

### Foundation of Space Shuttle Program



#### **Project Mercury (1958-1963)**

The Mercury program laid the foundation for manned spaceflight by proving humans could survive and function in space. It offered key insights into launch procedures, orbital operations, and recovery. It also pioneered the capsule design essential for safe atmospheric re-entry, paving the way for future space missions.

#### EXHIBIT PLAN

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- 2. Space Transportation System Key Technologies
- 3. Space Shuttle Enterprise
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- 6 Space Shuttle Atlantis & Columbia Tragic loss
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First day cover of project Mercury cancelled at Cape Canaveral

OMMEMORATING

FIRST SUCCESSFUL ORBITAL FLIGHT

BY AN AMERICAN · FEB. 20, 1962

JOHN H. GLENN, JR.

#### Apollo Program (1961- 1972)

The Apollo program aimed to land humans on the Moon and return them safely, leading to the development of powerful launch systems like the Saturn V.

refined spacecraft design, re-entry techniques, and laid the groundwork for the Apollo Applications Program, which later evolved into Skylab.

Apollo's legacy extended beyond lunar exploration—it served as a testing ground for powerful propulsion, human spaceflight systems, and mission control. This period marked a shift in NASA's vision, transitioning from single-use Saturn V rockets to a reusable spacecraft: The Space Shuttle.



COMMEMORATING FIRST MEN ON THE MOON Heetwood

Commemorative cover of Skylab 1

Skylab Program (1973- 1974)

The first U.S. space station marked a key

step in space exploration by testing long-

duration human habitation. It demonstrated

the use of orbital laboratories, aiding future

Space Shuttle missions. Several manned

and crew transfer.

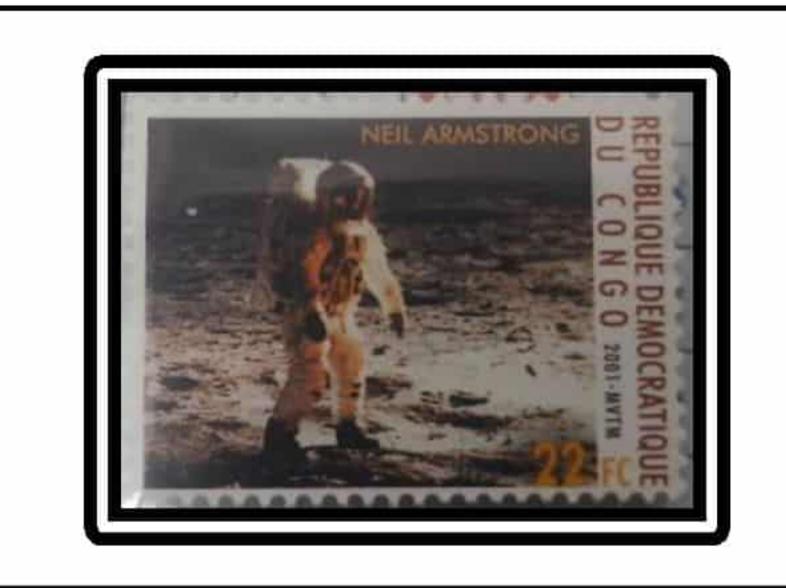
missions used Apollo spacecraft to dock with

the station, showcasing advanced docking

First day cover of Apollo 8

U.S. First Manned

Lunar Orbital Fl



Commemorative Stamp of Apollo 1.

First day cover of Apollo 11

FIRST DAY OF ISSUE

The Apollo program marked mankind's first steps on another world. With the success of Apollo 11 in 1969 and subsequent missions, NASA began contemplating a new era of spaceflight, one that emphasized sustainability, cost-efficiency, and reusability - Space Transportation System

Copernicus North 8¢US 12222222222 NASA LOCAL POST



Space Transportation system (STS) - Key Technologies





X24B PILOT

-CAPT. DICK SCOBEE ALL OBJECTIVES ATTAINED Pilot Checkout

Handling Qualities Evaluation TPS Qualification Test (HRSI)

Commemorative cover of 32<sup>nd</sup> X24B free flight for spaceplane re-entry

Commemorative cover of Enterprise captive inert flight on top of Boeing 747

The X-24B was a modified version of the X-24A, developed by NASA and the U.S. Air Force to test lifting-body concepts for spaceplane re-entry. It featured a sharper, more aerodynamic design for better glide performance. During its 36 free flights from 1973 to 1975, it proved that unpowered, precise landings from space were achievable, influencing the Space Shuttle program.

On February 25, 1977, the Space Shuttle Enterprise completed its first Captive-Inactive flight atop a Boeing 747 Shuttle Carrier Aircraft during the Approach and Landing Tests (ALT). This uncrewed return flight helped evaluate handling qualities and instrumentation, paving the way for later crewed captive and free-flight tests crucial to shuttle development.

At NSTL, key Shuttle engine tests marked major milestones. On July 8, 1977, the first static test firing of the Space Shuttle Main Engine occurred. A full-duration test followed on April 6, 1978. These validated engine reliability, power, and reusability—critical steps toward the success of the Space Shuttle program.

On June 13, 1979, NASA and Thiokol conducted successful solid rocket motor static test, demonstrating thrust performance and structural integrity—an essential step toward qualifying boosters for the Space Shuttle.



The Shuttle Orbiter 101 rode atop the NASA 747 during five Approach and Landing Tests. These were unmanned inert Orbiter flights.

LOPES IN THE SPEED REGIMES REQUIRED FOR THE FREE FLIGHT LAUNCH PROFILES

> Max. Alt. 26,000 ft. Max. Spd. 288 Knots Fitz Fulton and Tom McMurtry 2 hours 28 minutes Date: February 25, 1977

