CURRICULUM RESOURCE GUIDE FOR
STUDENTS & EDUCATORS

Space:

GLOBAL CHALLENGES & FUTURE CAREER PATHWAYS IN THE GROWING SPACE ECONOMY

WAC Global Connections Club in celebration of Seattle Space Week

WEDNESDAY, OCTOBER 8TH, 2025
4:00 - 5:00 PM PST
VIA ZOOM

COMPILED BY JULIANNA PATTERSON, SENG MAI, & ESTEPHANIE GOMEZ

How to Use This Guide

Visual Media

Audio/Podcast

Charts/Graphs/Infographics

Lesson Plans/Activities

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Outlining Standards

A Note on Learning Standards Presented in this Guide

Three sets of standards have been linked to each of the learning objectives in this packet. The **Washington State K-12 Social Studies Learning Standards** and the accompanying Grade Level Requirements are the social studies standards for WA State.

The College, Career, & Civic Life C3 Framework for Social Studies State Standards are the standards published by the National Council for the Social Studies. Guiding the packet as a whole is the Framework for Global Learning created by the Asia Society and the Council of Chief State School Officers titled ***Educating for Global Competence: Preparing Our Youth to Engage the World*** *(2011).*

Cross-objective standards are listed at the beginning of the packet, and content-specific standards can be found after each learning objective.

The standards provided have been selected for relevance, but are not exclusive: many other standards, such as Common Core, may be applicable to the resources and learning objectives identified in this packet. The intention for this packet's organization is to provide educators with an idea of resources available and possible uses for resources. Users should feel free to create their own learning objectives and to select resources according to the specific needs of their classrooms.

The student understands and applies reasoning skills to conduct research, deliberate, and form and evaluate positions through the processes of reading, writing, and communicating.

WASHINGTON STATE K-12 SOCIAL STUDIES LEARNING STANDARDS

There are five EALRs in Social Studies, one for each of the discipline areas: civics, economics, geography, and history, and a fifth for social studies skills.

(1) Social Studies EALR 1: CIVICS

The student understands and applies knowledge of government, law, politics, and the nation's fundamental documents to make decisions about local, national, and international issues and to demonstrate thoughtful, participatory citizenship.

(2) Social Studies EALR 2: ECONOMICS

The student applies understanding of economic concepts and systems to analyze decision-making and the interactions between individuals, households, businesses, governments, and societies.

(3) Social Studies EALR 3: GEOGRAPHY

The student uses a spatial perspective to make reasoned decisions by applying the concepts of location, region, and movement and demonstrating knowledge of how geographic features and human cultures impact environments.

(4) Social Studies EALR 4: HISTORY

The student understands and applies knowledge of historical thinking, chronology, eras, turning points, major ideas, individuals, and themes on local, Washington State, tribal, United States, and world history in order to evaluate how history shapes the present and future.

(5) Social Studies EALR 5: SOCIAL STUDIES SKILLS

The student understands and applies reasoning skills to conduct research, deliberate, and form and evaluate positions through the processes of reading, writing, and communicating.

Outlining Standards

COLLEGE, CAREER, & CIVIC LIFE C3 FRAMEWORK FOR SOCIAL STUDIES STATE STANDARDS

The C3 Framework is organized into the four Dimensions, which support a robust social studies program rooted in inquiry.

The four Dimensions are as follows:

(1) Developing questions and planning inquiries;

(2) Applying disciplinary concepts and tools;

(3) Evaluating sources and using evidence;

(4) Communicating conclusions and taking informed action

DIMENSION 1: DEVELOPING QUESTIONS AND PLANNING INQUIRES	DIMENSION 2: APPLYING DISCIPLINARY TOOLS AND CONCEPTS	DIMENSION 3: EVALUATING SOURCES AND USING EVIDENCE	DIMENSION 4: COMMUNICATING CONCLUSIONS AND TAKING INFORMED ACTION
Developing Questions and Planning Inquiries	• Civics • Economics • Geography • History	• Gathering and Evaluating Sources • Developing Claims and Using Evidence	• Communicating and Critiquing Conclusions • Taking Informed Action

Dimension 2 has four disciplinary subsections: **(1) Civics; (2) Economics; (3) Geography; (4) History**. Each disciplinary subsection has three to four additional categories, which provide an organizing mechanism for the foundational content and skills within each discipline.

C3 Framework Organization

CIVICS	ECONOMICS	GEOGRPAHY	HISTORY
Civic and Political Institutions	Economic Decision Making	Geographic Representations: Special Views of the World	Change, Continuity, and Context
Participation and Deliberation: Applying Civic Virtues and Democratic Principles	Exchange and Markets	Human-Environment Interaction: Place, Religions, and Culture	Perspective
Processes, Rules, and Laws	The National Economy	Human Populations: Spatial Patterns and Movements	Historical Sources and Evidence
	The Global Economy	Global Interconnections: Changing Spatial Patterns	Causation and Argumentation

