engines

Stakeholder(s):

NASA's Rocket and Propulsion Test (RPT) :
NASA's Rocket and Propulsion Test (RPT) program is responsible for managing and sustaining the Agency's expertise and facilities for ground testing of rocket engines. RPT provides vital propulsion data to validate initial designs, increase confidence in technical performance, reduce risks, and ensure launch readiness in preparation for Artemis I and Artemis II, as well as supporting the Commercial Crew Program's milestones.

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

3. Innovation

Catalyze economic growth and drive innovation to address national challenges

Stakeholder(s)

Armstrong Flight Research Center (AFRC)

Role: Commercial Spaceflight
AFRC hosts the program management office for Flight Opportunities, which supports commercial spaceflight industry maturation and validation of capabilities needed for NASA missions and commercial applications. The program awards flights and agreements to researchers from industry, academia, non-profit research institutes, and Government organizations. These investments advance technologies of interest to NASA, support commercial flight providers, and expand space-based applications and commerce.

Role: Innovation
AFRC also participates in NASA's Center Innovation Fund, which support emerging technologies and creative initiatives, led by NASA scientists and engineers, but often in partnership with other Centers, other agencies, research laboratories, academia, and private industry.

Role: Atmospheric Flight
AFRC is a leader in atmospheric flight research, bringing decades of experience, complex systems integration expertise, unique infrastructure, flight test techniques, and flight test systems to support the demands of a various aeronautics initiatives that leverage flight to perform basic research and validate the results of analysis and ground-based testing.

Role: Efficiency & Sustainability
AFRC enables efficient and sustainable aviation by developing electric aircraft, informing certification standards for advanced air mobility systems, participating in the development and flight tests of the world's first quiet supersonic aircraft to enable a new aviation market, and a new commercial subsonic configuration that will reduce the environmental impact of aviation.

Role: Flight Activities
AFRC's unique Dryden Aeronautical Test Range supports diverse missions with comprehensive resources for the control and monitoring of flight activities, including a flight test data portal to ensure retention and availability of critical data.

Role: Airworthiness & Flight Safety
The Center's world-class airworthiness and flight safety review process enables NASA and partners to conduct high-risk flight activities safely and effectively across subsonic, supersonic, and hypersonic speed regimes.

Role: Technology Transfer
Additionally, the AFRC Technology Transfer Office ensures that innovations developed for aeronautics and space are made more broadly available to the public—boosting the U.S. economy and maximizing return on the Nation's investment in NASA.

Ames Research Center (ARC)

Role: Program Management
ARC hosts the program management offices for both Small Spacecraft Technology (SST) and Small Business Innovative Research & Small Business Technology Transfer (SBIR/STTR).

Role: Small Spacecraft
SST develops and demonstrates new small spacecraft technologies and capabilities for NASA's missions in science, exploration, and space operations.

Role: Innovative Technologies
SBIR/STTR funds the research, development, and demonstration of innovative technologies that fulfill NASA needs and have significant potential for successful commercialization.

Role: Innovation & Maturation
In addition, ARC supports space technology maturation projects within NASA's Game Changing Development (GCD); participates in the Center Innovation Fund (CIF), supporting emerging technologies and creative initiatives, led by NASA scientists and engineers; and hosts the ARC Technology Transfer Office, ensuring that innovations developed for aeronautics and space are broadly available to the public.

Role: Air Traffic Management
ARC's 30 years of experience in advanced air traffic management systems improves the efficiency and safety of commercial aviation, reducing delays, fuel burn, and greenhouse gas emissions.

Role: Vehicles
ARC leverages expertise in system-wide safety, autonomy, artificial intelligence, and transforms the National Airspace Systems to accommodate all vehicle types and complex operations from low altitude to upper atmosphere flight regimes.

Role: Wildfire Suppression
ARC develops airspace tools to support aerial wildfire suppression.

Role: Simulations
The Center also conducts research and development of large-scale simulations for sustained atmospheric flight, including aerodynamic performance prediction, vehicle design and shape optimization, noise prediction, fluid-structure interaction, propulsion-airframe integration, and safety analysis.

Role: Vertical Flight Research
Though the Sustainable Flight National Partnership, ARC serves in a critical vertical flight research role for Advanced Air Mobility systems analysis and testing capabilities.

Role: Transonic Wind Tunnels
ARC operates the Transonic Wind Tunnels, used for evaluating new aircraft configurations for commercial and military applications as well as the launch abort

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Stakeholders (continued)

systems for the Artemis program, and the Unitary Plan Wind Tunnel.

Role: Air Traffic & Airspace Management
Additionally, ARC operates the Vertical Motion Simulator, Air Traffic Control Laboratory, Airspace Operation Laboratory, and Future Flight Central to provide realistic environments for air traffic and airspace management research and to study human systems performance, human and machine interactions, and future aviation safety challenges.

Role: Aeronautics Research Institute
ARC hosts the NASA Aeronautics Research Institute (NARI) that was established by NASA ARMD in 2012 to promote innovation in aeronautics to address challenges in the Nation's air transportation system, facilitate partnerships with the Federal Aviation Administration, other agencies, academia, and the commercial and emerging aviation industry, and inspire cross-Center activities. NARI advances the future of aeronautics by listening to stakeholders and recommending opportunities for game-changing technologies.

Glenn Research Center (GRC)

Role: Power, Propulsion & Communications
GRC conducts research and technology development for aerospace power, propulsion, and communications technologies from the conceptual stage through flight demonstration in collaboration with industry, academia, and other partners.

Role: In-Situ Resources
GRC is developing in-situ resource utilization concepts and technologies that will enable the use of natural resources in space for sustainable human exploration.

Role: Cryogenic Fluid Management
GRC leads the demonstration of cryogenic fluid management technologies that will enable future deep space exploration architectures.

Role: Maturation Projects
With an emphasis on these technology areas, GRC supports maturation projects within NASA's GCD.

Role: Solar Electric Propulsion & Fission Surface Power
In addition, GRC leads the Solar Electric Propulsion Project and the Fission Surface Power Project for NASA's Technology Demonstration Missions (TDM).

Role: Emerging Technologies & Creative Initiatives
GRC also participates in NASA's CIF, which supports emerging technologies and creative initiatives led by NASA scientists and engineers.

Role: Commercial Aviation
GRC collaborates with industry to address the challenges of next-generation commercial aviation, including the next single-aisle aircraft and emerging Advanced Air Mobility markets. This work includes hybrid-electric power and propulsion systems, components, and technologies, to meet sustainable aviation goals and develop electrified propulsion systems. GRC provides expertise and capabilities to demonstrate these technologies through extensive ground testing and flight demonstrations.

Role: Airbreathing Propulsion Systems
GRC leads research and technology development for advanced airbreathing propulsion systems of supersonic and hypersonic aircraft.

Role: Communications Technologies
The Center is also developing communications technologies to integrate future advanced vehicles into the airspace to transform the aviation industry.

Role: Innovative Technologies
GRC continues its long history of delivering innovative technologies and concepts to enable a pathway towards zero-emission aircraft, including materials and structures, sustainable fuels, advanced manufacturing, and power generation and storage.

Role: Technology Transfer
Additionally, the GRC Technology Transfer Office ensures that innovations developed for aeronautics and space are made more broadly available to the public.

Goddard Space Flight Center (GSFC)

Role: Economic Growth
GSFC's science and innovation enable economic growth on a national scale, and GSFC's missions drive technologies that affect people every day.

Role: Climate Models
The Center's climate models inform senior Government and industry policy makers.

Role: Weather Reports
Worldwide weather reports are possible because of GSFC satellites and weather models.

Role: Search & Rescue Technology
GSFC's search and rescue technology saves lives on Earth while GSFC's space weather detection models help protect astronauts and satellites in orbit and communications and power infrastructure on the ground.

Role: Commercial Applications
Further, GSFC transfers innovations to industry for commercial applications such as advanced laser and X-ray systems for communications, medical imaging systems, and robotics for safer mining and drilling.

Role: Consumer & Industrial Systems
The Center's cryogenic systems, component miniaturization, new sensors and instruments, and robotics systems are influencing the next generation of consumer and industrial systems and creating new capabilities for the space industry.

Role: Laser Communications
GSFC developed the Laser Communications Relay Demonstration, for NASA's TDM, which successfully launched in December 2021.

Role: Maturation Projects

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Stakeholders (continued)

GSFC also supports maturation projects within NASA's GCD.

Role: Emerging Technologies & Creative Initiatives
In addition, GSFC participates in NASA's CIF, which supports emerging technologies and creative initiatives led by NASA scientists and engineers.

Role: Technology Transfer
Additionally, the GSFC Technology Transfer Office ensures that innovations developed for aeronautics and space are made more broadly available to the public.

