



# Space Log

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## AMERICA'S FIRST SPACE SHUTTLE READY FOR LAUNCH

Columbia, America's first Space Shuttle destined for Earth-orbital flight is on the launch pad at Kennedy Space Center, Florida. It carries the hopes of the U. S. space program that has not sent astronauts into orbit for several years.

But the National Aeronautics and Space Administration officials feel that the delay has resulted in our being even better equipped for future space needs. The Space Shuttle program during this time has cost nearly 9-billion dollars (7-billion over budget) but Columbia has been called the "most sophisticated flying machine ever built." In fact, the U. S. Space program could have a tremendous impact on future space exploration as well as solving problems related to energy, science and military strategy.

One NASA official said, "If the shuttle orbiter flies as we expect it to, then America will have the best spacecraft in the world. It will carry us into a new era, a revolution in space." Robert Thompson, manager of the Space Shuttle Program Office summed it up as, "This is probably the toughest flight we have ever had. It is very important to the nation."

Supporting a two year delay in launch of the first orbital shuttle mission, the program has resulted in the first manned crew being "140 percent trained." That statement was made by astronaut John Young recently at the Johnson Space Center in Houston. Young, 50, was spacecraft commander of Apollo 16 when it explored the Moon in April 1972. He was also part of the three man crew of Apollo 10 and part of the two man crew of two Gemini missions. He will command the first orbital flight test of Columbia.

Robert Crippen, 43, will be flying in space for the first time and will be pilot on this mission, as the crewmate of Young. Crippen has been an astronaut since 1966 and will be fulfilling a dream of his. "I've been waiting 15 years for this moment," Crippen said. "We've been working 60 and 70 hours a week preparing for the flight. I guess we're workaholics to some extent, but we wouldn't be here if we didn't like what we do."

Part of the on-going testing during this two year delay has been in the Shuttle Orbiter Simulator at the Johnson Space Center. That training simulates Columbia's flight plan. About a recent simulation, Young said, "We were in the mission simulator 42½ hours and had 40 problems put to us. Solving those problems is what make space flight so great. The nature of this business is finding problems, fixing them and then solving them."

Examples of problems the astronauts have encountered during training are pressure losses inside the spacecraft, the opening and closing of the orbiter's cargo doors and environmental problems on board. Also tested during a recent simulation were the astronauts' space suits. A space walk is not planned for the first flight but Crippen may have to step out of the orbiter to make repairs if the payload bay doors become jammed or if they run into some similar problem. The shuttle will not carry cargo until its fourth flight. Communication satellites are among the materials, that eventually will be carried.

How will the general public react to Space Shuttle flights? Crippen said, "I doubt whether these future flights of the reusable shuttle will generate as much public excitement as the Gemini and Apollo missions did. The aim of the shuttle is to make going into space routine."

Young expressed his views on the shuttle flights. He said, "These shuttle flights could lead to a new era of colonization in space. This vehicle is 10 years ahead of what any other country can do. Having a permanent satellite in space is good for defense and communication."

## SPACE SHUTTLE FLIGHTS

The first Orbital Flight Test (OFT-1) with Young and Crippen is scheduled for launch in the early part of this April. Their backup crew will be Col. Joe H. Engle (commander) and Cmdr. Richard H. Truly (pilot). There will be a series of six Orbital Flight Tests, each of them increasing in complexity. On the first four flights, the 75-ton orbiter will return from space to an unpowered landing on a dry lakebed at NASA's Dryden Flight Research Center at Edwards, Calif. Thereafter, the spacecraft will return to a specially constructed runway at the Kennedy Space Center launch site.

## HOW SHUTTLE WILL HELP SHAPE OUR FUTURE

A successful Space Shuttle can have a great impact on the future of our world. In orbital flight, the shuttle can take advantage of the environment of space, where there is no air or gravity for unique jobs.

