Virginia Aviation History Project

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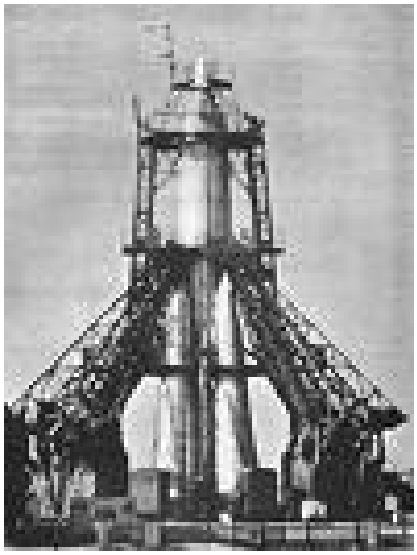
Sputnik Turns 50

by Linda Burdette

October 4, 2007, is the fiftieth anniversary of the launch of the Sputnik satellite by the USSR. Sputnik lifted off from Soviet Central Asia at 10:26 p.m. Moscow time on Friday, October 4, 1957.

It will no doubt be celebrated in today's Russia as a landmark achievement, but it also deserves mention and study here in the United States. For Sputnik created a furor in the U.S. that had far-reaching implications for aeronautics, federal aviation programs, and the Commonwealth of Virginia. Author Roger Launius described it very accurately when he said "the launch of *Sputnik 1* had a "Pearl Harbor" effect on American public opinion. It was a shock, introducing the average citizen to the space age in a crisis setting. The event created an illusion of a technological gap and provided the impetus for increased spending for aerospace endeavors, technical and scientific educational programs, and the chartering of new federal agencies to manage air and space research and development."



To fully understand the impact of Sputnik, we must first understand the political climate in which it arose. Work on U.S. satellites took various forms in the 1950s. Civilian interest centered on launching science satellites and military interest on reconnaissance satellites. In the U.S. a geophysicist, Dr. Lloyd Berkner, suggested that the community develop an international program of global geophysical research. This suggestion resulted in the 18-month International Geophysical Year (IGY) which lasted from July 1957 to December 1958. Dr. Berkner became the coordinator for IGY rocket and satellite plans.

However the competition between the scientists and their countries, especially countries of such differing ideologies, could not be denied. The U.S. sponsored an initiative prompting the international ruling body of the IGY to call for science satellite launches during the IGY. The

resolution was adopted in Rome on October 4, 1954, and even though unintended, this resolution was the impetus for the space race.

Immediately both the U.S. and the USSR began plans for launching a satellite. On April 16, 1955, the USSR created the first organization within the Soviet Academy of Sciences devoted to spaceflight. Meanwhile, on May 26 the U.S. National Security Council formally approved U.S. government participation in a science satellite project as long as it did not interfere with high-priority missile programs. On July 29, Eisenhower's office made the formal announcement that the U.S. would launch a science satellite during the IGY.

Without realizing it, that announcement began the space race. When news of the announcement reached the Soviet Union, that government announced that "the realization of the [Soviet] satellite project can be expected in the near future."

What the U.S. didn't know was that the Soviets were already developing their missile. On May 20, 1954, the Soviet government had ordered Sergei Pavlovich Korolev's design bureau, OKB-1, to develop the first Soviet intercontinental ballistic missile (ICBM), the R-7 which they planned to use as a satellite launcher.

Interestingly enough, Korolev had the same hurdle that the Americans did – the missile men objected that the satellite effort would interfere with ballistic missile development. The two countries approached this problem differently and so changed the course of history. In the USSR, Korolev convinced Soviet Premier Nikita Krushchev that since the R-7 ICBM was well along in development, progress on the satellite launch would go quickly and could be done without impact on the ballistic missile program. The U.S. elected to build an entirely new rocket for its satellite effort.