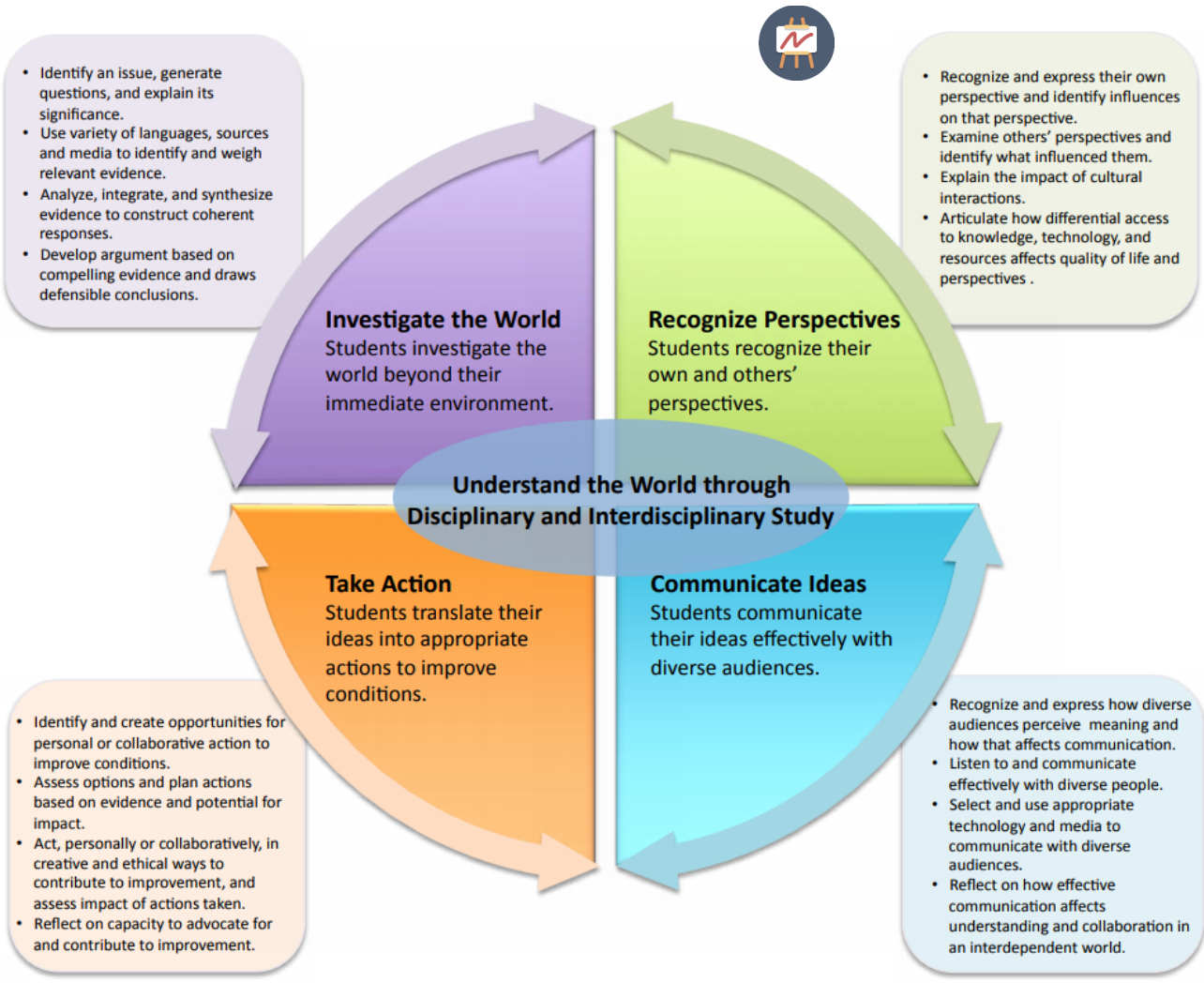
Educating for Global Competence

Frameworks taken from *Educating for Global Competence: Preparing Our Youth to Engage the World (*Asia Society and the Council of Chief State School Officers 2011*).*

"**Global competence is the capacity and disposition to understand and act on issues of global significance**" (Chapter 2).

Globally competent students are able to perform the following four competences:

1. **Investigate the world** beyond their immediate environment, framing significant problems and conducting well-crafted and age-appropriate research.
2. **Recognize perspectives** others' and their own, articulating and explaining such perspectives thoughtfully and respectfully.
3. **Communicate ideas** effectively with diverse audiences, bridging geographic, linguistic, ideological, and cultural barriers.
4. **Take action** to improve conditions, viewing themselves as players in the world and participating reflectively.



Key Terms

Space Exploration: Investigation, by means of crewed and uncrewed spacecraft, of the reaches of the universe beyond Earth's atmosphere and the use of the information so gained to increase knowledge of the cosmos and benefit humanity.

National Aeronautics and Space Administration (NASA): Independent U.S. governmental agency established in 1958 for the research and development of vehicles and activities for the exploration of space within and outside Earth's atmosphere.

STEM: Field and curriculum centered on education in the disciplines of science, technology, engineering, and mathematics (STEM). The STEM acronym was introduced in 2001 by scientific administrators at the U.S. National Science Foundation (NSF).

Orbit: In astronomy, path of a body revolving around an attracting centre of mass, as a planet around the Sun or a satellite around a planet.

Astronomy: Science that encompasses the study of all extraterrestrial objects and phenomena. Until the invention of the telescope and the discovery of the laws of motion and gravity in the 17th century, astronomy was primarily concerned with noting and predicting the positions of the Sun, Moon, and planets, originally for calendrical and astrological purposes and later for navigational uses and scientific interest.

International Space Station (ISS): Space station assembled in law Earth orbit largely by the United States and Russia, with assistance and components from a multinational consortium.

European Space Agency (ESA): European space and space-technology research organization founded in 1975 from the merger of the European Launcher Development Organisation (ELDO) and the European Space Research Organisation (ESRO), both established in 1964.

Microgravity: A measure of the degree to which an object in space is subjected to acceleration.

The United Nations Office for Outer Space Affairs (UNOOSA): Works to promote international cooperation in the peaceful use and exploration of space, and in the utilisation of space science and technology for sustainable economic and social development.

Outer Space Treaty, (1967): International treaty binding the parties to use outer space only for peaceful purposes.

Artemis: U.S. crewed spaceflight program begun in 2017 that is intended to return astronauts to the Moon during the 2020s for the first time since 1972.

Comet: A small body orbiting the Sun with a substantial fraction of its composition made up of volatile ices.

Space Manufacturing: Involves the production of manufactured goods in an environment outside

Learning Objectives

By engaging with this guide,

1. Students will be able to explain key milestones in space exploration and describe how space missions advance scientific knowledge and technology.

2. Students will explore the contributions of women in the space industry and analyze the impact of gender diversity on innovation and collaboration in space careers.

3. Students will identify examples of entrepreneurial ventures in the space economy and evaluate how new ideas and startups are shaping the future of space technology.

4. Students will examine how artificial intelligence and autonomous systems are applied in satellites, space missions, and mission planning.

5. Students will design or propose solutions to real-world space-related problems, applying critical thinking and creative problem-solving skills.

6. Students will analyze how space exploration affects life on Earth, including applications in communication, climate monitoring, and sustainability.

7. Students will evaluate the role of international partnerships in space research, exploration, and policy-making.

8. Students will describe emerging opportunities in space manufacturing and how in-orbit production can support sustainability and innovation on Earth.

9. Students will investigate a variety of career paths in the growing space economy and understand the education, skills, and experiences needed to pursue them.

10. Students will recognize ways to actively engage with the space field through competitions, internships, programs, and local or global initiatives.

Introduction to Session Speaker

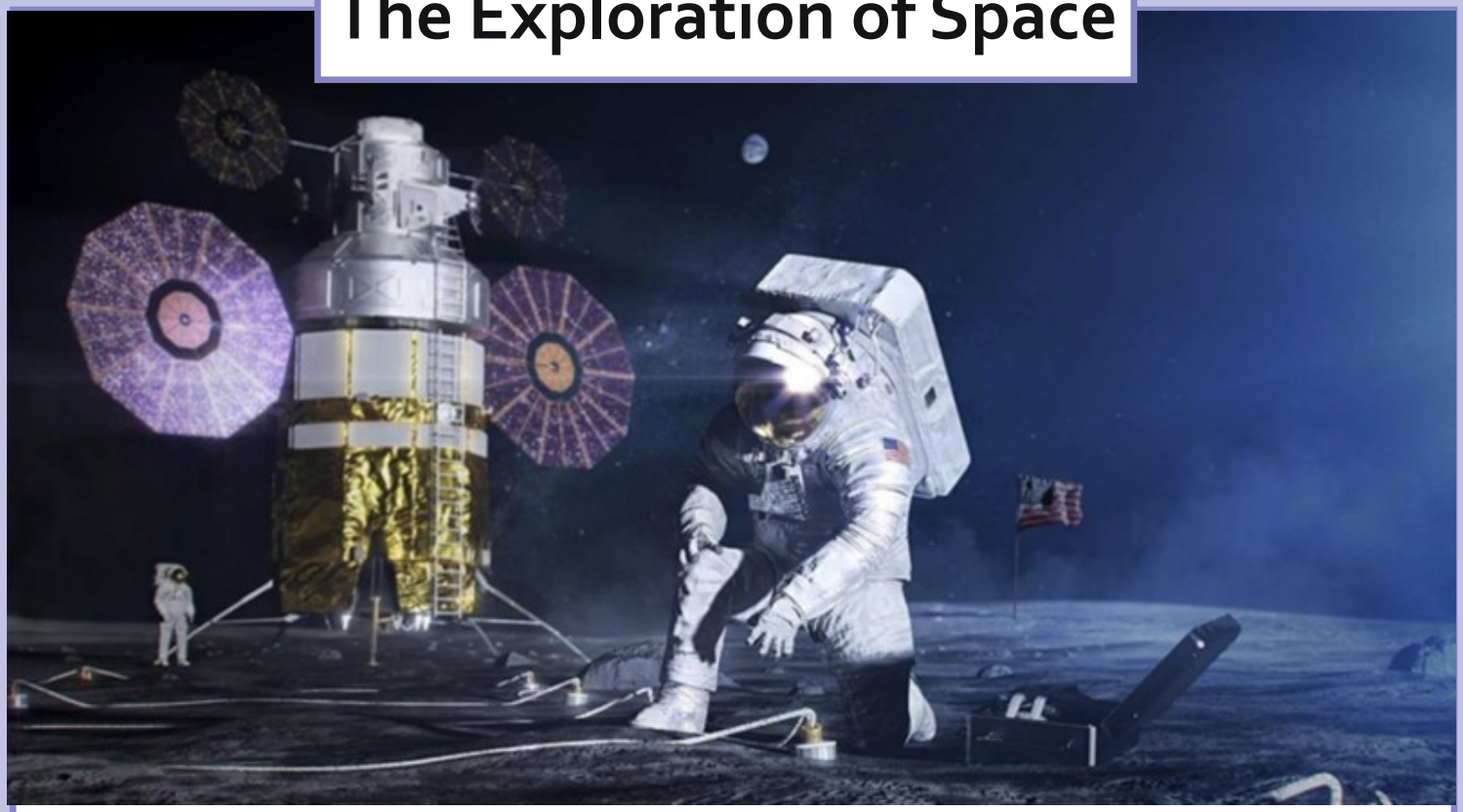
Dr. Ioana Cozmuta is the founder and CEO of G-SPACE Inc, a Silicon Valley-based New Space Company developing an end-to-end AI-powered software platform to design materials and manufacturing processes optimized for gravity-free environments. Prior to founding G-SPACE, Dr. Cozmuta helped enterprises such as Business Finland, Orange Silicon Valley, and DuPont to evaluate emerging opportunities in the New Space Market and co-founded a ZBLAN in-space manufacturing company. She is on the original IAC providing due diligence to Spaced Ventures, a crowdfunding company supporting New Space startups, and co-founded the Nexus Outer Space for All brain trust to expand New Space opportunities to civil society.

