



sputnik

THE LEGACY OF THE SPACE RACE
BY JOE FLANAGAN

at 50

IT WAS AN INDIAN SUMMER EVENING IN THE EISENHOWER YEARS, STARS emerging over a nation sated by prosperity and lulled into contentment by the wholesome and familiar. Yet the decade's can-do confidence had been tempered by an indefinable fear—bound up with science and space, communism and the atom. It found an expression in the monster movies and science fiction of the time, a sense that, despite unprecedented power and security, the country was surrounded by alien forces and secret phenomena. And the air was indeed different that night. Something was out there.

Several hundred miles up, a basketball-sized sphere floated just outside the atmosphere. Blasted into orbit from a secret launch pad in Kazakhstan, it was now a point of light moving slowly among the stars. Below, the printing presses rolled. A new word suddenly seemed to be everywhere: Sputnik. Unschooled in the space lexicon that would soon flood the language, newspapers called it a “moon.”

It was the starting gun for the space race. “Sputnik represents the first time humans broke the gravitational bonds of Earth and escaped into what President Kennedy called the ‘new ocean,’” says NASA chief historian Steven J. Dick. News of the very first satellite put a completely different face on the Cold War. The conflict was no longer simply about armies and spies and propaganda. Now it would be defined in the esoteric terms of nuclear physics and aerospace engineering: thrust, megatons, fission, and payload. “Sputnik changed everything,” says National Park Service historian Harry Butowsky. “It cast space exploration in a Cold War context.”

The story of space flight—and its parallel narrative, the arms race—is preserved today in a collection of sites around the country, sur-

vivors of a struggle that constantly remade itself, discarding old parts for new just as fast as technology allowed. In the 1950s and '60s, the cutting edge was a perpetually receding destination. Unaltered remnants from the early years are few, and until relatively recently haven't been seen as historic or at least very “old.” That Congress raised concern back in the '70s, when these places were beginning to decay, was provident. We can see that now, especially, when we look at the light years we have traveled since an awkward-looking Russian device launched the space age.

Under a 1980 congressional directive, the National Park Service, in consultation with NASA, the Department of Defense, and other agencies, conducted a study of the spacecraft, hardware, and facilities that remained. The “Man in Space National Historic Landmark Theme Study” was done to determine the significance and physical integrity of places linked to space. The report and several follow-up studies were authored by Butowsky, who also lectures on the subject at Virginia's George Mason University.

The result was a list of site candidates that, according to the report, “represent the best and most important remaining examples of the technology needed to land a man on the moon and to explore the earth, planets, and solar system.” Today nearly two dozen are national historic landmarks, the highest honor the federal government can bestow on a property for its importance to America's story. The Smithsonian has also preserved a great deal of the legacy at the National Air and Space Museum, which opened in 1976. In addition, the Historic American Engineering Record of the National Park Service, which documents important engineering and industrial relics

from the past, has recorded many sites—a few pictured here—some of which no longer survive. HAER's large-format photographs, measured drawings, and detailed histories have become part of a Library of Congress collection—with many images online—an irreplaceable record of the early space age.

The launch of Sputnik had such a profound effect on the United States that school curricula were upgraded to cultivate more advanced math and science skills. Eisenhower quickly signed the National Defense Education Act,



