NASA Facts

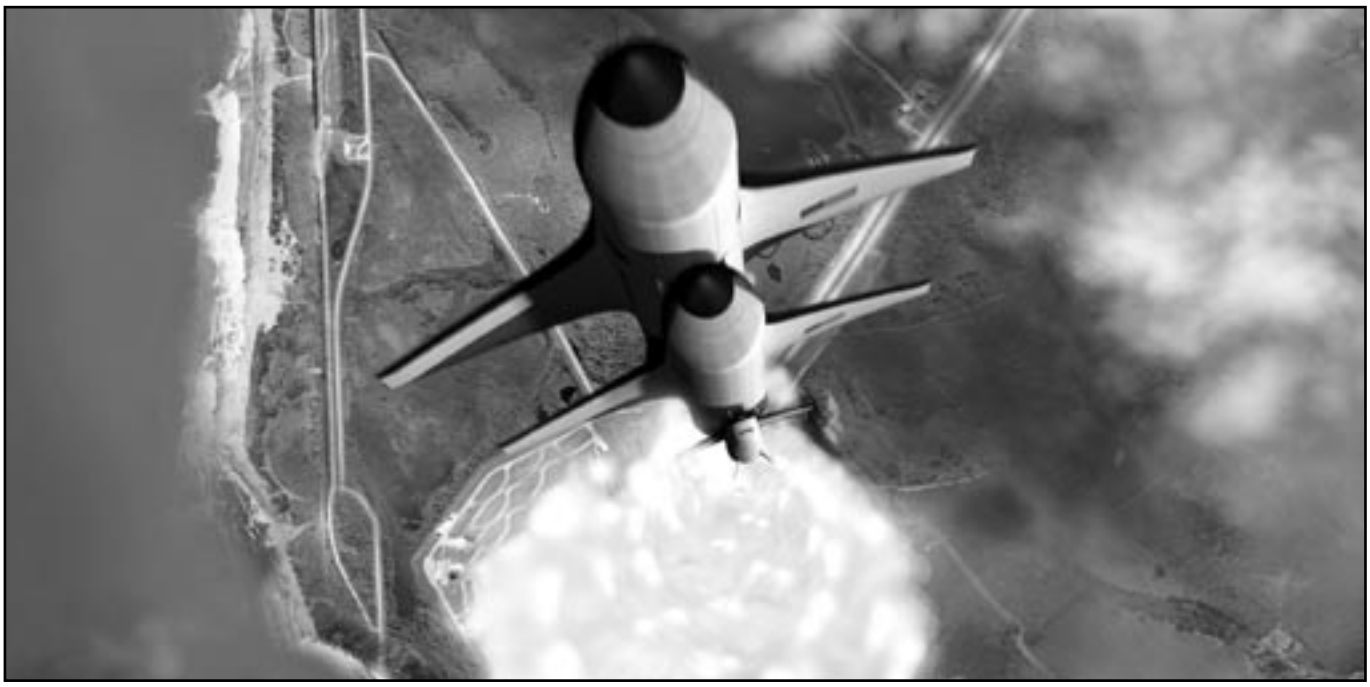
National Aeronautics and
Space Administration

Marshall Space Flight Center
Huntsville, Alabama 35812

FS–2003–04–51–MSFC **April 2003**

Marshall Space Flight Center

Today's vision for space—tomorrow's missions in space



NASA's vision:
To improve life here
To extend life to there
To find life beyond.

NASA's mission:
To understand and protect our home planet
To explore the Universe and search for life
To inspire the next generation of explorers
…as only NASA can.