From 2003 and 2018, Dr. Cozmuta worked at NASA in roles such as Commercial Space Partnerships Strategist, Industry Innovation and Microgravity Lead, Physics-based Risk Assessment Lead for mission entry, descent, and landing; Material Response Lead for the Mars Science Laboratory Heatshield instrumentation; Margins Lead for Constellation Orion, etc. where she successfully infused state-of-the-art technology to modernize existing NASA tools, built multi-industry models and pushed the boundaries of innovation.

Dr. Cozmuta's interdisciplinary academic background includes a bachelor's in Physics and a master's in Biophysics and Medical Physics from the University Babes-Bolyai, Cluj Napoca, Romania; a Ph.D. in Applied Physics from the University of Groningen, The Netherlands; a Postdoctoral Study in Materials Modeling and Simulation, Chemistry Department at CALTECH and a Research Assistant in Genome Technology, School of Medicine at Stanford University. Her research spanned indoor air quality, building materials durability, DNA sequencing, thermal protection systems, hypersonic reentry, microgravity, and in-space manufacturing as well as market, economics, commercialization, and entrepreneurship. She received numerous awards from NASA, NSF, and Air Force and has authored and co-author over 200 scientific articles and technical reports. Dr. Cozmuta is an elected member of the prestigious International Academy of Astronautics, and previous Chair of the world-renowned Gordon Research Conference series. She is a TEDx speaker and a passionate, and inspirational lecturer about the Space-Earth Confluence in technology, education, and business.

Learn more about Dr. Ioana Cozmuta and her work!

The Exploration of Space



Living in Space

"For more than two decades, people have lived and worked continuously aboard the International Space Station."

Living in Space

"Like every other living creature we know of, humans evolved at the bottom of a gravity well. We take the Earth's tug for granted, and so do our bodies. So it's not surprising that our bodies behave oddly in orbit. What is surprising is that humans turn out to adapt remarkably well to zero-g (more precisely, microgravity). After all, back in 1961, Soviet scientists were genuinely worried that any prolonged period of weightless might even be fatal - which is why they limited Yuri Gagarin's first space flight to just 108 minutes and a single orbit."

A Brief History of Space Exploration

"The development of ballistic missiles, first used by Germany toward the end of World War II, paved the way for the launch vehicles that would fuel a space race between the Soviet Union and the United States. The space race was then followed by an era of space cooperation, highlighted by the International Space Station."

The Joy and Opportunity of Living in Space *(August 22nd, 2024)*

"Only about 700 people have been to space. Those numbers will rise quickly as launch costs drop and commercial space stations come online. Retired NASA astronaut Cady Coleman describes the wonder of living in orbit and calls for a wiser, more inclusive approach in a new age of space exploration."

The Exploration of Space

The Future of Space Exploration *(November 17th, 2021)*

"Most engineers and scientists agree that this an extremely exciting and busy time to be working in the space industry. Several new things are happening above the Earth's atmosphere. Tourists can now pay private companies for a short trip to space, private industry is developing spacecraft for NASA missions, and a robotic helicopter is currently exploring Mars."

Will Humans Be Living in Space in the Next 50 Years?

"If all goes according to plan, humans will have been living in space for more than 20 years when NASA's centennial celebration rolls around in 2058. As part of President Bush's "Vision for Space Exploration" plan, the agency announced in 2006 that astronauts would break ground on a lunar base settlement no later than 2020."

Human Exploration of Space: Why, Where, What for? *(August 12th, 2008)*

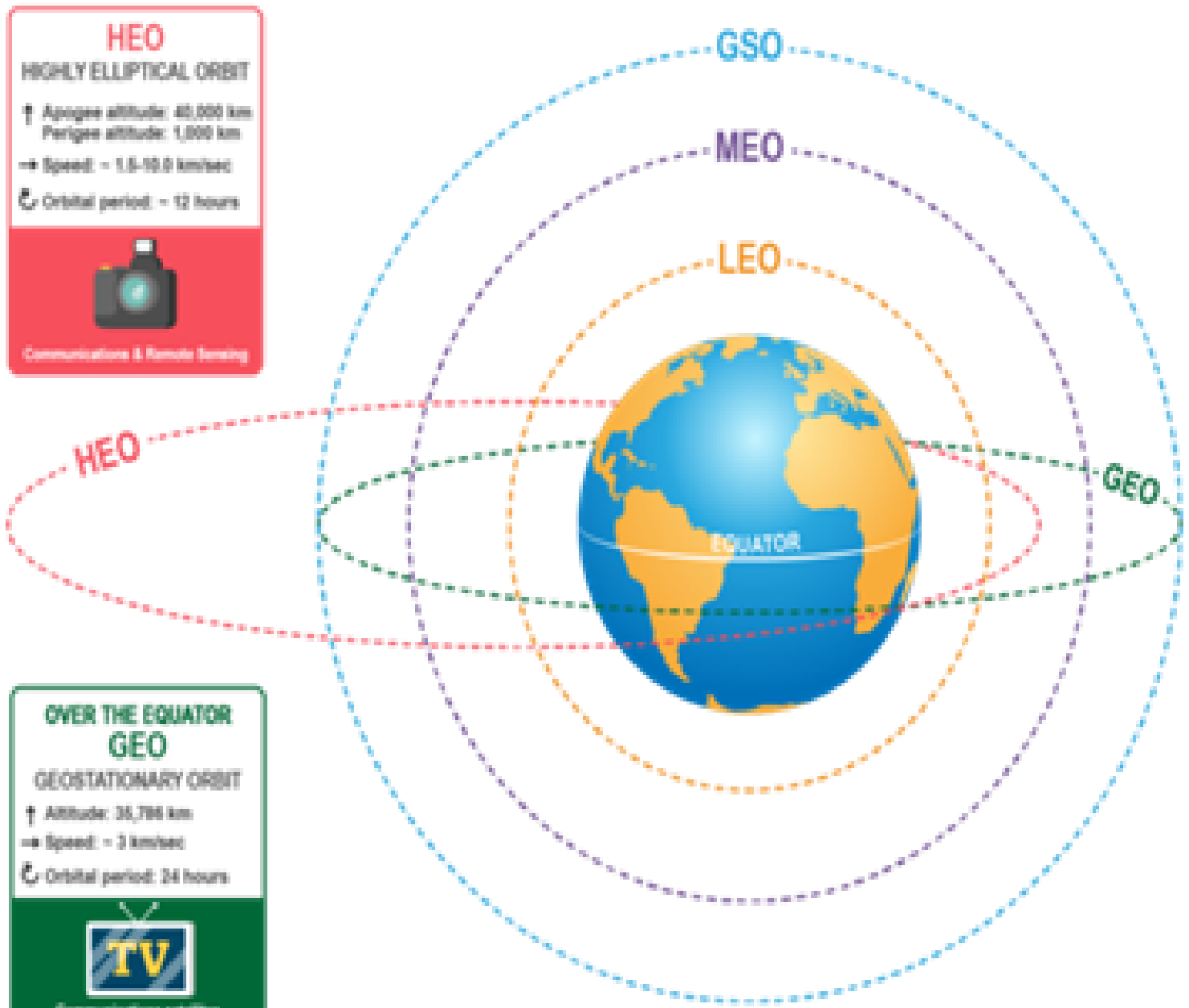
"The basic driving rationales for human space flight (HSF) are rooted in age-old and persisting dreams. Fascination with the idea of people going into the sky for adventures in other worlds goes back to ancient myths."

