Dawn of the spaceplane

Though it never flew, X-20 Dyna-Soar helped pioneer the way for the Space Shuttle

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Ironically, it was only two months after the surprise Oct. 4, 1957, launch of Russia's Sputnik into Earth orbit that the concept of a U.S. manned spaceplane was born.

In December of that year, the U.S. Air Force invited proposals from the aerospace industry to design a reusable military spaceplane. At the time, many in the United States believed the country trailed far behind the Russians in science and technology. Yet by the mid-1960s, a U.S. shuttle-type spacecraft could have been a reality.

On June 16, 1958, Boeing and the Martin Co. were selected to compete for the spaceplane, now designated the Dyna-Soar, for Dynamic-Soaring. Boeing would build the manned space glider and Martin would provide the booster rocket. The winners were chosen from proposals submitted by competing Bell, Convair, Douglas, Lockheed, McDonnell and Republic.

Initially, the goal of the Dyna-Soar program was to fly a sub-orbital vehicle. After review by then–Secretary of the Air Force Eugene Zuckert, the program was revamped, and on Nov. 9, 1959, a new contract was signed to develop Dyna-Soar for orbital missions. As a result, the booster would be upgraded from a Titan I rocket to the newly developed Titan III, which was capable of placing 20,000 pounds (9,000 kilograms) into low earth orbit (150 miles, or 240 kilometers), or approximately 13,900 pounds (6,300 kilograms) into a 1,000-mile (1,600-kilometer) orbit.

As envisioned, the first manned flight was to take place in August 1965 once a series of unmanned orbital flight tests were successfully completed. Dyna-Soar would be launched into orbit from Cape Canaveral, Fla., re-enter, and would glide to a landing on the dry lakebed at Edwards Air Force Base, Calif. The Air Force Dyna-Soar development budget for fiscal year 1960 was allocated at $16.2 million.

"The choice of flight paths available to the Dyna-Soar pilot will be almost infinite," George Stoner, Boeing Dyna-Soar program manager, said in a statement on Sept. 22, 1960. "By combining

the high speed and extreme altitude of his craft with his ability to maneuver, he will be able to pick any airfield between Point Barrow, Alaska, and San Diego, Calif., with equal ease."

The single-crewmember space glider was to be constructed of several new exotic alloys, including Rene 41 "super alloy," molybdenum and columbium. The blunt delta-wing vehicle would have a length of 35.4 feet (10.8 meters), a span of 20.8 feet (6.3 meters), vertical fin height of 8.6 feet (2.6 meters), and an empty weight of approximately 10,400 pounds (4,700 kilograms). Landing gear consisted of three skids similar to the North American Aviation X-15 high-speed research vehicle's rear skids.

Air Force Chief of Staff Gen. Curtis LeMay stated on Oct. 26, 1961, "Since space systems are extremely expensive, one of the first tasks of a manned space vehicle would be to repair equipment operating in our unmanned satellites." This far-reaching statement occurred more than 20 years before the Space Shuttle began satellite repair/recovery missions. And it was only three years ago that Boeing developed Orbital Express, an unmanned autonomous satellite that demonstrated on-orbit refurbishing missions.

Dyna-Soar's advantage was to insert flexibility into manned spaceflight, so the pilot could determine the point of initial re-entry into the atmosphere. The wings would provide aerodynamic maneuvering capability (unlike a space capsule), plus a cross-range of approximately 1,200 miles (1,900 kilometers) from the initial direction of flight. In addition, the ability to land at a conventional air base rather than being recovered at sea, such as the Mercury and Gemini space capsules, along with any collected payload, was a priority. Possible military missions included reconnaissance, space weapons, space rescue, satellite maintenance and monitoring of enemy satellites.

On March 15, 1962, four U.S. Air Force test pilots and two NASA pilots were assigned to the Dyna-Soar program. One of the NASA pilots was Neil Armstrong, who later returned to the space agency and would become the first person to walk on the moon.

The Dyna-Soar glider received its official X-20 designation from the U.S. Department of Defense on May 26, 1962. "The Dyna-Soar may be regarded as a logical follow-on to the North American X-15 in the exploration of aerospace," said then–Undersecretary of the Air Force Joseph Chanyk. "This military test system has the capability for manned, maneuverable, hypersonic reentry from orbital altitudes and velocities with a normal landing at conventional airfields."

Boeing built a full-scale engineering mock-up and established the initial tooling for a production line of 10 X-20s at the Missile Production Center in Seattle. Despite excellent government reviews of the program, however, and the military's expressed need for such a system, Defense Secretary Robert McNamara announced on Dec. 10, 1962, that the X-20 Dyna-Soar program was canceled. His rationale was that Dyna-Soar had no viable military mission and, citing the $400 million that had been spent on the project from 1958 through 1963, was too expensive.

At the time of the X-20 cancellation Boeing had 6,475 employees involved in the program and had completed about 40 percent of its program tasks. Subcontractors Honeywell and Radio Corp. of America had completed almost 60 percent of their work. The partially completed X-20 prototype and the full-scale engineering mock-up were scrapped, as well as the production line.

Although the cancellation was unfortunate, what Boeing engineers had accomplished on the X-20 Dyna-Soar program was an impressive technical achievement. It helped chart the course for the more than 120 manned orbital Space Shuttle flights that have taken place since 1981, launching satellites, performing space science experiments and performing more than 30 International Space Station construction flights. ■

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GRAPHICS: (LEFT) This artist's concept shows the X-20 with its orbital insertion stage (trans-stage) attached. **(RIGHT)** An X-20 Dyna-Soar rides into space aboard a modified 98-foot-high (30-meter-high) Titan I rocket. Dyna-Soar originally was to conduct suborbital flights, but that changed to orbital missions using a more powerful Titan III.

Tale of the tape

- Crew: One pilot
- Length: 35 feet 4 inches (10.8 meters)
- Wingspan: 20 feet 10 inches (6.4 meters)
- Height: 8 feet 6 inches (2.6 meters)
- Empty weight: 10,395 pounds (4,715 kilograms)
- Max takeoff weight: 11,387 pounds (5,165 kilograms)
- Powerplant: Orbital insertion rocket engine, 72,000 pounds (320 kilonewtons) of thrust

Performance

- Maximum speed: 17,500 miles per hour (28,000 kilometers per hour)
- Altitude: Low earth orbit 150–300 miles (240–480 kilometers)