Jet Propulsion Laboratory (JPL)

Role: Technology Challenges
To advance future NASA missions, JPL will address challenges across a range of technology fields, including communications, autonomy, artificial intelligence, machine learning, robotics, data science, nanotechnology, quantum sensing, and advanced manufacturing, design, and materials.

Role: Transformation
Leveraging these technologies in space vehicle systems will enable transformational missions, whether they are small spacecraft or complex landing, in-situ systems, and sample return.

Role: National Needs
JPL advances cutting edge technologies that support national needs in climate, quantum information systems, commercial space, transportation, and cybersecurity.

Role: New Discoveries & Exploration
JPL will execute technology demonstrations of capabilities that enable new discoveries and exploration. These include flying an optical communications system that increases the data volume from deep space missions, an atomic clock that enables robotic spacecraft to operate without near-continuous connection to Earth, landing systems that enable pinpoint landings on extreme terrain, and a coronagraph instrument that will pave the way toward finding life outside of our solar system.

Role: Technology Maturation & Demonstration
With an emphasis on these technology areas, JPL supports maturation and demonstration projects through NASA's GCD and Technology Demonstration Missions, respectively.

Role: Emerging Technologies & Creative Initiatives
JPL also participates in NASA's CIF, which supports emerging technologies and creative initiatives led by NASA scientists and engineers.

Role: National Problems & Economic Growth
JPL collaborates with other Government agencies and private-sector partners to address problems of national significance and catalyze economic growth.

Role: Communication, Data & Encryption
JPL also develops and transfers technologies that enable reliable high-speed communication, data transfer, processing, visualization, access, and encryption capabilities within the national sphere of influence around Earth and out to the Moon.

Role: Aeronautics & Space Innovations
The JPL Technology Transfer Office ensures that innovations developed for aeronautics and space are made more broadly available to the public.

Johnson Space Center (JSC)

Role: Development
Programs such as ISS, Orion, Gateway, Human Research Program, Commercial Low Earth Orbit (COMMLEO), Commercial Lunar Payload Services, Extravehicular Activities and Human Surface Mobility, along with the Center's support of Commercial Crew and Human Landing System activities, provide billions of dollars of development activity across the country.

Role: Cislunar Outpost
NASA is working with both commercial and international partners to establish the Gateway as a cislunar outpost for human explorers.

Role: Commercial Solutions
JSC incorporates new technologies and available commercial solutions to develop alternative components and broaden the supplier base.

Role: High-Tech Industrial Base
Additionally, the COMM-LEO program, which supports Strategic Goal 2, strengthens the high-tech industrial base and supports further development of a commercial marketplace in low Earth orbit through commercial and academic partnerships and technology transfer.

Role: Technology Maturation
JSC supports technology maturation projects within NASA's GCD.

Role: Emerging Technologies & Creative Initiatives
JSC also participates in NASA's CIF, which supports emerging technologies and creative initiatives led by NASA scientists and engineers.

Role: Technology Transfer
Additionally, the JSC Technology Transfer Office ensures that innovations developed for aeronautics and space are made more broadly available to the public.

Kennedy Space Center (KSC)

Role: Flight & Surface Systems
KSC supports research, development, testing, and demonstration of advanced flight and surface systems and transformational technologies to advance exploration systems, human and cargo landers, and deep space systems.

Role: Environmental Control & Life Support
KSC also supports environmental control and life support systems technology development, habitation space systems development, and operations and in-situ resource utilization.

Role: Commercial Investment
KSC works with commercial industry to encourage new opportunities and develop partnership agreements that further commercial investment to enhance the multi-user spaceport, enable innovation, and increase diverse access to space.

Role: Technology Maturation

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Stakeholders (continued)

KSC supports technology maturation projects within NASA's GCD Program.

Role: Emerging Technologies & Creative Initiatives
KSC also participates in NASA's CIF, which supports emerging technologies and creative initiatives led by NASA scientists and engineers.

Role: Technology Transfer
Additionally, the KSC Technology Transfer Office ensures that innovations developed for aeronautics and space are made more broadly available to the public.

Langley Research Center (LaRC)

Role: Aviation & Space Exploration
LaRC research helps the Nation meet fundamental challenges that arise from the rapid evolution of aviation and space exploration.

Role: Economic Growth
The Center's work fuels economic growth in traditional commercial aviation and space technologies and emerging markets.

Role: X-Planes
LaRC is a major contributor to the Agency's current experimental flight demonstrators (also known as X-planes), including the X-59 Low Boom Flight Demonstrator, to enable overland supersonic flight, and to future flight efforts as part of the Sustainable Flight National Partnership.

Role: High-Speed Commercial Flight
LaRC continues to push the boundaries for high-speed (supersonic and hypersonic) commercial flight and contributes vehicle and airspace technologies to enhance the emerging Advanced Air Mobility market.

Role: Composite Structures & Materials
LaRC also leads and supports activities including manufacturing initiatives in composite structures and materials.

Role: Public-Private Partnerships
The Center promotes public-private partnerships with in-space manufacturing and assembly and supports industry partners developing commercial space transportation systems for access to low Earth orbit and beyond.

Role: Autonomy Technology
LaRC ensures that NASA leverages the burgeoning autonomy technology area to benefit a variety of NASA missions.

Role: GCD Program Management
LaRC hosts the program management office for NASA's GCD.

Role: Future Space Missions
GCD advances space technologies that may lead to entirely new approaches for the Agency's future space missions and provide solutions to significant national needs.

Role: Inflatable Decelerator
LaRC also leads the Low-Earth Orbit Flight Test of an Inflatable Decelerator (LOFTID) project for NASA's TDM.

Role: Emerging Technologies & Creative Initiatives
LaRC also participates in NASA's CIF, which supports emerging technologies and creative initiatives, led by NASA scientists and engineers.

Role: Technology Transfer
Additionally, the LaRC Technology Transfer Office ensures that innovations developed for aeronautics and space are made more broadly available to the public.

Marshall Space Flight Center (MSFC)

Role: Economic Growth
MSFC's leadership in human space exploration ignites economic growth opportunities while inspiring, educating, and improving life on Earth.

Role: Advanced Manufacturing Technologies
MSFC partnerships with industry and academia advance and incorporate Advanced Manufacturing Technologies (e.g., additive, welding, composites) for use on Earth and in space, while establishing standards and qualifications for use in space flight. Additive manufacturing technology developments are paving the way for future lunar and Mars in-situ surface construction.

Role: Chemical Propulsion
MSFC's chemical propulsion expertise is at the forefront of innovation and development of advanced ascent, in-space, and lander propulsion systems. The development of these systems and related technologies, including the development of long-term cryogenic fluid management for nuclear propulsion systems, are essential to deep space human exploration.

Role: Environmental Control & Life Support Systems
MSFC sustains current human presence in space through the environmental control and life support systems aboard the space station and is advancing those systems for long term and deep space exploration.

Role: Ground & Flight-Testing Technologies
MSFC hosts the program management office for NASA's TDM. TDM focuses on ground and flight-testing cross-cutting technologies with strong customer interest that meet the needs of NASA and industry by enabling new missions or greatly enhancing existing ones.

Role: Nuclear Propulsion
MSFC also leads the Space Nuclear Propulsion Project for TDM as well as several maturation projects for NASA's GCD.

Role: Emerging Technologies & Creative Initiatives
In addition, MSFC participates in NASA's CIF, which supports emerging technologies and creative initiatives led by NASA scientists and engineers.

Role: Technological Innovation

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Stakeholders (continued)

MSFC also stimulates technological innovation through technology transfer and innovative Centennial Challenge competitions.

Role: Business Opportunities
Collectively, these activities provide business opportunities for industry and academia, while also improving life on Earth.

Stennis Space Center (SSC)

Role: Propulsion Industry
SSC is a catalyst for growth of the propulsion industry and the commercialization of space.

Role: U.S. Launch Industry
SSC supports development of the U.S. launch industry by testing the latest designs and transferring generations of experience to emerging companies. SSC accelerates development of the industry by leasing existing, underutilized facilities or greenspaces for industry propulsion development, reducing development time and costs.

Role: Technology Development
The SSC technology development program creates innovative, mission-ready solutions.

Role: U.S. Industrial Base
Through public-private and academic partnerships, SSC strengthens the U.S. industrial base in fields such as autonomous systems, digital twins, integrated systems health management, predictive and condition-based maintenance, artificial intelligence and machine learning, embedded systems, and computational fluid dynamics.

Role: Autonomous Space Systems
The Autonomous Systems Lab (ASL) continually enhances the NASA Platform for Autonomous Systems , the first platform for the development of Class A autonomous systems. The ASL provides best-in-class tools and expertise to help NASA and industry develop robust, safety-critical, human-rated autonomous systems for space missions and ground operations. The ASL works with NASA and other agencies to establish requirements for trusted autonomous space systems.