Did You Know?

"Yuri Gagarin from the Soviet Union was the first human in space. His vehicle, Vostok 1 circled Earth at a speed of 27,400 kilometers per hour with the flight lasting 108 minutes. "

(https://www.nasa.gov/image-article/april-1961-first-human-entered-space/)

ORBIT TYPES



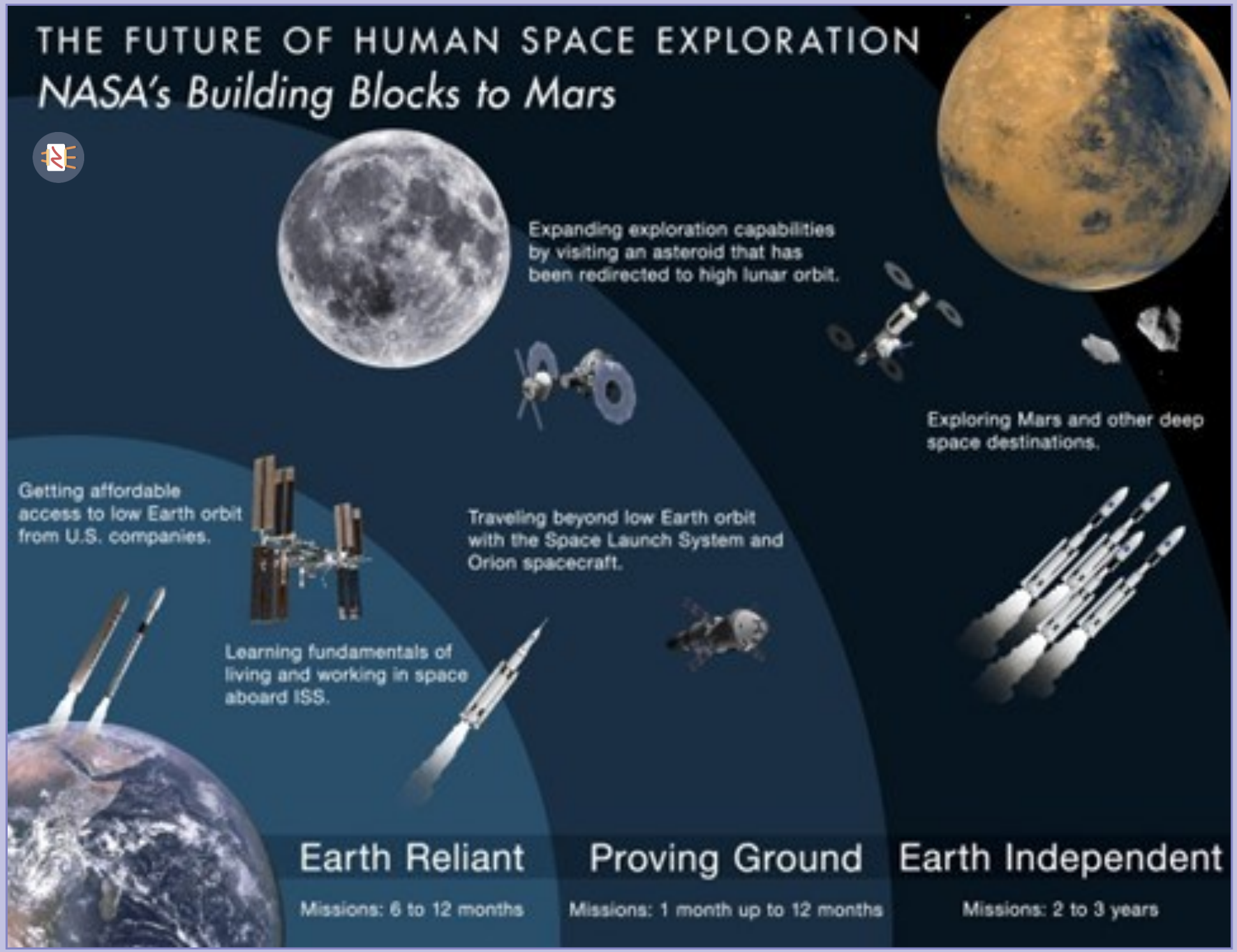
HEO
HIGHLY ELLIPTICAL ORBIT
Apogee altitude: 40,000 km
Perigee altitude: 1,000 km
Speed: ~ 1.5-10.0 km/sec
Orbital period: ~ 12 hours
Communications & Remote Sensing

GSO
GEOSYNCHRONOUS ORBIT
Altitude: 35,786 km
Speed: ~ 3 km/sec
Orbital period: ~ 24 hours
SBAS Weather satellites

MEO
MEDIUM EARTH ORBIT
Altitude: 2,000-35,786 km
Speed: ~ 3-8 km/sec
Orbital period: ~ 2-24 hours
Global Positioning System (GPS)
24 satellites

OVER THE EQUATOR
GEO
GEOSTATIONARY ORBIT
Altitude: 35,786 km
Speed: ~ 3 km/sec
Orbital period: 24 hours
Communications satellites
& Broadcast satellites

LEO
LOW EARTH ORBIT
Altitude: 160-2,000 km
Speed: ~ 8 km/sec
Orbital period: ~ 90 minutes
Voice and Data Services
Globalstar - 48 satellites


THE FUTURE OF HUMAN SPACE EXPLORATION
NASA's Building Blocks to Mars
Expanding exploration capabilities by visiting an asteroid that has been redirected to high lunar orbit.
Exploring Mars and other deep space destinations.
Getting affordable access to low Earth orbit from U.S. companies.
Traveling beyond low Earth orbit with the Space Launch System and Orion spacecraft.
Learning fundamentals of living and working in space aboard ISS.
Earth Reliant
Missions: 6 to 12 months
Proving Ground
Missions: 1 month up to 12 months
Earth Independent
Missions: 2 to 3 years

Women in Space

Women in Orbit: Progress, Challenges, and What's Ahead on International Women's Day 2025 *(May 9th, 2025)*
"Space technology has thrived on the ingenuity of countless individuals, but for many years, women's contributions remained overlooked or underrecognized. From early research roles hidden behind laboratory doors to remarkable achievements aboard space stations, women have proven integral to every facet of human exploration. Despite these milestones, the reality is that women still account for only a fraction of the industry's leadership and technical positions."

