KEYSTONE SPACE COLLABORATIVE

1 Allegheny Square
Nova Tower 1, Suite 100
Pittsburgh, PA 15212

Info@KeystoneSpace.org
412.343.2235
KeystoneSpace.org

THE KEYSTONE REGION STANDS READY TO LEAD AMERICA'S SPACE INDUSTRIAL REVOLUTION AND WIN THE SPACE INFRASTRUCTURE RACE

At the heart of an area once known as the Arsenal of Democracy, the Keystone region – Ohio, Pennsylvania and West Virginia – stands ready to answer the industrial demands of an increasingly urgent great power competition.

OVERVIEW

The United States is in the midst of a new and global Space Race – the U.S. and its allies representing democratic and capitalist countries set against a coalition of autocratic adversaries led by China to determine whose values will shape the exploration and development of space. The prize in this case is access to Cislunar space and the unlocked resources of the Moon, which may soon resemble the territorial disputes of the South China Sea.

China is making bold, strategic moves to establish the first sustainable human moon base at the South Pole of the Moon. This Chinese People's Liberation Army (PLA)-proposed base, dubbed the International Lunar Research Station (ILRS), will occupy an area of the Moon long believed to be of critical importance in terms of resource potential, energy generation, and as a point of embarkation to Mars and beyond. China has mobilized Russia and other foreign states, and has unveiled its first ILRS missions scheduled for as early as 2026 and 2028, whose plans include the establishment of lunar power and communications infrastructure at the South Pole of the Moon.

Other examples include China's owned and operated, permanently-crewed space station in low Earth orbit, Russia's deployment of a unique satellite, thought to be a prototype for an orbiting nuclear weapon in space, and increasing cyber attacks levied against United States satellites and ground station infrastructure. The list of potential and extant developments to counter U.S. pre-eminence in space is long and sobering.

The value of the global space industry is estimated to reach $1.8 trillion by 2035. Two important nodes in this economy— Low Earth Orbit (LEO) in near space and the Lunar South Pole represent the equivalents of the 21st Century's Panama Canal, or the two endpoints of the Transcontinental Railroad a generation before. By controlling these key nodes in the spaceflight domain, the United States can project power, provide security, and leverage economic growth and prosperity throughout the entire domain of near space where our adversaries seek to counter our leadership and defeat our objectives. Despite this strategic importance, challenging economic headwinds, budget constraints and uneven leadership, including a scattered strategy and soft commitments, leaves the United States at risk of trailing its foreign adversaries in a race we must win.

Much like the start of the Apollo program, the U.S. enters the next part of the 21st Century with the resources and capability to win, but at a disadvantage due to our adversaries' laser-focus on these geopolitical opportunities in space and our inconsistent commitment to winning the race back to Cislunar space and the Moon. Over the last 30 years, the U.S. has had three separate national initiatives to return to the Moon, and two have been subsequently cancelled with diverted focus on asteroids, LEO and Mars, before finally refocusing on human exploration of the Moon and Mars during the first Trump Administration with Space Policy Directive-1 (Dec. 2017)[1], which led to development of the Artemis program.

With proper stewardship, leadership and funding from the government, the United States is well poised to win this new space race by unleashing the power of the private sector. American companies have catalyzed a paradigmatic shift from government-led space activities to public-private partnerships that have enabled cost effective and unprecedented access to space. These companies are moving forward to pioneer the future of commercially owned, privately operated space stations in LEO, lunar orbit as well as the lunar surface, focusing on 'what you can do once you get there.' While we have seen the positive outcomes from empowering private sector space technologies and applications, we have yet to see the full growth of commercial demand from a large group of public and private sector customers. Regardless of the space destination, those customers will need space industrial infrastructure to realize their plans.