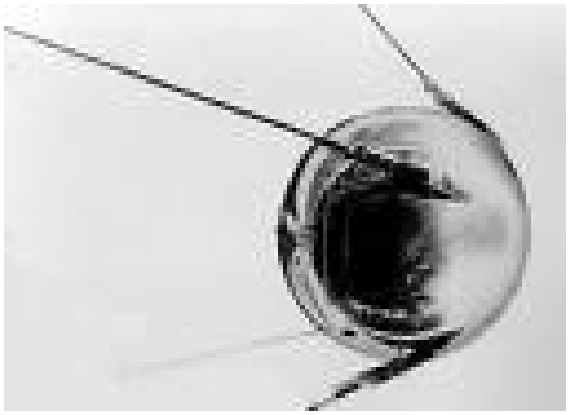
Part of the issue with the U.S. effort was the disjointed nature of the development programs. Three programs were vying for funding: the Air Force "World Series" plan, which envisioned launching a satellite weighing about 2500 kilograms (about 5000 pounds) on an Atlas missile with an upper stage; the Army's Project Orbiter, which proposed to launch a 5-pound, poorly instrumented satellite on a Redstone missile with a Loki upper stage; and the Naval Research Laboratory's Project Vanguard, which had an impressive suite of science instruments but which required development of a new rocket based partly on the Viking sounding rocket. The Air Force plan, which included both an existing booster and a competent array of scientific equipment, was eliminated because it might interfere with missile development. There was some talk of combining the Army's existing missile with the Navy's satellite, but this idea was rejected because of interservice rivalry. The Navy plan was eventually chosen and the U.S. accepted the delay inherent in developing the new missile.

The Vanguard program was officially started on September 9, 1955, with a plan to build six vehicles. Of these, one was expected to reach orbit. The program had a budget of $20 million and an 18-month timetable leading to first orbital launch. In the USSR, the Sputnik program began officially on February 25, 1956, with satellite assembly beginning on March 5, and launch targeted for the spring of 1957.

Both programs suffered from technical difficulties and shortage of funding. Korolev drove himself and his staff mercilessly when he received reports of American successes in testing the Vanguard missile. These reports were erroneous; Vanguard was experiencing major problems. Between September 1955 and April 1957, the program's cost shot up from $20 million to $110 million. On May 3, 1957, the Bureau of the Budget sent an urgent memorandum on the overruns to President Eisenhower. The Vanguard program had just completed a successful second Vanguard test launch, but Eisenhower kept the discussion focused on Vanguard's escalating cost. Eisenhower grudgingly admitted that the U.S. had little choice but to continue the costly program because it had publicly announced that it would launch a satellite, but he insisted that the total cost be held to $110 million. While the USSR was clearly focused on being the first in space, the Americans involved in the discussions revealed no hint of urgency in that regard.

Korolev continued his work and by September 1957 had conducted two successful tests of the R-7 rocket. He still apparently believed that the U.S. development was imminent because he was worried that the U.S. might launch its satellite during the September 30-October 5 IGY Rockets and Satellites Conference in Washington. So he scheduled the Sputnik launch on October 4. The R-7 rocket modified for launching the Sputnik was placed on the pad on October 3 and the rocket lifted off the following evening. Six minutes after liftoff Sputnik ejected from its expended carrier rocket and at 1:22 a.m. the next morning, Radio Moscow announced that the Earth had a new Soviet-made moon. By then Sputnik had twice passed unnoticed over the United States, where it was then mid-afternoon on October 4.

In hindsight, *Sputnik 1* itself was not such a spectacular satellite and world reaction was probably overwrought. An aluminum 22-inch sphere with four spring-loaded whip antennae trailing, it weighed only 184 pounds and traveled an elliptical orbit that took it around the Earth every 96 minutes. It carried a small radio beacon that beeped at regular intervals and could by means of telemetry verify exact locations on the earth's surface. Some U.S. cold warriors suggested that this was a way for the Soviets to obtain targeting information for their ballistic missiles, but that does not seem to have actually been the case. The satellite itself fell from orbit three months after launch on 4 January 1958.



But world reaction was swift and emotional. The aerospace industry magazine *Aviation Week* reported that the 8th International Astronautical Congress in Barcelona became an impromptu international forum for "much animated informal discussion about what the U.S. could do to recoup some of its scientific prestige. Manned space flight or hitting the moon were the two most common suggestions, but even those were tinged with doubt that there still existed an American lead in these categories." The magazine quoted an unnamed U.S. military official at the Congress as saying "if it weighs 18 pounds they're ahead of us - if it weighs 180 pounds, I'm scared!" An unnamed European delegate, the magazine also reported, pointed to the 23 U.S. and five Soviet papers at the Congress and pointedly concluded that "Americans talk about [spaceflight] and the Russians do it."

