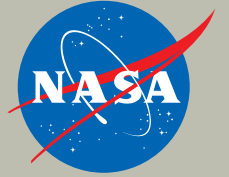


National Aeronautics and Space Administration



NASA

Economic Impact Report — FY19





Introduction

NASA has perhaps the most far-reaching impact of any government institution in terms of sheer scale—the Agency operates the most far-flung human inventions in the universe, with Voyager 1 at a range of more than 13 billion miles. But all of NASA’s endeavors begin here on Earth, in the United States of America, and they have an extensive economic impact across the entirety of our nation.

NASA commissioned a study of its national economic impact for FY2019 to better understand how its activities impacted the American economy. Working with partners in academia, a detailed comprehensive analysis was conducted to assess the benefits to national and state economies realized by the United States’ investment in NASA and space exploration. This analysis shows the immense impact that NASA and its partners have on the national economy, across all 50 states and the District of Columbia.

In addition to the overall impact of NASA’s work on the national economy the report examines the impact of the Agency’s Moon-to-Mars efforts specifically. The Artemis mission will put the first woman and next man on the Moon, where NASA will establish a long-term, sustained presence there and then proceed farther into the solar system to Mars. NASA’s Moon-to-Mars efforts, including the Space Launch System, Orion spacecraft, Human Landing Systems, Moon and Mars science missions, ground support equipment, space suits, and the many other technologies required to make it all possible, represent a significant investment in our nation’s space-faring capabilities, research and education endeavors, and national technology development here on Earth.



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While NASA has ten field centers operating in various parts of the country, the impact of NASA spending (both labor and procurement) is not confined to states that have active NASA facilities. All 50 states see economic benefits from NASA's missions of aerospace research and space exploration.

Results from NASA's research and development activities ripple throughout the national economy, supporting high-tech industries and creating or sustaining tens of thousands of knowledge-intensive jobs. In addition, NASA invests in economically valuable technologies that help the nation maintain its competitive advantage. NASA develops hundreds of new technologies each year and transfers thousands of products, services, and processes to private businesses. These transfers improve U.S. businesses productivity and global competitiveness.

In FY19, NASA employed more than 18,000 civil servants and had a budget of \$21.5 billion. Through labor expenditures and procurements, this resulted in a significant economic impact across the nation and drove the development of hundreds of new technologies, and transferred thousands of products, services and processes to private businesses across the nation.