The natural next phase is therefore not the commercialization of space, but indeed the industrialization of space – leveraging the public-private partnership model to enable industry-led development of strategic and sustainable building blocks to develop off-Earth ecosystems for sustained human presence, economic development, and security in space. Consistent with national space policies and strategic roadmaps and plans outlined by NASA, the private sector, and international allies, the prime domains of control and leadership for the United States are LEO and the Moon.

The time is now for the United States, through NASA, DOD and other federal agencies, to fund sustainable and commercially-provided infrastructure in space across LEO and Cislunar space. Given the gauntlet laid down by China and our foreign adversaries with the Tiangong space station and the announcement of ILRS, this begins with a commitment to and material investment in private sector-led human missions to LEO, and non-human missions to immediately establish a power grid and communications network on the lunar surface. These infrastructure building blocks are critical to 'controlling the high ground' by investing at both key nodes, re-establishing our human presence on the Moon and leveraging it as a proving ground for technologies that will enable future crewed missions and a sustained human presence on Mars and beyond. This approach not only will unleash the commercial space economy, it is the only timely and practical chance the United States has to control the narrative of humanity in space.

[1]See https://www.nasa.gov/news-release/new-space-policy-directive-calls-for-human-expansion-across-solar-system/; see also https://2017-2021.state.gov/space-policy-directive-1-reinvigorating-americas-human-space-exploration-program/

THE KEYSTONE REGION IS READY TO ANSWER THE NATIONAL SPACE IMPERATIVE

Building American space industrial infrastructure requires funding private sector R&D and the acquisition of commercial space power, space communications, and ancillary computing, AI, mobility, autonomy, testing products and offerings. The Keystone region is perfectly positioned and stands ready to lead the United States in the development of these building blocks by leveraging existing and prior investments in these key areas, and by activating the tremendous manufacturing capabilities of the region to support these industrial building blocks. Other regions are already building the ground systems, launch vehicles, spacecraft, and landers to get crews and cargo to LEO and the lunar surface. The Keystone region is uniquely prepared to capitalize on these important transportation systems with space infrastructure development that will make the United States a leading and permanent fixture in Earth orbit and Cislunar space.

The Keystone region is the birthplace of America's Industrial Revolution and of American aviation and spaceflight history. The region's industrial and manufacturing base enabled the United States to win the first Space Race and achieve unprecedented success during the Apollo era. And while the Keystone region has yet to garner national and international recognition as a "space region," behind its humble façade, the region boasts some of the nation's finest space R&D, commercialization and industrialization assets. For this reason, we humbly refer to the Keystone region as the Birthplace of American DREAMS (Data, Robotics, Energy, AI, and Manufacturing for Space).

The region is home to critical space research assets, with NASA Glenn Research Center, the NASA Armstrong Test Facility, and the Air Force Research Lab (AFRL) in Ohio, the NASA Katherine Johnson IV&V Center (KJIV&V) in West Virginia, and through an evolving strategic partnership, the NASA Goddard Space Flight Center in Maryland. NASA Glenn recently opened a major space communications center that could substantially contribute to cislunar communications, and has led the development of lunar-based Fission Surface Power, which will be essential to maintaining a long-term human presence on the Moon and later Mars. AFRL is developing cislunar space situational awareness assets. KJIV&V is ideally suited to provide software mission assurance for infrastructure reliability. Ultimately, the focus of these research centers is directly aligned with the space industrialization efforts for space power (solar and nuclear), materials research in space, autonomy and advanced technology, communications and mission assurance.