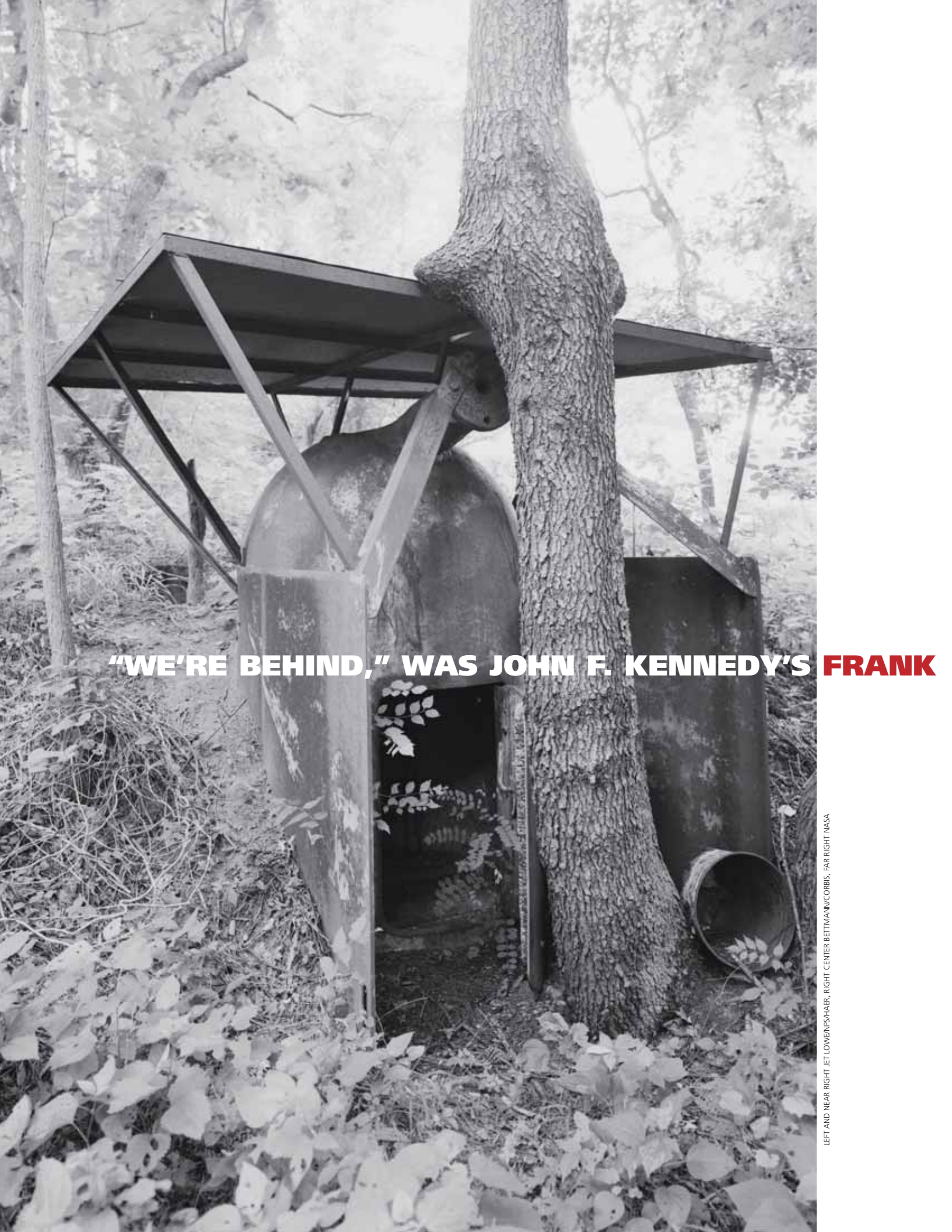
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ABOVE LEFT: COSMONAUT ALEXEI LEONOV'S HISTORIC FIRST SPACE WALK IN MARCH 1965. **ABOVE RIGHT:** COSMONAUTS ON RUSSIAN TELEVISION, JUNE 1963. **RIGHT:** ENGINES ON THE RUSSIAN PROTON ROCKET—A HEAVY BOOSTER INTRODUCED IN 1965 AND STILL IN USE TODAY—FROM PHOTOGRAPHER ADAM BARTOS' BOOK, *KOSMOS: A PORTRAIT OF THE RUSSIAN SPACE AGE*.

SPIES



LEFT RIA NOVOSTI, ABOVE ADAM BARTOS



"WE'RE BEHIND," WAS JOHN F. KENNEDY'S FRANK

LEFT AND NEAR RIGHT JET LOWENSPHAER, RIGHT CENTER BETTMANN/CORBIS, FAR RIGHT NASA

the biggest federal education initiative in history. A billion dollars would be spent building new schools, establishing student loans, and encouraging vocational training to supply workers for the defense industry. “We’re behind,” was John F. Kennedy’s frank assessment of the situation, feeding national anxiety over why, to paraphrase the headlines of the time, Ivan could do what Johnny could not. When the Navy’s Vanguard rocket, carrying what would have been America’s answer to Sputnik, lifted four feet off its launch pad and erupted in flames, the crisis deepened.

THE SPACE RACE HAD ITS ROOTS IN NAZI GERMANY’S V-2 ROCKET PROGRAM.