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In FY19, NASA's efforts*

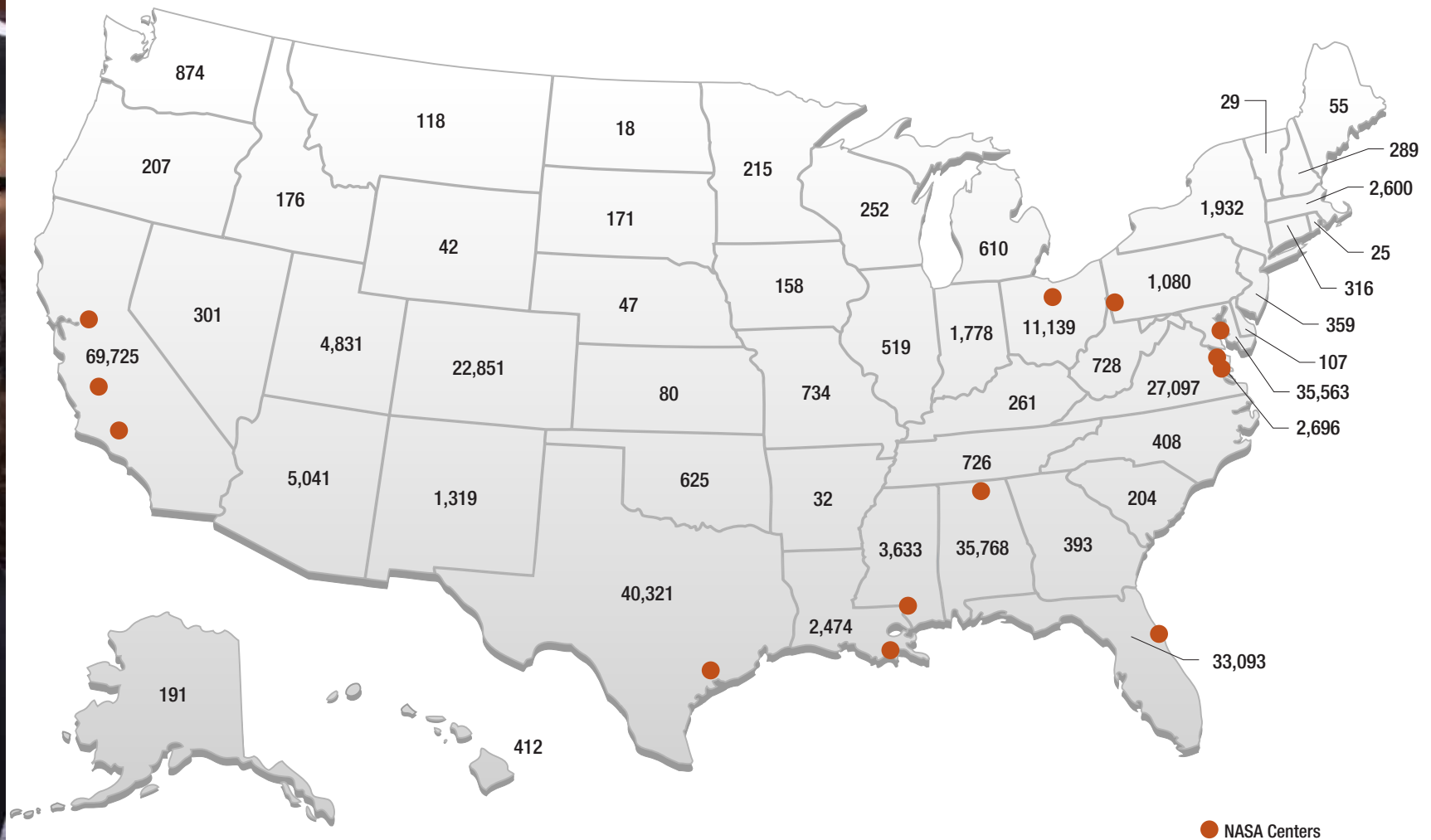
- Generated a total economic output of more than \$64 billion
- Supported more than 312,000 jobs
- Resulted in nearly \$7 billion in federal, state, and local tax revenues
- Impacted all 50 states and the District of Columbia.

*These are estimates derived by a macroeconomic modeling application [IMPLAN] based on NASA's procurement and labor expenditures.



