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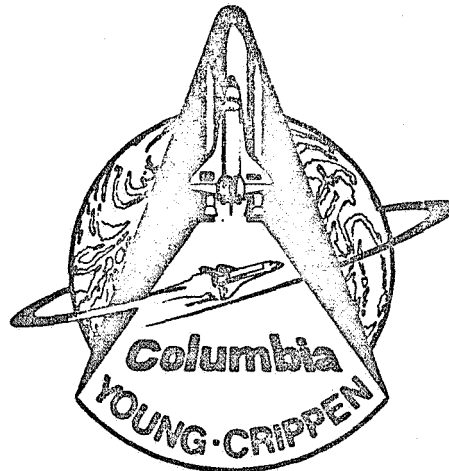


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Chronology of KSC and KSC Related Events for 1981



NASA
JOHN F. KENNEDY SPACE CENTER

WALlops ISLAND, VA 23337

National Aeronautics and
Space Administration
John F. Kennedy Space Center

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CHRONOLOGY OF
KSC AND KSC-RELATED
EVENTS FOR
1981
SELECTED
By Ken Nail, Jr.
New World Services, Inc.
ARCHIVIST

FOREWORD

The launch of Orbiter Columbia from the John F. Kennedy Space Center on April 12, 1981 heralded the beginning of a new phase in manned space activity, and the era of an operational Space Transportation System.

Columbia was the first reusable spaceship and the first to carry a human crew on its maiden flight. The landing on the dry lakebed at Edwards Air Force Base on April 14, 1981, after a 54-hour journey, was a star spangled event which excited the national spirit. Once again American astronauts were active in space.

This Chronology presents a record of aerospace and related activities in 1981 in which the John F. Kennedy Space Center had prominent involvement and interest. Articles were selected from Aviation Week and Space Technology, Defense Daily, Miami Herald, Sentinel Star (Orlando), TODAY (Cocoa), Spaceport News (KSC), NASA News Releases, and other sources.

The Chronology was prepared as part of the KSC history program to "document KSC's role in NASA's programs" and is intended as a reference source for historians and other researchers. The document is arranged by month and items by date of the published sources. Actual date of the event may be indicated in parenthesis when the article itself does not make that information explicit.

Research was accomplished and text prepared by Ken Nail, Jr. New World Services, Inc., Archivist; with the assistance of Elaine Liston.

Comments concerning the Chronology are invited and should be addressed to Information Services Section (SI-SAT-52), John F. Kennedy Space Center, Florida 32899.



M. Konjevich
Information Services

January 1981

January 2: To some people, a canister is a thing that looks like a mobile home standing on its head.

To others, it is a thing that looks much as though someone looped the nose, tail and wings off of an orbiter, then installed doors, ladders and handles on what is left.

Looking very strange indeed, the space age canister actually is a moveable home for payloads and is also a painstakingly engineered airtight container that precisely duplicates the interior dimensions of the orbiter's cargo bay.

It provides the clean environment necessary while orbiter payloads are being moved around the space center. Horizontal payloads, for example, are verified on the Operations and Checkout Building, then are moved to the Orbiter Processing Facility for installation.

Vertical payloads, verified at the Vertical Processing Facility, must be moved to the launch pad for installation via the Rotating Service Structure.

The canister, 21 meters (69 feet) long, can accommodate payloads up to 18.3 meters (60 feet) in diameter, weighing up to 29,483 kilograms (65,000 lbs).

Delivering a payload to the launch pad, the canister is hoisted to the proper elevation at the Rotating Service Structure where environmental seals protect the cargo during offloading.

The canister is taken on its KSC travels by a 48-wheeled, self-propelled and highly maneuverable transporter. The speed of the 19.8 meters (65 feet) long transporter varies from a maximum of 16 kilometers (10 miles) per hour, empty, to a loaded maneuvering speed -- or "creep rate" -- of .635 centimeters (one quarter-inch) per second -- or .0228 kilometers (.0142 mile) per hour. (SPACEPORT NEWS, 1-2-81, p. 3, Vol. 20, No. 1)

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<> Mr. J. A. Diggs has been named Equal Opportunity Officer at KSC. He had held the post as acting officer since July, 1979.

Prior to being appointed to the post, Diggs served as an Equal Opportunity Specialist here, as a field representative with the Office of Economic Opportunity in Atlanta, Georgia, and as Associate and Economic Director, respectively, of the Brevard County Community Action Agency in Cocoa. (SPACEPORT NEWS, 1-2-81, p.5, Vol. 20, No. 1)

<> 1981 Launch Schedule

<u>DATE</u>	<u>MISSION</u>	<u>LAUNCH VEHICLE</u>	<u>COMPLEX</u>
Feb 19	COMSTAR D	Atlas Centaur 42	36-A
March	GOES-E	Delta 154	17-A
March	INTELSAT V (F-1)	Atlas Centaur 56	36-B
April 23	SBS-B	Delta 155	17-A
May	NOAA-C	Atlas-F	WTR*
June 2	FLTSATCOM-E	Atlas Centaur 59	36-A
June 18	RCA-D	Delta 156	17-A
June 25	INTELSAT V (F-3)	Atlas Centaur 55	36-B
July 31	DE	Delta 157	WTR*
Sept. 15	SMF	Delta 158	WTR*
Sept. 17	INTELSAT V (F-4)	Atlas Centaur 58	36-B
Oct. 29	RCA-C1	Delta 159	17-A
Dec. 10	INTELSAT V (F-5)	Atlas Centaur 60	36-B

LAUNCH SCHEDULE for 1981 also includes the first launch of the Space Shuttle from 39A, now set for late March, WTR launch operations are conducted by KSC from Vandenberg Air Force Base, California. (SPACEPORT NEWS, 1-2-81, p.5, Vol. 20, No.1)

<> While the nation's attention is focused on Launch Complex 39 for the upcoming Shuttle launch, the expendable vehicle team will look to continue its string of 31 successes with ten launches scheduled for 1981.

With six Atlas-Centaur and four Delta launches, KSC will lift a variety of commercial, scientific and defense satellites into equatorial orbit. A large part of the expendable schedule will be devoted to the remainder of the INTELSAT V communications system, as four INTELSAT V satellites will be launched in 1981.

In addition to ETR launches, three other missions will be conducted from the WTR launch site at Vandenberg Air Force Base. Two NASA scientific satellites and one weather satellite will be lifted into polar orbit aboard two Deltas and an Atlas-F. (SPACEPORT NEWS, 1-2-81, p. 5, Vol. 20, No. 1)

January 6: A private group called the Viking Fund has collected some \$70,000 that it will give to NASA Wednesday to be used to continue processing data from the Viking spacecraft which landed on Mars in 1976. The budget squeeze on NASA was threatened to terminate the Viking data processing work. The Viking Fund was formed under the auspices of the American Astronautical Society (AAS). (DEFENSE DAILY, 1-6-81, p. 7, Vol. 114, No. 1)

<> Dr. Alan M. Lovelace, 51, who has been deputy administrator of NASA since June 1976, the number two spot in the agency, will step down to allow the Reagan Administration to name its own team at NASA.

NASA Administrator Dr. Robert A. Frosch announced prior to the presidential election that he would resign Jan. 20 to become president of the American Association of Engineering Societies. (DEFENSE DAILY, 1-6-81, p. 3, Vol. 114, No. 1)

<> NASA's space science spokesman Nicholas W. Panagakos, 55, died Dec. 28 of a heart attack at a hospital in Portland, Me. He has been NASA's public affairs officer for space science since 1971. He joined NASA in 1962 and worked for eight years as the information officer for the Goddard Institute for Space Studies in New York. During the 1968 presidential campaign, he was a speechwriter for Democratic vice presidential candidate Edmund Muskie. (DEFENSE DAILY, 1-6-81, p. 7, Vol. 114, No. 1)

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January 7: The Intelsat Board of Governors last month approved the purchase of three new Intelsat V-A communications satellites from an international team headed by Ford Aerospace for about \$100 million.

At the same time, the Board authorized Ford to proceed with long lead-time efforts in order to maintain options for up to three more Intelsat V-A's.

The new spacecraft will be basically similar to the Intelsat V spacecraft built by Ford, but will incorporate modifications and improvements that will boost their capacity from 12,000 to 15,000 telephone calls, plus two television channels.

The Intelsat V-A's are to be launched in the 1984-86 time period, augmenting the nine Intelsat V's which will be launched by the end of 1982. The first Intelsat V was successfully launched Dec. 6.

Intelsat plans to follow the Intelsat V-A series with a series of Intelsat VI satellites with a capacity of more than 40,000 telephone calls and two television channels. (DEFENSE DAILY, 1-7-81, p. 13, Vol. 114, No. 2)

<> NASA and the European Space Agency (ESA) have been unable to work out an agreement under which NASA would provide the Deep Space Network for tracking the ESA Giotto Halley's Comet mission in exchange for providing experiments on the spacecraft. Instead ESA is looking to purchase the DSN time or to barter something else in exchange for the time.

NASA had proposed to provide the DSN tracking and the Delta launch vehicle for Giotto in exchange for two principal investigator experiments on the ESA spacecraft, but use of the Delta in place of the French Ariane was vetoed in ESA. The Europeans then turned down the exchange of DSN alone for the two major experiments, feeling that this was too much to pay.

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A decision on the Giotto payload is expected after ESA's Space Program Committee meets Jan. 16. The spacecraft is expected to carry six or seven major experiments. It is considered likely that the U.S. will be invited to participate as co-investigators on one or two of the experiments.

Meanwhile, NASA's Jet Propulsion Laboratory is seeking Reagan Administration's initiation in FY '82 of a \$250 million U.S. Halley's mission, but there has been no indication from the Reagan camp that it intends increases in the space budget. (DEFENSE DAILY, 1-7-81, p. 14, Vol. 114, No. 2)

<> The first Space Shuttle scheduled to fly in space is currently undergoing checks of its systems while it sits at the launch pad.

Last week, the orbiter was connected to ground systems, and was powered up using ground electrical power for the first time at the pad. Validation of all connections to the Space Shuttle vehicle was complete early this week, and tests of many orbiter systems were underway.

Tests completed included the development flight instrumentation, radar altimeter, navigation radios, and the external tank to solid rocket booster connections. Also verified was the operation of the gaseous oxygen vent arm and hood, the so-called beanie cap which will remove cold oxygen vapors from the vicinity of the external tank tip to prevent ice formation.

On the Rotating Service Structure, small air leaks between the covers of the maneuvering system pod purge system and the pads themselves have prevented the purge air from reaching the desired 200 degree temperature. Engineers are checking the design of the purge covers to remedy the leaks.

A final assessment of the remaining gap filler work has determined that about 500 cap fillers remain to be installed before launch.

On Tuesday, checks of the water flow at the mobile launch platform level were begun. The water system will be used both to prevent flame and heat damage to the launch structure and also to provide sound deadening to protect the Space Shuttle from intense launch noise vibrations.....

Scheduled for the remainder of the week is the "Plugs Out Overall Test" which will test the ability of the Space Shuttle Orbiter to function without ground power, as it will after liftoff.

The strong back support for the payload bay doors will be installed in preparation for the cycling of the orbiter's doors while in the vertical position. This also checks the door fit within the Rotating Service Structure. (KSC NEWS RELEASE No. 4-81, 1-7-81)

January 8: Sen. Jake Garn (R-Utah), best known for his strong support of the nation's defense program, has been named the new chairman of the Senate Appropriations Subcommittee on Housing & Urban Development and Independent Agencies -- the unit responsible for the NASA appropriations bill in the Senate.

With the change from Democratic to Republican leadership in the Senate, he succeeds Sen. William Proxmire (D-Wis.) as chairman of the HUD-IA Subcommittee. Proxmire, while he has a reputation of being critical of the space program, has not made a major effort in recent years to take significant funding from the Space Agency.

Garn has not taken an active role on the space program but his aides confirm that the senator is a firm supporter of the Space Shuttle program, recognizing its need for the nation's defense and intelligence program, and he does not want that "critical" program to suffer as a result of the overall Federal budget cutting efforts planned by the Reagan Administration (a reduction which he fully supports).

On the House side, the HUD-IA Appropriations Subcommittee will continue to be chaired by Rep. Edward Boland (D-Mass.), with Rep. Lawrence Coughlin (R-Pa.) expected to continue as ranking minority member. The subcommittee, which has been the major adversary of the NASA program in Congress, upset over cost overruns in recent years, lost only one member in the election.

Garn, who was originally only fifth in line to take the HUD-IA Appropriations chairmanship, wanted the post to consolidate his authority over the nation's housing program. He earlier was named chairman of the Senate Committee on Banking, Housing and Urban Affairs.

Sen. Mathias (R-Md.), who was the ranking Republican on the HUD-IA Appropriations Subcommittee last year, and in line to take the chairmanship, opted instead for a position on the Senate Foreign Relations Committee, which required him to leave Appropriations.

The 11-man subcommittee is comprised of six Republicans, five of whom are conservative, including Sen. Jack Schmitt (N.M.), chairman of the NASA authorizing subcommittee and the leading proponent of the space program in the Senate, and five Democrats, four of whom are liberal. That membership is:

Republicans

Jake Garn (Utah) Chairman
Lowell Weicker (Conn.)
Paul Laxalt (Nev.)
Jack Schmitt (N.M.)
Alfonse D'Amato (N.Y.)
Arlen Specter (Pa.)

Democrats

Walter Huddleston (Ky.) (ranking)
William Proxmire (Wis.)
John Stennis (Miss.)
Patrick Leahy (Vt.)
James Sasser (Tenn.)

(DEFENSE DAILY, 1-8-81, p. 20, Vol. 114, No. 3)

January 9: Sen. Jack Schmitt (R-N.M.), the new chairman of the Senate Subcommittee on Science, Technology & Space, has urged the Reagan Administration to place more emphasis to the general space activities and R & D program of NASA.

In a letter to David Stockman, director-designate of the White House Office of Management & Budget, Schmitt praised Stockman's comprehensive plan to restore the U.S. economy but was critical of Stockman's inclusion of NASA among "low-priority" programs which "could be cut by at least one-third...."

"NASA should not be lumped into a 'low priority' category," Schmitt told Stockman. "This hurts the credibility of your other excellent proposals."

The senator told the OMB chief that his proposed Emergency Economic Stabilization and Recovery program cannot succeed if it ignores "the erosion of our research and technology base. Without that base and its continued reinforcement we will have little to which to recover to. Our over-all productivity, our national security and the motivation of our young people are all tied directly to the growth of that base."

The senator listed 11 non-defense R & D activities that "clearly are adding basic economic strength and should be emphasized in any recovery program." including the following five involving NASA:

- 1) Cooperative technology development programs with industry and academies, particularly in aeronautics and energy. Provides advantages in productivity, export and national security.
- 2) General space activities. Provides advances in productivity, national security, national motivation and in the competition with the Soviet Union.
- 3) Space and terrestrial applications. Provides advances in productivity, national security, mineral resource assessment for domestic, national security and foreign policy purposes.
- 4) Space research and technology. Helps keep future options open.

5) Technology utilization. Adds to short-term productivity growth.

Schmitt also called for support for the traditional basic research program and science and engineering education activities of the National Science Foundation and for the basic and applied energy research programs of the Energy Department.

At the same time, Schmitt said the following R & D activities can be deferred or de-emphasized: the applied research activities of NSF, and DOE's solar information/marketing program, ocean systems program, biomass program, coal conversion program and synfuels program.

He also called for a reorganization of some Federal R & D activities to reduce costs and improve management, including:

- Spin-off the Earth resources remote sensing activities of NOAA into the private sector, with NASA retaining cooperative technology development.
- Dismantle DOE by reestablishing ERDA as a separate agency without regulatory authority; creating a Nuclear Power Administration from elements of DOE and NRC, and combining all necessary non-nuclear energy regulations in a separate independent agency. (DEFENSE DAILY, 1-9-81, p. 25 & 26, Vol. 114, No. 4)

<> High attendance figures capped the year 1980, as more than 1.5 million people travelled to Kennedy Space Center's Visitors Center, the fourth most popular Florida tourist attraction.

More than 19 million people have come to the Visitors Center since it was opened in 1966 to view its wide array of static and dynamic exhibits, rocket and spacecraft displays, space movies and space science demonstrations. (NASA NEWS RELEASE, 1-9-81, No. 5-81)

January 12: NASA Administrator Robert Frosch and other top officials from NASA-Headquarters and field centers were scheduled to meet with top Air Force officials Saturday to consider a decision on the choice of an upper stage for the Space Shuttle for NASA's planetary missions -- starting with the Galileo Jupiter Orbiter & Probe and the NASA/ESA dual spacecraft International Solar Polar Mission.

The Air Force is responsible for developing the solid-propellant Inertial Upper Stage (IUS), planned as the workhorse upper stage for the Shuttle, which includes the basic two-stage vehicle to be used by DOD and by NASA, and the three-stage IUS which will be used for NASA's planetary missions.

But a cost overrun of at least \$112 million and a development completion delay on the Boeing-built vehicle has forced NASA to reconsider its plan for using the three-stage IUS for launching the Galileo in 1984 and ISPM in 1985 on two Shuttle missions each.

If the three-stage IUS is not ready in time for the Galileo launch in 1984, the next launch window for the configuration would be 1987.

The alternatives include:

1) Adapting a Centaur liquid-fueled stage to the Shuttle, which could then launch the Galileo Orbiter and Probe on a single Shuttle mission, but be delayed until 1985. Drawbacks including possible complications in modifying the Shuttle to accommodate the liquid fueled stage...and uncertainty of costs. Some say it will be cheaper than IUS; others that it will be more expensive. Centaur could also launch the two ISPM spacecraft on a single Shuttle flight in 1985 if a modified Shuttle is available.

2) Developing a new two-stage ("twin-stage") version of IUS, which would employ two of the larger IUS motors, rather than one large and one small. This configuration is designed to be able to launch Galileo and ISPM on single Shuttle launches, but would extend the Galileo flight time from two to four years.

Galileo and ISPM program officials would like to proceed with their programs as currently scheduled, with the three-stage IUS and dual launches in 1984 and 1985, respectively, although a twin-stage with a top stage could do the ISPM as a single launch in 1985 and is considered a viable alternative. They see going to the Centaur, with the changes to the spacecraft that it would require, as being the least desirable option.

But Space Transportation officials, faced with the IUS cost problems and possible further delays, see the Centaur as a strong option.

The new Boeing proposal for a twin-stage IUS offers advantages as well as disadvantages which will be part of complications of the final decision. (DEFENSE DAILY, 1-12-81, p. 35, Vol. 114, No. 5)

- <> OMB director-designate David Stockman in his Senate confirmation hearings last week listed a wide range of Federal programs which he believes can be cut, not excluding NASA, which he earlier listed among agencies that could be cut by "one-third."

Under questioning from Sen. John Glenn (D-Ohio) about the NASA budget, Stockman replied, "I could probably find something in NASA to cut." (DEFENSE DAILY, 1-12-81, p. 34, Vol. 114, No. 5)

- <> Nine members have been named to the Subcommittee on Science, Technology & Space of the Senate Commerce Committee, under the chairmanship of Sen. Jack Schmitt (R-N.M.). The subcommittee, headed last year by Sen. Adlai E. Stevenson (D-Ill.), who retired, is responsible for the NASA authorization bill. Senators named to the subcommittee are: (R) Schmitt (chairman), Barry Goldwater (Ariz.), Nancy Kassebaum (Kans.), Slade Gorton (Wash.) and Robert Kasten (Wis.).

(D) Donald Riegle (Mich.) (ranking), Wendell Ford (Kty.), Ernest Hollings (S.C.), and Howell Heflin (Ala.)

On the GOP side Kassebaum and freshmen Gorton and Kasten are new to the subcommittee. Former committee member Robert Griffin (Mich.) has retired.

For the Democrats, Heflin is new to the subcommittee, and Sens. Russell Long (La.) and Edward Zorinsky (Neb.) have dropped off along with Stevenson. (DEFENSE DAILY, 1-12-81, pp. 35-36, Vol. 114, No. 5)

- <> The Defense Department acknowledged Thursday that an experiment with a laser "pointing and tracking" device for aiming weapons in space will be conducted onboard the Space Shuttle.

It said the experiments involved a "small laser which is not a laser weapon," emphasizing that "it is not an experiment of laser weaponry."

Development of a laser weapon to defend against Soviet ballistic missiles is not foreseeable within this decade," the Pentagon said. (DEFENSE DAILY, 1-12-81, p. 34, Vol. 114, No. 5)

- <> NASA, which has put off plans for follow-on missions to Mars until the 1990's, is looking at a new proposal for a combined Mars Rover and Sample Return Mission -- the most ambitious proposed mission to Mars since the proposals for manned landings during the Apollo era.

The proposal for the Rover/Sample Return Mission, both of which separately are future mission candidates, was developed by NASA's Jet Propulsion Laboratory and Johnson Space Center. JPL, which built the Viking Mars Landers, is looking at the Rover, while Johnson is interested in the sample return. (DEFENSE DAILY, 1-12-81, p. 33, Vol. 114, No. 5)

January 15: NASA is now estimating that the total cost of developing the Space Shuttle will be \$9.6 billion, an increase of 26 percent above inflation from the original estimate (\$5.12 billion in FY '81 dollars). The total investment cost for four Shuttles, including development, production and facilities, is now between \$14 billion and \$14.5 billion. (DEFENSE DAILY, 1-15-81, p. 55, Vol. 114, No. 8)

January 16: Both the primary and backup astronaut crews for the first Space Shuttle flight got some valuable experience at the pad here last week. The four, plus other astronauts and some ground support personnel, were briefed on the use of the emergency pad escape system, known as the "slidewire."

The slidewire system might look like a thrill ride, but its purpose is to provide a quick and sure escape from the upper pad platforms in case of a serious emergency.

Five steel cables extend from the Fixed Service Structure at the level of the orbiter access arm and descend to a point about 1,200 feet to the west, just inside the pad perimeter. On each cable rides a flatbottomed basket made of Kevlar, a heat resistant, synthetic fiber. Each basket can hold up to three persons and is positioned for easy entry in event of an emergency.

Should the astronauts or ground personnel need to evacuate the tower faster than the elevator could function, they would board the baskets and release them. The descent is controlled by a friction brake, but still achieves speeds approaching 60 miles per hour on its way to the bottom.

Near the bottom, each basket engages a net, which in turn is connected to rows of heavy chains, which drag along the ground and act as a brake. The deceleration and stop is progressive, but rapid, and the system is similar to that once used to stop runaway jet aircraft.

Once stopped, persons in the baskets can run to a protective bunker or can use a tracked vehicle parked near the bottom of the cables. The vehicle can be driven away from the pad to safety.

For last week's lessons, the flight crews wore the space suits and other equipment they will wear during a mission. Such garments can make running and climbing cumbersome, and the astronauts learned where the more awkward phases of the procedures occur.

To eliminate any possible hazard to personnel during the tests, sandbags are used to duplicate the weight of riders. The system is similar to that used for Apollo flights, except that the older system used a single, large basket instead of several smaller ones. (SPACEPORT NEWS, 1-16-81, p. 2, Vol. 20, No. 2)

<> Barely showing its age, Pioneer 6 last month marked its 15th birthday - the longest lifespan of an interplanetary spacecraft to date.

Launched on Dec. 16, 1965, on Delta-35 from Cape Canaveral, Pioneer 6 has been circling the Sun between the orbits of Venus and Earth, cranking out data on the Sun's corona, solar storms, and even a comet's tail.

The tiny, 140-pound probe has circled the Sun 17 1/2 times, covering over 9 billion miles, and has sent about four billion data bits to Earth. Whenever the busy "big dish" antennas of NASA's Deep Space Network aren't tied up with other missions, they tune in for the latest report from Pioneer 6. The data received is forwarded to Pioneer experimenters and other space scientists and to "solar weather forecasters" at the NOAA Solar Disturbance Forecast Center at Boulder, Colorado. (SPACEPORT NEWS, 1-16-81, p. 4, Vol. 20, No. 2)

January 17: China is not training astronauts, but is interested in the U.S. space program, U.S. Rep. Bill Nelson reports from his trip to the Far East.

The Melbourne Democrat met this week with Chinese Vice Premier Fang Yi, minister of the state council in charge of the Science and Technology Commission.

"The vice premier said the Chinese are not training astronauts at present, although the Shanghai Daily reported last year that China had started an astronaut training program," said Nelson from Peking, one of the stops for his delegation from the House Science and Technology Committee. (TODAY, 1-17-81, p. 6A)

January 18: "It worked." That was the word from Bay St. Louis, Miss., where engineers fired a test version of the Space Shuttle's engine system for 10 minutes and 29 seconds Saturday afternoon.

The firing was the 12th and longest test of a system similar to the three engines now bolted to the Spaceship Columbia. That leaves only a final test of the flight engines on the Kennedy Space Center pad sometime in February. If that test is successful, the engines will be approved for the Shuttle's maiden flight - now scheduled for March, but more likely to take place in April or May.

A spokesman for Marshall Space Flight Center in Huntsville, Ala., the center responsible for the development of the engines, said the test went as planned.

"With today's successful firing, all main propulsion test objectives for the first flight and some objectives for later missions have been achieved," said James M. Sission, Marshall's manager for engineering and major test management office.

Saturday's test was something of a milestone in the Shuttle's development. Had the test been a major failure, it is likely that performing a retest would have delayed the launch of the Shuttle. (TODAY, 1-18-81, p. 11A)

January 19: NASA has decided to terminate development of the three-stage Inertial Upper Stage which was designed to launch the agency's planetary mission from the Space Shuttle and instead opted for the use of a modified Centaur upper stage for that role. The two-stage IUS will be retained for both NASA and DOD missions.

NASA Administrator Dr. Robert Frosch acknowledged that such a "significant change" in the agency's plans "will be subject to confirmation" by the new Reagan Administration.

The change to the more powerful, liquid propelled Centaur will allow NASA to launch its two currently approved planetary missions -- the Galileo Jupiter Orbiter & Probe and the NASA/ESA International Solar Polar Mission -- on single Shuttle flights rather than two flights each, but will require a delay in the Galileo from 1984 to 1985, ISPM will remain scheduled for 1985. (NASA's Space Science Office says that modification of the spacecraft for combined launch will not pose difficult problems, particularly since they were originally planned as combined launches.)

The agency's decision was announced Thursday afternoon by Frosch, who said the decision was based on the "rapid escalation of estimated costs" for the three-stage IUS and on NASA's conclusion that there is "a very low probability that we can prepare a three-stage IUS in time" to conduct the Galileo Orbiter and Probe launches to Jupiter in 1984.

NASA cannot use the three-stage IUS for a 1985 Galileo launch because its thrust is not great enough.

The other option open to NASA, the use of a new twin-stage version of IUS (using two large motors instead of one large and one small one), would increase the flight time for the Galileo Orbiter from two to almost five years, push back the launch of the Galileo Probe to 1986 and necessitate "an unacceptable long gap in the scientific data" from the program. Moreover, adoption of the two-stage IUS would cause a "sharp rise" in the cost of both the planetary program and the IUS, Frosch said.

Although NASA in the past had rejected use of the Centaur for the Shuttle upper stage (including a specific "directive" from the House Appropriations Committee) on the grounds of cost and the complications of modifying the Shuttle, Frosch says that NASA has no choice but to go to that vehicle now to conduct the Galileo and ISPM.

"No other alternative upper stage is available on a reasonable schedule or with comparable costs," he said.

The NASA administrator did not provide details of the costs involved in the stage decision, but said that the agency has funds in its FY '81 and FY '82 budget to begin modifications of the Centaur, integrating it with the Shuttle, and making the "relatively minor changes" to launch facilities at Cape Canaveral to accommodate Centaur. He said the agency intends to contract with General Dynamics this spring for integration of Centaur into the Shuttle.

A year ago, the cost of Centaur's development was estimated at \$390 million.

"The Shuttle/Centaur would satisfy our planetary mission needs and would offer both to commercial customers and to national security interests a highly capable launch vehicle with growth potential," Frosch said.

The NASA chief said the agency will discuss with the Air Force "the best means for providing upper stages" to meet U.S. needs "in the second half of the decade" and work with them to continue development of the two-stage IUS, which remains a need of both agencies.

Boeing is prime contractor for the two and three-stage IUS, with United Technologies the propulsion subcontractor. (DEFENSE DAILY, 1-19-81, pp. 74-75, Vol. 114, No. 10)

<> NASA submitted a \$7.081 billion FY '82 budget request to the White House Office of Management and Budget, which pared \$355 million, or 5 percent from the request, to \$6.726 billion figure.

The original OMB cut in FY '81 was \$307 million, or 5 percent, but the President later cut another \$200 million from the agency in a budget reduction.

Most of the major cuts made in the FY '82 NASA budget request involved work towards providing a full-capability Shuttle system. (DEFENSE DAILY, 1-19-81, p. 73, Vol. 114, No. 10)

January 21: NASA has officially approved the continuation of Voyager 2 on a trajectory which would take it to Uranus in 1986 after flying past Saturn this summer.

Under the approved plan, the spacecraft will encounter Uranus at a distance of 107,000 kilometers (66,000 miles) Jan. 24, 1986, making measurements and taking pictures as it speeds past and heads for a possible encounter with Neptune.

The Uranus encounter will provide the world with its first close-up look at that planet.

The decision to fly past Uranus is, in effect, a decision to retain the present trajectory. If agency officials had decided against a Uranus encounter, then a retargeting of the Voyager 2 would have been required.

Voyager 2, launched Aug. 20, 1977, is a sister ship to Voyager 1, which recently provided a historical close-up encounter with the ringed planet Saturn. Voyager 2 flew by Jupiter in July 1979 and will encounter Saturn August 25, 1981. (MARSHALL STAR, 1-21-81, p. 4, Vol. 21, No. 19)

<> NASA Saturday successfully concluded its series of Space Shuttle Main Engine Main Propulsion Tests with a 10 minutes and 29 second static firing of the three-engine cluster at the National Space Technology Laboratories at Bay St. Louis, Miss. The agency termed the test highly successful. The test was conducted at 100 percent of rated power, with one engine shut down 236 seconds into the test as planned. The test also included gimbaling of the nozzles and pogo simulation. The MPT program included more than one hour of engine firings.

Meanwhile at Johnson Space Center a three-day full-scale simulation of the first flight of the Space Shuttle Columbia was scheduled to begin yesterday. The prime crew for the mission, scheduled for March 14, John Young and Robert Crippen, will be in the mission simulator for the test. The test was slated to begin with a simulated liftoff at 6:30 AM CST Jan. 20 and conclude with a landing at 2:30 PM Jan. 22. (DEFENSE DAILY, 1-21-81, p. 93, Vol. 114, No. 12)

<> NASA's work toward development of a Space Station, seen for years as the next logical step in the space program beyond the Shuttle and Shuttle augmentation, will continue through FY '82 at very low level under the new FY '82 NASA budget. The Space Operations Center (SOC) concept developed by Johnson Space Center is now the prime Space Station candidate. The FY '82 budget contains some \$5,000,000 to \$7,000,000 for continuation of SOC Phase A studies. Initiation of the SOC Core and Modules is proposed for FY '84. (DEFENSE DAILY, 1-21-81, p. 93, Vol. 114, No. 12)

<> New World Construction, Inc., Titusville, Fl., has won a \$79,657 contract to install an air ventilation system in the Vehicle Assembly Building at NASA's John F. Kennedy Space Center.

The contract, one set aside for award to a small business firm, calls for the fabrication, installation, and testing of an air ventilation system in the low bay of the VAB, the world's second largest building.

The changes provided by the new system will provide fresh air to a work area and upgrade the system's generator. (NASA NEWS RELEASE, No. 11-81)

January 22: Sen. Howard Cannon (D-Nev.), who has been closely associated with the space program almost from its inception, has called on the Senate to take up the question of U.S. space policy now that the country is about to enter the Space Shuttle era.

Cannon, former chairman of the committee responsible for the NASA authorization in the Senate, said he believes the United States should move ahead with the fifth Space Shuttle Orbiter; increase its investment in space science, space applications, and space R & D; encourage private sector investment in the space program; and move to meet the launch vehicle competition from abroad.

"We have invested heavily, and we have worked hard to attain a leadership position" in space, he said in remarks addressed to the Senate. "I would not like to see our position wither away. We should not walk away from the environment of space and leave it to others until such time as we understand fully its uses and its implications for our national well-being." (DEFENSE DAILY, 1-22-81, pp. 99-100, Vol. 114, No. 13)

<> Kennedy Space Center Workers are preparing for a major test of the Space Shuttle this morning - the loading of the Shuttle's fuel tanks with liquid oxygen and liquid hydrogen.

Although the test will begin three days later than originally scheduled, William Schick, chief of Shuttle prelaunch test and operations branch, insists the Shuttle can still be launched in March.

"We may be able to compress or do some testing in parallel to make up those three days," Schick said. "We look good at this time for mid-March."

Today's test will mark the first time the supercold fuels that power the Shuttle's three main engines have been loaded into the Shuttle's tanks. Engineers will carefully monitor for an ice buildup, Schick said.

Experts fear ice may cascade off the Shuttle's fuel tank, damaging the spaceship Columbia's fragile, heat-resistant tiles. Accordingly, they have taken a number of precautions to prevent icing, including insulation of the fuel tank and the installation of vapor catchers.

Just before an actual Shuttle launch, both the hydrogen and oxygen tanks will be filled at approximately the same time.

But for today's and Friday's test, the hydrogen tank will be filled one day and the oxygen tank the next day.

After both tests, the tank will be photographed with infrared and regular cameras to check for ice buildup. Then a team of six workers will spend an hour checking the tank and the Orbiter's tiles at five different levels.

Those who hope to catch a long-distance glimpse of the operation from Playalinda Beach will be disappointed.

The beach is closed today and is likely to remain closed Friday and Saturday.

NASA spokesman Rocky Raab said the only beach access road is being closed as a safety precaution.

The major Shuttle tests that remain include: loading of the hazardous hydrazine fuel that will power the Shuttle's two in-orbit engines, the on-pad firing of the Shuttle's three main engines, and simulated flights by the astronauts into and out of orbit.

Late Tuesday, NASA officials at the Johnson Space Center in Houston said astronauts and flight controllers overcame a series of problems programmed into a simulated flight of the Space Shuttle Columbia.

The 54-hour simulation was designed to follow the same flight plan as the Shuttle's first orbital mission.

Malfunctions are introduced into the flight to give astronauts John Young and Bob Crippen and flight controllers practice in solving problems.

Officials said the programmed computer problems in Tuesday's test included a malfunction in one set of orbital maneuvering thrusters and failure of three inertial measuring units.
(TODAY, by David Bailey, 1-22-81, p. 14A)

January 23: An area that might easily become a target for reduction in the NASA budget if the Reagan Administration carries its budget reduction pledge to NASA, but one that NASA believes is highly important, is the \$300 million request in the FY '82 budget for Space Shuttle "Changes/Systems Upgrading."

This money is in fact a contingency fund to pay for potential unknown, but not unexpected, problems that may occur as the Shuttle nears the end of development and begins production and operational use. Availability of the funds allows the agency to budget the money in the most cost-effective manner without disrupting other elements of the program.

The probable need for the funds is indicated by the fact that the \$150 million budgeted in FY '81 for this line item has already been earmarked for Shuttle development.

At the same time, if the money does not have to be used for unforeseen problems, NASA has identified certain areas of the Shuttle program where the money could be used effectively to enhance the Shuttle's capabilities. (DEFENSE DAILY, 1-23-81, p. 108, Vol. 114, No. 14)

<> NOAA, which was assigned the job of establishing the Operational Landsat Land Remote Sensing Satellite System, has been given a \$264.8 million Satellite Services budget for FY '82, an increase of 182 percent from the \$94 million FY '81 budget.

The bulk of the increase is the new line item for \$123.8 million which will enable NOAA to establish a Landsat Operational System, based on an extension of the planned Landsat-D system being built for NASA. NOAA is spending about \$1.2 million on Landsat planning in FY '81.

The other major NOAA satellite line item, Environmental Satellite Services, is funded at \$118.1 million in FY '82, up from \$78.1 million in FY '81. Funding provides for operation of the national environmental satellite system. Increases provide for a polar orbiting satellite system, reimbursement to NASA for launch vehicles and launch services, and initiation of the NOAA/NASA/DOD National Oceanic Satellite System (NOSS). The FY '82 NOAA budget reflects decreased cost of continuing the polar orbiting and geostationary satellite systems. (DEFENSE DAILY, 1-23-81, p. 108, Vol. 114, No. 14)

January 24: America's first Space Shuttle crew members said Friday they have confidence in the Orbiter Columbia and feel ready "right now" for their scheduled March 17 liftoff.

Astronauts John Young and Bob Crippen said NASA's new versatile spacecraft has pushed technology 10 years ahead and may let America build a space station within the decade.

"The Shuttle will enable us to do in space in the next five years what would take 20 to 30 years without it," Young said. "America needs a space station, and with the Shuttle, we can build it at one-tenth the cost."

Speaking to newsmen at Johnson Space Center in Houston, the astronaut's press conference was beamed via television to five other NASA centers, including Kennedy Space Center.

They were asked several questions about their confidence in the brand new and untested Space Shuttle. Unlike the former Mercury, Gemini and Apollo space programs, NASA will not launch unmanned test flights of the Shuttle.

"If we can be confident with anything, I believe it's this vehicle," Young said. "Obviously we think it's safe, or we wouldn't be doing it."

The program is three years behind schedule and has overrun cost estimates of about a billion dollars, largely because of problems installing silica tiles to protect the Shuttle from scorching temperatures of re-entry.

The tiles are four to five times stronger than they need to be.

Young said that in the next several weeks some 3,600 tests will be made on the vehicle.

One of those, a liquid oxygen fuel loading test scheduled for Friday, was canceled to allow the launch team some rest from Thursday's successful loading of the Shuttle's tanks with liquid hydrogen.

The supercold fuels power the Shuttle's main engines and will hurl the vehicle into space with more than 7 million pounds of thrust.

Instead of the fuel loading test, technicians successfully re-tested three Shuttle auxiliary power units Friday. The test loading of liquid oxygen will take place today, said NASA spokeswoman Leslie Vock.

The astronauts also talked about the tests they will make of the craft's flight systems, environmental control systems, and opening the vehicle's payload bay doors.

There also will be other more mundane tasks like "checking out the potty on board," Crippen said.

"It's a test flight to check all systems," he said. "We mainly want to get it up and get it back down. Most of our training is devoted to two phases, the launching and landing." (TODAY, 1-24-81)

January 26: Washington--Soviet Union launched 12 new spacecraft in the closing days of 1980, bringing the total number of Russian launches for the year to 89. In contrast, the U.S. launched 13 missions in 1980, nearly seven times less than the Soviets; a disparity that continues to concern U.S. space officials.

From the launch of Sputnik 1 on October 4, 1957, to the end of 1980, the Soviets logged 1,339 launches in which a payload at least achieved earth orbit. The U.S. has logged 587 launches.

Total number of Soviet spacecraft launched in 1980 is more than 100 because at least two of the 89 launches carried eight spacecraft and some other Russian launches carried piggyback payloads in addition to the primary spacecraft.

The 89 launches for 1980 is the third highest annual launch rate demonstrated by the Russians and continues the aggressive military launch pace characteristic of the Russian space program during the past several years. During 1975 the Soviets also launched 89 missions. In 1976, 1977, 1978 and 1979 they launched 99, 98, 88 and 87 missions, respectively.

Ten of the missions in 1980 were to the Salyut 6 space station. Six of these were manned Soyuz flights and other four Progress tankers. The Soyuz 35 crew established a new manned flight endurance record of 185 days aloft during the course of this manned activity.

Of the 12 new spacecraft launched between Dec. 16 and Dec. 26, when Soviet launch activity for the year terminated, two were military photo reconnaissance satellites, eight were military communications spacecraft and two others were television relay and scientific mission oriented. (AVIATION WEEK & SPACE TECHNOLOGY, 1-26-81, p. 61, Vol. 114, No. 4)

<> The two astronauts who will fly the first Space Shuttle mission told a press conference in Houston Friday that they believe that the risks in the flight have been minimized, that they have full confidence in the Space Shuttle vehicle and the Shuttle team, and that they are ready to make the flight now.

Veteran astronaut John Young, who will command the mission, reported that he and his copilot Bob Crippen were "very pleased" with the just-completed three-day full-scale simulation of the first Shuttle flight which included more than 42 hours in the simulator for the planned 54-hour flight. He said that some 40 problems were encountered in the simulation and all were solved in real time. That capability is what makes space flight "such a great thing in this country." He praised mission control for a "terrific job."

Asked again about the risks in the flight, Young pointed out that extensive tests have been designed to cover every possibility imaginable. He said it is the nature of the space flight business to find problems and fix them.

"If there is a vehicle we can have confidence in, it's this vehicle," he said on a nationwide hookup to several NASA centers.

The astronaut, who has flown both Gemini and Apollo missions, said the Shuttle has a 1.4 safety margin, which is a "higher safety margin than any airliner."

"We obviously think it is safe or we wouldn't be doing it," he said.

Asked about the NASA decision not to include the Tile Repair Kit on the first flight and the affect that would have on the mission, Crippen said that he believes that NASA took the right course in placing the emphasis on making sure that the tiles will work.

Young added that the reason that the repair kit won't be on the first flight is simple: it's not ready. He noted that inclusion of the kit would entail a weight penalty of about 1000 pounds.

Asked about the possibility of flying the Shuttle unmanned in the first flight, Young said it would cost an additional \$250-\$500 million and delay the program for at least an additional year.

Questioned about the objectives of the first flight, Crippen said that if they can "get up and down even in one day" they would satisfy 95 percent of the mission's objectives. Another important objective, he said, will be to open the Shuttle's payload bay doors.

He added that the Shuttle vehicle is "looking real good and John and I are looking forward to a good flight."

Questioned about a purported 5-6 week delay in the first Shuttle flight beyond the March 14 date, Young said that such a delay would probably have to involve a roll-back of the Shuttle to the VAB, which he does not anticipate. He said as far as he knows, the Shuttle is only "two or three days" behind schedule for a launch March 14. (DEFENSE DAILY, 1-26-81, p. 116, Vol. 114, No. 15)

<> Former Rep. Olin E. ("Tiger") Teague (D-Tex.), a long-time chairman of the House Committee on Science & Technology and a leading congressional supporter of the space program, died Friday of renal failure and a heart attack at the National Naval Medical Center in Bethesda, Md. Teague, who was 70, served in the Army during World War II, was in combat 6 months, wounded a number of times, decorated eleven times and was discharged as an infantry colonel in 1946. Teague was elected to Congress in 1946 and served 16 terms before retiring in 1978. (DEFENSE DAILY, 1-26-81, p. 117, Vol. 114, No. 15)

January 27: The accident that damaged a Delta rocket booster last week cost millions of dollars and will "definitely" delay the launch of a weather satellite, NASA officials said Monday.

"It may be a total loss," said NASA spokesman Rocky Raab, who said the accident is still being investigated by a six-man assessment team.

The mishap occurred Thursday when the door of a rotating launch tower slammed into the first stage of the Delta rocket. The 74-foot rocket stage swayed six feet, almost toppling before it returned to an upright position.

Impact from the collision left a six-inch tilt in the rocket's inter-stage adaptor, a hollow 15-foot tube that links the first and second stages. Fuel tank connections in the rocket engines also appear to be damaged, Raab said.

The rocket's second and third stages were not in place at the time of the accident. A fully assembled Delta rocket is valued at about \$22 million.

The door that collided with the rocket had been closed accidentally during the night, Raab said. Investigators have not revealed the name of the worker who closed the door.

Raab said the accident will "definitely" delay the planned March 12 launch of a Geostationary Operational Environmental Satellite (GOES-E). The weather satellite is the second in a series of satellites launched by NASA for the National Oceanic and Atmospheric Administration.

During hurricanes and tornadoes the GOES satellites will measure atmospheric temperatures and moistures at various layers for a three dimensional profile of severe storms. (SENTINEL STAR, 1-27-81)

<> Kennedy Space Center engineers are inspecting a leaky seal on the external tank of Space Shuttle Columbia to determine if repairs will delay its scheduled March launch.

Gas that escaped during a weekend tanking operation or moisture in the air likely caused the erosion of the tank's foam insulation used to keep the tank from overheating and improve its aerodynamics, engineers said Monday.

"The seal didn't fit good," said Terry Williams, division chief for mechanical systems in shuttle launch operations, "and that's where we had damage to the foam insulation."

But Williams stressed that fixing the tank "will be a one-man, simple operation where you spray in primer and then patch in bonding matter and put some paint on over that."

The damage occurred when aerospace workers were loading liquid oxygen into the shuttle tank Saturday. The test left an area at the top of the 154-foot high tank damaged.

Engineers have not pinpointed the problem and until the damage is assessed, cannot predict if the first launch will have to be pushed back.

The damage could alter the tank aerodynamically and cause a poor seal when the tank is loaded for the on-pad firing of the shuttle's engines next month, Williams said. (HUNTSVILLE TIMES, 1-27-81)

- <> Rockwell International has named James A. McDivitt, a former astronaut, vice president, strategic management. (THE NEW YORK TIMES, 1-27-81)

- <> Reagan Administration budget director Dave Stockman, who earlier included NASA among agencies and programs that could take a "one-third" budget cut, appeared to reverse his course last week by praising the space program as a valuable contributor to American technology and a source of inspiration to the public.

The Space Shuttle, which accounts for half of the NASA budget, is considered fully exempt from any potential cuts, given its importance for planned defense and intelligence missions which President Reagan has singled out as particularly important.

The space program also received a highly favorable report from the Reagan space transition team.

Among the proposals for an initial trimming of the Federal budget is a 2 percent across-the-board in non-defense programs, which could represent \$134 million out of NASA's \$6.7 billion in FY '82 budget.

Reagan is expected to submit his revised FY '82 budget next month. (DEFENSE DAILY, 1-17-81, p. 127, Vol. 114, No. 16)

- <> NASA-Kennedy has awarded a \$3.9 million contract to Frank Briscoe, Inc. to activate and modify the High Bay 2 at the Orbiter Processing Facility. Work will include providing ground support equipment for the Orbiter hydraulic system and the platform for installing the Thermal Protection System and providing access to the Orbiter's payload bay doors. Work is expected to take 14 months. (DEFENSE DAILY, 1-27-81, p. 128, Vol. 114, No. 16)

January 28: A low-level study of a revolutionary space launch system that could launch "telephone pole-size" payloads of up to one-ton into orbit around the Earth is being conducted by NASA's Lewis Research Center, Cleveland.

The concept for the new system, an electromagnetic rail launcher, has been around for some 60 years, but has become of renewed interest because of recent laboratory advances which have increased the potential velocity of the system. (The electromagnetic rail launcher is akin to the "mass driver" proposal of space colony advocate Prof. Gerard K. O'Neill.)

Laboratory tests using a tiny electromagnetic rail system able to accelerate a few grams of material have achieved velocities of 10 kilometers per second, about half of what would be needed in an operational space launch system.

A project official noted, however, that an actual operational space launch system is probably "20, 30, 50 years away."

He estimated that such a system might cost on the order of \$20 billion, with much of the cost involved in providing the large amount of electrical power needed.

The electromagnetic rail launcher would be like a "lightning bolt," generating a massive amount of electrical power in approximately one second. Once built, the system could be used for multiple launches per day. One application might be to launch structural sections of a Space Station or a Space Base. The system could potentially provide enough materials for construction of a station structure in a matter of days.

The payload would have to be accompanied by a solid rocket, which would fire to circularize the orbit.

Lewis has been working on the concept for about a year, with about 1-1/2 man years of effort. A small increase is hoped for, but budget dependent.

The center is currently negotiating a contract to Battelle Columbus Laboratories to study the feasibility of electromagnetic rail launchers for space launch. Battelle will look for problems that would discourage NASA from proceeding with the study, as well as provide recommendations concerning future investigations. The study will run about a year. (DEFENSE DAILY, 1-28-81, p. 133, Vol. 114, No. 17)

<> Kennedy Space Center engineers found additional problems caused by last week's loading of supercold oxygen and hydrogen into the Space Shuttle's fuel tank as they continued their inspection of the tank Tuesday.

Most serious was a 2-foot by 4-foot area on the tank where the inner coating of insulation has actually come unglued from the tank's aluminum surface.

Officials had hoped if any debonding occurred, it would be between the outer coating of foam insulation and the thin inner coating of insulation, not between the inner coating and the tank's aluminum skin.

An initial assessment indicated it will take a week to repair the area, said Brian Grigsby, section chief for external tank and solid rocket booster mechanical systems.

Workers will lower floats -- plywood platforms suspended by ropes -- into the hard-to-get-to area, near where the Orbiter's nose is attached to the external tank.

But fixing the area is not as much a concern to officials as what caused the debonding.

"Now we have to determine why it debonded," Grigsby said. "We're hoping it's something simple like a bad batch of adhesive."

Officials are worried because the tank must be loaded two more times: once for a 20-second test firing of the Shuttle's engines and once again for liftoff.

If engineers cannot determine why the insulation came unglued, there's no guarantee it won't happen again.

Because the insulation protects the Shuttle from the heat of ascent and smooths its ride aerodynamically, the insulation must be nearly flawless.

Grigsby said fixing a 1 1/2-foot-long crack on the lower section of the tank will be relatively easy. Workers will use a gun similar to a handyman's caulking gun to apply additional insulation.

Engineers are also trying to determine why an area where oxygen vents from the top of the tank eroded insulation. The best method to fix that area is still under consideration, Grigsby said.

The areas must be repaired before the tank is reloaded for the on-pad firing of the Shuttle's three engines, still scheduled for Feb. 10. Grigsby said workers will do their best to make the repairs so that it will delay neither the test firing nor the March 17 launch date. (TODAY, 1-28-81)

<> The Space Shuttle's External Tank was filled with propellants for the first time during a tank-detank test last week at the Kennedy Space Center. The test was successfully completed Saturday night, bringing the launch of Columbia one step closer.

The test, which began last Tuesday was designed to check out the ground and vehicle's hydrogen and oxygen systems, according to Pete Leberte, Deputy Manager, Shuttle Engineering and Major Test Management Office.

Marshall engineers monitored the tanking from the HOSC. Leberte said, "Although we have simulated the tanking and detanking over 30 times, this was the first chance we've had to actually monitor the vehicle with the cryogenics aboard."

Leberte said, "All the test objectives were met without any major problems." He added, "We did find a couple of problems with procedures and few leaks in the ground system, but they are not expected to cause delays in the program." (MARSHALL STAR, 1-28-81, p. 1A, Vol 21, No. 20)

January 29: Jones Machine and Welding Shop, a Merritt Island, Fla., company, has been awarded a \$135,995 contract to fabricate 17 shoe retainer mechanisms for use at NASA's John F. Kennedy Space Center.

The shoe retainer mechanisms are part of the eight posts that attach the 4.4 million pound Space Shuttle to the Mobile Launcher Platform. Eight giant bolts hold the twin solid rocket boosters to the posts until lift off, when the bolts are exploded, freeing the Shuttle for flight. At lift off, the shock-absorbing springs inside the mechanisms allow the shoes to move and prevent them from being blasted away from the launch platform.

The shoe retainer mechanism will also be used at Vandenberg Air Force Base in California on the launch deck in future Space Shuttle launches.

The contract, one set aside for award to small business firms, calls for delivery of the mechanisms by July 15, 1981. (KSC NEWS RELEASE No. 17-81, 1-29-81)

<> NASA's John F. Kennedy Space Center has awarded a \$233,670 contract to David Boland, Inc., a Titusville company. The contract, one set aside for award to a small business firm, calls for modification of an existing building at KSC.

The building, currently used for maintenance and storage, would be converted into a series of shops to support tile processing. The tiles, which make up a major portion of the thermal protection system of the Space Shuttle orbiter, are processed by Rockwell International employees for installation on Space Shuttle orbiter.

The contract allows 60 days for the work to be completed. (KSC NEWS RELEASE No. 16-81, 1-29-81)

<> Chairman Don Fuqua (D-Fla.) of the House Science & Technology Committee indicated yesterday that the real increase in the NASA budget in FY '82 was long overdue and that the agency should not be a target of Reagan Administration budget-cutters.

While the Congress has to fight double-digit inflation, he told the NASA leadership at budget hearings, it must make certain that it doesn't "mortgage the nation's future progress" by taking funds from an agency such as NASA which contributes to much of the nation's technology base. He said he agrees with former NASA Administrator Frosch about the need to "revitalize" NASA.

He said there is growing concern about what may happen to the NASA budget, and that this is something that "Congress must grapple with." (DEFENSE DAILY, 1-29-81, pp. 140-141, Vol. 114, No. 18)

<> A delay in the launch of the Space Shuttle is foreseen following the development of cracks in the insulation of the vehicle's External Tank earlier this week.

About 50 square feet of the spray-on foam insulation on the Space Shuttle Columbia's External Tank developed cracks following the first propellant loading and unloading test of the tank which was concluded Tuesday at Kennedy Space Center.

NASA's Acting Administrator Dr. Alan M. Lovelace said yesterday that if the cracking is confined to the surface of the foam insulation, which is employed to prevent icing of the aluminum ET structure as well as to provide thermal insulation, then it is not a major problem and is "easily correctible."

In such a case, he estimated it would take 7 to 10 days to repair the insulation, which would delay the Shuttle Flight Readiness Firing now scheduled for mid-February and probably push back the first Shuttle launch from March 17 to the end of March.

L. Michael Weeks, Deputy Associate Administrator for Space Transportation Systems, reported to the House Science & Technology Committee that the agency had a similar cracking problem 6-8 weeks ago on the instrument pylons on the hydrogen tank. He said the agency solved that problem by making smaller pieces for the structure, and intends to do the same thing on the cracked portion of the ET's spray-on foam insulation.

The cracking of the foam insulation was attributed to the temperature and environmental changes in the tank caused by the extremely low temperature LOX/liquid hydrogen propellant. (DEFENSE DAILY, 1-29-81, p. 140, Vol. 114, No. 18)

January 30: Air Force Secretary Hans Mark, called by some the leading candidate for NASA Administrator, is one of the persons that Sen. Jack Schmitt (R-N.M.), chairman of the Senate Space Subcommittee, could support for the job. However, reports that Mark is the single choice of the senator are not correct. Schmitt has urged the Administration to look for a NASA Administrator who not only has the technical knowledge of recent NASA chiefs but also a knowledge of Capitol Hill.

Mark, who headed R & D for the Air Force before getting the top job, is a former director of NASA's Ames Research Center, which developed the concept of the Thermal Protection System for the Space Shuttle. Mark said earlier this year that he believes that the nation needs a minimum of five Space Shuttles. At the same time, he has advocated development of a new expendable launch vehicle for defense needs. (DEFENSE DAILY, 1-30-81, p. 150, Vol. 114, No. 19)

<> The launch of a weather satellite will not be delayed because of the accident that dented a Delta rocket last week. And the dented first stage is being sent back to the factory for possible repairs, a NASA spokesman said Thursday.

The launch of the GOES-E mission on schedule March 12 is possible because of the substitution of the first stage of another Delta rocket. A first stage was ready and waiting in a Cape Canaveral Air Force Station hangar for the June launch of an RCA communications satellite.

Kennedy Space Center officials reported at first that the run-in the Delta rocket had with its gantry on Jan. 22 might render the multi-million dollar first stage useless. The booster however, is being sent back to the McDonnell Douglas Astronautic Co.'s Huntington Beach, Calif., factory for inspection and possible reuse.

As soon as the tottering rocket was secured in place, a board of review went to work to determine the cause and extent of the accident. The Board is headed by Andrew J. Pickett, manager of the advanced planning and technology office.

A KSC spokesman reported that "the investigation board is actively pursuing the cause of the mishap and has not yet completed its investigation for its final report...but corrective actions have been incorporated into the Delta processing operations."

Blame for the accident has not yet been assigned.

The KSC spokesman said that processing of the new Delta will begin today with the erection of the first stage. It will continue next week, he said, with the mounting of the nine assist rockets. By Feb. 16, it is hoped the mission will be back on schedule. (TODAY, 1-30-81)

January 31: We'd have been well advised at least to have mentioned Explorer I last week when we wrote about the 10th anniversary of the Apollo 14 launch and the 20th anniversary of chimpanzee Ham's flight on a Mercury-Redstone.

The same day - January 31 - but three years earlier than Ham's ordeal, the first U.S. satellite lifted off Pad 26A at the Cape atop a Jupiter C rocket and achieved earth orbit.