In the planning stage now is a space telescope that will orbit 310 miles above the Earth. There will be no clouds to obscure its view nor will it be hindered by Earth's smog. It will give a view of the stars 50 times sharper than anything on Earth. This will open areas to all scientists and astronomers that have only been dreamed about in the past.

The shuttle will be able to carry into space components for building vast structures; industrial processes that are impossible on Earth could then be performed. As one astronaut put it, "We could move 20% of our factories out of Earth's environment and into limitless space."

Some of those industrial processes would be tailored to the electronic industry. Space factories would be able to produce useful metals and alloys along with crystals of unique purity and size. Medicines impossible to make on Earth could also be produced in space.

Communications satellites have always been expensive and upon a malfunction, they are dead. With the shuttle, satellites will not only be able to be launched from an Earth-orbiting shuttle, but satellites could be recovered in space. As a result, they could be built more cheaply and upon a breakdown, they could be recovered and returned to Earth for repair. This task alone would save millions of dollars.

For the military, the shuttle is considered essential. It could launch navigation and spy satellites vital to our country's defense in these uncertain times.

With our energy situation today, the shuttle could be quite a factor. Solutions could be found that could not be found on Earth. Shuttle crews could "harvest sunlight", beam it to Earth as microwaves, which could then be converted to electricity.

Yes, shuttle can definitely shape our future. No longer is our space program one that just glitters. With a successful shuttle it will be one that goes to work every day. Some of its uses may seem like it is out of a science-fiction story, but in a few years, that science-fiction may be part of our everyday life.

#### SPACE SHUTTLE CONFIGURATION

On the launch pad, the shuttle certainly does not look like a craft full of grace and sleek lines of a modern airship. Resembling a huge silo flanked by two large candles, one looks at it and asks, "And this is our spacecraft that has such a gigantic responsibility?" The Columbia, the winged orbiter clipped to the side of the "silo" has been nicknamed "Dumbo, the Space Truck." But looks are not everything.

That silo tank it rests upon is a massive tank loaded with over a million and a half gallons of liquid hydrogen and oxygen. It will fuel the main rocket engines aboard the orbiter during launch. What look like candles are two powerful solid-fuel rocket engines. Along with the main engines, they will thrust the spacecraft into orbit.

The solid-fuel engines burn for only 2½ minutes but consume one-million pounds of propellant and travel almost 180 miles. Then they will be jettisoned, parachuted to the ocean and recovered for reuse.

Inside the spacecraft there is room enough for up to seven crew members. It is a double deck cab, and by Apollo standards, it is spacious. The mainstay of the spacecraft is a 65-foot long cargo bay. The bay can hold up to 65,000 pounds of cargo.

The 122-foot-long orbiter is a combination of spacecraft and airplane. It is launched from Earth by rockets but it will return to Earth and land on a runway like an airplane. The shuttle is built to fly more than 100 missions.

The three main rocket engines that will launch the shuttle are five times as powerful as the Saturn engines that launched our Apollo spacecraft. These three rocket engines have a degree of high precision that was not even thought about during the days of Apollo. They are controlled with a throttle and every part is monitored. As an example, a computer will test every valve 50 times a second. This will make sure that the rocket is operating smoothly in every way.

There are five computers on the Columbia to do the monitoring. The astronauts can order the computers to give reports on a television-like screen in the cockpit. These computers will guide the spacecraft during launch and re-entry, and at critical times during the mission. NASA engineers state that the computers are so advanced that they could guide the spacecraft to an Earth landing without an astronaut doing anything to help. However, this is not expected to be put to use on a trial basis.

In its Earth-orbital mission, the spacecraft is controlled by small rocket thrusters. In the atmosphere, it is guided by flaps on the wing and tail, just like an airplane. As the Columbia returns from orbit, it will reach hypersonic speeds where no winged craft has flown before. Control at that time is uncertain.