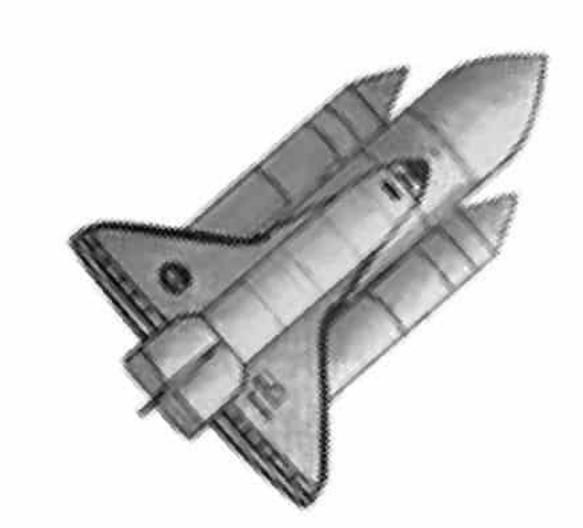






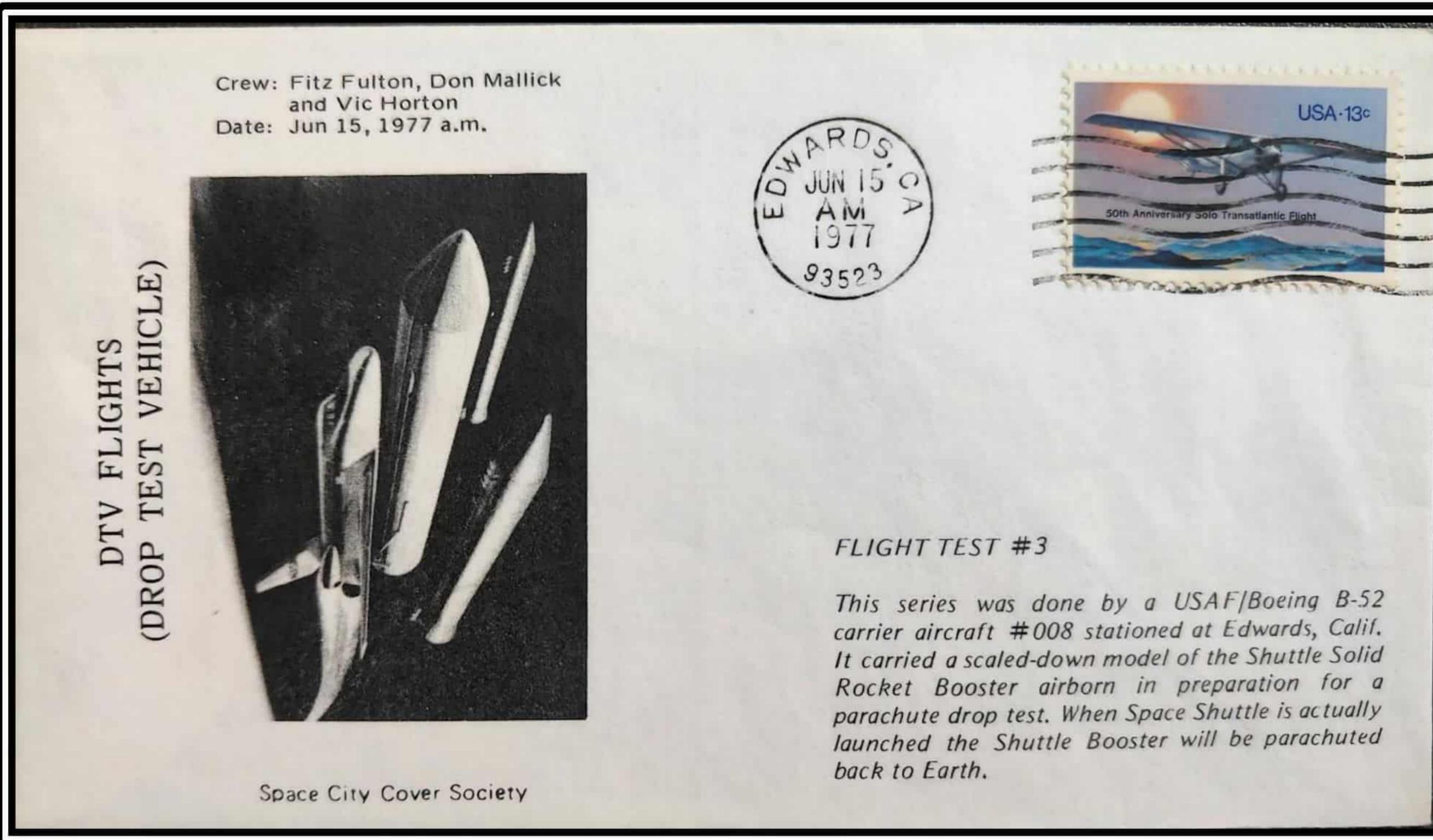
National space Technology lab main engine test event covers