Role: Emerging Technologies & Creative Initiatives
SSC participates in NASA's CIF, which supports emerging technologies and creative initiatives, led by NASA scientists and engineers.

Role: Technology Transfer
SSC also enhances access to NASA technology by maintaining multiple technology transfer processes for the Agency to drastically reduce licensing time while increasing process security.

NASA drives economic development and growth through technological innovation. The National Aeronautics and Space Act of 1958 specifically calls out this important theme, and since its inception NASA's investments have driven innovation, benefitting the U.S. economy and the American people. It was Apollo and other U.S. space programs, with their need for large quantities of integrated circuit components, that led to lower-cost production and provided a critical early boost to the growth of the American semiconductor industry. Similarly, NASA's early role in the development of satellite communications and remote sensing eventually led to the emergence of the robust space-based market, spanning a broad range of commercial communication and data services.

3.1. Space Technologies

Innovate and advance transformational space technologies

Develop revolutionary, high-payoff space technologies driven by diverse ideas to transform NASA missions and ensure American leadership in the space economy. | Technological leadership remains vital to our national security, economic prosperity, and global competitiveness. The Nation's continued economic leadership is due in part to the technological investments made over time that enabled our country to emerge as a global technological leader. That commitment accelerated the economy with the creation of new industries, products, and services that yielded lasting benefits. Moving forward, a technology-driven NASA will continue to help fuel our Nation's economic engine and support the creation of jobs for decades to come, while also providing valuable breakthroughs for NASA's missions and the commercial space industry. In short, technology drives the space economy. As NASA embarks on its next era of discovery and exploration, the advancement of transformational space technologies help guide the journey ahead. We invest in crosscutting and transformational technologies that have high potential for offsetting mission risk, reducing cost, and advancing existing or creating new capabilities. Our technology investments enable NASA's science and human exploration missions and foster growth and job creation in domestic industries. We harness innovation and entrepreneurship through partnerships with universities, small businesses, and other Government agencies, while also engaging the broader public. Through leadership in space technology, NASA will contribute to growing the U.S. industrial and academic base by transferring space technology into the space economy, continuing the Nation's global economic leadership, and strengthening our national security.

Stakeholder(s):

Space Technology Mission Directorate (STMD) :
Lead Office

Contributing Programs and/or Program Activities

Early-Stage Innovation and Partnerships

Small Business Innovation Research (SBIR)

Small Business Technology Transfer (STTR) Program

Technology Demonstration

Technology Maturation

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Strategy 3.1.1. Stakeholders

Work closely with stakeholders

Working closely with stakeholders, enlisting partnerships, utilizing evidence-based decision making, and promoting diversity, equity, inclusion, and accessibility are all key to our strategy.

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Tactic 3.1.1.1. Merit-Based Competition

Employ a merit-based competition model

To balance near-, mid-, and long-term technology requirements we employ a merit-based competition model, with a portfolio approach spanning a range of discipline areas and technology readiness levels. Integration across programs is key to identifying and successfully transitioning and transferring new capabilities. By working with potential stakeholders up front and continuously engaging through conception, maturation, and demonstration, we are more effective in transferring new transformative technologies and capabilities within NASA, the U.S. Government, and throughout industry and academia.

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Tactic 3.1.1.2. Evidence-Based Decision Making

Focus on evidence-based decision making

NASA's technology portfolio has grown significantly in recent years, and enhancements in portfolio management processes and functions are required to continue effective and efficient operations. We focus on evidence-based decision making as part of our success strategy.

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Tactic 3.1.1.3. Data Management

Continuously improve our management of data

Continuous improvement of data management enables us to have a more complete understanding of the vast array of projects within our portfolio, allowing for the investigation of technology development history to inform future investment decisions.

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Tactic 3.1.1.4. Investment Analysis & Outcomes

Apply outcome-based requirements and documentation to inform quantitative analysis of technology gaps and provide guidance for future investments

Strategic implementation planning remains an integral component of meeting our objectives. Moving forward, focused, outcome-based requirements and documentation will inform quantitative analysis of technology gaps and provide guidance for future investments.

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Tactic 3.1.1.5. DEIA

Promote diversity, equity, inclusion, and accessibility

NASA promotes diversity, equity, inclusion, and accessibility, guided by Executive Orders 13985 and 14041, through supporting participation by underserved communities in its technology programs. A key element of our strategy is inspiring and developing a diverse and powerful U.S. aerospace technology workforce. We remain focused on increasing the diversity of our innovation community.

Stakeholder(s):

Space Technology Programs :
Accordingly, our space technology programs participate in the NASA Science, Technology, Engineering, and Mathematics (STEM) Engagement Minority University Research and Education Project (MUREP) to engage and support Minority Serving Institutions (MSIs), including Historically Black Colleges and Universities (HBCUs).

HBCUs

MUREP :
Through MUREP, NASA reaches scientists, engineers, and students from underserved and underrepresented communities.

MSIs :
For example, in 2021, NASA awarded grants, up to $50,000 each, to 11 MSIs to foster partnerships between those institutions and U.S. small businesses while also potentially lowering the barriers of entry to participation in NASA's Small Business Technology Transfer program.

NASA's Small Business Technology Transfer Program

MSI STEM Research and Development Consortium :
We also recently launched a pilot initiative with the MSI STEM Research and Development Consortium aimed at increasing MSI participation in Federal research. Additionally, our annual "Technology Infusion Road Tour" reached representatives from MSIs to share insight and strategies on how to pursue procurement and technical opportunities with the Agency.

Underserved Communities :
Moving forward, our Early-Stage Innovation and Partnerships, Technology Maturation, and Technology Demonstration portfolios will continue to explore new approaches to increase participation by underserved communities.

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Strategy 3.1.2. Leadership

Ensure American leadership in the space economy

How NASA Engages and Works with Partners

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Tactic 3.1.2.1. Gaps & Leadership

To ensure American leadership in the space economy, NASA aggressively pursues critical technology gaps and global space technology leadership.

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Tactic 3.1.2.2. Competition & Partnerships

We embrace competition and external partnerships that spur innovation and entrepreneurship.

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Tactic 3.1.2.3. Partnerships

We create partnerships with universities, small businesses, industry, emerging commercial entities, individual innovators, and other Government agencies to meet NASA mission needs and support commercial expansion in space.

Stakeholder(s):

Universities

Small Businesses

Industry

Emerging Commercial Entities

Innovators

Government Agencies

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Tactic 3.1.2.4. International Partners

We also welcome opportunities to work with our international partners on shared priorities.

Stakeholder(s):

International Partners

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Tactic 3.1.2.5. Investment & Commercialization

With a focus on infusing NASA technologies into commercial products and services, we actively engage our stakeholders to help define investment content and identify opportunities where technological advances can enable a commercially viable product or service.

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Tactic 3.1.2.6. Contracts & Agreements

We utilize multiple mechanisms to partner with industry, including public-private partnerships through contracts and Space Act Agreements.

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Tactic 3.1.2.7. Risk & Financial Stakes

By sharing the risk and financial stakes with the private sector, other Government agencies and internal stakeholders, NASA encourages future commercial markets in the process of developing new capabilities.

Stakeholder(s):

Private Sector **Government Agencies**

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Tactic 3.1.2.8. High-Risk, High-Reward Activities

NASA invests in high-risk, high-reward activities across the technology development spectrum through our partnerships.

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Tactic 3.1.2.9. Underserved & Underrepresented Communities

Build better bridges to underserved and underrepresented communities

Stakeholder(s):

National Aerospace Technology Workforce :
NASA understands the future of American leadership in space depends on a national aerospace technology workforce comprised of inventors and innovators across a wide spectrum of disciplines in addition to technologists and engineers that tackle the hard problems that space presents, and our partnerships spur growth in these disciplines.

InventorsInnovators

Technologists

Engineers

Underserved Communities :
We also recognize that diversity of thought and background, and cross-disciplinary perspectives are critical to the Nation's success and that working to attain equity must include building better bridges to underserved and underrepresented communities, so no talent is missed in achieving our national space technology objectives.

Underrepresented Communities

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

3.2. Aviation

Drive efficient and sustainable aviation

Lead aviation innovation to enable safe and sustainable air transportation through revolutionary vehicle advances and efficient flight operations. | Air transportation is an integral part of modern life, providing safe, affordable, and convenient travel to the public. Consequently, it has become an integral part of the U.S. and global economy. In a 2020 economic impact report1 published by the Federal Aviation Administration, air transportation2 provided $78 billion of positive trade balance for the U.S. manufacturing sector, 10.9 million direct and indirect jobs and 21.3 billion tons of freight by the U.S. airlines culminating in $1.8 trillion of total U. S. economic activity (8.6 percent of the 2018 U.S. Gross Domestic Product). Of the 10.9 million jobs, over one million were high-quality manufacturing jobs. Nearly every product created and purchased today (from toys to groceries) is touched by aviation in some way. Speed, convenience, and economic benefits from air transportation are the primary factors in its rapid growth; benefits that have been even more important during the COVID-19 pandemic. NASA's research contributes significantly to the aviation sector in improving its safety, efficiency, and resulting economic well-being of the Nation. Our role is to reduce the risk inherent in innovative concepts. We explore early-stage concepts and ideas, develop new aviation technologies and air traffic operational procedures, and demonstrate their potential in a relevant environment. The Agency is steadfast in its commitment to cutting-edge research and technology development and demonstration to assure U.S. competitiveness in the aviation sector.