Women in the Space Industry: Bridging the Gender Divide in Science, Technology and Sustainability *(February 10th, 2025)*
"With rapid advancements in technology, a surge in public and private investment, and a growing focus on sustainability, the space sector is transforming the global economy, driving innovation, and unlocking new opportunities across industries such as telecommunications and renewable energy. However, like many fields of science, technology, engineering, and mathematics (STEM), the sector faces a persistent gender gap that limits the full potential of its workforce."

Why It's Time to Use Reskilling to Unlock Women's STEM Potential *(January 13th, 2025)*
"The Fourth Industrial Revolution marks a new and exciting chapter in human development, bringing profound changes to the way we work and live. But every opportunity inevitably comes with challenges – and none are greater than the urgent need to empower one billion people with better education, skills and economic opportunities by 2030 to create a more inclusive and future-ready global economy."

Women in Space

Women in Space

"A brief explanation of historical barriers and breakthroughs for women in space, representation and cultural shifts: women in space media and society to recent milestones and ongoing challenges."

Women in Space: Trailblazing Astronauts and Scientists *(September 25th, 2024)*

"Since its beginning, women have been at the forefront of space exploration. Despite facing unique challenges and barriers in a historically male-dominated field, female astronauts and scientists have persevered, demonstrating remarkable resilience and achieving significant milestones that have shaped the understanding of the universe."

Women in Aerospace: Encouraging the Pursuit of STEM Careers *(May 20th, 2024)*

"The frontier of space exploration is in the midst of a transformation, actively reshaping its policies and strategies to narrow the gender gap and inspire more women to pursue careers in STEM, particularly within the dynamic realm of aerospace. Historically, women have been significantly underrepresented in STEM fields, a trend highlighted by Forbes which reported that women constitute only 28% of the STEM workforce in the United States. This disparity is particularly stark in the aerospace sector. Nevertheless, the industry is undergoing a pivotal shift and there is a growing acknowledgment of the need for a more inclusive environment that nurtures the talents and contributions of women."

The Role of Women in Space Exploration Pioneers and Progress *(August 23rd, 2023)*

"Space exploration has always been seen as a male-dominated field. But, over the years, the role of women in this area has changed drastically. Women have made remarkable progress in recent times and have contributed immensely to space exploration."

Space for Women: Landmark Study on Gender Equality in the Space Sector

"The evolution of the space domain since its early stages has brought about impactful changes to society from scientific, technological, legal, political, and even cultural standpoints. Today, this critical sector underpins local, regional and global decision-making, as well as national economies and industries, and plays a significant role in our quest towards sustainable development."

Entrepreneurial Space

What is A Space Entrepreneur?

"Space entrepreneurs are just one of the many emerging professions in the global space ecosystem, as the private sector is often a hub for a variety of careers and professions that go far beyond astronauts and mission control."

Entrepreneurship In Space *(January 17th, 2025)*

"The transition from government-led space exploration to the prominence of private enterprises is a defining characteristic of modern space commercialization. Historically, space exploration was an exclusive arena dominated by state-run entities like NASA and Roscosmos. However, this landscape began to change in the early 2000s, with entrepreneurs entering the scene and introducing a fresh wave of innovation and competition."

Entrepreneurial Space and The Freedom For Entrepreneurship: Institutional Settings, Policy, and Action in The Space Industry *(January 5th, 2025)*

"Anticipating that innovation nurtures entrepreneurship, we began an extended case study of an innovative start-up in the space industry. We quickly saw that institutions imposed formidable barriers to implementing entrepreneurship from innovation. Curious about how, why and the extent of this situation, we widened our study to other start-ups, CEOs of existing businesses, an incubator, a technology transfer office and key influencers in large space companies and agencies."

What Every Entrepreneur Can (and Should) Learn From Early Space Exploration *(September 23rd, 2024)*

"In the race to create the next big thing, today's entrepreneurs are missing one critical ingredient: a daring spirit. It's this spirit that first propelled humanity into space but which has unfortunately diminished over time. Today, the most overlooked quality of a founder is the ability to say "Let's go for it," and to take a great risk in pursuit of their vision. This is exactly what we did during the early days of the space program. We had no idea if sending a person to space was even possible, but that didn't stop our nation from trying and pouring a massive amount of resources to complete the greatest feat in human history: landing a man on the moon."

Entrepreneurial Space

How Entrepreneurs Are Leading The New Space Race *(September 13th, 2023)*

"The United States is involved in a new global space race, to which individual entrepreneurs such as Elon Musk, Jeff Bezos and even Richard Branson are making enormous and positive contributions."

The Astropreneurial Co-creation of the New Space Economy *(May 2023)*

"We are witnessing the emergence of a new "techno-economic paradigm" in the New Space economy. The entrepreneur research during the current "Innovation and Communication" paradigm captured the co-creation of the digital ecosystem through the affordances and platforms of the digital technology."

Breaking into Space Entrepreneurship With CASSINI

"Space has become one of the most exciting ecosystems to generate revenue. Yet, when most people hear the term "space business" the first thing that pops into their head is a rocket blasting off of a launch pad and a control room. Space is more than Mars landings. It's about creating solutions that make a positive impact on the economy or help us green our planet."

How Does Entrepreneurship Lend Itself to Space Exploration *(April 15th, 2016)*

"Mars One is now planning to take the first four humans to Mars in 2026, on a non-return flight. Dianne and Josh were shortlisted as favourites amongst over 200,000 applicants worldwide, as a result of their distinct skillset, philosophy to life, and entrepreneurial pursuits."

Did You Know?

"In 1963 Valentina Tereshkova became the first woman to journey to space orbiting Earth in the Vostok 6 space capsule. "

https://www.space.com/21571-valentina-tereshkova.html

AI & Space: The New Frontier

[Artificial Intelligence in Space]

"In 2022, ESA Discovery funded 12 projects that explored whether we can apply the latest developments in AI and advanced computing paradigms to make satellites more reactive, agile and autonomous."

[The Future of Artificial Intelligence in Space: Navigating Challenges and Opportunities]

"The balance between promoting innovation and ensuring risks associated with AI systems are mitigated requires coordination and communication between different jurisdictions to create interoperable regulatory settings suitable for the inherently international space sector."

[Harnessing AI in the Final Frontier: AI's Role in Space Exploration & Development by Isaac Arthur *(March 4th, 2025)*]

"As humanity pushes deeper into the cosmos, artificial intelligence is playing an increasingly crucial role in space exploration and development. From autonomous rovers and spacecraft navigating distant worlds to AI-driven systems optimizing space station operations and asteroid tracking, intelligent machines are enhancing our ability to explore, settle, and safeguard our future in space. AI can analyze vast amounts of astronomical data, assist in in-situ resource utilization, and even support agricultural systems in space habitats. Join Isaac Arthur, President of the National Space Society, as he explores how AI is transforming our journey to the stars and why its careful integration could be a game-changer for the future of space exploration."

AI & Space: The New Frontier

Using AI for More Reliable Space Missions *(January 30th, 2025)*

"As we prepare to go deeper into space, the demand for autonomous systems capable of operating independently from ground control and crew interactions is increasing. Artificial Intelligence (AI) is shaping up to be an essential tool for reaching this goal. With support from ESA's Discovery programme, a team of researchers from Airbus explored how AI can collect and analyse data onboard the Columbus module of the International Space Station (ISS) in order to improve its prognosis and fault detection capabilities."

NASA's AI Use Cases: Advancing Space Exploration with Responsibility *(January 7th, 2025)*

"NASA's 2024 AI Use Case inventory highlights the agency's commitment to integrating artificial intelligence in its space missions and operations. The agency's updated inventory consists of active AI use cases, ranging from AI-driven autonomous space operations, such as navigation for the Perseverance Rover on Mars, to advanced data analysis for scientific discovery."