Christopher C. Kraft, director of the Johnson Space Center, says, "There is no wind tunnel in the world that can test all of the supersonic speeds the orbiter will encounter." It is this unknown factor that increases the risks greatly on the first Orbital Flight Test. As Kraft stated, "Get us beyond this first flight and the risks are a lot less than going to the Moon."

#### SPACE SHUTTLE PAST DIFFICULTIES

Delay after delay, due to a tight budget set by Congress has resulted in negatives. As one NASA official stated, "We have had to build the shuttle 'on the cheap'." This low funding has caused some short cuts in design and some past testing has proved disastrous.

The biggest headache was the tiles. The tiles are made from a foam silicate and protect the spacecraft from the 2,000 degrees of heat generated during the return from orbit to Earth. These now-developed tiles are so efficient at dissipating heat that they can be handled by the bare hand within seconds after glowing cherry red. But they are also very fragile. Workmen must wear gloves when installing them as each tile can be injured by just a jolt by a fist. And the installation is a slow and tedious process. Each tile takes hours to be put into place. There are 30,000 of them on a shuttle orbiter and no two tiles are alike. Each one has been designed for a specific place on the hull and each one has to be installed within tolerances of thousandths of an inch. Ten years of research and testing went into development of this tile shield. This shield covers the underside of the orbiter like an overcoat of bricks.



When the Columbia was flown piggy-back atop a specially equipped 747 from Edwards, Calif. to the Kennedy Space Center, some of the tiles came loose. It was then that NASA officials knew they had another problem on their hands and one that was going to take time and money to solve.

TILE TEST FLIGHTS... To try to solve the problem of the tiles coming loose, NASA put into action a special test program at the Dryden Flight Research Center at Edwards, Calif. Actual test flights were made by an F-15 and F-104 aircraft in about 60 flights over a 12-month period. Tile sections representing six different locations on the orbiter Columbia were flown at 1.4 times the aerodynamic load conditions that the Shuttle will encounter during launch. The six different tile locations on the orbiter that were flight tested by NASA Dryden are the closeout tile aft of the wing leading edge area, the forward wing glove area, vertical tail leading edge, window post area, elevon trailing edge, and elevon hinge area.

Maximum speeds of 1.4 times the speed of sound and dynamic pressures of 1140 pounds per square foot were achieved during the program. Following each flight the test section was inspected and precisely measured to identify any deformation in structural changes that may have occurred as a result of the flight loads.

As a result of the Dryden flight test program, design changes of varying degrees have been made to the thermal protection system on the under side of the orbiter wing leading edge, on the wing glove area, around the window posts, and on the vertical tail leading edge. These changes consisted of revision of attachment techniques to improve binding forces, modified gap filler assemblies to prevent detachment, and improved installation and testing techniques to ensure satisfactory compliance with design requirements. Changes to correct deficiencies resulting from the flight airloads were retested after modification to assure satisfactory performance and have been incorporated into the Shuttle Orbiter.

#### FROM LAUNCH TO LANDING

With an early April launch date for Columbia looking better each day that goes by, let's take a look at just what will happen from start to finish on a complete shuttle mission.

The crew will leave their homes at Houston just a day before the launch, whereas in the Apollo missions it was much sooner. Then, on launch day, the two crew members will board the craft in the early morning hours. Once inside, they will strap themselves in the orbiter's cockpit, with their windows looking straight up into the sky.

Then 90 minutes later, pumps will begin their work of starting the propellant flowing. This will flow at about 1,000 pounds per second and it will start the main rocket engines with a burst of power. For six seconds the engines will build up thrust. This will rock the craft forward 19 inches and the launch tower will move past slowly. The craft will then rock backwards and at that precise time, the solid rocket engines will ignite. This will provide another 5 millions pounds of thrust.

In a split second, the craft will rise swiftly up and away. In 2½ minutes it will be over 25 miles up and 150 miles down range. It is here that the solid rockets will fall away, while the main engines continue to fire.