Stakeholder(s):

Aeronautics Research Mission Directorate (ARMD) :
Lead Office

NASA Contributing Programs and/or Program Activities

Advanced Air Vehicles Program

Transformative Aero Concepts Program

Integrated Aviation Systems Program

Airspace Operations and Safety Program

Aerosciences Evaluation and Test Capabilities

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Strategy 3.2.1. Thrusts

Engage in high-risk, high-reward research and technology development

To continue NASA's leadership in aviation innovation and enable a revolutionary transformation of the aviation system, NASA is focused on six major research areas, or Thrusts, for the long-term future of aviation. These research Thrusts utilize the full capability of our in-house aeronautics expertise. Through high-risk, high-reward research and technology development, NASA seeks to enable [six research thrusts] Each Thrust is designed to address an important area of research and technology development that will further U.S. leadership in the aviation industry and enhance global mobility. This research is performed with an emphasis on multi-disciplinary collaboration focused on the critical, integrated challenges aligned to the six research Thrusts—what NASA refers to as convergent research. Together, these research Thrusts combine to enable safe, sustainable growth in the overall global aviation system, while pioneering transformative capabilities that will create revolutionary opportunities. NASA works with partners in other Government agencies, industry, and academia to support innovative concepts and technologies, and with international counterparts to leverage complementary investments.

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Tactic 3.2.1.1. Safety & Efficiency

Enable safe and efficient growth in global operations

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Tactic 3.2.1.2. Supersonic Aircraft

Enable innovation in commercial supersonic aircraft

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Tactic 3.2.1.3. Subsonic Transports

Enable ultra-efficient subsonic transports

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Tactic 3.2.1.4. Vertical Lift Air Vehicles

Enable safe, quiet, and affordable vertical lift air vehicles

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Tactic 3.2.1.5. Safety Assurance

Enable in-time system-wide safety assurance

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Tactic 3.2.1.6. Autonomy

Enable assured autonomy for aviation transformation

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Tactic 3.2.2.1. Diversity & Representation

Increase diversity and broadening representation in the Nation's aeronautics research and development enterprise

How NASA Engages and Works with Partners ~ NASA is committed to increasing diversity and broadening representation in the Nation's aeronautics research and development enterprise, both internal and external to NASA.

Stakeholder(s):

Private Sector :
We engage with the private sector and academia in research activities through solicitations such as the NASA Research Announcements.

Academia :
We encourage participation by academic institutions that serve underrepresented and minority groups through active outreach to professional organizations for women and to Minority Serving Institutions (MSIs) and Historically Black Colleges and Universities (HBCUs) informing them about NASA's portfolio and upcoming opportunities.

Minority Serving Institutions (MSIs)

Historically Black Colleges and Universities (HBCUs)

University Leadership Initiative :
ARMD's University Leadership Initiative (ULI) is one notable example of our efforts in this regard. ULI represents a new type of interaction with the university community, where universities take the lead, build their own teams, and set their own research path. Under this initiative, we explicitly require proposing university teams to include MSIs and HBCUs and continue to encourage women faculty members to apply.

Women Faculty Members

Minority University Research and Education Project :
We also leverage Minority University Research and Education Project (MUREP) funded by NASA Office of Science, Technology, Engineering and Mathematics.

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Tactic 3.2.2.2. Partnerships

Leverage ARMD's investments through joint efforts that complement NASA's internal capabilities, provide access to a wide range of technologies beyond the traditional aeronautics portfolio, and facilitate technology transfer to more mature states of development and eventual implementation

Stakeholder(s):

ARMD :
Partnerships with other Government, industry, academia, and foreign aeronautics agencies leverage ARMD's investments through joint efforts that complement NASA's internal capabilities, provide access to a wide range of technologies beyond the traditional aeronautics portfolio, and facilitate technology transfer to more mature states of development and eventual implementation.

Industry

Academia

Foreign Aeronautics Agencies

Government Partners :
Integrated technology demonstrations typically include selected industry or Government partners who contribute their own funding or knowledge.

Aviation Community :
These partnerships also give ARMD deep insight into the goals and needs of the aviation community, as well as providing user feedback and facilitating industry engagement early in the technology development cycle.

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Tactic 3.2.2.3. NAS & Technology

Leverage technology investments to improve the performance of the National Airspace System (NAS)

Stakeholder(s):

ARMD :
ARMD collaborates closely with the Federal Aviation Administration to support their decision making and to improve the performance of the National Airspace System (NAS), as well as with the Department of Defense and other Government agencies to leverage technology investments.

National Airspace System (NAS)

Federal Aviation Administration

Department of Defense

Government Agencies

Industry :
Industry partnerships allow rapid insertion of NASA aeronautics research results into air vehicles and subsystems, and NAS operations, tools, and processes.

Academic Institutions :
Partnerships with domestic academic institutions support cutting-edge research on emerging aviation technologies and on the education of new researchers in various fields of study.

International Government Entities :
To help address the global nature of air transportation, ARMD also forges partnerships with a wide range of international Government entities, such as the International Forum for Aviation Research.

International Forum for Aviation Research

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

4. Advancement

Enhance capabilities and operations to catalyze current and future mission success

Stakeholder(s)

Armstrong Flight Research Center (AFRC)

Role: Requirements & Processes
AFRC analyzes potential future Mission Directorate, program, and mission requirements and optimizes Agency capabilities through rigorous flight safety processes.

Role: Diversity
The Center continues to expand recruitment and workforce strategies to reach diverse candidates and build a workforce representative of all segments of society.

Role: Training, Awards & Recognition
AFRC's Office of the Chief Human Capital Officer, in collaboration with the Office of Diversity and Equal Opportunity, Office of Science, Technology, Engineering, and Math (STEM) Engagement, and employee resource groups, develops and promotes training, academic programs, and rewards and recognition approaches that enhance the employee experience, while also building and retaining capabilities for mission success.

Role: Mission Support
AFRC works with the Mission Support Directorate (MSD) to maintain the operating environment, support the locally assigned MSD workforce, and transform mission support operations by leveraging the skills and capacity of the enterprise workforce.

Role: STEM
AFRC's work in STEM engagement is focused on serving students. NASA invests in STEM engagement for students of all levels.

Role: Workforce
AFRC will leverage its community of talented and dedicated education professionals and its technical workforce to inspire and engage youth and build the next generation of explorers.

Ames Research Center (ARC) :

Role: Research & Testing
ARC manages and operates several unique research and testing facilities, including the Arc Jet Complex for simulating hypervelocity flight conditions and the NASA Advanced Supercomputing Facility, which hosts several eco-friendly, multi-petaflop supercomputers to meet NASA's high-performance computing needs.

Role: IT Infrastructure
ARC serves as the nerve Center for securing NASA's information technology infrastructure.

Role: Security Operations
It co-hosts the NASA Security Operations Center with Johnson Space Center to protect more than 100,000 devices and users.

Role: Education
ARC provides support and resources to educators and institutions to effectively engage students. ARC leverages its community of talented and dedicated education professionals and its technical workforce to inspire and engage students in STEM and build the next generation of explorers.

Role: Workplace
ARC strives to ensure mission success by enabling a positive environment that values diversity, equity, inclusion, and accessibility.

Role: Workforce
ARC aims to attract, fully utilize, and retain the best talent to achieve its mission. ARC must be viewed as an employer of choice with a diverse workforce.

Role: NASA Research Park
ARC hosts the NASA Research Park, which includes tenants from other Government agencies, academia, and innovative private-sector entities, enabling a research and development ecosystem and partnership for current and future NASA missions.

Glenn Research Center (GRC) :

Role: Capabilities
GRC develops and sustains integrated unique capabilities (expertise, laboratories, test facilities, and digital platforms) in propulsion, power, communications, materials and structures, cryogenic fluids, physical and biological sciences to support current and future science missions, human exploration space technology development, and aeronautics research. These capabilities support a broad portfolio of work including early-stage research, technology development, demonstrations, and aerospace flight system development.

Role: Digital Capabilities & Platforms
The GRC capabilities will increasingly integrate and leverage new digital capabilities and platforms to transform the way that NASA designs, develops, tests, and evaluates new technologies and flight systems.