It transmitted back to earth its discovery of a radiation belt (named after scientist James Van Allen) it hung tough for a dozen years before re-entering earth's atmosphere.

A few readers wanted to know why we'd slighted that historic space "first."

Well, guys, we really didn't. In fact, when Explorer I had its 20th anniversary in 1978, we celebrated it with a memory by Cocoa Beacher Bob Murkshe. When the satellite was launched he was RCA's manager of metric optics.

One of the great rocket pioneers, the late Dr. Hans Gruene, was sitting in the blockhouse at the corner of the launch console. In front of him was a pile of papers. As the rocket roared into space, recalled Bob, "He did real-time computation of the trajectory with a slide rule!" Why didn't he use a computer, you ask? Ha! Who had a computer? Why, that little battery-operated device with pushbuttons that you take shopping with you would have been worth its weight in diamonds then! (Milt Salamon in TODAY, 1-31-81)

January 1981: NASA's Kennedy Space Center has awarded its largest contract ever to a small business to the W & J Construction Corp., Cocoa, Fla. The \$6,689,666 agreement is for work on Pad B of Launch Complex 39 which will be used to launch the Space Shuttle in 1982, when the Shuttle becomes operational.

Under the fixed-price contract, W & J Construction, which has had previous Kennedy Center contracts, will install the long-run piping and cable to pump and monitor fuels, coolant, gaseous helium and nitrogen, compressed air and hydraulic fluids from their storage areas on the pad to the fixed service structure and the rotating service structure.

Connections to the Space Shuttle are made from the two service towers. Work is expected to be completed in 20 months. Pad B of Complex 39 is basically a duplicate of Pad A, the pad to be used to launch the first Shuttle flight.... Pad B will be used when the Shuttle begins regular operations. Complex 39 was the launch site for the Apollo moon landing missions and is being modified for Space Shuttle flights. (NASA ACTIVITIES, 1-81, p. 6, Vol. 12, No. 1)

<> Engineers at the Kennedy Space Center have begun a "grow your own" exploratory project designed to cut down on energy costs. Funded by NASA's Office of Energy Programs, the \$20,000 study is aimed at finding an energy efficient method of using various plant species for use as energy sources. The study will examine plant utilization by direct combustion, digestion to methane and fermentation to alcohol. The latter is receiving the most attention at the present time, using sugar cane or cassava. The plants will be used to produce alcohol for use as gasoline or in a specially altered car which will run on pure alcohol. (NASA ACTIVITIES, 1-81, pp. 17 & 18, Vol. 12, No. 1)

<> The KSC Awareness Report is a new daily on-center radio program, the first of its kind at a NASA Center. The innovative broadcast features news reports on everything from the latest payload lofted into orbit to the problems of preserving historic but deteriorating launch site structures. Produced by the Education and Awareness Branch of the Kennedy Space Center Public Affairs Office, the broadcast airs every weekday morning from 6 to 8 at 1610 KHz on the AM radio dial -- the same frequency used later in the day to transmit visitor information to tourists driving onto KSC and Canaveral National Seashore. (NASA ACTIVITIES, 1-81, pp. 17 & 18, Vol. 12, No. 1)

February 1981

February 2: Rep. Edward P. Boland (D-Mass.) has been reelected chairman of the HUD-Independent Agencies Subcommittee of the House Appropriations Committee, the unit responsible for the NASA appropriation in the House. The makeup of the subcommittee, because of GOP gains in the November election, has been shifted from 7/3 for the Democrats to 5/3. (DEFENSE DAILY, 2-2-81, p. 159, Vol. 114, No. 20)

<> Emphasis of the Advanced Programs part of the NASA Space Transportation System budget, funded at \$10.8 million in FY '82, will be on four major categories:

- 1) Unmanned Low-Altitude Space Platforms.
- 2) Unmanned Geostationary Platforms.
- 3) A Manned Space Operations Center.
- 4) Various elements of orbital test and transportation to support the above.

The FY '82 budget provides funds to continue design studies to define platform and power support systems and definition studies of geosynchronous platforms and the Space Operations Center concept. A Shuttle-serviced, permanent manned low-altitude facility continues under study. Definition studies will also be conducted on large structures, satellite servicing, and advanced transportation options. (DEFENSE DAILY, 2-2-81, p. 158, Vol. 114, No. 20)

<> Cape Canaveral -- Plan to phase out expendable launch vehicles has undergone a full reversal in the past few months and there is a belief here that the McDonnell Douglas Delta launcher will remain in use for years to come.

A combination in the slippage of the commercial operation of the space shuttle and strong demand by contractors to use space as a communications relay medium has prompted the National Aeronautics and Space Administration to take two major steps:

*Reorganize the management structure of the Kennedy Space Center to recognize the growing requirement for Delta and General Dynamics Atlas Centaur launches.

*Refurbish a second Delta launch pad to increase the launch rate to 10 per year from this facility.

Charles D. Gay, director of deployable payloads operations, said: "I don't know if we'll ever do away with Delta."

Under the center organization in effect prior to Jan. 5, part of Gay's operations involved deployable space shuttle payloads. This was done in anticipation that all payloads would do into shuttle.

The refurbishment of Pad 17B is being done so it can launch the Delta with Castor 4 solid propellant strap-on motors. Hoist capacity is increased from 25,000 to 40,000 lb., decks are being strengthened and cutouts enlarged to accommodate the larger solids. Previously, the Delta was launched from this pad with Castor 2 strap-on solid motors.

There are firm commitments by contractors to use Deltas through 1985 from the Cape Canaveral launch complexes and through next year from the Western Test Range at Vandenberg AFB. Atlas Centaur launch commitments go through 1984. (AVIATION WEEK & SPACE TECHNOLOGY, 2-2-81, p. 36, Vol. 114, No. 5)

<> Cape Canaveral -- National Aeronautics and Space Administration has convened a board of review to determine the impact of an accident in which a gantry door struck in the interstage adapter on a Delta launch vehicle on Pad 17A here.

The accident occurred on Jan. 22 as the tower was being moved to permit installation of three Castor 4 solid propellant strap-on rockets on the Delta. Force of the impact caused two of three bolts securing the launcher to pull free from their mounts and the vehicle to tilt several feet.

The Delta was scheduled to launch a geosynchronous operational environmental satellite (GOES), a weather payload, Mar. 12.

The first stage of the Delta was returned to the factory for refurbishment. It was placed with the first stage of a vehicle that was scheduled to launch the RCA-D satellite June 25. (AVIATION WEEK & SPACE TECHNOLOGY, 2-2-81, p. 36, Vol. 114, No. 5)

<> To the Editors:

With the launching of the space shuttle this year, Americans will once again be migrating to a new frontier. As in California more than a century ago, the colonization of space offers the same hope for new resources, new industry and a renewed sense of national spirit. (TIME, 2-2-81)

William N. Ellis
Huron, Ohio

Some people loudly object to NASA and the shuttle, saying the money should be spent elsewhere. From the beginning of the manned space program in the late 50's until the end of Project Skylab in 1979, NASA spent approximately \$60 billion. This sounds like a lot until one considers that today \$60 billion would last four months in the Department of Health and Human Services. (TIME, 2-2-81)

Kenneth P. Myers
Houston, Texas

February 3: The first launch of the Space Shuttle, previously scheduled for March 17, has been delayed to the week of April 15th at the earliest because of "a number of minor problems" encountered during the first integration of the Shuttle and its ground systems at Launch Complex 39A at Kennedy Space Center.

The most serious of the problems was the debonding of the spray-on foam insulation on two areas of the Space Shuttle's External Tank during fueling and defueling. One area is 7-by-8 feet and the other, 4-by-4 feet.

At the same time, NASA has rescheduled the critical Flight Readiness Firing (FRF) of the Shuttle Columbia's three main engines from Feb. 10 to Feb. 16. The 20-second firing has to be successful if the early April launch is to be made.

The rebonding of the spray-on insulation of the ET will not be made prior to FRF, NASA said, but well before the scheduled launch date. (DEFENSE DAILY, 2-3-81, p. 164, Vol. 114, No. 21)

<> The space agency yesterday delayed the maiden launch of the space shuttle Columbia from March 17 to the week of April 5 because of the failure of insulation on part of the ship's large external fuel tank.

The delay is another in a long series of launch postponements caused by a variety of technical problems. The first orbital flight of the reusable space transport is more than two years behind its original schedule.

The insulation problem was discovered after the two-section, 154-foot-tall tank was loaded with more than a half million gallons of frigid liquid oxygen and liquid hydrogen 10 days ago. (THE WASHINGTON POST, 2-3-81)

February 4: The Multi-Spectral Scanner on the Landsat-3 spacecraft has failed after 22 months in space, leaving only the MSS on Landsat-2, which was launched six years ago, to provide the multi-spectral data until Landsat-D is launched in the later half of 1982.

NASA blamed the Landsat-3's MSS problems on a failure in the multiplex digitizing circuits. It said that the spacecraft's MSS data has degraded "below the point of general operational usefulness" and that all attempts to correct the problem had failed. Landsat-3's Return Beam Vidicon Camera continues to operate. The spacecraft was launched in March 1978 and had a one-year design life. (DEFENSE DAILY, 2-4-81, p. 174, Vol. 114, No. 22)

- <> NASA's Kennedy Space Center is modifying a second Mobile Launcher Platform to adapt it for future Space Shuttle launches. The center has awarded a \$2 million contract to K & S Electric, Inc. to make mechanical and electrical modifications to Mobile Launcher Platform 2, a transportable launch base that was previously used for Saturn/Apollo missions. (DEFENSE DAILY, 2-4-81, p. 176, Vol. 114, No. 22)
- <> Third-term congressman Rep. Ronnie G. Flipppo (D-Ala.) has been elected chairman of the Subcommittee on Space Science & Applications of the House Science & Technology Committee, succeeding Rep. Don Fuqua (D-Fla.), who has headed the subcommittee for eight years.

Fuqua, who continues as head of the full committee, has shifted to the chairmanship of the committee's Subcommittee on Energy Development & Applications. (DEFENSE DAILY, 2-4-81, p. 177, Vol. 114, No. 22)

February 5: Among more than 100 possible cuts that could be made in the FY '82 budget, the Congressional Budget Office has included the elimination of the fourth Space Shuttle Orbiter, at an estimated savings of \$583 million.

However, the Reagan Administration, aware of the military potential of space and other needs, is expected to exempt the Shuttle from its budget cuts.

NASA flight projections, of course, not only show that three vehicles are not adequate, but that four will not be enough.

CBO noted that the fourth Orbiter is estimated to cost \$979 million, of which \$51 million has been authorized for FY '81. In addition, other costs of the fourth Orbiter cannot be separated from the common costs of the Shuttle production programs. It noted that when NASA deleted the planned fifth Orbiter, it estimated the savings to be \$365 million, or 63 percent of the estimated total costs for that vehicle. Sixty-three percent of \$979 million is \$583 million.

CBO noted that if one of the three Orbiters became inoperable and the Shuttle flight schedule were maintained, DOD would have to purchase about \$100 million worth of expendable launch vehicles to conduct its "critical missions." An alternative, it said, would be for the military missions to be given priority over civilian flights on the remaining Orbiters. (DEFENSE DAILY, 2-5-81, p. 180, Vol. 114, No. 23)

February 7: Hoping to make a name for their city, Titusville officials will hold a pre-Space Shuttle launch party for the nation's media and political heavyweights.

The only problem that has cropped up so far has been the date to be engraved on the 1,000 invitations.

Party planner Donn Searle said it's impossible to know the date of the party because NASA doesn't know exactly when the launch will be.

"We decided to put 'the afternoon preceding the launch of the Space Shuttle Columbia,'" Searle said.

Among those to be invited to the executive bash will be all U.S. representatives and senators in town for the launch, ranking military leaders, Gov. Bob Graham and the rest of the Cabinet, local officials and reporters from the big three television networks, foreign press and news wire services.

The event is being sponsored by Titusville city administrators with help from the Titusville Area Chamber of Commerce and the North Brevard Development Commission. (TODAY, 2-7-81, p. 2B)

February 9: Brown & Associates Management Services Inc., a Titusville, Fla. firm, has been awarded a \$321,579 contract to continue keypunch services for a second year at NASA's John F. Kennedy Space Center. The first year contract was for \$286,959 bringing the two-year total to \$608,538.

The contract, one set aside for award to a small business firm, will provide the major portion of keypunch and keyverify support services for NASA and NASA contractors at Kennedy Space Center.

The contract provides continued employment for 13 keypunch operators and two supervisors in the Central Instrumentation Facility. (KSC NEWS RELEASE NO. 28-81, 2-9-81)

February 10: NASA's John F. Kennedy Space Center has awarded a \$1,298,834 contract to a joint venture made up of three Central Florida firms, for the manufacture of 19 hypergolic control and checkout panels.

Each company will fulfill an aspect of the contract. Precision Fabrication and Cleaning, Sharpes, Fla., will fabricate and clean the panels; Olson Electric Co., Daytona Beach, Fla., will do the electrical work and Specialty Maintenance and Construction, Lakeland, Fla., will supply materials and make frames for the panels.

The hypergolic panels will be used at Vandenberg Air Force Base in California, to service the in-orbit propulsion systems of the Space Shuttle. Hypergolic propellants ignite upon contact and are used for the orbiter's secondary propulsion and attitude control systems. The hypergol control and checkout panels will be used to drain and clean the hypergol modules during ground servicing.

The contract calls for the work to be completed in one year. (KSC NEWS RELEASE NO. 26-81, 2-10-81)

February 11: The following is the membership of the House Subcommittee on Space Science & Applications, responsible for all but the aeronautics portion of the NASA budget, in the new Congress:

*Democrats: Ronnie G. Flipppo (Ala.), Chairman; Bill Nelson (Fla.), George E. Brown, Jr. (Calif.), Maryilyn Lloyd Bouquard (Tenn.), and Ralph M. Hall (Texas).

*Republicans: Harold C. Hollenbeck (N.Y.), ranking minority member; Raymond McGrath (N.Y.), and Bill Lowery (Calif.). (DEFENSE DAILY, 2-11-81, p. 215, Vol. 114, No. 27)

<> "The 1980's promise to be a decade of significant progress in international space cooperation," stated Dr. Alan M. Lovelace, acting NASA Administrator, in recent testimony to the U.S. House of Representatives Committee on Science and Technology.

"We will see the culmination of many cooperative projects begun in the 1970's, and will be laying the groundwork for future cooperative endeavors," he said.

"Last year saw tremendous progress in the Shuttle main engine program," Dr. Lovelace said. "We have now accumulated over 105,000 total test seconds, having completed single engine certification late last year, and three-engine cluster firings early this year. Future work will continue to expand the operating envelope both in terms of thrust and engine life." (MARSHALL STAR, 2-11-81, p. 4, Vol. 21, No. 22)

February 12: 2-D. Mr. Hollinshead said that the KSC list of VIP invitees for STS-1 launch had been compiled and that the gross number was less than 400 against a quota of 300. Those who cannot be accommodated will be given car passes for the Parkway site.

Tours and visitors to the VIC continue to exceed previous marks with this February being seven percent above last year.

2-E. Mr. Page reported on STS-1 vehicle status. He said that hypergolics are on board and that his desire is to keep it loaded rather than drain and refill. He is negotiating this position with Safety. He also reported that the most recent inspection showed that there was very minor tile damage -- 1 to 4. He also stated that the prospects are marginal for the simulated FRF scheduled for February 12.

There are some problems with SAIL software. The FRF is scheduled for February 17 with the TRR scheduled for two days before the completion of the simulated FRF. Mr. Page also discussed the likelihood of having to install microphones in the nose cone of the external tank to determine vibration experienced during the tanking process.

2-F. Mr. Walton said that the Comstar should be erected on February 10 and that launch on February 19 still looks good. He also reported that there was a problem with AC-56 launch vehicle which may require a destack. He also reported on the status of the Delta-GOES. They are reworking the operating procedures and have instituted a requirement that all operations will be performed with an observer in the block house.

There are conflicts within the schedule for launch of this vehicle which will probably cause a slip from March 12 to March 19. (EXECUTIVE STAFF NOTES #5-81, 2-12-81, p. 2)

<> NASA's John F. Kennedy Space Center has awarded a \$489,700 contract to the Holloway Corp. of Titusville, to remodel part of a building for computer space for future Space Shuttle users.

The contract, one set aside for award to a small business firm, calls for the renovation of the fourth floor of the Operations and Checkout Building in the KSC Industrial Area. False flooring and partitions in four rooms will be replaced with new flooring, wiring, air conditioning and a fire detection system.

The area will be made suitable for companies to house Spacelab experiment test and checkout equipment. The work will be completed in 185 days. (KSC NEWS RELEASE NO. 32-81, 2-12-81)

February 13: Officials of Rockwell International said yesterday that they are not looking at a cutoff of the Space Shuttle's Solid Rocket Boosters in planning for the Space Shuttle launches, that they assume, that once the solids ignite, they will continue to burn. Under questioning, they also said that if for some reason the SRB's cannot be separated from the Orbiter, the Shuttle cannot make orbit. (DEFENSE DAILY, 2-13-81, p. 229, Vol. 114, No. 29)

<> "Blacks are a little like the space program - very few people realize how much we owe to their contributions," says J. Diggs, KSC's Chief of the Opportunity Program Office.

Shedding light on those contributions is the idea behind the annual observance of National Afro-American History Month. The theme for the 1981 observance is "Black History: Role Model for Youth." KSC's tribute to Blacks, sponsored by the Equal Opportunity Advisory Committee, ends today.

Special events held this week included an exhibit of African art and artifacts, a special "soul" food menu in the Headquarters cafeteria, and the highlight of the week, a program featuring Dr. Julian Earls of Lewis Research Center as guest speaker.

Dr. Earls spoke to the theme of this year's observance, outlining the accomplishments of several notable Blacks. He emphasized that these Black Americans serve as outstanding role models for virtually anyone, but especially to the youth of this country, who are in need of recognizable role models. (SPACEPORT NEWS, 2-13-81, p. 4, Vol. 20, No. 4)

February 17: Dr. Stephen Gorove of the Ole Miss law school is an expert on how domestic and international law applies to outer space.

He has published two books on space law - the most recent being "The Space Shuttle and the Law" - and helps put out the The Journal of Space Law, the only journal in the world devoted exclusively to the legal problems arising from trips beyond our world.

"Really, the launching of the space shuttle will probably be the most significant event that has taken place since the beginning of the Space Age," Gorove said.

"It is going to open up my field - insurance, legal problems, criminal jurisdictions, civil liability. It's an enormous field which is opening up entirely new possibilities for government and industry."

Gorove said the thorniest question of law, as it applies to the shuttle, is when and where the craft is considered a spaceship and where it might be considered an airplane.

"Space law should be applied to the shuttle," he said. "In the current state of the technology, it is a spacecraft. If it is going to someday in the future fly as an aircraft flies, then we will have to take another look at it."

The question of spacecraft or airplane is important because different laws apply to the two types of vehicles, he said.

Space law is set down in four principal treaties, which set jurisdictional boundaries and liability limits and help officials deal with problems of liability in case of accidents and in insurance coverage, Gorove said.

A fifth treaty - the moon treaty - is currently being considered by the United States. (DAILY PRESS, [Newport News, Virginia], 2-17-81)

<> A crucial countdown rehearsal began tonight that will determine if the space shuttle Columbia is ready to carry two astronauts into orbit in April on its maiden voyage.

The 2 -day test, already delayed 24 hours, was intended to exercise all elements of the shuttle's system for the first time.

Experts at the Kennedy Space Center conducted the count, while flight controllers at the Johnson Space Center in Houston - where April's flight will be controlled - monitored the activity.

At Marshall Space Flight Center in Huntsville, Ala., design specialists stood by to provide advice on the shuttle engine systems.

The test includes all aspects of the launch countdown except for the astronauts - John Young and Bob Crippen - in Columbia's cockpit. During the practice, 526,000 pounds of liquid hydrogen and oxygen fuel were to be pumped into the vehicle's external tank. (THE WASHINGTON POST, 2-17-81)

February 18: Figures provided by NASA last year, prior to recent changes in the Shuttle launch schedule, show a total direct Space Transportation System cost of \$15.5 billion as follows:

(In Millions of Dollars)

Funding Through --	<u>FY '80</u>	<u>Completion</u>	<u>Total</u>
Shuttle Development	8,130	683	8,813
Shuttle Production	1,234	2,801	4,035
Operations Capability Dev.	122	188	310
Spacelab	125	326	451
KSC Facilities	225	30	255
Other Shuttle Facilities	185	30	215
Total	10,021	4,058	14,079
Adjustments			
Extend Shuttle Dev.			
Through '82	-	600	600
Shuttle Production:			
Real Year \$	-	292	292
Changes & System Upgrading	100	450	550
Add	100	1,342	1,442

(DEFENSE DAILY, 2-18-81, p. 246, Vol. 114, No. 31)

February 19: According to preliminary NASA estimates, it would cost something over \$3 billion to develop an orbiting manned space facility for launch in the late 1980's. Specifically, the agency put the cost at \$2.5 billion to \$3 billion in FY '75 dollars.

To launch a facility the size of Skylab (done on a single Saturn V flight in 1973) would take about four dedicated Shuttle flights at a cost of about \$100 million in FY '75 dollars.

(NASA's candidate manned space facility is the Space Operations Center, funded at less than \$1 million in FY '82). (DEFENSE DAILY, 2-19-81, p. 255, Vol. 114, No. 32)

<> With a countdown rehearsal running hours behind schedule yesterday, the space agency postponed a test firing of the space shuttle Columbia's main engine another 24 hours, until Friday.

"We got 11 hours behind in the count and decided to put off everything 24 hours," launch director George Page said in announcing the delay of the firing to 7:45 a.m. Friday. (PHILADELPHIA INQUIRER, 2-19-81)

<> With various tasks in the countdown for the Space Shuttle Flight Readiness Firing (FRF) taking longer than expected, NASA yesterday rescheduled the 20-second firing to 7:45 AM Friday, a 24-hour delay. The countdown was 11 hours behind schedule at 10 AM yesterday and officials added an 8 hour hold to allow workers a time to rest and catch up with lagging activities. Consideration was given to a nighttime firing today, but dropped in favor of a firing tomorrow morning. NASA said that "no major problems" had been encountered in the new countdown. (DEFENSE DAILY, 2-19-81, p. 257, Vol. 114, No. 32)

February 21: America's oft-delayed space shuttle received a much-needed boost today with a perfect, 20-second launch-pad test firing of the three main rocket engines, space agency officials said.

But the officials, while jubilant over the test, said a labor walkout at the Kennedy Space Center immediately after the 8:45 a.m. test firing, threatened the April 7 maiden launch of the reusable spacecraft. Officials said 800 aerospace workers and machinists employed by the Boeing Co. in spaceport support work had struck in a pay dispute.

James R. Thompson, Jr., manager of the shuttle's rocket engine program, termed the test "totally perfect from an engine standpoint."

But soon after the test, the jubilation turned to concern over the strike by members of the International Association of Machinists and Aerospace Workers.

An obviously angry Richard Smith, director of the space center, said the machinists went on strike with no warning and placed in some jeopardy the remaining test operations.

"We run a risk of jeopardizing some of the flight hardware," he said, adding the workers have important support jobs during the next few weeks leading up to the launch.

He said the Boeing Co. has a plan to deal with the strike and it is too early to determine if the walkout will affect the flight. Smith said the union members were within their legal rights to strike because their contract with Boeing had expired some time ago.

The workers are involved in a number of ground support operations and Boeing is a major shuttle contractor. (THE WASHINGTON POST, 2-21-81)

February 22: Boeing Services International began replacing 1,050 of its striking workers at Kennedy Space Center with management personnel Saturday to avoid any delays in the launch of the Space Shuttle Orbiter Columbia.

"We're doing everything in our power to make sure the strike doesn't interfere with the launch date," said Boeing Services official Donna Mikov.

Members of the International Association of Machinists and Aerospace Workers walked off the job Friday in a contract pay dispute. The walkout followed the 20-second successful test firing of the Shuttle's three main engines.

The walkout Friday initially jeopardized some post-test operations, such as purging Columbia's fuel tanks. But management personnel were able to fill in, officials said.

Boeing's contract with the union expired Jan. 23. Federal mediator Richard Deen said no progress had been made in bringing the two sides closer to an agreement.

Union representative Ted Maddin said Boeing and NASA were inviting a strike by making their pay offer and shouldn't have been surprised by Friday's walkout.

"They like to act like they're so naive and didn't know what was going on," Maddin said. "This could be a long strike because it was obviously planned by NASA and Boeing."
(TODAY, 2-22-81)

<> After reviewing preliminary data from the test firing Friday of the Space Shuttle Columbia's main engines, NASA officials Saturday reported it was "a very clean test."

Scientists said the 20-second test, which spewed flames and steam over the launch area, did little damage to the Shuttle.

"We didn't see any damage to any of the tile on the vehicle," said Kennedy Space Center spokesman Hugh Harris. "But there was some gap filler that came loose and we still have to evaluate that. But other than some scorched paint, it looks really good." (TODAY, 2-22-81)

<> An Atlas-Centaur rocket carrying a COMSTAR satellite for use in a domestic communications system roared into space Saturday.

The 20-foot-tall satellite was launched at 6:23 p.m. EST and will join three others used by the American Telephone and Telegraph Company and the GTE Satellite Corporation, a subsidiary of General Telephone & Electronics Corp.

The satellite, which was built to be an on-the-ground spare, will keep the system's capacity at 36,000 simultaneous telephone conversations until 1983, company officials said.

The first two COMSTAR satellites were launched in 1976. They will be moved closer together to serve as a single satellite - primarily for backup - to conserve their batteries, AT & T said. (SENTINEL STAR, 2-22-81, p. 2B)

<> A historian at the University of California, Walter A. McDougall, recently observed that between the two world wars one definition of great power might have been a nation that builds its own airplanes. Today, he said, it might be a nation that launches its own spacecraft.

This definition establishes the United States and the Soviet Union as undisputed superpowers, China, Japan, France, Britain and India as aspirants to modest power, and, as an emerging third force, Western Europe, by virtue of its collaborative space effort, the European Space Agency.

The 11-nation agency is planning a new generation of communication satellites and building a manned laboratory to be launched from Cape Canaveral aboard America's space shuttle, whose test firing last week ESA representatives witnessed. At the same time, the agency is competing with its American cousin, the National Aeronautics and Space Administration, for the space-haulage business by developing the Ariane rocket, which will give Europe its own launching capability. The agency's leaders will meet March 5 in Paris to draft a new 10-year plan for even greater European traffic in space. (THE NEW YORK TIMES, 2-22-81)

February 23: First launch of the Space Shuttle is now on track for early April following the successful 20-second Flight Readiness Firing (FRF) of the three main engines of the Space Shuttle Columbia on the pad at Kennedy Space Center Friday morning.

The test firing was conducted at 8:45 AM, an hour behind schedule because of problems with three of the four ground controls for the hydraulic power for the Solid Rocket Boosters. The three systems, not needed for the FRF, were subsequently turned off by NASA.

NASA reported that early data on the Space Shuttle Main Engine firing "matched perfectly" the results obtained in the acceptance firing of the three-engine Main Propulsion Test Article.

The successful FRF was the last major test prior to launch, which is scheduled for April 7, but expected to slip at least several days.

Development of the Space Shuttle is two years behind schedule. Cost is now estimated at \$9.6 billion, or 26 percent excluding inflation above the estimate made ten years ago (\$5.12 billion in FY '71 dollars).

During the SSME firing Friday, after their work was done, some Boeing contractor personnel working on support tasks walked off the job in a contract dispute. (DEFENSE DAILY, 2-23-81, p. 273, Vol. 114, No. 34)

February 24: In the aftermath of Friday's Space Shuttle engine test, tiles are chipped, tile spacers are missing and the fuel tank is pockmarked.

But inspection teams at Kennedy Space Center who combed the vehicle over the weekend looking for damage resulting from the 20-second engine firing found nothing that will further delay the Shuttle's launch in April, NASA officials reported Monday.

Engineers were worried that the static firing would shake off some of the tiles, which protect the rocket-plane from the fiery friction of ascent and re-entry.

NASA also was worried about damage caused to the Shuttle's fuel tank when it was first filled with super-cold liquid oxygen and hydrogen on Jan. 24.

"It does not appear that the area that debonded in the first tanking test grew in size," a NASA spokeswoman said. However, an outer, foam-like insulation was damaged in two areas, she said. Both of these areas can be readily fixed, she added. (TODAY, 2-24-81)

<> The head of the Soviet Union's cosmonaut training program, Lt. Gen. Vladimir Shatalov, has accused the U.S. of developing the Space Shuttle for military purposes. He cited press reports which indicate that the "scientific and economic aspects" of the Shuttle "have been put on the back burner." The general, whose country has conducted nearly 40 anti-satellite interceptor tests in space, asserted that "space should not be used as an arena for future

confrontations, fighting or resolving questions in non-peaceful ways." (DEFENSE DAILY, 2-24-81, p. 277, Vol. 114, No. 35)

- <> Boeing supervisors from Washington, Kansas, Pennsylvania and California donned hard hats Monday to fill in for 1,000 striking space workers.

Negotiations in the labor dispute were suspended indefinitely Monday afternoon, ruling out the chance for an early settlement. But Boeing officials claim the strike will not delay the space shuttle's scheduled launch in early April.

"We've told NASA that we'll meet our commitments," said Al Evenson, labor relations manager for Boeing Services International, the primary maintenance contractor at the space center. (SENTINEL STAR, 2-24-81)

- February 25:** The nation's space budget has to be cut for political reasons, even though it doesn't make "technical" sense to chop science spending, says the former astronaut who chairs the Senate Science, Technology and Space subcommittee.

"Frankly, I don't think it makes any technical sense to cut the (NASA) budget...but I also know that, politically, to get a general budget-cut package through the Congress, everybody's going to have to bear the burden," says Sen. Harrison "Jack" Schmitt, R-N.M.

Schmitt said that while he completely supports the budget-reduction package President Reagan unveiled last week, his subcommittee "will do what is necessary to fine-tune the administration's proposals" for trimming the budgets of NASA and other science-related agencies. (TODAY, 2-25-81)

- <> Rep. Ronnie Flippo (D-Ala.), the new Chairman of the House Space Subcommittee, has criticized the cuts made in the NASA budget by the Reagan Administration, charging that the revised budget does not adequately provide for a balanced space program.

He said that the revised budget represents a major setback in space science, space applications and in development of the Solar Electric Propulsion Stage (SEPS), failing to recognize "the positive contributions which the NASA programs make" in a wide range of areas, including the nation's economy.

He said his subcommittee will carefully review the actions proposed in space science and applications by the Reagan Administration.

"We want to avoid damage to our space program by arbitrary uninformed budget cuts," he said. (DEFENSE DAILY, 2-25-81, p. 284, Vol. 114, No. 36)

- <> The \$63 million Ground-based Electro-Optical Deep Space Surveillance System, designed to track and catalog objects orbiting the Earth at altitudes between 3500 and 25,000 miles, has begun operating at White Sands Missile Range.

Four additional GEODSS facilities are located in South Korea, Hawaii, the Middle East and Eastern Atlantic Ocean. Site maintenance is provided by RCA.

The GEODSS system, built by TRW, employs a telescope with electro-optic tracking, a television camera and digital computer. It is expected to identify and catalog about 500 orbiting objects in deep space, providing data to the NORAD Combat Operations Center in Colorado. The data will be used in the Air Force Spacetrack satellite surveillance system. (DEFENSE DAILY, 2-25-81, p. 287, Vol. 114, No. 36)

- <> The small, 63-inch-diameter solid propellant motor for the Inertial Upper Stage was successfully test fired for 51 seconds at a simulated altitude of 100,000 feet Feb. 13 at the Air Force Arnold Engineering Development Center.

The test, the 15th consecutive successful test firing of an IUS full-scale development motor at AEDC was the first firing of a 63-inch motor with a 50 percent propellant off-load. The IUS will use varying percentages of fuel,

dependent on mission needs, with duration of engine ignition controlled by the amount of solid propellant employed. The 51-second test generated a maximum thrust of 2300 pounds. The motor's nozzle was deflected plus and minus 7 degrees both in the vertical and horizontal planes throughout firing.

The motor used in the recent design was designed for the use as an upper stage on the Titan-340 expendable launch vehicle. Boeing is developing the 63-inch and a 92-inch-diameter motor for the two-stage IUS to be used on the Titan and Space Shuttle. The motors are built by Norden System's Chemical Systems Division.

A three-stage version of the IUS designed for planetary missions is being terminated by NASA. (DEFENSE DAILY, 2-25-81, p. 287, Vol. 114, No. 36)

<> Comsat's Comstar 4 communications satellite was successfully launched by NASA at 6:23 P.M. EST Feb. 21 from Kennedy Space Center by a General Dynamics Atlas-Centaur vehicle.

The 1746-pound, Hughes-built satcom was placed in a 340/22,240-mile transfer orbit over the equator. Kick stage firing to circularize the orbit at geosynchronous altitude was scheduled last evening by Comsat.

The four Comstar satellites, owned and operated by Comsat General Corp., are leased to AT&T and used jointly by AT&T and GTE Satellite Corp. to provide telephone circuits, WATS and private line services. The satellites can handle 18,000 simultaneous two-way calls and operate at 4/6 GHz.

Comstar 4, to be positioned at 127 degrees west longitude, will replace Comstar D-1 the first of the series, launched in May, 1976.

To succeed the Comstars, AT&T has ordered three advanced Telstar 3 satcoms from Hughes. (DEFENSE DAILY, 2-25-81, p. 286, Vol. 114, No. 36)

February 26: NASA's John F. Kennedy Space Center has awarded a contract modification, valued at \$3,601,000 to International Business Machines Corporation, Federal Systems Division, Cape Canaveral, Fla., for additional system engineering and software development services in support of Space Shuttle checkout and launch systems at KSC and Vandenberg Air Force Base, California.

Under this contract modification, IBM will continue to provide systems and engineering and software development services in support of sophisticated Space Shuttle checkout and launch systems at KSC and Vandenberg Air Force Base, California. Computer systems are used to automatically control and perform much of the Space Shuttle vehicle checkout while the vehicle components are being prepared for launch. The systems also provide the capability for work order control and scheduling and will conduct countdown and launch operations. (KSC NEWS RELEASE No. 40-81, 2-26-81)

<> Comsat General's Comstar D-4 domestic satcom was successfully placed into geosynchronous orbit at 6:36 PM EST Feb. 23 by a firing of its apogee kick motor. The Hughes-built satellite was launched Feb. 21 from KSC by an Atlas-Centaur vehicle. (DEFENSE DAILY, 2-26-81, p. 294, Vol. 114, No. 37)

February 27: The Space Shuttle may not have left its pad but program managers are in orbit over the results of last Friday's flight readiness firing.

The orbiter Columbia's three main engines roared for the planned 20-second static firing - a major milestone leading to the first Shuttle launch.

Engine ignition came at 8:45 a.m.

The critical test received nationwide media coverage with representatives from the three television networks and science writers from major newspapers and wire services present.

In a press briefing held an hour and 40 minutes after the firing, KSC Director Richard Smith and KSC Shuttle Operations Director George Page expressed confidence that the maiden voyage of Columbia will come in April, as scheduled.

"We got through on the first try and we're extremely pleased," said Smith. "I congratulate George and all the people who work for him in getting this done."

The Center Director said he is looking forward to an April launch.

Page told reporters the only anomaly in the test was the premature shutdown of hydraulic power units on the solid rocket boosters, a problem which appeared to be computer related.

"For all that rascal had to do, for that one little error, it still deserves a hand," said Page.

Page and others had been concerned that the enormous number of tasks required of the computer in the last nine minutes of the countdown might overwork the system, triggering a hold. But the countdown went smoothly.

He also praised the professionalism of the launch team on their first Shuttle countdown. "We're very proud," said Page.

"We have a lot more confidence now that we can come close to an early April launch," he added.

Post-FRF inspections have shown some of the orbiter's thermal protection tiles suffered small nicks or chips of a type expected to occur during launches. They can be repaired by treating the surface with silica.

At press time, post-FRF inspections of the external tank's thermal protection panels and the main engines had not yet been performed.

Work on repairing the debonded external tank insulation is expected to take about two weeks.

Damage to the launch facilities at Complex 39's Pad A were described as light and it appeared ready to support the first launch in April.

While the flight readiness firing had the spotlight, other important tests were also conducted last week, including an at-sea operation for the two solid rocket booster recovery ships - the U.S. Freedom and the UTC Liberty.

The ocean recovery operations - conducted in extremely rough seas - involved practicing the recovery of solid rocket booster parachutes and frustums. Also practiced was the dewatering system which will be used to drain sea water from each SRB so they can be towed back to Cape Canaveral.

Despite the rough seas, it was smooth sailing for the tests, program officials said.

In addition to the post-FRF inspections and external tank repairs, several more tests must be run before first launch.

A Shuttle Systems Test - actually a battery of tests performed on each system and sub-system - will begin this weekend to make sure everything is working properly. Then, another series of computer-simulated flights will be conducted with crew aboard the orbiter.

The final major test activity prior to launch will be the "dry" Countdown Demonstration Test - a rehearsal in which the Shuttle's tanks are not loaded with propellants. (SPACEPORT NEWS, pp. 1 & 5, Vol. 20, No. 5)

<> 2-C. Mr. Page gave an overall post-FRF status report. The beanie cap parted at the area where it had been stitched and not glued. The seal will have to be removed for rework and testing at the LETF; three of four HPU's shut down in the minus counting; on hold-down post #7 the B sides did not

fire; assessment of tile damage revealed only minor problems with some chipping and a few gap fillers moved out (would not have affected flight). The External Tank had some minor cracking with no apparent additional separation or debonding.

Mr. Utsman stated that assessment of the pad revealed that there was no damage.

Mr. Parker also reported no major problems with the FRF and few problems with the strike with BSI immediately afterwards. Pickets are at Gates 2 and 4 and the County has motorcycle policemen at both gates.

Mr. Utsman and Mr. Lohse discussed further on the strike and reported that work was continuing and that Boeing had brought in 210 personnel from other areas to assist in continuing essential work. Temporary hires are also being considered by BSI and sub-contractors are continuing to come in. Most strike related impacts are in the work arounds. Mr. Utsman also reported he is running a 24-hour civil service assessment log of strike-impacted work and contractor management personnel are working 12-hour shifts.

Mr. Page reported that a new launch schedule for STS-1 is being assessed.

2-E. Mr. Neilon stated that the Administration budget reductions would have impact on the cargo programs and that schedule impacts on Spacelab were being assessed.

2-F. Mr. Walton stated that the Comstar launch went extremely well with good orbital parameters with final move of the spacecraft scheduled for Monday night.

He also reported that there is still a problem with the Intelsat spacecraft; i.e., the solar panel deployment gear train must be removed and returned for rework. A three to six week slip is expected.

2-G. Mr. Hollinshead said that there had been several breaking and entering incidents at the VIC this past weekend and that Security will probably increase surveillance in that area. (EXECUTIVE STAFF NOTES #6-81, pp. 1-2)

February 1981: Johnson Controls, Inc. of Dallas, Texas, has been awarded a \$2,642,000 contract by NASA's John F. Kennedy Space Center for an electronic security system.

The new security arrangements are to include door alarms, motion detectors, video booths to allow verification of personal identify and area authorization before premitting entry, and conversion of the present method of allowing access by badge display to an electronic check of personal identification codes.

With the electronic system it will be possible, for example, to quickly count and identify individuals in a building or a section of a building at a given time. Elements of the system will be located on KSC and at Cape Canaveral Air Force Station facilities to protect critical flight hardware and Space Transportation System payload preparation and handling. (KSC NEWS RELEASE No. 42-81, 2-81)

MARCH 1981

March 2: National Aeronautics and Space Administration has elected to keep hypergolic propellants in the space shuttle orbiter as a means of reducing launch preparation time for the shuttle by 8-10 days.

The hypergolics -- monomethyl hydrazine fuel and nitrogen tetroxide -- fuel the orbital maneuvering system and reactor control engines. Tanks for both systems are located aft. The reaction control system has additional tanks forward in the orbiter.

It was thought the tanks would have to be emptied to allow workmen access to the external tank for insulation repairs because the hypergolic propellants are hazardous. They are storable and do not boil off and it was decided to leave them in the tanks.

It would have taken about four days to detank the hypergolics after the flight readiness firing and 4-4.5 days to reload them.

Because of the hazardous potential, the launch pad would be cleared during both operations.

The nose section holds 1,369 lb. of oxidizer and 856 lb. of fuel.

Each of the two aft modules holds a total of 2,905 lb. of nitrogen tetroxide and 1,815 lb of fuel. (AVIATION WEEK & SPACE TECHNOLOGY, 3-2-81, p. 19, Vol. 114, No. 9)

<> Sen. Strom Thurmond (R-S.C.) has urged support for the Space Shuttle program, which he says will initiate "a new era not unlike the beginning of aviation 75 years ago."

With its reusable and versatile capabilities, the Space Shuttle "cannot help but enhance the free world's defense capability, assure continued U.S. technological leadership and promote international cooperation in scientific and industrial use of space," Thurmond said.

Asserting that the U.S. space program is at "a critical turning point," Thurmond charged that this country has "all but retreated from space." Meanwhile, "Russian and Soviet bloc cosmonauts come and go like weekend tourists at Salyut 6 (and) the Russians, West Europeans and Japanese will visit Halley's Comet while we sit home and watch."

Beyond just having the Space Shuttle, Thurmond said, "we must make sure that we keep its flight manifest full with the military and scientific payloads that will help to make America first in the world again and keep America first."
(DEFENSE DAILY, 3-2-81, p. 5, Vol. 115, No. 1)

<> Boeing Services International supervisory personnel moved the Complex 39A rotating service structure back into place and did a number of other post-firing supporting functions to safe and secure the launch pad following the walkout of the International Association of Machinists and Aerospace Workers here 15 minutes after the flight readiness firing Feb. 20.

The supervisors last week were installing scaffolding on the rotating structure to enable access to the external tank for repairs on the insulation. The tank will undergo two more cryogenic propellant test loadings to determine whether the insulation will hold. Platform modifications began Feb. 24 and were scheduled to be completed March 1.

Repairs on the tank are to begin March 2 and a goal of 13 days has been set for completion.

The key activity Boeing supervisor personnel performed was supporting, draining and purging of the external tank following the test firing. This was accomplished within 24 hours after the firing to prevent corrosion in the tanks and plumbing.

Approximately 130 non-union Boeing International Services supervisors have been detailed here since the walkout in accordance with the company's strike contingency plan. Less skilled employees are being hired locally. (AVIATION WEEK & SPACE TECHNOLOGY, 3-2-81, p. 17, Vol. 114, No. 9)

March 3: While burly guards with automatic weapons may be enough to keep human saboteurs from the Space Shuttle, an M-16 doesn't stop black belly plovers and tree swallows.

These feathered Brevard residents, along with other bird species, are becoming a "real problem" at the Kennedy Space Center because of potential damage they may inflict to the Shuttle as well as the hazard they pose to training jets used by Shuttle pilots.

It appears birds enjoy nesting around the three-mile long Shuttle runway. NASA officials fear the birds may become feathered missiles and collide with a landing Shuttle or T-38 jet trainers.

The problem is serious enough that NASA is spending \$10,000 to research it. The study, which should be completed by the end of the year, is being conducted by the Merritt Island National Wildlife Refuge Center.

NASA has solved one bird problem, caused by the infamous leas tern. This bird liked to nest at the end of the Shuttle runway. But every time jets revved up their engines for takeoff, the nests of the terns were blown away.

Being a compassionate agency, NASA decided it would be better to get rid of the birds rather than have them engaged in a constant state of home building.

NASA had considered setting up a water piping system to drench the nesting birds. But after studying the problem, the wildlife center recommended painting the end of the runway black, because terns prefer a white decor. The plan worked. (TODAY, 3-3-81)

<> Maybe it's just as well the Space Shuttle won't be launched in March. Much of the runway it would have landed on in California is under water.

The Shuttle's spaceship Columbia is supposed to land on a massive dry lake bed at Edwards Air Force Base after its maiden voyage into space -- still scheduled for the first week in April. But the "dry" lake bed is wet.

"We're getting drizzled on," said Sharon Wanglin, a public information specialist at Dryden Flight Research Center.

If the Columbia were in the air today, it could not land at Edwards tomorrow because of the base's soggy runways. "The lake bed is really an intermittently dry playa (a desert basin)," said T.K. Gwin, Edwards' airfield manager. "What that amounts to is the lowest-lying area in the valley. When it rains, all the water runs there and sits.

"The wind blows the water back and forth and smooths out a clay base that's as much as 150 feet deep in the middle...if it dries out, it makes an excellent runway," Gwin said.

"Right now, it's wet," he said. Puddles 40 to 50 feet across are standing on the runway, but it's not covered from shore to shore, he said.

What about next month, when April showers bring May flowers, and when the Shuttle is scheduled for launch and landing? Excusing the pun, Wanglin said, "It's still up in the air."
(TODAY, 3-3-81)

<> A special team of technicians and engineers arrived at Kennedy Space Center on Monday to begin repairing the Shuttle's fuel tank.

But that work has already been delayed at least six days because the specially sealed scaffolding is not ready.

Two dozen workers with Martin Marietta Aerospace, the company responsible for the Shuttle's external tank, arrived from National Space Technology Laboratories, Bay St. Louis, Miss.

There, they have been practicing repair procedures on a fuel tank similar to the Shuttle's mammoth 154-foot long external fuel tank.

The repairs at KSC, which could begin Saturday if work stands on the Shuttle's launch pad are ready, involve 17 panels of cork insulation in three areas. The insulation came unglued when the tank was filled with liquid oxygen and hydrogen on Jan. 24.

Both Martin and NASA have said the Shuttle cannot be launched until engineers are sure they know why the insulation came unglued. That's because the panels protect the tank's aluminum skin from the heat generated by air turbulence.

That heat can reach temperatures of 1,000 degrees Fahrenheit before the ablative cork insulation starts burning away.
(TODAY, 3-3-81)

March 4: 2-A. Mr. Smith extended his congratulations to everyone involved in the successful Shuttle FRF and said that he had received a congratulatory note from Hans Mark and a letter congratulating all involved from Dr. Lovelace.

Mr. Smith said that a revised STS-1 launch schedule would not be published until the two tanking tests scheduled for March 22 and 25 had been completed. A launch date of not earlier than April 6, 1981, may be used for support planning purposes. The dry CDDT is scheduled for March 17.

2-E. Mr. Utsman reported on progress being made on the external tank access modifications. While they are proving to be very costly, he believes we can make the schedule for a Saturday RSS rotation.

He also reported that there were no new developments in the BSI strike situation and that there are no major impacts.

2-F. Mr. Minderman stated that BSI had been responsible for minor wall rearrangement prior to office moves and while due to the strike some of the changes could not be made affected organizations had given good cooperation in proceeding with moves without these wall modifications which will be performed later. He requested a continuation of everyone's understanding and cooperation. (EXECUTIVE STAFF NOTES, #7-81, 3-4-81, pp. 1-2.)

March 5: Eighteen percent of the U.S. public believes that too little is being spent on space, while 34.5 percent think the space budget is about right and 39.1 percent believe that too much is being spent, according to a national opinion poll taken by the University of Chicago. This from the National Space Institute, which points out that only seven years ago only 7.5 percent of the public thought too little was being spent on space, while 58.5 percent thought too much was being spent. (DEFENSE DAILY, 3-5-81, p. 39, Vol. 115, No. 4)

<> State officials have decided to invest in a special \$650,000 advertising blitz aimed at luring more tourists here during the spring.

NASA could provide a big boost to the April tourism effort if it can keep the launch of the Space Shuttle Columbia on schedule. The launch - first U.S. manned space flight in nearly six years - is expected to draw several hundred thousand people to Brevard, many of whom will be out-of-staters.

Another reason for us to pull for an April launch. (TODAY, 3-5-81)

March 6: The chairman of the Aerospace Safety Advisory Panel has told Congress that there is "no open issue that is a real safety concern" in the first Space Shuttle flight, that he believes the Shuttle is in "good shape" and will have "a good flight next month."

At the same time, chairman Herbert E. Grier told the House Space Subcommittee that there are still some areas of concern about the Shuttle which will have to be further evaluated after the first flight. That flight will "provide a variety of data that should substantially reduce many of the uncertainties and wide variations in predictions now confronting designers," he said.

Asked about the fixes on the insulation of the Shuttle External Tank, Grier said the panel is satisfied with the fixes and believes that the insulation is "perfectly adequate for the first flight."

While there are no unresolved safety issues for STS-1, Grier said there are limitations on the flight, e.g., the astronauts cannot use their ejection system for the first few seconds of the flight because they would "eject into a fireball."

Grier told the Subcommittee that he believes that "funding economies" have adversely impacted the STS-1 mission.

"While this is not directly related to safety, it may create an environment in which the best solutions to problems are not always pursued and may result in the acceptance of more risk than necessary." (DEFENSE DAILY, 3-6-81, p. 43, Vol. 115, No. 5)

March 7: Space Shuttle launch preparations and repairs are on schedule for a launch on April 7, said Don Phillips, a Kennedy Space Center division chief.

But that is based on a success-oriented, very optimistic work schedule, he said. And Phillips is of the opinion that a mid-April launch is more likely.

"My personal opinion, and it does not reflect the opinion of the agency, is somewhere around mid-April, but we have an outside shot at the week of April 6. But admittedly it is an outside shot because one small hit (problem) there, and obviously it will have a schedule impact." (TODAY, 3-7-81)

March 9: In addition to its reductions in the NASA budget, the Reagan Administration continues to leave nine top jobs at the agency, including that of administrator, filled on an acting basis.

Former NASA Administrator, Dr. Robert A. Frosch, resigned effective Jan. 6 and was replaced on an acting basis by Dr. Alan M. Lovelace, the former deputy administrator, who is expected to leave the agency when the Reagan Administration gets around to naming its NASA team.

Lovelace's current two-month stint as acting administrator is the longest the agency has been on an acting basis since George Low served as acting administrator from Sept. 16, 1970, to April 26, 1971, seven months and ten days, during the Nixon Administration.

In addition to the nine posts being filled on an acting basis, the deputy administrator post, the number two job in the agency, remains unfilled, although Dr. Anthony J. Calio, associate administrator for space and terrestrial applications, has been named special assistant to Lovelace, responsible for general management of the agency. That, of course, leaves the Applications Office without a full time chief.

Another NASA official, Dr. Walter C. William, chief engineer, while he is not serving on an acting basis has been assigned to work at Rockwell International for "an indefinite period." (DEFENSE DAILY, 3-9-81, p. 53, Vol. 115, No. 6)

<> Planners of advanced space mission are narrowing the issues on how to establish the first U.S. long-term operating bases in space while they await the Reagan Administration's policy on a possible new space initiative beyond introduction of the shuttle.

The Administration is attempting to cut the National Aeronautics and Space Administration's science and applications budgets severely, but prefers that large cuts not be made to the space shuttle program. Defense Dept. shuttle requirements are a prime factor in this approach.

There is a faction in the Administration that hopes to convince President Reagan to declare the objective of a major new space initiative immediately after the first successful shuttle flight. Decision on a new initiative will have to be made by the Administration, since it will govern space policy for the first four and possibly eight years of the shuttle era.

The development of a large platform capability or manned space station structure are the strongest candidates for such a goal. NASA and industry planners are finding that determination of the most appropriate way to proceed toward these goals will be a difficult task.

The head of advanced programs in NASA's Office of Space Transportation, Ivan Bekey, believes a Reagan statement that "our next major step in space should be establishment of a permanent presence in space" would suffice, leaving NASA to determine the details of the goal after further study. (AVIATION WEEK & SPACE TECHNOLOGY, 3-9-81, p. 75, Vol. 114, No. 10)

March 10: Jointly evading hot air pockets from the press corps, astronauts John Young and Robert Crippen hinted Monday that the first flight of the Space Shuttle may be sweet and low -- an abbreviated version of the scheduled 54-hour flight.

In their last official press conference before the launch of the Shuttle, scheduled next month at Kennedy Space Center, they said the chances of pulling off the entire 36-orbit mission in the Spaceship Columbia is probably unrealistic. A successful mission may be redefined as getting up and getting back, said Crippen.

And don't be surprised if the landing site is changed, Young cautioned. With the previously parched Mojave Desert lake basin at Edwards Air Force Base in California now standing in water, Northrup strip in New Mexico is looking better and better all the time.

Much of the questioning, in fact, centered on what would happen if the astronauts ran into problems. And when a man with a Henry Kissinger accent still had trouble coming to grips with the intricacies of bailing out, Young just blinked and said, "You just pull the little handle."

But for the soggy runway at Edwards Air Force Base, Young had no such snappy answers: "I've heard it from a unreliable, unauthoritative, unofficial source that the lake bed could take a month to six weeks to dry.

"One of the things about landing on a lake bed is if you veer off to the side, you haven't done anything. Whereas if you land on a runway and veer off to the side at a place like Kennedy, you might be swimming with the alligators."
(TODAY, 3-10-81)

March 11: It didn't hurt the space shuttle, but NASA's revised 1982 budget drew angry protest Tuesday from the space agency's European partners.

As expected, the \$6.122 billion budget for the National Aeronautics and Space Administration guarantees full funding for the shuttle but slashes scientific and exploratory space programs to the bone. Bearing the brunt of the budget cuts, many of NASA's cooperative programs with the European Space Agency were delayed or scrubbed.

The worst news was the cancellation of the joint "Solar Polar" mission, scheduled for launch in 1985. The mission was to include two spacecraft: one furnished by NASA and one by the ESA, circling the sun in opposite directions.

The new budget eliminates the American spacecraft and leaves Europe holding the bag. NASA hopes to pack most of its instruments aboard the European probe, but the withdrawal has disturbed NASA's European partners.

Representatives of 11 nations cooperating in the ESA protested the cutbacks in a formal message to the State Department.

"We certainly knew this was coming," said Ian Pryke, a spokesman for ESA's Washington headquarters. "We've been working two weeks to get the mission reinstated; obviously we haven't succeeded."

"Until this problem is solved, we're going to be very wary about future cooperation (with NASA)," Pryke said.

The revised budget also postpones the first three missions of spacelab, a modular laboratory that will ride piggyback in the shuttle's cargo bay. The first mission will be delayed three months; the second two missions for more than a year. (SENTINEL STAR, 3-11-81, p. 8-A)

- <> "My opinion is that NASA's program of planetary and astronomical research is the most productive and exciting element of contemporary science. We now have superb technical and scientific capability for actually doing the investigations that have been the dream and hope of mankind for centuries. As a citizen of the United States, I would be grieved to see this nation deny its capability and its historical destiny." -- Dr. James A. Van Allen, discoverer of the Van Allen Radiation Belts, March 5, 1981. (DEFENSE DAILY, 3-11-81, p. 70, Vol. 115, No. 8)

- <> Repair of the 17 debonded insulation panels on the Space Shuttle Columbia's External Tank got underway Monday at Kennedy Space Center, with the agency expecting the job to take 13 1/2 days. NASA continues to hold to the April 7 launch date, but a slip of a week is not unanticipated. The 3-day launch readiness verification test is scheduled for Friday. Meanwhile, the prime landing site for the STS-1, the "dry" lakebed at Edwards AFB is not dry now after the recent rains, but is drying and expected to be in condition for the STS-1 landing. White Sands is the backup landing site. (DEFENSE DAILY, 3-11-81, p. 70, Vol. 115, No. 8)

March 12: Vice President George Bush will tour Kennedy Space Center on Tuesday afternoon, March 17, as part of a visit to Brevard County.

Accompanied by NASA Acting Administrator Alan Lovelace and Kennedy Space Center Director Richard Smith, the Vice President will visit the Launch Control Center where Space Shuttle checkout and launch activities are being controlled. In the Control Room the Vice President is expected to say a few words to the Kennedy Space Center team responsible for preparing the first Space Shuttle for launch next month.

The Astronaut crew for the April launch, John Young and Robert Crippen, will brief the Vice President at the launch pad and lead him on an inspection of their spaceship. (KSC NEWS RELEASE No. 45-81, 3-12-81)

<> The Reagan Administration has clamped a lid on the future U.S. space and aeronautics program by not only eliminating basically all new starts and most advanced technology and industry-supporting programs from the FY '81-82 NASA budget but by providing virtually no new start funds in its budget estimates for the agency in the FY '83-85 period.

It has however, provided all the funds necessary for development and production of the Space Shuttle and its supporting systems, including a \$60 million addition for the Shuttle in FY '81.