When the war ended, the United States and the Soviet Union smuggled out as much technology and expertise as they could. Wernher von Braun, the brains behind the German rocket effort, wound up in

tinental missile. There were problems with stability and fuel. Both sides had their share of failures. For the Americans, much of this process took place on a test stand at the Redstone Arsenal. Made of concrete and salvaged metal, it was used repeatedly from 1952 to 1960, with no change in its design. Most of its cost was in the massive concrete foundation that was required to withstand the thrust of powerful rockets. Now a national historic landmark, the Redstone test stand is a witness to the first major breakthroughs in the arms race and the quest to reach the moon.

A MONTH AFTER RUSSIA’S “OCTOBER SURPRISE,” SPUTNIK 2 WENT UP, THIS

time with a passenger. It was unknown whether a living being could survive a launch into space or the effects of weightlessness. While the passenger, a small dog named Laika, died due to a failure in the



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White Sands, New Mexico, experimenting with captured V-2s. His former assistant, Helmut Gröttrup, was doing similar work for the Russians. The era’s boldest innovations—the atom bomb and rocket flight—were irresistible and terrifying, which explains the secrecy and grim intensity that surrounded the competition for technology.

In the years preceding Sputnik, both sides tried to adapt World War II missile technology to a new generation of rockets. By 1951, the United States was running out of captured V-2s and moved Wernher von Braun along with 130 other German scientists and engineers to the Army’s Redstone Arsenal in Huntsville, Alabama. There, they began work on what would become the Redstone rocket.

On the other side of the world, the Russians were feverishly conducting their own secret research. The coveted prize was a rocket that could fly from one side of the world to the other—an intercon-

craft’s thermal control system, the experiment opened the way for human space flight and provided some of the first information on how living organisms responded to the experience.

In the wake of the Vanguard disaster, von Braun and his team got permission to prepare their Redstone rocket for a satellite launch. Renamed Jupiter C, it fired the first American satellite into space in January 1958. Explorer I carried more sophisticated instruments than Sputnik’s, and detected the Van Allen radiation belts surrounding the earth, a major discovery at the time.

Pasadena, California’s Jet Propulsion Laboratory designed critical components for Explorer I. An important research center during the war years, it was soon enlisted in the drive for space supremacy. The lab was a fertile testing ground for emerging technologies such as robotics and communications. The far-flung aeronautics and space industry consisted of a number of similar facilities that would be united under the umbrella of NASA, created by President Eisenhower in 1958.

Leading the Soviet effort was rocket engineer Sergei Korolev, who had spent years in prison after Stalin’s Great Purge of 1938. Released and recruited for the space program, Korolev was a formidable opponent to the minds at NASA. He oversaw the Sputnik launches,

LEFT: REMAINS OF OBSERVATION BUNKER NEAR A ROCKET TEST STAND AT ALABAMA’S MARSHALL SPACE FLIGHT CENTER. ABOVE LEFT: THE HISTORIC REDSTONE ROCKET TEST STAND, WITH INSTRUMENTATION AND CONTROL FACILITY IN THE FOREGROUND. CENTER: PRESIDENT KENNEDY AT CAPE CANAVERAL IN 1962. RIGHT: TESTING A MODEL ROCKET ENGINE.



LEFT NASA, BELOW ADAM BARTOS

THE RUSSIANS SET THE PACE. AS THE DECADE

was instrumental in developing the first Russian ICBMs, and led the Vostok projects—a series of spacecraft that brought the USSR some of its greatest early successes.

Hoping to capitalize on the success of Explorer I, the United States launched its successor in March 1958. The satellite, which carried equipment to detect cosmic rays and micrometeorites, never reached orbit. Less than two weeks later, Vanguard I went up. A satellite whose small size was derided by the Soviets, it nonetheless produced volumes of information. Its data showed that the earth is more oval than spherical and geographers got some of the first hard evidence of continental drift. Vanguard was the litmus test for solar energy cells, which were a stunning success, lasting for seven years. Like many of the era's spacecraft, it unlocked secrets not only of space, but of the ever-evolving technology needed to get there, thus informing subsequent flights.

In May of 1958, the Russians announced that the third Sputnik was now in orbit. Its instruments were testing the upper atmosphere, as the first Sputnik had done. The Americans responded in October with Pioneer I, which was intended to reach the moon but failed, nonetheless yielding information about the near-Earth atmosphere before coming down over the South Pacific.