Role: Workforce
GRC takes action to attract, develop, and retain a diverse workforce that reflects societal demographics and emphasizes equity, inclusion, and accessibility.

Role: Workplace
The Center will continue to evolve with increased workforce flexibility and agility, including enhanced capabilities to work across different office, laboratory, and remote work environments to meet current and future NASA mission needs.

Role: Mission Support
GRC leverages NASA mission support capabilities to ensure integration of efficient operations, communications, financial management, procurement, infrastructure management, legal services, occupational safety and health programs, information technology, and other services to deliver on current and future commitments.

Goddard Space Flight Center (GSFC)

Role: Diversity

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Stakeholders (continued)

GSFC relies on, recognizes, and nourishes the diversity of its workforce, and commits to diversity, equity, inclusion, and accessibility throughout the organization and among its suppliers and partners.

Role: Accessibility
Physical and digital accessibility is integrated into missions, products, and the Center's infrastructure plans.

Role: IV&V
The GSFC-managed Independent Verification and Validation (IV&V) facility in West Virginia provides software assurance services Agency-wide. The Center manages electrical, electronic, and electromechanical parts services for NASA. Students apply each year for internships and other work opportunities at the Center, and GSFC involves university faculty, students, and researchers as principal partners in all phases of its work.

Role: STEM
GSFC's STEM learning activities, internships, fellowships, and post-doctoral opportunities are used to translate core missions into experiences that motivate and inspire students and educators at all levels.

Role: Partnerships
GSFC consistently reaches across Federal agency, commercial, and academic boundaries to execute NASA's Mission, creating innovative partnership arrangements for nearly every project.

Role: Agreements
As a result, the Center manages one of the Agency's largest portfolios of cooperative and reimbursable agreements with industry, academia, other Government agencies, and international partners. These include relationships with the U.S. Space Force and longstanding agreements to provide weather and terrestrial observing satellites to the National Oceanic and Atmospheric Association (NOAA) and the U.S. Geological Survey.

Jet Propulsion Laboratory (JPL)

Role: Talent
JPL maintains a diverse talent pipeline that attracts and engages the brightest minds across the STEM community.

Role: Diversity
To further diversify this pipeline and increase retention and promotion rates among underrepresented groups, JPL is focusing on increasing engagement with Historically Black Colleges and Universities, fostering career opportunities for underrepresented groups, and launching an accessibility taskforce.

Role: Workplace
JPL strives to create an environment where employees feel included, represented, and valued while providing flexibility around where, when, and how they work best.

Role: Systems
JPL transforms the enterprise to better support flight projects by thinking about the enterprise as a system comprised of people, processes, tools, data, facilities, and other resources that work together to accomplish NASA's Mission.

Role: Space Access
JPL and the Infrared Processing and Analysis Center are innovating in mission and science operations to match future concepts and smaller missions enabled by easier access to space.

Role: Robotic Missions
JPL is also pursuing and infusing advanced capabilities in communication, navigation, and mission operations to enable the next generation of robotic missions.

Role: Investigators
JPL develops future principal investigators through various experiential workshops that increase participants' capabilities to ideate, collaborate, and communicate compelling science-driven missions.

Role: Engagement, Connections & Learning
To bring space down to Earth for all, JPL is also leading engagement activities and will continue making connections with the public through engaging learning activities to inspire the next generation of explorers.

Johnson Space Center (JSC)

Role: Astronauts
JSC collaborates with the Commercial Crew Program on development and certification process for getting U.S. astronauts to and from the ISS.

Role: Costs & Capabilities
The ISS program and JSC's Flight Operations Directorate are reducing operational costs and developing new capabilities, while increasing science utilization and commercial access to low Earth orbit.

Role: Technical & Professional Support
JSC promotes mission success by delivering reliable, adaptable, and streamlined technical and professional support infrastructure and capabilities.

Role: Public Engagement
The Center engages the public in NASA projects through robust public outreach and social media programs, including opportunities for interaction with astronauts.

Role: Collaboration
JSC also focuses on lowering barriers to collaboration with both existing and emerging partners. The Center does this by developing critical expertise, serving as champions for innovation, and proactively recruiting as well as developing a diverse pool of highly motivated employees that propel the frontiers of space exploration.

Role: DEIA
JSC actively promotes diversity, equity, inclusion and equal opportunities via our Inclusion and Innovation Council, ten Employee Resource Groups, and the Inclusive Leadership Cadre.

Role: Academia
Lastly, JSC is intentional about partnering with academia to promote STEM activities with a broad and diverse community of students.

Kennedy Space Center (KSC)

Role: Collaboration

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Stakeholders (continued)

KSC collaborates with partners, including other Centers and external entities, to advance and share technology, promote STEM learning, and engage with the public regarding NASA's Mission.

Role: Workforce & Services
KSC safely and strategically optimizes its diverse workforce and provides innovative, cost-effective, and efficient Center services to support the Agency's Mission.

Role: Evaluation & Alignment
KSC continually evaluates and aligns its highly-valued people and programmatic and institutional capabilities to implement rigorous and innovative safety, facility and systems engineering and integration, IT, and other services to ensure reliable and quality products.

Langley Research Center (LaRC)

Role: Transformation
LaRC continues to transform the way it provides capabilities and conducts operations.

Role: Infrastructure
Following the new Agency-wide enterprise support model, LaRC works with the Office of Strategic Infrastructure and mission directorate infrastructure groups, such as Aerosciences Evaluation and Test Capability, to fund and support capabilities required by the Agency and the Nation to conduct NASA missions.

Role: Diversity
LaRC is committed to a diverse workforce, actively engaging and recruiting from underrepresented and underserved groups and universities to find the best and brightest talents to solve NASA's challenges.

Role: STEM
Additionally, LaRC supports the Agency's STEM efforts by providing leadership and contributions to STEM engagement opportunities and activities.

Marshall Space Flight Center (MSFC)

Role: STEM
MSFC inspires the next generation of explorers through STEM activities and other outreach events such as the Human Exploration Rover Challenge and Student Launch Initiative.

Role: Outreach
MSFC's outreach extends to secondary and post-secondary education institutions alike, with a specific focus on inclusion of traditionally underserved and underrepresented populations and institutions of learning. MSFC engages in education outreach campaigns and routinely hosts interns each academic semester. These inclusionary activities serve as a pipeline for recruitment of a talented and representatively diverse population that allows the Center to shape the workforce to meet the demands of the evolving space industry.

Role: Workforce
Just as MSFC seeks to inspire today's next generation, it also continually seeks to develop its current workforce through technical, programmatic, and personal training in an effort to prepare tomorrow's leaders to address the challenges they will face as they inspire future generations.

Role: IT
By leading and providing key enterprise information technology systems, services, and infrastructure, MSFC is enabling NASA's transformation to a new work paradigm that supports the needs of the Agency and the employee alike. In this mission support role, MSFC enables the Agency's future while providing cybersecurity, network and application services, and secure data communications.

Stennis Space Center (SSC)

Role: Support Services
SSC works diligently with the MSD to transform local delivery of support services through the new enterprise models.

Role: Base Operations
SSC provides significant cost savings to NASA through the consolidated contract for base operations at both SSC and the Michoud Assembly Facility, as well as administering the Multiple Award Construction Contract (MACC)-II regional construction contract.

Role: Facilities
Similarly, SSC's unique facility operations cost-sharing model with its Federal City tenants provides additional efficiency.

Role: STEM
SSC supports a STEM portfolio with a diverse set of activities, education products, internships, challenges and competitions, informal and formal education and out-of-school student learning activities, and educator support. Robust face-to-face and virtual opportunities attract and retain students on STEM pathways with significant attention on underserved and underrepresented students.

Role: Talent
SSC's talent recruitment plan leverages the Office of the Chief Human Capital Officer's talent strategy by utilizing LinkedIn and Talent Marketplace to reach new and diverse candidates.

Role: Relationships
SSC builds constructive relationships with schools and universities, community-based organizations, small businesses, and professional associations to expand outreach to underrepresented communities and to create and maintain an inclusive workplace culture.

NASA's complex and bold missions require modern, adaptable technical and professional support capabilities to enable mission readiness, resilience, and our continued leadership in science, exploration, discovery, and innovation. The pace of change and innovation in aerospace is increasing, and NASA must deliver critical support capabilities for mission success. We will pursue the goal of enhancing capabilities and operations to ensure that NASA has the right people, infrastructure, technology, and technical excellence and oversight needed to advance the Agency into the Artemis era and beyond.