Within 10 minutes of launch, all of the propellant will be used up and the large tank (the one that looks like a silo) will drop away and burn up in its fall back to Earth. This tank is the only part of the Shuttle system that is not reusable. Two smaller engines on the craft will then ignite and will be fueled by on-board propellant. With this, this shuttle will be put into its scheduled orbit of the Earth.

The Orbiter, designed to carry 32½ tons in its cargo bay, and up to 7 crew members, is designed to orbit in space for up to 30 days. However, the Columbia's mission is 54 hrs., 30 min. on launch to landing. So for two days, Young and Crippen will test systems aboard the spacecraft. One of the major tasks will be to test the large cargo bay doors. They will open and shut them, and should a problem develop, many hours of training have gone into solving them. With a jamming of the cargo bay doors, Crippen would don his space suit, go to the area and become a mechanic.

Toward the end of the mission's schedule, Young and Crippen would begin their preparations for bringing the large orbiter home safely to an airplane-like landing. While the craft is over the Indian Ocean, they will fire two small rocket engines; this will slow down their flight speed. This in turn will drop them out of their orbit at 18,000 miles per hour.

As the intense heat builds up from the outside, this is where the tiles will be put to the real test. The tiles will glow red from the intense heat caused by the atmospheric friction but the Columbia will be precisely angled to take it.

By now, there are no propulsion engines aboard running. The Columbia is coming in like a glider or big bird, with its wings outstretched in one position. Its gigantic speed is enabling it to fly. It will only takes minutes for it to cross over two oceans and be over the welcome land of the United States.

As Columbia zooms over the coastline of southern California, Young will rock the craft left and right. This will enable it to lose speed. As Columbia approaches Edwards Air Force Base, it will make a steep turn left and will aim for a landing on a runway in a dry-lake bed. When the wheel touches the ground, Columbia will still have a speed of 200 miles an hour. It will taxi several thousand feet and will then come to a rest.

It is then that all will know that the years of planning, the two years of delay, the many years of sacrifice on the part of many, the long hours of training, all will be reimbursed. Again, as Chris Kraft, director of the Johnson Space Center said, "Get me beyond the first shuttle flight, and the risks are a lot less than going to the Moon."

Be proud, Americans. We are not a nation with a malaise. We are a nation of dreamers; but dreamers, that after careful planning get down to the basics of putting those dreams and plans into action. And that is what our U.S. space program is all about. Our cheers go out to NASA, to its dedicated employees, its technicians who have made it all possible and especially to our honored astronauts.



## SCCS COVERS FOR THE COLUMBIA MISSION

The Space City Cover Society has been producing space covers for collectors since January of 1967. This is our 15th year! With our NASA Local Post issues, we hold the record of being the Local Post (space oriented) with the longest, continuous period of operation. And we will have our commemorative covers ready for the up-coming Columbia Shuttle mission. Here are details on several recent issue plus what we will have for the mission itself.

SHUTTLE MOVED TO LAUNCH PAD....December 29, 1980 was a red-letter day for the Space Shuttle Columbia. After a five-week checkout in the cavernous Vehicle Assembly Building, the entire shuttle assembly was rolled to the launch pad. This assembly consisted of the orbiter, external tank and twin rocket boosters and was carried by the mobile launching platform.

The shuttle's 3½-mile trip to launch pad 39A took about eight hours, with the transporter crawling along a rock-covered road at 1 mph or less. There were frequent inspections along the way to make sure that the shuttle was level. Once there, a snag developed in transferring the mobile launching platform, to which the shuttle is attached, onto the pad. A NASA spokesman said a small steel access tower on the pad's surface had to be cut away. The entire operation of moving the Columbia was completed by nightfall of December 29.

Bolted nose-up across the huge crawler-transporter, the 10-million pound load had made the trip that was watched by several thousand spectators. There was a ceremony upon the completion of the trip. Young and Crippen, Columbia's crew, were dressed in blue flight suits. They were on the wind-blown platform with NASA officials and other dignitaries. NASA Administrator Robert Frosch told the shivering crowd, "We are now at the threshold of a new capability to investigate the universe."