NASA's Acting Administrator Dr. Alan M. Lovelace told DEFENSE DAILY Tuesday that there is "little or no wedge for new starts" in the President's estimated NASA budgets for FY '83-85. Reagan's adjusted figures for FY '81-82 and for the three out-years are as follows:

FY '81	\$5.523 billion
FY '82	\$6.122 billion
FY '83	\$6,492 billion
FY '84	\$5,859 billion
FY '85	\$5,599 billion

Asked by DEFENSE DAILY if the restrictions on the NASA budget were made because of the Reagan Administration's belief that it is not important to move ahead in space or because of the Administration's emphasis on balancing the budget by 1984, Lovelace said it was the latter, i.e., the Administration's "priority" to reduce the nation's budget.

He said that in talking with Reagan officials, "I did not get the feeling that there was no tomorrow."

The acting NASA chief said that in light of the cuts made in the federal budget that he did not think that NASA was treated "unfairly," or that the cuts would have been less if Reagan had already chosen a NASA administrator and science adviser. (DEFENSE DAILY, 3-12-81, p. 76, Vol. 115, No. 9)

<> Look for the first Space Shuttle mission to be launched April 8-9 at the earliest, Acting NASA Administrator Dr. Alan M. Lovelace told the Senate Space Subcommittee. April 7 has been the target date. Officially the mission remains scheduled for the week of April 5.

The acting NASA chief also said that NASA has not made a decision to move the landing site from Edwards to White Sands because of the rain which has caused standing water on the "dry" lakebed landing site at Edwards. He indicated that a final decision on the landing site will not be made until two days in advance of the mission at the earliest, adding that the site can, in fact, be changed in virtually real time if necessary. (DEFENSE DAILY, 3-12-81, p. 79, Vol. 115, No. 9)

March 13: Rep. Ronnie G. Flipppo (D-Ala.), chairman of the House Space Subcommittee, has told NASA that the subcommittee will take a careful look at NASA's plans to reprogram \$60 million in FY '81 to support the Space Shuttle program, pointing out that the subcommittee told the agency earlier that it wanted to see no more supplementals for the Shuttle.

Flipppo expressed concern about NASA's management control over the Shuttle program. He was told by Michael Weeks, deputy associate administrator for STS, that the major single reason for the cost increases on the Shuttle program in the recent past was the discovery 18 months ago of problems with the adhesion of the Thermal Protection System tiles and the subsequent need to undertake a major change of design of the tiles.

Flippo is concerned also about NASA's plans to adapt the Centaur as a Shuttle upper stage and will hold a hearing on that matter, including the competitive aspects of the project. (DEFENSE DAILY, 3-13-81, p. 84, Vol. 115, No. 10)

- <> The KSC Hispanic Working Group is a new representative body established here to help management formulate policy decisions as they relate to Hispanic issues.

The group is composed of volunteers selected from various Directorates and other work areas on the center. Hispanic Working Group Chairman Emilio Mola does the initial searching and screening for likely group members.

If the persons agree to participate, their supervisors and the Center Director review and approve them for the task.

In actual operation, the group works to maximize employment possibilities for Hispanics, serves as a sounding board for the center's Hispanic population and attempts to widen the appreciation of the Hispanic contribution to the nation.

To do the latter, the group works closely with IMAGE of Cape Canaveral, a branch of the national organization dedicated to advancing the Hispanic culture and its appreciation. On KSC, the Working Group arranges the various activities associated with Hispanic Heritage Week and other special holidays with high Hispanic interest, such as Puerto Rico Discovery Day on Nov. 19.

Mola is the Hispanic programs monitor in KSC's Equal Opportunity Program Office.

The other five members of the group are: Fernando Esparza, TI-CSD-4, 7-8520; Manuel Virata, PM-STF, 7-3625; Raul Reyes, CS-MVD, 7-2395; Juan Rivera, TG-FLD-22, 7-7048; Alicia Thompson, DF-PEO, 7-3210; and Augusto Venegas, DL-NED-23, 7-9172. Each is available at any time.

Kennedy Space Center has approximately 70 full-time NASA employees who classify themselves as Hispanic, although this category includes numerous nationalities. In addition, the

various contractors at KSC have many Hispanic employees who are also encouraged to contact a member of the working group. (SPACEPORT NEWS, 3-13-81, p. 6, Vol. 20, No. 6)

- <> Problems with sagging insulation on the Shuttle's fuel tank is probably not the fault of the tank's prime contractor, Martin Marietta Aerospace, and NASA is likely to foot the \$2.6 million bill for the repairs, a NASA spokesman said.

Cork panels of insulation, which protect the Shuttle's tank from heat generated by air turbulence during ascent, first came unglued when the tank was filled with super-cold fuel on Jan. 24.

The repairs to the tank and associated tests at National Space Technology Laboratories in Bay St. Louis, Miss., are estimated to cost about \$2.6 million, said Brad Marman, a public information officer in NASA's Washington headquarters. The first panel was glued back to the tank on Thursday, a Kennedy Space Center spokesman said.

NASA also will probably pay \$700,000 more to make sure that tanks on future Shuttles will not have the same problem, Marman said. (TODAY, 3-13-81)

- <> NASA's FY '82 request for Shuttle production has been reduced \$36 million by the Reagan Administration -- reducing the planned long-lead material procurement for a fifth Orbiter and deferring the delivery of the Orbital Maneuvering System payload bay kit.

The cut in the fifth Orbiter option was from \$25 million to \$5 million. However, NASA says the remaining funds "still provide for the option of a subsequent decision on starting the fifth Orbiter without incurring substantial gapping in the production flow." With these funds, the fifth Orbiter could be delivered in 1987 if a production decision is made on or before the FY '83 budget request.

The OMS package is needed to allow the Shuttle to maneuver to a higher orbit for the Space Telescope mission, which has now been delayed 15 months, allowing a concomitant delay in the OMS. (DEFENSE DAILY, 3-13-81, p. 84, Vol. 115, No. 10)

<> Final systems tests on the first Spacelab flight unit began in Europe this week as KSC's processing team continued to build experience with an engineering prototype of the versatile orbiting science laboratory.

The Spacelab engineering model that arrived here in December has been in the Operations and Checkout Building's low bay undergoing trial-run processing operations.

"The engineering model is almost identical to the flight unit," said Rudig Selg, the European Space Agency's (ESA) Spacelab representative at KSC.

A joint program of ESA and NASA, Spacelab will fly aboard the Space Shuttle to provide a fully furnished laboratory adapted for the weightless environment of space. It will be pressurized so scientists may work without spacesuits.

The first Spacelab flight is scheduled for 1983.

A team of more than 100 NASA and MDTSCO employees are currently working on Spacelab activities here at KSC, according to Roger Gaskins, KSC's division chief for Spacelab and horizontal payloads.

"With the limited hands-on experience we've had, I think it's going extremely well," he said of the processing on the engineering model.

One of the engineering model's primary uses will be to verify that facilities and equipment designed to process flight units will do so as planned.

"It's a full blown electrical and mechanical pathfinder which will be pretty active for the rest of this year and a good part of next," said Gaskins.

Meanwhile, the first flight unit is being readied in Bremen, Germany, for delivery to the United States later this year.

Gaskins returned early last week from a 10-day visit to the ERNO plant in Bremen, where Spacelab is being assembled. ERNO is ESA's prime contractor on the project.

"ERNO performed a stowage review and NASA conducted a safety walkdown of both segments of the flight unit," said Gaskins.

He said astronaut Owen Garriot - science pilot on the Skylab 3 mission - participated in a crew station review to ensure that man and machine will work in harmony. Part of the review, for example, involved checking to see that controls can be easily reached and are readily visible.

NASA also began the process of turning over four of the Spacelab's 16 racks to European researchers who have experiments flying on the first Spacelab flight.

Selg said that some modifications and mechanical rework remains to be finished but that the flight unit is essentially completed.

A series of final systems tests are underway this week.

Delivery of the unit to KSC is expected to be accompanied by a five-fold increase in the ESA resident team here.

Selg said the four-member resident team currently at KSC will probably swell to 20 with the arrival of more engineers.

NASA and ESA will share equally the payload space available on the first Spacelab flight. European experiments will be integrated in Europe.

One of three European payload specialists will fly aboard the Shuttle with a crew of American astronauts on this first voyage of the orbiting laboratory.

A second Spacelab - being purchased by NASA - is already under production, said Selg.

Spacelab will be the principal scientific payload of the Space Shuttle throughout the 1980's and is expected to make valuable contributions to science, medicine, industrial processing and other related fields. (SPACEPORT NEWS, 3-13-81, p. 4, Vol. 20, No. 6)

March 16: Because of delays in developing the Space Shuttle, along with delays in developing the IUS upper stage and constructing the Shuttle launch facility at Vandenberg AFB, the U.S. may have to increase its buy of expendable launch vehicles in the near term, and Space Shuttle Orbiters in the long term to meet its launch capability needs.

This is the conclusion of a new General Accounting Office study centered on the Space Shuttle's ability to meet the payload needs of the Defense Department. (DEFENSE DAILY, 3-16-81, p. 89, Vol. 115, No. 11)

<> Delivery of the first shuttle era space suits to Kennedy Space Center for integration into the Columbia culminates a difficult five-year development that will enhance U.S. extravehicular capability but at a cost double what Johnson Space Center here originally intended to pay.

The two extravehicular mobility units (EMU's), consisting of both the pressure suits and portable life support systems, will be mounted in the orbiter's airlock. Astronauts John Young and Robert Crippen will use the suits only in the event of a serious emergency requiring extravehicular activity (EVA).

The possibility Crippen could be forced to conduct an EVA to close malfunctioning payload bay doors is the primary reason for carrying the new suits on the first shuttle mission.

Young and Crippen will not wear the suits for launch and reentry, but rather use ejection escape pressure suits similar to the systems worn by USAF/Lockheed SR-71 crews.

Unlike Apollo, when suits were custom tailored to each astronaut, in the shuttle a limited number of modular components are used to form suits that can serve the entire astronaut corps. NASA used Air Force specification charts and developed a sizing system covering individuals from the fifth to the 95th percentile. Small, medium and large sizes were planned to cover the range for both male and female astronauts, with the plan to procure and update female sizes as women joined the astronaut corps. When new astronauts were added to the program and old astronauts underwent fit checks with the new hardware, NASA found some individuals could not fit into the new suits. This resulted in adding extra-small and extra-large sizes to the program and readjusting the spread among sizes. Other fit problems caused additional redesign requirements. (AVIATION WEEK & SPACE TECHNOLOGY, 3-16-81, p. 69, Vol. 114, No. 11)

- <> Estimated development costs for the Space Shuttle have increased by \$275 million in FY '81 due primarily to problems encountered in readying the Shuttle Columbia for flight, including the rebonding of the thermal insulation tiles.

As a result, NASA has reprogrammed \$75 million from STS Operations, \$55 million from Shuttle Production and \$150 million from Changes & Systems Upgrading in FY '81 for Shuttle development.

The production funds were made available by rephasing of the procurement of initial operational spares and ground support equipment for simultaneous launch processing of two Orbiters and the deferral of support activities for the production program.

Michael Weeks, NASA deputy associate administrator for Space Transportation Systems, told Congress Wednesday that the \$55 million transfer from production "leaves us with no reserves, so it does increase the risk to our already tight delivery schedule, although the \$60 million added to the Changes and Systems Upgrading line items could provide added schedule confidence."

In other STS areas, Weeks:

--States that development of the Solar Electric Propulsion System (SEPS), added to the FY '81 budget by Congress, has been cancelled, with \$7 million in FY '81 and \$18 million in FY '82 funds deleted. Acting Administrator Lovelace told DEFENSE DAILY that there is little likelihood of reinstatement of the program in the near term because the user community has not identified a firm need date for the system.

--Pointed out that the Centaur upper stage is capable of boosting 13,000 pounds to geosynchronous orbit, compared to 5000 for the IUS, which has a military as well as civil use. For NASA it could accommodate TDRSS growth, he said.

--Said it costs about \$6 million in FY '75 dollars for each External Tank (about \$9.6 million in current dollars).

--Noted that NASA hopes to make the second Shuttle flight in August or September.

--Said it costs about \$6 million to refurbish the Solid Rocket Booster, including several hundred thousand dollars to transport the SRB's from Florida to Utah and back.

--Reported that NASA plans to complete three Shuttle Main engines in FY '82 and would like to produce about one engine every four months through 1985 in order to support four Orbiters.

--Said the third and fourth flight External Tanks will be readied for shipment to KSC in 1981 and 1982, respectively, but that future deliveries "are under assessment, pending review of technical and budgetary issues and considering likely flight needs." (DEFENSE DAILY, 3-16-81, pp. 92-93, Vol. 115, No. 11)

March 17: The panels of cork insulation that came unglued from the Space Shuttle's fuel tank during fueling exercises Jan. 24 have been placed back on, an official at Kennedy Space Center said Monday.

"The work is moving right along pretty close to schedule," said Thomas Wirth, Martin Marietta's director of external tank operations. "All the panels we took off are either bonded down on the ship or are under vacuum cure."

In all, 32 panels have been glued back onto the tank. The panels of insulation protect the aluminum skin of the Shuttle's fuel tank from the heat generated by friction during ascent.

Wirth said the team of Martin technicians, who are working on two shifts around the clock, still has plenty of work to do. They must conduct two tests to make sure the panels will stay on the tank. Then they will trim and smooth all the rough edges and finally apply a coating of silica foam insulation.

Wirth said the technicians hope to start spraying on foam sometime Wednesday.

"Barring any tremendous weather problems, we intend to have it done in time to support the propellant loading test on the 23rd," Wirth said. (TODAY, 3-17-81)

March 20: An employee of Rockwell International working on the Space Shuttle Orbiter Columbia at Kennedy Space Center died Thursday after he and five other workers entered the aft end of the Orbiter after it had been purged with nitrogen gas. Five of the men lost consciousness in the nitrogen-rich environment. In addition to the man who died, another was listed in critical condition. An investigation has been ordered. (DEFENSE DAILY, 3-20-81, p. 122, Vol. 115, No. 15)

<> Rockwell International was awarded a two-year, \$158.8 million contract modification by Kennedy Space Center Thursday for processing of the Space Shuttle Orbiter through launch and landing. The award, which runs to April 1982, brings Rockwell's Shuttle processing contract to \$286 million. (DEFENSE DAILY, 3-20-81, p. 122, Vol. 115, No. 15)

<> A Rockwell employee, John Bjornstad, 50, of Titusville, died shortly after noon, March 19, as the result of an accident earlier that day at the Kennedy Space Center, Fla.

Six people were exposed to a pure nitrogen gas atmosphere while working on the Space Shuttle at approximately 9:30 a.m. The group had entered the aft section of the orbiter following completion of the two-day long dry-countdown demonstration. This was the final major simulation prior to the first Shuttle launch in early April.

At the time they entered the orbiter structure, the area was being purged with gaseous nitrogen. Although nitrogen is not toxic, it does exclude oxygen in the normal air from the area, causing loss of consciousness.

All of the men were treated at the scene by the Kennedy Space Center's Occupational Health team and transported to the Health Facility in the KSC industrial area.

One person, Forrest Cole of Merritt Island, was initially transported to Jess Parrish Hospital in Titusville and later was taken by helicopter to Shand's Teaching Hospital in Gainesville, where he was placed in the intensive care unit.

A third person, William L. Wolford of Rockledge was taken to the Wuesthoff Hospital in Cocoa for observation. Three others were treated and released.

Both NASA and Rockwell International have formed investigation boards. The NASA Board is being headed by Charles Gay, Director of Expendable Vehicles. Charles Murphy, Launch and Landing Director for Rockwell, is heading their board.

The other people who were treated and released are: Nicholas Mullon, Merritt Island; J.L. Harper, Titusville; and Don Largent.

All of the men except Largent were technicians working for Rockwell International. Largent is an employee of Wackenhut Services, Inc. (NASA NEWS RELEASE No. 81-42, 3-20-81)

March 23: Primary runway for the space shuttle landing here should be in condition to support the first shuttle mission scheduled for early next month, barring any significant rainfall in the vicinity of the lakebed runway prior to launch. Edwards is the main landing site for the shuttle orbital flight test series.

Last week seasonal rains resulted in some water on the approach end of Runway 23 in the area where the orbiter is expected to touch down, but the moisture is expected to dry completely by the end of the month.

Backup runway at Edwards for the shuttle mission is Runway 15, which is dry but currently undergoing needed repair work in preparation for the mission. Other lakebed runways designated as possible alternatives are runways 18 and 36.

A microwave scanning beam landing system has been positioned for use on Runway 23 and is not capable of being moved on short notice in the event of a runway change, but NASA officials said the system is not a requirement for the initial flight.

Precision approach path indicator (PAPI) lights will be operating on Runways 23, 15 and 04, which is a hard surface runway. The lights are designed to provide shuttle crewmembers with a visual reference during their rapid descent to let them know if the orbiter approach is too high or too low. (AVIATION WEEK & SPACE TECHNOLOGY, 3-23-81, p. 24, Vol. 114, No. 12)

<> Thirty-three-hour countdown demonstration test was completed on the space shuttle Mar. 19, clearing the way for the final critical tests before launch.

The tests are high and low pressure loadings of the cryogenic propellant tanks scheduled to be done later this week.

The demonstration last week covered virtually all aspects of the countdown except propellant loading and included the astronaut crew as an integral part of the launch preparation procedures.

Among key events that took place were the warming of the inertial measuring unit, pressurization and checkout of the main engines, loading software in the main engine controller, loading software in the orbiter computers and closing the payload bay doors.

The doors, closed Mar. 18, will remain closed until flight.

Other activities in the countdown demonstration included activating flight control systems, verifying that development flight instrumentation and orbiter instrumentation was functioning, powering up the star tracker and putting all switches in the proper position.

The crew cleared the orbiter at midnight, Mar. 18, and returned at 4:15 a.m. Mar. 19. John Young and Robert Crippen were in the cockpit for the final 2 hr. of the count. (AVIATION WEEK & SPACE TECHNOLOGY, 3-23-81, p. 27, Vol. 114, No. 12)

March 24: The \$604 million cut from NASA's FY '82 budget by President Reagan will mean the loss of 15,000 expected contractor jobs.

The agency's contractor employment stood at 113,000 last September and was projected to rise to 123,000 by September 1982 under the Carter Administration's budget. The estimate has been pared to 108,200 under the Reagan budget.

NASA's employment, at 22,613 last September will be cut to 21,873 by September 1982, 840 people less than planned under the Carter budget. (DEFENSE DAILY, 3-24-81, p. 141, Vol. 115, No. 17)

<> The 33-hour Dry Countdown Demonstration Test of the Space Shuttle Columbia was successfully completed last week. George Page, Shuttle launch director, said "everything in general went very well...I think everybody was pleased with today's run." (DEFENSE DAILY, 3-24-81, p. 141, Vol. 115, No. 17)

<> Acting NASA Administrator Dr. Alan M. Lovelace reiterated last week that NASA's projected budgets for FY '83 and FY '84 provide "little or no funding wedge" for new starts and, moreover, assume an inflation rate that is substantially below what it is now.

He told the Senate Subcommittee on Science, Technology and Space that the Reagan Administration is using an inflation estimate of 8.3% for FY '82, 7% for FY '83 and 6% for FY '84. NASA is currently experiencing an inflation of about 11 or 12 percent, he said.

Subcommittee Chairman Jack Schmitt (R-N.M.) indicated that he believes the 8.3 percent estimate is too low, citing a congressional study which calculated that the rate would be closer to the present figure.

In his opening remarks, Schmitt, who has already said that he will not oppose the Reagan FY '82 funding level for NASA, said, "It's time for the United States to recognize the relationship between our science and technology foundation and our national economy." He said that NASA must do its part in the needed budgetary restraint but it also must be part of the "appropriate investment for the future."

He said the FY '82 NASA budget is "not a budget representative of the world's first space power and it has not been for the past ten years."

Citing the global competition for exploiting the space environment, particularly from the Soviet Union, he said that as the Russians "continue to see America's support for a strong space program diminish, Soviet dominance will become even more evident." (DEFENSE DAILY, 3-24-81, P. 141, Vol. 115, No. 17)

March 25: Working under funding from Pennsylvania State University and several aerospace companies planning to build Space Shuttle-related space systems, a Penn State aerospace engineering professor is examining the problems involved in launching a satellite from the Shuttle, as well as a vehicle to dispose of space debris.

Prof. Marshall H. Kaplan said the launch, maintenance and retrieval of satellites from the Shuttle will involve "tremendous problems."

To launch a satellite, the Shuttle has to release the spacecraft, which must drift for about 45 minutes until it's far enough away to fire its booster rockets without endangering the Shuttle.

Because the satellite is not simultaneously pointed in the right direction, forced to spin, and thrust upward (as in an expendable vehicle launch), the chances of its going into a tumble, losing its orientation and missing its precise final orbit "are substantially increased," Kaplan said.

This is a major problem, he said, since not only is the planned orbit at stake, but requires that consideration be given to such things as a satellite's size, shape, weight and fuel needs in designing a spacecraft to insure that it will go into the correct orbit.

Kaplan said that one of the major objectives of this study is to provide the satellite with the "intelligence" it needs to direct itself to its final orbit. He is also looking at what type of propulsion system would best serve the needs of shuttle-launched satellites, particularly from the standpoint of safety.

Kaplan's study also includes an investigation of ways to remove man-made space debris, e.g., remnants of launch vehicles and old, non-functioning satellites, from Earth orbit.

In particular, he is studying the design, docking capability and other details of remotely controlled space vehicles that would orbit for a period of months, maneuver to a number of objects, and then either pick them up for return to Earth, or attach a retro-rocket to them to propel them into the Earth's atmosphere where they would burn up. (DEFENSE DAILY, 3-25-81, p. 146, Vol. 115, No. 18)

<> 2-A. Mr. Griffin reported that Vice President Bush's visit to KSC on March 17 was considered a success and KSC's handling of the event was very professional.

Mr. Griffin requested a brief status report after the Senior Staff meeting on the investigation of the Pad A accident. Dr. Buchanan stated that Mr. Cole, one of the accident victims, remains hospitalized in critical condition, but that he is showing improvement of his vital functions (heart, lungs and kidneys). Mr. Page indicated the personnel at Pad A are asking for an ambulance to be stationed at the pad. Mr. Griffin stated that Dr. Buchanan should determine the resources required to provide an ambulance at Pad A when the Shuttle vehicle is there.

2-F. Mr. Hollinshead announced that KSC has been requested to participate in the SHARP Program (Student High School Apprentice Research Program) again. KSC has sixteen students to place in meaningful jobs in scientific/research fields. (EXECUTIVE STAFF NOTES, #10-81, pp. 1-2)

March 26: Acting NASA Administrator Dr. Alan M. Lovelace told the Senate Space Subcommittee yesterday that the agency has asked Congress to allow it to proceed with development of a wide-body Centaur upper stage for the Space Shuttle and asserted that "a sole source contract with General Dynamics for the development and production" of the stage is essential to meet the 1985 launch date for the Galileo Jupiter Orbiter/Probe.

However, subcommittee chairman Jack Schmitt (R-N.M.) did not commit himself in any way to support for the NASA plan, emphasizing that the important thing is to select the best upper stage that can meet the long-term needs of both NASA and the Defense Department, not just to satisfy the requirements for Galileo.

Asked by Schmitt what the savings would be from dropping the three-stage inertial Upper Stage and going to Centaur for Galileo, allowing a single launch in 1985 instead of a dual launch, Lovelace said the costs would be "about equal."

The savings from the single launch would be offset by the higher development costs for Centaur. (DEFENSE DAILY, 3-26-81, p. 153, Vol. 115, No. 19)

March 27: NASA Wednesday successfully conducted the fueling test on the Space Shuttle External Tank, with no indication of separation of any of the thermal insulation tiles on the tank. In the initial fueling of the tank in January, some 35 insulation tiles were debonded and had to be rebonded. Wednesday's test began at 10:30 AM and concluded at 9 PM after several technical problems were encountered and overcome. A final fueling test, to check out fueling procedures, is scheduled today. Maiden launch of the Shuttle remains scheduled for the week of April 5, with April 10 considered a good bet. (DEFENSE DAILY, 3-27-81, p. 167, Vol. 115, No. 20)

<> "There was a certain Walter Mitty excitement factor out there. It was like meeting Lou Gehrig when I was 12 years old. It was a thrill, a tremendous thrill."

That's how Vice President George Bush described his introduction to the Space Shuttle Columbia and prime crew astronauts John Young and Bob Crippen here last week.

After climbing into the orbiter's cockpit, Bush eased into the commander's seat and received a first-hand report on America's new spaceship from the crew who will pilot the craft on its first voyage into space.

"Hey listen, I looked over at Crip and John...and for the first 30 seconds I was a little dizzy lying there with the blood rushing to my head. To see that panel...and obviously just begin to comprehend the tip of the iceberg in terms of the technology, why it came home to me rather dramatically how impressive this whole thing is."

Obviously enthused by his visit to the launch pad, Bush later addressed the KSC workforce from the Launch Control Center, giving a hearty endorsement to the Shuttle program and heaping praise on the men and women who are making it a reality.

"I just can't tell you how impressed I am with what I've seen and what I know to be the sense of mission that all of you have," said the Vice President. "This program is going to go forward. I don't believe the American people have yet begun to fully understand what your efforts mean, not just to this generation but to future generations."

Bush, in comments broadcast around the center over the public address system, said the new administration in Washington views the space program as having "tremendous national importance" and he commended KSC employees for their "selfless work for this country."

The Vice President told space center workers that he believes the Shuttle's first mission will re-awaken the nation's sense of pride.

His praise for the KSC workforce was echoed by acting NASA Administrator Dr. Alan Lovelace, who flew down from Washington to accompany Bush on his tour of the space center.

"You can't say too much to compliment the NASA-contractor team down here," Lovelace told SPACEPORT NEWS. "I think this is a super event for the Vice President to come down here," he added.

Bush and his wife met the prime crew astronauts on the deck of the Shuttle's mobile launcher platform, were the special visitors were presented with a model of the Shuttle and two Landsat photos -- one of Houston, Texas, where they resided prior to moving to Washington, and another of Mrs. Bush's hometown in Maine.

Bush met with reporters at the new Complex 39 press site and reiterated the administration's support for the Shuttle program.

"We're committed to the Shuttle," he said. "We think it has an extraordinarily useful role to play. This program will have the opportunity of recharging the country, of getting its optimism up. I love it when something good happens to the United States." (SPACEPORT NEWS, 3-27-81, p. 1 & 7, Vol. 20, No. 7)

<> Above all else, we must be a team - and Joe Fitzsimmons, who has been with the space program at KSC since the Mercury and Gemini years, sees the Shuttle team growing stronger, day by day.

Fitzsimmons has seen a lot of changes here since he reported to work for NASA two weeks after John Glenn's historic orbital space flight in 1962.

In those days, he was a co-op student from Georgia Tech, working in operations support. Later, he was test conductor for the lunar module which carried astronauts to the surface of the Moon during the Apollo program.

Today, he's a test conductor for the Shuttle, manning a console in the Launch Control Center's Firing Room 1.

KSC's a different place these days -- there's a different launch vehicle and a different way of doing things.

But one important ingredient hasn't changed, he says.

"The enthusiasm we had with the earlier manned programs is still here," says Fitzsimmons. "Launch fever? These people have got it. I see T-shirts, badges, stickers everywhere I look, ever since the vehicle rolled out of the OFF."

In the "old days," he recalls, engineers watched their consoles intently, ready to sing out if problems arose. Now computers monitor the systems, sound the alarm, or even initiate an automatic shutdown.

The sparse population of engineers in Firing Room 1 during a Shuttle mission simulation is in sharp contrast to the "crowd scenes" of the Apollo days but the comparison is deceptive, he says.

"There are fewer people actually sitting at console," he points out, "but there are a lot more writing programs for the computers behind those consoles."

But in spite of all the automation, words exchanged person-to-person remain critically important, he adds.

In the early stages of Apollo, he recalls, there was a lot of explaining of terms, until everyone learned what the other fellow was saying and until the same words meant the same thing to everybody.

"It's been similar in the early Shuttle program," says Fitzsimmons. "But it's all coming together. I see it blending, solidifying day by day."

For KSC workers like Fitzsimmons, who cut their teeth on the early manned flights, the gap between the last Apollo flight they worked and the first Shuttle mission has been a long one.

With the wait now almost over, Fitzsimmons and his teammates in Firing Room 1 are "go" for launch. (SPACEPORT NEWS, 3-27-81, p. 4, Vol. 20, No. 7)

<> Dave Moja gazes out towards Complex 39 from his window in the Operations and Checkout Building and sees a lot more than the Space Shuttle Columbia.

His eyes return to the colorful transparencies on his desk.

"We're looking some years into the future," says Moja, of KSC's Future Aerospace Projects Office.

He's part of a team at KSC which coordinates advanced planning with other NASA centers, performing pioneer studies to determine KSC facilities and operations support requirements for a broad range of candidate projects.

Orbiting way stations supporting spaceflight to geosynchronous orbit and beyond, space platforms where science and applications research is performed, enormous satellites to beam solar power toward an energy-hungry world - these are the types of missions Moja deals with.

It's a study not of what will be, but of what might be.

"We are the focal point at KSC for the agency's advanced planning efforts.

"As studies at the other centers progress, we initiate our own to concentrate on ground operations planning. We're going to have studies starting this fall on what would have to change at KSC for any of these options which may one day be pursued," he explained.

Moja represents KSC on future project studies managed by the Johnson Space Center. Tom Feaster is KSC's representative for projects managed by the Marshall Space Flight Center. And Dr. Gerry Sharp works advanced planning for future scientific payloads.

Some of the nearer term possibilities involve orbital aids which would be employed aboard the Shuttle, says Moja. These would be things like the Power Extension Package that would allow extended Shuttle power and duration or the graphically named "cherry picker" -- essentially an open work station attached to the end of the orbiter's remote manipulator arm.

Other future possibilities the KSC office is involved in studying are new launch vehicles derived from the current Space Shuttle. One concept of a Shuttle-derived rocket employs all the existing propulsion elements of the Shuttle but replaces the orbiter with a cylindrical cargo vehicle which would not be manned. Such a configuration could substantially increase payload capacity.

But one of the most exciting prospects under preliminary study is the Space Operations Center - a permanently manned station which would serve as an orbital depot.

"This would be a base for orbital transfer vehicles - a way station for travel to geosynchronous orbit and perhaps for planetary flights," explained Moja. "These are what we call habitation modules," said Moja, pointing with the back end of his pen at several can-shaped appendages on an orbiting structure depicted before him.

The Space Operations Center would be a shuttle-launched, shuttle-serviced facility which would be re-supplied every 90 days to permit continuous operation.

An advantage of such an orbital base, Moja said, would be the capability to support integrating a number of satellites onto a single structure where they would, perhaps, share a common power source and be launched toward geosynchronous orbit as one unit.

A beam builder device at the center could facilitate the construction of other large structures.

Another prospect - the Science and Space Applications Platform - would be an unmanned orbiting laboratory from which experiments in a range of scientific disciplines would be conducted.

Whatever's in store over the next 20 years of space travel, it's a sure bet KSC's Future Aerospace Projects Office will have visited it before the rest of us. (SPACEPORT NEWS, 3-27-81, p. 5, Vol. 20, No. 7)

March 30: Return of the space shuttle to Kennedy Space Center after its first flight to begin preparations for the second orbital flight test mission could require up to one month if the shuttle is forced to make an emergency landing at the White Sands backup recovery site, and up to two months if the orbiter has to land at one of three designated contingency airfields overseas.

National Aeronautics and Space Administration officials are prepared to rush some of the most essential shuttle recovery equipment to Northrup Strip at White Sands Missile Range, N.M., on short notice in USAF/Lockheed C-5 aircraft should the shuttle abort its mission on the first orbit, or have an underburn when its orbital maneuvering system (OMS) engines are fired for deorbit. The underburn would result in the shuttle landing at White Sands, about 700 miles southeast of Edwards.

The essential recovery equipment - called a mini-convoy - includes a 132,000-lb. purge transporter to disperse propellant fumes from the aft end of the orbiter, a large ground coolant transporter to cool shuttle avionics gear and other electronic components, two vehicles used to connect the purge and cooling umbilicals to outlets on the aft end of the orbiter and crewmember egress vehicle. (AVIATION WEEK & SPACE TECHNOLOGY, 3-30-81, p. 72, Vol. 114, No. 13)

March 31: The External Tank of the Space Shuttle Columbia successfully passed the second of two fueling tests Friday and NASA today, following a flight readiness review at Kennedy Space Center, is expected to set Friday, April 10, as the launch date for the first Space Shuttle flight.

The fuel loading tests Wednesday and Friday which involved loading of 526,000 gallons of liquid oxygen hydrogen, were designed to test the adhesion of the ET's cork and foam insulating panels, some 35 of which came loose during an earlier fueling test.

Shuttle launch director George Page reported that the two fueling tests "were successful. We have absolutely no debonding problem."

As a result, "we feel the 10th is a viable launch date," Page said Sunday. (DEFENSE DAILY, 3-31-81, p. 178, Vol. 115, No. 22)

April 1981

April 1: NASA's space science chief Andrew J. Stofan reiterated last week that NASA plans to launch the Venus Orbiting Imaging Radar (VOIR) and Gamma Ray Observatory in 1988 instead of 1986 because of deletion of new start funds for the programs by the Reagan Administration, leaving open the question of where the money will come from to fund the programs in FY '83-85 -- years where NASA is projected to have new start funds. (DEFENSE DAILY, 4-1-81, p. 189, Vol. 115, No. 23)

<> All seventeen Republican members of the 40-member House Committee on Science & Technology, whose responsibility includes authorizing funds for NASA, have informed committee chairman Don Fuqua (D-Fla.) that they will oppose increases above the Reagan Administration request for all agencies in the committee's purview in FY '82.

The action is a break with the previous bipartisan nature of the committee's actions. With Democrat and Republican support, the committee has tended to boost the NASA budget several tens of millions of dollars in previous years.

In a letter to Fuqua last week, the 17 GOP members of the committee stated: "We intend to support fully the overall budget levels proposed by the Reagan Administration for each of the agencies under the committee's jurisdiction. This is not to say that we are unanimous (in) our support for the exact dollar amounts for various programs within each agency. Clearly, we have some reasonable differences here, both among members and between ourselves and the Administration. However, we do agree that it is absolutely essential once subcommittee and full committee mark-ups are concluded that the 'bottom line' figure for each agency not exceed the President's proposal, even by small amounts.

"...During our authorization hearings, we have all heard pleas for funding for some programs above the President's request. Taken in isolation, many of these pleas have merit. But what the minority members wish to emphasize is the overriding importance of approving the Administration's funding levels as a means to national recovery. Exceptions, no matter how limited, will inevitably lead to a flood of further budget additions." (DEFENSE DAILY, 4-1-81, p. 190, Vol. 115, No. 23)

April 2: During the past three years, the funds appropriated for construction of Space Shuttle facilities for the Air Force have totaled \$364.1 million, including \$286.7 million for facilities at Vandenberg AFB, Johnson Space Center, and Cape Canaveral, and the reprogramming of \$77.4 million to cover launch complex cost overrun at Vandenberg. Another \$38.2 million is requested for FY 1982, including \$19.9 million for Vandenberg and \$18 million for solid rocket booster retrieval and disassembly facility at Port Hueneme, Calif. The initial operational capability date at Vandenberg is August 1984, with an initial capability of about 10 launches per year. It is planned to increase that rate to a maximum of 20 per year. (DEFENSE DAILY, 4-2-81, p. 196, Vol. 115, No. 24)

<> Grumman Aerospace Corp. is being awarded a contract by NASA's Johnson Space Center to study simulations to verify the conceptual designs of Space Shuttle Orbiter-based construction equipment. (DEFENSE DAILY, 4-2-81, p. 196, Vol. 115, No. 24)

<> NASA announced yesterday that the Space Shuttle Columbia is ready to fly and set Friday, April 10 as the date for the maiden Shuttle flight. If all goes as scheduled, the launch will take place 45 minutes after sunrise. Astronauts John Young and Robert Crippen will be at the controls of the Orbiter for the planned 36-orbit, 54-1/2-hour flight, which will land at the dry lake bed at Edwards AFB, California. The maiden launch is two years and a month behind the schedule set a decade ago. (DEFENSE DAILY, 4-2-81, p. 199, Vol. 115, No. 24)

April 6: Ten years of research and development, schedule slips, underfunding, cost growth and vacillating political support are behind the space shuttle. A new decade is about to open for the reusable space launch system that has absorbed a dominant share of NASA's budget since its inception.

While the confirmation and appointment process plodded on for the agency's new politically appointed leadership last week, the acting heads of the agency and shuttle program managers sat down at the Kennedy Space Center and committed as firmly as possible under the circumstances to a realistic launch date for the first shuttle flight -- April 10.

Launch preparation work for the initial trip of the four-flight orbital test program for the shuttle is two shifts behind -- less than a full day. That is a far cry from the black days of the tile bonding problems when the schedule delays were measured in weeks or months. Barring some unforeseen accident or critical unexpected failure, the shuttle is ready to go.

Weather is now the biggest foreseeable hazard to the launch schedule. Mission requirements for the Kennedy launch site and abort runway there, the planned landing site at Edwards AFB, California, and Northrup Strip at White Sands, N.M., are no more than 50% cloud cover, no more than 10 kt. tail- or crosswind or 25 kt headwind. April weather records show there is only an 11% chance to get these weather conditions on any given day.

There is a 6-hr. 30-min. launch window after sunrise, but clearly plenty of opportunity for recycling from one day to another waiting for the right meteorological conditions. It will be a familiar uncertainty to veteran launch watchers. (AVIATION WEEK & SPACE TECHNOLOGY, 4-6-81, p. 11, Vol. 114, No. 14)

- <> Discipline over areas with controlled access and communications procedures are being tightened here in the wake of a space shuttle launch pad accident March 19 that killed two Rockwell International employees and injured four others. Rockwell employee John G. Bjornstad died the day of the accident and Forrest Cole died April 1.

The Rockwell International work team entered the aft fuselage section of the shuttle orbiter Columbia and were overcome by a 100% nitrogen atmosphere that deprived them of oxygen. The aft fuselage area houses the space shuttle main engine propellant manifold and engine power heads. It is commonly maintained in a 100% nitrogen purge to prevent buildup of any possible leaking oxygen or hydrogen gas.

"We have spruced up a lot of the discipline control areas and we are now doing fewer things in parallel than we were before," according to George F. Page, Kennedy shuttle operations director. Final report of the accident investigation team has not be released, but a high NASA official said cause of the accident was largely a

communications problem. "Communications and understanding of the overall pad team was less than perfect," according to preliminary information, the official said. "The safety guys who give the all-clear for work mean the all-clear for areas of normal work or areas that are explicitly not closed for access.

"The access area to the aft fuselage had a rope and a sign, but the sign used was the same kind of sign used to basically control access as opposed to hazards. They were not using the hazards sign, so the rope was taken down by people who thought it was okay to enter when in fact it was supposed to have been taken down by safety monitors after they had sampled the area for gas. The sign was taken down by an access monitor, preliminary information indicates," he said.

"It was a communications problem. Now they are going to make sure everybody understands the rules and will probably announce over the intercom the specific exceptions involved in pad access."

The accident investigation team has been interviewing numerous individuals at Kennedy Space Center. Managers say no pressure is being applied to finish the final accident report in order to enhance schedule to first shuttle launch. The accident report is not expected to affect scheduling. (AVIATION WEEK & SPACE TECHNOLOGY, 4-6-81, pp. 18-19, Vol. 114, No. 14)

- <> NASA has awarded contracts worth \$96 million to Honeywell Information Systems to provide computers for the central data system of the Space Shuttle Launch Processing Systems at Kennedy Space Center and Vandenberg AFB. The LPS automatically checks out the Shuttle while it is being prepared for launch. For FY '82 the contracts are valued at \$30 million, and carry options valued at \$66 million through FY '86. (DEFENSE DAILY, 4-6-81, p. 215, Vol. 115, No. 26)

- <> U.S. space shuttle project management has taken measures to prevent the shuttle's air-to-ground command links from being interfered with by the Soviet Union or terrorist organizations.

Protection of the air-to-ground command capability will be achieved manually for the first shuttle mission and will involve a data encryption capability by the fifth shuttle flight.

During early flights, before the tracking and data relay satellite system is available, Soviet or terrorist groups would have to make interference attempts while the shuttle is within line of site. TDRSS, however, would provide an additional line-of-sight target for would-be forces of interference. TDRSS will be protected against unwanted radio penetration.

The space shuttle has so much onboard autonomous capability that harmful interference would probably be unsuccessful if attempted. Such attempts could, however, deprive ground stations of data.

During launch and emergency, abort calls should be made from the Mission Control Center in Houston, but the spacecraft itself has displays to show the abort modes available to the crew. (AVIATION WEEK & SPACE TECHNOLOGY, 4-6-81, p. 17, Vol. 114, No. 14)

April 7: The Soviet Union charged Saturday that the United States plans to use the Space Shuttle for "turning outer space into an arena of battle for America's dominance of Earth."

The Tass News Agency said the Pentagon is "intensively preparing for using outer space for military purpose," using the so-called "Soviet threat" as an excuse for building up the military aspects of the space program.

"Having failed to achieve a military superiority on Earth, the U.S. strategists are switching to outer space," it said. Tass also charged that the U.S. wants to break the agreement barring deployment of nuclear weapons in space. (DEFENSE DAILY, 4-7-81, p. 233, Vol. 115, No. 27)

<> The 73-hour countdown for the maiden flight of the Space Shuttle Columbia at 6:50 AM this Friday began at 11:30 PM Sunday. The countdown includes six "holds" totaling 30 hours and 20 minutes.

NASA yesterday expected to fix a short circuit that developed Sunday in a wire between a control box and a "pogo" suppression valve in the Space Shuttle Main Engine system which caused the valve to pop open. NASA yesterday also replaced a leaky oxygen valve in ground equipment supporting Columbia's fuel cell generator. The replacement delayed work by about three hours, but the lost time is expected to be made up by late today. (DEFENSE DAILY, 4-7-81, p. 223, Vol. 115, No. 27)

April 8: Acting NASA Administrator Alan Lovelace has acknowledged that it is likely that the Space Shuttle will not be able to handle all of the payloads on its manifest over the next four years and said NASA is looking at increased use of expendable vehicles, such as Delta, for some civilian payloads.

The problem, cited by Chairman Edward P. Boland of the House HUD-IA Appropriations Subcommittee, is that NASA now believes it can build only 32 to 40 External Tanks per year by the end of 1985 rather than the 48 that are required for the missions on the manifest. Lovelace cited the need to draw manpower from ET production to deal with the ET's rebonding problem at KSC. (DEFENSE DAILY, 4-8-81, p. 229, Vol. 115, No. 28)

April 9: The Space Shuttle Columbia remains on schedule for its maiden launch at 6:50 AM tomorrow morning from Kennedy Space Center. At 4 PM EST Wednesday the countdown for launch was a hold at T-23 hours, with four hours remaining in the hold before countdown was to be resumed. (DEFENSE DAILY, 4-9-81, p. 233, Vol. 115, No. 29)

April 11: A puzzling computer breakdown forced postponement of the launching of the space shuttle Columbia Friday, and space agency officials pressed to reschedule it for Sunday.

The earliest the orbital test mission could blast off is 6:50 a.m. Sunday. But until the computer problem in the spaceship could be corrected, officials were unable to say when the reusable winged Columbia would be cleared for another launch attempt.

Friday night, engineers at Johnson Space Center in Houston identified the source of the malfunction as a timing fault in one set of spaceship computers that disrupted communications with the backup computer.

What repairs were required and what effect they would have on launching plans would not be decided until officials at the Johnson Space Center held a telephone conference with officials of the Kennedy Space Center at Cape Canaveral at midday today.

Arnold D. Aldrich, the shuttle deputy program manager at the Johnson Center, said the problem was a "time skew" traced to the operating instructions programmed into the Columbia's primary computers. It caused the primary computers to reject communications from the backup computer because they did not arrive when expected.

Launching crews at the Kennedy Space Center planned to keep the spaceship ready through today so the countdown could be resumed at 6 p.m. today, aiming for a Sunday morning lift-off.

The crews were not to begin refueling the shuttle later today until they received a favorable report on the computer problem from engineers and electronics experts at the Johnson Center.

After the launch postponement was announced at 9:56 a.m. Friday, crews went to the launching pad and helped Young and Crippen out of the cockpit. They had been confined to their couches, lying with their faces skyward, for more than six hours. The lift-off had been scheduled for 6:50 a.m.

Young appeared grim as he returned to the astronaut quarters at the space center. He and Crippen have been in training three years for the mission, which already is more than two years behind schedule because of development problems with the shuttle's propulsion system and heat-shielding tiles. The computers, ironically, relatively had been free of problems during the \$10 billion development program.

Friday was the first time in 15 years that U.S. astronauts had encountered such a frustration on the launching pad. Having a launching "scrubbed," as it is known in space vernacular, was a frequent occurrence in the initial manned flight program of Mercury.

But the last time it happened was May 17, 1966, when the Gemini 9 astronauts, Thomas P. Stafford and Eugene A. Cernan, had to walk away from their spacecraft after the Agena target craft they were to rendezvous with failed to reach orbit. They did not finally fly until June 3. (THE NEWS AND OBSERVER, (Raleigh, N. C.), 4-11-81)

<> A simple failure to communicate among computers that would not "talk" to each other delayed the maiden flight of the space shuttle Columbia Friday morning.

The ship carries five computers in a data-processing system that runs almost every aspect of operation. It is designed to keep working even if one fails.

Four of the computers have identical programs, or detailed lists of instructions for specific operations. The fifth has a simpler backup program for emergency use.

Late in the countdown, the launch crew discovered that the backup computer was not trading data -- "talking," in computer parlance -- with the four main computers. This left the potential for a complete computer-system failure should the four main units somehow go awry.

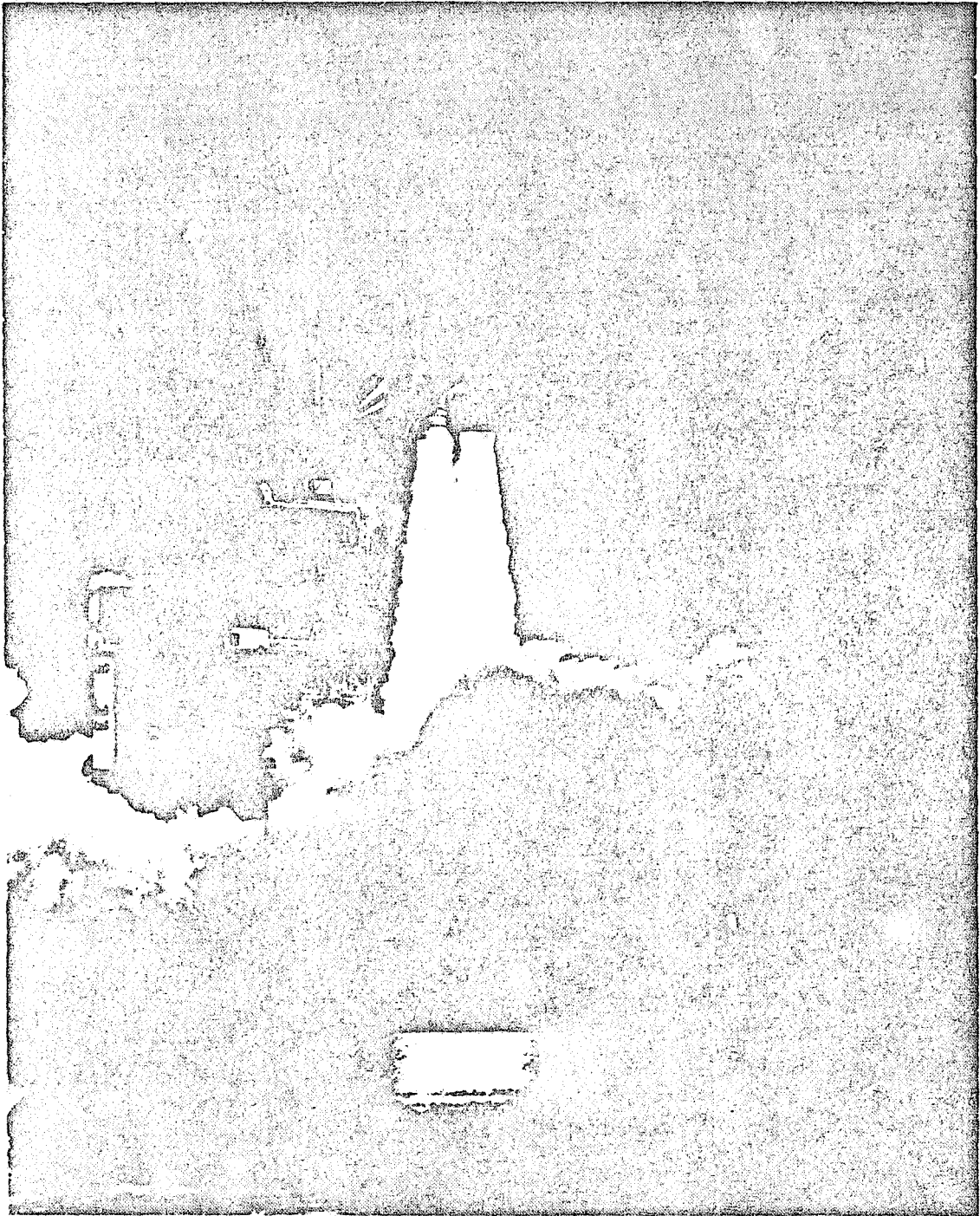
Mission Control would not let the spacecraft take off without the entire computer system in working order.

The source of trouble seemed to be in the program written for the backup computer. The launch was delayed while technicians made a painstaking line-by-line check of its program. (THE CHARLOTTE OBSERVER, 4-11-81)

April 13: On his first full day back in the White House since he was wounded in an assassination attempt, President Reagan arose at 6:50 A.M. today to watch the televised launching of the space shuttle Columbia on its first orbital flight.

"It's a spectacular sight," Mr. Reagan exclaimed, according to Larry Speakes, the deputy White House press secretary.

ORIGINAL PAGE IS
OF POOR QUALITY



Space Shuttle Columbia launched into history at 0700 EST, April 12, 1981; STS-1 concluded successfully with the landing at Edwards AFB, California, on April 14.

In a message read to the Columbia astronauts by George F. Page, the mission director, Mr. Reagan said, "May God bless you and may God bring you safely home to us again."

TEXT OF STATEMENT

You go forward this morning in a daring enterprise and you take the hopes and prayers of all Americans with you. You go in the hand of God and draw on the courage of life.

Our countryman and poet, William Cullen Bryant, said America is where "mankind throws off its last fetter." With your exploits we loosen one more.

"Who," he said, "shall place a limit to the giant's strength, or curb his swiftness in the forward race." Through you, today we all feel as giants once again. Once again we feel the surge of pride that comes from knowing we are the first and we are the best and we are so because we are free.

For all Americans, Nancy and I thank you and the 50,000 others who have worked to make this day possible. As you hurtle from earth in a craft unlike any other ever constructed, you will do so in a feat of American technology and American will. May God bless you and may God bring you safely home to us again. (THE NEW YORK TIMES, 4-13-81)

<> House opponents of the Halley Intercept Mission say that the \$5 million added to the FY '82 budget by the House Science Committee for further study of the mission is inadequate to carry out the project on the required schedule for the 1986 return of Halley's Comet. They say \$30 million would be needed in FY '82 if the \$250-\$300 million mission is to be conducted. NASA did not request funds for the project from the Carter Administration because it had higher priority projects. (DEFENSE DAILY, 4-13-81, p. 252, Vol. 115, No. 31)

<> A Chinese news report late last week said the Space Shuttle's principal objective is military operations, with reconnaissance from synchronous orbits beyond the range of Soviet antisatellite devices. Because of this mission, the Soviets have always been against the Space Shuttle type of vehicle, the report said. (DEFENSE DAILY, 4-13-81, p. 253, Vol. 115, No. 31)

April 14: The Space Shuttle Columbia, piloted by astronauts John Young and Bob Crippen, which flew into history Sunday in the maiden launch in the Shuttle program, is scheduled to land on the dry lake bed at Edwards AFB, Calif., at 1:28 (EST) this afternoon, ending a near-perfect 54 1/2 hour mission.

The major anomaly in the mission is the loss of an estimated 15 insulation tiles on the Columbia's two OMS pods -- an area which will not be subjected to maximum heat loads and an area not critical to bringing the spacecraft through reentry.

Despite speculation about the possible loss of critical "black tiles" on the underside of the vehicle, flight director Neil Hutchinson said, "We're not worried about any others (tiles) being loose." As for what caused the 15 tiles to debond, he said, "It's fairly obvious the phenomenon was shock waves in the ascent that we didn't anticipate."

Top secret Air Force telescope cameras in Hawaii and Florida were scheduled to "inspect" the underside of the Shuttle -- flying at an altitude of 170 miles -- yesterday to see if any tiles had, in fact, come off.

Deputy flight director Gene Kranz said the return could be handled a little differently if some underside tiles are missing, e.g., turning off some electrical lines in the underside of the Orbiter and some of the coolant pipes in the spacecraft's wings.

However, he said, "I want to emphasize that we are not concerned about the tiles." (DEFENSE DAILY, 4-14-81, p. 256, Vol. 115, No. 32)

<> It's the number one song 172 miles above the Earth.

Aboard the Space Shuttle, Jerry Rucker's "Blastoff Columbia" served as a country-western alarm clock Monday for astronauts John Young and Bob Crippen.

Rucker, a 36-year-old technician for Martin-Marietta at the Kennedy Space Center, said it was his love of the space program that inspired the song.

"I thought it needed a song," he said.

Sung by Roy McCall, of Titusville, "Blastoff Columbia" was published by Silver Pelican Co. in Maitland.

For now the song, like the Shuttle, is in the spotlight.

"According to my publisher, the song is being played all over the United States. I have a feeling the record will get notice after the landing. This is something America can be proud of," said Rucker, who lives in nearby Geneva and writes gospel music as a hobby.

"This means more to me than any I've written so far. It really came from the heart," he said.

The words to the song are:

We have liftoff. It's beautiful. It's leaving the pad.

Well, many, many hours went into this thing. A job well done by the Shuttle space team. We can't say that she's sleek and lean, but I'll tell you right now, she's a mean machine -- The Columbia.

Not the kind you smoke, this here bird. She's high on herself.

Rockwell, Martin, USBI, all got together and they give it a try. You oughta see that sucker fly. Thar she goes, now wave bye bye.

These solid rocket booster's hanging off the side, look out boys you're in for a ride. She's gonna switch into overdrive. Just lay back and let her slide.

Don't hit any fence posts on the way up there boys. Flip in the switch...Awlright.

Crippen and John are in the driver's seat...Home Sweet Home never sounded so sweet. After this ride, they're gonna be beat.

Shook their socks off. Rest of the time when G-2...Hold on boys. Awlright. (TODAY, 4-14-81)

<> More than 200,000 people, undaunted by warnings of rattlesnakes and snarled traffic, were expected to welcome home the Space Shuttle Columbia today when it glides to a landing on a sunbaked lake bed in the Mojave Desert.

"This is the only time we're ever going to see anything like this," said Francis Bonar, one of hundreds of early arrivals at Rogers Dry Lake on this remote desert air base.

Chamber of Commerce officials in nearby Lancaster Monday estimated the crowd would top 200,000 by the time the world's first roundtrip spaceship is scheduled to touch down at 1:28 a.m. EST after orbiting the globe for 2 1/2 days.

Lancaster Mayor Fred Hann predicted the biggest crowd in the city's history.

Tents and trailers began packing a public viewing area 3 1/2 miles from the landing site Sunday night. Awnings were being erected across the lake bed where VIP's, including Air Force Secretary Verne Orr, were to watch the landing.