4.1. Workforce

Attract and develop a talented and diverse workforce

Cultivate a diverse, motivated, and highly qualified workforce through modernizing our Human Capital processes and systems, increasing our workforce agility and flexibilities, and implementing a robust Diversity, Equity, Inclusion, and Accessibility (DEIA) approach to ensure systematic and sustainable fairness, impartiality, and equity in our business practices. | NASA will modernize how we attract, hire, support, lead, and retain the quality, diversity, and depth of talent necessary for mission success. Recent experiences and lessons from the pandemic, as well as nationwide workforce and workplace trends, will inform and help NASA institutionalize and improve our hybrid work practices. NASA's modernization strategy will also address other factors such as an increasing number of retirement-eligible civil servants over the next five years and increasing competition for highly qualified science, technology, engineering, and mathematics (STEM) talent, especially as more commercial entities enter the field. While NASA has long enjoyed a reputation of attracting top talent; we recognize the value of recruiting and employing a diverse workforce cannot be understated. The Agency is better positioned to fulfill its current and future missions when we intentionally invite people with different backgrounds, who show promise and potential, into spaces to inspire and challenge us to think and work differently. In 2020, NASA added Inclusion to our Core Values, recognizing that inclusion is intrinsic to our work, our relationships, and our achievements. Inclusion increases collaboration and productivity. Additionally, it encourages employees to go above-and-beyond to achieve our goals. Also, all people want to feel a sense of inclusion and belonging. Inclusion happens when people can have psychological safety in being their authentic selves, sharing their ideas, knowledge, creativity, and innovation. The combination of all our values and the emphasis on Inclusion lets NASA strive to have a healthy culture and be an employer of choice.

Stakeholder(s):

Mission Support Directorate (MSD) :
Lead Office

Office of Diversity and Equal Opportunity :
Lead Office

NASA Contributing Programs and/or Program Activities :
Mission Enabling Services

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Strategy 4.1.1. DEIA & Human Capital

Continue to instill DEIA and other human capital best practices to modernize how we hire, retain, and develop our distributed and digitally enabled workforce

NASA will continue to instill DEIA and other human capital best practices to modernize how we hire, retain, and develop our distributed and digitally enabled workforce. NASA will continuously improve our hiring and onboarding processes to enable our managers and human capital professionals to employ the right people, when and where they are needed to meet mission needs today and in the future. We will develop our people to meet

evolving mission needs through increasing partnership opportunities with academia, and others, as well as through experiential rotations and meaningful leadership development assignments.

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Tactic 4.1.1.1. Agility & Responsiveness

Cultivate a workforce that is more agile and responsive to changing skill demands and requirements

NASA will cultivate a workforce that is more agile and responsive to changing skill demands and requirements. Through effective and strategic workforce planning we will align workforce requirements directly to the Agency's Strategic Plan. In addition, we will identify gaps between competencies the workforce currently possesses and future requirements. Lastly, we will identify and implement gap reduction strategies such as: continuing to use contractors and term-limited appointments, leveraging NASA Excepted Employment appointments or temporary workers to meet current specific mission requirements, and ensuring we maintain a stable workforce to meet future demands. We will use Agency-specific direct hiring and term appointment authorities for the civil servant workforce to provide us the flexibility to optimally align competency and skill requirements to future mission needs.

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Tactic 4.1.1.2. Culture, Policies & Tools

Transform our culture, policies, and tools to foster productive hybrid work environments that help NASA attract and retain a diverse, motivated, and highly qualified workforce

We will transform our culture, policies, and tools to foster productive hybrid work environments that help NASA attract and retain a diverse, motivated, and highly qualified workforce. Informed by lessons learned from the pandemic and nationwide workforce and workplace trends, our remote work and telework options will be balanced now and in the future, to promote inclusive teams that incorporate multiple gender and racial identities, include diverse professional and education experiences, and lead to a greater diversity of thought which enables our workforce to provide premier support to our aerospace, science, technology, and exploration missions.

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Tactic 4.1.1.3. Social & Political Issues

Address social and political issues that need national and local attention and solutions

NASA enthusiastically supports the Administration's emphasis on DEIA to address social and political issues that need national and local attention and solutions. NASA is committed to inspiring and facilitating an environment in which DEIA standards are expected in our operations. To that end, our multiprong strategy includes:

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Tactic 4.1.1.3.1. Commitment & Action

Commit the Agency to action that fulfills Presidential directives (e.g., Executive Orders (see Appendix E), memoranda, etc.) and other Federal guidance and/or policies

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Tactic 4.1.1.3.2. Culture & Business Practices

Sustain creative engagement to inspire and promote incorporation and transformation of DEIA in our culture and customary business practices at the Agency, Center, organization, and individual levels

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Tactic 4.1.1.3.3. Collaboration & Benchmarking

Continue our cross-collaborations with other agencies, such as the Equal Employment Opportunity Commission, Department of Justice, and the Office of Personnel Management for DEIA policy guidance, and reaching out to the Department of Homeland Security and the Department of Defense to benchmark best practices in DEIA

Stakeholder(s):

Equal Employment Opportunity Commission

Department of Justice

Office of Personnel Management

Department of Homeland Security

Department of Defense

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Tactic 4.1.1.3.4. Performance Goals

Update performance goals beginning in FY 2022 to align with this Strategic Objective

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Strategy 4.1.2. Human Capital Practices

Align human capital practices to support the strategies outlined in the President's Management Agenda, place DEIA as a central norm of the workplace, and support Executive Orders concerning DEIA

Alignment with Federal Workforce and DEIA Priorities, and Related Executive Orders ~ NASA will align human capital practices to support the strategies outlined in the President's Management Agenda, place DEIA as a central norm of the workplace, and support Executive Orders concerning DEIA. Our programs seek to address under-representation based on race, ethnicity, gender identity, sexual orientation, tribal affiliation, and socioeconomics. The Agency has already begun revising and updating its internal policies and guidelines, including a NASA Policy Statement on DEIA will enable NASA to achieve several objectives, including:

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Tactic 4.1.2.1. DEIA

Reinforce NASA's historical commitment to improve DEIA

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Tactic 4.1.2.2. Rights & Responsibilities

Provide notification to NASA employees of their DEIA rights and responsibilities

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Tactic 4.1.2.3. Discrimination, Retaliation & Harassment

Take proactive steps to prevent discrimination, retaliation, and harassment in order to avoid and mitigate legal liability

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Tactic 4.1.2.4. Policy Statements

Comply with the U.S. Equal Employment Opportunity Commission's Management Directive 715 requirement for the annual issuance of an equal employment opportunity policy statement by the head of each agency

Stakeholder(s):

U.S. Equal Employment Opportunity Commission

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

4.2. Mission Support

Transform mission support capabilities for the next era of aerospace

Re-build, modernize, and right-size NASA's mission enabling capabilities to ensure mission readiness and cultivate a reliable foundation for the future innovations in aerospace and science. | As NASA's missions evolve and increasingly integrate with industry, and hybrid workforces and workplaces become the norm, mission support requirements will change. In alignment with NASA's Core Values, mission support's top priority is

ensuring mission success—safely and securely. This is increasingly challenging with the growing complexity of our missions. Much of NASA's infrastructure is from the Apollo-era. It is time to re-build, modernize, and right-size NASA's mission-enabling capabilities. To advance an environment of inclusion, integrity, teamwork, and excellence required for the Artemis era, we must strengthen our technical authorities and modernize our physical and information technology (IT) infrastructure. NASA will focus on the following three priority areas:

Stakeholder(s):

Mission Support Directorate (MSD) :
Lead Office

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Strategy 4.2.1. Technical Authorities

Strengthen NASA's Agency Technical Authorities

Protect the Agency, public, and orbital and planetary environments from potential harm, while reaching mission success through innovative technical excellence. | With increasing mission complexity and a rapidly changing aerospace industry, NASA must evolve policies and practices that continue to protect the health and safety of our workforce and the public. NASA must also mitigate the technical risk to our missions and the space environment. NASA's Agency Technical Authorities advise Agency leaders and partners on programmatic and technical readiness and risk to ensure mission success. They must have the tools to ensure safety, security, and technical excellence objectives are met. The Agency Technical Authority role remains crucial and will play an important role in NASA's future missions, partnerships, and status as a leader in aerospace. NASA is evolving mission enabling and oversight capabilities to successfully implement our missions in human exploration, climate research, and other objectives. Specifically, NASA will:

Stakeholder(s):

NASA Contributing Programs and/or Program Activities

Center Engineering, Safety, & Operations

Agency Technical Authority

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Tactic 4.2.1.1. Risk

Advance our ability to identify and mitigate new risks to personnel, both on the ground and in flight, as we continue to provide innovative support capabilities in aerospace, science, technology, and exploration to both protect and enhance performance across our entire workforce and our partners

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Tactic 4.2.1.2. Policies, Standards, Tools & Expertise

Modernize our policies, standards, tools, and expertise to ensure that health and safety, security, and mission assurance practices are adaptable and woven into the design and development of increasingly complex missions and operations by NASA and its partners

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Tactic 4.2.1.3. Assessments & Evaluations

Increase organizational resilience by assuring success through independent assessments and evaluations of mission threats through the development and dissemination of mitigation strategies

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Tactic 4.2.1.4. Relationships

Continue to foster relationships with other Government agencies, such as the Federal Aviation Administration and Space Force, industry leaders, and international partners through interagency, Government-industry, and international working groups and committees aimed at the advancement of space industry practices, reduction of risk by implementing medical policy related to spaceflight, and state-of-the-art advances in aviation and spaceflight health and performance

Stakeholder(s):

Government Agencies

Federal Aviation Administration

Space Force

Industry Leaders

International Partners

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Strategy 4.2.2. Infrastructure & Capabilities

Modernize infrastructure and technical capabilities

Rebuild and right-size NASA's infrastructure and technical capabilities to advance the Nation's science and aerospace leadership, while supporting environmental stewardship, sustainability, and enhancing resource conservation efforts.