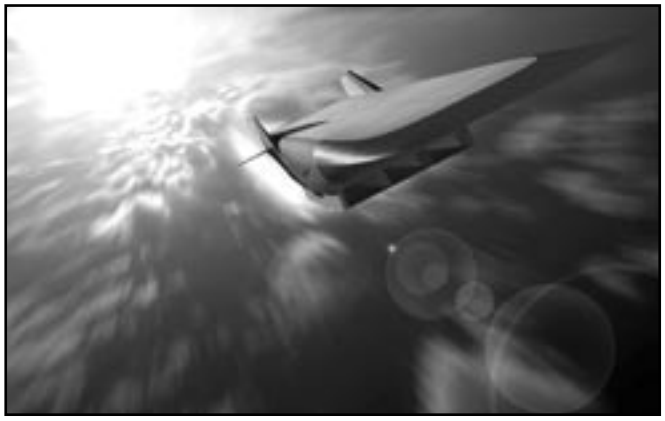
NASA's Marshall Space Flight Center in Huntsville, Alabama, plays numerous key roles in realizing the Space Agency's vision and accomplishing its multifaceted mission of:

- Developing new generations of safe, reliable, reusable launch vehicles and spacecraft powered by innovative, cutting-edge propulsion technologies.
- Providing world-class propulsion systems for America's current space fleet.
- Providing hardware and support for science operations aboard the International Space Station.
- Supporting NASA's science and research efforts, and delivering practical applications of NASA space research and technologies to Earth.

- Educating America's youth about the wonders of space exploration and encouraging them to pursue rewarding careers that could help pioneer humanity's future in space.
- Providing technical and organizational support across the field centers, test facilities, and laboratories that make up NASA.

The Space Launch Initiative
The Space Launch Initiative—a joint research and development effort incorporating the work of every NASA field Center, the United States (U.S.) Air Force Research Laboratory, and numerous government, industry, and academic partners and contractors—is the key to opening the space frontier for commercialization, scientific discovery, and economic expansion. The program is managed by NASA's Office of Aerospace Technology in Washington, D.C. and implemented by the Marshall Center.

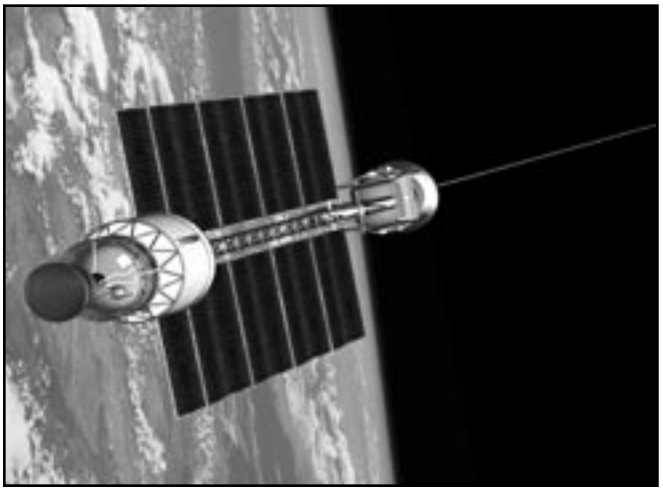
Created in February 2001 to identify options for developing a new, full-scale reusable launch vehicle, the Space Launch Initiative has evolved into a foundational theme for two emerging programs: The Orbital Space Plane Program and the Next Generation Launch Technology Program. NASA intends for the Orbital Space Plane to provide a crew rescue vehicle for the International Space Station within the decade, enabling a larger permanent crew to occupy the Station and depart safely in the event of an emergency. The Orbital Space Plane will be used to ferry crew and light cargo to the Space Station by 2012. The Next Generation Launch Technology Program is developing innovative technologies needed for future generations of space launch vehicles—ones that will be safer, more reliable, and less expensive than today's space transportation systems.



The Marshall Center supports NASA's Space Launch Initiative, overseeing development of next-generation reusable launch vehicle technologies that include innovative propulsion concepts such as the X–43C hypersonic flight demonstrator.