Event cover of the NASA solid rocket motor static test by Thiokol

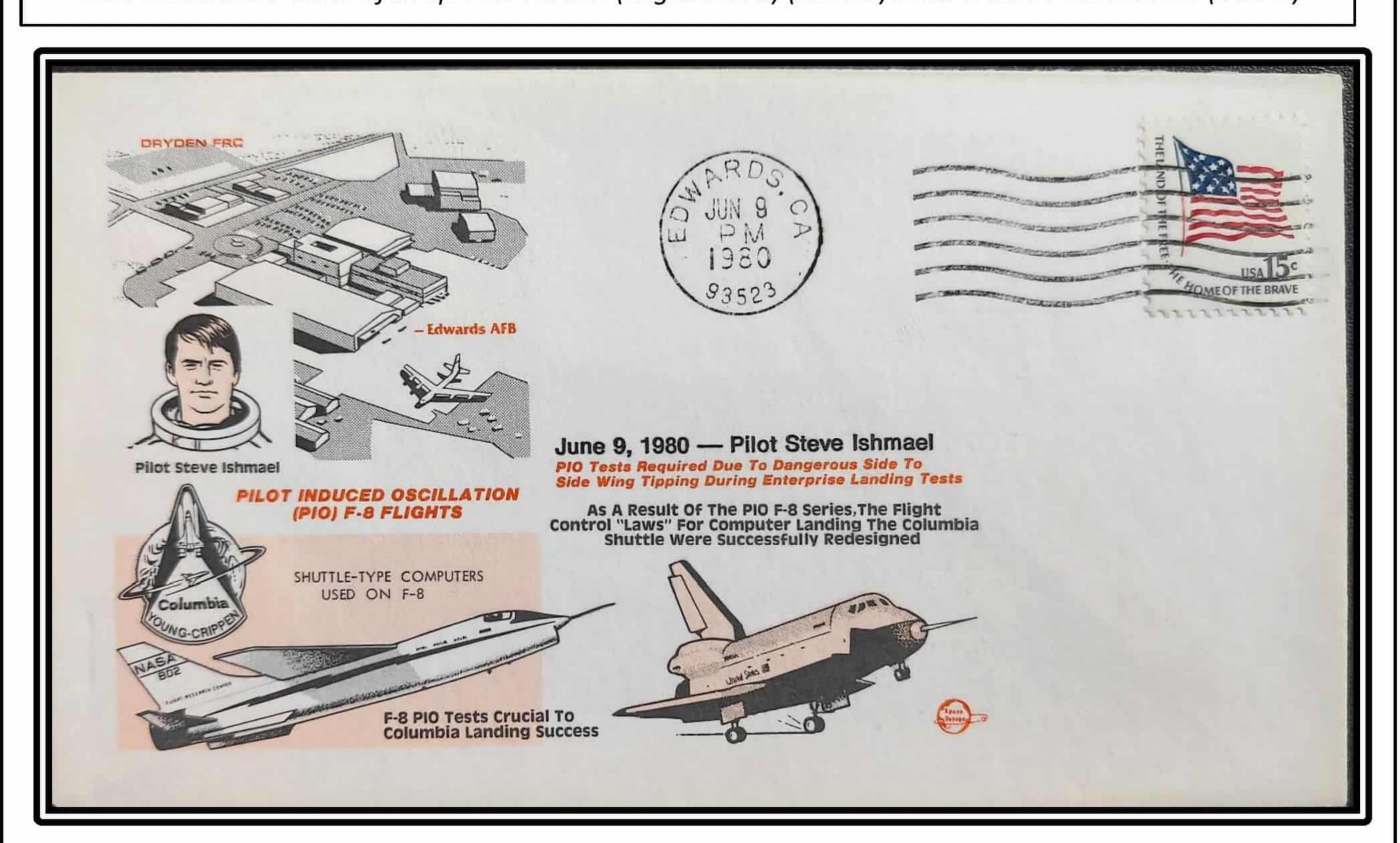




#### Space Shuttle Enterprise



Commemorative cover of Drop Test Vehicle (Flight test 3) (above ) Pilot induced oscillations (below)



On June 9, 1980, NASA conducted a flight test using the **Space Shuttle** *Enterprise* **to study pilot-induced oscillations (PIO) during landing.** The test simulated final approach conditions to evaluate control sensitivity and response. Insights from this test helped refine flight control systems and landing procedures for future operational shuttle missions.

On June 15, 1977, NASA unmanned drop test of Shuttle Space Enterprise at Edwards Base. Force Released from a Boeing Shuttle Carrier Aircraft, the test assessed handling aerodynamic and glide characteristics. It marked a critical step in verifying the shuttle's ability to land safely

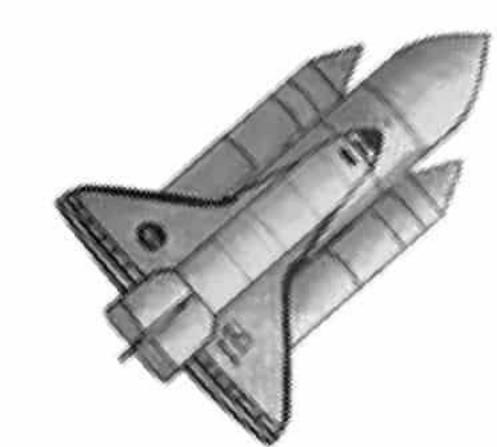
On February 13, 1985, Space Shuttle Enterprise was officially transferred the Smithsonian Institution. NASA handed over the orbiter to the National Air and Space Museum, recognizing its historic Although program. Enterprise never flew in space, it was crucial for Approach and Landing Tests (ALT) in 1977, design and aerodynamics The transfer marked the beginning of Enterprise's life as a exhibit, museum allowing the public to engage with the legacy of the early Space Shuttle era.



On November 14, 1978, NASA conducted a key landing test with Space Shuttle *Enterprise* at Edwards Air Force Base. **Part of the Approach and Landing Tests (ALT), it validated the orbiter's ability to glide and land unpowered**. This final captive flight helped confirm readiness for future free-flight and orbital missions.

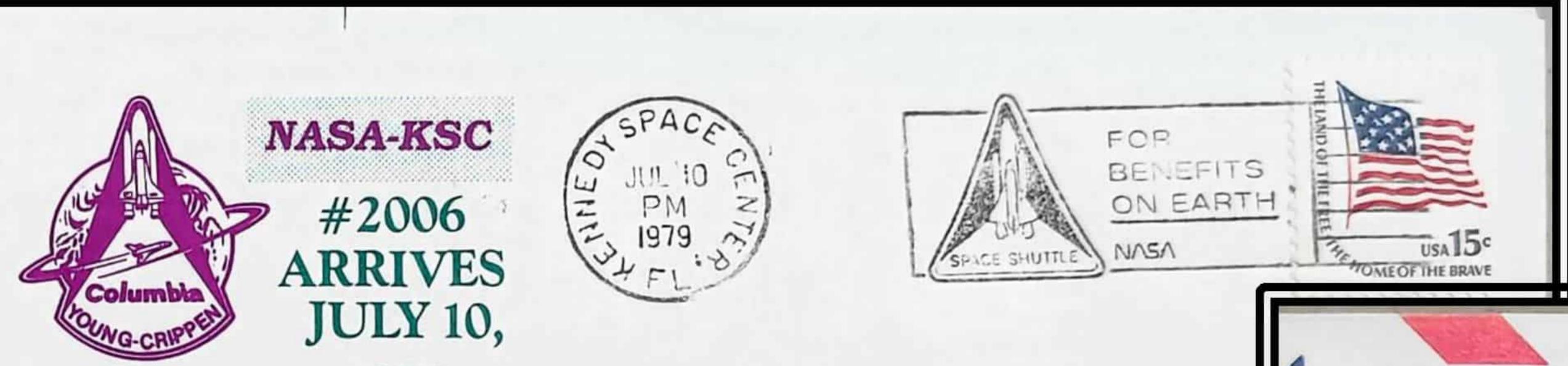


Commemorative cover commissioning of Shuttle Runway (above ) and Space shuttle Enterprise



Space shuttle - Columbia





-Arrival by truck from National

MAIN ENGINES ARRIVE

SHUTTLE COLUMBIA

AT KENNEDY CENTER

produce 375,000 pounds of thrust at lift-off

Space Technology Labs, Mississippi

In July 1979, NASA received the **main engines** for Space Shuttle Columbia at Kennedy Space Center. These advanced, reusable engines enabled powerful thrust for launch. advancing NASA's goal of routine, **reusable spaceflight** 

On March 5, 1979, NASA held an open house for the Space Shuttle Columbia at Rockwell's Palmdale facility. Thousands of visitors, including media and officials, viewed the nearly complete orbiter. The event showcased progress on the first shuttle, building public interest and support ahead of its future space missions