Stakeholder(s):

NASA Contributing Programs and/or Program Activities

Infrastructure & Technical Capabilities

Exploration Construction of Facilities (CoF)

Institutional CoF

Science CoF

Space Operations CoF

Environmental Compliance and Restoration

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Tactic 4.2.2.1. Infrastructure & Facilities

Ensure that our mission critical infrastructure and facilities are available and reliable

Resilient and ready infrastructure is critical for mission success. Much of NASA's current infrastructure dates back to Apollo-era space exploration, with 83 percent of facilities beyond design life. The demands on the NASA infrastructure continue to increase as our commercial partnerships increase and our missions become more complex. NASA will prioritize and transform our asset management to ensure that our mission critical infrastructure and facilities are available and reliable in the Artemis era and beyond.

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Tactic 4.2.2.2. Capabilities & Assets

Ensure critical capabilities and assets are mission-ready, reliable, and affordable

Guided by our Agency Master Planning process, we are taking an Agency-wide and mission-driven approach to ensure critical capabilities and assets are mission-ready, reliable, and affordable. At the same time, we are investing in the long-term asset health, sustainability, and physical footprint reductions that ensure NASA's future mission success. This mission-driven approach, utilizing data-driven and risk-informed methodologies, will ensure that NASA prioritizes sustainment and investment in mission critical infrastructure, divestment of unneeded infrastructure, and the leasing of assets to commercial partners where practical. We will continue our right-sizing efforts by demolishing and eliminating obsolete facilities to reduce our overall physical footprint, resource consumption, maintenance costs, and aging infrastructure risk, as well as enable our ability to re-new and rebuild modern and sustainable infrastructure to support future mission success.

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Tactic 4.2.2.3. Sustainability

Apply sustainable best practices in the management of our facilities, fleet, and cross-cutting operations, as well as our compliance with environmental laws

We will also continue to implement and improve sustainable best practices and outcomes in the management of our facilities, fleet, and cross-cutting operations, as well as our compliance with environmental laws. NASA is committed to sustained (year-over-year) reduction of our overall energy and water consumption. By identifying and quantifying facilities which are significant energy users and developing initiatives to reduce energy and water consumption in these facilities, eliminating unneeded and redundant facilities, and reducing our carbon footprint as we transform to increasingly hybrid work environments and fully transition to a zero-emission vehicle Federal fleet.

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Tactic 4.2.2.4. Aircraft

Better align aircraft operational capabilities with NASA mission requirements

NASA will establish, implement, and manage an Agency-level plan to better align aircraft operational capabilities with NASA mission requirements across the Agency, strategically manage our aircraft capabilities to meet long-term Agency needs, and support NASA's leadership in aerospace and science. The domain of this plan includes NASA aircraft, associated infrastructure, support equipment, Unmanned Aircraft Systems, and the acquisition of Commercial Aircraft Services. This more robust, responsive, and agile approach to aircraft capability management and development will enable the Agency to optimally deploy aircraft capabilities and resources when and where needed, prioritize sustainment of current NASA aircraft capabilities, and support investment and divestment decisions. It will also empower the Agency to better leverage commercial and other Government aircraft capabilities to support achievement of NASA strategic goals and objectives.

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Strategy 4.2.3. Technology

Support our workforce and programs with secure, innovative technology

Address rapidly changing IT, expanding data collections, and increasing cybersecurity threats

Stakeholder(s):

Mission Enabling Services :
Priority Area 3: Information Technology Contributing Support Program

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Tactic 4.2.3.1. Processes, IT & Data

Transform business processes, IT, and data management to effectively meet our mission needs

NASA depends heavily on secure digital processes, technology, and accessible data to achieve mission success. The Agency will transform business processes, IT, and data management to effectively meet our mission needs, while keeping pace with evolving technologies and threats. Strengthened engagement between our IT organization and our customers will lead to a shared understanding of IT needs, and evaluation of customer satisfaction will determine if those needs were met. NASA will focus on consistent IT service delivery, reliable operations, expanded digital capabilities, and proactive and resilient cybersecurity, all supported by engaged, customer-focused IT teams.

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Tactic 4.2.3.2. Business Practices

Harmonize business practices across NASA's centers

This transformation will depend on the harmonization of business practices across NASA's centers to reach effectiveness and efficiency goals. Timely, secure data sharing and support for the Agency's partnerships with industry remain critical to the success of NASA's missions. Modernization of the Agency's IT infrastructure will enable seamless, reliable, and secure collaboration across NASA's workforce and partners and will foster innovation in our expanding digital environment.

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Tactic 4.2.3.3. Risk Management & IT Modernization

Reinforce our operational resilience through strategic cybersecurity risk management and by modernizing IT capabilities

As IT evolves globally, cybersecurity threats are increasing in frequency and sophistication. This trend has the potential to exploit the complexity and interconnectedness of NASA's systems and data, placing the Agency's missions at risk. We will reinforce our operational resilience through strategic cybersecurity risk management and by modernizing IT capabilities. We will support our geographically hybrid workforce seamlessly and securely while strengthening the security and privacy of our data. NASA's transition to an enterprise operating model for IT will amplify these outcomes by strengthening customer engagement, service planning and delivery, and cost-effective management.

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

4.3. Explorers

Build the next generation of explorers

Engage students to build a diverse future STEM workforce. ~ NASA makes vital investments toward building a diverse STEM workforce. The scope of our STEM engagement comprises all endeavors to attract, engage, and educate students and to support educators and educational institutions.

Stakeholder(s):

Office of Science, Technology, Engineering, and Mathematics (STEM) Engagement (OSTEM) :
Lead Office

NASA Contributing Programs and/or Program Activities

STEM Engagement Program :
NASA Space Grant; EPSCoR; MUREP; Next Gen STEM

Mission Enabling Services :
Center STEM Engagement

STEM Workforce :
Given the Nation's need for a skilled STEM workforce and projected demand, NASA clearly has a vested interest in attracting, engaging, and preparing its future STEM professionals. The national STEM ecosystem will benefit from NASA contributions to attract and retain students on STEM pathways, with increased attention on underserved and underrepresented students. Recent national and international tests show that in the last decade, U.S. students have demonstrated little or no growth in mathematics and remain ranked in the middle of advanced economies on international science and mathematics assessments.

Students :
NASA will implement strategies to broaden student participation to increase diversity, equity, inclusion, and accessibility (DEIA) in STEM through NASA opportunities and activities. While the number of women and underrepresented minorities earning STEM degrees has grown in broad science and engineering occupations over the last decade, significant underrepresentation remains in areas critical to NASA like engineering and computer and mathematical sciences. NASA is committed to building a diverse, skilled future STEM workforce—our next generation of explorers with the technical skills needed to carry forward our Nation's vital mission and work in aeronautics and space into the future.

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Strategy 4.3.1. Immersion & Inspiration

Immerse students in NASA's work and inspire the next generation to explore

NASA is committed to engaging students in its mission, with the aim to immerse students in NASA's work and inspire the next generation to explore. To that end, NASA will continue to make vital contributions in STEM engagement. NASA's work in STEM Engagement is a collaborative endeavor which encompasses efforts across the OSTEM, the Mission Directorates, and the Field Centers. We will sustain our track record of inspiring, attracting, and engaging students through a strategy that will support Federal STEM education priorities and drive Agency efforts to:

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Tactic 4.3.1.1. Diversity

Attract diverse groups of students to STEM through learning opportunities that spark interest and provide connections to NASA's mission and work

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Tactic 4.3.1.2. Opportunities

Create unique opportunities for a diverse set of students to contribute to NASA's work in exploration and discovery

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Tactic 4.3.1.4. Experiences

Build a diverse future STEM workforce by engaging students in authentic learning experiences with NASA's people, content, and facilities

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Tactic 4.3.2. Evidence Building

Engage in evidence-building activities specifically focused on underserved and underrepresented students and communities

NASA is committed to an evidence-driven model and will continue to engage in evidence-building activities specifically focused on underserved and underrepresented students and communities using a comprehensive performance assessment and evaluation framework. The framework includes a learning agenda and an evidence-based decision-making process that engages both internal and external stakeholder audiences.