Advanced Space Propulsion
The Marshall Center manages numerous key propulsion research areas intended to dramatically improve access to and travel in space. Marshall implements NASA's In-Space Propulsion Technology projects on behalf of the Office of Space Science–seeking near-term, alternative propulsion technologies to significantly reduce the time and cost required for spacecraft to reach their objectives and allow for more robust science missions throughout the solar system.

The Marshall Center will soon house a new, state-of-the-art propulsion research facility, the Propulsion Research Laboratory. Slated to be operational by April 2004, the laboratory will accommodate academic, industry, and government researchers from across the Nation and will be hosting research into a broad range of propulsion technologies and advanced energy sources.



An in-space tether such as this one could use the scientific principle of momentum exchange to raise and lower the orbits of satellites and other objects in space, and, in time, could help propel missions to the Moon, Mars, and beyond.

Space Shuttle Propulsion
The Marshall Center is responsible for the design, development, testing, and flight performance of the Space Shuttle's Main Engines, External Tank, Solid Rocket Boosters, and Reusable Motors.

The Space Shuttle flew its first complement of three redesigned main engines in 2002. The enhanced Block II main engines incorporate an improved high-pressure fuel turbopump with a stronger integral shaft/disk and tougher bearings, making the engines safer and more reliable, and potentially increasing the number of flights between major overhauls.

Bill Emrich, a Marshall center researcher, studies components of the gas-dynamic mirror—a magnetic, mirror-based fusion propulsion system now being tested at Marshall's Propulsion Research Center facilities.

International Space Station Support
The Marshall Center maintains a key role in International Space Station hardware development and science operations. Marshall is overseeing development of the Node 2 module, a Space Station hub for distribution of water, electrical power, thermal controls, and the life support system. The Center also manages the Station's Multipurpose Logistics Modules, "moving vans" built by the Italian Space Agency to carry laboratory racks filled with equipment, experiments, and supplies to and from the Station.

The Payload Operations Center at Marshall is NASA's primary Space Station science command post, coordinating all scientific and commercial experiments on the Station as well as Earth-to-Station science communications. The Marshall Center is responsible for training Station crew and ground controllers to operate and maintain all U.S. science experiments. Marshall also works closely with the European and Japanese space programs to ensure successful operations of their payloads.

Physical Science
Space is the only place where research can be conducted in microgravity—the low gravity inside spacecraft orbiting Earth. Previously limited to relatively short-duration flights aboard the Space Shuttle, microgravity research now may be conducted inside the International Space Station's Destiny laboratory.

The first experiments were conducted in 2002 in the Microgravity Science Glovebox, a Space Station facility managed by the Marshall Center. This sealed work area allows the Station crew to perform experiments that involve fluids, flames, particles, and fumes that need to be safely contained. Marshall engineers and scientists are also developing and manufacturing the Materials Science Research Rack, which uses furnaces to melt and solidify materials, and is scheduled to be delivered to the Station in 2004.

Before experiments reach the Station, scientists can test their hardware at the Marshall Center's Microgravity Development Laboratory, which provides experiment hardware similar to that found aboard the Station. The laboratory includes the NASA Telescience Center where researchers can remotely command and monitor their experiments aboard the Station.

Flight Engineer Peggy Whitson works with the Microgravity Science Glovebox aboard the International Space Station, preparing for a materials experiment to study semiconductor-manufacturing processes.

Support for Commercial Research
Science experiments developed at Marshall contribute to research areas as diverse as manufacturing, communications, and medicine. Research for NASA's Physical Science program adds to our basic knowledge about materials science and biotechnology. Some experiments are so important to America's economy that companies pay for the research, using the results to create new products or improve manufacturing processes. To develop these commercial experiments, industry works with more than 15 NASA Commercial Space Centers across America. NASA's Space Product Development Program at Marshall manages these Centers.

New technologies derived from space science and research offer a wealth of benefits on Earth. These

technologies are available to private industry, universities, and other government agencies through the Marshall Center's Technology Transfer Department, which encourages a broad use of Marshall-developed technologies and expertise by American private enterprise for new product development and to find solutions to technical problems.