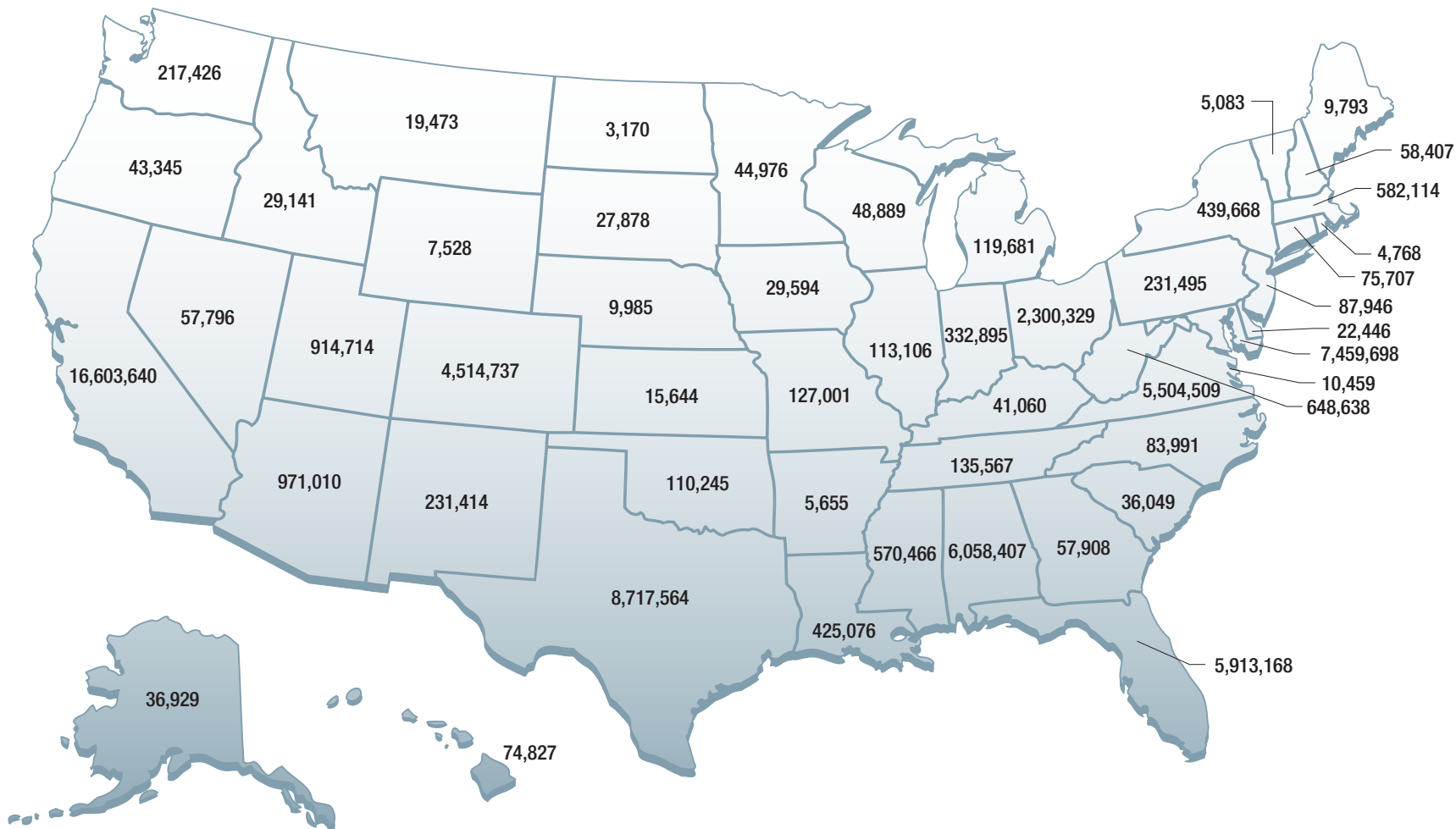


NASA Employment Impacts by State



NASA's Nationwide Impact

NASA Output Impacts by State (in \$ thousands)





From the Moon to Mars

NASA's Artemis program will return humans to the Moon and pave the way to Mars. To get there, NASA has engaged partners and suppliers across the nation to research, develop, and build the launch vehicle, spacecraft, and technologies needed for a sustained presence on the lunar surface. Artemis reaffirms American leadership in space, leads to nationwide economic impact, and encourages American industry and international partnerships for the betterment of all humanity.

When the next American astronauts set foot on the lunar surface, it will represent the culmination of a nationwide effort to put them there—the work of thousands of people across the country. The work underway to take us to the Moon and on to Mars creates economic benefits and opportunities in communities far beyond the NASA field centers.

Nationwide impact of Moon to Mars

NASA's Moon to Mars (M2M) program employs thousands of highly skilled professionals, and the U.S. Government channels billions of dollars of federal spending on M2M into the states in the form of contracts. The M2M program's economic impact goes well beyond its immediate employment of NASA civil servants. Wide-ranging benefits are created for the local and state economies, as well as the U.S. economy as NASA's contracting boosts economic activity elsewhere in the country. M2M contracts to firms, government agencies, and academia not only support the U.S. aerospace industry but also result in advanced development and innovative solutions in areas including materials, structures, avionics, software, and analysis techniques.

Some highlights of the economic impacts that occur throughout the national economy include:

- M2M economic activity across the U.S. supports more than 69,000 jobs.
- M2M spending supports more than \$14 billion in total economic output across the country.
- The M2M program generates an estimated \$1.5 billion in federal, state, and local tax revenues nationwide.