Stakeholder(s):

Underserved Students

Underserved Communities

Underrepresented Students

Underrepresented Communities

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Tactic 4.3.3. Collaboration

Collaborate with other Federal agencies, state and local Government, industry, institutions, and the non-profit sector to contribute to a shared goal of a globally competitive workforce

NASA is well positioned within the Nation's STEM ecosystem to collaborate with other Federal agencies, state and local Government, industry, institutions, and the non-profit sector to contribute to a shared goal of a globally competitive workforce. Our unique contributions are vital to attract and build a vibrant and diverse next generation STEM workforce that will continue the Nation's legacy of exploration and discovery. To execute our STEM engagement efforts, we will leverage our community of talented and dedicated education professionals and its technical workforce, who together can inspire and engage youth and students in STEM.

Stakeholder(s):

Federal Agencies

Industry

State Governments

Institutions

Local Governments

Non-Profit Sector

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Tactic 4.3.4. Engagement

Conduct STEM engagement efforts

NASA conducts STEM engagement efforts through a diverse portfolio of opportunities, activities, products, and resources for students, educators, and educational institutions. OSTEM is responsible for the strategic direction, operational integration, and assessment and evaluation of STEM engagement. OSTEM implements the STEM Engagement Program, consisting of four projects: the National Space Grant College and Fellowship Project (Space Grant); Minority University Research and Education Project (MUREP); Established Program to Stimulate Competitive Research (EPSCoR); and Next Generation STEM project (Next Gen STEM). NASA Mission Directorates create opportunities for students to actively engage in NASA's work. These include mission-driven learning opportunities, challenges and competitions, work experiences, and competitive student research opportunities.

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Tactic 4.3.5. Investments

Make strategic investments in STEM engagement

NASA will continue to make strategic investments in STEM engagement. NASA implements Space Grant, a national network of colleges and universities with over 1,000 affiliate institutions and organizations working to expand opportunities for students to participate in NASA's aeronautics and space projects.

Stakeholder(s):

Space Grant :
Space Grant is made up of 52 consortia located in all 50 states, the District of Columbia, and Puerto Rico. Moving forward, Space Grant will continue to provide valuable learning experiences for undergraduate and graduate students and build delivery of experiential opportunities for middle and high school students.

Undergraduate Students

Graduate Students

Middle School Students

High School Students

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Tactic 4.3.6. Partnerships

Establish partnerships with Government, higher education, and industry that are designed to drive sustainable improvements in research and development capacity and competitiveness

NASA EPSCoR establishes partnerships with Government, higher education, and industry that are designed to drive sustainable improvements in research and development capacity and competitiveness in eligible jurisdictions.

Stakeholder(s):

NASA EPSCoR

Government

Higher Education

Industry

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Tactic 4.3.7. Competitive Opportunities

Expand competitive opportunities to address specific gaps needs while building capacity at institutions

Stakeholder(s):

MUREP :
MUREP provides support via competitive opportunities and awards to MSIs. MUREP investments enhance the research, academic, and technology capabilities of MSIs through multiyear cooperative agreements, bolstering their capacity in educating and preparing students for STEM careers. MUREP will continue to expand competitive opportunities to address specific gaps needs while building capacity at institutions.

MSIs

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Tactic 4.3.8. Learning Opportunities

Develop and deploy evidence-based STEM learning opportunities

Stakeholder(s):

Next Gen STEM :
Next Gen STEM develops and deploys evidence-based STEM learning opportunities that provide a platform for students to learn via NASA's endeavors in exploration and discovery.

K-12 Educators :
Through Next Gen STEM, NASA makes vital investments in K-12 and informal education.

Informal Educators

Museum and Informal Education Alliance :
This includes competitive awards to the Museum and Informal Education Alliance, comprised of more than 2,000 member organizations, including museums, science centers, parks, libraries, planetariums, nature centers, and after-school groups.

Museums

Science Centers

Parks

— continued next page

Stakeholders (continued)

Libraries

Planetariums

Nature Centers

After-School Groups

K-12 Students :
Looking ahead, Next Gen STEM will strengthen efforts to engage K-12 students, build networks within the formal education ecosystem, engage educators through the NASA CONNECT community of practice, train NASA STEM experts to expand work with students, and expand challenges and competitions to broaden student participation.

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Tactic 4.3.9. Collaboration & Connections

Continue to build collaborative efforts and facilitate connections to better serve students and educators

Stakeholder(s):

Students :
NASA will continue to build collaborative efforts and facilitate connections to better serve students and educators.

Educators

NASA Mission Directorates :
The Mission Directorates will continue to create mission-centered learning opportunities and drive student contributions to NASA's work.

Aeronautics Research Mission Directorate :
The Aeronautics Research Mission Directorate in collaboration with MUREP, will offer unique research opportunities in critical challenges facing aviation, while efforts with Space Grant will increase award opportunities to university students proposing entrepreneurial solutions to make aviation more sustainable.

Earth Sciences Division :
Partnership efforts between the Earth Sciences Division and MUREP will foster MSI contributions and build capacity in climate change research.

Underserved Communities :
NASA will cultivate broadened participation from underserved communities through connections between existing networks to programs such as Science Mission Directorate's Science Activation, which supports a cooperative network of competitively selected teams that work together to connect NASA science experts, unique content, and authentic experiences with diverse communities across the Nation.

Global Learning and Observations to Benefit the Environment Program :
In addition, efforts to build connections between the Global Learning and Observations to Benefit the Environment Program and NASA STEM engagement networks will broaden student contributions to understanding the Earth system and climate change.

NASA STEM Engagement Networks

OSTEM :
Finally, OSTEM and the Mission Directorates will expand collaborations to enable student contributions to NASA's missions, building upon Artemis Student Challenges, the Breakthrough, Innovative and Game-Changing Idea Challenge, and the University Student Research Challenge.

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Tactic 4.3.10. Access & Expertise

Provide student opportunities and access to NASA's STEM professionals and their expertise

Stakeholder(s):

NASA STEM Workforce :
NASA's STEM workforce demonstrates a unique level of dedication to building the next generation of explorers.

OSTEM :
In addition to OSTEM, NASA Mission Directorates and their programs, as well as the STEM disciplinary organizations, provide exciting student opportunities and access to NASA's STEM professionals and their expertise.

NASA Mission Directorates

NASA STEM Professionals

Students :
NASA's compelling and exciting STEM engagement opportunities and efforts will inspire students to reach for the stars and build our Nation's next generation of explorers.

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Tactic 4.3.11. Partnerships

Collaborate with partners

How NASA Engages and Works with Partners ~ NASA has a rich history of collaborating across the Nation's STEM ecosystem to foster innovative student learning experiences that leverage our unique mission, people, and facilities. NASA collaborates with partners to:

Stakeholder(s):

NASA Partners :
We conduct strategic partnerships with a wide range of external STEM engagement stakeholder organizations through formal Space Act Agreements. Generally, these provide unfunded collaborators with access to NASA mission data and imagery, subject matter expertise in scientific and technical disciplines connected to our Mission, and support with curation of NASA education resources, products, and materials. Through these efforts, we coordinate with industry, educational institutions, and non-profit organizations to support development of high-quality opportunities for both youth outside of the classroom and students in pre-kindergarten through graduate school.

Federal Agencies :
NASA also works in partnership with other Federal agencies to coordinate efforts and to collaborate on specific initiatives.

U.S. Department of Education :
For example, NASA works with the U.S. Department of Education to provide students with access to scientific and technical mentors and equip educators with STEM resources that can be used both inside and outside of the classroom.

National Science Foundation :
We also collaborate with the National Science Foundation to advance diversity and inclusion goals through coordination of fellowship programming and undergraduate student engagements.

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Tactic 4.3.11.1. Engagement

Engage students across the United States in opportunities connected to our missions, themes and STEM engagement efforts

Stakeholder(s):

Students

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Tactic 4.3.11.2. Innovations

Foster innovative models, methods, or approaches tied to national and Agency STEM education goals

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Tactic 4.3.11.3. Underrepresented Groups

Broaden participation of students from groups traditionally underrepresented in STEM

Stakeholder(s):

Underrepresented Groups

Performance Indicators

Description	Type	Start Date	End Date
	Target		
[To be determined]	Actual		

Administrative Information

Start Date: 2022-03-28
End Date:

Publication Date: **2022-05-01**
Source: https://www.nasa.gov/sites/default/files/atoms/files/fy_22_strategic_plan.pdf

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_fd43891e-c8fb-11ec-9031-1daaf882ea00

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