Not only had the Soviets been first in orbit, but *Sputnik 1* weighed nearly 200 pounds, compared to the intended 3.5 pounds for the first satellite to be launched in Project Vanguard. In the Cold War environment of the late 1950s, this disparity created even more angst.

However, the Eisenhower Administration grossly miscalculated the public's alarm. On October 9, Eisenhower faced the press for the first time since the launch. Seeking to calm Congress and the public, he assured reporters that Sputnik contained "no additional threat to the United States," adding that "from what [the Soviets] say, they have put one small ball in the air." But the political damage had been done, especially when his comments were placed beside the alarmist statements emanating from Congress. Typical of these were comments by Democratic Senator Richard Russell of Georgia, chair of the Armed Services Committee: "We now know beyond a doubt that the Russians have the ultimate weapon - a long-range missile capable of delivering atomic and hydrogen explosives across continents and oceans. . ."

But Eisenhower had not been completely idle. On October 8 he had asked outgoing Secretary of Defense Charles Wilson to order the Army Ballistic Missile Agency (ABMA) at Redstone Arsenal, Huntsville, Alabama, to ready a Jupiter-C rocket to launch a satellite. Project Vanguard transferred a science instrument - James Van Allen's radiation detector - from one of the later planned Vanguard satellites to the ABMA effort (thus

effectively putting into place one of the plans considered, but rejected, earlier to put a Navy satellite on an Army missile.)

However the American problems just got worse. On November 3, 1957, Korolev's team launched Sputnik 2. The satellite, which weighed 1,120 pounds and stayed in orbit for almost 200 days, was a hastily prepared combination of the PS-2 satellite and a life support capsule. On board was a canine passenger named Laika. The Russians had proven that they could successfully send living beings into space. (For years, Russia did not admit that Laika died from stress and overheating within five hours of the launch, although they did admit that they had no plans to bring the dog back to earth alive.)

For the next year, the normal investigations and recriminations sounded from Washington. One Congressional aide, George E. Reedy, summarized the feelings of many Americans: "the simple fact is that we can no longer consider the Russians to be behind us in technology. It took them four years to catch up to our atomic bomb and nine months to catch up to our hydrogen bomb. Now we are trying to catch up to their satellite."

Faced with numerous demands to reorganize the U.S. space program, Eisenhower asked his science advisor to convene the President's Science Advisory Committee (PSAC) to come up with a plan for a new space flight organization. Quietly considering the creation of a new civil space agency for several months, PSAC worked with staff members from Congress and came forward with a proposal that placed all non-military efforts relative to space exploration under a strengthened and renamed National Advisory Committee for Aeronautics (NACA).

Established in 1915, NACA's mission was "to supervise and direct the scientific study of the problems of flight with a view to their practical solution." This meant that the NACA was to treat aeronautics not so much as a scientific discipline, but as an area for engineering research and development. In practice this turned out to mean that the NACA would perform basic research that provided "practical solutions" to serious problems facing the aircraft industry and the military air services. NACA had since become a small, loosely-organized, and elitist organization known for both its technological competence and its apolitical culture. It had also been moving into space-related areas of research and engineering during the 1950s, through the work of a Space Task Group under the leadership of Robert L. Gilruth. While totally a civilian agency, the NACA also enjoyed a close working relationship with the military services, helping to solve research problems associated with aeronautics and also finding application for them in the civilian sector. Its civilian character; its recognized excellence in technical activities; and its quiet, research-focused image all made it an attractive choice. It could fill the requirements of the job without exacerbating Cold War tensions with the Soviet Union.