A mini-midway complete with hot dog, peanut and beer stands sprang up in the public viewing area. Early arrivals snapped up Space Shuttle T-shirts and hats. Some planted American flags in the hard desert ground at their campsites. (TODAY, 4-14-81)

<> Moscow, commenting on the flight of the Space Shuttle Columbia yesterday, continued its criticism of the spacecraft as an instrument of the arms race. "Work on the shuttle began 10 years ago. The American military connected it with far reaching plans to extend the arms race to space. An important element of the very first mission is the testing of a sighting device for laser weapons." (DEFENSE DAILY, 4-14-81, p. 257, Vol. 115, No. 32)

- <> Asked yesterday if the Reagan Administration is going to be responsive to the calls for added space efforts by the United States, in the wake of the success of Space Shuttle Columbia, such as joint missions with the Europeans, White House spokesman Larry Speakes said, "Once we get our NASA people appointed, we will discuss it with them." (DEFENSE DAILY, 4-14-81, p. 257, Vol. 115, No. 32)
- <> Sen. William Proxmire (D-Wis.) says the Space Shuttle, originally estimated to cost \$5 billion, will actually cost about \$20 billion, or "about \$400 for every American family." Proxmire, who has been a persistent critic of the Space Shuttle program, told ABC's "Issues and Answers" Sunday that the program is being "grossly oversold." He said the United States is "putting a truck up in the sky and we're being told it's a second coming." Sen. Harrison Schmitt (R-N.M.), chairman of the Senate Space Subcommittee, also on the program, said, "We really have no alternative. The new ocean of space is there. We opened it up far more than the Soviets did. But the competition between oppression and freedom has now expanded into that arena." Schmitt added that the U.S. "must be there as dominant, if not more so, than any other nation." (DEFENSE DAILY, 4-14-81, p. 257, Vol. 115, No. 32)

April 15: Sen. John Glenn (D-Ohio), who has not had much to say about the space program since coming to the Senate, said Sunday that the money being spent on the Space Shuttle is justified.

"I think it would be worth every nickel spent on it just for the military uses the Shuttle and the space program can be put to," he said. "But we're not doing that. We're doing a lot of civilian research and new material development in addition to military uses of surveillance and communications and perhaps defensive weapons," possibly including "lasers in space" that could shoot down Soviet ICBM's aimed at the U.S.

As for U.S./Soviet cooperation in space, Glenn noted that in 1962, when he orbited the Earth in the first U.S. manned orbital flight, "I proposed...that we get together, the astronauts and the cosmonauts," but nothing came of it but one Apollo-Soyuz mission. "I think it probably would be pretty late in the game to do that now," he said. "We seem to be pretty much going our own ways." (DEFENSE DAILY, 4-15-81, p. 270, Vol. 115, No. 33)

- <> President Reagan yesterday praised Space Shuttle astronauts Young and Crippen, saying their "brave adventure has opened a new era in space travel. You put new worlds within closer reach and more knowledge within our grasp." (DEFENSE DAILY, 4-15-81, p. 265, Vol. 115, No. 33)
- <> The Soviet trawler Ekwator tried to move into the Space Shuttle solid rocket booster recovery area during the launch on Sunday and had to be ordered out by a U.S. helicopter and cutter. The Coast Guard helicopter first spotted the Ekwator at the edge of the recovery area 170 miles east of Flagler Beach, Florida, and asked it to move out of the area. After initially complying, the Ekwator made several efforts to move in closer, but was prevented by the cutter Steadfast. Finally, the Ekwator went dead in the water outside of the impact area. Yesterday, the trawler monitored the recovery of the United Technologies booster castings as they were towed back to the Navy's Trident submarine base at Port Canaveral. One of the casings was to be towed up the Banana River to the Kennedy Space Center yesterday. (DEFENSE DAILY, 4-15-81, p. 270, Vol. 115, No. 33)
- <> The 54-hour maiden flight of America's Space Shuttle Columbia concluded in triumph at 1:21 PM EST (10:21 AM PST) yesterday when pilots John Young and Robert Crippen set the 214,000-pound reusable spacecraft down in a perfect wheels-down landing on the dry lakebed at Edwards AFB, California. Firing of the OMS engines to begin reentry began at about 12:22 PM. Six minutes later, Young reported the burn was "on time and nominal."

Early indications were that the flight was near perfect and that the Columbia is in excellent condition. There were no reports that any of the critical "black tiles" on the underside of the spaceship debonded.

Young, who emerged first from Columbia at 2:25, bounded down the steps that were brought out to the Orbiter after it was shut down and checked by technicians for toxic gas leaks, shaking hands with the technicians and walking under the Columbia to look at the tiles. Crippen emerged several minutes later, also all smiles, and the two immediately got in the van to take them back to the air base. The astronauts were to be flown to Houston tonight for five to eight days of debriefing.

Young, a veteran of four previous space missions, told mission control that the Shuttle "is an all right flying machine. It doesn't fly like anything I ever flew before. It is really super."

"It was one fantastic mission," added Crippen.

Shortly after the successful landing, NASA-Johnson director Chris Kraft commented: "We just became infinitely smarter."

Meanwhile, early indications from the Cape were that damage to the Shuttle's Solid Rocket Boosters that were recovered in the Atlantic was less than earlier expected.

"I have no doubt that these SRB's will be reusable," Roy Runkle, a NASA design engineer for the SRB, told reporters. (DEFENSE DAILY, 4-15-81, pp. 264-265, Vol. 115, No. 33)

- <> The twin rocket boosters that helped propel Columbia into orbit will be refurbished at a cost of \$14.2 million and put to use on the sixth shuttle mission, planned for December 1982.

National Aeronautics and Space Administration (NASA) officials said yesterday that the boosters were "in very good condition" despite the battering they took with their plunge into the Atlantic Ocean on Sunday.

Reconditioning the boosters will cost \$36 million less than building a new pair from scratch. (THE PHILADELPHIA INQUIRER, 4-15-81)

- <> From the moment John W. Young and Robert L. Crippen entered the space shuttle Columbia to the moment they emerged safely after their flight, both carried \$800,000 worth of accident insurance.

The coverage was arranged through the National Space Club Scientific and Educational Foundation, which promotes research and education relating to rocketry and astronautics, and by Corroon & Black-INSPACE, a Washington-based firm that specializes in insuring space risks.

James W. Barrett, chairman of Corroon & Black, said his firm arranged for each of eight insurance firms to provide \$100,000 worth of coverage on each astronaut. The nonprofit foundation paid the premiums, and, in turn, each insurance company made a donation to the foundation. (ASSOCIATED PRESS, 4-15-81)

<> Boeing Aerospace Co., one of the Phase-A study contractors for preliminary definition of NASA's conceptual Space Operations Center (SOC), reports completion of the first phase of its study, accompanied by the release of an artist's concept of the Shuttle-serviced, modular SOC.

As depicted, the Boeing SOC concept is comprised of: 1) Two "large mobile home" -sized Habitat Modules that would serve as living quarters; 2) Two attached Cylindrical Service Modules which contain propellant, batteries, power processing, units, oxygen and nitrogen; 3) A Logistics Module which serves as a storeroom for consumables such as food, water and hydrazine; 4) A large hexagonal hanger for servicing and storing spacecraft; 5) A tubelike docking module for docking spacecraft and building structures in space; 6) Two solar arrays attached at either end of a long boom to provide power for the center; 7) A flat panel radiator; and, 8) A track or truss structure and moveable "cherry picker" crane used for handling spacecraft.

Boeing notes that the SOC concept differs from previous Space Station concepts in that it would begin primarily with operational functions rather than as an R & D operation.

These functions would include construction of space structures; tending of free-flying satellites; and servicing, launching and recovering space-based vehicles, in addition to scientific research.

The center, orbiting some 200-250 miles above the Earth, would be permanently manned, with crew members staying about 90 days before returning to Earth.

Boeing says an initial station with a crew of four could be constructed in the late 1980's. (DEFENSE DAILY, 4-15-81, p. 271, Vol. 115, No. 33)

April 16: The Soviet evening television news program devoted about 30 seconds today to film clips showing the Columbia landing and its two astronauts being greeted after getting off the plane that took them to Houston.

The Soviet commentator, reading from a New York dispatch by Tass, the official Soviet press agency, said the new feature of the American spaceship was that it could be re-used and should be able to put payloads into orbit at a lower cost than rockets.

"These characteristics of the re-usable ships," the Tass dispatch said, "can serve both in the exploration of space for peaceful purposes and in the solution of tasks of a purely military nature."

"A big role is reserved for the shuttle program in the testing of various types of the newest weapons, which the United States intends to station in space," the press agency added. (THE NEW YORK TIMES, 4-16-81)

<> The second cargo carrier in America's space transportation fleet is taking shape here and is due to become operational in just over a year.

Rockwell International's assembly plant in this wind-swept Mojave Desert town 20 miles south of the landing strip where the Space Shuttle Columbia landed Tuesday is one of a kind.

Its 400 workers assemble a single product - Shuttles, at \$500 million per copy delivered to NASA. Rockwell, the prime contractor for the Space Shuttle, labored nine years to get Columbia in shape for Sunday's launch at Kennedy Space Center, and the reusable spacecraft's first five flights will all be tests of increasing complexity.

But the Columbia's sister carrier, Challenger, "will right into operational flight" in June 1982 when it is transported from the tall, 110,000-square-foot building where it is being assembled, according to Rockwell spokesman Bill Green. (TODAY, 4-16-81)

<> While a full inspection of the insulation tiles on the Space Shuttle Orbiter Columbia remains to be completed, NASA is starting preparations for the second flight of Columbia in September.

The backup astronauts for the first Shuttle flight, space rookies Joe H. Engle and Richard H. Truly, have been named to pilot the second flight, which is slated to last four days, compared to the two-day (54 hours, 20 minutes, 52 seconds) Orbital Flight Test-1 mission. Both astronauts participated in the landing tests of the Shuttle Orbiter Enterprise.

The third test flight of the Shuttle is planned for next spring; the fourth and final test flight in the fall of 1982, and the first operational flight, carrying the first Tracking and Data Relay Satellite, is planned for the end of 1982.

Columbia is slated to begin its return flight to Cape Canaveral from Edwards riding atop a 747 airliner in about a week.

Scientists estimate that the nose and leading edges of Columbia's wings were subjected to temperatures of about 2750 degrees F during reentry, which started at an altitude of 400,000 feet over the Pacific. The spacecraft, traveling at more than 17,000 mph when it began reentry landed at a speed of 215 mph.

Deke Slayton, manager of the Orbital Flight Test program, said Tuesday that shuttle officials are "all supremely happy with the way the vehicle performed. I guess we consider it a 100 percent successful mission."

Slayton said he got a preliminary report from the ground crew saying the tiles looked to be in good shape. (Sixteen tiles came loose from Columbia's OMS pods during takeoff.) A close inspection was delayed because a small amount of explosive freon and hydrazine gases were detected near Columbia shortly after landing.

The one negative report on the mission is that the Shuttle's launch pad at the Cape suffered significant damage, which is going to require "a lot of time and manpower to fix." Pad director John Styles said the pad will have to undergo "some redesign." (DEFENSE DAILY, 4-16-81, p. 273, Vol. 115, No. 34)

- <> U.S. Rep. Bill Nelson is calling for the Reagan administration to establish a firm national policy on space - including goals for an orbiting space station by 1990.

The Melbourne Democrat said Wednesday his proposal has the full support of the House Science and Technology Committee and its space subcommittee.

Nelson said he gained his colleagues' backing at this week's successful Space Shuttle launch from Kennedy Space Center and landing at Edwards Air Force Base in California.

"I will urge the new administration to make a strong declaration of space policy in the near future -- what we should do and when," Nelson said.

The nation hasn't had a space policy in eight years, Nelson said at an Orlando news conference. (TODAY, 4-16-81)

- <> These are the firsts connected with the space shuttle Columbia:

It is the world's first reusable spaceship.

It is the first spaceship to carry a human crew on its maiden flight.

It is the first spacecraft to ride piggyback on its main fuel tank into space.

It is the first spacecraft to have booster rockets that were designed to be reused. By the way, the boosters themselves

were the first to use solid fuel for a manned flight. And they are the biggest solid fuel rockets ever used in the space program with a total thrust of 5.3 million pounds.

It is the first winged spaceship. The wing span is 78 feet. The tail is 46.3 feet tall.

It is the first spaceship to have a cargo capacity. Such capacity is about 1 1/2 times as great as an Air Force C-130 cargo plane and the shuttle's hold can accommodate a Greyhound bus.

It is the first spaceship capable of ferrying as many as 10 people in an emergency. (HOUSTON CHRONICLE, 4-16-81)

April 17: Federal officials moved yesterday to suspend the license of a pilot who may have risked a collision with the space shuttle Columbia by flying his private plane into restricted air space seconds before blastoff.

The pilot, not identified pending receipt of the suspension notice, was chased away from the launch pad 90 seconds before the Columbia lifted off Sunday.

He later said he was trying to photograph the launch, spokesmen for the Federal Aviation Administration said.

Kennedy Space Center security helicopters twice had to chase the single-engine Cessna-150 away from the launch pad and an FAA chase pilot later forced the plane to land at a local airport. (THE SUN, 4-17-81)

<> NASA Space Shuttle officials continue to be optimistic that the Shuttle Orbiters will be able to make the 100 flights for which they were designed, following preliminary examinations which show the Columbia to be in excellent condition.

Orbital Test Flight director Deke Slayton said, "Overall, we're happy about the performance of the whole system." "I see no reason why we can't have 100 missions with this machine, probably more than that."

Slayton said that besides the 16 insulation tiles that were pulled of the OMS pods during launch, no additional insulation tiles on Columbia were lost. Some of the tiles on the underside of the Columbia, however, were discolored by the heat of the reentry and some were chipped or pitted by sand kicked up by the landing on the dry lakebed at Edwards.

However, said Slayton: "All the damage looks like it's repairable." (DEFENSE DAILY, 4-17-81, p. 281, Vol. 115, No. 35)

<> Somalia has become the 106th member country of Intelsat, the International Telecommunications Satellite Organization. (DEFENSE DAILY, 4-17-81, p. 281, Vol. 115, No. 35)

April 20: Shuttleliner Columbia's departure from Launch Complex 39A here last week was well within the strictest airline on-time standards. There was a small ball of flame visible from the viewing site when the orbiter's three main engines ignited at the pad within a minute of the launch schedule revised after the recycled first attempt April 10. A small squirt of steam ejected to the right and a larger one an instant later to the left. The shuttle stack hung for six seconds on the pad for thrust monitoring and umbilical retraction before the pair of solid rocket motors fired. Then it popped off the pad, executed a quick 100-degree roll to the right just above the lightning mast on the support tower leaving all but the tips of its delta wing hidden behind the belly-mounted, bulging external tank, in turn flanked by the slimmer solid boosters. With that, it barreled straight up leaving a fat, pristine white cumulus-puffed finger of smoke in its wake.

Unlike the majestic, deliberate acceleration of the Apollo spacecraft Saturn 5 liquid rocket powered booster and its deep bass low-frequency vibration, the shuttle lit up and was gone. It was the typically solid-rocket-motor fast getaway of the Titan 3 launch vehicle.

Cheers, yells of elation, shouts of encouragement swelled from the crowd as the shuttle's smoke trail arched over to trace orbital insertion trajectory. Despite all the emotion of a 10-year development program with a two-year slip and letdown of the earlier aborted launch, uproar seemed slightly out of place, for the shuttle was all business.

The resumed final countdown at the T-5 hour point -- and incredibly the complex final 9 minutes on automatic sequencer -- went just like the documents. No glitches, no unplanned holds, no second agonizing recycle of the launch date. For a first flight of a space vehicle, let alone one more complex than Apollo, it was a remarkable performance.

Improvements are still needed. The first mission missed the tracking and data relay satellite system now in development whose delays will slip operational service to 1983 or 1984. Without it on STS-1, the crew could communicate with mission control only 30-40% of each orbit because of loss of NASA worldwide tracking stations for budgetary or political reasons.

What happened to cause launch recycle -- random out-of-phase timing mismatch between the shuttle's four primary and one backup flight computer system -- also makes an important point about the shuttle. The shuttle is an electric airplane, with complex avionics and software, one that is still in a test program. It represents a different generation of operating and procedural technology, and there will be new kinds of problems to solve as it moves through its remaining three orbital test flights and into operation over the next two years. (AVIATION WEEK & SPACE TECHNOLOGY, 4-20-81, p. 13, Vol. 114, No. 16)

<> Shuttleliner Columbia's arrival here two days and six hours after launch was as precise and businesslike as its departure, except for a bit of showmanship to herald its approach -- a double sonic boom that sounded like the climatic cannon shots in the 1812 Overture.

At something like 80,000 feet, when the twin boom hit, the shuttle was invisible to the naked eye. Its position overhead could be approximated, though, by the two contrails of a pair of Northrop T-38 chase aircraft flying a 5-minute racetrack pattern outboard of the orbiter's planned course to landing. There was a blip amid the contrails -- possibly a last puff of the orbiter reaction control thrusters, and then the contrails disappeared as the T-38s cut inside the orbiter's gentle 1.3-g left-hand turn toward Runway 2. on Rogers Lake for a delicately timed rendezvous with the spacecraft decelerating from supersonic speed.

When the orbiter finally appeared to the watchers on the ramp at NASA's Dryden Flight Research Center, it was flaring on final just over the low hills to the north. In the slight haze and shimmering heat waves of the Mojave Desert, the orbiter could easily have been mistaken, with only a casual glance, for an arriving medium-size commercial jet transport. It was a relatively long flare as the aircraft commander, astronaut John Young, let the energy gradually bleed off and the orbiter settle softly to the dry lake bed. There it kicked up a streamer of tan silt like the spray of the speedboat, silhouetting one of the chase planes, an inspection, speed calibration and photo aircraft flown by astronaut Jon McBride, as the T-38 pulled up to start its own approach. The orbiter rolled to a halt in the black-line criss-cross markers of Runways 23, 18 and 30, within a couple of hundred feet of a prelaunch planned stopping point, 8 minutes ahead of scheduled arrival.

The shuttle is designed to change spaceflight from exploratory, one-of-a-kind, disposable hardware leaps into the unknown of Mercury, Gemini and Apollo to a routine airline-analogous turnaround. What the by-the-manual launch, two days in orbit, reentry and landing demonstrated is that the shuttle's design goal is now achievable.

Despite the skepticism that has grown with the Shuttle's slips, the frustrated wisecracks about "that turkey on the pad" after the scrub of the first launch, the worry about the missing tiles on the orbital engine pods discovered in orbital inspection with the vehicle's TV camera, the message from the shuttle's sparkling Palm Sunday liftoff and precision landing in the beige California desert is that the shuttle will work. (AVIATION WEEK & SPACE TECHNOLOGY, 4-20-81, p. 13, Vol. 114, No. 16)

- <> Launch processing system for National Aeronautics and Space Administration's space shuttle here provides checkout, control and monitoring functions an order of magnitude better than those available for Apollo, but requiring about one-tenth the firing room staff, according to NASA officials. Designed principally to implement the short turnaround time requirement for operational shuttle flights, the launch processing system uses minicomputers in "what is probably one of the largest distributed processing systems ever built," according to Walter Murphy, chief of guidance digital electronics and software here.

Although there is some central processing, the consoles in a shuttle firing room are driven principally by about 45 miniprocessors, all Modcomp 240 central processors in basic architecture, but with varying interfaces. The units are made by Modular Computer Systems, Ft. Lauderdale, Florida.

The miniprocessors drive the firing room's 15 consoles, each comprised of three bays and support equipment, Murphy said.

"With 15 consoles and three people per console, we have about 45 people with real control capability," he said. Apollo launch facilities required about 450 people.

"One of the biggest gains is in repeatability," according to Murphy. More than 50 test counts have been conducted with the actual vehicle and with the Shuttle Avionics Integration Laboratory (SAIL) at Johnson Space Center in Houston, Murphy said. Several hundred firings have been run against simulators.

The firing room here interfaces with the shuttle vehicle through the pulse code modulation (PCM) telemetry downlink. Control through launch is effected via the launch data bus. "We stay on hard wire line until the umbilical is pulled out," he said. (AVIATION WEEK & SPACE TECHNOLOGY, 4-20-81, p. 32, Vol. 114, No. 16)

- <> Shortly after the software/hardware synchronization problem developed in space shuttle orbiter STS-1's onboard computers during the initial launch attempt April 10, two teams were formed here at Johnson Space Center to troubleshoot the situation on a high-priority basis.

Computer program tapes were quickly sent from Cape Kennedy here and masses of computer printouts were made in an attempt to provide data on signal input-outputs with time correlations.

One team, comprising approximately 8-10 personnel at Johnson and several at Kennedy Space Center, worked on data analysis.

The operation entailed obtaining reams of computer printouts and dividing these among data analysis team members for close scrutiny.

The team believed at 3:00 p.m. April 10 that they had finally determined the problem, with John R. Garman, assistant division chief, spacecraft software division, Johnson Space Center, and Lynn Killingbeck, an IBM Systems software specialist, credited with identifying the problem.

At a 5:00 p.m. meeting that day, the teams arrived at final problem identification and a solution for overcoming it. Unfortunately, this was too late to prevent the launch from being cancelled that day. (AVIATION WEEK & SPACE TECHNOLOGY, 4-20-81, p. 22, Vol. 114, No. 16)

<> Damage to the Kennedy Space Center Launch Complex 39A from liftoff of the space shuttle was minimal and will be no factor in the schedule toward second launch, according to NASA officials.

Damage was characterized as no more extensive than that created by Saturn 5 launch vehicles and involved damage to light fixtures and instrumentation cabling. Damage to the cabling and light fixtures was expected.

Some handrails on the fixed service structure were blown away and one was driven through an elevator about 100 feet away. The handrails will be redesigned for pre-flight removal. Small shower-head sized water spray nozzles in the solid rocket booster flame trenches were melted, also as expected. (AVIATION WEEK & SPACE TECHNOLOGY, 4-20-81 p. 29, Vol. 114, No. 16)

April 22: The external tank for the second flight of the Space Shuttle Columbia was loaded on a barge at the Michoud Assembly Facility in New Orleans last week on a five-day trip to Cape Canaveral. The tank, which carries the liquid oxygen/hydrogen propellant for the Shuttle's three main engines, is 154 feet high, 27.5 feet wide and weighs 76,000 pounds unfueled. Martin Marietta Aerospace builds the ET at Michoud. The second Shuttle flight is planned for late September. (DEFENSE DAILY, 4-22-81, p. 306, Vol. 115, No. 38)

<> 2-C. Mr. Page gave the status of the STS-1 hardware and said that the Orbiter might not begin its flight returning to KSC until Saturday, April 25. There was a general discussion of possible ceremonies upon its arrival at KSC with the likelihood that KSC employees and their families would be invited to attend.

2-G. Dr. Buchanan discussed residue samples which had been removed from Pad A and the service structure. Aluminum oxide, silicon oxide, and iron oxide as well as hydrochloric acid have been identified necessitating a washdown of the structure to protect employees health and to prevent corrosion. (EXECUTIVE STAFF NOTES #12-81 for meeting of April 20, 1981, 4-22-81)

<> Except for the loss of two \$100,000 parachutes, the Space Shuttle's assist rockets are in good shape. In fact, parts of them may be back in the air as early as the sixth Shuttle flight -- scheduled for 1982.

"We're pretty well elated by the whole system," said John M. Gerding, the chief of NASA's solid rocket booster retrieval branch. "Recovery was a piece of cake."

The trio of parachutes on each booster opened perfectly, he said. But two of the parachutes sank to the bottom of the ocean because their floats were torn away when the parachutes were deployed. (TODAY, 4-22-81)

<> The 900 members of the International Association of Machinists and Aerospace Workers employed on the Space Shuttle program at Kennedy Space Center by Boeing Services International who went on strike February 20, voted Saturday to accept the latest contract offer from BSI. The workers struck to protest elimination of cost-of-living allowance from their three-year contract. (DEFENSE DAILY, 4-22-81, p. 310, Vol. 115, No. 38)

April 23: Former CIA director William Colby says the Space Shuttle offers the possibility of reopening the arms limitation talks with the Soviet Union. "We have agreed to limit weaponry in space. It is possible to destroy such a system, but the immediate result if the Soviets should

destroy our system, is that we would destroy theirs. The Shuttle offers the possibility of negotiating new arms controls and systems," Colby said in Charlottesville, Virginia. (DEFENSE DAILY, 4-23-81, p. 314, Vol. 115, No. 39)

<> President Reagan today announced the nomination of business executive James Montgomery Beggs to become Administrator of the National Aeronautics and Space Administration and Dr. Hans Mark as Deputy Administrator.

Beggs has been Executive Vice President, Aerospace, and a director of General Dynamics Corp., St. Louis, Mo. Mark is former Secretary of the Air Force and former Director of NASA's Ames Research Center, Mountain View, California.

Beggs, if confirmed, will succeed Dr. Robert A. Frosch who resigned on January 20, 1981, to take over as the first president of the American Association of Engineering Societies in New York. Frosch had been Administrator since June 21, 1977.

Born in Pittsburgh, Pa., Jan. 9, 1926, Beggs and his wife, the former Mary Harrison, have five children.

Mark served as Secretary of the Air Force from July 1979 to 1981. He had served as Under Secretary since 1977.

Born June 17, 1929, in Mannheim, Germany, Mark came to the United States in 1940 and became a citizen in 1945. He received his bachelor's degree in physics from the University of California at Berkeley in 1951 and a doctorate in physics from Massachusetts Institute of Technology in 1954.

He and his wife, the former Marion G. Thorpe, have two children. (NASA NEWS RELEASE NO: 81-51, 4-23-81)

April 24: Nobody was more pleased about the results of the first Space Shuttle flight than KSC officials. Here are some of their comments:

"I've been on a lot of first launches. I've been in this business over 20 years. But I've never felt anything like this," said George Page, Director of Shuttle Operations. "I'm so proud of that launch team. I thought the landing was an absolutely fantastic conclusion to a perfect mission."

"It was fantastic," said Dr. Bob Gray, manager of the Shuttle Projects Office. "It went all the way but I was afraid to think it would be this good in advance. It sure shows me that all things promised for Shuttle can and surely will come about. It's an outstanding tribute to America's space talents and capabilities."

"It was super," remarked Tom Utsman, Director of Technical Support. "It's going to be hard to beat. It's hard to believe it was a first mission."

"Much praise and thanks goes to our design and operations organizations. It was indeed a great effort by the KSC, JSC and MSFC Shuttle team," said R.L. Clark, Associate Director for STS Development.

"We're delighted with the performance of the equipment we supplied," said Deputy Director of Design Engineering H.C. Paul. The Launch Processing System provided much better visibility into equipment operations than we had ever had before, and offers the potential for further automation of Space Shuttle processing at KSC.

"The many systems at the pad functioned properly with only minor exceptions and sustained the rigors of the launch with flying colors." (SPACEPORT NEWS, 4-24-81, p. 3, Vol. 20, No. 8)

<> I extend my personal congratulations to each and every member of the KSC team for the successful first launch of the Space Shuttle. We have come down a long and sometimes bumpy road, but the results of our patience and effort can be seen today in every face in the NASA/industry team. The resounding success of the first flight is a legitimate source of pride for all of us.

But let us not be so blinded by our pride that we lose sight of the road ahead. The mission of the Space Shuttle is to fly safely again and again. We must be prepared to make the same efforts, to exercise the same diligence each and every time. Our path to those future launches has already begun.

We have set a fine example for ourselves in this first step, and I look forward to sharing the remainder of the journey with you.

Richard G. Smith, KSC Director (SPACEPORT NEWS, 4-24-81, p. 3, Vol. 20, No. 8)

<> An estimated crowd of 41,000 witnessed the historic liftoff of Columbia from viewing sites on Kennedy Space Center.

Workers and their families, visitors and invited guests fought mammoth traffic jams to get onto KSC and to their front row seats for the occasion.

For many, it was the second time in as many days but when they got to their sites, they found a little more elbow room than had been available on the first launch attempt April 10 - which was scrubbed when a computer problem developed in the final minutes of countdown.

Nearly twice as many folks - a capacity crowd - turned out for the scheduled launch on April 10. Many of the local residents who had car passes apparently stayed home on Sunday, watching the launch on TV instead of battling the crowd again.

But for those who endured, the sight of Columbia rising above Pad 39A was an unqualified thrill.

Among the watchers were 2,700 professional observers, media representatives from around the country and as far away as Japan, reporting on the launch of Columbia for their news organizations.

"Seeing all those people coming here to view the launch and knowing that hundreds of thousands more viewed liftoff from the shorelines told me that the public's interest in the space program is a lot greater than some believe," said Arnold Richman, chief of the Visitors Services Branch.

Bus after bus - 119 in all - ferried special guests and VIPs from their hotels to space center viewing sites. As dawn broke, the bleachers across the street from the VAB were beginning to fill up with invited guests - including former astronauts, corporate executives, government officials, educators and foreign visitors.

"It was a beautiful sight and I was glad to be here," said former Apollo Astronaut Neil Armstrong - the first man to walk on the Moon.

"Just fantastic!" exclaimed former Apollo launch director Rocco Petrone. "I see a lot of use of the Shuttle."

"Apollo was sensational but this exceeded that," remarked Florida Congressman Don Fuqua, chairman of the House Science and Technology Committee. He said the time appears right for a fresh look at our future efforts in space. "I think this launch will renew confidence in our program," he added.

"This is the greatest launch team in the world," said U.S. Rep. Bill Nelson, also a member of the Science and Technology Committee. "Every American is grateful for their high degree of excellence, this is a great day for America, an important day for America."

Celebrities Pat Boone, John Denver and Nichelle Nichols - otherwise known as Star Trek's Lt. Uhuru - were here April 10 for the scheduled liftoff but were unable because of prior commitments to make a return to launch site on April 12.

Present both days, however, were film producers George Lucas - "Star Wars" - and Steven Spielberg - "Close Encounters of the Third Kind."

Among the thousands of viewers who watched the launch from the NASA Causeway East were visitors from all corners of the country.

"This is my third space shot that I have seen," said Ted Miller of Berlin, Pa. "But this was the most fabulous and I'm so happy to be a part of history being made."

As did many of the viewers, Joel Siegler of Milwaukee, Wis., had a personal interest in the Shuttle. His company - Siegler Machine and Tool Co. - has supplied machine tools to other firms building parts for the Columbia.

"It was terrific," said Siegler.

Florence and Jack Whaley traveled here from Los Gatos, Calif., to see Columbia off on its maiden voyage.

"I thought the launch was terrific," said Jack Whaley. "I've worked for NASA for 20 years at Ames Research Center in California. I'm in the Research and Development Section of it. And we have tested this configuration that I just saw go up in the air and it's quite a thrill." (SPACEPORT NEWS, 4-24-81, p. 6, Vol. 20, No. 8)

<> We're back in the manned spaceflight business again.

It was smooth sailing all the way for Columbia, from the moment of its dazzling early morning liftoff to the flawless touchdown on a California desert runway 54 hours and 21 minutes later.

The Space Shuttle thundered away from KSC's Pad 39A on its maiden flight a few seconds after the scheduled 7 a.m. launch on April 12, the dawn of a new era in space.

"We'll try to do a little better next time," quipped Shuttle launch director George Page in a post-launch press briefing that was punctuated with applause and cheers.

But there was no doubt about the accomplishment achieved with the successful flight of Columbia - the world's first reusable spaceship.

The historic mission flown by Astronauts John Young and Bob Crippen demonstrated in a remarkable performance, the hardware of a new Space Transportation System that has been under development for nearly 10 years.

America has opened the third decade of manned spaceflight with a versatile new tool that will play a major role in expanding mankind's presence on the space frontier.

Even as Columbia flew 170 miles above the Earth, work had already begun on its second flight into orbit. And the winged spaceship will soon be back in its nest at KSC, undergoing preparations for a return to space.

For the moment, however, NASA and its contractors are in what has been described as an "exhilaration mode," basking in the success of a mission that has scored big points for America's space efforts.

Liftoff had been planned for 6:50 a.m. on Friday, April 10. Anyone who tried to travel the roads on and adjacent to Kennedy Space Center could easily see that a lot of folks fully expected it to go.

But a computer problem in the final minutes of countdown forced a postponement of the launch until Sunday morning.

There were no hitches on the second attempt. When the ignition command went out, Columbia got up and went with a roar that cracked across miles of marshland, and a release of power that made the ground tremble under those who watched from sites a safe distance away.

About 50 minutes later, as the Columbia flew over the Indian Ocean, a second firing of the Shuttle's orbital maneuvering system engines circularized the craft's orbit at an altitude of about 150 miles. Another burn later in the flight boosted them a little higher.

Young and Crippen spent the next two days performing checks of Columbia's systems during on-orbit operations. The long payload bay doors opened and closed without trouble.

Both crewmen praised the vehicle for "performing like a champ."

Crippen, on his first flight into space, was quick to give a hearty endorsement to space travel. "I highly recommend it," he said.

And when it was time for Columbia to return to the ground, it responded flawlessly to computer commands and John Young's control stick.

"What a way to come to California," remarked Crippen.

Columbia's dramatic unpowered descent began over the Pacific. As the craft glided toward California, it was flown at hypersonic speeds through a series of S-turns that gradually decreased its speed as it banked north and south of a straight line to Edwards Air Force Base. As sure as the mission was a milestone in the history of space travel, the re-entry was a milestone in the history of aeronautics.

And when it came time to set Columbia down on the dry lake runway at Edwards, Young made it look easy.

Touchdown came at 1:20 p.m. EST - two days, six hours, 20 minutes and 52 seconds after liftoff.

A KSC ground crew greeted the Columbia in SCAPE suits, "sniffing" the air around the craft for toxic gases and beginning the process of safing the vehicle.

"You can't believe what a flying machine this is," Young told controllers in Houston as he and Crippen waited to exit the craft. "It's really something special."

About an hour after the landing, the Columbia's hatch opened and a grinning commander Young bounded down to inspect the Columbia from nose to tail. Soon after, Crippen emerged from the portable white room which had been positioned snug against Columbia's hull.

After the astronauts had departed, the rest of KSC's 300 recovery and safing crew members went to work on the orbiter to prepare it for it's triumphant return home.

Their first looks confirmed that the orbiter had come through its test flight in excellent shape. No additional tiles had been lost during the reentry, according to Deke Slayton, and repair work would be minimal before the ferry flight could be begun.

By the day after landing, Columbia had been moved to the mate-demate device at Dryden for mating with the 747 carrier aircraft. The craft's windows were covered with protective shields and a number of purge and safing operations had been started.

The trip home will take two days.

Already back at KSC were the two solid rocket boosters which helped begin the Columbia's journey.

The two boosters will be refurbished, returned to the contractor for refueling and used again on a future flight, possibly as soon as STS-6.

Perhaps the best summary of the Columbia's mission can be found in a comment made by Deke Slayton, Orbital Test Flight Manager, in a post-landing press briefing.

"It was as perfect a mission as one could expect," he told reporters. "The Shuttle will do for space what the DC-3 did for aviation." (SPACEPORT NEWS, 4-24-81, pp. 1-2 & 8, Vol 20, No. 8)

April 25: When the space shuttle Columbia thundered off its launching pad at Cape Canaveral, Fla., earlier this month, a small circle of German engineers, eyes fixed on a television screen here, were particularly excited.

The engineers were sitting across a field from the metal buildings that house the assembly line for Spacelab, a reusable orbiting laboratory scheduled to go into space in the shuttle's voluminous cargo bay in late 1983.

"Columbia is America's dream," said Manfred Fuchs, director of project development at Erno Raumfahrttechnik, the West German aerospace company that is Spacelab's prime contractor. "If that dream doesn't work, ours won't either."

Spacelab proved in the last seven years to be not only Europe's biggest, most ambitious space undertaking, costing nearly \$1 billion, but also a curiously complex experiment in industrial and management cooperation. The shuttle's success gave the project a much needed lift, after delays in America's orbiter threatened to sap the interest of European governments and industry. (THE NEW YORK TIMES, 4-25-81)

April 27: Poor weather is always a concern just before a rocket is launched into orbit, but until now there has been little worry about rainfall right after a launch -- the space shuttle has changed that.

The shuttle's two huge solid-fuel booster rockets have created the possibility that a sudden thunderstorm or shower immediately following a launch could produce acid rain, scientists point out.

So the National Aeronautics and Space Administration is conducting studies to determine the environmental effects of such rain. (THE WASHINGTON POST, 4-27-81)

<> While hailing the flight of the space shuttle, the archbishop of Canterbury, Robert A. K. Runcie, warned yesterday that man must explore "inner space, which labors the fears and the desire to dominate, which are the sources of the violence and the divisions which disfigure the world." In a sermon at Washington Cathedral, the archbishop said, "There is a terrifying disparity between our technical achievements and our moral progress." (PHILADELPHIA INQUIRER, 4-27-81)

April 28: The House HUD-IA Appropriations Subcommittee has gone along with the changes proposed in the FY '81 NASA budget by the Reagan Administration, which includes adding \$60 million to the Space Shuttle program and taking \$7.5 million from Space Flight Operations, \$28 million from Applications, \$6 million from Aeronautics and Space

Technology and \$10 million from R & PM. The changes were previously authorized by the House Science Committee. The net effect of the changes is a reduction of \$14.5 million in the FY '81 NASA budget to \$5,522,688,000.

The Senate HUD-IA Appropriations Subcommittee is scheduled to mark-up the FY '81 HUD-IA appropriation, including NASA, early next week. The House subcommittee has tentatively scheduled hearings on the FY '82 NASA budget next week; the Senate subcommittee is planning hearings May 12. (DEFENSE DAILY, 4-28-81, p. 339, Vol. 115, No. 42)

- <> NASA's Jet Propulsion Laboratory intends to initiate preliminary studies this year for definition of the new technology that will be required for spacecraft to investigate the far outer planets in the 1990's.

The studies will specifically include investigation of concepts for an advanced spacecraft system for the outer planets missions "as a departure from" the traditional three-axis-stabilized Mariner-class spacecraft.

The mission opportunity period for coordinated exploration of Saturn, Uranus, Neptune and Pluto, utilizing gravity assist from the planet Jupiter, will begin in 1991. In addition, NASA is planning the Saturn Orbiter/Dual Probe mission in the late 1980's a direct mission to orbit Saturn and send probes into Saturn's atmosphere and to Saturn's large moon, Titan. (DEFENSE DAILY, 4-28-81, p. 343, Vol. 115, No. 42)

- <> With the Space Shuttle Orbiter Columbia bolted to its top, a 747 carrier aircraft took off from Edwards AFB at 10:18 AM PDT yesterday on a two-day return trip to Kennedy Space Center. The aircraft will stop over at Tinker AFB, Okla., and make the final trip to KSC today. The flight was delayed Sunday when a tailcone strut had to be replaced. Late arrival of the replacement strut delayed the flight three hours yesterday. (DEFENSE DAILY, 4-28-81, p. 342, Vol. 115, No. 42)

- <> NASA, which is currently in the process of revising its flight manifest for the Space Shuttle program, will reduce the number of flights planned through FY '85 from the

original 44 to between 26 and 36, a reduction of 18-41 percent. The agency says that it believes the 36-flight figure is achievable.

The revisions are being made because of the slip in the maiden Shuttle launch and the curtailment of the NASA space science program, with some missions eliminated and others pushed back until later in the decade.

NASA expects to complete the new manifest in about three or four weeks. The agency continues to retain the 487-flight mission model for the 1981-1982 period.

Meanwhile, the second Orbital Flight Test of the Space Shuttle Columbia (OV-102) is planned for September/October, with NASA believing the later date is more likely and Rockwell saying the earlier date can be met.

OFT-3 is planned for January 1982; OFT-4 for April 1982.

The first operational flight of the Shuttle is planned for September 15, 1982, carrying a NASA science payload and two commercial communications satellites.

The second operational flight is planned for November 1982, carrying the German Shuttle Pallet Satellite (SPAS-01).

The third operational flight is planned for January 1983, carrying the first Tracking & Data Relay Satellite (TDRS-A).

The second Space Shuttle Orbiter, Challenger (OV-99) is scheduled for delivery in June 1982; the third, Discovery (OV-103) in September 1983, and the fourth, Atlantis (OV-104) in December 1984. A fifth Shuttle (OV-105), if initiated in FY '83 could be delivered in 1987. (DEFENSE DAILY, 4-28-81, p. 338, Vol. 115, No. 42)

April 29: Just two weeks ago, I joined millions of my fellow Americans in marveling at the magic historical moment that John Young and Bob Crippen created in their space shuttle Columbia.

The last manned effort was almost six years ago, and I remembered how, over the years, we had all come to expect technological precision of our men and machines. Each amazing achievement became commonplace, until the next new challenge was raised.

With the space shuttle, we tested our ingenuity once again -- moving beyond the accomplishments of the past into the promise and uncertainty of the future. Thus, we not only planned to send up a 122-foot aircraft, 170 miles into space, but also intended to make it maneuverable and return it to earth -- landing 98 tons of exotic metals delicately on a remote dry lake bed.

The space shuttle did more than prove our technological abilities, it raised our expectations once more; it started us dreaming again. "The republic is a dream," wrote Carl Sandburg. "Nothing happens unless first a dream." (President Reagan's April 28 speech before Congress, as printed in THE NEW YORK TIMES, 4-29-81)

<> With little of the fanfare that surrounded its April 12 lift-off, the space shuttle Columbia returned to its home port yesterday to be prepared for a second voyage this fall.

A crowd of about 1,200 space center employees and family members burst into applause as the aircraft rolled onto an apron next to a facility where Columbia will be plucked off the 747.

Richard Smith, director of the Space Center, said the 54-hour, 36-orbit flight that ended in California on April 14 was "more successful than we ever dared hope for." He said he knew of no problems that would prevent a second flight in September or October. (PHILADELPHIA INQUIRER, 4-29-81, p. 6-A)

<> Space shuttle Columbia's thunderous tower of flame would have been far longer and louder without one weight-cutting breakthrough achieved in a Quonset-hut laboratory in Ohio 30 years ago.

Glass-industry researcher Dominick Labino's discovery of a new way to produce microscopic glass fibers led to the ultra-lightweight tiles used to insulate the space shuttle from the searing 2,500 degree F. heat of reentry.

Other heavier materials could withstand the high temperatures but at the steep cost of using more fuel for liftoff or reducing the shuttle's load capacity. As well, the remarkable durability of the tiles results in the shuttle's "RSI" (Reusable Surface Insulation) being scheduled for 100 round trips into space.

Extensive research before the first flight demonstrated the tiles' heat-resistant qualities, their resistance to damage from being plunged from 2,500 degree heat into water or from workers walking on them and their dimensional stability despite great, sudden temperature changes.

Working with Minnesota sand and closely guarded trade secrets, employees in a neat red-brick factory overlooking the Maumee River in Waterville, Ohio, today produce all the silica fiber used in the shuttle's protective tiles. A series of mergers absorbed Mr. Labino's original company, and Johns-Manville Glass Fibers Corporation now churns out the fiber under contract to Lockheed. The glass fiber is so fine that one pound of it could cover a three-acre field. Stretched out as a single fiber, a pound of the invisible thread would be 10 million miles long, Labino explains.

It seems perfectly logical to Labino that one important breakthrough for the space shuttle program came from his tiny laboratory 30 years ago. He expects to continue making new discoveries in his larger but still modest private laboratory which this "retiree" operates without government or industry funding. (THE CHRISTIAN SCIENCE MONITOR, 4-29-81)

<> The Space Shuttle Columbia, riding atop a 747 aircraft, arrived at Kennedy Space Center at 11:23 AM yesterday after a 3 1/2 hour flight from Tinker AFB, Ohio, completing a two-day trip from Edwards AFB, where it landed April 14. Working date for the second flight of Columbia is Sept. 25, but officials say a mid-October launch is more probable. (DEFENSE DAILY, 4-29-81, p. 347, Vol. 115, No. 43)

April 30: The space shuttle Columbia was being towed at a snail's pace Wednesday to the Orbiter Processing Facility, where it will be refurbished for a second test flight next fall.

Columbia, America's reusable rocket ship, arrived at Kennedy Space Center Tuesday amid the cheers of 500 space workers, concluding a two-day 2,248-mile piggyback ride from California atop a modified 747 jet transport.

Workers guided the aircraft into a steel-framed de-mating tower and got ready for the 90-minute tow to the orbiter building two miles away, where it will remain about three months.

Richard Smith, director of Kennedy Space Center, said technicians will troubleshoot the entire orbiter, closely examine the protective tiles that guard its heat-sensitive aluminum skin, and service the in-flight maneuvering systems.

Also on the list is construction of a more comfortable cockpit for astronauts Joe Engle and Richard Truly, who will be inside the shuttle the second time it goes into orbit.

CBS News Tuesday quoted space agency officials as saying the launch would be delayed until next year.

Earlier, however, Smith said the Shuttle would be ready the first part of October, although it will be 18 months before it starts hauling commercial satellites and scientific gear into space on a regular basis.

"It's in excellent shape," Smith said. "I don't see why it can't go 100 times." (THE MIAMI HERALD, 4-30-81, p. 10A)

<> Although they could very well be the first husband and wife in outer space, Dr. Margaret Rhea Seddon and Lieut. Cmdr. Robert Lee Gibson, both astronauts, will settle for a trip to Hawaii by conventional jet following their marriage May 30 in her home town of Murfreesboro, Tenn.

Dr. Seddon, the first woman to gain the full rank of astronaut, was a resident in nutrition and surgery at City of Memphis Hospital in 1978 when she was among the first six women chosen for astronaut training. During the flight of the space shuttle Columbia she was at Cape Canaveral, Fla., aboard one of two standby helicopters. Dr. Seddon and Commander Gibson have dated for two years since meeting at the Johnson Space Flight Center in Houston, where they are now stationed.

The only previous astronaut couple, Drs. Anna and William Fisher, both physicians, were married before joining the space program.

Since Commander Gibson is a pilot and Dr. Seddon would serve as a "mission specialist," the couple "have as good a chance as any" to fly together, Dr. Seddon told THE NASHVILLE TENNESSEAN yesterday. If so, she said, "We'll be so busy up there we won't even have time to say 'hello'." (THE NEW YORK TIMES, 4-30-81)

MAY 1981

May 1: America's preeminence in planetary exploration is in deep trouble, according to NASA scientists attending Thursday's session of the 18th Annual Space Congress at Cocoa Beach.

In fact, after the ravages of the recent budgetary process, only one probe into deep space is scheduled over the next decade, and that mission is tentative.

Voyager I's successful close encounter with Jupiter and Saturn was followed by an almost flawless launch of the Space Shuttle last month. So it is hard for Americans to imagine that we will be anything but number one in space for some years to come.

"But even as we're sitting here at this moment basking in the renaissance of America's manned space program...there's a chill wind blowing through our planetary program," said Torrence Johnson, NASA's lead scientist for the Galileo project.

The Galileo project will send both an orbiter and a probe to Jupiter. The orbiter will fly by Jupiter 20 to 100 times closer than Voyager did. The probe will descend through Jupiter's atmosphere, sending information back to Earth, until it comes so close to the surface of the planet that temperatures and pressure destroy it.

But the Galileo project, originally planned for 1982, has been repeatedly delayed because of problems with its launch vehicle -- the Shuttle. And because of those delays, the position of the planets has changed, and the rocket originally designed to boost the probe and orbiter from the Shuttle's payload bay into deep space is no longer powerful enough.

An alternate and more powerful Centaur booster and an attendant increase in cost must now be approved by Congress. (TODAY, 5-1-81, p. 16A)

<> Thomas J. O'Malley, Rockwell International's vice president and general manager of launch operations at Kennedy Space Center, has been named man of the year by the Canaveral Council of Technical Societies.

The Society, which sponsors the Space Congress, honored O'Malley "for his leadership in building and testing this nation's -- and the world's -- first reusable space vehicle."

O'Malley, who has been with Rockwell since 1967, first worked for the Curtis Wright Co. He was test conductor on the Atlas ICBM program in the late 1950s and was in charge of the Mercury flight that sent John Glenn into Earth orbit.

The Society also announced the chairman for its next Space Congress: George R. Faenza, the director of McDonnell Douglas's Kennedy Space Division. (TODAY, 5-1-81)

May 2: The space shuttle Columbia may be assigned to rendezvous with a crippled sun-gazing satellite in orbit as early as next spring to replace a faulty electronic unit in the \$77 million solar observatory.

The extraordinary space repair mission is under serious consideration by space agency engineers and received a boost from the highly successful maiden test flight of the shuttle earlier this month.

A senior National Aeronautics and Space Administration official will be briefed on the idea next week and a formal proposal is expected to be made to NASA's managers by June.

Donald Turner, a payload integration manager in the shuttle operations office, said it would be technically possible to send the Columbia up to fix the satellite next spring. But he said there are a number of complications, including the fact that a package of test flight data instruments would have to be dropped from the mission.

The satellite also is expected to be just barely within reach of the shuttle. The satellite now is in an orbit 333

miles high, and is expected to have dropped to around 327 miles next spring. That's the maximum altitude the Columbia will be able to achieve by that time.

The repair would not require spacewalking by the two-man shuttle crew. The idea is to use the shuttle's 50-foot-long manipulator arm to grab the observatory and place it on a platform in the shuttle's cargo bay.

The arm, directed by astronauts watching the action on television, then would turn two bolts to remove the faulty control system unit or module. A new module would be inserted into the satellite and the spacecraft would be released to resume normal operation.

Turner said astronauts have practiced such an operation at the Johnson Space Center in Houston and feel confident the job could be done.

The arm will be installed in the Columbia in the next few months to be tested for the first time in space on the shuttle's second flight, now expected in late September or October. (SENTINEL STAR, 5-2-81, p. 5-B)

May 4: The House Subcommittee on Space Science & Applications has called on the Reagan Administration to commit the United States to a major new space project, citing the construction of manned, multi-purpose orbiting Space Base as one good candidate for such an undertaking.

"Commitment to a major, high-challenge space engineering initiative is both technically feasible and desirable," the subcommittee said, and the Administration should commit this country to such an initiative.

The recommendations by the House subcommittee, which is chaired by Democrat Ronnie G. Flippo (Ala.), is in line with that made by the chairman of its counterpart in the Senate, Republican Jack Schmitt (N.M.), who has called for a new start on a Space Station in 1984. The recommendations also have the backing of Rep. Don Fuqua (D-Fla.), chairman of the subcommittee's parent Science & Technology Committee.

In a 41-page report on "United States Civil Space Policy" released last week, the House subcommittee also recommended that NASA submit a set of long term goals for the space program, which reflect "a balance" between space science, applications and space transportation. (DEFENSE DAILY, 5-4-81, p. 11, Vol. 116, No. 2)

<> Up to eight RCA-built satellites may be launched this year, including three Defense Department spacecraft. The first two "Nova" military navigation satellites, follow-ons to the Navy's Transist system, are slated for launch this year, along with the DOD's Block 5D-2 Defense Meteorological Satellite Program (DMSP) spacecraft. Nova, unlike Transit, has an orbit adjust system and a capability to store astronomical data for eight days. The Block 5D-2, planned for launch late this year, employs extra sensors and has a longer service life than its predecessors. The other RCA satellites planned for launch this year are two NASA Dynamic Explorers (single Delta launch), two RCA Satcoms, and the NOAA-C weather satellite. (DEFENSE DAILY, 5-4-81, p. 15, Vol. 116, No. 2)

<> They all laughed at Christopher Columbus, too -- so retired Navy Capt. Robert Truax, 63, is sticking to his dream of launching the first privately sponsored spaceship. Last summer he conducted a successful 60-second ground test of his homemade "Volksrocket" -- built of parts salvaged from the aerospace industry's junkyards -- with an eye toward a fifteen-minute manned flight into space and back this fall. Now money troubles may turn his vision into mission impossible.

"We ran out of money last September," says the engineer who once worked on the Navy's Polaris missile program. Truax sank his entire savings of \$60,000 into the project and then looked for backers. He thought his worries were over when a Chicago real estate broker and 38 investors raised \$250,000, but the group pulled out. Truax says he has been approached by venture capitalists in Phoenix and Dallas and hopes to raise \$1 million more. His staff, meanwhile, has dwindled to five volunteers.

Still up in the air: who will man the rocket if it is ever launched? Truax is thinking of asking his old pal, ex-astronaut Jim Lovell, to help screen the 4,000

applicants, who range from a psychologist to a jockey. One of the most promising candidates is a female Braniff pilot who has logged 3,000 hours of flying time.

There were technical kinks to iron out, too. For example, propellants have been pumped into the combustion chamber too quickly, causing flames to shoot out in all directions when the rocket is ignited. Truax figures he needs four Volksrockets on hand to conduct unmanned tests. The rocket is meant to be reusable: it will parachute to earth and be recovered from the sea.

Truax is negotiating with Miami city officials in hopes of launching the manned rocket from the Florida coast. But even if he manages to raise the money he needs it will take at least another year to get ready for that flight. Meanwhile, in his driveway in Saratoga, Calif., sits the 25-foot-long rocket "Private Enterprise." "Whenever I get too frustrated," he says, "I just grab my monkey wrench and hammer and build a little more." (NEWSWEEK, 5-4-81)

May 5: By the standards of 20 years ago it was a technological wonder. Today it would hardly rate more than perfunctory media coverage.

The day was May 5, 1961. Alan Shepard sat atop a Redstone rocket in a cramped Mercury capsule -- known as Freedom 7 -- and was catapulted into space.

The 15-minute, 22-second ride earned him a place in history as the first American to be launched on a suborbital flight.

The historic moment blazed a trail toward other space accomplishments. And the memory of that first manned mission, while lost in today's advanced technology, still lingers at Kennedy Space Center.

"We all had butterflies in our stomachs," said Isom Rigell, NASA deputy director of cargo operations.

Rigell, who was acting chief of electrical systems 20 years ago, took time out Monday to recall launch day as he walked about Freedom 7's now silent operations room at Cape .

behind them ready to respond to any problem," he said.

A problem occurred at one panel, delaying the countdown for 52 minutes.

Rigell said he recalled Shepard barking into the microphone, "I'm cooler than you are. Why don't you fix your little problem and light this candle."

Rigell said he and others hurried to replace an inverter in the rocket's electrical system.

"The device had to work right," he said laughing at Shepard's impatience.

Shepard encountered another delay when a computer error was detected.

After a total hold time of two hours and 34 minutes, the count continued and progressed without trouble.

During blastoff, Rigell and the rest of the crew cheered the Mercury rocket.

"You could just feel the rocket take off," he said. The pad was located only several hundred feet away from the operations building.

Looking out toward a short window facing the launch, Rigell said, "Once the rocket lifted off, we couldn't see it." Information was fed to the crew by a tracking station.

"When we knew the rocket was right on course, we had the job done," he said.

Shepard successfully splashed into the Atlantic Ocean a little more than 300 miles from Cape Canaveral.

"We were pleased because it helped the country," Rigell said. "We were really catching up with the Russians."

The Soviet Union successfully completed a manned orbital mission 23 days earlier.

Regarding the progress of the past 20 years, Rigell said, "Back then we didn't envision how fast we would travel in space."

"(President) Kennedy came along and was telling us we're going to the moon."

While the first manned flight was pretty exciting, Rigell feels bigger and better things are to come.

As acting director of Spacelab, Rigell said he looks forward to the day when the United States and several European countries will form a permanent space station.

The next Space Shuttle flight scheduled for this fall will transport equipment for the jointly owned Spacelab, he said. (TODAY, 5-5-81)

<> Preparations are under way at Kennedy Space Center for installation of the scientific payload for the second flight of the Space Shuttle Columbia, which will be launched in late September/October.

The payload -- OSTA-1 (Office of Space and Terrestrial Applications - 1) -- is designed to demonstrate the Shuttle's capability as an operational space platform for scientific and applications research. The experiments most of which are being provided by the NASA office, are concerned primarily with remote sensing of land resources, atmospheric phenomena and ocean conditions. They are:

1) Shuttle Imaging Radar (SIR-A). An imaging radar to test advanced technique for mapping geological structures important in oil and gas explorations.

2) Multispectral Infrared Radiometer (MSIRR). Will measure the solar reflectance of mineral-bearing rock formations.

3) Feature Identification & Location Experiment (FILE). Designed to discriminate between water, bare ground, vegetation, snow or clouds and thus be able to direct sensors to collect only wanted data.

4) Measurement of Air Pollution from Satellite (MAPS). Designed to measure the distribution of carbon monoxide at the altitude between 7, 5 and 11 miles.

5) Ocean Color Experiment (OCE). Designed to map algae concentrations which may indicate feeding areas for schools of fish and locate possible pollution in the oceans.

6) Night & Day Optical Survey of Lightning Storms (NOSL).