WACO, TEXAS 76703



Event cover of arrival of Space shuttle main engine to be used for Columbia

1979

Open house event cover for first look of Columbia

-6,600 lb. "power plants" will

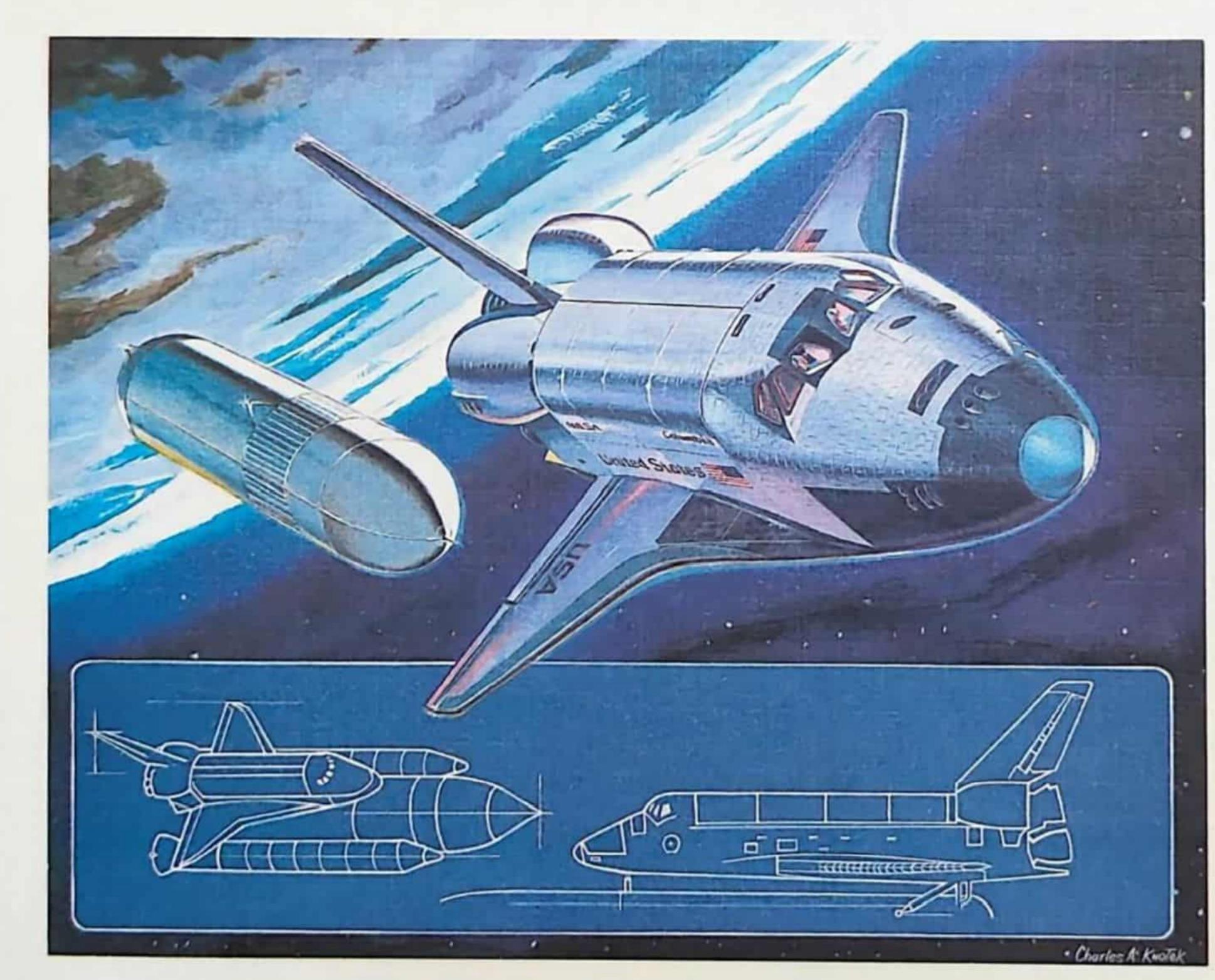
19,000 Rockwell Employees and Friends
Jammed Bldg. 294 at Palmdale, California
Rockwell facility for their first look at the
almost completed Spacecraft during a
limited Open House.



Commemorative cover with pictorial postmark of Columbia Space Shuttle during inaugural flight

Space Shuttle *Columbia* was NASA's first operational orbiter, making its historic maiden flight on April 12, 1981, during mission STS-1 coinciding with 20<sup>th</sup> anniversary of first human spaceflight.

Named after a 1792 exploration ship, *Columbia* helped usher in the era of reusable space vehicles. It completed 28 missions, including deploying satellites, conducting scientific research, and servicing space stations. Heavier than its sister orbiters, Columbia often carried scientific payloads. *Columbia*'s legacy endures as a symbol of innovation, exploration, and human spaceflight progress.



First Flight of the Space Shuttle April 12-14, 1981



USA Holar balooning

FIRST DAY OF ISSUE

Cover to commemorate the 1st Operational flight of Space Shuttle Columbia on April 12, 1981





STS 2

(NOV 12 -NOV 14 1981)

Columbia becoming the

spacecraft. The crew, Joe

Engle and Richard Truly,

planned for five days, the

mission was cut short due

to a fuel cell malfunction.

Columbia safely landed on

November 14 at Edwards

Force

demonstrating

technical issues.

reusability

conducted

deployed

payload.

reused

orbital

OSTA-1

Originally

Base,

shuttle

despite

Space Shuttle Columbia - Operational Flights





Commemorative cover to mark the **landing** of Second flight of the Space Shuttle Columbia (STS2)

Commemorative cover to mark the **Lift off** Second flight of the Space Shuttle Columbia (STS2)



Commemorative cover to mark the **lift off** Third flight of the Space Shuttle Columbia (STS3)

commemorative cover to mark the **landing** of Second Jugnic of the Space Shattic Columbia (S132

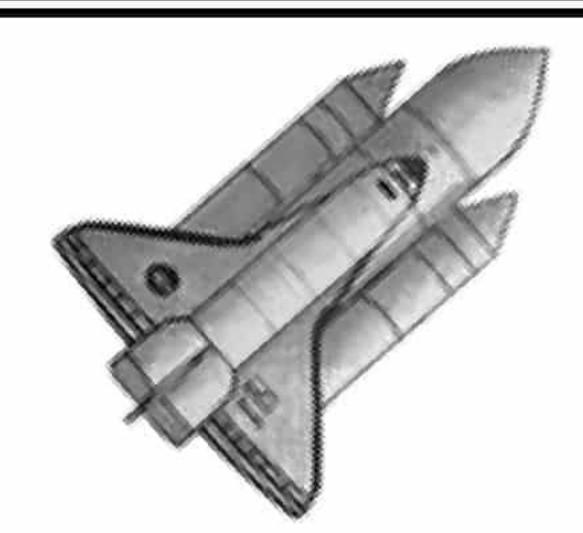
#### STS 3 (March 22 1982)

STS-3 launched on March 22, 1982, with *Columbia* and astronauts Jack Lousma and Gordon Fullerton. The mission tested the shuttle's thermal performance and carried science experiments.