FOR BOTH SIDES, PROGRESS IN SPACE CONTINUED A STEP AT A TIME. THE Russians set the pace. As the decade turned, they reeled off a series of firsts: the first rocket to clear earth's orbit; the first satellite to circle the sun; the first craft on the moon. While the Americans played catch-up, the Soviets managed to photograph the far side of the lunar surface—and then, in April 1961, put a man in space. The following day, the House Committee on Space grilled an uncomfortable NASA administrator, asking if they could expect to see cosmonauts celebrating the 50th anniversary of the Russian Revolution from the surface of the moon in 1967.

With their dependable new Vostok rocket, which would serve them well into the 1980s, the Soviets achieved the first two-spacecraft flight and the first long duration mission. They also sent the first woman—Valentina Tereshkova—into space.

The Americans realized that Russian guidance systems could put a nuclear warhead on a faraway target. The undercurrent of anxiety that ran through the 1950s had now, by the early '60s, become open

ABOVE: COSMONAUT YURI GAGARIN, THE FIRST MAN IN SPACE, PRIOR TO THE HISTORIC LAUNCH, APRIL 1961. RIGHT: SOYUZ ROCKET POISED FOR TAKEOFF AT A ONCE-SECRET COSMODROME, IN KOSMOS: A PORTRAIT OF THE RUSSIAN SPACE AGE.



TURNED, THEY REELED OFF A SERIES OF FIRSTS:

THE FIRST ROCKET TO CLEAR EARTH'S ORBIT; THE FIRST SATELLITE TO CIRCLE THE SUN; THE FIRST CRAFT ON THE MOON. WHILE THE AMERICANS PLAYED CATCH-UP, THE SOVIETS MANAGED TO PHOTOGRAPH THE FAR SIDE OF THE LUNAR SURFACE— AND THEN, IN APRIL 1961, PUT A MAN IN SPACE.



THE STORY OF SPACE FLIGHT—AND ITS PARALLEL NARRATIVE,



fear, fed by the Cuban Missile Crisis and the failed Bay of Pigs invasion. President Kennedy vowed to put a man on the moon by the end of the decade.