Chandra X-Ray Observatory
NASA's Chandra X-Ray Observatory, the third of NASA's four Great Observatories, was launched in 1999 and is the world's most powerful x-ray telescope. The Marshall Center manages the operation and science activities of the Marshall-developed Chandra X-Ray Observatory. Chandra is roughly a billion times more powerful than the first x-ray telescopes—enabling scientists to identify never-before-seen phenomena such as a small galaxy being cannibalized by a larger one and a black hole gobbling up matter in our own Milky Way Galaxy.

Space Optics Manufacturing
The Marshall Center has more than 30 years of experience developing sophisticated optical systems for space exploration, specializing in space optics manufacturing technology development. The Space Optics Manufacturing Technology Center at Marshall supports NASA's development of advanced, ultra-lightweight optics materials, fabrication technologies, and state-of-the-art test facilities. The Center is currently working with NASA's Goddard Space Flight Center on optics technology for the James Webb Space Telescope—the successor to the Hubble Space Telescope, as well as ultra-lightweight optics for the Constellation-X Space Telescope—the successor to the Chandra X-Ray Observatory.

National Space Science and Technology Center
The Marshall Center partners with Alabama universities, industry, and other federal agencies in the National Space Science and Technology Center. With core facilities that opened in Huntsville in 2001, the center is a collaborative effort that enables scientists, engineers, and educators to share research and facilities. The National Space Science and Technology Center focuses on cutting-edge advances in space science, materials science, biotechnology, Earth sciences, propulsion, information technology, optics, and other areas that support NASA's mission; and it is anchored by Marshall's space science and technology expertise.

National Aeronautics and
Space Administration

George C. Marshall Space Flight Center
Marshall Space Flight Center, Alabama 35812

Gravity Probe B
NASA's Marshall Space Flight Center and Stanford University are developing a sophisticated experiment called Gravity Probe B to test Einstein's Theory of General Relativity. Einstein's theory predicts that space and time are distorted by the presence of massive objects. Scheduled for launch in 2003, Gravity Probe B will be one of NASA's first missions to address a question of fundamental physics in the new millennium.

Education Initiatives
The Marshall Center manages a wide variety of educational programs–including the NASA Earth-To-Orbit Engineering design challenges, the Student Launch Initiative, and the annual Great Moonbuggy Race–designed to heighten student interest in mathematics, science, and technology. These and other initiatives teach students from elementary school through college about the challenges of solving engineering and scientific problems. Marshall also sponsors a number of rewarding internship programs that give high school and university students, as well as teachers, the opportunity to work with some of the Nation's top aerospace professionals.

More About the Marshall Center
The Marshall Center is carrying out its vision of being the world leader in space transportation systems. With its rich history spanning more than four decades, Marshall remains one of NASA's largest field Centers, occupying more than 1,800 acres on the Redstone Army Arsenal in Huntsville, Alabama, employing nearly 2,700 civil servants and more than 4,000 on-site support contractors.

The Marshall Center is just one key element of the NASA collective that is pursuing the Agency's mission by routinely partnering with, fostering, and supporting the work of the following NASA organizations: NASA Headquarters in Washington, D.C.; Ames Research Center in Moffett Field, California; Dryden Flight Research Center at Edwards, California; Glenn Research Center in Cleveland, Ohio; Goddard Space Center in Greenbelt, Maryland; Johnson Space Center in Houston, Texas; Kennedy Space Center, Florida; Langley Research Center in Hampton, Virginia; and Stennis Space Center in Bay St. Louis, Mississippi. The Marshall Center also works closely with the U.S. Department of Defense, the Department of Energy and other government agencies, and with leading academic institutions and industry partners around the Nation.

For more information about Marshall, visit:

http://www.msfc.nasa.gov/

or write to us at:

MSFC Public Inquiries
Government and Community Relations Office
CD50, Huntsville, AL 35812.

Pub 8-40130