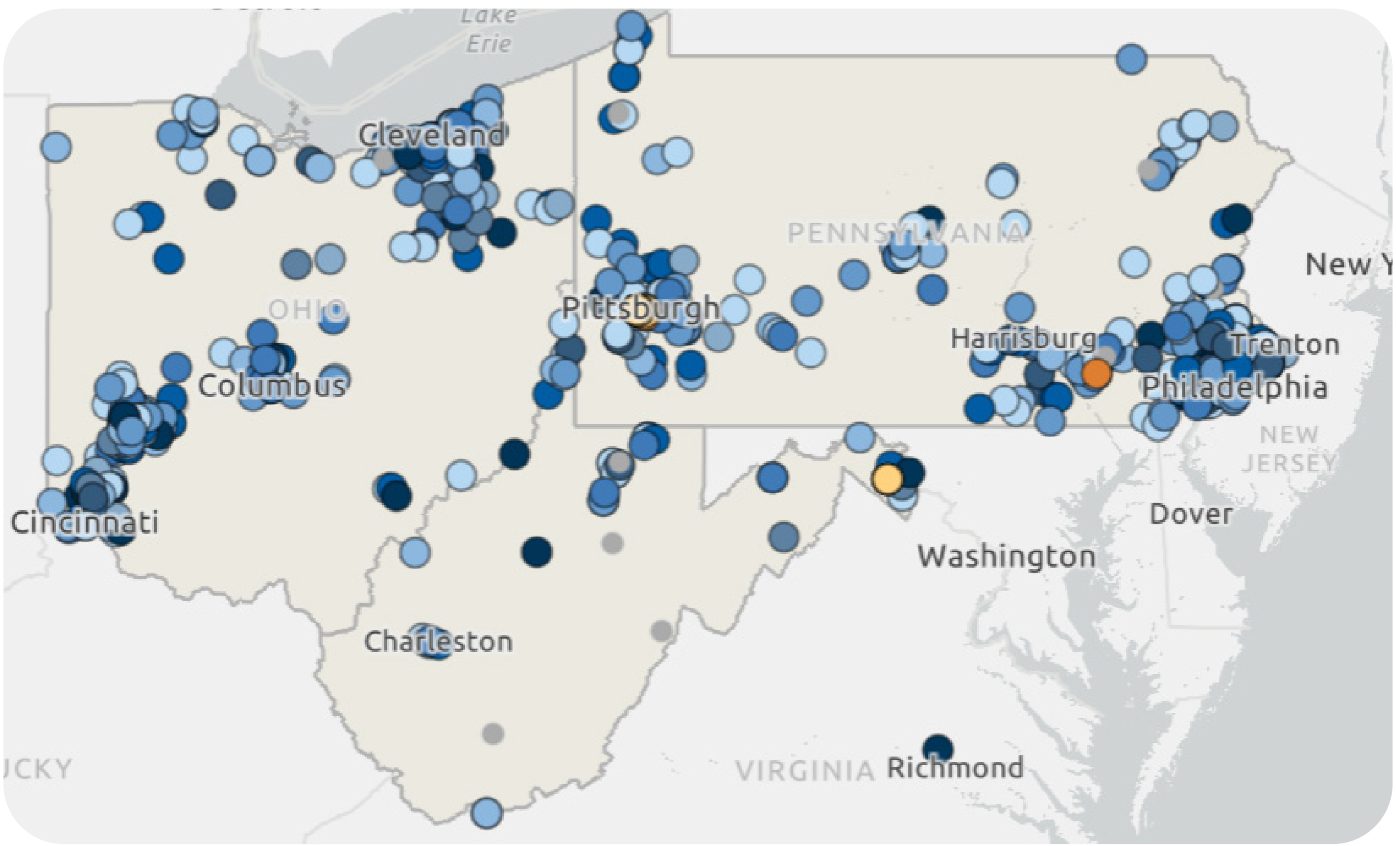
Top research universities like Penn State University, The Ohio State University, West Virginia University, University of Pittsburgh, Carnegie Mellon University and Case Western Reserve University all boast globally-recognized space research labs and programs, focusing on relevant translational research in space power and computing, autonomy and AI, robotics and mobility, advanced space materials, manufacturing and In-Space Servicing, Assembly, and Manufacturing (ISAM), human and space biology, and space communications. Many other universities and community colleges across the region are in the process of developing complementary space research capabilities as well.