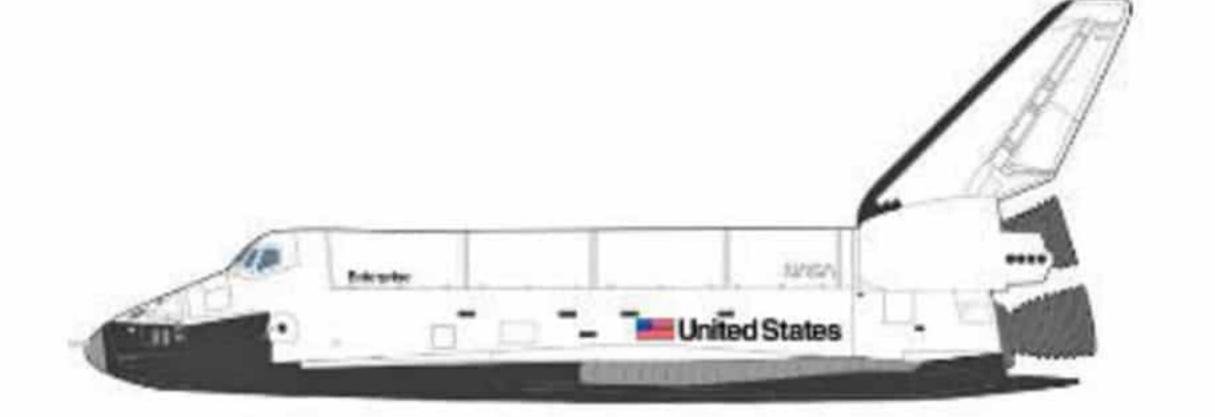
STS 5 (Nov 11, 1982)
STS-5 launched on November 11, 1982, with Columbia carrying its first operational crew: Vance Brand and Robert Overmyer. It marked the first commercial satellite deployment from a shuttle.



Commemorative cover to mark the **Lift off** of Fifth flight of the Space Shuttle Columbia (STS5)



Space Shuttle Atlantis & Columbia Tragic loss





SPECIAL FRENCH CANCEL

S T S - 2 7

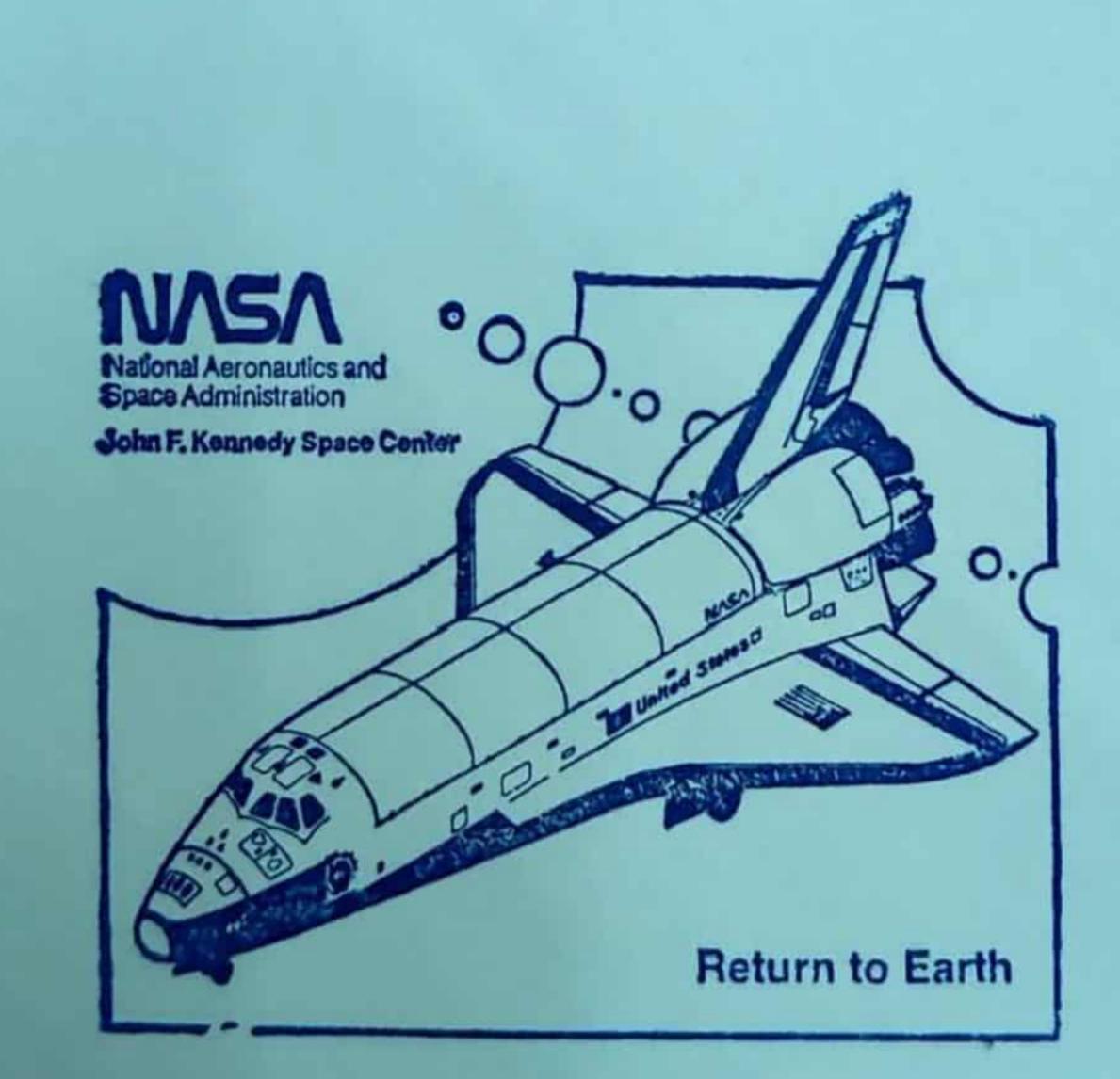
STS 107 (Final mission of Columbia)