7) Heflex Bioengineering Test (HBT). A biological engineering experiment designed to determine the relationship between plant growth and moisture content in zero G. (DEFENSE DAILY, 5-5-81, p. 22, Vol. 116, No. 3)

<> NASA and the West German Ministry for Research & Technology have signed a Memorandum of Understanding confirming the general understandings for the terms under which NASA will furnish launch and associate services to Germany on a reimbursable and cooperative basis using the Space Shuttle. Specific Launch Service Agreements will be signed for each individual activity. West Germany to date has paid earnest money to NASA for two reimbursable Spacelab missions on the Space Shuttle -- one for materials processing and life sciences experiments and the second for astrophysics experiments. Germany also plans to use the Shuttle to launch its Rosat x-ray satellite in 1986. Private organizations in Germany have also reserved a total of 25 Small Self-Contained Payloads for Shuttle flight on a space-available basis. (DEFENSE DAILY, 5-5-81, p. 19, Vol. 116, No 3)

<> Mr. Schmitt. "Mr. President, in his address to a joint session of Congress last Tuesday, President Reagan said: 'The Space Shuttle did more than prove our technological abilities. It raised our expectations once more; it started us dreaming again.'

"The President's words are so true. I should like to cite an example of this. The Honorable Ronnie G. Flipppo, U.S. Representative from the Fifth District of Alabama, and Mrs. Manuel (Jean) Lujan, the lovely wife of my distinguished New Mexico colleague, the Honorable Manuel Lujan, U.S. Representative from the First District of New Mexico, were so inspired by the flight of the Columbia that they combined their talents and composed a song, commemorating that flight. I request that the words of that song be included in the Record."

The text follows:

Salute to Space Shuttle Columbia's Maiden Voyage
(by Hon. Ronnie G. Flipppo)

O'Lord my name is Columbia
And I'm perfect in every way
I can't wait to get back to America
Cause she gets better looking each day.
To know me is to love me.
Oh, I must be a hell of a plane.
O'Lord it's hard to be humble.

But I'm doing the best that I can.
There are those who say I'm not worthy
But as you can see on TV
My spirit is the same as America's
The home of the brave and the free.
I'll fly up there for our future,
For all of the World to see.
I'm Columbia, the son of a great people
And God keep America free.

And now that I'm so damn beautiful
And gained many admirers along the way,
Some remember when I was an ugly duckling,
My friends were Winn and Fuqua.
When I glide back to earth in my glory
With brave Crippen and Young guiding me
I can't help expressing my feelings
That this triumph is one for the free!

O'Lord but it's hard to be humble
Thru grumblings of funding and such
I've proved myself worthy and able
Columbia's era has punch.

I've started my journey at Kennedy
And orbited far far above.
I circled two days and six hours
And returned to the land that I love.

And now I am ready to labor
For the benefit of all mankind
The future looks brighter than ever
For me and for others behind.
O'Lord but it's hard to be humble
And it's only my mission to search,
To serve, to be there for the asking,
I salute all mankind down on earth.

(from the CONGRESSIONAL RECORD -- SENATE, S 4409, OFFICE OF
LEGISLATIVE AFFAIRS -- LEGISLATIVE ACTIVITIES REPORT,
5-5-81, Vol. XIX, No. 28, [Attachment A])

May 6: A 22-year-old Rockledge man fell to his death Tuesday
while working on a space shuttle launch tower.

The accident occurred at 2:30 p.m. when the worker toppled
from pad 39B where construction crews are converting an
Apollo-era gantry for future space shuttle launches, said
NASA officials.

The Brevard County Sheriff's Department identified the
victim as Anthony E. Hill, 22.

A NASA board of inquiry is expected to finish an
investigation of the March accident sometime this week. A
second inquiry board will be appointed to examine Tuesday's
accident, said NASA spokesman Dick Young.

Hill was employed by Wilhoit Construction, a subcontractor
to Briscoe Corp. of East Orange, N.J. Briscoe is the
primary contractor for the conversion project.

When the accident occurred, 45 Wilhoit employees were
assembling the rotating service structure that swings into
place around the shuttle to service the spaceship before a
launch, said project engineer Clifton Reeves.

"I was not there myself, but I understand that work stopped for some time after the accident," Reeves said. "I can't say what height he fell from. It's still under investigation. (SENTINEL STAR, 5-6-81)

- <> A Hialeah firm has been awarded a \$34,150 contract to manufacture the equipment that allows the Space Shuttle's payload bay doors to be opened and closed on earth.

Fandino & Sons, Inc., of 1111 E. 52nd St., Hialeah, will fabricate a counter-weight device used to permit opening and closing the doors in a horizontal position. The device supports the weight of the doors in normal earth gravity. It will be used at Vandenberg Air Force Base, California, from where the Shuttle is to be launched into polar (south-north) orbit, starting in the mid-1980's.

The contract is one set-aside for award to a small business firm.

The machinery is substantially the same as that now used in the Orbiter Processing Facility at KSC. (KSC NEWS RELEASE NO. 139-91, 5-6-81)

- <> Satellite Television Corp., a wholly-owned subsidiary of Comsat, has requested reservations from NASA to launch two satellites on the Space Shuttle in 1985 to provide satellite-to-home subscription television.

STC plans to launch one operational and one spare satellite to provide pay television service in the eastern U.S. STC requested approval from the FCC in December to begin construction of the two satellites, noting that it will take 3-4 years to have them ready for launch. FCC authorization to proceed with construction is required before STC can place any firm launch orders.

The FCC last month unanimously accepted STC's application for interim operating authority for the satellite-to-home television service.

STC chairman John A. Johnson said that the company would prefer to use NASA launch services "wherever possible," citing the "significant financial benefits of the Shuttle."

The STC satellites, however, will be built for launch both aboard the Shuttle and The European Ariane launch vehicle. The company said that neither the U.S. Delta nor Atlas-Centaur is suitable for its satellites. (DEFENSE DAILY, 5-6-81, p. 32, Vol. 116, No. 4)

May 7: Brevard County has the Space Shuttle. If Robert Truax has his way, Miami will have the "Volks-rocket."

The 63-year-old aeronautical engineer and retired Navy captain is determined to realize his dream of launching the world's first privately funded and produced manned rocket.

John Feeny, a vice president in charge of promotion for Truax's three-man firm in Saratoga, California, will meet with Dade County officials later this week to discuss making their launch from here.

"We've been offered launch sites all over the world, but we want to keep it an all-American project," said Feeny, a University of Miami graduate. "This is the perfect area. It seems a natural because Miami has had such bad publicity and this could help turn it around."

Truax added: "You want to know the truth? We've got to somehow pay for this project. I've got a quarter million dollars of my own money and another quarter million from other people who want their money back.

"One way to do it is to take advantage of the public interest that seems to be there and sell tickets to the launch site."

Truax said four of six tests of his rocket so far have been successful.

"I've been collecting parts over the years, just rescuing them from the junk heap, because I couldn't bear to see such beautiful machines melted down for scrap," he said. (TODAY, 5-7-81)

- <> The iron worker who fell to his death Tuesday from a space shuttle launch tower should have been wearing a safety harness, construction company officials acknowledged.

"The normal procedure is for workers to put on a safety belt," said Thomas Kirby, supervisor for Wilhoit International Corp., a subcontractor on launch pad 39B, where iron worker Anthony E. Hill, 22, of Rockledge, died after plunging 100 feet from the metal gantry.

Kirby said Hill was not wearing the safety device when he fell from the structure Tuesday afternoon. Hill, one of 45 Wilhoit workers renovating the tower for shuttle launches, had been on the job about three months, Kirby said.

He was installing a handrail on the rotating service structure when a metal grate gave way underneath him, witnesses said. The grate fell only one level, but Hill plummeted to the cement base of the pad.

A NASA board of inquiry was appointed Wednesday to investigate the accident, but space center officials said it will probably be weeks before the board completes its report. (SENTINEL STAR, 5-7-81, p. 2-C)

- <> The Bionetics Corporation of Hampton, Virginia, has been awarded a nine-month, \$2,045,395 extension of its contract to maintain reference standards and to repair and calibrate electronic and mechanical test equipment at NASA's John F. Kennedy Space Center.

This is the fifth extension of the Bionetics contract and brings its total value since May, 1976, to \$8,924,869. Bionetics is a small business firm.

The cost-plus-fixed-fee contract extension covers the period from May 1, 1981, through Jan. 31, 1982. (KSC RELEASE No. 141-81, 6-7-81)

- <> Flowers Chemical Laboratories of Altamonte Springs, Florida, has been awarded a one-year, \$45,374 contract by NASA's John F. Kennedy Space Center.

The contract calls for the laboratory to develop techniques that will allow more efficient and economical disposal of certain wastes that must now be treated as hazardous.

The waste in question is produced when a compound called Marshall Sprayable Ablative (MSA) is applied to the nose cones and aft-skirt fairings of the recoverable Solid Rocket Boosters that help propel the Space Shuttle toward orbit. An ablative substance is a form of insulation that protects by burning away as the SRB's, for example, move from lower to higher temperatures.

MSA is prepared by combining a powder with a liquid base containing solvents. It is then sprayed on the SRB sections to be protected. The leftovers from spraying and finishing must be disposed of as hazardous waste. Some waste is also produced when the rockets are being prepared for reuse.

If the solid ingredients in the waste could be separated from the liquid, the volume of hazardous waste would be reduced. Recovering the solvents from the liquid waste would further decrease its toxicity.

The contract is one set-aside for award to a small business firm. (KSC RELEASE NO. 142-81, 5-7-81)

May 8: Problems in manufacturing the Space Shuttle's External Tank will limit NASA to conducting a maximum of 36 Shuttle flights through 1985, the agency told the House HUD-IA Appropriations Subcommittee.

The agency had planned to conduct 48 Shuttle flights in the 1982-85 period, but 7 NASA missions were cut from that total by the revised FY '82 Reagan budget.

The missions, primarily commercial satcoms, that cannot be accommodated on the Shuttle, will be carried on expendable launch vehicles, primarily the Delta and also the Atlas-Centaur, acting NASA Administrator Dr. Alan Lovelace said.

He expressed confidence that the Shuttle and the expendable vehicles will meet the launch requirements.

Associate Administrator John Yardley projected ET production at from 25 to 36 tanks through 1985, and said he thought 36 is achievable. Lovelace, however, said that the agency is looking at a flight manifest of 34 Shuttle missions in that period. (DEFENSE DAILY, 5-8-81, p. 45, Vol. 116, No. 6)

- <> The reusable insulation tiles on the Space Shuttle Orbiter Columbia experienced temperature levels during reentry "much lower than predicted," and, as a result, current estimates are that only 100 tiles will have to be replaced and 300 tiles repaired. An additional 100 tiles, identified as replacement candidates prior to the STS-1 flight, may also be replaced.

The overall repairs and modifications to Columbia required as a result of the first flight are described as minimum.

As for the damage to the launch pad, NASA says that damage was less than occurred on any Apollo launch. (DEFENSE DAILY, 5-8-81, p. 46, Vol. 116, No. 6)

- <> It was a pioneering flight that opened a new arena for human accomplishment -- space.

Tensions mounted as the moment for liftoff neared.

And then...

"...five, four, three, two, one, zero. Liftoff. You're on your way, Jose," came the send-off from Deke Slayton at Mission Control.

A reassuring voice responded quickly: "Roger, liftoff and the clock is started. Reading you loud and clear. This is Freedom Seven."

Alan Shepard was off the ground and on his way to becoming the first American in space.

Tuesday (May 5th) marked the 20th anniversary of Freedom Seven's historic flight, and the birth of the U.S. manned space program.

Though Shepard's journey lasted only 15 minutes, it was the beginning of a great endeavor that would eventually land Americans on the Moon and lead to the creation of a new national resource which will enable the nation to use this new environment to its fullest -- the Space Shuttle.

At 9:34 a.m. on May 5, 1961, the slender black and white Redstone rocket roared to life.

With just about one percent the liftoff thrust of the Space Shuttle, and Redstone boosted a tiny Mercury spacecraft containing Shepard on a ballistic trajectory that would peak 116 miles above the Earth's surface and bring Freedom Seven to a splash-down in the Atlantic Ocean a little over 300 miles downrange from Cape Canaveral.

America's first manned space mission was an unqualified success.

Though it was long ago abandoned as an active site, the launch complex is now part of the sprawling Air Force Space Museum. It comes to life once again during frequent visits by those taking KSC guided bus tours and the Sunday drive-through tours of Cape Canaveral Air Force Station.

Across the Banana River, at KSC's Visitors Center, is the recently remodeled Hall of History, and a manned spaceflight exhibit which includes the first Mercury capsule flown in space. It was an unoccupied craft successfully tested on a sub-orbital flight five months before Shepard's mission.

On display near the capsule is a Mercury spacesuit -- used by Astronaut Gordon Cooper.

The Freedom Seven Mercury capsule flown by Shepard is on exhibit at the National Air and Space Museum in Washington, D. C. and his suit is on display at the Johnson Space Center in Houston. (SPACEPORT NEWS, 5-8-81, p. 1, Vol. 20, No. 9)

- <> Small business is big business at KSC, says Jack Dryer, Industry Advisor and Small Business Specialist in KSC's Procurement Office. Dryer's comments came as KSC prepares to join other NASA centers during Small Business Week, May 10-16.

Small businesses account for a large amount of KSC's contractor work, garnering 20,262 awards and contracts during FY 1980 at a value of \$46.6 million. Further, KSC has awarded \$40 million to small business firms through March of FY 1981, said Dryer, bringing the total to over \$257 million since FY 1970. In those years as much as 60 percent of all small business awards went to Florida-based firms.

Among the small businesses currently under contract with KSC are: Expedient Services of Titusville, which provides roads and grounds services; BAMSI, a minority-owned firm which supplies key punch services, New World Services, another minority-owned firm which operates the technical and research library; McGregor-Werner, Inc., which furnishes publications, audio-visual and word processing services; Atlantic Technical Services, which handles mail and distribution services; Management Services, Inc., which operates chemical cleaning and component refurbishment facilities; Bionetics Corporation, which operates the calibration laboratory; the Unified Services, a minority-owned firm which supplies janitorial services. Various other small businesses currently furnish supplies or perform construction work at the Spaceport. (SPACEPORT NEWS, 5-8-81, p. 3, Vol. 20, No. 9)

- <> The 18th Space Congress was called to order last week on twin notes of pride and practicality. The chord was sounded by two distinguished Congressmen, U.S. Representatives Bill Nelson and Don Fuqua.

Nelson, a longtime Space Congress figure, introduced Fuqua with an anecdote which reflected the pride both men felt during the desert landing of the Columbia.

As keynote speaker, Fuqua then accented the practical aspects of Space Shuttle operations.

"We must get down to what the practical uses of the Space Shuttle are," he said, "We must use it like an airliner to space."

Fuqua noted that many of those practical uses were as yet undreamed of, but predicted that they would be as diverse and innovative as the imaginations of the Space Shuttle's users.

As Chairman of the House Science and Technology Committee, Fuqua next observed that the key to an ongoing space program is funding stability, especially in the areas of research and development.

He said he believes that research and development programs which are promising should be continued and not be subjected to the whims of committees or administrations. Funding, he added, should not be based on the waxing and waning of interest by those outside the field.

Following the keynote address was a panel discussion chaired by John Yardley, NASA's Associate Administrator for the Space Transportation System. Yardley summed up the first Space Shuttle mission as a major success, but he noted certain areas for improvement.

These include determining why the flotation bags for two of the six parachutes to sink and be lost; finding out why the tumble valve on the external tank failed to open as it should have after tank separation; determining what caused a flight data recorder in the orbiter to fail and lose mission data; and determining what caused some of the thermal protection tiles to be damaged.

On the latter topic, Yardley explained that the tiles in general performed much better than expected, keeping orbiter skin temperatures more than 100 degrees cooler than predicted. Workers have so far found 303 tiles which were damaged in some degree, mostly small chips or gouges

Other NASA panel members included Donald "Deke" Slayton, manager of the orbital flight test program, Daniel Germany, who manages the orbiter production program, Glynn Lunney, manager of the STS Operations Program Office, and Aaron Cohen, who manages the Space Shuttle Orbiter Project Office.

Slayton responded to earlier speculation that one of the flight test missions might be eliminated due to the success of the first mission.

He reminded the audience that the entire program was success oriented, and that the planners had set four as the minimum number of test missions needed.

Slayton did, however, say that the first landing on a concrete runway at Edwards and the first landing at KSC might be moved up by one flight, possibly occurring on the third and fourth missions respectively.

Other panel members outlined the preliminary results of STS-1 and gave predictions for traffic flow, orbiter production schedules and future improvements to the Space Shuttle during their presentations. A final panel member represented the Space Shuttle commercial user. John Almond, Vice President of Engineering for TELESAT of Canada spoke of the concerns and troubles caused by Space Shuttle launch delays, but also said that things look very good for the future. (SPACEPORT NEWS, 5-8-81, p. 2 & 6, Vol. 20, No. 9)

May 9: The Space Shuttle's launch helped boost attendance to an April record at Kennedy Space Center, NASA reports.

April's visitors totaled 198,688 at KSC's Visitors Center, operated under contract by TWA Services Inc. That is more visitors than for any other April since the center opened in 1966. It is 26 percent higher than April 1980.

KSC Tours has set attendance records every month this year.

NASA and TWA officials both give credit to the Shuttle for renewed interest in the space center, which has been visited by 20 million people since its opening. (TODAY, 5-9-81)

May 11: Sen. William Proxmire (D-Wis.) has criticized NASA for its management of the Tracking & Data Relay Satellite System (TDRSS) program, which he says has increased in cost by over \$1 billion. He cited a report by the NASA inspector general which said that the ten-year-old lease of the TDRSS spacecraft will cost \$2.156 billion instead of the \$842

million originally estimated. Proxmire called the satellite system "overpriced, overweight, oversold and overdue." He pointed out that the TDRS can only be launched by the Space Shuttle, and that the delay in launching the satellites is costing the taxpayers \$1 million a day. The first TDRS is now scheduled for launch in January 1983 on the third operational Shuttle flight, some 26 months behind schedule. (DEFENSE DAILY, 5-11-81, p. 60, Vol. 116, No. 8)

<> Shuttle project and launch site managers here are weighing the needs of launch crew rest against orbiter vehicle turnaround and shuttle funding requirements to help target liftoff of Columbia's second flight test mission, to be piloted by astronauts USAF Col. Joe H. Engle and Navy Capt. Richard H. Truly. A mid- to late-October launch would be the earliest date possible if an optimum launch crew rest schedule is followed.

First post-flight turnaround of the shuttle orbiter Columbia will take significant steps toward space airline type operations as many tests traditional for earlier space vehicle processing here are deleted. Inherent autonomy of the orbiter and system redundancy will allow this approach, and cost considerations mandate it. There are many older members of the Kennedy launch team here who consider this approach controversial so early in the shuttle flight program. Younger launch team members who have had less experience with the Saturn/Apollo system have fewer reservations over test reductions.

The shuttle orbiter Columbia arrived here on its Boeing 747 carrier aircraft April 28 to begin at least a 25-week preparation for the second liftoff.

Manpower fatigue and morale have become important considerations for pacing Space Transportation System (STS-2) processing, especially in light of the planned reduction in vehicle tests. "Our launch director, center director and shuttle project director are all concerned with fatigue and morale. We are not sure we can work the launch team on three shifts, seven days a week for the second flow as was done on the first," Glenn Parker, orbiter manager for the Kennedy Shuttle Projects Office, said.

Parker said there is strong consideration here to adopt a two-shift six-day per week work schedule except in critical areas. Some persons would be placed on a two-shift five-day

per week schedule under such a concept. Under three-shift, seven-day operations the STS-2 vehicle processing flow would last at least 25 weeks from vehicle roll-in to the Orbiter Processing Facility through the second liftoff from Pad 39A. That schedule would place liftoff of Engle and Truly about October 19 based on Orbiter Processing Facility roll-in April 29. (AVIATION WEEK & SPACE TECHNOLOGY, 5-11-81, p. 50, Vol. 114, No. 19)

May 13: The Kennedy Space Center is among the NASA centers and government agencies observing the week of May 10 as Small Business Week.

By presidential proclamation, the week honors the 12 million small businesses which provide the livelihood of more than 100 million Americans.

As part of the KSC observance, Fred Boles, KSC Procurement Officer, will make a presentation on KSC's contribution to the small business community at the Brevard Community College Lecture Auditorium, Room 104, Vocation Center, in Cocoa, on Saturday, May 23, from 9:30 - 11:30 a.m. The presentation is open to the public without charge.

During Fiscal Year 1980, KSC issued \$46.2 million in more than 20,000 awards to small businesses. Of that amount, about \$19.2 million went to Florida-based firms, many of them in Brevard County.

Thus far in Fiscal Year 1981, KSC has awarded over \$40 million to small business concerns. Since Fiscal Year 1970, the value of awards to small business concerns by KSC has exceeded \$257 million.

In a memorandum to center managers, KSC Director Richard G. Smith noted: "To implement this new emphasis on the Small Business Program, all personnel who participate in the requirements process - engineers, logisticians, procurement personnel - must be alert to the small business opportunities available.

"Your understanding and support of our efforts to place awards with small business firms, whenever possible, are essential to its success. Please join with me in supporting this segment of the private enterprise sector." (KSC RELEASE NO. 145-81, 5-13-81)

- <> A record number of major corporations are taking a look at Brevard County -- and many of them apparently like what they see.

Enthused by an unusually high number of industrial prospects, county development officials predict that 1981 may produce a bumper crop of new industrial plants on the Space Coast. They say recent announcements by International Telephone and Telegraph Corporation and Hughes Aircraft Company may be only the beginning.

Unlike the job explosion of the late 1970s that zeroed in on South Brevard while virtually ignoring the rest of the county, this year's prospects are expected to be much more evenly distributed. Titusville and Central Brevard are getting their share of corporate lookers -- some of them firms whose work relates to NASA's Space Shuttle at nearby Kennedy Space Center.

"Our activity has never been higher," said John E. McCauley, executive director of the county-funded Brevard Economic Development Council. "It looks like it will be a very good year." (TODAY, 5-13-81)

- <> The possibility of a manned U.S. mission to land on Mars by the year 2000 is once again on the long-range drawing boards of NASA planners.

The manned Mars landing mission was given major consideration in the late 1960's as a possible follow-on to the Apollo lunar landing project, but has fallen by the wayside for the more productive and broader-based Space Shuttle and planned Space Station projects. Development of the Shuttle and Space Station projects will, of course, give the U.S. a major new capability to effectively conduct the manned Mars mission. (Another possible impetus, which some say is a good possibility, is the initiation of a Soviet manned Mars project.)

One group that is taking such a mission into account is NASA's Solar System Exploration Committee, which advises NASA on which future planetary, solar and other solar system mission the agency should conduct. The committee is slated to report to the agency this summer on which solar system exploration missions should be conducted after those

presently approved and is basing part of its recommendations on the possibility of the manned Mars flight by the year 2000 -- considering which missions should be conducted as precursors to that mission.

NASA due to budget limitations has dropped plans for any follow-on unmanned Mars missions for this decade, but is studying a number of possible missions for the early 1990's, including a Mars Sample Return Mission and a combined Sample Return/Rover mission. (DEFENSE DAILY, 5-13-81, pp. 71 & 72, Vol. 116, No. 9)

- <> NASA's John F. Kennedy Space Center has awarded a contract to the Florida Institute of Technology, University Boulevard, Melbourne, for research on improvement of systems to remove the vapors of hypergolic liquids.

The value of the one-year contract, which calls for a preliminary design of the improved system, is \$62,695.

Hypergolic propellants are used in the Space Shuttle's Orbital Maneuvering Subsystem and its Reaction Control Subsystem. They are also used on unmanned vehicles such as the Delta.

Hypergolic propellants are liquids that ignite on contact, without an ignition system. This easy start and restart capability makes them desirable for spacecraft maneuvering systems. They are also easy to store because they do not have extreme temperature requirements. Some other rocket propellants, such as liquid hydrogen and liquid oxygen must be kept extremely cold.

The vapors from hypergolic liquids are extremely toxic, and working with them requires stringent safety precautions. (KSC RELEASE NO. 147-81, 5-13-81)

May 14: ACL-Filco Corporation, 3333 West Warner Avenue, Santa Ana, California, has been awarded a contract of \$2,190,844 by NASA's John F. Kennedy Space Center to produce 26 control panels used in processing Space Shuttle orbiters between missions.

The panels and associated hardware are used in draining hypergolic propellants from the orbiter's Auxiliary Propulsion System and the Forward Reaction Control System, securing those systems and checking them out. When the Space Shuttle returns from orbit some fuel remains in the systems.

ACL-Filco is a small business firm. The work is to be completed between mid-May, 1981, and October, 1982. (KSC RELEASE NO. 144-81, 5-14-81)

May 16: The second flight of the space shuttle Columbia, the reusable rocket plane that returned the United States to space glory last month, has been scheduled for Sept. 30, the space agency announced Friday.

The four-day, five-hour orbital voyage will mark the first time a spaceship has flown more than once. The Columbia again will land at Edwards Air Force Base, California.

Officials at the Kennedy Space Center said they originally planned to launch astronauts Joe Engle and Richard Truly Oct. 18, but advanced the date to Sept. 30 by deleting unnecessary tests.

Launch by Sept. 30, the last day in the fiscal year, would enable NASA to meet a commitment to Congress: two Shuttle flights in fiscal 1981. (THE MIAMI HERALD, 5-16-81).

May 19: Seven years after joining NASA as head of the effort to develop the Space Shuttle, which successfully made its maiden flight a month ago, John F. Yardley, NASA's associate administrator for space transportation systems, has announced his intentions to leave the agency effective May 30 to return to McDonnell Douglas Astronautics Co. as president.

Largely unsung, he was the key man in the development of the Space Shuttle. His resignation following the successful Shuttle flight was not unexpected.

Yardley was vice president and general manager of McDonnell Douglas Astronautics' Eastern Division prior to joining NASA. He joined McDonnell in 1946 as a structural engineer and later served as project engineer for design of the Mercury spacecraft (1958-60), as launch operations manager for the Mercury and Gemini spacecraft (1960-64) and as technical director for Gemini (1964-67).

The post of associate administrator for space transportation systems will be taken by L. Michael Weeks, who was named Yardley's deputy in November 1979. Prior to that, Weeks had served since 1975 as manager of advanced systems development for General Electric's Reentry and Environmental Systems Division.

Weeks began his career at McDonnell Aircraft Corp., where he worked on the Mercury program under Yardley. He later served at Aerospace Corp., working on the Manned Orbiting Laboratory (MOL) program, and was vice president and general manager of LTV Corp.'s Missile and Space Division. (DEFENSE DAILY, 5-19-81, p. 99, Vol. 116, No. 13)

<> Boeing Services International, Inc. has won a supplemental agreement to an existing contract with the space center. The agreement covers a modification to the contract to permit accelerated efforts in support of Space Shuttle launch preparations.

The value of the cost plus award fee agreement is \$5,075,000 and brings the total value of the Boeing contract at KSC to \$187,343,227. (KSC RELEASE NO. 153-81, 5-19-81)

May 20: President Reagan Tuesday honored America's space shuttle astronauts, telling the mission's commander during an Oval Office award ceremony, "I'm glad you're not a fella who believes in keeping your feet on the ground."

A beaming President and Vice President George Bush welcomed Columbia spacecraft commander John Young, the shuttle's pilot, Navy Cmdr. Robert Crippen, and their families to the White House. The astronauts were honored for their successful mission in Earth orbit April 12-14.

The President then attended a luncheon for 21 past and present U.S. astronauts in the Rose Garden.

Young and Crippen received the Distinguished Service Medal Citation from the President, and acting NASA administrator Alan Lovelace received the Presidential Citizen's Medal.

In addition, Young, who flew on America's first two-man orbital spacecraft in 1965 in the Gemini program, received the Congressional Space Medal of Honor. He is the only person to fly in space five times.

Among those attending the luncheon were William Anders, Neil Armstrong, Alan Bean, Frank Borman, Scott Carpenter, Eugene Cernan, Michael Collins, Charles Conrad, Gordon Cooper, Sen. John Glenn (D-Ohio), Fred Haise, James Lovell, James McDivitt, Walter Schirra, Sen. Harrison Schmitt (R-N.M.), Russell Schweickart, Alan Shepard, Donald Slayton, Thomas Stafford and the two Columbia astronauts, Young and Crippen. (THE MIAMI HERALD, 5-20-81, p. 14A)

May 21: Gerald D. Griffin, Acting Associate Administrator for External Relations at NASA Headquarters and Deputy Director at the Kennedy Space Center, will relinquish his Headquarters duties effective June 1 and return to full-time duty at Kennedy Space Center, Florida.

Griffin has been serving in the dual role since July 7, 1980. Russell Ritchie, the Deputy Associate Administrator for External Relations, will manage the office until a successor is chosen.

While at Headquarters, in addition to his External Relations duties, Griffin served as the NASA Transition Officer during the Carter-to-Reagan transition. He also played a key role in planning NASA's external activities related to the first flight of the Space Shuttle on April 12-14.

Since assuming the Headquarters post, he has spent about 25 percent of his time at Kennedy Space Center.

Dr. Alan M. Lovelace, NASA Acting Administrator, said: "Gerry Griffin has done an outstanding job in handling the responsibilities of two demanding jobs simultaneously. His duties as Transition Officer, coupled with the complex planning required for the first Shuttle Flight, caused us to keep him in a dual role for about a year at considerable hardship to Gerry and his family. I very much appreciate his efforts and the cooperation of the KSC management team that allowed this arrangement to work." (KSC RELEASE NO. 81-67, 5-21-81)

May 22: Rocco Petrone, director of Marshall Space Flight Center during 1973-74, has been hired by Rockwell International as executive vice president of the space transportations systems group.

Petrone started his career at Redstone Arsenal then moved to launch operations at Cape Canaveral and Kennedy Space Center, Florida. He returned to Huntsville as Marshall's deputy director then director during the center's worst period of lay-offs.

After leaving the space program he became chairman and chief executive of the National Center for Resource Recovery outside Washington.

A Rockwell spokesman said Petrone's responsibilities will not involve activities under contract to Marshall. (HUNTSVILLE TIMES, 5-22-81)

<> Dallas Gillespie, Deputy Comptroller, was recently appointed as Chairperson of the Equal Opportunity Advisory Committee. He will serve in this capacity for one year.

The EOAC is made up of a cross-section of the NASA workforce by grade, sex, ethnic background and level of authority from each Directorate. Additionally, each employee group with exclusive recognition is represented on the Committee.

Members of the Committee and its Chairperson are appointed by the Center Director following recommendation by their Directorate. The primary responsibility of the EOAC is to furnish advice and assistance to Center management for program improvement and for evaluating program effectiveness.

This committee serves as a two-way conduit between KSC management and employees to surface issues and ideas and provide feedback for plans and concepts. Some issues the EOAC Committee has dealt with in the past include the use of the Reassignment Opportunity Bulletin vs. Merit Promotion Announcements.

Another issue discussed concerned women employees with administrative degrees employed in clerical positions not being able to compete for higher grade jobs.

Issues of discussion for the coming year will include but not be limited to:

- * Continuation of ethnic group programs (Black History Week, Hispanic Week, etc) vs. Proclaim Your Heritage Week.
- * Formation of a Black Employees Working Group.
- * Formation of a Language Skills Development Program.
- * Development of the KSC Affirmative Action Plans as it relates to hiring and promotion goals for minorities, women and the handicapped.

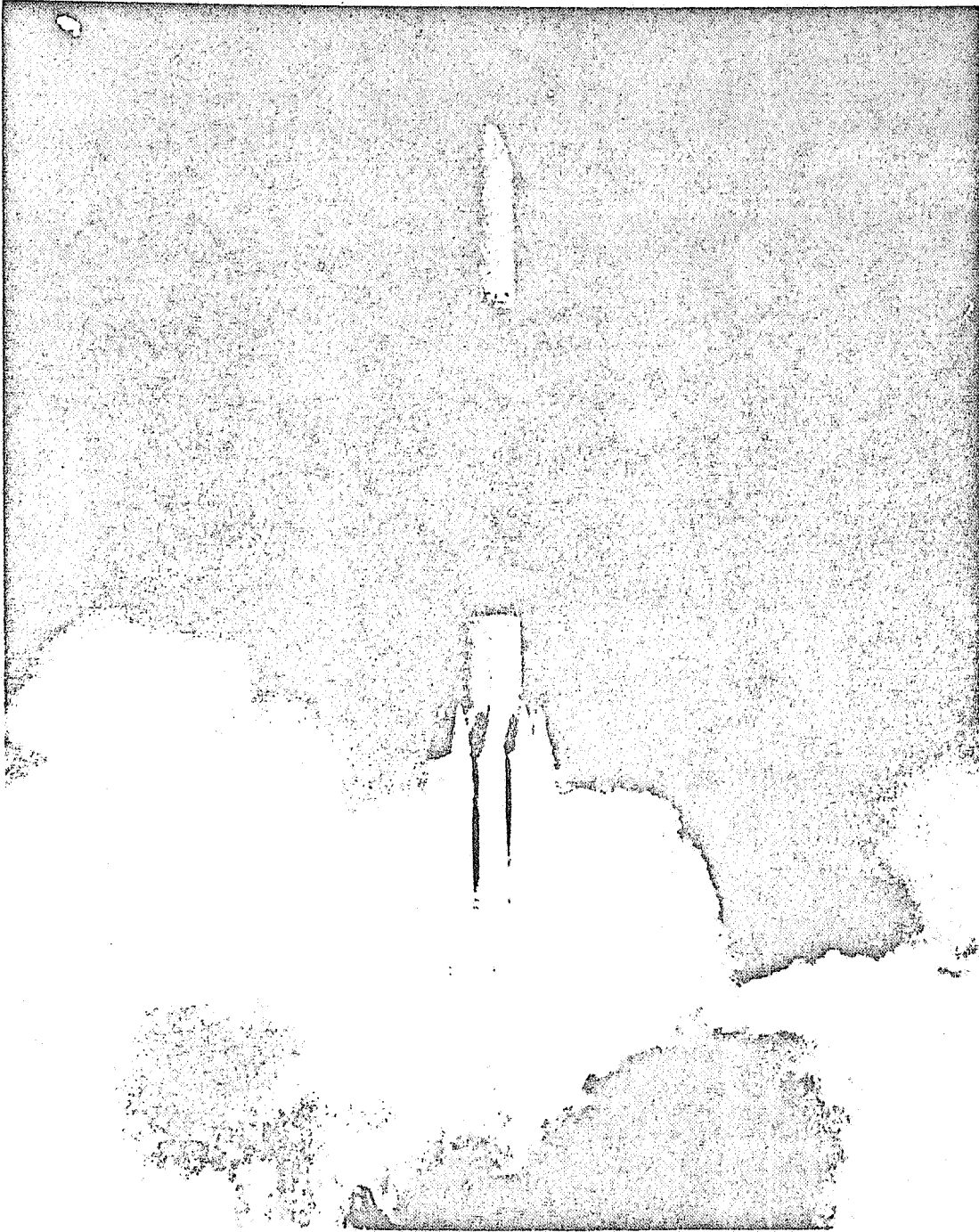
Members of EOAC ask for your support to ideas and encouragement to make this committee a success. (SPACEPORT NEWS, 5-22-81, pp. 2&6, Vol. 20, No. 10)

Acting NASA Administrator Dr. Alan Lovelace told the House Science & Technology Committee Wednesday that the project the U.S. needs to proceed with now to build on the capabilities provided by the Space Shuttle is the Space Operations Center (SOC) -- a modular, permanently manned orbiting Space Station.

"I think that the sooner the United States can get on with that the better," Lovelace said.

The FY '82 NASA budget contains less than \$1 million for continuation of Phase A studies on the Space Operations Center. NASA has proposed to initiate development of the SOC Core and its modules in FY '84. (DEFENSE DAILY, 5-22-81, p. 124, Vol. 116, No. 16)

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The launch of Goes-E aboard a Delta rocket on May 22, 1981.

<> Launch of the NOAA GOES-E weather satellite, which was postponed Thursday because of a circuit breaker malfunction in an ARIA tracking aircraft, was postponed again this weekend because of a potential vibration problem. Testing conducted by Hughes Aircraft, GOES prime, on the GOES-F satellite indicated that launch vibrations could potentially cut off the power to the GOES-E's new Visible Infrared Spin-Scan Radiometric Atmospheric Sounder...instrument. NASA is now looking at whether it has to de-mate the spacecraft from its Delta launch vehicle. A new launch date has not been set. (DEFENSE DAILY, 5-22-81, p. 126, Vol. 116, No. 16)

<> There was more pomp in Washington and bigger crowds in Chicago. But Thursday it was like coming home, according to space shuttle commander John Young.

"The fireworks in Chicago were only one-millionth of the fireworks that went on here in April," Young told 2,000 space center workers who gave him a standing ovation. Cripp and I were thankful we didn't have a rear-view mirror."

Looking back on the launch that catapulted the Columbia into orbit, pilot Robert Crippen said the shuttle was not the "turkey" some critics imagined.

"I'm here to tell you that turkey really flies nice," Crippen said. "That's a superb flying turkey."

Crippen and Young toured the processing hangar where the Columbia is being readied for a Sept. 30 launch. Large portions of the spaceship have been dissected or dismantled, and the shuttle's two orbital maneuvering engines have been removed for refurbishment.

Before Columbia rolls to her launch pad again in late August, Rockwell International technicians must replace 300 tiles and strengthen 500 more. There will also be a new outer coating on 2,000 tiles that were slightly damaged during the launch and landing.

Stacking began this week on the solid-fuel rocket boosters that will carry the Columbia aloft on its second flight. Final mating of the orbiter, rocket boosters and an external fuel tank is scheduled for August.

Some technicians hardly looked up from their tasks as Young and Crippen clambered up metal catwalks for a better look at the spacecraft that carried them 37 times around the Earth.

Dr. Robert Gray, manager of shuttle projects, apologized for the lack of fanfare.

"We have no motorcycle escorts or ticker tape parades," said Gray. "But we do have the launch pad and the shuttle. No one else has shown you that yet."

"It's been a pleasure doing business with you. We want to thank you for taking such good care of the flying machine," he said.

At a noon ceremony, the astronauts helped launch a new stamp series commemorating the space shuttle flight. Thousands of stamp collectors mobbed the visitors center to purchase the stamps on the first day of issue. One dealer even flew in from West Germany to snap up \$12,000 worth of stamps. (SENTINEL STAR, 5-22-81, p. 3A)

May 23: The space agency finally carried out the launch of the GOES-5 sophisticated weather satellite late Friday after delaying it three times.

The satellite shot into space at 6:29 p.m. EDT atop a fire-spitting Delta rocket.

If all goes well, the Geostationary Operational Environmental Satellite No. 5 will be parked 22,300 miles above the equator near the coast of Ecuador. It will give forecasters pictures and sophisticated readings on weather patterns across eastern North America, Central America, South America and a large area of the Atlantic Ocean.

The GOES-5 is a replacement for a National Oceanic and Space Administration satellite launched February 6, 1975. The more sophisticated satellite becomes the second of a new series that carries a telescope-type instrument that will improve weather forecasting, particularly on the development of storms and tornadoes, officials said.

GOES-4 was launched over the Pacific Ocean last September.
(SENTINEL STAR, 5-23-81, p. 9-C)

<> Like all heroes should, astronaut John Young ate all his carrots. In fact, he ate almost everything on his yellow, plastic Princeton Elementary School cafeteria plate except the tiny American flag atop the strawberry shortcake. He didn't finish his peas either.

Making a triumphant return to his hometown of Orlando Friday after successfully piloting the space shuttle Columbia, Young probably could have had his pick of restaurants for lunch. The city and its restaurants were his.

But the tightly choreographed schedule of six stops in seven hours left little time for lunch anywhere but the basement cafeteria of Young's old elementary school.

The sixth-graders with whom he shared lunch were clearly inspired by his astronomical feats and obviously impressed by his presence, but not enough to follow his example and eat all their carrots. Most cleared their plates of the turkey, mashed potatoes, gravy and rolls, but left their vegetables unmolested.

Twelve-year-old James D'Ortano, sitting next to Young, hardly touched his lunch at all. The youngster spent the entire lunch hour quizzing Young about his space shuttle flight, being an astronaut, and other things more exciting than vegetables and yellow gravy.

"He said when he flew the Columbia, at first it was sort of scary, then after that it was like riding in a car," James said. (SENTINEL STAR, 5-23-81, p. 12-A)

<> The 154th Delta rocket to leave the ground since 1967 cleared its pad and the Earth's atmosphere Friday, carrying a National Oceanic and Atmospheric Administration weather satellite successfully into a preliminary orbit.

Although the GOES-E (Geostationary Orbital Environmental Satellite) had been nicknamed the "No-GOES" because of a series of launch delays, the Delta and its \$16 million payload worked just as the engineers said it would.

"Let me say that's the way we like to do it: clean, simple and by the textbook all the way," said Charles Gay, KSC's director of Deltas and Atlas Centaurs.

In fact, the rocket launched from Cape Canaveral Air Force Station at 6:29 p.m. worked a little too well. Its first stage was a little "hot" -- aerospace jargon for too fast. The speed was corrected automatically by the rocket when the second stage cut off seven seconds early, Gay said.

From a stationary vantage point 22,300 miles above Columbia, South America, the infrared and camera eyes of the satellite will keep a watch on the Caribbean Sea, the Gulf of Mexico and the Atlantic Ocean to monitor the development of weather, especially hurricanes. It is the GOES satellite that provides the weather photographs seen on television and in newspapers. (TODAY, 5-23-81)

May 24: Leaving its bright orange perch by the ocean behind, an Atlas Centaur rocket Saturday ferried an international communications satellite from Cape Canaveral Air Force Station's launch complex 36B to a new home high in space.

Although 20 minutes late, the 6:42 p.m. launch of INTELSAT 5 satellite was picture perfect, blazing a flaming trail across an azure sky. Then, about 50 seconds into flight, the rocket suddenly laid a five-second-long, snake-like contrail as it passed through an area of humid atmosphere.

Earlier it had appeared the INTELSAT would sit. An operator on the control panel inadvertently flicked the wrong switch less than two minutes from T-Zero. But he caught and reported his mistake, and the count was recycled back to the five-minute mark.

After systems were checked, the rocket was launched with less than 60 seconds to spare before the first launch slot ran out -- "A real cliff hanger," said one engineer.

Once in stationary orbit over the Atlantic Ocean, the satellite, second in a series of a dozen INTELSAT 5 satellites, will transmit signals back and forth among the Americas, Europe, the Middle East and Africa. The largest satellite of its kind, an INTELSAT 5 can transmit some 12,000 phone conversations plus two color television programs.

INTELSAT is a 106-nation organization in the process of setting up a worldwide satellite communications system. Nearly two-thirds of the world's transoceanic signals are carried over INTELSAT satellites.

The INTELSAT 5 series will include satellites in stationary orbits above the Atlantic, Pacific and Indian oceans. The total capacity of the series, including spares will be 153,000 telephone conversations and 24 television channels.

Manufactured by Ford Aerospace & Communications Corp., with the help of an international team of aerospace manufacturers, the average cost of an INTELSAT 5 is about \$34 million. INTELSAT paid NASA \$42 million for the launch. (TODAY, 5-24-81)

May 27: NASA now estimates that the cost to complete development of the Space Telescope will be \$700 to \$750 million in FY '82 dollars, which compares with the original estimate of \$540 million to \$595 million in FY '82 dollars, according to the Senate Commerce Committee. (DEFENSE DAILY, 5-27-81, p. 143, Vol. 116, No. 18)

May 28: NASA calls it a "getaway special" and the list of customers ranges from movie director Steven Spielberg to a Las Vegas casino and the government of West Germany.

So far, 290 space fans, groups and governments have paid \$500 cash deposits to rent space in the cargo bay of the space shuttle beginning in the 1982 or early 1983 to send small experiments into orbit.

High school students in Camden, N.J., for example, plan to send an ant farm up to see if the zero-gravity atmosphere affects insect social organization.

The "getaway special" -- which comes in three sizes and costs \$3,000 to \$10,000 -- was conceived in 1976 by the space agency to get the public involved in the shuttle program.

To qualify for passage, customers must show their experiment has some scientific purpose. (THE MIAMI HERALD, 5-28-81)

May 29: The FY '81 supplemental appropriations bill approved by the Senate last week includes a \$33.4 million reduction in the amount requested by the Reagan Administration for NASA Research & Development.

The bill calls for a rescission of \$37.9 million from the Carter Administration's FY '81 NASA R & D budget -- compared to the \$4.5 million rescission recommended by the Reagan Administration and approved by the House Appropriations Committee.

The key action in the Senate bill is the denial of the transfer of \$60 million of Space Science & Applications funds to the Space Shuttle.

At the same time, the Senate bill restores \$14.6 million for the International Solar Polar Mission, \$3 million for the Solar Electric Propulsion Stage, \$3 million for Materials Processing, \$2 million for Technology Utilization and \$4 million for Aeronautical R & T which the Reagan Administration proposed to eliminate. (DEFENSE DAILY, 5-29-81, p. 159, Vol. 116, No. 20)

<> NASA's John F. Kennedy Space Center has awarded a one-year, \$1,121,274 contract extension to Atlantic Technical Services, 1203 Charles Street, Longwood, Florida.

The contract extension is for the second year of providing mail and distribution services in support of NASA and contractor elements at the Kennedy Space Center and covers the period from May 1, 1981, through April 30, 1982.

The new award brings the aggregate value of the parent contract to \$1,898,566. Atlantic Technical Services is classed as a small business firm. (KSC RELEASE NO. 158-81, 5-29-81)

May 30: If you haven't been out to Kennedy Space Center lately to see the visitors center, you're in for a pleasant surprise. It has grown bigger and better in recent months.

And to show Brevard County community leaders how much bigger and better the state's fourth most popular attraction has become, NASA and TWA Services Inc., the company that runs the center, took about a 100 merchants and officials through the new facilities Friday.

The most obvious addition is a 224-foot-long Saturn 1-B rocket that makes the other rockets around it look as if they were bought at a fireworks stand in South Carolina.

TWA Services, as part of a 10-year concession agreement with NASA, is paying a Winter Park contractor \$64,000 just to paint and refurbish the rocket.

H.B. Chambers, vice president and general manager of TWA Services, told the leaders the firm is also spending: \$610,000 to make additions to the cafeteria, \$230,000 to improve the sewage treatment plant, and \$139,000 for a preliminary engineering and design report.

Chambers also announced plans to build a 500-seat theater for lectures and demonstrations, and a 440-seat movie theater, with a five-story high screen using 70 mm film shot by IMAX Corp.

Only a few such theaters in the world use the special film and screen. The theater at Circus World, west of Orlando, uses the special "you-are-there" IMAX film.

IMAX is now making a film of the first Space Shuttle mission, Chambers said.

Besides housing two theaters, the building will have 10,000 square feet of space for additional exhibits.

A new souvenir and sales building will also be built, and the present souvenir building will be converted into a restaurant, Chambers said. TWA Services' expansion costs will be about \$8.5 million.

The tour facility operates at no cost to the government, and each year a portion of the earnings is reserved for improvements.

After telling the leaders TWA Services' plans, Chambers bragged about how well the visitors center is now doing:

"Nationally, tourism is down over 15 percent, and yet with no Shuttle for the public to see, this month we will be 39 percent ahead. In peak periods our personnel complement periodically reaches 375...Our 1981 payroll budget is \$4.4 million.

"In 1980, our total expenditures amounted to \$5.2 million, and construction commitment to \$836,000.

"The majority of this money is spent in our community. When estimating our 1981 gross income...the impact on the Florida economy in the in-state expenditures of dollars at the supermarket, barbershop, filling stations, motels, restaurants and elsewhere is \$72 million," Chambers said.
(TODAY, 5-30-81)

June 1981

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June 1: Shuttle orbiter Columbia's aerodynamic smoothness during reentry was five times better than design specification, allowing a much cooler reentry and thus preventing more significant heat damage to thermal protection system tiles that were chipped and gouged by debris from the Shuttle's external tank during ascent.

Based on preflight reentry unknowns, thermal protection system engineers said they would have had a difficult time clearing Columbia for flight had they known in advance the Martin Marietta tank was going to produce the debris shower that occurred April 12 during first launch of the shuttle system.

"Fortunately, we proved we are not very sensitive to debris, at least for this particular reentry," according to Robert Dotts, thermal protection subsystem manager for the Johnson Space Center, who is overseeing detailed tile assessment activities in Kennedy's Orbiter Processing Facility here. A tank debris study team has been formed, and at a minimum, cameras will be added to the vehicle on the second flight to observe any tank debris activity."

Durability of the tiles, proved under the damaging conditions and launch and reentry stresses of first flight, is an important factor in achieving cost-effective orbiter turnaround as the U.S. builds toward routine, airline-type operations in space with the shuttle.

"It looks like this is a 100-mission vehicle after the first flight. It has exceeded our wildest estimates," the thermal protection system manager said. "We will be able to fly the second shuttle mission with very little engineering analysis." (AVIATION WEEK & SPACE TECHNOLOGY, 6-1-81, p. 40, Vol. 114, No. 22)

June 2: The "hottest real estate on Earth" may lie 22,300 miles above the equator in the exclusive domain where satellites whirl in silent procession.

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This is geosynchronous orbit, a narrow corridor in space that allows satellites to "hover" above a fixed location on Earth. The demand for such "parking spots" above both hemispheres is booming, and experts say the traffic jam will get worse before the end of the decade.

Of the 1,101 satellites now in orbit, only 10 percent are in geosynchronous orbit. The rest travel at lower altitudes, circling the Earth up to 16 times a day.

In 1968 only 10 satellites occupied geosynchronous orbits. There are now 110 geosynchronous satellites, and the count is expected to climb to 300 in the next four years. The space shuttle, during its first 40 missions, will carry at least 11 geosynchronous satellites.

"It's the sweet spot," says one NASA official. "It's where everybody -- including the military -- wants to be."

Theoretically, an almost unlimited number of satellites could occupy the vast flyway without colliding. But because communication satellites have the unneighborly tendency to jam each other, they must be spaced 1,500 miles apart to avoid interference.

There are 21 prime spots above the Western Hemisphere for communication satellites; twelve are already taken by American and Canadian satellites, and the remainder will probably be filled by the end of the decade.

The United States occupies eight of these satellite slots, and the Federal Communication Commission has authorized use of six more geosynchronous locations by the mid-1980's. Still more geosynchronous satellites are awaiting FCC approval to launch.

Canada has four locations locked up and may require more satellite spots in the future. Latin American nations have launched no satellites yet but are eagerly staking out their shares of the orbital parking lot.

On the advice of the State Department, the FCC decided to leave three spaces open for Latin America. (SENTINEL STAR, 6-2-81)

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June 3: Following a users conference late last week, NASA has now made flight assignments for the 34 Space Shuttle flights it is scheduling through 1985 (including four test flights), a decrease of 14 flights from the 48 planned in December.

Seven of the flights that were eliminated represented NASA missions that were delayed by budget cuts or combined into single launches. The other missions were bumped on the basis of which had been scheduled first, with missions previously scheduled for 1985 pushed into 1986. These include Syncom 4 & 5, two Australian satellites and satellites for Luxembourg and Italy. The reason for delaying these missions is lack of confidence that enough lightweight tanks could be built in time.

Dr. Stanley L. Weiss, NASA's associate administrator for the Office of Space Transportation Operations, said yesterday that the users conference was "clearly upbeat," that there was an increased level of confidence in the Shuttle as a result of the successful STS-1 flight and that users were more anxious to stick to the Shuttle rather than move to expendable vehicles. He said the users now feel that they will fly close to when they want to on either the Shuttle or an expendable (Delta or Atlas-Centaur). (DEFENSE DAILY, 6-3-81, p. 184, Vol. 116, No. 23)

<> Lockheed Missiles & Space Co. says that the reusable LI-900 and LI-2200 (Lockheed Insulation/9 pounds and 22 pounds per cubic foot) silica tiles developed for the Space Shuttle has potential application as an insulation for aircraft turbine engines, as well as for protective fire proof walls. The company adds that an automobile manufacturer wants to look at using the LI-900 material as insulation for car and truck engines. Lockheed emphasized that any possible commercial application of the tiles are downstream; current emphasis is on manufacturing tiles for upcoming Shuttle flights. (DEFENSE DAILY, 6-3-81, p. 183, Vol. 116, No. 23)

June 4: What's bad news for the Kennedy Space Center's Shuttle is good news for rocket engineers across the river at Cape Canaveral Air Force Station.

The reduction in the number of Shuttle flights over the next four years from 44 to 30 means that more Deltas and Atlas Centaurs will be launched.

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Just how many more Deltas and Atlas Centaurs will be launched won't be known for about 30 days, said Joe Mahon, NASA's director of expendable launch vehicles in Washington, D. C.

Mahon explained customers have 30 days from last Tuesday, when a users' conference ended, to decide whether they want to reserve a throwaway rocket or use the Shuttle.

But at least 20 more Deltas and nine Atlas Centaurs will be launched from here through 1985 and an expected increase in demand will probably mean the Delta program will be extended into 1986, Mahon said. (TODAY, 6-4-81)

<> When the space shuttle Columbia blasts off again on a five-day mission this fall, it will carry a \$100 million mechanical arm and half a dozen photographic and electronic eyes to view the Earth.

"From our parochial point of view, it's the time when the shuttle finally gets to do what it's supposed to do," said John Neilon, of the National Aeronautics and Space Administration. "And that is to carry useful experiments and cargo."

On Thursday, Neilon and other NASA officials showed off the cargo that will accompany astronauts Joe Engle and Richard Truly on the second shuttle flight, slated for as early as September 30.

Also on board will be a 50-foot mechanical arm, which in the future will be used to release and catch satellites. The device works much like a human arm.

The manipulator-arm system was developed and built by Canada for about \$100 million and donated to the U.S. space program. An agreement between the two countries calls for NASA to buy the next three arms at a cost of about \$65 million.

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Bruce Aikenhead, who heads the manipulator program for the National Research Council of Canada, said the arm weighs less than 1,000 pounds and is 15 inches in diameter. The device "will be stretched out and its shoulder, elbow and wrist joints will be fully manipulated in space," he said.

The most important experiment will be one that will send and receive radar signals to create map-like images of the Earth's surface. These will be used to gather data on mineral resources. (SENTINEL STAR, 6-4-81)

<> Widows of two mechanics killed in a March 19 accident aboard the space shuttle Columbia plan to file separate suits against NASA totaling \$23 million.

In a formal claim this week, attorneys representing the widow of Forest Cole asked the space agency for \$3 million in damages for the "wrongful" death of her husband due to negligence. NASA has six months to deny, ignore or settle the claim before the suit is filed in federal court.

"I just feel like this is something that should never have happened," said Mrs. Cole, of Merritt Island. "My husband trusted them; he went into that nitrogen-filled room never dreaming there was danger."

Cole, 50, and John Bjornstad, 51, of Titusville, died after inhaling pure nitrogen in a shuttle engine compartment after a launch pad test. The two Rockwell International mechanics were part of a five-man crew sent back to work after an all-clear signal was sounded prematurely. (SENTINEL STAR, 6-4-81, pp. 1C & 2C)

June 5: From Broomfield, Ky.; from Brigham City, Utah; from Rockford, Ill.; from Huntington Beach, Calif. -- bit by bit the 60,000 parts that make up the Shuttle's two assist rockets have ridden the rails to Kennedy Space Center from all over the country.

During the last several weeks, technicians in the Vehicle Assembly Building have been stacking the rockets' segments on their launch platform, which has been newly painted pea-soup green to mask the scars of April's fiery blastoff.

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On Thursday, Fred Catalano, manager of launch operations for United Space Boosters Inc. (USBI), the company that puts it all together and checks it out, proudly showed off the finished product for the second Shuttle launch.

But it all started more than three years ago in March 1978. That's when technicians at McDonnell Douglas Astronautics Co.'s plant in Huntington Beach began work on the casing for the lower section of the rocket.

Nine months later workers began putting together the hydraulically powered steering system that fits inside the section. Sunstrand Corp. does the work in Rockford, Ill., home of 1980 presidential candidate John Anderson.

Stacked atop the steering segment of the rocket is the first of four sections containing 554 tons of the solid fuel. These potentially dangerous segments are made in a remote desert area near Brigham City, Utah, by Thiokol Chemical Corp. Construction on the lowest of these motor segments began in January 1980.

Sitting atop the four loaded segments are three more sections: one containing guidance equipment; one that holds the three parachutes that bring the rockets back to Earth gently; and a nose cap.

Although the nose caps top off the whole works and are the last parts to go on, it was the nose cap for the left rocket that first arrived at KSC in March 1978. The nose caps are made by Kaman Corp. of Broomfield, Ky. -- not exactly the aerospace capital of the world.