And perhaps most notably, the Keystone region boasts incredible commercial space industry and supply chain assets that are aligned with the federal and university R&D strengths of the region. The Keystone Space Collaborative is actively tracking and mapping prime contractors, subcontractors, and suppliers comprising the regional commercial space ecosystem across OH, PA, and WV, as well as executing a regional strategy that, with the support of this administration, will take those building blocks and transition them into bridges galvanizing the United States' leadership in the critical space infrastructure race.

The numbers are impressive – as of early 2023, we have identified 728 direct recipients of NASA or DOD space infrastructure-relevant contracts and grants, and at least double that number of companies making up the region's robust space supply chain. Notable companies headquartered (or that perform significant space-relevant work) in the region include large companies like Lockheed Martin, L3Harris, ANSYS, Constellium, Westinghouse, BWXT, GE Aerospace, and others. But the Keystone region's space identity is perhaps best characterized by small businesses boasting top notch space technology, advanced manufacturing and testing capabilities, and that comprise a critical part of the Artemis supply chain.

Examples of small businesses that have secured significant space infrastructure-related federal funding and customer contracts include Voyager Technologies (OH), Alcyon Technical Services (ATS) JV (OH), Materion (OH), Astrobotic Technology (PA), Advanced Cooling Technologies (PA), Aalyria (PA), Touchstone Research Lab (WV), TMC Technologies (WV), Acoustic Research Systems (WV), Argo Navis (WV), and many, many others (a more fulsome list can be found at https://keystonespace.org/ecosystem/).

KEYSTONE SPACE COLLABORATIVE ECOSYSTEM MAP



The Keystone region's space industry participants lead the nation in space power and communications, space technology (particularly autonomy, mobility, computing, and mission assurance), as well as manufacturing capability. Ensuring that the Keystone region's federal, research and industry assets remain strong must be a critical national goal, which if met, will uniquely position the Keystone region to serve as the nation's hub for reliable space industrial infrastructure.

THE KEYSTONE SPACE COLLABORATIVE AS PARTNER TO THE CURRENT ADMINISTRATION

The Keystone Space Collaborative serves as a unifying force and dedicated catalyst for the commercial space industry across Ohio, Pennsylvania, and West Virginia. It is committed to positioning the Keystone region as a national and international leader in space industrial infrastructure development. By fostering collaboration and extending its efforts between and beyond state boundaries, Keystone Space focuses on creating a cohesive regional identity in the space sector while advancing shared objectives.

Keystone Space seeks to bring the power of its regional coalition of industry participants, R&D institutions and researchers, as well as advocates at the local, state and federal level to forge a strategic partnership with the current Administration and address the national imperative – to enable the United States to architect the future of humanity's off-Earth ambitions and reclaim its rightful place as the global leader of the space economy. The Keystone region's contribution will be the foundational infrastructure – focused on space power and communications – necessary to industrialize space and help win the new Space Race for the United States.

ABOUT THE KEYSTONE SPACE COLLABORATIVE

The Keystone Space Collaborative, founded in 2021 by a group of space industry leaders from Ohio, Pennsylvania and West Virginia, is dedicated to growing the regional space ecosystem across the Keystone region. Its strategic focus is built around four pillars: industry growth, workforce development, translational R&D, and regional space advocacy. These pillars drive Keystone Space's organizational strategy and activities.

Key initiatives include annual conferences and regional programs, innovation challenges, data analysis, industry reports and ecosystem mapping, strategic partnerships with NASA, DOD and other federal agencies and their respective regional centers, the opening of the Keystone Space Innovation Center, and collaborations with synergistic space industry-focused organizations within the Keystone region and in other states and allied nations.

With backing from federal and state funding, philanthropic support, and membership revenue, the Keystone Space Collaborative has garnered national recognition for its efforts to build a diverse, multi-state space industry cluster. Through its work, Keystone Space is positioning the Keystone region as a rising leader in the global space market.