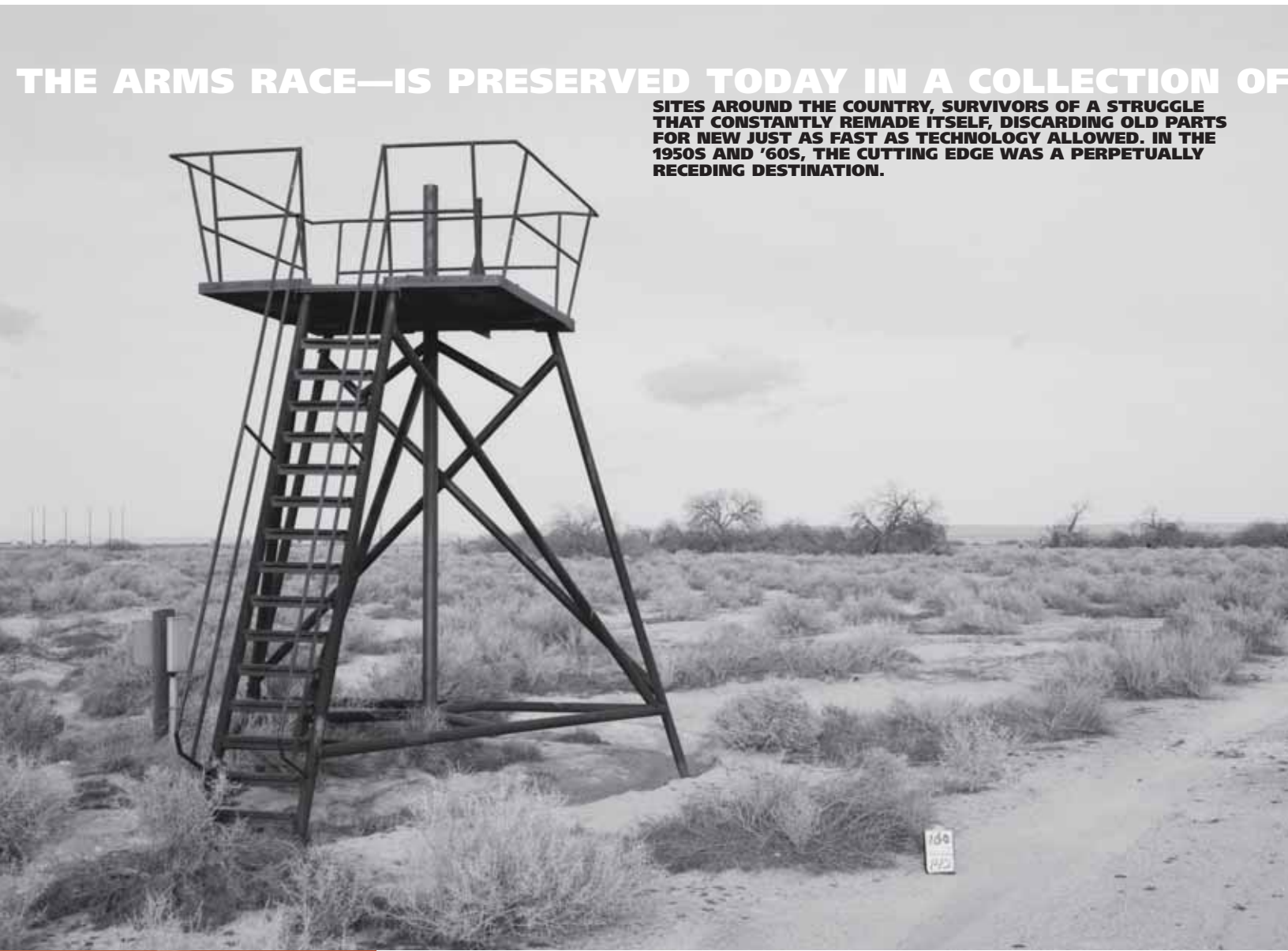
THE IDEOLOGICAL AND POLITICAL WAR FOUND DRAMATIC EXPRESSION IN the flaming launch footage of iconic spacecraft, the most visible aspects of the race to the moon. Always a step behind, the United States forged on. The nation thrilled to the daredevil exploits of the Mercury astronauts. In 1961, Alan B. Shepard, Jr., became the first American in space. The following year, John Glenn orbited the earth three times, part of NASA's Mercury program, which was, in broad terms, a run-up to an eventual moon launch. It was the golden age of the American space program. Astronauts were household names,

their splashdowns watched on television like sporting events. The facilities that supported the missions were places like Cape Canaveral, where launch pads and the original mission control room are part of a national historic landmark. There is also Houston's Space Environment Simulation Laboratory, still in use, and the Rendezvous Docking Simulator, a relic that hangs from the ceiling of a giant hangar at NASA's Langley Research Center in Virginia. Both are landmarks as well.

While manned space flight was getting all the press, Sputnik's legacy grew. Both sides continued to fire satellites into the heavens, and their capabilities multiplied. The impact on meteorology, communications, and earth science would be far-reaching, not to mention

THE ARMS RACE—IS PRESERVED TODAY IN A COLLECTION OF

SITES AROUND THE COUNTRY, SURVIVORS OF A STRUGGLE THAT CONSTANTLY REMADE ITSELF, DISCARDING OLD PARTS FOR NEW JUST AS FAST AS TECHNOLOGY ALLOWED. IN THE 1950S AND '60S, THE CUTTING EDGE WAS A PERPETUALLY RECEDING DESTINATION.



ABOVE DAVID DE VRIES/NPS/HAER, LEFT NASA



LEFT ABOVE: WHAT'S LEFT OF AN OBSERVATION BUNKER AT CALIFORNIA'S EDWARDS AIR FORCE BASE, WHERE ROCKET PROPULSION WAS TESTED ON RAILS IN THE DESERT. ABOVE: ABANDONED CAMERA TOWER USED FOR RECORDING EARLY ROCKET PERFORMANCE. LEFT: NASA SCIENTIST.

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BELOW: LIKENESSES OF SPACE PIONEERS SERGEI KOROLEV AND KONSTANTIN TSIOLKOVSKY ADORN THE WALLS OF A RUSSIAN SCIENTIFIC RESEARCH INSTITUTE, IN *KOSMOS: A PORTRAIT OF THE RUSSIAN SPACE AGE*. **RIGHT:** TOYS ON A MOSCOW DEPARTMENT STORE SHELF IN 1967.