NACA's reputation was well earned. After World War II, new aerodynamic and control problems had to be solved as the demand for military aircraft to perform at greater speeds and higher altitudes increased. By 1957 the X-15, one of a series of rocket-propelled piloted aircraft, was on the drawing boards. It was intended to be capable of exceeding Mach 6 (six times the speed of sound) and of climbing beyond 107,000 meters (67 miles) - above nearly all the sensible atmosphere. NACA was, in fact, approaching the conditions of space flight by extension of the operational limits of manned aircraft. Other NACA engineers were working on other space-related problems. At Langley's Pilotless Aircraft Research Division in Virginia, aerodynamicists were acquiring important data on aerodynamic heating at speeds of Mach 10, unattainable in the wind tunnels of the time, by flying models of aircraft and missiles mounted on rockets. When *Sputnik* went up, many of these engineers were already talking about the problems of putting humans in an earth-orbiting spacecraft.

In a speech to a joint session of Congress on April 2, Eisenhower called for a NACA-based civilian National Aeronautics and Space Agency (NASA) The President also handed down a directive ordering NACA and the Defense Department to begin arranging transfer of non-military Department of Defense space assets to NACA. NASA was formed on 1 October 1958, less than a year after the launch of *Sputnik 1*.

At its inception, NASA consisted mainly of the four laboratories and some 8,000 employees from NACA. Within a few months NASA acquired the Vanguard satellite project, along with its 150 researchers from the Naval Research Laboratory; plans and funding for several space and planetary probes from the Army and the Air Force; and the services of the Jet Propulsion Laboratory (JPL) outside Pasadena, California, where scientists were planning an unmanned spacecraft (Ranger) that would take close-up television pictures of the lunar surface before crashing into the moon.

Of course, the rest is history, and NASA reinstated U.S. prestige and technological skill by reaching the moon in July 1969. So what was Sputnik's impact on the Commonwealth of Virginia? Well among the NACA installations transferred to NASA were Langley Aeronautical Laboratory, Langley Field, Va., and its subsidiary Pilotless Aircraft Research Station at Wallops Island, Va. Both of these installations had long and distinguished histories before joining NASA, but also experienced growth and expanded missions under the space program.

Langley Research Center

Although established in 1915, NACA did not have operational laboratory facilities until 1920, when Langley came on line with its first primitive wind tunnel. Construction of Langley Field actually began in 1917, but the chaos of mobilizing for war in Europe delayed completion of the NACA's facilities for three years. By the end of the 1920s Langley was generally acknowledged to be the world's premier aeronautical research establishment.

In the early 1960s as part of NASA Langley helped give birth to the space age. Project Mercury, the nation's inaugural man-in-space program, was conceived and managed initially from Langley. Spear-heading this effort was the Center's Space Task Group, a special force of NASA employees that later expanded and moved on to become the Manned Spacecraft Center (now Johnson Space Center) in Houston. Before their move to Texas, however, they led the original seven astronauts (Shepard, Grissom, Glenn, Carpenter, Slayton, Schirra, and Gordon) through the initial phases of their spaceflight training at Langley.

The Lunar Landing Research Facility came into operation at the center in July 1965. Designed to test the Apollo Lunar Lander and to train Apollo astronauts, the huge structure (250 ft high and 400 ft long) would be used to explore techniques and to forecast various problems of landing on the moon and enabled a test vehicle to be operated under one-sixth g conditions.

Wallops Island

Established in 1945 by NACA, Wallops is one of the oldest launch sites in the world. Its support of scientific research and orbital and suborbital payloads places it at the center of NASA's space and Earth sciences.

Since 1945, Wallops Flight Facility has launched more than 15,000 rockets from Wallops Island for science studies, technology development, and as targets for the U.S. military. The first test rocket was launched on June 27, 1945. The first research rocket, a Tiamat, was launched several days later on July 4.

The mission of the Pilotless Aircraft Research Station at Wallops included studying airplane designs at supersonic flight and gathering information on flight at hypersonic speeds. These tests included aircraft and missile designs from a variety of organizations and corporations including Douglas, McDonnell, Boeing, North American, Lockheed, and Grumman.

With the establishment of NASA in 1958, Wallops' role in the new space agency expanded and it played a key role in the development of the Mercury space capsule, the first step in the U.S. human space program. The basic design of the capsule and the escape system were tested at Wallops. The development of the SCOUT rocket was conducted at Wallops and the facility saw its first launch of a satellite into Earth orbit in 1964. In addition, Wallops supported other aspects of the space program including Project Mercury, Project Gemini, Project Apollo, and the Space Shuttle missions.