The various parts are delivered in one bay just inside the door of the VAB, where assembly is completed by USBI. There they wait for the delivery of the mobile launch platform into another bay. That platform was unavailable until after April 12, the date on which the first Space Shuttle rode from it into orbit.

On May 20, the left lower steering segment was placed on the platform, with the right one following two days later.

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Stacking began on May 26 when the first fueled section was carefully placed on top of the left steering segment. Workers alternate stacking from the left to right booster to equalize the weight on the launch platform -- 647 tons per rocket.

USBI's Catalano said the two rockets were stacked in half the time it took to stack the set for the Shuttle's first launch.

"We learned an awful lot off of STS-1," he said. For instance, the first set of segments weren't exactly circular because of the way the rockets were picked up and transferred. This time, workers used a four-point lift system, which helped to circularize the segments, he said.

On June 30, the Shuttle's fuel tank will be lowered into place between the rockets. The Orbiter Columbia is scheduled to join its other element on Aug. 28, with liftoff scheduled for 8 a.m. on Sept. 30. (TODAY, 6-5-81)

June 7: In December of last year, NASA accepted the first part of an \$850 million gift -- a couple of aluminum cans with a back porch.

The label might have read: From Europe with love -- one Spacelab and one Spacelab model.

Ten European nations quite literally have given the United States a laboratory to fly in its Space Shuttle. It is the European Space Agency's major contribution to the Shuttle system.

Although it may sound simple-minded to describe one of the world's most sophisticated orbiting laboratories as a couple of aluminum cans, Spacelab's simplicity is one of its chief attractions.

Spacelab -- not to be confused with Skylab, the orbiting laboratory that burned up in the atmosphere in 1979 -- is, in essence, one of a series of huge sealed cans with an open-air back porch. Within Spacelab, thousands of experiments will ride into space and back, firmly clamped to the payload bay of the Shuttle's airplane-like orbiter.

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To conduct the zero-gravity experiments, scientists aboard the Shuttle will crawl through a tunnel from the orbiter's basement to get into the lab, which is large enough for four people to work in at a time. The scientists can work in their shirtsleeves -- no special pressure suits are required.

The experiments in Spacelab will be mounted on a series of racks which slide in and out of the cannisters on tracks. Each experiment can be individually supplied with electricity, heating or cooling and data from an on-board computer. And Spacelab is a can with windows and doors. It can be equipped with an airlock and a variety of overhead windows.

Here at Kennedy Space Center, more than 100 members of a team made up of representatives from the European Space Agency, NASA and McDonnell Douglas Corp. are beginning the work that will culminate in a seven-day Spacelab mission planned for mid-83. Ultimately, 20 Europeans will be stationed at KSC. (TODAY, 6-7-81)

June 8: A Houston-based group of businessmen has notified the nation's space agency that it intends to launch a five-story-high, privately built rocket this summer from an isolated island off the coast of Texas.

The privately financed Percheron Project plans to develop commercial launch services similar to those now provided exclusively by the National Aeronautics and Space Administration (NASA). A 50-mile suborbital flight by an unmanned rocket comparable in size and power to early versions of the Army's Redstone missile is planned to get the project under way.

Officials of Space Services Inc. of Houston, the company behind the project, have told The Miami Herald that they plan to test-fire a newly designed rocket engine in early July at a private launch site on Matagorda Island, a sparsely populated barrier island 50 miles northeast of Corpus Christi.

If the 30-second ground tests of the engine are successful, says the company's president, Houston real-estate developer David Hannah, Jr., the group's first -- and only -- rocket will be fired on a short flight over the Gulf of Mexico later in the month.

By 1983, the company hopes to have more powerful boosters capable of putting communications and earth-surveying satellites into orbit at a price one-sixth of what NASA charges -- a price Hannah believes will generate a booming market for low-cost access to space.

NASA, caught by surprise when it first learned of the plans earlier this year, has not formally evaluated the group's chances of making a successful suborbital shot -- or its long-range hopes of putting heavier payloads in space.

But space agency officials have told The Herald that they are taking the proposal seriously. They say that the launch appears to be within the realm of technical feasibility and that NASA has no clear authority to block it.

NASA General Counsel Neil Rosenball...says the question was never even considered in the Space Act of 1968, which sets forth NASA's responsibilities. (THE MIAMI HERALD, 6-8-81, pp. 1A & 10A)

June 9: Rockwell International has encountered no major problems thus far in fabrication of the second Space Shuttle Orbiter -- Vehicle 099 "Challenger" -- and NASA says that "no problems are anticipated" in meeting the planned June 1982 delivery date.

Orbiter 099 was used as the Structural Test Article for the Shuttle development program, and is being modified to a flight configuration. All major elements of the vehicle have been demated and are currently in rework. To date, over 10,000 Thermal Protection System (TPS) insulation tiles have been installed; primary and secondary structural installations are underway.

Final assembly of the vehicle is scheduled to begin in July with the crew module and aft fuselage delivered to Rockwell's Palmdale, California facility.

Challenger is scheduled to make its first flight in December 1982, employing the new lightweight External Tank and orbiting the first Tracking & Data Relay Satellite (TDRS-A).

NASA says that the September 1983 delivery schedule for the third Shuttle Orbiter -- Vehicle 103 "Discovery" -- is "considered achievable but will be tight due to having to utilize work-arounds early in the build cycle." (DEFENSE DAILY, 6-9-81, p. 214, Vol. 116, No. 27)

June 10: Two Titusville fire fighters died of burns this week when a thunderstorm-fanned brushfire trapped the men on a bulldozer on Kennedy Space Center property, officials said Tuesday.

Beau Sauselein, 32, died Tuesday at Shands Teaching Hospital in Gainesville with third-degree burns over much of his body. He was hospitalized Monday in critical condition, officials said.

Scott Maness, also 32, was taken to the Jess Parrish Hospital in Titusville, where he died Monday afternoon, said National Aeronautics and Space Administration (NASA) spokesman Mark Hess.

Both fire fighters were employees of the U.S. Fish and Wildlife Service. (THE MIAMI HERALD, 6-10-81, p. 3C)

<> Attendance to the Visitors Center at NASA's Kennedy Space Center continued at a record-setting pace through May, making the first five months of 1981 the busiest in the history of the attraction.

More than 143,700 people came to the Visitors Center in May breaking all previous attendance marks recorded for that month since the attraction opened in 1966. Of that total, nearly 115,000 also took the guided bus tour of KSC facilities used to assemble, checkout and launch the Space Shuttle. The total for May was 38 percent higher than for the same month in 1980.

New attendance marks have been set for each of the first five months of 1981. For the year, attendance is running just over 26 percent higher than for the same period in 1980. Visitor Center officials are optimistic that if the trend continues, the VIC will record its first 2 million visitor year.

Up to now, the VIC's banner year was 1972, the same year NASA launched its final two Apollo lunar landing missions, when nearly 1.4 million people were attracted to the Visitors Center.

The current surge in visitor attendance is being attributed to a renewed public interest in space, largely due to the success of the first Space Shuttle flight, launched from KSC in April.

The Visitors Center, which will celebrate its 15th birthday in July, has attracted more than 20 million visitors since it opened. (KSC RELEASE NO. 161-81, 6-10-81)

June 11: Kennedy Space Center has awarded a \$1 million contract to Fluid Energy Controls Inc. (Orlando) to provide 22 hypergol and pneumatic panels for Space Shuttle facilities at KSC and Vandenberg AFB. (DEFENSE DAILY, 6-1-81, p. 232, Vol. 116, No. 29)

<> NASA officials say spaceflight projects should remain a function of the government and scoff at plans by a group of Texas businessmen to launch satellites for profit.

Space Services Inc., a new Houston-based company, says it can launch satellites for a fraction of NASA's price, and hopes to become the first private U.S. business in the market by late 1982.

"Are they aware that I've got a staff of several thousand people working in a program that launched 10 flights last year?" said Peter Eaton, NASA's program director for Delta Launch Vehicles.

But Gary Hudson, whose GCH Inc. has spent the last six months building the first rocket for Space Services, said Eaton's problem is that he is part of the government bureaucracy.

"All bureaucrats require staffs of several thousand people," he said. "The Thor rockets were launched (by the space agency in the late 1950s) by eight people from a transporter. Why does Eaton need 600 to 1,000 people now to do the same thing?"

David Small, space specialist for the State Department's legal office, said the government has not even decided yet whether it will approve the venture. "I'm just not ready to make a formal judgment," Small said.

Eaton asked, "If they launch their rocket and it comes down in the middle of downtown wherever, who's going to pay the damages?"

Space Services President David Hannah said the company carries \$25 million in flight insurance.

"The cutting edge of all this is whether the government will say, 'The government's got to do this kind of work,'" he said. "If it does, then I think we really have given ourselves over to a socialistic form of government."

A sub-orbital test flight of the 53-foot-long rocket is set for next month, Chafer said, with a splashdown in the Gulf of Mexico. "If this is successful I think we will have established our credibility," said Hannah. The rocket will be launched from Matagorda Island on the Texas coast.

Hudson said Space Services will put a satellite such as those used in weather observation into a 100-mile-high orbit for about \$2 million.

He predicted a \$5 million pricetag for sending communications satellites into geosynchronous orbit, in which the payload turns with the Earth and constantly remains about 23,000 miles above the same point, appearing stationary to people on the ground.

NASA officials said it costs about \$22 million for the lower orbit and \$25 million for the higher one using Delta rockets carrying 2,400 pound payloads comparable to those foreseen by Space Services.

Eaton laughed at Hudson's cost estimates and said the entrepreneurs probably do not realize how complicated spaceflight is.

Chafer said it didn't seem that complicated to him. "It's a fairly basic technology. It doesn't appear to us to be all that difficult, although in the long term there will no doubt be some setbacks." (TODAY, 6-11-81)

June 11: An accident battered at least 15 thermal protection tiles on the space shuttle Columbia's left wing Thursday and may have damaged the wing itself.

The accident hit at 5:20 a.m. while technicians were testing the hydraulic system that raises and lowers the shuttle elevons, or wing edges. The left edge struck an access platform, damaging 15 to 18 black tiles and inflicting possible structural damage to the shuttle.

The accident is not expected to delay the shuttle's second launch, now scheduled for September 30. Before the accident, Rockwell International planned to replace about 300 tiles and strengthen 500 more. The spaceplane is scheduled to roll to its launch pad in late August.

In another Thursday mishap, hydraulic fluid was found leaking from a line that usually contains gaseous nitrogen. The problem apparently was caused by faulty ground support equipment, not flight hardware, a NASA spokesman said. (SENTINEL STAR, 6-12-81)

June 12: A weightless paper clip floating around in a power supply box caused one of the minor problems that arose during the flight of the Space Shuttle in April, officials said Thursday.

The paper clip, apparently overlooked before the launch, caused a short circuit in the power box. A backup unit provided the necessary power, however.

The short was one of 52 minor problems that have been examined in two months of evaluation of the April 12-14 mission.

Joseph E. Mechelay, manager of the mission evaluation, said Thursday that all the problems were so minor the Columbia could be ready for its second launch from Kennedy Space Center long before the scheduled September 30 liftoff.

Another problem was that areas on either side of the rear of the vehicle sustained higher temperatures than expected, Mechelay said.

Engineers still do not understand what caused the problem, he said, but they now plan to put more insulation tiles in the affected area. (TODAY, 6-12-81)

June 14: Sen. William Proxmire (D-Wis.) charged Sunday that NASA is not charging commercial and foreign users of the Space Shuttle enough money to pay for the actual operating costs of the vehicle.

NASA, in fact, to attract customers for the Shuttle, promised six years ago to set a set-fee of \$18 million in FY '75 dollars for a full Shuttle payload for the first three years of Shuttle operations. (That \$18 million, incidentally, is estimated at about \$35 million in FY '82 dollars.)

However, Proxmire charged that even the \$18 million figure was based on improper accounting, resulting in a "phony fee schedule" and "a windfall" for foreign and commercial users of the Shuttle.

The error, he said, is that NASA for contract purposes has estimated that each Shuttle Orbiter can make 500 flights, while the procurement contract with Rockwell calls for a life of only 100 flights.

While Acting NASA Administrator Lovelace told Proxmire earlier that the Orbiter may well be able to fly 500 flights, Proxmire noted that at a rate of 14 flights per year, double that projected through 1985, the Orbiter would have to fly for 36 years to meet the 500-flight goal, which he said is "absurd."

The result of this, he said, is that depreciation costs account for only \$1 million of the \$18 million user fee. Using 100 instead of 500 flights as the baseline, the depreciation cost would total \$5 billion, boosting the user fee to \$22 million, the senator said. He called the 500 flight figure "remarkably optimistic."

Proxmire called on NASA to publicly state that it must subsidize Shuttle operations to get commercial and foreign users if that is the case.

He said that NASA "should not pretend that the Shuttle is self-sufficient and then rig the user fee charges so that the taxpayer in reality foots the bill." (DEFENSE DAILY, 6-16-81, p. 256, Vol. 116, No. 32)

June 16: The Columbia's crippled wing will be patched with pieces from a dummy space shuttle, NASA officials said Tuesday, but the September 30 launch is still on.

The cannibalized parts, stripped from the Enterprise, will fill a five-foot gap on the Shuttle's left wing where an accident last week damaged 18 thermal protection tiles and tore and bent the wing's trailing edge. The wing edges, called elevons, enable the Shuttle to maneuver aerodynamically during descent and landing.

The Columbia's wing, being raised hydraulically during a test, struck a platform inside the shuttle hangar.

The Enterprise is a dummy spaceship equipped with wooden rocket engines. Originally designed for space travel, it was later adapted as a prototype and flew a series of approach and landing tests in 1977 at Edwards Air Force Base in California. The dummy spaceship also served as a mannequin for fitting the orbiter with its flight hardware and ground-support equipment.

The Enterprise is stored in a hangar at Rockwell International's Palmdale, California plant. NASA has no plans to convert the prototype into a working shuttle, but it will be used for measurements at Vandenberg Air Force Base in California, where the Air Force is building a west coast launch facility for the shuttle.

The mock spaceplane was named after the star ship Enterprise because of heavy lobbying by fans of the Star Trek television series. (SENTINEL STAR, 6-17-81, p. 6C)

June 17: The two men nominated by President Reagan to head the space agency said Wednesday that a manned orbiting station should be America's next major space goal.

"We should start thinking soon about a space station, because that will open up all kinds of potential applications -- scientific, research, practical uses of space," said James Montgomery Beggs, nominated to be administrator of NASA.

"The space station is the next natural step, the establishment of a permanent presence in space," added Hans Mark, nominated as deputy administrator.

They testified at a confirmation hearing before the Senate Commerce, Science and Transportation Committee. Sen. Harrison Schmitt, R-N.M., who chaired the session, called them an "excellent team" and said he was certain the committee would send their nominations to the full Senate. (TODAY, 6-18-81, p. 1A)

June 18: When the second Shuttle leaves Kennedy Space Center this fall for its five-day mission, it will have a \$100 million arm on it and half a dozen photographic and electronic eyes to look down on the Earth and its oceans.

"From our parochial point of view, it's the time when the Shuttle finally gets to do what it's supposed to do," said John Neilon, the manager of KSC's cargo projects office, "and that's to fly experiments and cargo."

Neilon and other NASA officials were showing off what will fly on the second Shuttle at a grand cargo premiere at KSC Thursday.

Most of that cargo will be scientific instruments. The Columbia's payload bay, which was only about 10 percent full for the first flight, will be almost 40 percent full for the second flight.

To the rear of the Columbia's 60-foot-long hold will be a bundle of instruments that will tell scientists how the Shuttle is performing. Toward the front of the cargo bay will be another, but larger, package of instruments that will tell scientists something about the Earth below.

Edwin C. Johnson, a KSC cargo official, said that the rear package's instruments are designed to verify what computer models and wind tunnel tests have been telling Engineers about the Shuttle. "They're designed to prove that the predictions were correct in the first place," Johnson said. The instruments will measure noise, heat, vibration and possible contamination in the payload bay.

A similar package flew on the first flight of the Shuttle.

The second group of instruments will be mounted on a large aluminum platform provided by the European Space Agency. Among the experiments will be:

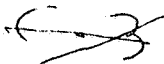
* A radar camera that will provide two-dimensional photos of the Earth's surface in hopes of identifying valuable minerals, coal and oil. Using a 33-foot-long antenna, scientists hope to identify geological faults, folds and stratification that pinpoint hidden natural resources.

* Two television cameras that will tell scientists whether areas of the Earth are covered with water, vegetation, bare ground, or snow. Presently, scientists wanting to estimate the amount of a certain crop growing on the Earth's surface have to sift through the total recorded satellite images, including rocks and bare hills. If this experiment is successful, images of vegetation could be separated from other features.

* An air pollution monitor that will measure the amount of carbon monoxide in the lower atmosphere. With information gathered by this experiment, scientists will explore the possibility of using satellites to monitor air quality.

* An ocean color experiment. The experiment will map the distribution of algae in the Atlantic and Pacific Oceans. Where there are high concentrations of algae, fish schools tend to congregate.

* An infrared sensor that will be used to identify rock types.



Also aboard the flight of the Columbia will be a 50-foot-long arm that will be used on later Shuttle flights to release and catch satellites. The robot arm cost the Canadian government \$100 million to develop and build. It is Canada's contribution to the Shuttle program. NASA is buying three more of the arms from Canada for \$65 million.

The arm has a shoulder, elbow and wrist like any other arm, but the hand is another matter.

It is called an end effector -- "that's a bit of robotics jargon for the business end of the arm," said Bruce Aikenhead of the National Research Council of Canada.

Aikenhead said that although the arm weighs less than 1,000 pounds and cannot lift its own weight on Earth, once it's free of the Earth's gravity it can handle something the size and weight of a Greyhound bus.

Astronauts Joe Engle and Richard Truly will sit at a control board in the rear of the Columbia's cockpit and exercise all the arm's joints during the second flight, scheduled now for September 30. Then they will practice snagging what's called a grapple fixture. But the arm will not actually pick anything up until the (third) flight. (TODAY, 6-19-81)

June 19: An unannounced test change was largely to blame for the March 19 accident that killed two space shuttle mechanics, according to a NASA board of inquiry.

The 400-page report, released Friday to the White House and members of Congress, outlines a total communications breakdown between officials controlling the countdown test and the men who were supervising launch pad operations 3 1/2 miles away.

According to the report, pad officials were using a different set of instructions and were never briefed on the change that had been made three days earlier.

The test "deviation" extended the usual time for flushing nitrogen from an aft engine compartment, so technicians could determine whether nitrogen gas was leaking into the crew compartment.

Unaware of the test change, pad officials re-opened many areas of the shuttle for work, including the nitrogen-filled engine compartment. The gas overwhelmed five Rockwell International mechanics as they entered the compartment. The two victims were identified as John Bjornstad, 51, of Titusville, and Forrest Cole, 50, of Merritt Island.

Bjornstad never regained consciousness after collapsing and was pronounced dead at a hospital a short time after the accident. Cole died on April 4 at Shands Teaching Hospital in Gainesville.

Widows of Bjornstad and Cole are seeking separate claims against NASA totaling \$43 million, for the wrongful deaths of their husbands. NASA has six months to deny, ignore or settle the claims before they are filed in federal court.

The test procedure "did not contain adequate steps for clearing the vehicle or pad for hazardous operations and for...reopening the vehicle and pad for resumption of normal work," the investigative board said in a report.

The board said the lack of a warning sign was also a significant factor in the accident, saying it "negligently permitted" the crew to return to the compartment before the toxic gas had been cleared.

"Since the firing room crew knew that GN2 (gaseous nitrogen) was still flowing, the public address system announcement that the pad was open for normal work was in error," according to the report.

No disciplinary action has been taken against anyone involved in the accident, said spokesmen for Rockwell International and the space agency. (SENTINEL STAR, 6-20-81)

June 22: For 25 years the United States has been running the "only game in town" when it came to placing communications satellites in orbit for western nations. The cost and complexity of developing launch vehicles with the power and reliability to put sizable payloads in orbit kept other countries from duplicating our space achievements.

But that era is now over. It was ended Friday with the successful orbiting of two satellites by a three-stage Ariane rocket, which was fired from a base in South America.

The \$1.6 billion Ariane program was created and financed by a 10-nation consortium led by France and West Germany. In a way, the opening of this new avenue to space may be bad news for our own program, because it means our "toll charge" may have to be lowered if we want to continue getting most of the traffic.

In the long run, however, we think competition for space developments can only benefit the people of all nations. Our industrial and economic system was built on free enterprise and competition, so we shouldn't bemoan the fact that the Europeans have decided to challenge American technology in the new field of commercial exploitation of space.

"This means space is no longer the exclusive preserve of a few powerful nations, but now belongs to all of humanity," commented one elated official of the European Space Agency after Friday's successful launch.

Even if a bit overzealous, the statement makes a point. Although we don't see cause to be upset about our losing a monopoly on satellite launching services, we do think it would be bad for the United States to allow its leadership in this field to slip away. We clearly have leadership now, as was demonstrated by the highly successful first flight of the Space Shuttle in April.

The Soviet Union, our most formidable competitor, does not have the capability to take up -- and bring down -- payloads of the size that can be carried in the Shuttle's rather voluminous cargo bay. The use we make of this new tool -- which many view as the workhorse of space -- will determine whether the United States retains and capitalizes on its lead in space. (TODAY, 6-22-81)

June 23: "Increasing competition to U.S. operations in space can...be expected from the European Economic Community which, through the European Space Agency (ESA), is developing its own space transportation system, the expendable Ariane...Ariane, designed to compete with the U.S. Shuttle and already drawing customers from it, will be

able to launch Atlas-class payloads to geosynchronous transfer orbit (1700 kg) while follow-on versions in development or planning have capabilities...up to 2420 kg. Even a fully reusable crew and supply transport vehicle, the Hermes, is being studied for a two-stage version of Ariane V" -- Chairman Don Fuqua (D-Fla.), of the House Science & Technology Committee, June 23, 1981. (DEFENSE DAILY, 6-26-81, p. 320, Vol. 116, No. 40)

June 24: Computer Sciences Corporation's Applied Technology Division has received a one-year, \$45.5 million extension from Kennedy Space Center for continued operation of the Space Shuttle launch processing computers and the center's computer complex, and other services. The extension brings the value of the CSC contract to \$155.5 million. (DEFENSE DAILY, 6-24-81, p. 303, Vol. 116, No. 38)

<> No one will be disciplined or censured because of the March 19 accident at Pad 39A that claimed two lives, Kennedy Space Center director Richard Smith said Wednesday.

"I don't see that it was any one person's fault," Smith said in an interview.

"The system broke down at several places, and I don't see anything that says you ought to single out a single operation or organization and take disciplinary action."

Smith also said all the measures recommended by an investigative board will be either put into effect or studied.

"We put most of these findings into effect before the launch of STS-1 (April 12)," he said.

Smith said procedures have tightened and the chain of command has been clarified.

The most significant change, Smith said, was the way access signs have been modified.

Although there was an "access control sign" barring entrance to the hazardous area that Bjornstad and Cole entered, there should have been a "safety hazard sign" -- indicating a more stringently controlled and more hazardous area.

Smith said the second most significant change has been "tightening-up of procedures -- not major changes in the procedures, because the procedures were already there."

Those procedural changes involve making sure everybody knows about any work or tests added to the schedule.

The investigative panel determined the addition of a "tack-on" test to the launch dress rehearsal was the single factor that most contributed to the accident. The test, one of 500 such deviations, was added on several days before the accident.

The tack-on test, which involved prolonging the flow of nitrogen in the Orbiter, was not adequately discussed in pretest briefings, was not included on the main schedule or on Rockwell's work schedule and was virtually ignored on the day of the countdown as workers began pressing test conductors to open the pad back up for work, the report said.

Another factor in the accident was scheduling what NASA calls side work at the same time as hazardous operations. The board found the practice was used in an effort to stay on schedule.

The panel recommended "scheduling of side work during hazardous operations should be prohibited as a matter of practice."

But Smith didn't promise any such prohibition for the second Shuttle launch scheduled for late September.

Such side work will be scheduled during hazardous operations "at times, but it will undergo much more careful scrutiny," he said.

The problem with the chain of command has also be attended to, Smith said. (TODAY, 6-25-81)

June 26 Symetrics Industries, Inc., of 557 N. Harbor City Boulevard, Melbourne, has been awarded a contract to supply NASA's Kennedy Space Center with 20 multi-circuit Operational Intercommunications Systems (OIS).

The value of the fixed-price contract is \$64,251, until March 20, 1982. The contract is one set aside for award to a small business firm.

The communications systems will be used in the control rooms of the Complex 39 Launch Control Center and will be used primarily to provide a means for test directors, engineers and technicians to communicate during Space Shuttle tests and launches. Each control unit will permit their operators to monitor up to eight channels simultaneously. (KSC RELEASE No. 172-81, 6-26-81)

<> Around-the-clock launch preparations for the space shuttle's second flight, still scheduled for September 30, are going smoothly. But there are still major problems with fuel tank icing and excessive blastoff stress.

Ice formation on the nose of the huge, blimp-shaped tank caused damage to Columbia's skin on the maiden launch, and engine firing pressure on the spaceship was four times greater than anticipated, Dr. Robert Gray, manager of the shuttle projects, said Friday.

The stress problem could be serious on the second flight because the shuttle will be carrying a payload of sensitive Earth-scanning equipment. (SENTINEL STAR, 6-27-81, pp. 1C & 2C)

June 27: Two local firms have recently been awarded contracts by NASA at the Kennedy Space Center.

Management Services Inc., with offices at the space center, has won an extension to its contract under which it performs precision cleaning and chemical analysis services. The \$2.5 million extension brings the total value of NASA's contract with Management Services Inc. to \$13.1 million. The contract runs through February 28, 1982.

New World Construction Co., of Titusville, has won a \$178,885 contract to build a repair shop for Space Shuttle main engines. The shop will be located inside the Vehicle Assembly Building at KSC.

NASA also announced that the Applied Technology Division of Computer Sciences Corporation has won an extension to its KSC contract. The company provides technical support services ranging from Shuttle launch computer operation to radio frequency control and analysis. The extension is for \$45.5 million, bringing the total worth of CSC's contract to \$155.5 million. The extension runs through May 31, 1982. CSC is located in Falls Church, Virginia. (TODAY, 6-27-81)

<> Imagine the glistening white Shuttle, basking in the light of a September moon, with four day-glo orange racing stripes painted down its side.

Yes, some bright orange stripes might be painted onto the Shuttle fuel tank to help observers watch the re-entry and breakup of the tank over the Indian Ocean.

And no, Shuttle astronauts Richard Truly and Joe Engle don't plan to hang a pair of foam dice on the Shuttle's rear view mirror.

According to a spokeswoman for Marshall Space Flight Center in Alabama, engineers at Johnson Space Flight Center in Texas assigned external tank experts at Marshall to study the possibility of painting the tank to make it a little easier to see.

Apparently, tank experts are less than enthusiastic about the idea. In fact, they declined to talk about it other than to say the idea was being considered.

But Kennedy Space Center has the paint and is ready to put it on.

"We're talking on the external tank about putting four day-glo orange stripes down its length," said Bob Gray, head of Kennedy Space Center's Shuttle Projects Office. "I don't know that you'd call them stripes being how they're 10 feet wide and 15 feet long."

There would be four stripes at different elevations on the tank, Gray said. That would make the tank show up better in photographs to be snapped from aboard a ship stationed in the Indian Ocean.

How about a pair of fender skirts for the crawler transporter? (TODAY, 6-27-81)

June 29: The Senate Friday by voice vote confirmed the nomination of James Beggs to be administrator of NASA. The nomination of Hans Mark to be deputy administrator was sent to the floor by the Commerce Committee after that of Beggs because of a minor paperwork problem, and therefore didn't get on the calendar. Speedy confirmation is expected when the Senate reconvenes July 8. Beggs, 55, has been executive vice president in charge of Aerospace Operations for General Dynamics since 1974.

Meanwhile, the nomination of George A. Keyworth of the Los Alamos National Laboratory to be President Reagan's science adviser has not yet been submitted to the Commerce Committee, which will hold confirmation hearings shortly after it gets the nomination. (DEFENSE DAILY, 6-29-81, p. 327, Vol. 116, No. 41)

<> Multi-instrument array keyed toward future oil and mineral exploration from space and improvement of overall U.S. remote sensing capability is scheduled for loading in the cargo bay of the orbiter Columbia this week as the first formal payload of the space shuttle program.

Designated OSTA 1, for the first Office of Space and Terrestrial Applications shuttle payload, the instrument complement includes five sensors mounted on a British Aerospace Spacelab engineering pallet and two smaller systems to be carried in Columbia's cabin with astronauts USAF Col. Joe H. Engle and Navy Capt. Richard H. Truly, during the second shuttle mission. Launch is targeted for September 30.

OSTA 1 has spent about two years in checkout and integration here, a processing flow that nears an end June 29, as the 5,604-lb. system is scheduled to be hoisted over Columbia's open payload bay doors and bolted to the cargo bay. The OSTA 1 schedule called for lift out of its cargo integration

and test equipment checkout stand in the operations and checkout building and it was placed in the payload canister on June 24, in preparation for the scheduled transfer to the Orbiter Processing Facility on June 29.

The move is being made about two weeks earlier than originally planned to insure that any electrical or structural interface problems between the shuttle's first payload and the orbiter can be resolved without affecting the September 30 launch target, James Ragusa, Kennedy's site support manager for the OSTA 1 payload, said. Interface problems should be minimal because of the lengthy OSTA 1 checkout here and the time the payload spent in the cargo integration and test equipment (CITE) stand, a pseudo orbiter electrically and physically.

OSTA 1 completed a major electrical activation in the CITE stand April 27-29, according to Ragusa. (AVIATION WEEK & SPACF TECHNOLOGY, 6-29-81, p. 54, Vol. 114, No. 26)

<> Specialty Maintenance and Construction, Inc. of Lakeland, Florida, has won a contract with the space center to update lighting and air conditioning systems in a vital technical building (the Central Instrumentation Facility) here.

The fixed price contract with the firm is for a total of \$1,097,624, and is the result of a set-aside for small business firms. (KSC RELEASE No. 171-81, 6-29-81)

June 30: The second flight of the Space Shuttle Orbiter Columbia, scheduled for launch September 30 at Kennedy Space Center, has been extended one day to five days and six hours because of the near-perfect flight of the first mission, and, in particular, the lower-than-expected consumption of oxygen and hydrogen by the Columbia's fuel cell electric generators in the maiden flight.

The extra day will give astronauts Joe Engle and Richard Truly more time to test the Remote Manipulator System, which has been installed in the Columbia's payload bay. It will also provide an extra day for operation of the Shuttle's first payload -- the OSTA 1 -- a package of seven primarily Earth resources experiments, most of which will be carried in the payload bay aboard an engineering model of the Spacelab pallet. Installation of the instruments was scheduled for yesterday.

The experiments are the Shuttle Imaging Radar, the Ocean Color Experiment, the Shuttle Multi-Spectral Infrared Radiometer, Measurement of the Air Pollution from Satellites, Nighttime and Daylight Optical Survey of Thunderstorm Lightning, Feature Identification and Location Experiment (an advanced technology experiment involving location of surface features and clouds) and the Heflex Bioengineering Test (a life science experiment involving sunflower seeds).

In addition to OSTA 1, Columbia will carry the Induced Environment Contamination Monitor (IECM), a system development by Marshall Space Flight Center comprised of ten instruments to check for contaminants in and around the cargo bay which might adversely affect experiments. The monitor will look for outgassing from materials within the Shuttle, along with gases from the reaction jets which control the vehicle in orbit.

NASA, in a briefing Friday, said that the only problem of any significance resulting from the maiden Shuttle flight was a stronger-than-expected overpressure that occurred when the two Solid Rocket Boosters were ignited on the launch pad.

It said the overpressure subjected parts of the Columbia to stresses close to the maximum pressure they were designed to withstand. NASA is looking at several launch pad modifications to reduce the pressure if it is determined that the overpressure is a possible hazard. Modifications, if needed, will not delay the September 30 launch date, the agency said.

Scheduled today at the Vehicle Assembly Building at KSC is the bolting of the External Fuel Tank to Columbia's Solid Rocket Boosters.

The Columbia is scheduled to be moved from the Orbiter Processing Facility to the VAB on August 4 for mating with the ET and SRBs. The mated vehicle is scheduled to move to the launch pad August 26. (DEFENSE DAILY, 6-30-81, p. 332, Vol. 116, No. 42)

- <> Rep. Bill Nelson (D-Fla.), a member of the House Space Subcommittee, has suggested that President Reagan set forth a national space policy that includes the goal of establishing a Space Operations Center, a permanently manned Space Station, in low Earth orbit by 1989. (DEFENSE DAILY, 6-30-81, p. 332, Vol. 116, No. 42)
- <> The space shuttle's 97-foot blimp-shaped fuel tank began a slow rendezvous Monday evening with two 115-foot rocket boosters.

Crews worked through the night to connect the tank and the rockets, a launch assembly that is to be joined with the space shuttle Columbia on August 4.

A giant crane began moving the tank from the west side of the Vehicle Assembly Building to the east side to meet the pair of rockets at 5:30 p.m.

NASA spokesmen, still hoping to see Columbia's second launch go on schedule September 30, said Monday afternoon that the tank and rocket mating began several hours earlier than initially planned. Work was expected to end sometime this morning.

The dazzling white tank forms the backbone of Columbia's "launch configuration." Each booster is attached to four points on either side of the tank. The spaceship grips the tank with three connections.

Each booster kicks in 2.6 million pounds of thrust to help the main engines lift Columbia from the pad and into orbit. The boosters, spent in two minutes, are blown free 28 miles above the Atlantic Ocean.

The tank, filled with liquid oxygen and hydrogen, remains attached to the shuttle for 6 1/2 more minutes, fueling the spaceplane's three engines. It is jettisoned 70 miles above Earth and tumbles into the Indian Ocean.

There are plans to paint Day-Glo orange strips on the external tank for the second mission so a tracking ship can get better pictures of its descent, a NASA spokesman said.

Most of the tank is supposed to disintegrate before it strikes the water. The reusable boosters are towed into Port Canaveral.

The two boosters used for the first mission in April are being refurbished. (SENTINEL STAR, 6-30-81, p. 4C)

<> Two thirds of the second Space Shuttle is bolted together and ready to go.

The candle-shaped rockets are sitting on the movable launch pad, and Monday night the fuel tank was hoisted from its preparation area high into the roof beams of the Vehicle Assembly Building. Then it was lowered back down between the two assist rockets and "was mated hard down" by 7 a.m. Tuesday.

"It took less than half the time it did for STS-1 (the first Shuttle mission)," said Dick Jones, supervisor for the operation for Martin Marietta Aerospace, the company responsible for the Shuttle's fuel tank.

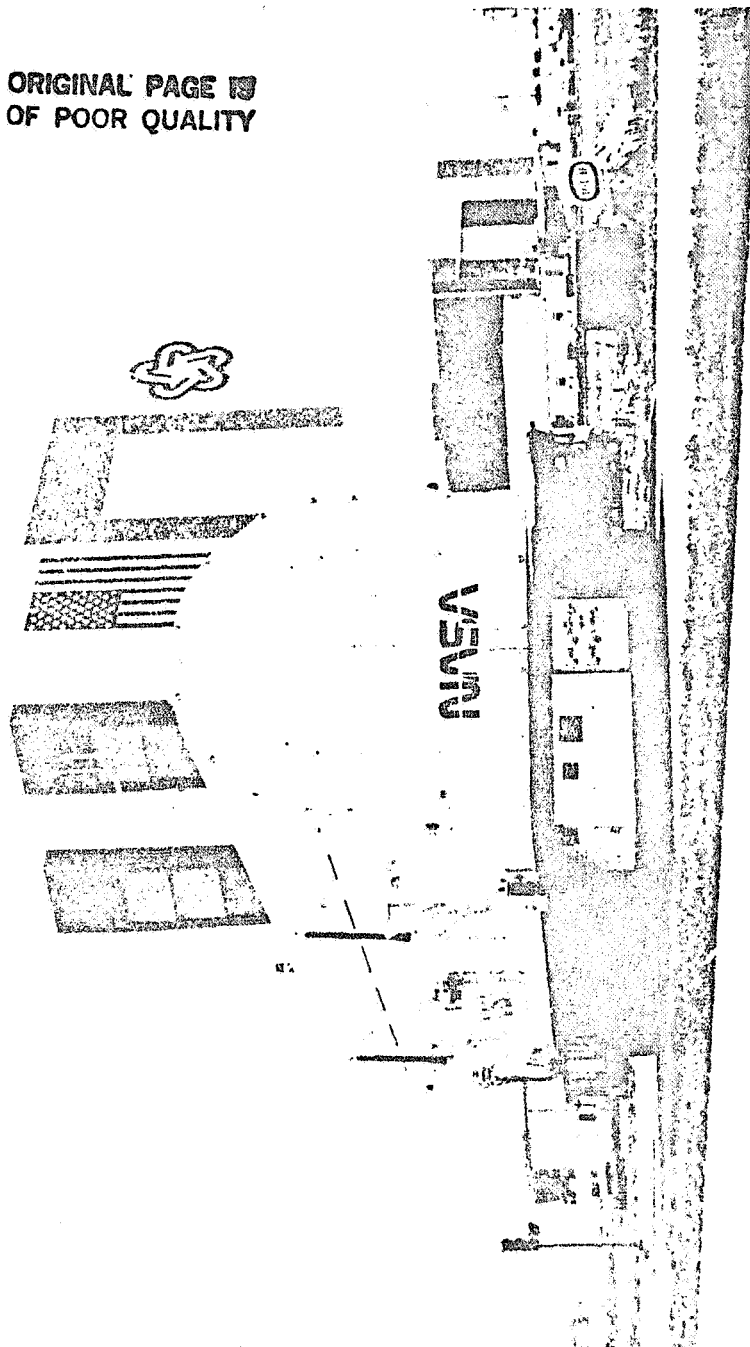
Jones said the operation went more smoothly this time primarily because many of the modifications that had to be made on the first tank were made in Michoud, Louisiana, where the tanks are manufactured.

The tank has already been loaded once with liquid oxygen and hydrogen at the National Space Technology Laboratories in Bay St. Louis, Mississippi. (TODAY, 7-1-81)

June 1981: Honeywell Information Systems, Inc., McLean, Virginia, has been awarded two contracts for Space Shuttle Launch Processing System elements by the Kennedy Space Center, Florida. One contract, in the amount of \$19,422,731 provides for computers and software support services at Vandenberg Air Force Base, California; the other contract, in the amount of \$10,750,331 provides parallel services for Kennedy Space Center, Florida. The Launch Processing System controls and performs much of the Space Shuttle vehicle checkout automatically while the vehicle components are being prepared for launch...The Kennedy Space Center contract performance period extends from Sept. 1, 1981

through Sept. 30, 1982. Annual options may be exercised thereafter which would extend the contract through Sept. 30 and bring the potential aggregate value of the contract to \$62,286,698. (NASA ACTIVITIES, 6-81, p. 18, Vol. 12, No. 6)

ORIGINAL PAGE 13
OF POOR QUALITY



The payload canister approaches the Vehicle Assembly Building on July 1, 1981.

JULY 1981

July 1: The engineering model Spacelab pallet that carries five of the seven experiments for the OSTA-1 (Office of Space & Terrestrial Applications-1) scientific payload, was loaded into the cargo bay of the Orbiter Columbia July 1 at the Orbiter Processing Facility at Kennedy Space Center. OSTA-1 will be the first payload carried into space by the Shuttle. (DEFENSE DAILY, 7-6-81, p. 21, Vol. 117, No. 3)

July 3: Alan Lovelace, acting administrator of NASA since January when Robert Frosch resigned, will leave the agency July 11 for private industry, NASA headquarters in Washington announced Thursday.

Lovelace will join General Dynamics Corporation in St. Louis as corporate vice president for science and engineering. He will direct and coordinate the company's engineering, research, advanced product and program development, a NASA spokesman said.

In December, Lovelace announced he intended to retire from NASA but agreed to stay when then-administrator Frosch decided to leave the agency for a job as president of American Association of Engineering Societies.

NASA's new chief, James Beggs, 55, left a post as vice president of General Dynamics to come to NASA. The Senate confirmed his nomination last week and he starts work Tuesday.

President Reagan recently awarded Lovelace the Presidential Citizen's Medal for his role in the Space Shuttle's development. (TODAY, 7-3-81)

July 6: A pressure pulse four times stronger than predicted generated heavy loads on the space shuttle orbiter when the two solid rocket boosters were ignited for the first launch April 12. National Aeronautics and Space Administration has been attempting since the launch to determine if the overpressure was random or a problem that will require a hardware fix.

Analytical work is under way here and at Marshall Space Flight Center to find out why the pulse was not deflected away from the shuttle system and why it reached a force of 2.0 psi. when the prediction was 0.5 psi. A load of 2.0 psi. could damage structures inside the payload bay, particularly attach points for payloads and systems, according to Robert H. Gray, manager of the Kennedy Shuttle Projects Office.

Gray said the pressure wave surrounded the entire orbiter vehicle. No damage resulted, but loading on the aft heat shield approached design limits, elevons were moved about 6 inches and the crew compartment was subjected to a 3g load that lasted a few milliseconds, according to Gray.

There is no general agreement within NASA that launch measurements are completely accurate and Marshall is conducting tests to verify numbers and data.

Several changes are being considered on the launch pad to insure deflection of the pressure pulse if a fix is required. Among them:

- * Installing steel deflector barriers on the launch platform.

- * Closing exhaust holes during the ignition phase with steel cables arranged like a grid and covered with a burnable "soft" metal.

- * Incorporating a water barrier deflecting system.

Exhaust and flame should be carried away along the concrete deflector tunnels that are part of the launch complex. If it is concluded that the existing system is not adequate, a decision on how to proceed will be made within several weeks, Gray said. He called the overpressure incident the most serious problem NASA has in preparing for the second shuttle launch, but that it will not affect the planned September 30 launch date because any required fix can be completed by then. (AVIATION WEEK & SPACE TECHNOLOGY, 7-6-81, p. 21, Vol. 115, No. 1)

<> On April 12, NASA's newest flying machine rose proudly from its pad, accompanied by the click, whir and hum of hundreds of government cameras recording the event.

But just eight days later, as Kennedy Space Center photographers were busily developing the thousands of pictures they took of the Space Shuttle's liftoff and landing, President Reagan issued a moratorium banning government agencies from publishing new material or making new movies.

"I think that the president's order is a good thing," said Charles Hollinshead, KSC's director of public affairs. "It just hit us at a bad time."

The president was not singling out NASA. The ban applies to 20 government agencies.

"The federal government is spending too much money on public relations, publicity and advertising," Reagan said. "Much of this waste consists of unnecessary and expensive films, magazines and pamphlets."

Like the films, magazines and pamphlets published on NASA's Apollo missions?

"They do put out a lot of stuff," said a spokesman for the president's Office of Management and Budget, which is assigned to make sure the moratorium is heeded. "It's the sort of slick, high quality stuff that attracts a lot of attention."

"But I wouldn't say NASA is notable in its expenditures in relation to the other agencies," said the official, who asked not be named.

How is NASA reacting to the restrictions?

"So far it hasn't caused us a lot of problems," said KSC's Hollinshead.

"We're not singing the blues," said Brian Duff, director of public affairs in NASA's Washington office. "Austerity has taught us how to be lean." (TODAY, 7-6-81, p. 1A)

- <> President Reagan's national security adviser, Richard Allen, has initiated a federal interagency review on uses of the space shuttle, stimulated by the successful first flight of the vehicle. The review will be managed by the White House Office of Science and Technology Policy and headed by its director, George A. Keyworth, President Reagan's science adviser. Space industrialization and priorities between military and civil uses of the space shuttle will be addressed both in the context of constrained budgets and revitalizing U.S. technical capability.

As the White House assessment was being launched, NASA and USAF were holding their own meetings at Systems Command Headquarters at Andrews AFB, Maryland. Most important early result of the session was a decision to slip the initial shuttle operational capability at Vandenberg AFB, California, from mid-1984 into 1985. (AVIATION WEEK & SPACE TECHNOLOGY, 7-6-81, p. 15, Vol. 115, No. 1)

- <> NASA's John F. Kennedy Space Center has awarded the firm of Frank A. Kennedy, of Cape Canaveral, Florida, a contract to provide the Spaceport with a Vapor Detection Calibration Capability in a high-pressure gas cleaning area.

The fixed-price contract carries a value of \$88,754, and is to be completed 150 calendar days after the contract was awarded on June 30, 1981. The contract is one set aside for award to a small business firm.

The contract calls for modification of a high-pressure gas cleaning area located at Launch Complex 39. (KSC RELEASE No. 174-81, 7-6-81)

- July 8:** The Denver (Colorado) Aerospace Division of Martin Marietta Aerospace, Inc. has been awarded a supplemental agreement to an existing contract with NASA's Kennedy Space Center. The award provides for communications security devices to be incorporated into the Space Shuttle checkout and launch support facilities at the space center.

The value of the cost plus fee agreement is \$5,360,676, and brings the total value of the Martin Marietta contract at KSC to \$101,781,432. The overall contract covers the period from February 4, 1980, through January 1, 1982.

The contract supplement calls for the installation of encoding and decoding devices in the Checkout, Control, and Monitor Subsystems of the Launch Processing System used to checkout and launch the Space Shuttle. The new equipment, designed to enhance security for sensitive communications, will be installed in the Launch Processing System in the Launch Control Center firing rooms. (KSC RELEASE No. 176-81, 7-8-81)

July 10: As part of its continuing evaluation of projected costs of the Space Shuttle, NASA informed the White House Office of Management & Budget this spring of "threats" to the program that could increase its costs by \$300 million to \$500 million in FY '83 over what the agency had earlier estimated.

A top agency official told Defense Daily yesterday that current estimates continue to show the possibility of an increase of that magnitude.

The projected FY '83 budget for Space Transportation Systems had been \$2.8 billion, which has been boosted by inflation to about \$3 billion. The increase, if it materializes, would boost the FY '83 STS budget to \$3.3-\$3.5 billion.

If there is a slip in the delivery schedule for the Orbiters, the increase could go higher. Costs could also be affected by changes in the spares policy.

The largest part of the project cost increase is for production of the three follow-on Orbiters, which, in fact, are developmental-type vehicles in that they are continually being upgraded. Some cost increase, under that circumstance, is not totally unexpected.

Rockwell International, Shuttle prime, has informed NASA that because of increased manpower requirements and the need for longer engineering work, its costs and the costs of its vendors and subcontractors on the Orbiter have gone up

substantially. In addition, improvements in the Orbiter ordered by NASA have raised costs. The total possible increase in Orbiter production costs in FY '83 is estimated at \$150-\$300 million.

The other area of increased costs is Shuttle Operations, including the increased costs for the lightweight External Tank which is behind schedule, as well as increased costs for the Solid Rocket Boosters and spares.

None of the projected increases in operations costs are related to the STS-1 flight, which, if anything, indicated that costs may be less than expected.

NASA is not yet saying that the \$300-\$500 million cost increase is a certainty. It believes that some of the increases may be subject to negotiation, although that may be optimistic. (DEFENSE DAILY, 7-10-81, p. 51, Vol. 115, No. 7)

July 13: Damage to the solid rocket booster system that helped propel the first space shuttle into orbit was largely confined to the aft skirt area and program engineers believe the cause of the damage have been isolated and can be eliminated in future missions.

Emphasis in the first mission, April 12, was on the ascent performance of the boosters and both functioned without anomaly during this phase. On descent, the nozzle extension was blown away at an altitude later determined to be too high, and stiffener rings in the aft skirt were found not to be strong enough to withstand the water impact.

The nozzle extension was severed from the spent booster when programmed to do so at apogee. This resulted in an unforeseen incidence of aerodynamic flutter that tore the thermal curtain. The resulting whipping action destroyed some of the instrumentation that measured temperature and pressure, according to George S. Morefield, chief engineer of United Space Boosters, the company that has the contract for installation, assembly and checkout of the booster system.

The thermal curtain protects against flame and radiant heating.

On the second flight according to Morefield, the integrated electronics assembly will be programmed to delay the nozzle extension severance from apogee, which was 270,000 feet in the first flight, until about 20 seconds after deployment of the main recovery parachutes at an altitude of approximately 1,500 feet.

"We don't care about the curtain as long as it works on ascent," Morefield said, "but we lost some instrumentation." In addition to the later nozzle extension, power lines in the aft skirt will be wrapped with heat-reflective tape.

When the boosters descended during the first flight, there was outgassing and puffs of flame, which caused the insulation to ignite. Flames spilled over the edge and attacked the thermal curtain. The new procedure will keep the flame farther away from the curtain, Morefield said.

Redesigning the stiffener rings can not be finished in time for the scheduled September 30 second flight of the shuttle, but should be ready for the third and subsequent flights, he said. (AVIATION WEEK & SPACE TECHNOLOGY, 7-13-81, p. 57, Vol. 115, No. 2)

<> Economic importance of the solid rocket booster retrieval and refurbishment to the space shuttle program is underscored in an analytical projection of new versus refurbished booster costs carried out until about the mid-1990's.

One new booster system today costs \$25 million. A refurbished booster has an estimated cost of \$7 million. For a shuttle launch, according to the National Aeronautics and Space Administration analysis, the cost is \$50 million versus \$14 million. Precise assessment of the costs depends on a detailed study NASA and its contractors are conducting of components and structures that can be reused. (AVIATION WEEK & SPACE TECHNOLOGY, 7-13-81, p. 24, Vol. 115, No. 2)

July 15: Astronaut Richard Truly, who will pilot the second space shuttle flight, met briefly with reporters Wednesday to express confidence in Columbia and optimism for a September 30 launch.

Truly flew to the space center from Houston Wednesday morning to watch the closing of the shuttle's payload doors. The doors will be opened on the five-day flight so that scanning experiments can point toward the Earth.

The 44-year-old astronaut, dressed in blue NASA coveralls, said he and astronaut Joe Engle were very well prepared for the launch because they trained as a backup crew for the first flight. For five months in 1977, Truly and Engle flew space shuttle landing test flights.

Truly, a Mississippi native, is a Navy captain who has logged more than 5,000 hours in jet aircraft. He became a NASA astronaut in September 1969 and was the capsule communicator for all three of the manned Skylab missions and the Apollo-Soyuz mission.

Truly said the main difference for astronauts between the first and second mission of Columbia is that different computer programs will guide the spacecraft, and the second flight will be twice as long.

"We should be much more confident than at the first flight because we're sure those three engines work," Truly said. He said that three months before the first launch "scare stories were coming out of the woodwork," but he hasn't heard any this time. (SENTINEL STAR, 7-16-81, p. 3C)

<> Ten Idaho firefighters will be imported today to help extinguish a 1,000 acre blaze that threatens radio and radar facilities at Kennedy Space Center on the Merritt Island National Wildlife Refuge.

The blaze started Monday and is the most recent in a series of fires that have plagued the refuge for two months, charring hundreds of acres and killing two U.S. Fish and Wildlife officials in June.

The firefighters, from the Boise Interagency Fire Center, should arrive this afternoon, refuge manager Robert Lee said.

"They (firefighters) can provide us with the expertise to be more effective and can also give us a break," an exhausted Lee said late Tuesday evening. "We've been at this since I don't know when."

Lee said the fire jumped the NASA Causeway Tuesday and began threatening NASA facilities located by the Visitors Information Center. The facilities included small communications buildings and large radar discs.

Also, Lee said the U.S. Forest Service is sending in a special tanker plane this morning to dump a phosphate-based fire retardant on the blaze. (TODAY, 7-15-81, p. 1B)

July 16: With talk that America's exploration of space has been rejuvenated by the Space Shuttle project, officials and guests at Kennedy Space Center celebrated Thursday the first manned landing on a celestial body.

Sampling a 3-by-5 cake commemorating the 12th anniversary of the Apollo 11 launch, about 350 people crowded the Visitors Information Center to hear some nostalgic references to the team that put Neil Armstrong and Buzz Aldrin on the moon in 1969. Michael Collins remained in the command module which circled the moon.

None of the Apollo 11 astronauts attended the KSC celebration.

Donald F. Williams, commander of the U.S. Navy Astronaut Corps, called the Apollo 11 mission a "great event of modern times" and the first step toward space colonization.

"The destiny of the people of planet Earth is to leave this Earth and explore the rest of the universe," Williams said. "There's a lot out there and we haven't even begun to look at it."

Walter Kapryan, deputy director of Apollo 11 launch operations and now a manager for Lockheed Engineering and Management, said after the moon launch the American people became complacent and lost interest in space exploration.

He said the decrease in space program funding after the moon launch was a "national tragedy and a waste of one of our nation's most valuable resources. The Apollo 11 staff was just dispersed to the winds."

Now, Kapryan said, the nation's enthusiasm for space exploration has been rekindled by the Shuttle's success, which he believes is good.

"Without goals, individuals and nations stagnate. History has shown us that," he said. (TODAY, 7-17-81)

<> The Aerospace Services Division of Pan American World Airways, Inc., Cocoa Beach, Florida, has been awarded a one-year extension of its contract to supply medical services at NASA's John F. Kennedy Space Center and Cape Canaveral Air Force Station.

The \$3,573,338 award covers the period July 1, 1981, through June 30, 1982, and brings the cumulative value of the contract since July 1, 1977, to \$12,372,535. The new award marks the fifth year of service under a contract with a one-year basic term plus four one-year options.

Under the contract, Pan American will provide occupational medicine and environmental health services to civil service, military and contractor personnel.

Services are provided by physicians, medical technicians and nurses in facilities at KSC and Cape Canaveral Air Force Station. (KSC RELEASE No. 181-81, 7-16-81)

July 17: Frank Byrne, Deputy Director of Information Systems at NASA's Kennedy Space Center, has received a \$10,000 Space Act Award from the NASA Board of Inventions for devising a computer launch system improvement. The award was presented to Byrne at a special ceremony at KSC on July 20 by Center Director Richard G. Smith.

Byrne received the award for his patented invention entitled "Common Data Buffer System." The common data buffer forms an important part of the Launch Processing System (LPS), which is used to checkout and launch NASA's Space Shuttle at

KSC. The system's basic function is to allow the individual computers of the LPS to communicate with each other. It launched the first Space Shuttle, and replaced the relatively antiquated Apollo launch system previously used. The U.S. Patent and Trademark Office issued U.S. Patent No. 4,254,464 covering the invention on March 3, 1981.

Byrne who lives in Cocoa Beach, Florida, invented the system while working in KSC's Directorate of Electronic Engineering. (KSC RELEASE No. 185-81, 7-17-81)

July 20: The review of U.S. space policy to be conducted by the White House Office of Science and Technology Policy under a specific directive from President Reagan will be completed by about Christmas and its results should impact the FY '83 Federal budget, Dr. George A. ("Jay") Keyworth II, the director-designate of OSTP told Senate confirmation hearings yesterday.

Keyworth has said that the interagency review of U.S. space policy to be concluded by OSTP will develop "the ideas and plans that will set the course" for U.S. activities in space "for years to come." He said the review will be one of his first major tasks as director of OSTP.

Senator Jack Schmitt (R-N.M.), chairing hearings by the Commerce Committee into Keyworth's nomination, said that the U.S. has not had a national purpose for its space program since the first manned landing on the Moon 12 years ago yesterday. That was "the end of our space purpose," he said. "While the Space Shuttle is a magnificent accomplishment, it is not a purpose."

Keyworth said that there is "considerable concern" in the administration about the future of space. He said the problem is sufficiently complex, including the problem of the "turf" of various agencies, that it will take five months to complete the review

Schmitt expressed the hope that the findings of the review would be reflected in the FY '83 budget and in supplementals that may be submitted so that the space program could benefit, and Keyworth indicated that it would.

Asked by Senator Howell Heflin (D-Ala.) whether more coordination between NASA and the Defense Department on space is needed, Keyworth said that he felt that coordination should be strengthened, noting that appointment of former Air Force Secretary Hans Mark to be deputy administrator of NASA should help.

Questioned by Schmitt about the U.S. role in international cooperative research and development, Keyworth said that such programs are important to America. He added that U.S. commitments to international projects "absolutely must be honored," and he volunteered that he would be reexamining the Administration's decision to terminate the U.S. spacecraft for the International Solar Polar Mission (ISPM). (DEFENSE DAILY, 7-21-81, p. 105, Vol. 117, No. 14)

July 26: It's being called the case of the missing LOX, and it means the orbit of the second Space Shuttle will be slightly lower and slower than that of the first mission.