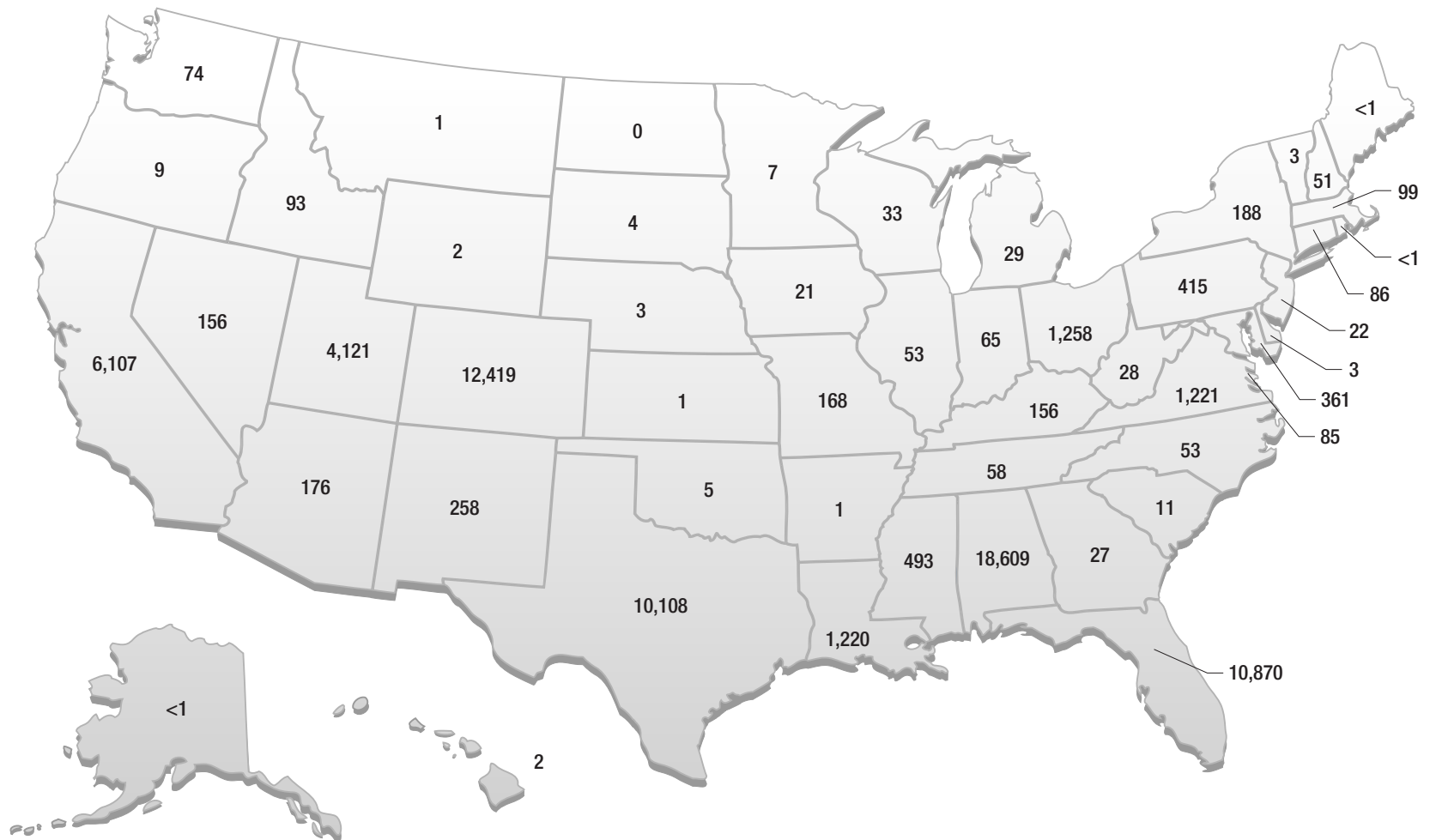
What is Moon to Mars?

NASA's Moon-to-Mars efforts include a variety of programs and projects that represent all the needed components for launch, spaceflight, landing, and sustained presence on the lunar surface. These programs and projects include:

- The Space Launch System
- Orion spacecraft
- All ground support equipment for development, testing, and launch of SLS/Orion
- Gateway
- Human landing system
- Space suits for lunar surface operations
- In situ resource utilization, surface power systems, life support, and other advanced technology developments for a sustained lunar presence
- Mars 2020 & Sample Return
- Commercial Lunar Payload Services

