Introduction

The National Aeronautics and Space Act of 1958 declared "it is the policy of the United States that activities in space should be devoted to peaceful purposes for the benefit of all mankind . . . [and that] the general welfare and security of the United States require that adequate provision be made for aeronautical and space activities."

NASA—the National Aeronautics and Space Administration created in the wake of the Space Act—has and continues to accomplish those precepts every day. With many hundreds of satellites launched into space and close to 200 human spaceflights, NASA is a proven leader in space exploration.

However, to fully understand NASA's emergence and partnership with space programs throughout the world, we must first explore the environment into which NASA was created.

PRE-NASA SPACE EXPLORATION

World War II provided the impetus for not just new inventions but also for innovative modes of production that virtually guaranteed mass deliveries. By the end of World War II, the aircraft business had become the single largest industry in the world, much of it in the United States. In 1939, fewer than 6,000 planes had been produced; by the time of the attack on Pearl Harbor, on December 7, 1941, more than 25,000 had been manufactured, and in the few short years from then until the end of the war in 1945, another 275,000 were built. This was also the beginning of California's rise to industrial power, as 44 percent of the aviation industry was centered there. Aviation industry meant not just planes but also development of newer instruments, more responsive controls, and modern techniques.

In 1947, the United States modified V-2 rockets that had been captured from Nazi Germany and sent the first animals—fruit flies—into suborbital space. Suborbital flights are those where the vehicle crosses the Kármán line (62 miles, 100 km above sea level). Because the vehicles' speeds didn't reach orbital velocity, however, those initial spacecraft fell to Earth before completing a full orbit. To stay in orbit, a vehicle needs a speed of around 18,000 miles per hour when it reaches the Kármán line, and initial rockets didn't carry enough fuel to reach such levels.

The National Advisory Committee for Aeronautics (NACA), which had been founded in 1915 before U.S. participation in World War I, began experimenting with "rocket planes" such as the supersonic Bell X-1 in the mid-1940s. Other countries were experimenting with their own versions of rockets. When the International Geophysical Year (1957–1958) was declared, international competition stretched to 67 countries in fields of study ranging from aurora at the poles to meteorology, and gravity to solar activity. The capstone, however, and the match that lit the US/USSR space race, was the USSR's launch of the world's first artificial satellite, *Sputnik 1*, on October 4, 1957.

Concerned over possible threats to national security and with national pride at stake, the U.S. Congress proposed immediate action. After consultation with President Eisenhower, a new federal agency—NASA—was proposed to conduct nonmilitary operations in space. Military operations were to be retained by the appropriate Department of Defense organizations, in close cooperation with the newly created Advanced Research Projects Agency (ARPA), which began operations in February 1958 to develop space technology for military applications.

Five months later, on July 29, 1958, President Eisenhower signed the National Aeronautics and Space Act into being, creating NASA, which began operations on October 1, 1958. To consolidate departments and work within the limited budget, NACA was absorbed into NASA. In many ways, it was simply a change of name; in others, it was a deeper purpose, a change of mind-set. All NACA employees, including its three research laboratories (Langley Aeronautical, Ames Aeronautical, and Lewis Flight Propulsion), the High-Speed Flight Research Facility, and Wallops Flight Facility, became key parts of NASA, as did other smaller institutions.

EARLY DAYS OF NASA

Coming out of World War II and the Korean War, the United States was in far better shape than most of the world. The only substantial attack on its shores had been in 1941, more than 15 years earlier by the time NASA was founded. There was no limit to the belief in American ingenuity, no bounds to hopes for the future. Project Vanguard, an International Geophysical Year project led by the Naval Research Laboratory intended to launch a satellite in 1955 and 1956, was popular. The U.S. Army's Redstone ballistic missile launch system provided backup to national goals of space exploration.

Sputnik 1, a 184-lb., battery-operated satellite that fell to Earth some three months after it achieved orbit in 1957, shattered the illusion of American superiority. The United States sent *Explorer 1* into space three months after

Sputnik 1, but second place did not sit well with Americans. Disappointment happened again on April 12, 1961, when the Soviet Union sent Yuri Gagarin into space, the first man to orbit the Earth. Alan Shepard followed a month later. The national mood with regard to space became grim and fearful, afraid of a second-place finish.

President John F. Kennedy changed that with his speech before a joint session of Congress on May 25, 1961, less than a month after Shepard's flight, and again on September 12, 1962, in a speech at Rice University: "This generation does not intend to founder in the backwash of the coming age of space. We mean to be a part of it . . . we mean to lead it." "Americans are leaders" was the sentiment of the time, "and leaders lead." Sending a man to the moon would surely regain our rightful spot at the top.

NASA's first administrator was T. Keith Glennan, who had immediate supervision of the National Advisory Committee for Aeronautics—its 8,000 employees, its research laboratories and two other facilities, and its annual budget of almost $100 million.

The Space Act's section 102 set the following eight goals for NASA:

1. The expansion of human knowledge of phenomena in the atmosphere and space;
2. The improvement of the usefulness, performance, speed, safety, and efficiency of aeronautical and space vehicles;
3. The development and operation of vehicles capable of carrying instruments, equipment, supplies, and living organisms through space;
4. The establishment of long-range studies of the potential benefits to be gained from the opportunities for, and the problems involved in the utilization of aeronautical and space activities for peaceful and scientific purposes;
5. The preservation of the role of the United States as a leader in aeronautical and space science and technology and in the application thereof to the conduct of peaceful activities within and outside the atmosphere;
6. The making available to agencies directly concerned with national defense of discoveries that have military value or significance, and the furnishing by such agencies, to the civilian agency established to direct and control nonmilitary aeronautical and space activities, of information as to discoveries which have value or significance to that agency;
7. Cooperation by the United States with other nations and groups of nations in work done pursuant to this act and in the peaceful application of the results thereof; and
8. The most effective utilization of the scientific and engineering resources of the United States, with close cooperation among all interested agencies of the United States in order to avoid unnecessary duplication of effort, facilities, and equipment.

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