The Space City Cover Society prepared covers for this event, postmarked Cape Canaveral on the 29th of December. These covers are appropriately cacheted.

FLIGHT READINESS FIRING....With the successful firing of Columbia's three powerful engines on February 20, 1981, and after an official evaluation of the test, NASA officials have given the okay for launch no earlier than the week of April 5. On hand to watch the test were Young and Crippen.

Friday's flawless, scheduled 20-second engine firing was at 6:45 a.m. EST, and it was a big boost to the nearly \$10-billion Space Shuttle project. In the practice firing at Cape Canaveral, the craft's power plant generated 1.1-million pounds of thrust, just as planned, while the 122 foot tall Columbia, its two solid-fuel boosters, and a giant fuel tank, remained locked firmly on the pad by bolts. On an actual launch, explosive charges will sever the bolts to release the spacecraft, and the solid-fuel boosters would ignite to help it into orbit.

This test marked the first time in the U. S. manned space program that engines have been fired on the launch pad during a countdown practice. In the earlier Mercury, Gemini and Apollo projects, NASA gained that experience by launching the capsules unmanned before committing astronauts to fly them.

For this historic space event, the Space City Cover Society was represented by our servicer and our commemorative covers were cancelled at the Cape Canaveral post office on that day.

COVERS FOR THE MISSION ITSELF....This first Space Shuttle mission (STS-1) will be 54 hours, 30 minutes in duration with launch from the Kennedy Space Center. Mission operations will be controlled by the Johnson Space Center. The Dryden Flight Research Center is the primary landing site, but provisions exist for a return-to-launch-site abort landing at the Kennedy Space Center and an abort landing after less than a single orbit (abort-once-around) at the Northrop Strip, White Sands Missile Range, N.M.

The Space City Cover Society will have four major sets of covers, two covers per set. The first set will be for the launch date and landing date, with both machine cancelled at either Cape Canaveral or Kennedy Space Center, Florida (whichever post office is open on both days). The second set of two will be machine cancelled at Houston (Mission Control Center) on both the launch date and landing date. The third set will be cancelled at Houston on both launch date and landing date with the Mailer's Permit Postmark (the Space City Cover Society has permit #1). The fourth set will be cancelled on both launch date and landing date at Edwards, Calif., where the scheduled landing of Columbia will take place.

Should there be an abort of the mission at any time after launch, we will go ahead and cancel the covers, which will have an appropriate launch and landing cachet, and then overprint with any abort details. This is what we did on the aborted Apollo 13 mission and it was the covers produced by the Space City Cover Society that gave the collector the entire information on the cover, including the abort details.

We will have our familiar NASA Local Post commemorative issue for this event. There will be a single stamp printed in bi-colors, featuring the logo of the Columbia mission. Each cover of the Houston set (both the machine cancelled and Mailer's Permit Postmark sets) will have, in addition to the U.S. stamp and cancel, a single of this new NASA Local Post. Each of the Local Post singles on cover will be cancelled with the NASA Local Post commemorative cancel. This new Local Post issue will be available to collectors in sheets of six, perforated, and size 3½ X 5½ inches.

A bit of information about the U. S. stamps that will be used on our covers. We assume that the rate will be 18¢ and we will use whatever first class stamp is available at the time we prepare our covers. There will be a set of eight U. S. space stamps issued later but it is our understanding that they will not be issued until after the shuttle mission.

We hope all of this information will be helpful to you, the collector, and that it will help in your planning of your needs in regards to the Space Shuttle program. If it has been awhile since you collected space covers, NOW is the time to start once more. And if this is coming to a new collector, why not begin your space cover collection with the Space Shuttle. This is an entirely new concept in space travel and transportation and you will be getting in on the start.