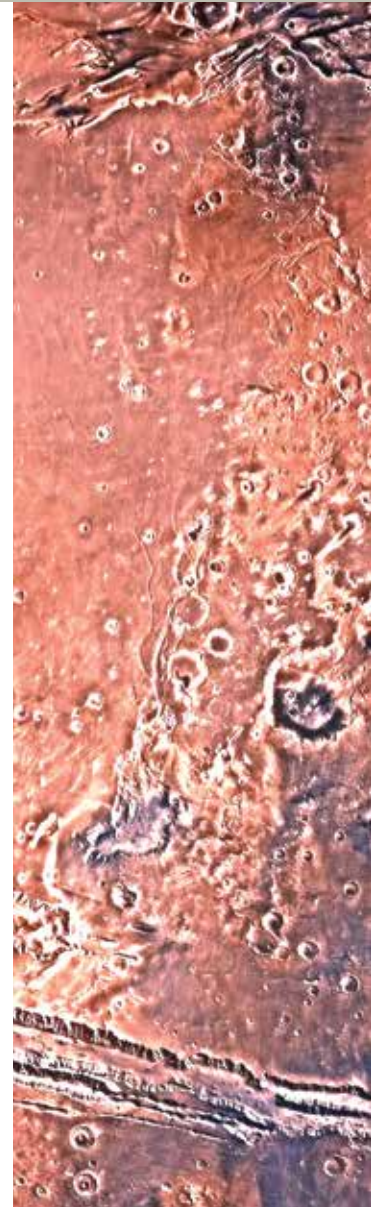
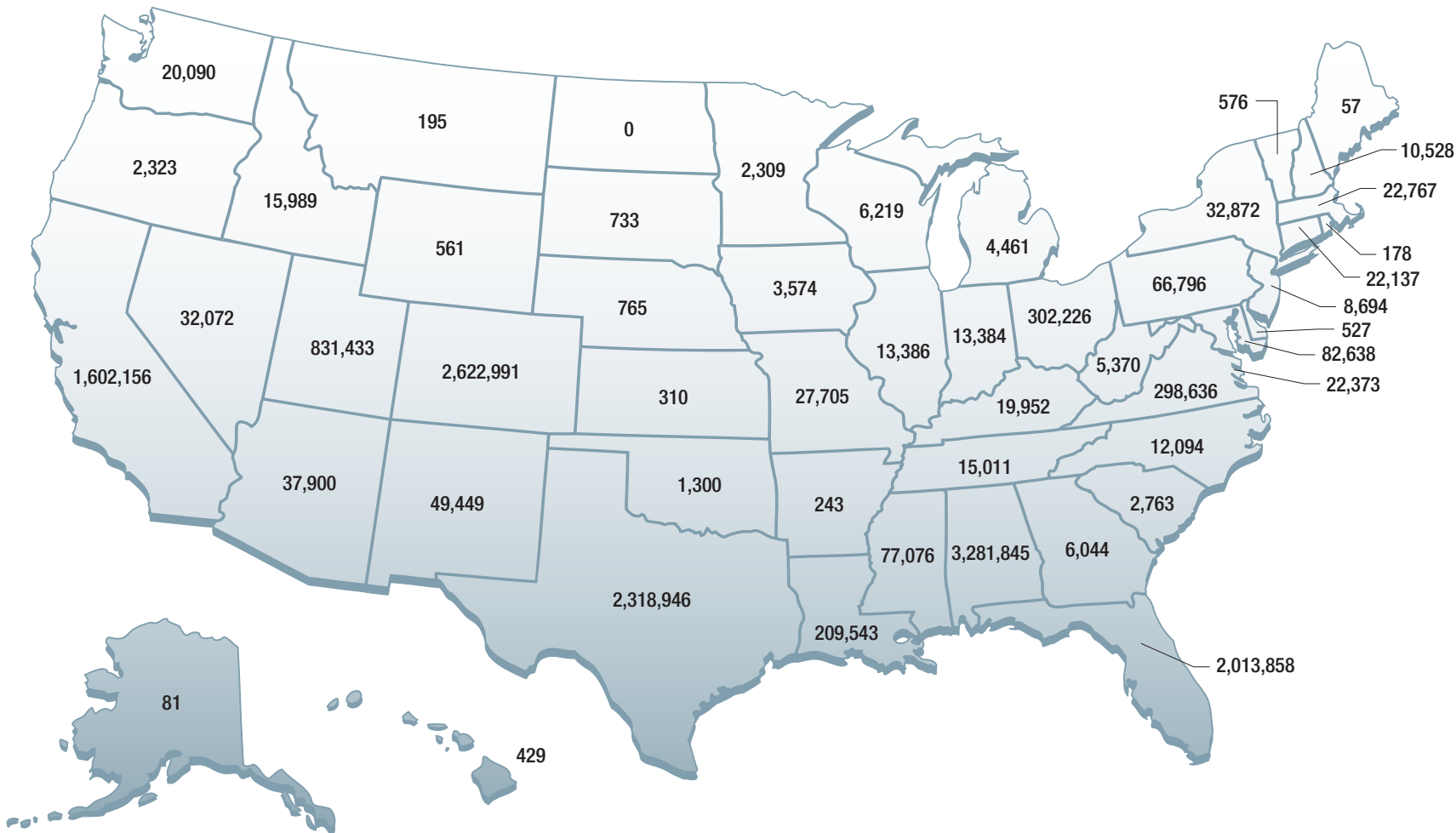