Did You Know?

"The new global space economy is valued at $613 billion."
https://spacenews.com/the-global-space-economy-hits-a-new record/

AI & Space: The New Frontier

AI in Space: Exploration, Research, and Innovation *(December 31st, 2024)*

"Imagine a future where computers run by artificial intelligence (AI) pilot spaceships and explore space, but the benefits of such groundbreaking technology do not benefit millions of ordinary people. Similarly, imagine classrooms fill with children who, despite technological advances, are still educated using methods from the nineteenth century."

Could AI Build Cities in Space? *(December 12th, 2024)*

"Fast forward into the future, when building in space is normal, from huge satellites and spacecraft in orbit, to entire cities on the Moon and Mars. Could robots guided by AI make it happen?"

Beyond Human Reach: How AI is Revolutionizing Deep Space Travel *(March 14th, 2024)*

"In the vast expanse of the cosmos, the allure of exploration beckons humanity like a distant siren's song. From the twinkling stars of our own Milky Way to the enigmatic depths of interstellar space, the cosmos tantalizes us with the promise of discovery and adventure. But as we gaze towards the heavens, we face a daunting challenge: how do we traverse the cosmic abyss and unravel its secrets?"

Space Loves AI, AI Doesn't Love Space *(March 11th, 2024)*

"Space-related applications of artificial intelligence and machine learning are often confined to the ground because moving AI onboard satellites, while promising, is significantly more difficult. Running AI in space is like running a marathon on the moon — impressive if achieved, but limited by the environment," said Sylvester Kaczmarek, chief technology officer at OrbiSky Systems, a London startup focused on AI edge operations."

The Space Tech Challenge

How Space Technology Impacts Life on Earth? *(August 14th, 2025)*

"When most people think about space technology, they picture rockets, astronauts, and distant planets. But what many don't realize is that space innovations have a direct and profound impact on our daily lives here on Earth. From GPS navigation to climate monitoring, technologies developed for space missions are woven into the fabric of modern society. Space exploration has pushed the limits of engineering, science, and creativity — and in doing so, it has delivered countless benefits that make our world safer, more connected, and more advanced."

NASA TechRise Student Challenge

"As part of its strategic investments in the growth of the U.S. commercial space industry, NASA's Flight Opportunities program purchases flight testing services from its cadre of commercial providers for the NASA TechRise Student Challenge."

How NASA Is Increasing Equity In STEM Beyond Space Exploration *(April 5th, 2024)*

"The National Aeronautics and Space Administration (NASA) hopes to inspire people to look into the skies and to their communities."

The Role of Space Technology in Addressing Global Challenges | Experts' Opinions *(October 1st, 2023)*

"The past few decades have been marked by important scientific discoveries and technological innovations in the space industry bringing impact for the international development sector among many others. From discovering new planets to launching missions to Mars, significant milestones in space exploration have been achieved."

Centennial Challenges

"The goal of NASA's Centennial Challenges is to stimulate innovation in basic and applied research, technology development, and prototype demonstration that have the potential for application to the performance of the space and aeronautical activities of the administration."

The Space Tech Challenge

Current Challenges and Opportunities for Space Technologies *(June 15th, 2020)*

"With the launch of Sputnik in 1957 and the subsequent beginning of the space age, the progression of Space Technologies has, on the one hand, led to the development of hundreds of applications (Pelton et al., 2017) that use satellite data, including devices for everyday use, from satellite televisions to the Satnav in our cars."

Overcoming Space Accessibility's Challenges and Barriers – UAE Achievements

"Space brings important benefits to the people worldwide: navigation, communication by satellite, Earth observation for monitoring in case of natural disasters or humanitarian aids."

Space Communications: 7 Things You Need to Know

"Movies and television shows can make communicating with space look easy. Astronauts on far off planets video chat with loved ones on Earth with crystal clear quality and no delay. Communicating to and from space is a challenging endeavor. Fortunately, NASA has the experience and expertise to get space data to the ground."

Artemis Student Challenges

"NASA's Artemis program will land the first woman and first person of color on the Moon using innovative technologies to explore more of the lunar surface than ever before! Discover the Artemis Student Challenges and explore how you can take part in one of NASA's mission-related challenges."

Fast Facts

"The sunset on Mars appears blue."

https://www.natgeokids.com/uk/discover/science/space/ten-facts-about-space/

Space & Society, Global Cooperation in Space

The Future of Space Careers: Roles in Business, Policy, and Leadership *(June 16th, 2025)*
"The space industry is no longer limited to astronauts, engineers, and rocket scientists. As space commercialization expands, there is a growing need for business leaders, policymakers, legal experts, and sustainability specialists. From space law and finance to sustainability and entrepreneurship, professionals from diverse backgrounds now have the opportunity to shape the future of space."

Global Partnerships Are Shaping the Future of Space Exploration *(January 24th, 2025)*
"International cooperation is proving vital to fostering advancements in scientific and technological achievements in space, with promising opportunities in health care and other sectors such as quantum computing."

Outer Space Must Be a Place for Peace and Cooperation, Not an Arms Race, Speakers Affirm, as Fourth Committee Takes Up Space Matters *(October 24th, 2023)*
"Outer space must become an arena for international cooperation for global sustainable development, and not a theatre for an arms race, the Fourth Committee (Special Political and Decolonization) heard today as it began its consideration of international cooperation in the peaceful uses of outer space."

Artemis, Ethics and Society: Synthesis from a Workshop *(September 21st, 2023)*
"As NASA plans and implements its Artemis and additional Moon to Mars activities, it will set precedents in spaceflight for decades to come. Including ethical and social considerations in Artemis planning will improve the likelihood that the future we create is one where humanity collectively wants to live. A wide range of stakeholders have called for NASA to address ethical and societal issues, notable examples being the U.S. National Academies' recent Planetary Science and Astrobiology decadal survey and the U.S. National Science and Technology Council's cislunar strategy."

Is Space for Everyone? Ethics from Earth to Space and Back *(March 4th, 2023)*
"This session, from the 2023 AAAS Annual Meeting, increased understanding about creating an ethical future as humanity spreads out into space, while recognizing that planning for that future affects the present, too."

Space & Society, Global Cooperation in Space

If Humanity Is to Succeed in Space, Our Ethics Must Evolve *(April 4th, 2022)*

"On July 16, 1969, the day the Apollo 11 mission launched the four-day flight that would land three American astronauts on the moon, one million people made their way to Cape Canaveral, Florida, to watch liftoff. Among them was aerospace engineer Wernher von Braun, a director at the National Aeronautics and Space Administration (NASA), whose leadership and Saturn V rocket were central to the Apollo program's success. The moment marked the pinnacle of von Braun's career and the realization of his childhood dream of sending a manned rocket to the moon."

International Cooperation & Space Exploration *(March 1st, 2021)*

"Led by the United States for the last 20 years, Canada, the 16 member nations of the European Space Agency (ESA), Japan, and Russia have all very successfully worked together flying and operating the International Space Station (ISS). The space station has proven to be an outstanding model for cooperation by the nations of the world."

Lost in Space: An Exploration of the Current Gaps in Space Law *(2021)*

"The Outer Space Treaty of 1967 and other galactic treaties fail to account for increasing advancements in the space industry, such as the unregulated fields of resource mining and the future colonization of space. As a result of the gaps in international law and regulations, individual countries and companies have taken innovative steps toward space exploration."

The Impact of Space Activities Upon Society

"As the 21st century gets further underway, the impact of space activities upon the welfare of humanity will only increase. It has been acknowledged that one of the most significant events of the 20th century was when humanity left its ancestral home and stepped on the surface of another celestial body. We can imagine that during the 21st century the human expansion and insight into the cosmos will produce some of the more significant events of this new century."