And it also has forced computer specialists to rewrite the Shuttle's flight program so that the rocketplane, scheduled for blastoff September 30, will be taking a different path into space.

LOX is NASA's abbreviation for liquid oxygen, which is mixed with hydrogen to power the spaceship Columbia's three engines.

The problem is that after engineers analyzed data from early April's flight of the Shuttle, they found they couldn't account for nearly 4,000 pounds of liquid oxygen.

"We found we had a lower quantity at the end of the mission...than we had predicted," said Horace Lamberth, head of the fluid systems division at Kennedy Space Center.

And that could come from any one of three things, Lamberth said: The engines could have used more oxygen than expected; engineers could have miscalculated the density of the liquid oxygen they put into the tank, resulting in a lower quantity; or the size of the tank could have been miscalculated.

The problem is further complicated by the excessive amount of time it would take to pin down which of the three alternatives is to blame for the missing LOX.

"You can't wait until you get all that analysis done," said Richard Kohrs, Johnson Space Center's manager of systems integration in the Space Shuttle program office. "And we need the flight data from the second mission...So you go ahead and fly STS-2," he said.

But you fly it very conservatively just in case you run short of liquid oxygen. (TODAY, 7-26-81)

<> The Federal Aviation Administration has proposed a 180-day suspension of the license of a Cocoa pilot who flew into a restricted area minutes before the April 12 launch of the space shuttle Columbia, officials said.

But space agency officials, saying a catastrophe could result if pilots get away with flying too near Kennedy Space Center during liftoff, want Jerry Ralph Stevenson punished more severely.

Stevenson, 22, plans to appeal the FAA ruling at an informal hearing Tuesday with the agency's lawyer, FAA spokesman Jack Barber said in Atlanta. The pilot was notified of the recommendation by mail this week. (SENTINEL STAR, 7-26-81)

July 27: In addition to the six orbiter experiments to be conducted as part of the second space shuttle mission, four other experiments have been designated for flight on future shuttle orbiters. Three of the new experiments could be on the third shuttle mission if time permits and performance is met, according to Edwin C. Johnson, Jr., technical assistant for cargo integration in shuttle operations.

They are:

- * Shuttle entry air data system.
- * Shuttle upper atmosphere mass spectrometer.
- * Shuttle infrared leeside temperature sensing.

The fourth experiment, technology flight instrumentation, will not be carried until after the fourth flight, when the orbital flight test program is scheduled for completion.

The shuttle entry air data system was devised to obtain more precise measurements of air data at speeds above Mach 3.5 at various angles of attack and sideslip. Its development depended on the ability to penetrate the shuttle orbiter reinforced carbon-carbon nose cap without affecting performance of the cap. The system consists of 14 penetrations for ports and tubes and 28 pressure transducers, which will provide measurements from an altitude of about 56 miles to touchdown. The upper atmosphere mass spectrometer will measure atmospheric constituents at altitudes higher than those to be investigated by the entry air data experiment. This information will contribute to calculations of static and dynamic force coefficients and derivatives in flight over the entry trajectory. The infrared leeside temperature sensing experiment is designed to provide high-resolution infrared imagery of the upper surface of orbiter wings and fuselage during reentry. The camera for this experiment will be housed in the top of the vertical stabilizer and will view the wings and fuselage through two windows that are transparent to the infrared spectrum and are cooled by gaseous nitrogen. The camera will operate from 5 minutes before entry through the descent phase.

Development flight instrumentation on board the orbiter Columbia totals 3,978 sensors. About 25% of these instruments will be retained for technology flight instrumentation experiments, which will concentrate on measurements of aerodynamics, aerothermodynamics and flight control. Modular auxiliary data systems that will process measurements will be located forward and in the cargo bay. (AVIATION WEEK & SPACE TECHNOLOGY, 7-27-81, p. 45, Vol. 115, No. 4)

<> Problems with the Space Shuttle Columbia's new mechanical arm have postponed a simulated flight test for another 16 hours.

The 32-hour test at Kennedy Space Center, which had already been pushed from Friday back to 8 a.m. today, has now been rescheduled for midnight tonight.

Technicians were still "troubleshooting" electrical problems with the arm's emergency jettisoning system Sunday night, said NASA spokesman Dick Young. The system allows the arm to be discarded if it won't fold back into place while in space.

The series of tests are primarily designed to prove that the Shuttle's payload, a bundle of instruments that will search the Earth's surface for minerals and other resources, has been connected to the spaceship properly.

Young said it is too soon to tell if the testing delays will affect the Columbia's move to the Vehicle Assembly Building scheduled for August 4. The Shuttle's second flight is set for September 30. (TODAY, 7-27-81, p. 10A)

<> Recommendation that the U.S. pursue development of a large, permanently manned space station as the next primary focus of its space program will be made to President Reagan by James M. Beggs, new administrator of the National Aeronautics and Space Administration.

Beggs told AVIATION WEEK & SPACE TECHNOLOGY he also would recommend to the President that he make a public statement of commitment to establishing a permanent U.S. presence in space as a way of helping focus efforts on an eventual station operation.

"Whether we are going to be able to bring a station through to a new start in the next three or four years is a short time horizon for this agency, but we sure are going to try," Beggs said.

"That clearly is where you go, because if you don't go toward the space station, then the real payoff on the space shuttle will not be achieved. You have to go space station if you are going to use the shuttle as it ought to be used.

"I think the probability is reasonably high that we can get a policy statement out of this Administration as to what we ought to be doing. I think we can get an early space policy document that continues the President Carter initiative. As to the President giving any type of commitment to the manned permanence thing, I don't know, I would not hazard to guess on that. We are going to try."

While Beggs will raise the space station initiative with President Reagan, the White House will be examining the course of the U.S. space program as a whole and the relationship between NASA and the Defense Department in space program developments. (AVIATION WEEK & SPACE TECHNOLOGY, 7-27-81, p. 23, Vol. 115, No. 4)

July 28: NASA's Kennedy Space Center has awarded Butler Construction Co. of Rockledge, Florida, a contract to construct security modifications to a room in KSC's Launch Control Center (LCC).

The value of the fixed-price contract is \$235,000, and is to be completed 90 days after receipt of a notice to proceed. The contract was awarded July 23, and is one set aside for award to a small business firm.

Butler Construction is to supply labor, equipment and materials to construct modifications to Room 4R10 of the LCC. The modifications consist of construction of visual barriers, personnel access barriers, and installing sound suppression systems and personnel access control systems. (KSC RELEASE No. 187-81, 7-28-81)

<> A simulation of space shuttle Columbia's next mission ran into delays this weekend after NASA discovered it got its wires crossed on the ship's new mechanical arm.

Five to six wires on the 50-foot limb, which will hoist satellites into space on future missions, were incorrectly installed due to errors on the wiring diagram, said Charles Henschel, shuttle test director. One wire was left out.

Rewiring of the arm was expected to be completed Monday night and the simulated test was rescheduled for midnight, Henschel said.

Thirty-two hours of testing will begin with the dormant Columbia being awakened by its computer brains telling the spaceship it is flying.

Columbia will be fully powered, its life-support systems switched on, and its computers doing a "fake-out" to get the ship to "think it's in orbit," Henschel said.

"The prime purpose is to make sure the various systems are compatible," Henschel said. "Making sure the shuttle and its payload communicate is especially important," he said.

Testing begins with 5 1/2 hours of powering the ship, making it habitable, and starting the computers. Astronauts will later conduct a "mission run," which is a simulated ascent, orbit and descent. The tests and simulations will leave Columbia about 70 percent ready for launch, Henschel said.

The first crew aboard for routine checks will be support astronauts Dick Scobee and El Onizuka. Mission astronauts Joe Engle and Richard Truly and backup astronauts Ken Mattingly and Henry Hartsfield will participate at various times later in the test.

An astronaut crew will open the payload bay doors, switch on the scanning instruments, and check the robotic arm. The timetable for operating the scanners will be verified, and the instruments will be tested to ensure they are working correctly, said Eldon Raley, cargo operations director.

"This is an important payload for the benefit of mankind," Raley said. "Earth resources data is important to our future. The test is to prove that we can talk to the system that transmits data to the ground."

Engineers are no longer worried that the cargo pallet will be damaged by the excess blastoff stress that threatened Columbia on its first launch. Studies have shown that the 4,000 pounds of instruments are too light to be wrenched by the launch, said Jerry Kenney, payload mission manager. (SENTINEL STAR, 7-28-81, p. 6C)

<> A company hoping to offer the nation's first commercial satellite launching service raised its first rocket on a launch pad Monday after three days of delays caused by bad weather.

"I'm thrilled. It's just beautiful," said Charles Chafer, vice president of Space Services, Inc., after workers used a crane to lift the 55-foot-long spaceship onto the stand at Matagorda Island.

The company plans engine tests this week -- a three-second "burn" today and a 25-second burn Wednesday -- and hopes to launch a suborbital flight August 12, company spokesman Walt Pennino said. The flight plan submitted to the Federal Aviation Administration calls for a three-mile flight that reaches an altitude of 14,500 feet.

That plan was contained in a request for a waiver of an FAA rule prohibiting unmanned rocket flight in controlled air space. (TODAY, 7-28-81, p. 10A)

<> A large water-spray system will be installed around the base of the space shuttle's solid rocket boosters to reduce engine firing pressure when the Columbia blasts off on its second flight, a NASA official said Tuesday.

The \$1.5 to \$2 million spray system will be designed and installed by mid-September and shouldn't delay the shuttle's encore voyage, said Dr. Robert Gray, manager of the shuttle projects.

Although the schedule is very tight, all other preparations for Columbia's September 30 launch are on target. "If all goes supersmooth we can make it," Gray said. "At this point, we feel real, real good compared to the first launch because there are fewer unknowns."

Water from several 38-inch lines will be shot across the bottoms of the twin solid rocket boosters to absorb excess liftoff pressure which caused minor damage to the ship on its maiden launch last April.

The spray water system is the easiest solution to the pressure problem because it doesn't involve building burdensome additions to the launch pad, Gray said. Technicians have designed several other modifications to correct the overpressurization, but they would require too much work or delay the launch.

The problem on the maiden launch occurred when pressure created by the firing of the solid rocket boosters was deflected back to the ship. The force moved the entire shuttle-tank-rocket assembly, jarred the cockpit and flexed the wing flaps 6 inches.

Although the shock lasted only 20 milliseconds -- not long enough to be felt or recognized by the astronauts -- it created an "unacceptable" situation for future launches, Gray said.

The new system will be designed to shoot water, at the rate of 75,000 gallons per minute, across the primary holes to absorb the pressure. Gray said the water, which will come from a nearby storage tank, will be turned on for about 25 seconds.

Although a final decision on the water spray system was not expected until late Tuesday, Gray said he was 90 percent sure that it would be adopted. "It's the best system. We like it" better than the other modifications, he said. (SENTINEL STAR, 7-29-81, p. 2C)

July 29: A planned test firing of the first rocket designed for private commercial use had to be rescheduled Tuesday because engineers weren't satisfied everything was in order, a company official said.

"They (engineers) weren't satisfied that, mechanically, everything was in order," Space Services Inc. spokesman Walt Pennino said Tuesday after the five-second burn of the engine in the 55-foot Percheron rocket was postponed until Thursday.

"They didn't want to run that risk until all the fittings and instrumentation and pumping systems were in order," he said.

As for rescheduling the five-second test for this morning, Pennino added, "We can't guarantee that, either." (TODAY, 7-29-81, p. 14A)

<> The scheduled Tuesday transfer of the space shuttle to the Vehicle Assembly Building will be delayed one to three days due to problems encountered during preliminary systems testing, NASA said Wednesday.

The postponement will "very possibly" push back the Columbia's scheduled September 30 launch, although that hasn't been officially confirmed, said shuttle test director Charles Henschel.

"All I can say officially is that we're still on for September 30, but that's starting to look soft," he said.

"We're trying to juggle our schedule" to make the original launch date, Henschel added.

NASA crews will begin working full time on Sundays next week to pick up time.

The towing of the shuttle to the VAB, where it will be mated with its solid rocket boosters and external fuel tank, has been delayed because it took five days longer than planned to complete the simulated tests.

The space shuttle currently is resting in its glorified garage about 300 yards from the VAB.

Wiring and computer problems with the shuttle's payload system were the primary cause for the holdup, Henschel said. Those problems were solved and the test ended at 2 a.m. Wednesday.

Earlier this week, NASA discovered that four to five wires controlling the shuttle's new mechanical arm had been erroneously installed. One wire was left out completely. The 50-foot limb will hoist satellites into space. That arm is scheduled to be tested during the second flight but it won't do any lifting.

Two other problems arose Tuesday. The left payload bay door wouldn't open and a computer wouldn't verify movements of the mechanical arm.

Astronauts Richard Truly and Joe Engle tested systems in the cockpit Tuesday and were satisfied with the results, Henschel said.

Despite the problems, Henschel said the simulation was far better than the simulation for the maiden shuttle flight last spring.

Engineers said they are confident another potential problem area has been solved. There had been fears that modifications to prevent the shock and vibration experienced during the first launch would cause delays. (SENTINEL STAR, 7-30-81, p. 5C)

<> NASA's Kennedy Space Center has awarded a supplemental contract to Reynolds, Smith and Hills Architects, Engineers, Planners, Inc. of 2460 N. Courtney Parkway, Merritt Island, Florida. The contract is for a study of KSC's launching facilities to be conducted to see if modifications are needed for use of the Centaur upper stage as part of the Space Shuttle system.

The value of the fixed-price contract is \$834,872, and brings the total amount of the Reynolds, Smith and Hills contract at KSC to \$863,868. The new contract covers the period of 73 days from award. The contract was awarded July 22. The study is to be conducted at Reynolds' Merritt Island, Florida, facilities.

The contract supplement calls for Reynolds to perform a study of possible modifications to NASA's Space Shuttle launch facilities to accommodate a Centaur and payload in a shuttle orbiter payload bay. These facilities include Mobile Launcher Platform 2 and the Rotating Service Structure and Fixed Service Structure at the Complex 39 launch pads. (KSC RELEASE No. 188-81, 7-29-81)

July 30: An Air Force Space Division/Boeing Aerospace Inertial Upper Stage test vehicle has arrived at Cape Canaveral for launch checkout of the first flight vehicle scheduled for next year.

Called a Pathfinder, whose UTC solid rocket motors and ordnance devices are loaded with inert material, the vehicle will be used to duplicate the exact flow of IUS hardware from shipment of components to integration to launch readiness.

Taking part in the test will be flight-type hardware of a Martin Marietta Titan 34D launch vehicle, the IUS Pathfinder test vehicle, and a spacecraft model. The test is considered a critical phase in the IUS development program because the first flight mission is operational. (DEFENSE DAILY, 7-30-81, p. 163, Vol. 117, No. 21)

<> About a tablespoon of toxic rocket fuel was responsible for an evacuation of the Orbiter Columbia's hangar at Kennedy Space Center on Thursday afternoon.

More than 100 Space Shuttle workers were evacuated for an hour from the Orbiter Processing Facility after fuel dripped from the Columbia. Fire and safety teams easily extinguished a thermal protection blanket that began smoking at the rear of the Orbiter.

No injuries or damage to Shuttle hardware occurred, said KSC spokesman Rocky Raab.

Firefighters with Wackenhut Services responded to the 2:30 p.m. accident.

"Anytime something happens at the Orbiter Processing Facility and that bird is in there, we are very interested. It was taken care of and well under control," said one Wackenhut Services employee.

Raab said there were no flames involved. But he added the hypergolic fuel that dripped from a small thruster engine at the rear of the Orbiter is highly toxic and began to smoke on the blanket.

"The men who were working with the thrusters were wearing protective self-contained suits" that are designed to protect against inhaling the "high-powered fuel," Raab said.

He said while there was no immediate threat to workers in the facility, the evacuation was necessary as a precaution. The Shuttle workers were moved to the facility's parking lot.

The evacuation was orderly "and followed normal procedures," said KSC spokesman Al Seeschaaf.

"Someone saw the smoke and immediately set the alarm off and then there were bells, sirens and flashing lights everywhere," he said.

The accident happened while Shuttle workers were replacing a thruster engine at the right-hand side of the rear of the Orbiter.

Apparently, there was some residual fuel in one of the lines, a spokesman said.

The Orbiter's 44 thrusters are used to fine tune the spaceship's path once it is in orbit. (TODAY, 7-31-81)

July 31: A man from West Germany wants to know how America found the expertise to send a space shuttle into orbit when it couldn't properly hang its own flag.

Jason Matthews, a schoolboy in Nottinghamshire, England, writes that the American flag adorning the Columbia looks different from the one in his encyclopedia.

They're just two of the many people who are asking the same question: "Say, can't you see that Old Glory is hung backward on the space shuttle?"

NASA is used to questions. When 50 callers and letter writers insisted that the Stars and Stripes had been reversed, the space center promptly typed a reply.

Its reply to the letter writers is simple -- the flag isn't backward, your perception is.

U.S. regulations state that when the flag is displayed on aircraft, the star field precedes the stripes in the direction of aircraft movement. The flag on the shuttle is supposed to appear to be flying from a mast.

According to those rules, the Stars and Stripes was applied to Columbia with a silica-base, heat-resistant paint that can withstand heat up to 1,200 degrees Fahrenheit.

The public confusion stems from a NASA-released photograph of the Columbia's April 14 landing at Edwards Air Force Base in California. The picture, which was widely reprinted in newspapers and magazines, shows the shuttle's right side as its rear wheels touched down on the Mojave Desert.

From that angle, the flag looks unusual because the star field is in the upper right-hand corner, said NASA spokesman Rocky Raab on Thursday.

"That's why people are curious," he said. "If they saw the flag on the other side they wouldn't have said anything because it looks correct from there, because the star field is in the upper left-hand corner."

Doris Mauney, who has answered NASA mail for more than five years, said most letter writers are trying to help rather than rib the space center.

"Most of them point it out in a nice way to help us," she said. "Apparently, they felt they were the only ones who noticed and they hoped that no one else would. However, the man from West Germany was nearly irate about it."

The flag correspondence, from adults and children around the United States and Europe, is just a small part of the new interest in NASA that officials attribute to Columbia's successful mission.

"Dear NASA" letters are being posted at an average of 10,000 a month, as opposed to 3,000 a month five years ago.

But the flag observers, Raab said, are still relatively few compared to those who ask the most frequent questions about the space program -- "How do I join?" and "How do the astronauts go to the bathroom?" (SENTINEL STAR, 7-31-81, pp. 1A & 8A)

AUGUST 1981

August 1: Robert A. Foster, formerly director of Computer Sciences Corp.'s Applied Technology Division in Houston, has been named director of the division's Kennedy Space Center operations. He replaces Thomas Williams who was recently named president of the division. E. P. Boykin, formerly head of finance and administration for Computer Sciences Corp. at KSC, has been promoted to director of the Houston operations, Foster's former post.

The Applied Technology Division is KSC's largest operating unit. (TODAY, 8-1-81)

August 3: Astronauts Joe Engle and Richard Truly won't be caught kicking the tires on this Space Shuttle, even if it is the world's first used spacecraft.

"I wish I could buy a used car that looked as good," Truly said during a news conference from Johnson Space Center in Houston Monday.

Appearing before the press in a video hookup aired simultaneously in Houston, Washington, Huntsville, Alabama, and Kennedy Space Center, the astronauts said they feel confident the Shuttle will perform as smoothly the second time around as it did in April.

"We're going to be ready when the bird's ready," Engle said.

They predicted certain modifications inside the Orbiter Columbia should make the scheduled September 30 flight easier than the trip taken by Bob Crippen and John Young last April.

Included in those changes is a wireless communications headset that "will reduce the number of cords in the Shuttle and make space flight a lot easier. We won't be getting tangled up in each other," Truly said.

Young and Crippen had complained about getting caught in the "spaghetti" attached to their headsets.

As for any advice the second pair of Shuttle astronauts received from their predecessors Truly quipped jokingly, "Yes, don't do anything dumb."

The astronauts also discussed the more serious prospect of a venture out of the Columbia and into space to fix a robot arm if it should fail to fold back into the Orbiter's payload bay.

The arm, to be tested during the five-day flight, is designed for future missions to retrieve or launch satellites from the cargo bay. "If we could fix it by EVA (leaving the Orbiter) we would. If we couldn't, we would jettison the arm," Truly said.

But they said they will approach this mission conservatively and in the event of any failure in the ship's hardware, they will return early. (TODAY, 8-4-81)

August 5: A jumbo tractor-trailer, carrying a 60,000-pound steel slab to the Kennedy Space Center, ripped out a section of railing on the Titusville Causeway Wednesday morning.

One of the three Boeing Services International workers aboard the NASA trailer was taken to Jess Parrish Memorial Hospital in Titusville following the 10:15 a.m. mishap.

Paul Dumont, 48, of Titusville, was listed in stable condition Wednesday night with a fractured left arm.

According to witnesses, the trailer that was hauling a steel plate from Mims Industrial Steel Inc. edged too close to the westbound lane of the bridge on County Road 402.

One of the trailer's massive back tires jumped the curb and brushed along about 20 feet of the concrete railing, crumbling it.

The trailer was traveling east, but because of its size -- 20 feet wide -- it took up both lanes.

Brevard County Commissioner Gene Roberts estimated damage to the county bridge at under \$10,000.

No charges have been filed in the accident, and a Florida Highway Patrol spokesman said it is still under investigation.

The steel plate, being transported to launch complex 39, is designed for modifications to the Space Shuttle pad but not for the scheduled September 30 launch.

It would be used to shield the Orbiter against the shock of the solid rockets during ignition. (TODAY, 8-6-81)

<> Special spacecraft fans donated by NASA to the Smithsonian Institution have been retrieved from the museum by the agency's Marshall Space Flight Center and will be used on Space Shuttle missions.

NASA said that if it had to purchase the fans new today, they could cost more than \$22,000 each. It estimated that the saving from reuse of the fans could exceed \$500,000.

The fans, of the type used to provide ventilation inside the Apollo Command Module after splashdown and to circulate air aboard Skylab, were removed by Marshall from the backup Skylab on display at the Smithsonian's Air and Space Museum.

Of the 35 fans tested, 25 will be available for up to 10 flights each aboard the Space Shuttle, NASA said. To date, 13 of the fans have been programmed for use, e.g., one will be used to circulate air in the Spacelab transfer tunnel, another will serve as a flight spare, and two will be used in a cosmic ray experiment on the second Spacelab mission. (DEFENSE DAILY, 8-5-81, p. 195, Vol. 117, No. 25)

August 6: NASA Inspector General June G. Brown has initiated a review of the production phase of the Space Shuttle Orbiter program aimed at ensuring that money for the program is properly expended. The review, to be completed by March, will include participation by the Air Force Inspector General and is designed to ensure that "appropriate controls and safeguards are in place to the expenditure" of billions of dollars for Shuttle production. The requirement for spare parts and identification of alternate sources of supply, and contract changes will be among the subjects of the study. A NASA spokesman described the review as

"preventative" and not connected with allegations that Rockwell used funds allocated for Shuttle production for Shuttle development. (DEFENSE DAILY, 8-6-81, p. 202, Vol. 117, No. 26)

August 7: Despite the destruction Wednesday of the prototype 55-foot, 60,000-pound thrust Percheron rocket when its engine exploded during a planned 3-4 second test, the companies building the rocket as a commercial launch system say they plan to build a new rocket and continue with the program.

It was estimated that it would take from six months to a year to get another rocket ready.

The Percheron (named after a French draft horse) project is being conducted by Space Services, Inc. of Houston, Texas, headed by David Hannah, Jr., a real estate developer, joined by a group of private investors. The rocket is being built for Space Services by GCH Inc. of Sunnyvale, California, which is headed by Gary C. Hudson, a 31-year old, self-taught engineer, and employs 17 engineers.

The companies have projected start-up costs of \$10 to \$30 million for the Percheron project and have spent something over \$1.2 million to date.

The 55-foot Percheron rocket, bolted to its launch stand on Matagorda Island, Texas, blew up shortly after 5 PM Wednesday after engineers began the countdown for the first preliminary test firing of the kerosene and liquid oxygen-fueled engine.

GCH engineers said that they believe the explosion was caused by the failure of the small liquid oxygen valve to open, which caused kerosene to run onto the engine. They believe the kerosene caused a small explosion in the engine compartment that in turn caused the kerosene tank to explode hurtling the top two-thirds of the rocket 200 feet into the air. Four pieces of the rocket landed back on the ground, causing no injuries. The rocket's base remained bolted to the stand.

Space Services, which had said its chances for a successful test firing of the engine were about 50/50, had planned to follow a series of three static tests with a six-mile suborbital test flight of the rocket this month. The company had received FAA clearance for the test Wednesday.

Long-range plans called for conducting an orbital test flight of the vehicle later this year from an unnamed site and conducting six such tests over the next two years, with the vehicle to be declared operational in 1983.

Planning to undersell both the Space Shuttle and Ariane launch vehicles, Space Services has said that it expected to charge from \$3 to \$5 million to place a 2000-3000 pound payload in low Earth orbit, and \$15 to \$16 million to place a 5000 pound payload into geosynchronous orbit. (DEFENSE DAILY, 8-7-81, p. 210, Vol. 117, No. 27)

- <> NASA's new inspector general June G. Brown told DEFENSE DAILY Wednesday that the recently instituted review by her office of the production phase of the Space Shuttle Orbiter program is aimed at uncovering "weaknesses" in NASA's acquisition system for the Orbiters.

The objective is to avoid costs before they occur by instituting more controls where they are needed, she said.

Asked if the review was prompted by allegations now being investigated in the courts that persons in Rockwell International, Shuttle prime, charged funds used for other programs to ongoing Shuttle development, Brown said it was not, and that the review is not going over any "specific problems."

She indicated that the magnitude of the Orbiter production program and the amount of money still to be spent is the driving factor in the study, which she said was fully endorsed by former acting NASA Administrator Dr. Alan Lovelace.

Asked if she planned to initiate similar reviews of other NASA programs, Brown said she did not, primarily because the majority of her staff, up to 20 people at times, will be involved in the Orbiter production study, and because there are no other projects of this magnitude currently extant.

The NASA IG review is to focus on "financial and project management, including contract changes" in the Orbiter production program. (DEFENSE DAILY, 8-7-81, p. 209, Vol. 117, No. 27)

- <> The Navy's FLTSATCOM-5 communication's satellite, which will serve as an on-orbit spare for the constellation of four spacecraft now providing global military satellite communications coverage, was successfully launched at 4:16 AM EDT yesterday from Cape Canaveral aboard a General Dynamics Atlas-Centaur vehicle. The 2300-pound spacecraft is built by TRW's Defense Space Systems Group. It will be positioned in geosynchronous orbit at 93 degrees west longitude above the equator, a position selected because it is a heavy traffic area for FLTSATCOM's mobile users. The four-satellite FLTSATCOM system provides high-priority UHF communications relay links between 900 ships, submarines and aircraft of the Navy fleet and selected ground stations, between a thousand Air Force aircraft and air-to-ground terminals, and SAC. (DEFENSE DAILY, 8-7-81, p. 211, Vol. 117, No. 27)

- <> Kennedy Space Center Deputy Director Gerald D. Griffin announced his resignation from NASA today, to be effective August 22. He has accepted a position with Scott Science and Technology, Inc. (SST), of Lancaster, California.

Griffin will serve as Vice-President for Operations with SST. SST is an international corporation dealing primarily in research and development of high technology products and systems. The corporation has offices in Albuquerque, Colorado Springs, Houston, Los Angeles, and London, as well as corporate headquarters in Lancaster where Griffin will be located.

Griffin recently returned to his full-time position as KSC Deputy Director. Since July 1980, he had been serving in the dual role of Acting Associate Administrator for External Relations at NASA Headquarters and Deputy Director of the Kennedy Space Center. He was named to the Kennedy post in May 1977 after serving one year as the Deputy Director of the Dryden Flight Research Center.

Griffin was named NASA Assistant Administrator for Legislative Affairs in 1973 and later was appointed Deputy Associate Administrator (Operations) in the Office of Space Flight, serving in that position until 1976.

Before joining NASA Headquarters, Griffin worked at NASA's Johnson Space Center where he was a Flight Director for all eleven manned Apollo missions. He was lead Flight Director for Apollos 12, 15, and 17. Previously, he was flight controller in Mission Control for Gemini missions. He joined the Johnson Space Center (then Manned Spacecraft Center) in 1964 and was named Flight Director in 1968. (KSC NEWS RELEASE No. 194-81, 8-7-81)

<> Boeing Services International, Inc., Kennedy Space Center, Florida, has been awarded a supplemental agreement to an existing contract with NASA's John F. Kennedy Space Center. The award provides for Boeing to handle supply and transportation services at the Space Center and adjacent Cape Canaveral Air Force Station.

The value of the cost-plus-award-fee agreement is \$13,545,786, and brings the aggregate contract value to \$41,435,032. The one-year supplemental contract covers the period from July 1, 1981, through June 30, 1982.

The contract supplement calls for Boeing to continue supply and transportation functions at both the Kennedy Space Center and Cape Canaveral Air Force Station. The supply functions include operations at the Central Receiving Facility and various supply warehouses located throughout the two installations. These supply facilities provide technical and administrative materials that are required for everyday operations, and replenish materials that have been requisitioned. Transportation functions include handling outgoing shipments for NASA and contractor organizations from KSC and Cape Canaveral Air Force Station.

The new award represents the fourth year of service under a contract for one year plus four one-year options. (KSC RELEASE No. 193-81, 8-7-81)

August 8: Federal Firefighters, using a tanker plane dropping fire-retardants, stopped the progress of a brush fire that broke out Saturday south of the Merritt Island National Wildlife Refuge and threatened to move north.

About 20 firefighters set up a fire line in hopes of containing that blaze that erupted about 3 p.m. along the Indian River about 4 miles west of the Kennedy Space Center

industrial complex and a mile south of the NASA Parkway, said Jack deGolia, spokesman for the U.S. Fish and Wildlife Service.

Les Tschohl of the U.S. Bureau of Land Management originally estimated that the fire had spread across 300 acres of palmetto and brush within two hours. But after some of the smoke cleared, officials learned that only 50 acres had been burned, deGolia said.

Authorities said that if the fire had gone north to the wildlife refuge it probably would have threatened one house in the area. Federal firefighters stationed a pumper at the home to protect it, deGolia said. (SENTINEL STAR, 8-8-81)

August 10: The Shuttle Orbiter Columbia was expected to roll from its hangar to the Vehicle Assembly Building at 4 a.m. today.

The 300-yard tow had been delayed four hours from midnight because many chores were taking longer than expected, Kennedy Space Center spokesman Mark Hess said Sunday.

The transfer was expected to last about an hour.

Once inside the cavernous VAB, workers will begin hoisting the Orbiter to a vertical position so it can be linked to its silo-like external fuel tank and two 150-foot-tall booster rockets.

The move from the Orbiter Processing Facility to the VAB was originally scheduled last Tuesday. But the trip was postponed several times because of wiring problems in the device deploying the robot payload arm.

Officials said they do not expect the delays to postpone the September 30 launch date, but said the schedule is extremely tight and more trouble could push it back.

The Shuttle is scheduled to roll out to Launch Complex 39A on August 26. (TODAY, 8-10-81)

<> Combination water cascade/trough system was selected last week by the National Aeronautics and Space Administration as the method to deflect the pressure caused by ignition of the two solid rocket boosters in the space-shuttle launch system.

Modifications to the launch pad and mobile launch platform began August 4 and NASA said the work will not affect the scheduled September 30 launch date of the second space shuttle.

Because of a delay in transferring the orbiter to the vehicle assembly building from the orbiter processing facility, NASA elected to waterproof thermal protection system tiles before the transfer. The waterproofing operation was performed by hand using aerosol cans.

Originally, waterproofing was to have been done with a spray boom, but the opportunity to complete the job before transfer to the vehicle assembly building will save two days in this facility.

Transfer of the orbiter was put off from August 4 by a delay in completing the orbiter integration test. (AVIATION WEEK & SPACE TECHNOLOGY, 8-10-81, p. 27, Vol.115, No. 6)

August 11: The tedious task of attaching the external tank and solid rocket booster stack to the Orbiter Columbia got under way Tuesday morning at the Kennedy Space Center's Vehicle Assembly Building.

The first step was to hoist the spaceship to a vertical position for attachment to the three connection points on the 154-foot high external tank.

By late Tuesday afternoon, the Orbiter had been securely bolted to two of the tank's connections.

A mechanism that retracts the landing gear at the nose of the Orbiter was not operating properly. In addition, there was a problem with the electrical wiring in the ground support equipment which is also involved with the Orbiter's nose landing gear.

The Orbiter's landing gear must be fully prepared during this stage of the checkout. The next time it will be extended is when the spaceship lands on the runway at California's Edwards Air Force Base at the end of its mission.

Before the landing gear was retracted, films were made of every part of the nose wheel well.

Only about 63 thermal protection tiles remain to be bonded to the Orbiter between now and the Shuttle's move to the launch pad, set for August 26.

The second blastoff of the Space Shuttle Columbia is scheduled for September 30 and KSC officials say mating operations are smooth enough so that the launch may go on time.

The next important date in the Shuttle's road to launch is an interface test which will determine if the three Shuttle components -- Orbiter, solid rocket boosters and tank -- all work in concert. (TODAY, 8-12-81)

<> The space shuttle Columbia received a small jolt Monday when a forklift carrying an access platform bumped into a wing flap and damaged two of its thermal protection tiles.

The accident occurred a few hours after the spaceplane was towed a quarter-mile from its hangar to the monolithic Vehicle Assembly Building, where it's scheduled to be reunited with its solid rocket boosters and equipped with an external fuel tank.

Space center spokesman Dick Young said the damage was minor and shouldn't affect the timetable for the shuttle's scheduled September 30 launch.

The ruined tiles were removed shortly after the collision and will be replaced after the orbiter is mated with the twin boosters and fuel tank. That union was scheduled to begin Monday night and will take several days to complete.

An August 26 target date has been set for rolling the rocket-tank-orbiter assembly to the launch pad. But officials on Monday were far from reassuring about meeting the deadline.

"We just might make it," said George Page, shuttle launch director. "The next three days will tell us. It looks good but there's a lot of work to be done."

Kennedy Space Center Director Dick Smith said it will be "a bit of a struggle" to make the September 30 launch. "There's still a reasonable chance, but it's more work than we initially anticipated. Remember, this is the first time we've ever processed a vehicle to fly again."

Page and Smith both said the shuttle is in better shape now compared to preparations for the first flight.

"We've learned a lot of things, but there's still more to learn," Smith said. (SENTINEL STAR, 8-11-81)

<> Every year they visit from deep space, flashing across starlit skies for a few sultry days in August. Their return to the void is as silent as their arrival.

The Perseid meteors are back to perform, beginning tonight.

Commonly known as shooting stars, meteors are tiny chunks of rock, iron, and ice ranging in size from less than an inch long to the size of basketballs.

Almost all disintegrate during their fall through the earth's atmosphere, leaving a glowing trail through the night sky.

A few meteors can be seen on any clear night, but during the Perseid shower they become a celestial Fourth of July with 60 to 80 sighted an hour.

Despite interference to viewing from a bright, full moon, this year's heaviest meteor activity is expected tonight, Wednesday night and early Thursday morning before sunrise.

The only rules for good meteor gazing is to pick the darkest spot possible and scan the entire sky, said Robert Wood, Brevard Community College professor of astronomy and director of the college's observatory.

"Just lean back in a lawn chair and look," Wood said.

Traveling in a westerly direction, the meteors appear to originate from the constellation Perseus -- hence the name Perseid meteors.

Dating from the breakup of an ancient comet, the Perseid meteors travel as fast as 30 to 40 miles per second and start burning to a cinder about 80 miles above Earth.

And they will be visible from anywhere on the globe.

"Most burn up but some could strike the earth," said Wood, adding the likelihood is remote.

The meteors, traveling in a cluster, orbit the sun in the same manner as the Earth.

Steve Morgan, a member of the Brevard Astronomical Society, said veteran star gazers will be disappointed with this year's shower.

The problem is with another heavenly body -- the moon.

"A full moon really makes it hard to see," Morgan said. "A lot of people will sit this one out." (TODAY, 8-11-81)

August 12: The Space Shuttle's rollout to the launch pad will be delayed by one day due to a slower than expected attachment of the spaceship Columbia to its fuel tank and rocket boosters.

The mating of the Shuttle components was completed Wednesday and a series of tests of the entire Shuttle stack are scheduled to start no sooner than Saturday, Kennedy Space Center officials said.

One problem in mating was a simple one-inch movement of the Columbia during its connection to the external fuel tank's forward attach point.

"This required repositioning the vehicle. Even one inch could throw a number of interfaces (critical connections between the Columbia and tank) out," said space center spokesman Dick Young.

Between now and the scheduled August 27 rollout to the launch pad, Shuttle workers must hook up cables between the tank and the Orbiter that will fuel the Shuttle's main engines with liquid oxygen and liquid hydrogen.

It will take the remainder of the week to properly hook up the lines which serve as a vital electrical link between the Orbiter and the 154-foot high tank.

The five-day, full-stacked Shuttle test will involve two simulated countdowns, mock ascent and descent.

During the procedure, astronauts Joe Engle and Richard Truly will test their space legs in the Orbiter.

The Space Shuttle mating, in the Vehicle Assembly Building, began Monday after the Orbiter was towed 300 yards from its hangar.

KSC officials said the one-day rollout delay should not postpone the scheduled September 30 launch. (TODAY, 8-13-81, p. 16A)

<> NASA's Voyager 2 spacecraft, after a flight of four years and 1.24 billion miles, will fly by the planet Saturn at a distance of 63,000 miles above the planet's cloud tops on August 25, returning 18,500 pictures of the planet, its rings and its moons and taking other scientific measurements.

The photographs and data returned by the spacecraft will augment and refine the earlier findings of its sistership, Voyager 1, which flew by Saturn at a distance of 77,000 miles nine months ago.

Voyager 1 was launched August 20, 1977, from Cape Canaveral aboard a Titan-Centaur rocket. Voyager 2 was launched September 5 on a faster, shorter trajectory.

Both spacecraft were designed and built by NASA's Jet Propulsion Laboratory. (DEFENSE DAILY, 8-12-81, p. 238, Vol. 117, No. 30)

August 13: A military communications satellite launched a week ago has developed an onboard power failure.

U.S. Air Force officials are now searching for the cause of the malfunctioning power system, a problem that could keep the system from operating at full strength.

"It's premature to say now if it is a good or a bad satellite. We haven't fully activated all the parts" (including its communications machinery), said Earl Gray, spokesman for the space division of the Air Force System Command.

The FLTSATCOM satellite, the last in a series of five, was sent into orbit from Cape Canaveral Air Force Station before dawn August 6 and developed problems within hours of launch.

The major difficulty is with a power system designed to point the satellite's solar panels toward the sun and its communications antennas toward Earth, Gray said.

A second difficulty, a wobbling of the craft, has been corrected, Gray said. (TODAY, 8-13-81)

<> Boeing Services International, Inc., Kennedy Space Center, Fla., has been awarded a supplemental agreement to an existing contract with NASA's John F. Kennedy Space Center. The award provides for Boeing to perform Ground Support Operations services for a fifth contract year at the Space Center.

The value of the cost-plus-award-fee agreement is \$63,381,627, and brings the aggregate contract value to \$257,242,135. The one-year supplemental contract covers the period from July 1, 1981, through June 30, 1982.

Ground Support Operations that Boeing handles at KSC include operation and maintenance of the huge Crawler Transporters used to transfer the Space Shuttle to the launch pads. Other functions include handling toxic wastes, operation of heavy equipment such as the cranes used in the Vehicle Assembly Building and the Orbiter Processing Facility, minor repairs to KSC buildings and facilities, and general office moving functions.

The new award represents the fifth year of service under a contract for one year plus four one-year options. (KSC NEWS RELEASE No. 196-81, 8-13-81)

August 14: Some NASA officials have grumbled that "The Right Stuff" is the wrong stuff to show the public about America's first manned space program.

But NASA has tentatively approved the movie anyway -- and it's the biggest entertainment production ever to receive space agency cooperation, according to a NASA spokesman.

Chardoff-Winkler, the maker of "Rocky" and "New York, New York," plans to begin filming the movie version of "The Right Stuff" at the space center in January.

NASA officials have cleared the first draft of the film's script, which was inspired by Tom Wolfe's irreverent, naked-eye chronicling of the space program circa 1958 - 1963.

The script was written by William Goldman, author of "Lord of the Flies." And final approval is expected after NASA officials read the script revisions, which are being written by the film's director.

Chardoff-Winkler needs NASA's blessing before it brings cameras and crew to the space center next year.

Without a working agreement with the space agency, Chardoff-Winkler would face the heavy expense of building recreations of the old Mercury control rooms on Cape Canaveral and other space center equipment to be used in the film.

The producers also want to include NASA footage of the Mercury launches because "some of that early stuff cannot be reproduced," Executive Producer Hal Polaire said in a telephone interview from his office in Culver City, California.

It appears that Chardoff-Winkler will get what it needs to make the movie, said Byron Morgan, head of NASA's motion picture bureau in Washington. (SENTINEL STAR, 8-14-81, p. 1-A)

August 17: A California businessman has donated payload Shuttle flights to a Brevard group that promotes science for young people.

"Col. Frank Lenahan has given us four payload reservations and may let us have five more," said Drazen Premate, 25, founder of the non-profit Inter-Space Society. The Society helps place student science experiments in space through the use of NASA's "Get-Away Special" Program.

"Lenahan is giving us number 32 and three other numbers from 41 through 48," Premate said. "That puts us right near the top of the list of 350 reservations."

A retired Air Force fighter pilot and aerospace researcher, Lenahan said he wants to see young people involved in science research.

"The Space Shuttle program has a lot of potential and the place to get great ideas is out of high school and college students," he said. "Nothing would make me happier than to see their projects succeed."

The Get-Away Special (G.A.S.) was announced by NASA in 1976 as a program for using leftover cargo space on Space Shuttle missions. The extra room will house special containers with science experiments to be carried into low earth orbit at \$50 per pound.

NASA will furnish soup-can shaped containers for the experiments in two sizes: 5 cubic feet and 2.5 cubic feet. Each canister can hold six or eight experiments and can weigh up to 200 pounds.

Reservations for G.A.S. payloads cost \$500 per container, and the experiments will fly on a space-available, first-come, first-served basis. (TODAY, 8-17-81, p. 1-B)

<> A series of integrated tests on the Space Shuttle were postponed from Saturday to 8 a.m. today because mating the spaceship Columbia with its external tank took longer than expected, said Kennedy Space Center spokesman Dick Young.

The five-day tests of the Shuttle elements -- Orbiter, booster rockets and external fuel tank -- are designed to make sure everything has been connected correctly and all the components work as a system, Young said.

During the latter part of the tests, crew members will simulate an ascent to orbit, descent and landing, and a return to launch site. Young said if something goes wrong during the Shuttle's flight before it is too far out of range, the Orbiter can make a 180-degree turn and return to Kennedy Space Center.

There has been no official assessment yet to determine if the latest delay will affect the launch date of September 30, Young said. (TODAY, 8-17-81, p. 10-A)

<> Kennedy Space Center is faced with a new challenge almost as great as designing and launching the first Shuttle -- making it do what it's supposed to do.

When NASA engineers came away from their draft boards and planning tables back in the early 1970s, they told their budget-conscious bosses they had come up with a spaceship that could be landed, patched up and put back into orbit within 160 hours -- or just about a week's time.

That was nine years ago. Now, if the second shuttle flight is launched on time in late September, it will have taken more like two dozen weeks to prepare the Columbia for launch.

And KSC planners say they'll be lucky to achieve a 10-week turnaround by the ninth flight -- much less the flight rate of 40 Shuttles a year scheduled for 1990.

"It's mind boggling if you think of it in terms of the way we do business today," said Wes Branning, head of a committee charged with coming up with ways to shorten turnaround time.

Branning's committee, nicknamed STAG for Shuttle Turnaround Analysis Group, must figure out how NASA is going to launch 334 Shuttles from KSC by 1994.

"We must radically change the way we process the vehicle," Branning said.

Some of the changes Branning's committee has in mind are relatively simple: installing permanent jacks in the floor of the Orbiter's hangar; changing the way payloads are attached to the Orbiter so they can be replaced more quickly; and streamlining checkout operations.

Other changes will be more difficult. The committee plans to reduce testing by 50-60 percent. The way various elements of the Shuttle are put together must be simplified. That means major design changes.

And one change Branning's committee has recommended is the simultaneous loading of volatile and toxic fuels. These fuels have always been loaded separately in the past.

Loading them in concert is unprecedented and likely to be controversial, especially with hypergolic fuels -- designed to ignite when they come in contact with one another.

Branning said his committee anticipates some resistance from veterans.

"We didn't do those things back in the old days," he said. "But in those days we were using primitive hardware. Since then we've developed our design capability to the point that it's safe to do these sort of things."

According to Branning, these mechanical changes to the Shuttle and to KSC's facilities will not be difficult technologically.

"In developing the Shuttle, some of the problems we ran into with the thermal protection system (the tiles) and the main engines were pushing the state of the art," Branning said. "The type of changes we're making right now to get us to an improved turnaround are well within the state of the art."

But the changes won't come cheaply. "We're getting ready to put a lot of money into making the system achieve its operational goals," said one upper-level manager recently. Branning stressed that every change is being analyzed to make sure the "payback" merits the expense.

Though expensive, the mechanical changes will prove relatively easy. It's just a matter of getting them designed, approved and implemented.

But other changes more difficult than the mechanical ones must be made -- changes in philosophy at KSC that money can't buy.

"The problem you have is NASA has always worked in an R & D (research and development) environment," Branning said. "KSC does not have an operational philosophy like the airlines do. The airlines have R & D folks who design their planes, develop them, get all the bugs out of them and then turn them over to the airlines as operational aircrafts."

"We've got to educate our R & D people to come into an operational phase."

"To me," said Robert Buckley, formerly the chairman of Branning's committee, "we can design the most efficient flight and ground hardware, but the manner in which we operate and manage our people has to be changed." (TODAY, 8-17-81, pp. 1-A & 10-A)

<> Kennedy Space Center has awarded a \$4.3 million supplemental to Modular Computer Systems Inc. (Fort Lauderdale, Florida) to provide additional mini-computers and peripherals for the Checkout Control & Monitor System of the Space Shuttle Launch Processing Systems at KSC and Vandenberg AFB, California. The award, which runs through December 1982, brings the value of the MCSI contract to \$31.9 million. (DEFENSE DAILY, 8-17-81, p. 259, Vol. 117, No. 33)

August 18: "We've been operating here at Kennedy Space Center essentially the same way for the last 20 years," said Robert Buckley, head of KSC's operations planning office.

And it's past time to change.

Here are some of (the) changes Buckley and other planners want to make:

- *Reduce paperwork by 50 percent.
- *Computerize day-to-day operations.
- *Reduce Shuttle testing by 50-60 percent.
- *Increase automation by 25 percent - this year.
- *Reduce the day-to-day involvement in and monitoring of contractor operations by the government.

Ironically for a space agency, NASA is old fashioned in many ways.

"NASA needs to catch up and modernize," Buckley said. "The way we work and the process by which we accomplish our work must be as modern and efficient as the rockets and launch systems we're working on."

And presently, that is not the case.

"It has always been an embarrassment to me," said Buckley, "that we're looked on as space scientists, but we're doing business in an old fashioned way by ignoring the use of the computer as a tool. Avis can locate a car anywhere in the country and determine its maintenance record," he said. And yet, the majority of KSC's quality control records are on paper.

If a quality control worker finds something wrong with a tile, for instance, he would fill out a form, itemizing the deficiency. Several people would have to read the report, approve it, sign it and pass it on.

If a part is needed, another form would have to be filled out, which would need more approving and more signing. Someone would have to look on the shelf for the part and fill out additional forms before sending the part out.

"That's one example involved a lot of people, a lot of paper and a lot of time," Buckley said.

If the system were computerized, the quality control worker could: enter the deficiency on a computer terminal without having to go back to his office, check for the part without bothering anyone at the warehouse and review a history of the tendency of similar parts to break.

"It's not a matter of proving it's practical - industry has already done it," Buckley said.

But it's not enough to computerize the paperwork. Some of the paperwork must be eliminated, especially in the area of checking out and launching a manned spaceflight.

"NASA has always been proud that we set ourselves above what's been called a bureaucratic agency," Buckley said. "But there's been some erosion of that."

"What happened is after the Apollo fire (of 1967 in which three astronauts were killed) through Congressional action, recommendations were made that laid on tremendous amounts of documentation checks and balances. And that has resulted in the tremendous bureaucratic system we have now."

Although the paperwork may be justifiable for a developmental program, much of it must be eliminated before the Shuttle system can become economical or feasible.

"When we reach these higher launch rates, the amount of data we'll be processing will far surpass the capability of doing the work on paper," he said.

"What we intend to do," Buckley said, "is examine all the requirements that exist for documentation and determine what the minimum amount of documentation is that we need for operations." The measure should not be hard to push through. "If you talk to George Page (KSC's launch director) and those guys over there (the launch team), that's one of their major objections, a lot of paperwork and a lot of signing. They've got the right frame of mind - a Can Do attitude."

But it's not just paperwork directly related to the Shuttle that needs to be eliminated or streamlined. "We need to drastically reduce the amount of paper associated with the way we're presently doing business," Buckley said.

Again, Buckley looks to the computer to accomplish this: "The center is in the process of looking for a data management system at a center level."

NASA must also let the contractors who do the work assume more responsibility, Buckley said. NASA now attempts to match the number of engineers and quality control workers contractors employ with an equal number of NASA engineers and quality control personnel.

"In the past that has proven to be a successful way to operate in the developmental stage...and we're not kicking that. After all, two sets of eyeballs are better than one.

"But for an operational system and for the sake of economics, we must streamline our check-out teams to the bare minimum," Buckley said.

In fact, in hopes that NASA and KSC can get back to the mission prescribed in its charter - research and development, the agency is considering taking a major step: turning the Shuttle over to private industry. (TODAY, 8-18-81, p. 1-A)

<> NASA at 8 AM yesterday started the nine-day Shuttle Interface Test on the mated Space Shuttle Columbia in the Vehicle Assembly Building at Kennedy Space Center. Due to the difficulties in mating the vehicle, NASA is running behind schedule for rollout of the vehicle to the launch pad, which may slip four or five days beyond the planned

August 26 date. Such a slip would likely impact the planned September 30 launch for STS-2, but such a decision has not yet been made. (DEFENSE DAILY, 8-18-81, p. 268, Vol. 117, No. 34)

<> The second Intelsat V communications satellite, launched May 23, is now in operation relaying communications between North America and Europe. The Ford Aerospace-built spacecraft will be the prime Intelsat satellite to provide communications services between the Americas, Europe, the Middle East and Africa. The first Intelsat V spacecraft, launched in December 1980, is being used as the on-orbit spare for the Atlantic network, which will eventually consist of four satellites. A total of nine Intelsat V and three Intelsat V-A satellites, all built by Ford, are planned. They will be succeeded by up to 16 Intelsat VI satellites. (DEFENSE DAILY, 8-18-81, p. 270, Vol. 117, No. 34)

August 19: Technicians hooked up ground-support electrical equipment and began data-processing and systems checks in a series of tests on the space shuttle Columbia that will continue through the beginning of next week.

The tests are to prepare the Columbia for its second flight into space September 30. The reusable spacecraft spent more than two days in space in an April 12 mission.

Dick Young, a spokesman at Kennedy Space Center, said officials hope the tests can be completed in time to keep an August 27 scheduled date for the shuttle's rollout to the launch pad.

Testing, which began Monday, is running about three days late because the mating of Columbia to its external fuel tank took longer than expected. The delay last week threw National Aeronautics and Space Administration technicians off their schedule.

Early next week, astronauts Joe Engle and Dick Truly will rehearse the Columbia's second flight in simulations of liftoff, orbit, re-entry into Earth's atmosphere and emergency procedures.

Work was continuing on the Columbia's thermal tiles. Workers in the Vehicle Assembly Building have 62 more tiles to add to the shuttle. (THE MIAMI HERALD, 8-19-81)

<> Some day Greyhound Bus Lines may be operating the Shuttle. Or Piedmont Airlines. Or United Space Boosters Inc. Or Rockwell International.

Chances are, it won't be NASA.

On the recommendation of three independent studies - one of them chaired by James Beggs, the man who is now the administrator of NASA - the agency is strongly considering turning over its Space Transportation System to a private contractor.

The transition will depend on how quickly the Shuttle matures as a spacecraft, but it could be made as early as 1984: "It probably will be sooner than a lot of people would like," said W. E. Backus, head of Kennedy Space Center's planning office.

Backus explained that it all got started back in 1977 in Washington headquarters: "They wondered whether NASA, being a basic R & D outfit, was in the long term solution to operate a repetitive, transportation system."

Two studies were ordered: one by the National Association of Public Administrators (chaired by Beggs) and another by the Aerospace Corp., a think tank extensively used by the Air Force. A number of alternatives were considered, including: turning the system over to the Department of Transportation; splitting NASA in two parts, a research arm and an operations leg; letting the Department of Defense run the Shuttle; and creating a quasi-commercial outfit like Amtrak (Startrak?).

Both studies ultimately came up with the same recommendation: "What they basically concluded is that for the foreseeable future...NASA should run it," Backus said. "However, they thought that the prudent thing for NASA to do is gradually make changes in the way NASA operates so the system proves to be really viable...then we would be able to make the transition to a quasi- or full- commercial operation."

Another study by the consulting firm of Booz Allen and Hamilton Inc. was ordered to find out how the transition could be made: "What they concluded was that the greatest cost saving would be...combine all the flight hardware contracts into one and all payload contracts in one," Backus said.

"In other words, one contractor to drive the truck, and one to host all the customers and care for their particular needs," he said. Kennedy Space Center decided to add a third contractor to be responsible for mowing the grass, emptying the garbage, sweeping the floors and conducting other day-to-day activities.

"What they said, in effect, is if we're going to let this thing become a viable commercial operation, we should disengage our R & D types from their traditional technical involvement," Backus said. "Right now, for instance, civil servants are involved in signing all procedures, being present during all operations, coordinating contractors, making schedule decisions...What they envisioned the civil servants would do is concentrate more on contractor performance. It would be getting out of the middle of the trees to watch the performance so you'll have a better ability to judge the contractor's performance because you're not a part of the operation."

Presently, over a dozen or more contractors are responsible for the various elements of the Shuttle system: one for the Orbiter, one for the assist rockets, one for the fuel tank, one for payloads; one for the computers; and so on. Each contractor reports to NASA separately and NASA monitors each contract on an individual basis.

Under the proposed system, the single contractor in charge of operating the Shuttle could hire the same subcontractors now doing the job. Or the main contractor could train his own people to do the job.

Backus said that as soon as people out at KSC hear about the concept, they usually ask two questions: "Will I lose my job?" and "How could the flight contractor be anyone other than Rockwell?"

Will large numbers of workers lose their jobs? "I don't know the answer to that, but historically, the answer has been no," Backus said. "In the past when contracts have changed, 80 percent of the people have kept their jobs."

Won't Rockwell International, the company now responsible for designing and developing the Orbiter and integrating the Shuttle's various parts, inherit the contract? "No, it doesn't have to be Rockwell," Backus said. "Whoever gives the best overall proposal would be the one to win it. In fact, this time the cost proposal would be a very big item, whereas when you're going through an R & D proposal, the technical excellence is a very high factor."

Backus pointed out that the Air Force, chose Martin Marietta, the company that builds the Shuttle's fuel tanks, to be the integration contractor at the West Coast Shuttle launch site at Vandenberg Air Force Base, California.

"Boeing and Lockheed build airplanes, but they don't run an airline. General Motors builds buses, but doesn't run a bus line, Electric Boat Co. builds boats but it doesn't run a ship line. "It takes a different kind of mentality. A whole different set of thinking has to go on between design and operations," he said.

Why doesn't NASA run its own Shuttle? "When you put R & D personnel into an operational system, you do two things: they keep trying to improve the technical performance as opposed to the cost performance. And you sap the agency's R & D capability." (TODAY, 8-19-81, p. 1-A)

August 20: The rollout of the Space Shuttle Columbia from the Vehicle Assembly Building to the launch pad at Kennedy Space Center has been rescheduled from August 26 to August 31 because equipment testing aboard the Shuttle is behind schedule.