M2M Employment Impacts by State



Moon to Mars Impact

M2M Output Impacts by State (in \$ thousands)





NASA and the Global Space Economy

NASA, from its inception with the National Aeronautics and Space Act of 1958, has a mandate wherever possible to involve the international community in its mission of scientific discovery and space exploration. Beyond direct partnerships with dozens of nations over its history, the expansion of humanity's influence into orbit and beyond has led to a booming space economy — satellites, launch vehicles, research and development, space tourism, and more.

Today, there are 81 nations active in space, employing more than a million people and representing more than \$85 billion in spending by world governments. The total value worldwide of this space economy has grown to more than \$400 billion. There are 40 active and emerging spaceports worldwide, with more in development. The number of patents awarded to space-related technologies and

processes has quadrupled over the past two decades. Independent projections suggest that, before this decade ends, more than 10.5 million people will be employed in STEM fields.*

International Partnerships

NASA's most obvious and significant international partnership orbits approximately 250 miles above the Earth's surface, circling the planet every hour and a half. The International Space Station, representing 15 nations and five space agencies (NASA, Roscosmos, the European Space Agency, Japanese Aerospace Exploration Agency, and the Canadian Space Agency) has been operating for 20 years, providing a unique orbital laboratory that has performed thousands of experiments during its operational lifetime.

In addition to the ISS, NASA had more than 700 active international agreements for various scientific research and technology development activities in FY19, representing everything from ground-based research and development to scientific instruments that study other worlds.

The Artemis Accord

Announced in May 2020, the Artemis Accords represent a set of guiding principles for international cooperation in the next phase of human space exploration. When NASA sends the first woman and next man to the moon's surface, international partners will be key to developing a sustained human presence on the moon and also for pressing further into our solar system to explore Mars. The Artemis Accords stress peaceful cooperation, transparency, and responsible and sustainable approaches to the exploration and commercialization of space.

<https://www.nasa.gov/specials/artemis-accords/index.html>

* Data from The Space Foundation 2020 Scorecard (https://www.thespacereport.org/wp-content/uploads/2020/02/SpaceFoundation_2020_Scorecard.pdf)



NASA in Your Life

When NASA develops the advanced technologies necessary for space exploration or makes breakthrough scientific discoveries about the universe, it isn't just applicable to the Agency's missions in space. Many of these developments find applications in everyday American life. Through spinoff technologies and the Agency's Technology Transfer Program, NASA provides an impact on American lives beyond dollars and jobs.

These spinoff technologies find new and beneficial applications in health care, transportation, public safety, energy, industrial production, and more. From new remote sensor technology that helps doctors better diagnose patients to new insulation to make power plants more efficient, NASA technology has an impact on the daily life of every American in myriad ways.

NASA and COVID-19

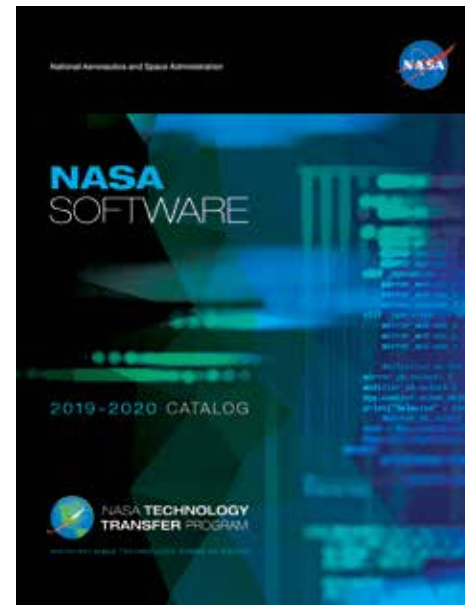
NASA brought its highly skilled technical expertise to bear to help address the COVID-19 pandemic. Engineers and scientists across the Agency developed technology and used their scientific skill to help us better understand and combat the threat of the virus. And for parents and students required to stay at home, NASA released materials to help these new home-schoolers with their STEM education.