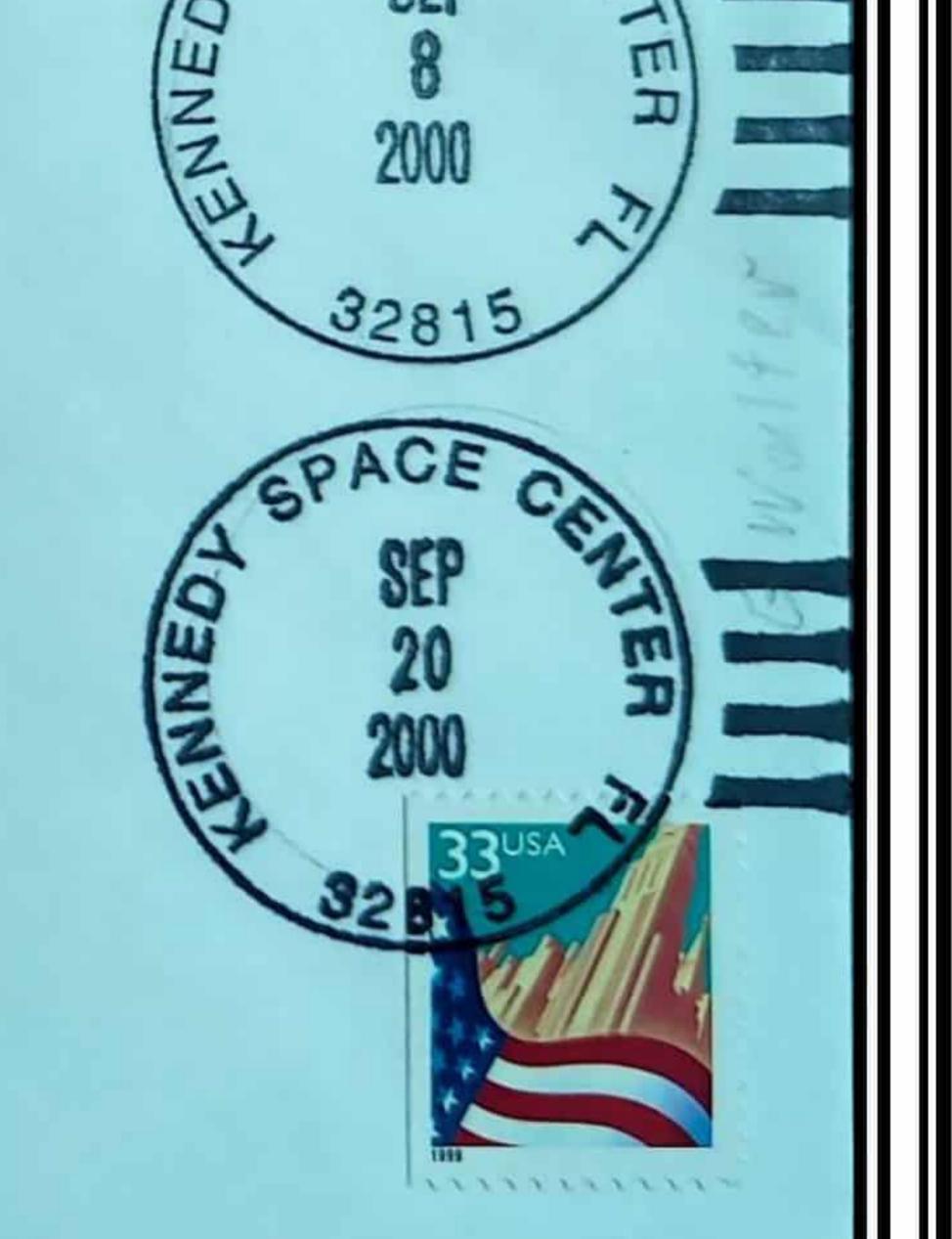
Lift-off of STS-107 -Space Shuttle Columbia lifted off from Kennedy Space Center's Launch on January 16, 2003. 82 seconds after liftoff, a piece of foam insulation broke off from the external tank and struck the left wing's leading edge, likely damaging the thermal protection system.

Re-entry of STS-107 - On February 1, 2003, Columbia began its return to Earth. After re-entry in Earth's atmosphere the sensor on the damaged left wing began failing and the structural integrity of left wing collapsed due to superheated gases. Columbia disintegrated over Texas, at about 200,000 feet and Mach 18, killing all seven crew members. The planned landing at Kennedy Space Center never occurred.

Postmarks commemorating the STS 107 mission

STS-106 launched aboard Atlantis on September 8, 2000, to prepare the International Space Station for long-term habitation. The 12-day mission concluded with a successful landing on September 20 at Kennedy Space Center.