The Influence of Culture on Space Developments

"For a quarter of this 20th century, humankind has been successfully extending its presence into space. The landing of men on the Moon in 1969 during the Apollo 11 mission broke our perceptual blinders-we were no longer earth-bound as our ancestors had thought for centuries. Perhaps the real home of the human species lies on the high frontier. Just as the application of fire and tools changed our primitive forebears, so space technology and its accomplishments force modern men and women to change their image of our species. We now are free to explore and use the universe to improve the quality of human existence."

Space Manufacturing

In-Space Manufacturing

"For long-duration space travel to be feasible, it is crucial for there to be a paradigm shift in the design and manufacturing of space architectures. In-Space Manufacturing (ISM) is a program which seeks to develop technologies for these exploration missions. ISM can provide on-demand fabrication, repair, and recycling for critical systems, habitats, and mission logistics and maintenance (both in-transit and on-surface). This can provide cost savings by decreasing launch mass."

Advanced Materials & In-Space Manufacturing

"The impact of the space environment on materials and manufacturing processes can lead to new and improved materials as well as manufacturing processes. Resulting innovations have a positive impact on both Earth and Space-based applications."

Microgravity Made Simple

"A software-first, AI/ML-powered platform built to scale microgravity manufacturing and research. Explore, optimize, and predict microgravity behavior without ever leaving Earth."

In-space Manufacturing

"In-space manufacturing unlocks the benefits of microgravity to solve industry challenges on Earth. Axiom Space is creating an innovation platform for the in-space production of advanced materials and biomedical products that support the development of a robust commercial economy in low-Earth Orbit and beyond."

Space Manufacturing

In-Space Manufacturing: Technologies, Challenges, and Future Horizons *(March 5th, 2025)*
"In-space manufacturing represents a transformative frontier in space exploration and industrial production, offering the potential to revolutionize how goods are produced and resources are utilized beyond Earth."

The Rise of Space Manufacturing *(November 7th, 2024)*
"In 1969, space was much less complicated. Only a few nations had launched satellites into orbit, and the race for dominance was between just two — the United States and the Soviet Union. The Moon, recently claimed by the Apollo 11 mission, belonged to America alone."

Bend-Forming | Revolutionary In-Space Manufacturing *(September 26th, 2024)*
"Researchers are working on a concept that could vastly improve how we build large structures in space. Launching large objects into orbit today is limited by rocket size and cargo capacity. A new idea from NASA's Innovative Advanced Concepts program could help us get around these limitations. The Bend-Forming process may one day enable us to fabricate large 3D wireframe structures in space. This concept could transform in-space manufacturing, literally shaping a new generation of spacecraft built in space."

Manufacturing In Space: An Inside Look at a Seemingly Crazy Idea *(September 11th, 2024)*
"So far, the pharmaceutical industry has led the charge. The goal is to find an environment to mix and manufacture chemicals that may accelerate development timelines or improve the performance of various drugs."

Fast Facts

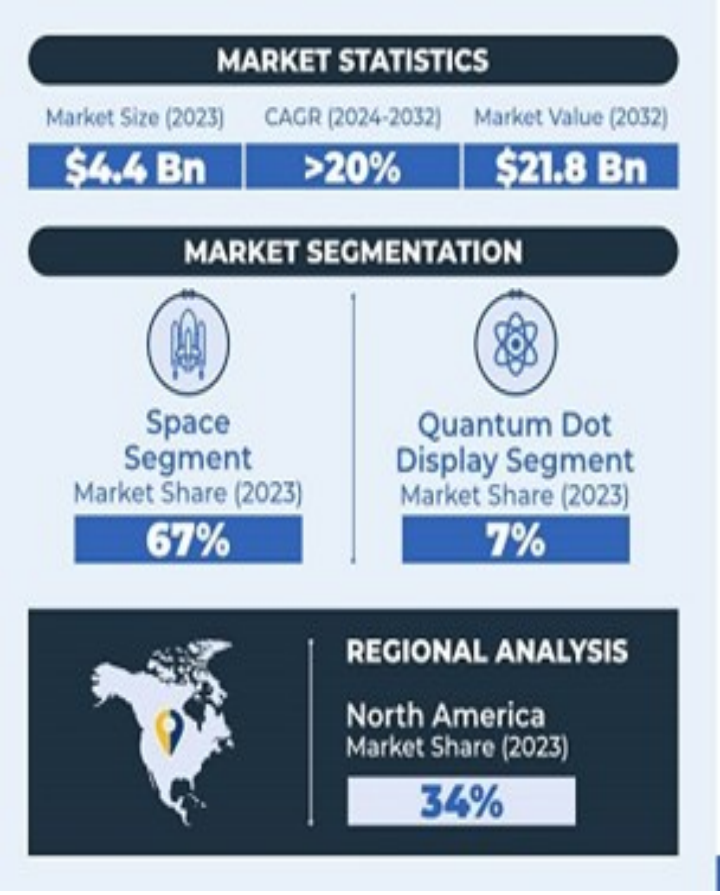
"To mitigate the loss of muscle and bone mass in the human body in microgravity, the astronauts work out at least two hours a day."

https://www.nasa.gov/international-space-station/space-station-facts-and-figures/

Space Manufacturing

[How Space Factories are Becoming a Reality *(August 20th, 2023)*]

"Space offers a unique environment for research and development because its higher levels of radiation, microgravity and near vacuum-less state allow companies to come up with new manufacturing methods or materials that are not possible on Earth. It's a fledgling market that analysts and several startups are predicting will take off. The market for materials manufactured in space could reach $10 billion by 2030, according to estimates from McKinsey & Co. In-space manufacturing is not entirely new. The International Space Station has hosted several experiments from academics, government agencies and commercial customers for things such as growing human tissue, making purer semiconductors and developing new or better drugs. But access to the ISS has always been competitive and interest continues to grow. A number of space startups see an opportunity to fill this gap for in-space manufacturing demand using compact space factories."



Did You Know?

"Since 1957, more than 8,000 satellites from more than 50 countries have been launched."

https://sciencetrek.org/topics/satellites

Future of Careers in Space

Industry Insight: Space Jobs of the Future

"Courtney Stadd spent more than 35 years helping draft and implement federal policies and regulations to spur the growth of commercial space. Today, he is widely consulted within the industry. The article below was originally published in *The Space Report Quarter Three in October. The views presented herein are those of the individual author and do not represent the Space Foundation."*

Career Options for the Future Space Scientist

"For centuries, space science and exploration consisted of what astronomers could observe with telescopes from Earth. However, the past 60 years of scientific, engineering and technological advancements has dramatically changed the nature of space science. While a job as an astronaut symbolizes what most people think of a career in space science, reality is that space science is a diverse, multidisciplinary subject that includes nearly every scientific discipline as well as a broad collection of specialties."

The Role of Space Exploration in the Jobs of the Future

"Space exploration has always been an area of fascination for humans. From the first moon landing in 1969 to the recent launch of the SpaceX Dragon capsule, space exploration has captured the imagination of people around the world. But space exploration isn't just about exploration and discovery; it's also about creating new job opportunities and driving economic growth. In this blog, we will explore the role of space exploration in the jobs of the future."

Future of Careers in Space

The Future of Space Sector Jobs: Careers That Don't Exist Yet *(September 1st, 2025)*

"The space sector is experiencing a dramatic transformation. Once dominated by government agencies such as NASA, ESA, and the Russian Space Agency, space has become a global commercial marketplace. Start-ups, private investors, and international partnerships are fueling a new "space race" that is not only about exploration but also about economic growth, defence, climate science, and connectivity."