- Engineers at JPL developed a ventilator specifically for COVID-19 patients in just 37 days, releasing the design for free to manufacturers.
- NASA astrobiologists contributed research and advanced software to study the novel coronavirus' structure.
- NASA supercomputers were volunteered to a consortium of high-powered computers nationwide to compile and process the huge volumes of data coming in about the virus and its impacts.

Infusing NASA Technology Into the American Economy

NASA's Technology Transfer Program ensures that innovations developed for exploration and discovery are broadly available to the public, maximizing the benefit to the Nation. The first step in getting NASA technology into your daily life are New Technology Reports

(NTRs), detailing any invention, discovery, improvement, or innovation that was either conceived or first put in practice as part of NASA work. In addition to NTRs, every year NASA personnel file dozens of patent applications and enable hundreds of people to access NASA-developed software for use in research or business.



Tech Transfer 2019

- 1,839 New Technology Reports
- 85 new patent applications filed
- 122 patents issued
- 2,692 software usage agreements

State	NASA Jobs	NASA Economic Output	Moon to Mars Jobs	Moon to Mars Economic Output
Alabama	35,768	\$6.1 billion	18,609	\$3.3 billion
Alaska	191	\$37 million	<1	\$81,000
Arizona	5,041	\$971 million	176	\$37.9 million
Arkansas	32	\$5.7 million	1	\$243,000
California	69,725	\$16.6 billion	6,107	\$1.6 billion
Colorado	22,851	\$4.5 billion	12,419	\$2.6 billion
Connecticut	316	\$75.7 million	86	\$22.1 million
Delaware	107	\$22.4 million	3	\$572,000
Florida	33,093	\$5.9 billion	10,870	\$2 billion
Georgia	393	\$78.6 million	27	\$6 million
Hawaii	412	\$74.8 million	2	\$429,000
Idaho	176	\$29.1 million	93	\$16 million
Illinois	519	\$113.1 million	53	\$13.4 million
Indiana	1,778	\$332.9 million	65	\$13.4 million
Iowa	158	\$29.6 million	21	\$3.6 million
Kansas	80	\$15.6 million	1	\$310,000
Kentucky	261	\$41.1 million	156	\$20 million
Louisiana	2,474	\$425.1 million	1,220	\$209.5 million
Maine	55	\$9.8 million	<1	\$57,000
Maryland	35,563	\$7.5 billion	361	\$82.6 million
Massachusetts	2,600	\$582.1 million	99	\$22.8 million
Michigan	610	\$119.7 million	29	\$6.6 million
Minnesota	215	\$45 million	7	\$2.3 million
Mississippi	3,633	\$570.5 million	493	\$77.1 million
Missouri	734	\$127 million	168	\$27.7 million
Montana	118	\$19.5 million	1	\$195,000
Nebraska	47	\$10 million	3	\$765,000
Nevada	301	\$57.8 million	156	\$32.1 million
New Hampshire	289	\$58.4 million	51	\$10.5 million

Summary of NASA Economic Impacts by State

New Jersey	359	\$87.9 million	22	\$8.7 million
New Mexico	1,319	\$231.4 million	258	\$49.4 million
New York	1,932	\$439.7 million	188	\$45.4 million
North Carolina	408	\$84 million	53	\$12.1 million
North Dakota	18	\$3.2 million	0	0
Ohio	11,139	\$2.3 billion	1,258	\$302.2 million
Oklahoma	625	\$110.2 million	5	\$1.3 million
Oregon	207	\$43.3 million	9	\$2.3 million
Pennsylvania	1,080	\$231.5 million	415	\$91.7 million
Rhode Island	25	\$4.8 million	1	\$178,000
South Carolina	204	\$36 million	11	\$2.8 million
South Dakota	171	\$27.9 million	4	\$733,000
Tennessee	726	\$135.6 million	58	\$15 million
Texas	40,321	\$8.7 billion	10,108	\$2.3 billion
Utah	4,831	\$914.7 million	4,121	\$831.4 million
Vermont	29	\$5.1 million	3	\$576,000
Virginia	27,097	\$5.5 billion	1,221	\$298.6 million
Washington	874	\$217.4 million	74	\$20.1 million
West Virginia	728	\$137.5 million	28	\$5.4 million
Wisconsin	252	\$49.9 million	33	\$6.2 million
Wyoming	42	\$7.5 million	2	\$561,000
Washington, DC	2,696	\$648.6 million	85	\$22.4 million
Nationwide Total	312,623	\$64.3 billion	69,233	\$14.2 billion



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