BELOW ADAM BARTOS, RIGHT BETTMANN/CORBIS



SPUTNIK'S LEGACY GREW.



what the far-away devices meant for the future of surveillance, a field both East and West pursued fervently. There were revolutionary developments in miniaturization, microprocessing, robotics, and solar power. Says NASA's Steven Dick, "We take for granted global weather forecasts, GPS navigation, and instantaneous communication, none of which were possible before. Instruments such as the Hubble Space Telescope allow us to see our place in the scheme of 13.7 billion years of cosmic evolution."

The Pioneer Deep Space Station, a collection of low buildings and giant satellite dishes in the California desert, earned landmark status for its early role in tracking unmanned vehicles in the far reaches of space. The Spacecraft Magnetic Test Facility, a national historic landmark at Maryland's Goddard Space Flight Center, was critical to measuring the effect of magnetism on a craft's movement in space. It is the only site of its kind in the United States.

Introducing space age relics to the nation's inventory of historic sites was a frontier in itself. All are under the jurisdiction of NASA, the Air Force, or the Army, whose primary missions are not preservation. While some are open to tours, others are not for reasons of security, safety, and, in some cases, because they are still in use. The National Park Service has tapped some of the potential with its Teaching With Historic Places lesson plans for teachers.

WHILE THE AMERICANS WERE ASCENDING, THE RUSSIAN ECLIPSE HAD BEGUN.

The Soviet run of "firsts" was done largely at the behest of Nikita Khrushchev, who, says Butowsky, "wanted to show the superiority not only of Soviet science but of the Soviet system." When the Americans were mounting the Gemini missions in the first half of the '60s, the Russians could have been aiming at the moon. Instead, Khrushchev was bent on one-upping the other side. Russia used up money and resources that could have been spent on more far-sighted work.

DRIVEN BY FEAR

BY SERGEI KHRUSHCHEV

In February 1956, my father, Nikita Khrushchev, visited the head Soviet rocket engineer, Sergei Korolev, because he wanted to see the miracles he had been hearing about. I was a student in technical school and was there when Korolev showed us the R-7, the new missile that could reach American territory. Then he showed my father the satellite. Korolev told him that he believed he could send it into an orbit around the earth.

Much of the driving force behind Sputnik was fear. In the Soviet Union, we were surrounded by American bases. We lived under pressure. At that time there was an ongoing discussion in the U.S. Congress over how many Soviet cities they would have to bomb in order to preserve democracy. Fear was part of our times.

The International Geophysical Committee was due to meet in October 1957, and Korolev was determined by that time to announce the launch of a satellite. He pushed his people both day and night. They switched to a smaller model than the one they showed my father: a sphere with four antennae and two transmitters. They published in radio magazines the frequencies on which its signals could be heard, but nobody paid attention.

When they launched Sputnik, I was with my father when they came to tell him. He smiled and was very happy. He told them all how famous they were going to be. But we really didn't understand the magnitude of the event. We had launched the first nuclear electric power station in 1954, so it just seemed like one more achievement. It was 50 lines in the newspaper on October 5. In the United States it made headlines. It wasn't until October 6 that it was front-page news in the Soviet Union.

My father once tried to frighten the Americans by saying, "We are producing missiles like sausages." I asked him, "Why are you saying this? It's not true." And he responded that if the Americans knew how weak we were, they would attack us. In the early '60s, Kennedy vowed that the Americans would land on the moon. At one point, he proposed to my father, "Let's go together," and he rejected this, but he did so out of fear. Later, Kennedy brought it up again, and my father liked the idea because he believed it would improve our chances for peace. But fate was different. President Kennedy was assassinated and my father was forced out of power. But I think that if they had both remained, we might have gone to the moon together in 1969 and it might have been the end of the Cold War.

Adapted from a speech at Northern Virginia Community College, October 2007.



THE LAUNCH PADS, HARDWARE, SIMULATORS,

ABOVE: THE RIGHT STUFF. TEST PILOTS POSE WITH EXPERIMENTAL X-15 ROCKET PLANE IN 1962. ABOVE RIGHT: JOHN GLENN, THE FIRST AMERICAN TO ORBIT THE EARTH.