Commemorative cover of STS 27 mission on-board space shuttle Atlantis

SHUTTLE MISSION STS-27

DECEMBER 2nd, 1988

COR-ROBERT L. GIBSON

PILOT-GUY GARDNER

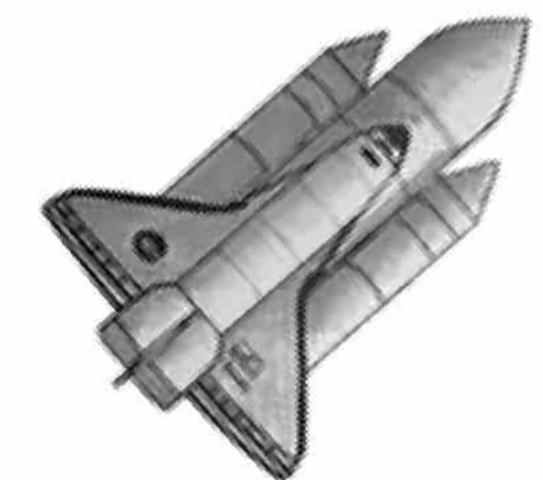
SPECIALIST-RICH MULLANE

SPECIALIST-JERRY MUSS

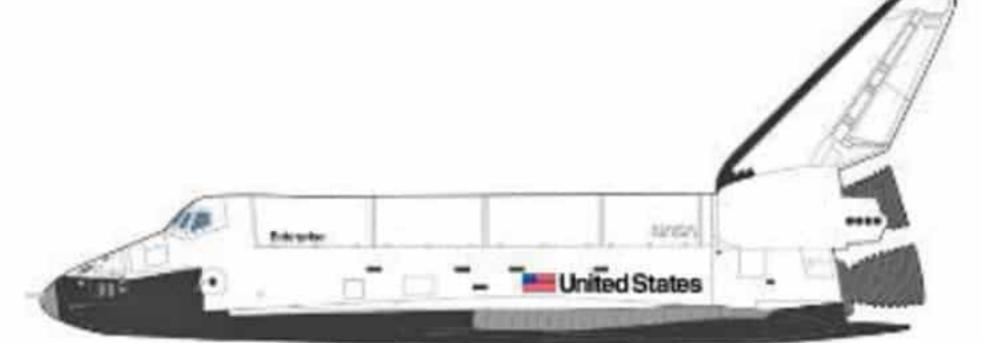
SPECIALIST-WILLIAM SHEPARD

"ATLANTIS" OV-104

Commemorative cover of STS 106 mission on-board space shuttle Atlantis

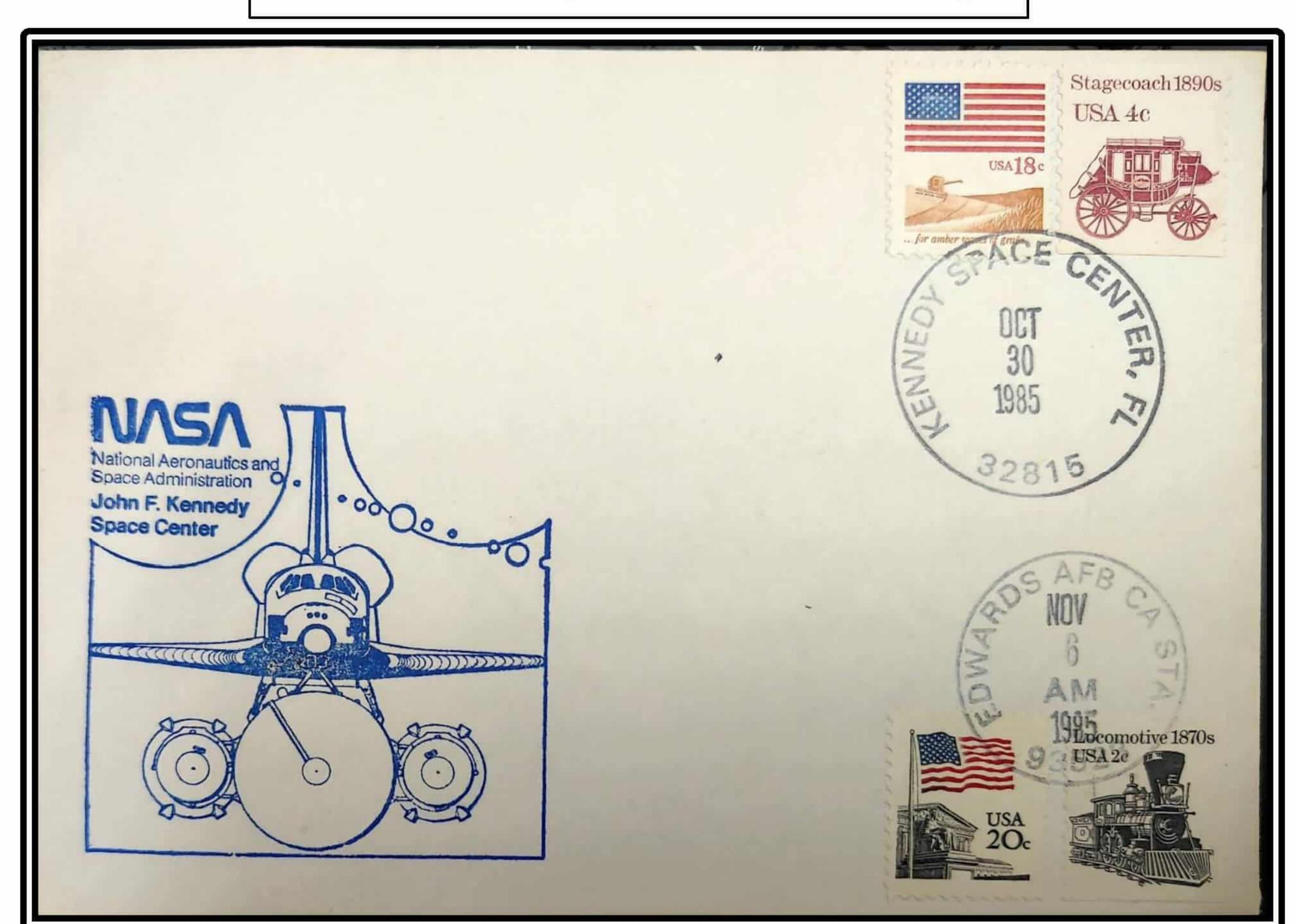


Space Shuttle Challenger





Commemorative cover of STS 6 mission on-board Challenger



Commemorative cover of STS 61A mission on-board Challenger space shuttle

#### STS 6 (First mission of Challenger)

Challenger's first mission, STS-6, launched on April 4, 1983, and landed safely at Edwards Air Force Base on April 9. The flight deployed the first Tracking and Data Relay Satellite and included the Shuttle program's first spacewalk, marking a successful debut for NASA's second operational space shuttle.

Commemorative cover of STS 7 mission on-board Challenger

STS-41C launched on April 6, 1984, aboard Challenger, marked the first on-orbit satellite repair. The crew successfully captured, repaired, and redeployed the malfunctioning Solar Max satellite. The mission ended with a safe landing on April 13 at Edwards Air Force Base.

#### STS-61-A (Spacelab D-1)

STS-61A launched on October 30, 1985, aboard *Challenger* and was the **first shuttle mission controlled by a foreign nation, West Germany. It featured the D-1 Spacelab** and conducted over 75 experiments. With a record crew of eight astronauts, the mission ended successfully with a landing on November 6, 1985.

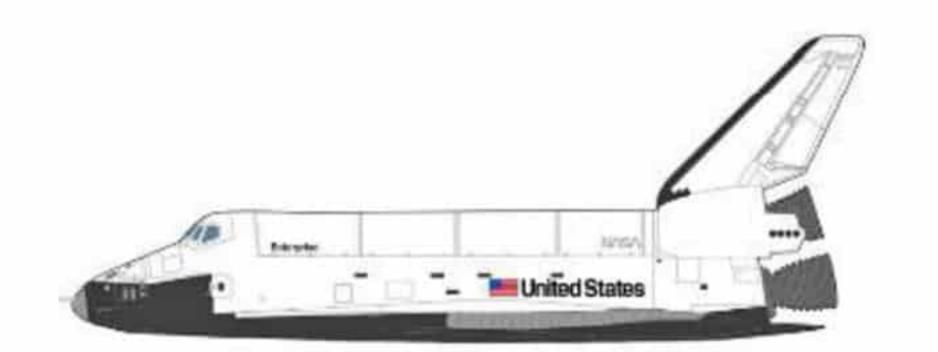


STS 7 - Challenger launched on June 18 and landed six days later at Edwards Air Force Base, California. Sally Ride's participation was a ground breaking moment for NASA, making this landing symbolically significant as the return of the first American woman from space.