Will the Future of Work for Gen Z Include Space? Tech Leaders Predict Space Work and Travel Could be Just a Decade Away *(September 1st, 2025)*

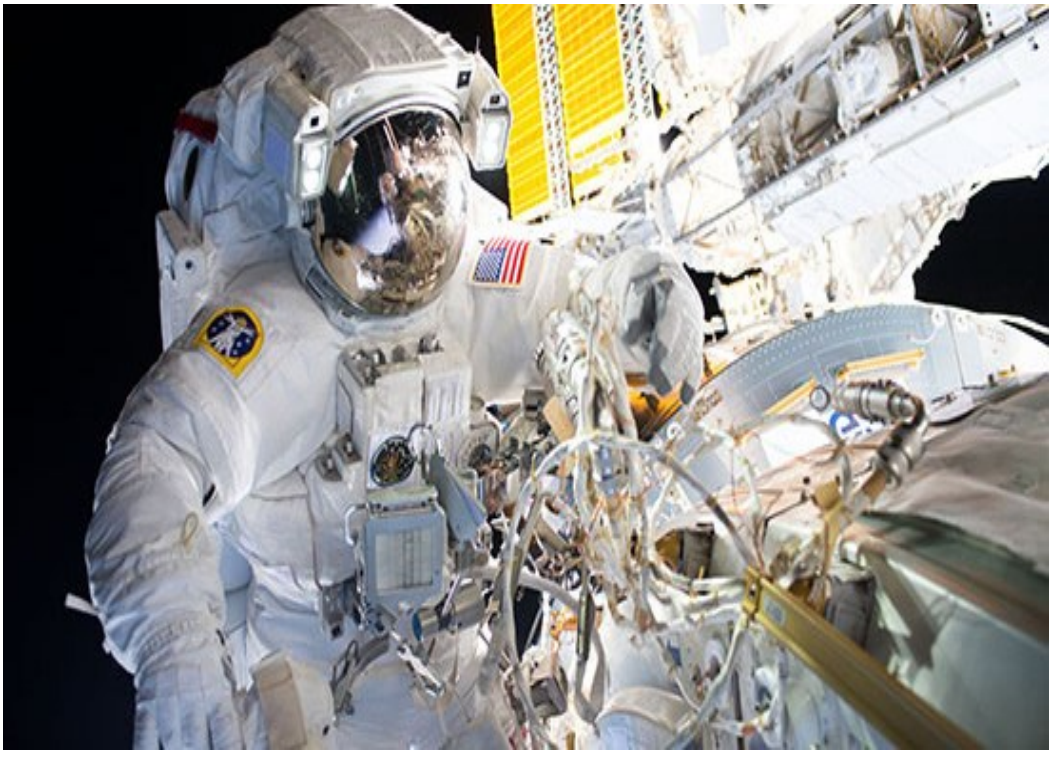
"As entry-level jobs disappear into thin air for Gen Z, the secret to finding an AI-proof job may lie in space. Billionaires Sam Altman, Elon Musk, and Jeff Bezos are all bullish that mainstream space travel is on its way—and college graduates could be headed to Mars within the next decade. But not everyone agrees; Microsoft cofounder Bill Gates says money is better spent solving the myriad of problems on Earth."

The Future of Space Careers: Roles in Business, Policy, and Leadership *(June 16th, 2025)*

"The space industry is no longer limited to astronauts, engineers, and rocket scientists. As space commercialization expands, there is a growing need for business leaders, policymakers, legal experts, and sustainability specialists. From space law and finance to sustainability and entrepreneurship, professionals from diverse backgrounds now have the opportunity to shape the future of space."

The Future of Space Careers and Innovation *(May 2nd, 2025)*

"There was a time when gazing at the night sky stirred poetic thoughts and distant dreams. For me, it stirred purpose. As a military aviator who soared at supersonic speeds and later transitioned into the vast unknown of the space sector, the idea of space being "out there" transformed into something deeply personal. Space is no longer a distant dream—it is the next tangible frontier of human evolution, innovation, and opportunity."



Future of Careers in Space

Securing our future: Space Workforce for Tomorrow *(September 16th, 2024)*

"Without a steady pipeline of space workforce professionals, our ability to innovate and compete globally is threatened. This shortage is not just a space workforce issue — it is a significant national and economic security risk. The space industry is vital to our defense capabilities, which are crucial for maintaining the leadership, stability and prosperity of our nation."

Aero and Space Careers of the Future *(July 16th, 2024)*

"Working in aerospace is, in large part, about looking ahead. Decades in advance, engineers, scientists and managers, among others, are working on incredible new technologies for future generations of aircraft and spacecraft. The aviation, aerospace and space sectors look set to evolve rapidly and will be propelled by a new generation of professionals. So what could their careers look like?"

Fast Facts

"In 24 hours, the space station makes 16 orbits of Earth, traveling through 16 sunrises and sunsets."

https://www.nasa.gov/international-space-station/space-station-facts-and-figures/

Youth Opportunities to Engage with Space

NASA STEM Opportunities and Activities For Students

"Multiple challenges and opportunities reaching a broad audience of middle and high schools, colleges, and universities across the nation."

Education Partner Organizations

"The Space Station Explorers community includes a growing number of partner organizations whose innovative programs bring new excitement to STEM education."

Opportunities for Engaging Young People with the Space Sector

"Space research is often considered "inherently inspiring" to young people. However, this report highlights substantial ethical concerns held by young people around the space sector."

Empowering the Next Generation: International Youth Initiatives for Space Sustainability *(March 6th, 2025)*

"When the words "youth and sustainability" are uttered, the image that often springs to mind is that of impassioned young climate activists leading demonstrations, their voices raised in urgent protest against environmental degradation. However, this narrow view fails to capture the full spectrum of youth engagement in sustainability issues, particularly in the realm of space exploration and utilisation."

Youth Opportunities to Engage with Space

The Future of Space Exploration: How Teens Can Get Involved *(October 9th, 2024)*

"The future of space exploration holds limitless possibilities, and today's teens are in a prime position to play a pivotal role in shaping that future. From technological advances to upcoming Mars missions, the next generation will be responsible for pushing the boundaries of our knowledge and capabilities in space. In this post, we'll explore how teens can get involved in the growing field of space exploration and why their contribution is so vital."

Goodwill's Youth Aerospace Program Launches Careers in STEM *(September 29th, 2021)*

"Since 2020, the Port of Seattle has supported Goodwill Seattle's Youth Aerospace Program, which helps underserved high schoolers prepare for a career in the Aerospace industry. The program begins when the youth is starting their junior year of high school, and ends with their graduation from high school. The Port of Seattle helps keep this program free for students through its Opportunity Youth Initiative, and also contributes to the paid stipend for students, which can be a critical factor in job hunting for low-income youth."

Seven Easy Ways to Get Young People Involved in Space Activities Today *(2021)*

"It's never been a better time to get young people involved in space activities that are provided by different agencies from around the world - with most of them being free. Jonathan Nalder shares a few ideas and links for you to jump right in and start today."

Teaching Space Inspires Youth *(2016)*

"Every child has looked up at the twinkling stars on a clear night and wondered about the vastness above. The night sky captures a child's imagination and leads to profound thoughts and questions about our place in the world. The need to explore and discover is a common thread among humans, and the greatest unknowns lay in the night sky above us. Giving students a window into the beauty of space and teaching the journey of humankind's exploration of other worlds is a powerful tool to inspire and engage an interest in science and engineering."

Fast Facts

"Peggy Whitson set the U.S. record for spending the most total time living and working in space at 665 days on Sept. 2, 2017."

https://www.nasa.gov/international-space-station/space-station-facts-and-figures/