Khrushchev fell from power in 1964, and the next year, Sergei Korolev, head of the Soviet space program, died. In 1966, Russia's Luna 9 became the first craft to "soft land" on the moon. Luna 10 became the first to enter lunar orbit. The Russians continued to achieve the remarkable, but the tide had turned.

Wernher von Braun, now director of NASA's Marshall Space Flight Center in Huntsville, Alabama, was well into designing a rocket that would carry astronauts to the moon. Saturn V became a legend unto itself. The 36-story behemoth produced nine million pounds of thrust, enough to push a 150-ton payload to the moon. From William Walter's *Space Age*: "Its bottom stage was so enormous it had to be shipped to Cape Canaveral by barge—no other form of transportation could handle it. To prevent rain clouds from forming above the roof of the building in which it was assembled, engineers had to design a special air-conditioning system." There has never been anything quite like the Saturn V. No other launch vehicle has surpassed it in size or power. Its five engines caused tremors 50 miles away.

There are three surviving Saturn Vs on display. One is at the U.S. Space and Rocket Center, a museum at the Redstone Arsenal not far from the Marshall Space Flight Center. The museum is the brainchild of von Braun himself. A project to preserve the rocket won a \$700,000 Save America's Treasures grant from the National Park Service. An exhibit space was literally built around it, with glass walls on one side so it's visible from nearby Interstate 565. Plans are for an opening in January.

The Saturn V carried Michael Collins, Neil Armstrong, and Buzz Aldrin to the moon in the summer of 1969, an event that announced an end to the space race. The Soviets, while far along, could not build a rocket to do the job. The Americans launched the Saturn V 13 times between 1967 and 1973 in increasingly ambitious missions to the moon. Russian engineers, meanwhile, watched repeated failures of their putative moon rocket—the N1—before scrapping it altogether.

WHILE AMERICA WENT ON TO BECOME THE UNDISPUTED LEADER IN SPACE, RUSSIA SOLDIERED ON, concentrating on its space station, Salyut, and probes to Venus and Mars. NASA sent six missions to the moon. The final flight, Apollo 17, docked with a Soviet Soyuz spacecraft in 1975, a largely symbolic event intended to ease relations. But space exploration was no longer a priority. The United States was preoccupied with Vietnam and social unrest. Each lunar landing generated less interest.

Yet unmanned exploration flourished. Robotic spacecraft landed on Mars and orbited Venus, Jupiter, and Saturn. "The most spectacular part of space," says Butowsky, "is the unmanned program. You have these spacecraft that are 10 billion miles away from Earth and they're still returning useful information. They're at the edge of the solar system."

The legacy of the space race would be difficult to measure, so profound was its impact. The drama of those years, ringing with the language of Armageddon and charged with a nationalism approaching religious zeal, was fitting for an epic time. The launch pads, hardware, simulators, and testing sites remain largely out of sight now, abstract forms whose purpose seems inscrutable. They lack the expressive impact of a cliff dwelling or a Victorian hotel, but speak the language of another kind of history, of a time when faraway space came right into our living rooms. A history of the future, introduced by an unprepossessing object that floated among the stars 50 years ago.

The Man in Space NHL theme study is at www.nps.gov/history/history/online_books/butowsky4; the Teaching with Historic Places lesson plan, "America's Space Program: Exploring a New Frontier," is at www.nps.gov/history/nr/twhp/wwwlps/lessons/101space/101space.htm.



BELOW: ABANDONED OBSERVATION BUNKER AT TEST AREA 1-120, EDWARDS AIR FORCE BASE, WHERE TECHNICIANS TESTED SOME OF THE MOST DRAMATIC DEVELOPMENTS IN THE RACE TO THE MOON.

AND TESTING SITES REMAIN LARGELY OUT OF SIGHT NOW,
ABSTRACT FORMS WHOSE PURPOSE SEEMS INSCRUTABLE. THEY LACK THE EXPRESSIVE IMPACT OF A CLIFF DWELLING OR A VICTORIAN HOTEL, BUT SPEAK THE LANGUAGE OF ANOTHER KIND OF HISTORY, OF A TIME WHEN FARAWAY SPACE CAME RIGHT INTO OUR LIVING ROOMS.