Commemorative cover of STS 41C mission on-board Challenger space shuttle

Space shuttle - Discovery



STS-63 launched on February 3, 1995, aboard *Discovery*, featuring the first rendezvous with the Russian space station *Mir*. It marked a key step in U.S.-Russian space cooperation. The mission included a spacewalk and various science experiments. Pilot Eileen Collins became the first woman to pilot a Space Shuttle. Landing occurred February 11.

Commemorative cover of Take-off and landing of STS 70 mission on-board space shuttle Discovery



The O'Rate makeup stamp

The C'Rate makeup stamp

SRICE CENTER

JUL

13

1995

USA

29

USA

29

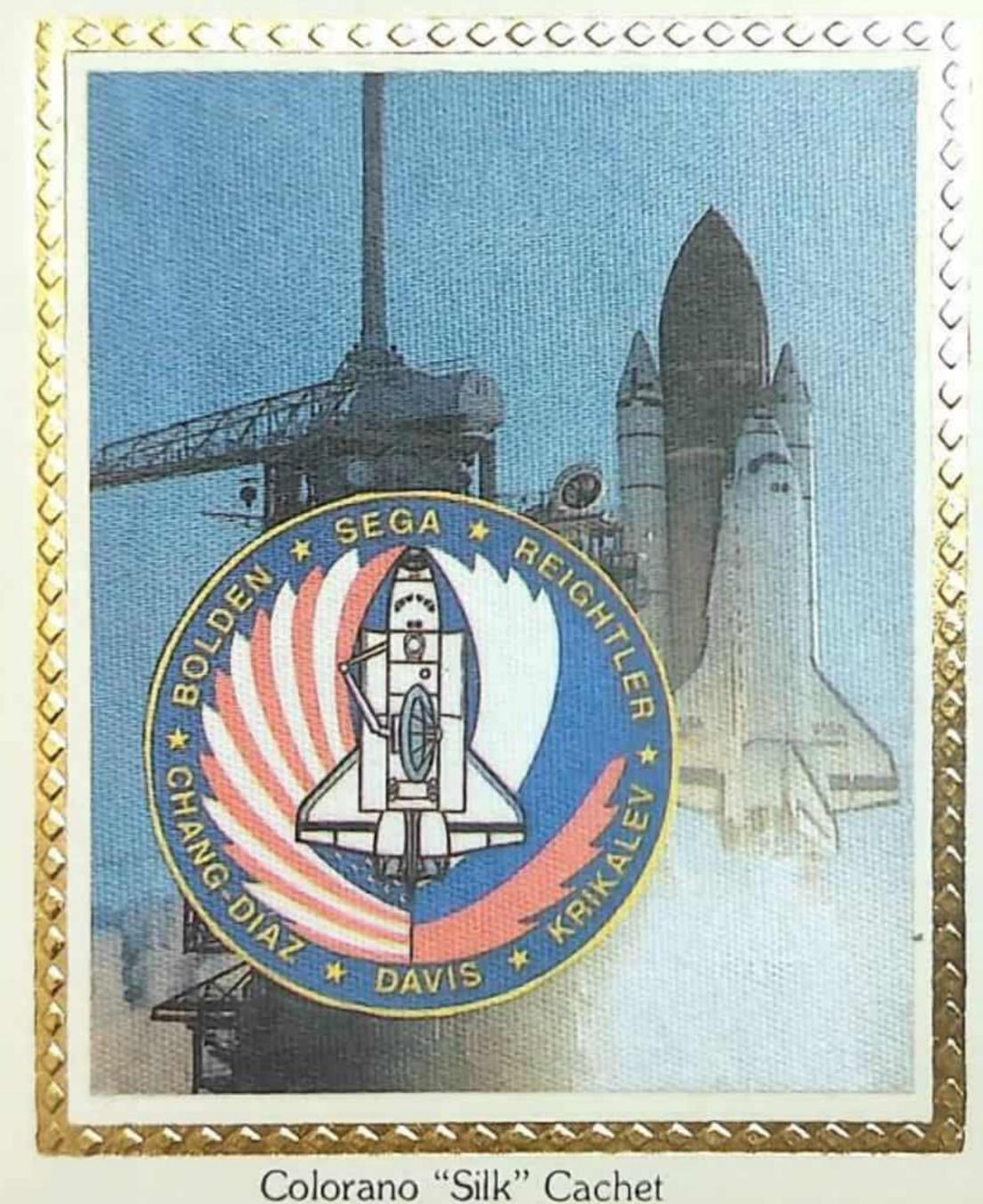
USA

30

USA

STS-70 launched on July 13, 1995, aboard *Discovery*. Its primary mission was to deploy the Tracking and Data Relay Satellite-G (TDRS-G), completing **TDRS** constellation NASA communications. The five-day mission also included biological science experiments. Discovery landed safely at Kennedy Space Center on July 22, 1995.

Commemorative cover of Takeoff and landing of STS 70 mission
on-board space shuttle Discovery



SPACE SHUTTLE DISCOVERY STS-60 uary 3, 1994 — The orbiter and its six member crew began

February 3, 1994 — The orbiter and its six member crew began shuttle Mission 60 at 7:10 am today when the 4.5-million-lb vehicle lifted off Pad 39A on a planned eight-day flight. Making up the crew are Charles F. Bolden, Jr., mission commander; Kenneth S. Reightler, Jr., pilot; Franklin R. Chang-Diaz, N. Jan Davis, Ronald M. Sega and Russia's Sergei K. Krikalev, mission specialists. Discovery's is the first U.S. Space crew to include a Russian cosmonaut.

Commemorative cover of STS 60 mission on-board space shuttle Discovery

STS-60 launched on February 3, 1994, aboard *Discovery*, marking the first U.S. mission with a Russian cosmonaut, Sergei Krikalev. The mission deployed the Wake Shield Facility and carried the SPACEHAB module for microgravity research. *Discovery* landed safely on February 11 at Kennedy Space Center

STS-114 launched on July 26, 2005, aboard Discovery, marking NASA's return to flight after the Columbia disaster. The mission tested new safety procedures, including inflight heat shield inspection and repair techniques. The crew delivered supplies to the ISS and performed spacewalks. Discovery landed safely on August 9 at Edwards Air Force Base.



Stamp sheetlet commemorating space shuttle Discovery mission STS 114

The Space Shuttle program was retired in 2011 after 30 years and 135 missions. The final flight, STS-135 aboard Atlantis, ended on July 21, 2011. The program enabled satellite deployments, space science, and ISS construction. Its retirement marked a shift to commercial partnerships and future deep-space exploration initiatives by NASA.