The delay is expected to impact the planned September 30 launch of the Shuttle, but no decision on a rescheduling has been made as yet.

At Kennedy Space Center, a NASA spokesman said there were "no big problems" with the Shuttle, "just a lot of little ones." He said that testing is taking longer than expected as is putting test programs in computers aboard the Columbia. Mating of the Orbiter to its External Tank also went over schedule.

NASA is currently running the Shuttle Interface Test on Columbia, which is scheduled to conclude early next week with the flight astronauts conducting simulated takeoff, orbital maneuvers, descent and landing. (DEFENSE DAILY, 8-20-81, p. 283, Vol. 117, No. 36)

August 21: The NASA manager responsible for recommending to the NASA administrator what course the agency should take toward developing a space station is currently continuing to evaluate two basic space station concept options and does not expect to reach a final decision on what station concept to recommend for construction until 1983 or possibly 1984 after further contractor studies.

In an interview with DEFENSE DAILY, Ivan Bekey, chief of advanced concepts in the Advanced Programs Directorate of NASA-Headquarters Office of Space Transportation Systems, said the two major concepts that are being evaluated are:

- 1) The Space Operations Center (SOC) concept developed by Johnson Space Center and evaluated in a recently completed Phase A study by Boeing Co. with Rockwell International looking at integration of the SOC with the Space Shuttle; and,
- 2) A "Growth" Science and Applications Space Platform concept developed by Marshall Space Flight Center and currently in pre-Phase A study by McDonnell Douglas. (DEFENSE DAILY, 8-21-81, p. 287, Vol. 117, No. 37)

<> Kennedy Space Center has awarded Martin Marietta a \$3.48 million revision contract for accelerating work on the Space Shuttle External Tank. (DEFENSE DAILY, 8-21-81, p. 292, Vol. 117, No. 37)

August 22: University of South Florida professor Bill Fisher was among 21 men and women selected Friday as Space Shuttle astronauts.

Fisher, whose wife Anna was selected as a Shuttle astronaut in 1979, is one of five physicians qualified to travel in space.

A resident of Houston, the 35-year-old Fisher, is a specialist in emergency medicine with particular interest in healing properties in space and the effect of weightlessness on the inner ear.

A member of the 70-member U.S. astronaut corps, Fisher was selected as a candidate in 1980 and began training in July of that year.

Fisher is not expected to fly in the Shuttle until after 1983.

Fisher and his wife made Brevard headlines in December 1980 when they were credited with attempting to save the life of a Cocoa Beach man involved in a motorcycle accident.

The Fishers spotted the man lying lifeless on SR 528. They revived him but he died more than a week later.

Another native Floridian included in Friday's announced crop of Shuttle astronauts is Richard Richards of Key West.

NASA also selected two European scientists, one from Switzerland, the other from Holland, for the astronaut training program because of the European Space Agency's funding and development of Spacelab.

One will continue to train as a payload specialist at Marshall Space Flight Center, in Huntsville, Alabama, and the other will be assigned to Johnson Space Center in Houston. (TODAY, 8-22-81)

<> Voyager 2, racing to a Tuesday night rendezvous with Saturn, already is taking "snappier-looking pictures" of the pastel features swirling in the planet's butterscotch clouds, scientists said Friday.

And as the spaceship sails, to just 63,000 miles above the cloud tops - the closest thing to a surface on the gaseous planet - it promises still more surprises and perhaps a few answers to the riddles found during Voyager 1's flight past the planet last November.

"We expect to get an even better look at Saturn this time," project scientist Edward C. Stone said at a news conference. (TODAY, 8-22-81)

August 24: October 2 was set last week as the launch date for the second space shuttle mission as National Aeronautics and Space Administration continued to experience delays in accomplishing integr. and tests of the shuttle system.

"Overall, system testing is going very well, but we are plagued by human errors," according to A.D. O'Hara, director of space transportation system processing. "We are trying to determine why there are errors - if people are tired, or if there is a lack of discipline to existing systems."

The October 2 date represents a two-day delay from a schedule set May 18, and although NASA is establishing a space shuttle turnaround schedule, O'Hara said: "We are not happy as managers. We laid out a schedule and work is taking longer than we forecast."

Rollout of the shuttle system to Launch Complex 39A now is scheduled for August 31. Meeting this date depends on simulated mission runs by prime and backup astronaut crews scheduled to begin at 10 a.m., August 24. The crews are to simulate a primary ascent, primary descent and backup return to launch site abort.

Problems causing delays last week involved two faulty umbilical connections between the ground and the orbiter. A helium leak developed at a metal-to-metal seal that used ground bolts. When flight bolts were installed, the leak stopped.

It took longer than expected to install ordnance because of the scheduling problem with the small, specialized crew that does this work, O'Hara said.

A group consisting of Kennedy and Johnson Space Center representatives and representatives of Rockwell International, the prime shuttle orbiter contractor, is analyzing potential design changes - such as the helium umbilical connection seals - that could ease the launch preparation operation.

Although many more tiles were removed after the first shuttle flight than expected, the thermal protection system tile work for the coming flight "is a dream" compared to the work that preceded the first launch, O'Hara said.

Mobile launch platform modifications are under way concurrently with shuttle interface tests in the Vehicle Assembly Building here. The modifications are designed to deflect a high-pressure pulse from solid rocket booster ignition away from the orbiter. Although considerable cutting and welding is required, there have been no interference problems between the launch platform and shuttle stack, O'Hara said.

Primary differences in launch preparations between the first and second shuttle flights are the addition of an integrated test with Johnson Space Center and with the Office of Space and Terrestrial Applications (OSTA) payload, addition of an integrated cyogenic loading and auxiliary power unit recertification, deletion of the flight readiness firing and use of a restructured launch countdown with fewer built-in holds. (AVIATION WEEK & SPACE TECHNOLOGY, 8-24-81, p. 21, Vol. 115, No. 8)

<> (letter to the editor of Today) I keep reading references to the upcoming Space Shuttle's STS-2 mission as "the first flight of a 'used' spacecraft." Technically, this is not true.

Gemini spacecraft number 2 was launched from Complex 19 on January 19, 1965, on the unmanned GT-2 mission. The spacecraft reached an altitude of about 106 miles, and traveled approximately 2,122 miles downrange during its 18-minute suborbital flight. During re-entry, the spacecraft was subjected to the most severe heating of any Gemini mission. A successful recovery was made by the aircraft carrier USS Lake Champlain.

The spacecraft was returned to the McDonnell Aircraft Corporation where it was refurbished and modified to the Gemini B configuration for use in the Air Force Manned Orbiting Laboratory program. The main visible external change was a small circle cut into the heat shield to simulate a hatch to be used by Air Force astronauts in entering and leaving the Manned Orbiting Laboratory.

Gemini B was launched from Complex 41 aboard a Titan III-C on November 3, 1966, as part of the OV43 payload. The flight was a "roller coaster" trajectory, reaching about 123 miles in altitude before the vehicle was pitched down and the transtage engine ignited (increasing velocity.)

For years, this first American spacecraft to have flown twice in space has been on display in the exhibit hall of the Air Force Space Museum on the Cape. It is still there.

True, the upcoming STS-2 mission will be the first manned flight aboard a "used" spacecraft, but let's give credit where credit is due. (TODAY, 8-24-81, p. 8-A)

<> Just 15 months ago, the wind whistled through the rusty orange grid-work of Cape Canaveral's abandoned Complex 13 as Air Force officials debated what to do with its deteriorating hulk.

Its towering gantry, once the focal point of a nation on its way to the moon, was valued only by the pound - as scrap.

Now Complex 13 and a few other surviving launch sites at Cape Canaveral Air Force Station are on their way to becoming historic monuments.

First ignored and then dynamited as hazards, the imposing towers that pointed America toward the moon and stars fell one by one during the 1970s, when America's interest was turned toward Southeast Asia and problems closer to home.

Of 34 launch pads at the Cape, only nine are still in use. Of those not in use, only three remain intact.

Gone is Complex 19, where 20 men were placed into orbit as part of the Gemini program.

Gone is Complex 14, the pad that was the starting place of John Glenn's ride into orbit.

Gone are Complexes 34 and 37, where 15 Saturn rockets were launched and where three astronauts gave their lives in an effort to put man on the moon.

But now there is growing hope for the remaining launch towers and for other valuable Indian and pioneer sites at Cape Canaveral.

"I have a pretty good feeling about it," said Major Jerome Ashman, commander of Cape Canaveral Air Force Station. "I think that within the constraints of the budget we're going to do everything we can to preserve these sites."

Two separate efforts are under way to save historical sites at the Cape - one ordered by Congress and one requested by the Air Force. (TODAY, 8-24-81)

August 25: Astronauts Joe Engle and Dick Truly guided the space shuttle Columbia through a mock launch Monday evening, eight hours after a balky computer forced a delay in a series of rehearsals for the craft's second voyage.

The Columbia made its make-believe liftoff at 6 p.m. Officials at Kennedy Space Center said the simulation - scheduled for 10 a.m. - was delayed by problems in the special computer program for the rehearsals.

The program, which would not be used during a real mission, "fools" the spaceship into thinking it is flying, they said. The computer shut down four seconds before the simulated liftoff in the first attempt.

Engle, Truly and backup astronauts Thomas Mattingly and Henry Hartsfield will put the craft through simulated liftoff, launch and re-entry problems as the tests continue through today.

The shuttle isn't fueled and the vehicle is still in the Vehicle Assembly Building, lashed nose-up to its towering fuel tank and solid-fuel boosters. The astronauts rest on their backs in the ejection seats as they go through the test maneuvers.

The Columbia is scheduled to be rolled out of the VAB to its launch pad on August 31.

Launch is still set for September 30. (SENTINEL STAR, 8-25-81)

August 27: The Space Shuttle passed the last in a battery of tests with straight A's Wednesday and was declared ready for its move to the launch pad Monday. But NASA officials in Washington, D. C., said they doubt the spacecraft will be launched on schedule.

"It (September 30 launch) is a very remote possibility," said Dave Garrett, a NASA spokesman in Washington. "At this point it looks more like the first week of October. That could be anywhere from October 2 to October 9."

The delay would be blamed on the slower than expected work in mating the Orbiter Columbia with its solid rocket boosters and fuel tank earlier this month.

The Shuttle's nine-day integrated tests, which ended early Wednesday morning, were successful overall, said A. D. O'Hara, director of space transportation system processing at Kennedy Space Center.

O'Hara said the tests conducted inside the garage-like Vehicle Assembly Building, showed a "maturing of the Shuttle hardware and test teams" as compared to similar tests before the first Shuttle launch.

"The guys in the firing room reacted well. We were very pleased," O'Hara said.

During tests Monday through Wednesday, Shuttle astronauts and the back-up crew operated the Columbia's controls while computers put the Shuttle through simulated launch ascent and landing.

Wednesday's one-hour test involved the Shuttle backup crew of Ken Mattingly and Henry Hartsfield in a smooth mock re-entry into the Earth's atmosphere and a landing.

The Columbia also received high marks earlier this week after primary astronauts Joe Engle and Richard Truly guided the Shuttle through a make-believe launch, which was delayed eight hours by a faulty computer program.

Before the Shuttle is moved to launch Complex 39A, it must be disconnected from the skeleton of work stands that girdle the 184-foot vehicle, said KSC spokesman High Harris.

After that, one of NASA's super transporter-crawlers is positioned under the mobile launch pad. The entire 4 million-pound unit is carried at about one mile an hour to the pad.

The Shuttle's rollout to the pad should take about five hours, Harris said. (TODAY, 8-27-81, p. 1-A)

<> When the Space Shuttle Columbia circles the globe, a cloud of dust and debris travels with it "like a dirty little atmosphere," a University of Florida space expert says.

And the Shuttle's first scientific payload will include an instrument to study the mess.

"Everything that orbits around the Earth has a little cloud of dust and dirt and flakes of paint that orbits around with it," said Jerry Weinberg of UF's Space Astronomy Laboratory. "The sun shines on it and creates a glow. It's hard to look through it."

An instrument that will examine the debris will move to Kennedy Space Center soon to await its scheduled January 1982 ride, the third scheduled voyage of the reusable spacecraft.

"We're spending lots of money to observe the universe from a space platform. This instrument will see how the surrounding contamination cloud - it's like a dirty little atmosphere, really - affects the light that comes in different parts of the spectrum," Weinberg said.

The device will help determine where the dust comes from so the Shuttle may be able to clean up its unwanted companion, said Weinberg, who devised such an instrument.

Space scientists are careful to keep dust to a minimum: the Shuttle is housed in a dust-quarantined laboratory, and visitors first go through sophisticated vacuum cleaners.

"But still, when the Shuttle's bay doors were opened, a bolt and other debris floated out," Weinberg said.

Weinberg, who has been studying space dust for 21 years, also will study the astronomical glow of dust throughout the solar system. (TODAY, 8-27-81)

<> Hundreds of space workers who normally enter Kennedy Space Center from SR 402 were forced to make a detour Wednesday morning when the drawbridge linking the space center and Titusville malfunctioned.

County Road and Bridge Director Macon Ballard said one of four electrically controlled mechanical wedges, which normally lock the bridge in the closed position, was somehow knocked out of alignment when the bridgetender attempted to close the swing span at 6 a.m.

"It was just a matter of realigning the wedge and doing some welding. It was a minor repair but time consuming," Ballard said.

The bridge, which spans the Indian River, was reopened to vehicle and boat traffic about 11 a.m. Wednesday. (TODAY, 8-27-81)

August 29: The second mission of the Space Shuttle Columbia has been pushed back to October 9 if launch preparations continue without problems, NASA announced late Friday afternoon.

The decision to postpone the September 30 launch came as no surprise to Shuttle engineers who were put five days behind schedule because of problems preparing the spacecraft inside the Vehicle Assembly Building.

The biggest setback came during the mating of the Orbiter with its massive external fuel tank and two rocket boosters two weeks ago, said Kennedy Space Center spokesman Dick Young. (TODAY, 8-29-81, p. 1-A)

<> The launch of a business communications satellite from Cape Canaveral Air Force Station on September 3 has been delayed indefinitely because of engine problems, said a spokesman for Satellite Business Systems Incorporated Friday evening.

Spokesman Bill Dunne said the launch of SBS-2 had been put back "for what could be weeks and maybe months" because of problems with a solid-fuel motor in the so-called Payload Assist Module, or PAM.

"There was a bad engine firing last night," said Dick Young, Kennedy Space Center spokesman.

A meeting is set Monday between representatives of SBS and NASA officials working with expendable launch vehicles to discuss the satellite's problems.

The PAM motor amounts to the third stage of the rocket vehicle and thus is essential since its boost provides the final thrust needed to put the satellite in orbit. The motor on the SBS payload assist module is known as a STAR-48 and was built by Thiokol Corporation.

The satellite is to be launched aboard a two-stage Delta rocket. (TODAY, 8-29-81)

<> The school science fair was never like this.

High school students today can take their experiments anywhere - even 170 miles up, thanks to a small locker aboard the Space Shuttle.

Meeting at Kennedy Space Center Friday, high school students from around the country told NASA scientists and the public what they would like to subject to a zero gravity environment.

That includes everything from flying insects to tiny sponges to rats with arthritis.

The young men and women are a select group chosen from a field of 1,500 entries in the first Shuttle Student Involvement Project, a joint venture of NASA and the National Science Teachers Association.

But Friday's presentation wasn't all academic. There was talk of money - without it a number of student Shuttle experiments that get off the ground will be severely limited.

"Anything designed to go up in space is expensive. There are design reviews, safety checks," said Dr. Glen Wilson, NASA acting director of academic affairs.

He estimated some of the experiments can cost as much as \$4,000 to \$6,000 and more - a burden even to the corporate sponsors that bankroll the student experiments.

One of those more expensive experiments belongs to the only Florida winner, Aaron Gillette of Winter Haven.

The Winter Haven Senior High School 12th-grader plans to send tiny sponges, or sporifera, into orbit and induce them to break apart into individual cells, as they do in nature.

Why take pictures of tiny sponges breaking apart and coming together again?

Looking ahead to the 21st century when orbiting space stations may be a new place to do business, Gillette would like to know more about the healing process in space and even the production of artificial limbs above the earth.

Neither Gillette nor Wilson have any idea when the sponges will accompany Shuttle astronauts in space.

"It's unlikely for this Shuttle mission. Some of the more complex experiments will take two to three years to prepare," Wilson said. (TODAY, 8-29-81)

August 31: The space shuttle Columbia was scheduled to be rolled out of the huge Vehicle Assembly Building before dawn today for the snail's-paced first leg of its next journey to outer space.

The shuttle, attached to its two solid-fuel booster rockets and huge external fuel tank, will be moved 3 1/2 miles across the Kennedy Space Center to its ocean-side launch pad, where it will be readied for its second launch October 9.

The trip to the pad at 1 mph with frequent stops, is expected to take seven hours. It is scheduled to begin at 5 a.m. so the shuttle can reach the launch pad at 1 p.m. before expected afternoon thunderstorms begin. (SENTINEL STAR, 8-31-81, p. 2-C)

- <> More than 200 employees of Kennedy Space Center were honored with awards for their contributions and service to the Space Shuttle program on Monday, August 31. Group achievement awards were presented to 39 organizations that played outstanding roles in making the first Space Shuttle mission a success.

Presenting the awards were NASA Administrator James M. Beggs; L. Michael Weeks, Acting Associate Administrator for Space Transportation Systems, and KSC Director Richard G. Smith.

The awards ceremony was held in a large tent near the Barge Basin at Complex 39 and its date coincided with the rollout of the Space Shuttle for the second mission from the Vehicle Assembly Building to the launch pad. Visible in the background was the Space Shuttle vehicle being transported to the pad at snail's-pace speed of about one mile per hour.

The NASA Distinguished Service Medal, one of the highest agency awards that can be earned by an individual, was presented to six persons. It is granted for distinguished service, ability or courage in making a contribution representing substantial progress to aeronautics or space exploration.

Recipients of the DSM were: Raymond L. Clark, Robert H. Gray, Peter A. Minderman, George F. Page, Richard G. Smith and Thomas E. Utsman.

The NASA Distinguished Public Service Medal, for meritorious contributions, was awarded to six contractor employees. They were: Paul C. Donnelly of United Space Boosters, Inc.; Howard S. Hardcastle of Boeing Services International, Inc.; Thomas J. O'Malley of Rockwell International Corporation; Dr. Thomas Williams of Computer Sciences Corporation; Thomas C. Wirth of Martin Marietta Aerospace; and Eugene C. Wood of Martin Marietta Corporation.

The NASA Outstanding Leadership Medal, for notably outstanding leadership was awarded to 11 employees including: John T. Conway, Col. Marvin L. Jones (USAF), William H. Lohse, John R. Lyon, Joseph F. Malaga, Alfred D. O'Hara, Henry C. Paul, Andrew J. Pickett, Thomas S. Walton, Wiley E. Williams, and George T. Sasseen.

The ten employees honored with the NASA Exceptional Engineering Achievement Medal were: Satish Amand, William W. Bailey, Ronald L. Bartcher, Donald D. Buchanan, Frank Byrne, Kenneth R. Clark, Terry D. Greenfield, Robert B. Martin, James D. Phillips, and Orval Sparkman.

The NASA Exceptional Service Medal, signifying achievement or service characterized by unusual initiative or creative ability, was awarded to 80 employees. The NASA Public Service Medal, awarded for exceptional contributions to engineering, design and development or management coordination of programs related to the accomplishment of the mission of NASA, was presented to 30 contractor employees. The NASA Certificate of Appreciation, for service or contribution to the center which warrants local recognition, was presented to 85 outstanding space center workers.

The NASA Group Achievement Award, for outstanding teamwork or group effort, was presented to 17 organizations for their contributions to the launch of the Space Shuttle. Some of the organizations are: the KSC Launch Operations Support Team, the Eastern Space and Missile Center at Patrick Air Force Base; Detachment 11, Second Weather Squadron, Patrick Air Force Base; the KSC Executive Management STS-1 Support Staff; the Shuttle Center Support Team; the Public Affairs Office; The Sensor Development Team, Director of Design Engineering; the Engineering Documentation Team, Director of Design Engineering; the Microwave Scanning Beam Ground System Team; the Launch Processing System Engineering Management Team, Director of Design Engineering; and the Department of Defense Manager's Space Shuttle Support Office.

Also included were: the San Antonio Air Logistics Center, Directorate of Energy Management Material Division; the 2179th Communications Group; the General Services Administration Interagency Motor Pool; the Solid Rocket Booster Retrieval Team; the Federal Aviation Administration STS-1 Launch Support Team; and the Reliability and Safety Analyses Team, Director of Design Engineering.

The NASA Public Service Group Achievement Award, for outstanding teamwork or group achievement, was presented to 22 contractors, including: Rockwell International Corporation for the Launch Operations Group; Martin Marietta Aerospace for the External Tank Operations Project; United Space Boosters, Inc.; Thiokol Corporation; Catalytic, Inc.; McGregor & Werner, Inc.; RCA Services Company for the Communications and Instrumentation Support Services Project Team; Planning Research Corporation for the Design Management Team; and Boeing Services International, Inc. for both the Ground Systems Operations Team and the Supply and Transportation Services Team.

Other contractors honored were: Technicolor Graphic Services, Inc.; the Bionetics Corporation for Standards and Calibration Support Services Team; Pan American for Occupational Medicine and Environmental Health Services Team; both RCA Services Company and Pan American for Space Shuttle Support; Honeywell Information Systems, Inc. for Launch Processing System Central Data Subsystem Project Team; and Management Services, Inc. for Component Refurbishment and Chemical Analysis Team.

Additional contractors honored were: Wackenhut Services, Inc.; Expedient Services, Inc.; Unified Service, Inc.; Canteen of Florida, Inc.; Atlantic Technical Services, Inc.; and RCA Communications. These last six recipients are involved in center support operations. (KSC NEWS RELEASE No. 218-81, 8-31-81)

SEPTEMBER 1981

September 1: The space shuttle Columbia returned to the firing pad Monday to start final preparations for takeoff again in six weeks.

The winged space freighter, carrying its first working payload and an untested satellite-unloading crane, rode a massive crawling machine from its assembly building to the oceanside firing site 3 1/2 miles away in less than six hours.

Never before had a spaceship returned to a launch pad for flight a second time. The Columbia, set to start flight No. 2 October 9, is designed to make the trip 100 times.

"We have reached a real milestone in the program," said NASA administrator James M. Beggs.

The shuttle, attached to a new external fuel tank and two new solid propellant-booster rockets, stood in its launch-ready position on the same mobile platform it scorched when it blasted off on its maiden flight April 12.

The whole assembly, weighing 11,918,000 pounds and standing 227 feet high, began the slow journey to the launch site at 4:45 a.m. on the back of the huge crawling machine originally built to carry Apollo moon rockets in the 1960s.

The eight-tread tractor carrying the shuttle was powered by two 2,750-horsepower diesel engines that use 150 gallons of fuel for every mile traveled.

Powerful floodlights illuminated the first part of the trip. The shuttle presented an eerie view as pre-dawn mist and diesel exhaust swirled in light beams around the black-and-white machine.

The first rays of the morning sun hit the space machine as it was well on its way down the crushed rock roadway that also served as the first leg of the Apollo moon flights.

George Page, launch director, said he expects work from now to launch day to go smoothly.

"We have a fairly high confidence of making it," Page said, referring to the new October 9 launch date. The flight was delayed nine days last week by minor problems and the desire to give the launch crew some rest over the next 39 days. (THE MIAMI HERALD, 9-1-81)

<> The congressmen, movie stars and generals who watched the first Space Shuttle launch in April from the shadow of the Vehicle Assembly Building won't get that close again.

NASA's decision to move the VIP viewing sites comes after a study that showed the potential for a mist of Shuttle rocket exhaust to spread to the sites, three miles from the launch pad.

While the mist is not toxic, it can be irritating and cause discomfort, said Dr. Albert Koller, Jr., of NASA's office of environmental management.

Koller, at a press briefing following the Space Shuttle's rollout to the launch pad Monday, said the mist was detected after the first launch.

Because there were no winds blowing in the direction of the VIP site, the cloud of hydrogen chloride, aluminum oxide and water fell in a small area near the launch pad.

But Koller said northerly winds during an autumn launch, like the second Shuttle flight scheduled October 9, could push the highly acidic debris over to the bleachers.

"It would cause some reddening of the skin and burning but no permanent damage," Koller said.

NASA announced VIPs would be located outside a four-mile radius of the launch pad. Other public viewing areas would be confined outside a four-mile radius on the NASA Causeway between Kennedy Space Center and Cape Canaveral Air Force Station.

"We're just being conservative," Koller said, adding NASA environmental specialists will continue their study of the exhaust cloud during the second Shuttle launch.

Despite the rocket exhaust debris, the Space Shuttle received high marks from environmentalists studying its effect on wildlife.

The only damage to plant life came from the exhaust debris which caused some "spotting to plants," according to the report. Koller said animal life in the area did not seem to be disturbed by the launch.

Sound levels from the launch were measured at 111 decibels at the viewing site - less than the noise experienced at a rock concert, Koller said.

According to the report, U.S. Fish and Wildlife Service personnel observed no disturbance to wildlife from the sound or force of the launch. (TODAY, 9-1-81)

September 3: The spaceship that took the hard knocks so the Space Shuttle Columbia could be launched safely into orbit faces an inglorious retirement - rusting in the sagebrush under the hot California sun.

Currently, the Shuttle Enterprise is a mechanical guinea pig for more highly sophisticated Orbiters under construction. It will never be launched and its usefulness will cease in several years.

Instead of putting the Enterprise to pasture in California, there are those who'd like to see the prototype Shuttle retire on Nevada turf.

Imagine a full-sized spaceship open for the public to tour, complete with mock-up Spacelab and cockpit. And imagine it right in front of the Visitors Information Center at Kennedy Space Center.

Arnold Richman, chief of KSC Visitors Services, lets his imagination run a little wild when it comes to the Enterprise. When NASA finishes its testing and has used what they can for Orbiter spare parts, they can give it to us, he said.

"We in public affairs (at KSC) have asked Washington that the Enterprise be considered for display here," he said. With close to 1.5 million visitors a year expected because of the Shuttle launches, Richman said KSC is the best place to view a mockup.

Too big for indoors, the Enterprise could rest near the Visitors Information Center. With the inside fully renovated, Richman foresees the test flight Orbiter equipped with slide show facilities, life-size payloads, open for a tour through the hull.

"People have no idea how big the Shuttle is or what it's capable of doing. When it's in the Vehicle Assembly Building, Orbiter Processing Facility or on the launch pad it's not really accessible," Richman said.

Saving the Enterprise from a lonely afterlife in the California desert won't happen easily.

First, NASA will make use of the non-flying Shuttle space craft for four to five years.

On September 16 it will be moved from storage to NASA's Dryden Flight Research Center in Edwards, California. There it will undergo high temperature and stress tests so engineers can make improvements on Shuttle Orbiters now under construction.

The Enterprise also is used for Shuttle spare parts. When a forklift brushed up against the Shuttle Columbia and damaged some tiles August 10, the hole was patched with a piece of the Enterprise, said Sharon Wanglin, a spokeswoman for Dryden Center.

Wanglin said despite the rigorous testing, the Enterprise will remain intact. From there it is up to NASA to decide how to retire the craft.

Rep. Bill Nelson, D-Melbourne, said he will join the fight to bring the Enterprise to his district.

"From our standpoint, we're the only place to have it. But it's going to be a long haul getting it here," he said.

Nelson, like Richman, said one important question remains unanswered - how much the mission back to KSC will cost and who will pay. (TODAY, 9-3-81)

September 4: More than 216,600 people toured the Visitors Information Center at NASA's Kennedy Space Center in August. So far this year the center has had just over 1.5 million visitors, about 25 percent more than during the same period last year.

Of the August visitors, 173,336 took the guided bus tour of KSC to view the Orbiter Processing Facility, the Vehicle Assembly Building and Complex 39, where the Space Shuttle is refurbished, assembled and launched...Patronage of the bus tour for the month ran 24.1 percent of August 1981.

In July 237,865 people visited the center, and 190,292 took the bus tour. (KSC NEWS RELEASE No. 225-81, 9-4-81)

September 5: Federal officials have blamed Rockwell International and NASA for the deaths of two Space Shuttle workers at Kennedy Space Center March 19.

Occupational Safety and Health Administration officials also fined Rockwell, employer of the two workers, a total of \$420 for failure to "prevent employees from entering the (Shuttle's) aft access compartment during the operation of gaseous nitrogen purge."

NASA was blamed for opening Pad 39A "for normal work while a purge was being conducted," but not fined because the space agency is another branch of the federal government.

"That would amount to the government paying the government," said William Demery, OSHA's Tampa-based area director. He released details about the investigation report Friday.

OSHA used a complex method to calculate Rockwell's fine, mandated by the agency's own rules, Demery said.

These included factors such as the number of employees, their proximity to and the frequency of their exposure to danger, and other stress factors, he said.

A proposed penalty of \$700 was reduced by 40 percent to \$420, Demery said. The agency gave Rockwell credit for its cooperation and good accident record, he said.

"The penalty is not important," Demery said. "Rockwell rewrote its procedures, and they are excellent at this stage. We feel they took immediate steps to prevent an accident of this type from happening again.

"There's no reason for OSHA to press further," he added. "They're (Rockwell) not out there trying to hurt people."

Demery acknowledged OSHA's investigation of the tragedy was completed July 10, the day citations were "hand-delivered" to Rockwell and NASA officials at KSC. But he denied agency officials had attempted to withhold information from the public.

"We don't normally inform the press when citations are delivered," he said. "Besides, NASA and Rockwell are required to post the citations where the accidents occurred." (TODAY, 9-5-81)

September 7: Seven-year development of the remote manipulator system by Spar Aerospace, Ltd., as Canada's \$100 million contribution to the space shuttle program has resulted in a blending of human, computer and mechanical capabilities for operation of a complex space system.

Astronauts U.S. Air Force Col. Joe H. Engle and Navy Capt. Richard H. Truly will put the manipulator arm through a lengthy series of development exercises as a key objective of the second space shuttle mission.

Operation of the remote manipulator arm from the shuttle orbiter's aft cockpit station has required development of a highly interactive man/machine interface, which was a challenge considering the dynamics and mechanical requirements of the system. Operating the arm utilizes the same rotational and translational hand controller philosophy employed in flying the orbiter and previous spacecraft, and this AVIATION WEEK & SPACE TECHNOLOGY editor had no difficulty adapting to and operating the manipulator system in Spar's Simfac simulation facility.

U.S. astronauts have spent many hours in Simfac developing and verifying manipulator system procedures. Astronauts William B. Lenoir, Sally K. Ride, Judy A. Resnik and USAF Major John M. Fabian have formed the core of this group, with Fabian especially involved in Air Force-oriented activities with the system.

Manipulator system displays are relatively simple, and one of the more challenging aspects of operating the manipulator is learning the most effective utilization of the several control modes available to the astronaut.

Precise positioning requirements, the dynamic/mechanical aspects of the system and the unusual management arrangement between the U.S. and Canada combined to result in the manipulator system's being one of the most thoroughly tested and verified systems of the shuttle program. In spite of this, Spar management is concerned that they may not be able to meet the 100-mission operating life of each system without significant refurbishment or redesign. This is because of changes in the orbiter launch and landing loads environment as determined by Rockwell International after the manipulator had been designed and built to a lesser loads environment specification by Rockwell and the National Aeronautics and Space Administration.

"We currently have negative margins on fracture critical items, elements of the structure where if you apply the load repetitively, as through multiple launches, parts could eventually fail," Eric R. Grimshaw, operations director for Spar's Remote Manipulator Systems Division, said.

The problem is not one of flight safety but a question of manipulator system lifetime without requiring refurbishment. Grimshaw said Rockwell's pre-first flight data show the first manipulator system could be used for between only two and 10 flights without fear of disabling failure.

Considerable analysis is needed to determine the validity of the preflight stress analysis data, however, in connection with the real data provided by the first flight. Spar and Rockwell have been examining both the preflight analysis and the data from the first flight to see if, combined, they present any problems for future use.

With respect to the design specification to which the system was built, Spar believes the manipulator system hardware and software validation and test have been more stringent than for most other shuttle systems. (AVIATION WEEK & SPACE TECHNOLOGY, 9-7-81, p. 57, Vol. 115, No. 10)

<> A contract has been awarded for construction of a viewing site at the KSC Shuttle Landing Facility.

The \$218,944 contract was awarded to Frank A. Kennedy, Inc., 415 Commercial Drive, Cape Canaveral, Florida. The contract is one set aside for award to a small business. (KSC NEWS RELEASE No. 226-81, 9-7-81)

<> Consider the Space Shuttle as a flying tow truck that must break free of gravity's grip and catapult cargo as heavy as 16 Cadillacs into space.

To accomplish that, there can be no room for excess baggage. A few extra pounds anywhere can be a burden.

So NASA has ordered its 4.5 million-pound space workhorse to go on a diet.

That means lighter materials in parts of the Shuttle Orbiter, less wiring and removal of the paint overcoat on the massive external fuel tank.

Shuttle contractors say the tank color will probably be the most obvious change. The once all-white Shuttle will sport a light brown fuel tank for the third launch. (TODAY, 9-7-81)

September 9: The space shuttle Columbia will be pulled from active duty next year and returned to California so workers can renovate the spaceplane, even adding a kitchen, NASA officials in Washington said Tuesday.

Under NASA's new schedule, Columbia will be temporarily retired in October 1982 after completing its fifth flight.

The space shuttle then will be transferred to Rockwell International's Palmdale plant where technicians will make \$20 million worth of modifications, including replacing ejection seats for the pilot and co-pilot with permanent seats.

The world's first reusable spacecraft is not expected to be ready for flight again until June 1983.

The renovation, however, won't reduce the number of missions flown in the space shuttle program, said Col. Joaquin Saavedra, chief of mission analysis and integration for the shuttle program.

NASA plans to meet its ambitious schedule by launching the second space shuttle, Challenger, in place of Columbia. Challenger is scheduled to arrive here in June.

Original plans were to alternate Columbia and Challenger, but now Challenger will fly three missions while Columbia is out of commission, Saavedra said.

When Columbia returns to duty, the two orbiters are expected to alternate flights. (SENTINEL STAR, 9-9-81, p. 3-C)

<> Shuttle astronauts Joe Engle and Richard Truly rehearsed Tuesday for the second flight of Columbia by practicing landings on the 15,000-foot runway at Kennedy Space Center.

John Young, commander of the first Shuttle mission, went along for the morning ride to give pointers to the two space rookies who are in the final phases of preparing for the October 9 launch.

The practice touchdowns were made in a Grumman Gulfstream jet, modified by NASA to have a cockpit resembling the Shuttle's.

Meanwhile, the Shuttle launch team started a demonstration countdown in the early hours Tuesday. The test will last 33 hours and include a simulated ignition of the spacecraft's main engines.

Truly and Engle don their flight suits to spend the final two hours of the simulated countdown in the Shuttle's cockpit.

KSC spokesman Dick Young said the astronauts will enter the crew compartment of the Columbia at 10 a.m. for a simulated lift-off at noon.

"This duplicates an actual Shuttle launch," Young said. "The only difference is that the external tank isn't loaded."

"So far the test has been going very well." (TODAY, 9-9-81)

September 10: Four NASA scientists have come up with a way to launch future space shuttles horizontally from an airport runway. And they'll do it by turning the super-sophisticated orbiter into, of all things, a biplane, according to an article in the September issue of Popular Mechanics.

"Everything worked out very well" in wind-tunnel tests, says William J. Small, who with co-workers L. Robert Jackson, John P. Weidner and James A. Martin came up with the design.

The key element in the complex NASA patent is the use of two-winged turbojet boosters slung under the shuttle's delta wings. Each booster contains a pod of 8 to 10 engines, burning jet fuel to develop thrust of 100,000 pounds per engine.

After a takeoff run of at least 4,150 feet, the orbiter, essentially a biplane at takeoff, according to Small, rises off the runway and assumes a high angle of attack - something over 22 degrees.

Some five minutes later, at an altitude of about 50,000 feet, the two jets - carrying human pilots or robotic gear controlled from the ground - detach and circle back for a landing, while the shuttle's rockets take it into orbit.

Because every portion of the vehicle can be recovered, says the Popular Mechanics article, the method would cost less than a conventional vertical rocket liftoff.

It would also give the space plane the ability to leave earth from any large airport, a substantial advantage in military applications of the shuttle. (DAILY COURIER-NEWS, [of Elgin, Illinois], 9-10-81)

<> The Space Shuttle Columbia successfully "blasted off" Wednesday afternoon, after an unexplained power failure delayed the last major dress rehearsal by 3 1/2 hours.

Astronauts Dick Truly and Joe Engle, who were in the cockpit during the simulation, called the rehearsal a "definite success."

We learned an awful lot and it was a good refresher course for us," Engle said, adding that the main objective of the second Shuttle mission set for October 9 will be to expand the spaceship's payload capacities.

An unexpected power failure Tuesday night had Kennedy Space Center engineers and technicians confused.

At about 9 p.m., the Orbiter Columbia shut itself down, said KSC spokesman Rocky Raab. "It's supposed to do that when it senses something wrong."

Power was restored to the Shuttle at midnight. But what was wrong is still unknown.

"We haven't done extensive troubleshooting on the problem," Raab said. "But we will study it as long as it takes to find out what went wrong."

In addition, other less serious problems arose during the rehearsal and are not expected to affect the October launch date.

Technicians detected a console problem concerning the ground supply hydraulics controlling the pad and the Orbiter.

Raab said this problem was probably the result of inconsistent readings among instruments at the pad, the Orbiter and the firing room. He declined to elaborate.

Also, improper calculations were fed into the computer program governing the Inertial Measurement System - a massive gyro-compass that controls the movement of the Space Shuttle as it travels through space.

Fourth, there was a computer problem involving the program designed to activate the tumble valve on the external fuel tank.

The valve is supposed to open automatically shortly after the external tank drops from the Shuttle. The valve lets out pressure, causing the tank to hit the Earth's atmosphere at an angle that allows the tank to disintegrate, instead of bouncing off the atmosphere and back into space.

Fifth, the simulated external tank loading process took an hour-and-a-half longer than anticipated.

At 3:55 p.m., officials simulated launch and then went through steps for a failure of one engine.

"It's something that could happen in an actual launch, so we went through procedures for it," said KSC spokeswoman Anne Skinner.

If it had been a real mission, the launch would have been scrubbed.

"We'd feel terrible," if that happened, Truly said. "But we'd still have the Orbiter sitting there. If we had had to abort a mission later in flight, we could have come back to the runway here at the Kennedy Space Center."

No engines were fired as part of the rehearsal. However, most of the electrical equipment and computers programs were tested up to the moment of ignition.

One of the most significant parts of the rehearsal involved the Ground Launch Sequence, which is activated nine minutes before takeoff.

The computerized sequence performs - much faster than humans could - hundreds of steps just before the launch.

A separate test is scheduled for Monday during which liquid oxygen and liquid hydrogen propellants will be put inside the 154-foot-tall external fuel tank. (TODAY, 9-10-81)

September 11: Budget Director David Stockman's insistence that NASA cut \$367 million from its 1982 budget is the wrong medicine for the economy, according to the economics practiced in the office of Florida Rep. Bill Nelson.

A "boll weevil" Southern conservative who has been part of the political coalition that's approved President Reagan's "economic recovery" program thus far, Nelson wrote Reagan last week to ask that he "reverse these most crippling additional cuts in the agency which helps keep America a world leader in technology and innovation."

"It is precisely the innovation and technology advancement spurred by NASA which has been responsible for the economic growth since the late 1950s," said Nelson, a Democrat who represents Brevard County. "It was this innovation which drove the economy and permitted President Kennedy to cut taxes drastically, an action Mr. Stockman has commended."

A member of the House Budget and Science and Technology committees, Nelson said he's devising strategy on how to block Stockman's suggested cuts in Round 2 of the 1982 budget battle. (TODAY, 9-11-81, p. 1A)

<> John F. Murphy, a former administrative assistant to Senator Barry Goldwater (R-Ariz.) and director of legislative affairs for the Agency for International Development since

March has been named director of legislative affairs for NASA. Murphy served as administrative assistant to Goldwater from 1974 until joining AID earlier this year.

He replaces Terence T. Finn, who has been named deputy director of government/industry affairs for the agency. Finn, a former staff member of the Senate Budget Committee, joined NASA as director of legislative affairs in September 1978. He at one time served as legislative director assistant to Senator Joseph D. Tidings (D-Md.)

Joining NASA as deputy to Murphy is Patrick A. Templeton, who has been manager of government and community relations for General Electric's Major Appliance Business Group. He has been with GE since 1965. (DEFENSE DAILY, 9-11-81, Vol. 118, No. 3)

September 14: House/Senate conferees Thursday approved a \$6.187 billion FY '82 appropriation for NASA, \$65 million above the \$6.122 billion requested by President Reagan in his revised March budget.

The House had originally approved a \$6.134 billion appropriation, with a \$35 million boost in R & D to be made at NASA's discretion, while the Senate had approved a \$6.214 billion appropriation, with a \$90 million boost in R & D allocation to nine programs, including \$45 million for Aeronautical R & T. Those programs are SEPS, Spacelab payloads, UARS experiments, materials processing, search and rescue, TU, Tech Transfer, ISPM and AR & T.

The compromise bill provides \$4.973 billion for R & D - an increase of \$70 million, with the money to be allocated at the discretion of NASA. The Senate agreed to go along with the "ceilings" placed on the nine programs by the House, which cannot be exceeded unless the House and Senate Appropriations Committees concur. The ceilings are the amount requested by President Reagan as follows: Space Shuttle, \$2.194 billion; STS Upper Stage, \$75 million; Upper Stage Operations, \$40 million; Space Telescope, \$120 million; Gamma Ray Observatory, \$8 million; Galileo, \$108 million; VOIR, \$10 million; Landsat-D, \$84 million and Spacelab, \$111 million.

At the same time, the House dropped its recommendation that NASA reprogram funds if needed for production of a fifth Shuttle Orbiter, and agreed to the Proxmire amendment barring NASA from spending funds for the Search for Extraterrestrial Intelligence. (DEFENSE DAILY, 9-14-81, p. 31, Vol. 118, No. 4)

September 15: Kennedy Space Center officials went through final preparations today for a critical tanking test and simulated launching of the space shuttle Columbia. The shuttle is scheduled to be launched for the second time on October 9.

The tanking exercise, during which the shuttle's external tank will be filled with 143,000 gallons of liquid oxygen and 183,000 gallons of liquid hydrogen, was scheduled to begin at 2 A.M., tomorrow. NASA officials said they also planned to rehearse the final 45 minutes of countdown with a simulated launching set for 8 A.M.

After the 184-foot-tall external tank is allowed to warm up for 18 hours, preparations will begin for Wednesday's test of the newly installed pressure water system on the launching pad.

The pressure water system, which sprays water around the holes of the solid rocket boosters' exhaust, is designed to prevent a recurrence of the overpressurization shock waves that were created during the shuttle's first mission last April. (THE NEW YORK TIMES, 9-15-81)

September 16: A fuel loading test of the Space Shuttle was successfully completed by NASA at 8:02 AM EDT yesterday, clearing the way for final preparations for the October 9 launch of the Shuttle. (DEFENSE DAILY, 9-16-81, p. 42, Vol. 118, No. 6)

<> Astronauts Joe Engle and Richard Truly said Tuesday they want to fly a fully loaded space shuttle next month despite concerns that excessive blastoff pressure may ground experimental hardware already stowed for the voyage.

"It certainly would disappoint us" to leave the experiments behind, Truly said, "but we're certainly not planning on doing that. We're planning to fly them."

"The overpressure problem doesn't lend itself to a clear, analytical solution," said flight commander Engle, "but it's being attacked by NASA and we're confident the problem will be solved."

The Columbia has been packed with a 5,000-pound payload of experiments and sensitive monitoring equipment and a 50-foot mechanical arm for its second voyage, scheduled for liftoff October 9. They are scheduled to be tested during the flight.

But NASA officials said Monday the delicate equipment could be scrubbed from the mission if the pressure problem isn't corrected. (SENTINEL STAR, 9-16-81, p. 1-A)

September 17: NASA is continuing to look at ways to reduce the overpressure from the Space Shuttle launch, including the possible addition of water troughs in the Solid Rocket Booster ports. A major water deluge test of the new water vibrations suppression system built into the launch pad was scheduled yesterday. The Canadians, builders of the Remote Manipulator System, and the Office of Space & Terrestrial Applications, responsible for the OSTA-1 payload, have expressed concern that the overpressure on launch could damage the RMS or the imaging radar on the OSTA-1. NASA believes that it has solved the overpressure problem, but official clearance remains to be given. (DEFENSE DAILY, 9-17-81, p. 52, Vol. 118, No. 7)

<> NASA officials Wednesday successfully tested a crucial launch pad water-spray system designed to reduce liftoff pressures on the space shuttle Columbia and its first cargo.

As planned, the system spurted 70,000 gallons of water below the launch pad for 45 seconds, clearing probably the last major hurdle before the scheduled October 9 launch.

"On a scale of 1 to 10, I'd say this was 10," said Bill Tolson, chief of NASA's launch structures and accessories section. "Apparently, everything is clear for the launch."

NASA was considering several methods of diminishing what engineers call the "overpressurization shock wave," first discovered during the shuttle's first flight in April. Wednesday's tests involved only plumbing and the flow of water on the launch pad. The rocket boosters were not fired.

The spray system is designed to shoot 100,000 gallons of water into holes below the shuttle's twin solid rocket boosters to absorb the massive pressure of rocket firing. (SENTINEL STAR, 9-17-81)

September 18: The House Tuesday passed the FY '82 HUD-IA appropriation bill approved in conference committee including a \$6.187 billion appropriation for NASA, \$65 million above the Administration's request.

The bill includes a \$70 million increase for NASA R & D to be sent for the Solar Electric Propulsion System, International Solar Polar Mission, Shuttle/Spacelab Payload Development, Upper Atmospheric Research Satellite Experiments, Technology Transfer, Materials Processing, Search and Rescue, Technology Utilization, Aeronautical Research & Technology, and Mid-Level Facility. Funds can be spent at the discretion of NASA, with the proviso that the funding be applied in a manner to bring about "a meaningful enhancement of each of these programs." The R & D appropriation is \$4.973 billion.

The bill also includes \$99.8 million for Construction of Facility, a cut of \$5 million, and \$1.114 billion for Research & Program Management, the amount requested.

The HUD-IA bill also includes \$1.071 billion for the National Science Foundation, a \$37.5 million increase over the Administration's request. (DEFENSE DAILY, 9-18-81, pp. 58 & 59, Vol. 118, No. 8)

<> The negotiations on NASA's FY '83 budget now taking place between the agency and OMB include a close look at NASA's projected manifest for the Space Shuttle, which some expect to be reduced, with a concomitant delay in some payloads, as a result of increased Space Shuttle production costs and the new round of civil budget reductions. The manifest, which

has been basically complete since June, tentatively includes 31 flights from Kennedy Space Center through FY '85. (DEFENSE DAILY, 9-18-81, p. 64, Vol. 118, No. 8)

September 21: Space shuttle system last week underwent three preflight tests as final preparations continue for the scheduled October 9 launch. Last week's milestones were:

*Test loading of the external tank with cryogenic propellants.

*System test of modifications to the mobile launch platform to deflect overpressure resulting from solid rocket motor ignition away from the shuttle.

*Recertification of the No. 2 auxiliary power unit by means of a hot firing.

No debonding of the external tank's cork insulation was seen immediately after the tank test loading was completed September 15, although there was some cracking in the sprayed-on foam insulation along an air load ramp protuberance.

The test loading was considered successful although several anomalies developed, according to Horace L. Lamberth, head of the fluid systems division in NASA's shuttle engineering directorate. Most significant was a leak in the main fuel valve to the No. 2 space shuttle main engine, which was discovered when skin sensors indicated cold temperatures. A decision was made September 16 to change this valve.

Some leaking also was found in the liquid hydrogen quick disconnect umbilical. Lamberth said the seal will be retested several more times, but that the fix can probably be accomplished by increasing helium purge pressure. Changing the seal would require considerable time, he said.

Finally, a point sensor failed in the liquid oxygen tank. This sensor tells when the tank is loaded, but there are other sensors in the tank and replacement will not be necessary.

Lamberth said the fixed service structure's beanie cap gaseous oxygen vent system worked well and ullage pressures were within the specification spread. The liquid oxygen and liquid hydrogen tanks were loaded simultaneously to flight capacity.

The water cascade/trough modification to the mobile launch platform was tested in its plumbing design September 16 coincidental with scale model tests at Marshall Space Flight Center. The Kennedy test involved a full water flow in both solid rocket booster exhaust holes and troughs in one of the holes. (AVIATION WEEK & SPACE TECHNOLOGY, 9-21-81, p. 25, Vol. 115, No. 12)

September 23: Space Shuttle Columbia's second launch may be delayed as much as a month once ground crews finish assessing damage from Tuesday morning's accidental spill of poisonous oxidizer.

George Page, Kennedy Space Center's director of launch operations, told reporters Tuesday afternoon that the launch has been delayed for at least a week past its October 9 target date.

"We've got a ways to go before we can give you an idea of the launch slip," Page said when asked how much the flight would be delayed. "I'll tell you right now, in my book we're down at least a week, maybe two weeks."

Page spoke to a press conference held at Kennedy in Florida. It was monitored here at Marshall Space Flight Center's communications office.

The spill occurred as technicians on the shuttle launch pad were loading nitrogen tetroxide, a toxic fluid, into the forward reaction control system, a module of rocket thrusters located forward of the crew compartment in Columbia's nose. The thrusters control the shuttle attitude in space.

About 12:15 a.m. CDT, technicians disconnected the filling line which then failed to close, sending up to three gallons running down the right side of the shuttle.

"Within a short time it became apparent that we had a pretty serious problem," Page said.

As technicians dried the spill, using special absorbent cloth, they could feel the heatshield tiles along Columbia's side coming loose in their hands. The tiles protect Columbia from the heat of re-entering the Earth's atmosphere.

Nitrogen tetroxide is easily stored in its pure form and does not harm metal. But it breaks down organic materials such as the synthetic rubber that bonds the tiles to Columbia's aluminum skin.

"When you get the (bonding) wet with the nitrogen tetroxide, you have no adhesive qualities at all," Page explained.

The liquid also is extremely poisonous to humans. Whenever it is handled, space workers wear outfits called SCAPE suits - self-contained atmospheric protective ensemble - that are somewhat like spacesuits. No injuries were reported.

Partly because only technicians in the bulky SCAPE suits were allowed on the launch pad for several hours, the extent of the tile damage was not immediately known. At least 67 tiles had been removed by 3:30 p.m. Another 200 or so might be damaged and could require removal, cleaning and rebonding.

The spill area is about two feet wide at its top, six feet across the bottom and 18 to 20 feet high. Technicians are trying to define its boundaries to determine the extent of repair work needed.

There is no danger to the silica heatshield tiles, Page said, although they did soak up the fluid. They can be decontaminated and rebonded. The aluminum skin should be safe unless there was a good deal of water present, Page said. That would cause formation of nitric acid and could weaken the metal.

Once the extent of the spill and its damage are known, Page and other space agency managers must decide if it can be repaired on the launch pad.

The rotating gantry now around Columbia was not designed for such work, so work platforms will have to be rigged.

If any oxidizer has leaked into the forward reaction control system module, it must be removed for cleaning. That capability, too, was not designed into the gantry, so Columbia might need to be returned to its hangar.

That could delay the launch by as much as a month, according to Page.

"Right now we hope that isn't going to be the case," he said, "but we can't rule that out."

Experts from Johnson Space Center in Houston, where the orbiter is managed, and from Rockwell International in Downey, California, where it was designed and built, are to go to Kennedy to assess the damage and the repairs.

The cause of the leak remained unknown Tuesday afternoon. (HUNTSVILLE TIMES, 9-23-81, p. 8)

<> It's being billed as the Shuttle slip -- just another delay that causes Brevard County's tourist industry to waver under a mass of motel cancellations and postponements.

In anticipation of the second Shuttle mission, Titusville's 1,300 motel rooms have been booked solid for the October 9 timeframe.

But now those reservations aren't worth much.

Because of Tuesday's accident on the Shuttle pad, the blastoff has been postponed for at least one to two weeks.

The news could be worse for Brevard's tourism. If the Shuttle spectacle is delayed until late November or longer, it will come smack in the middle of an already tourist-heavy time in Florida.

In October, hotel reservations usually hit a low -- Florida-bound airplanes fly with empty seats and beaches have far less than the usual number of Northern visitors.

An October 9 launch "would have come at a blessed time because...hotels would have probably been only about 50 percent occupied," said Bill Lyerly of the Titusville Chamber of Commerce.

If the spaceship takes off during winter, hotel rooms in the Titusville area will be at an even greater premium than they were during last April's launch.

NASA officials estimate about 39,500 viewers, plus about 2,700 media representatives, will be permitted on Kennedy Space Center grounds to view the launch. And thousands are expected to crowd the beaches and highways.

When news of the delay circulates throughout the nation, Lyerly expects hoards of motel cancellations and postponements.

"We're going to have to slip and slide again. We don't know what the extent is yet of the delay, but we're used to it," Lyerly said Tuesday.

Some tourists, however, grow impatient and give up trying to fit their schedules to the shifting Shuttle mission.

One businessman from Seattle, Washington, had already canceled his motel reservations by Tuesday afternoon after hearing of the accident, said Peter Gwiazda, manager of the Best Western Executive Motel in Cocoa Beach.

"Any more (Shuttle postponements) and I'm sure eventually people just can't keep delaying their plans," Gwiazda said.

Motel officials say they will transfer reservations to a new date if a patron requests the change.

Airlines will not experience the same swarm of cancellations because flight reservations aren't as top-heavy for the October 9 period.

Most Eastern Airlines flights in and out of Melbourne and Orlando for October 8-10 are "wide open," said Ray Nau, a sales manager for the airline.

Delta Airlines also reported only "normal capacity" in bookings leaving Orlando in the days following the original expected launch date. (TODAY, 9-23-81)

- <> The head of the company which built the Percheron rocket, the privately-funded launch vehicle which exploded in a static test last month, told Congress yesterday that NASA has taken the space program to a point where private industry can and will take on a series of private space projects that will accelerate U.S. space accomplishments and benefit the American society and economy.

David Hannah Jr., president of Space Services Inc. (Houston) told the House Space Subcommittee, which is holding three days of hearings on the future of the U.S. Space Program, that his company is continuing with a second Percheron rocket which it expects to launch by the end of 1982.

He reported that NASA has been extremely helpful, both officially and unofficially, in helping his company analyze the problems with the Percheron and what should be done to make it successful. Moreover, he said there are hundreds of former NASA employees who have retired from the agency and live in the Houston area, many of which are being used for advice by Space Services and whose expertise is available to other companies interested in the space business.

He told the subcommittee that he does not see the Percheron competing with the NASA Space Shuttle, but supplementing it for smaller payloads.

"I think we can work together," he said, saying the Space Services/NASA connection can be "a good marriage."

The Percheron rocket is designed to launch 300-to-500-pound payloads into low Earth orbit, and ultimately to launch 1000 pounds into geosynchronous orbit.

Hannah said the most promising potential markets for Percheron are for low Earth orbit remote sensing satellites, such as might be used by oil companies for exploration, as well as certain types of communications satellites that would operate in low Earth orbit. He added that once the capability of Percheron to place payloads in low Earth orbit at a low cost is demonstrated, the market will blossom.

He said he believes that the Percheron's services could be offered at 30 to 40 percent less cost than NASA vehicles, noting that 30 percent of the NASA costs results from man-rating their vehicles. (DEFENSE DAILY, 9-23-81, p. 82, Vol. 118, No. 11)

- <> John F. Kennedy Space Center Director Richard G. Smith has named a mishap investigation committee to investigate the circumstances surrounding a mishap involving a leak of nitrogen tetroxide oxidizer which resulted in damage to the Space Shuttle Orbiter. The mishap took place on September 22, 1981, at Pad A of Launch Complex 39.

The committee was charged with the responsibility to investigate the facts, determine the probable cause of the mishap, assess the possibility of recurrences of similar mishaps and recommend corrective or remedial actions.

The members of the committee are as follows:

Mr. Wiley E. Williams (KSC) - Chairman; Mr. Russell E. Rhodes (KSC); Mr. Haggai Cohen (NASA HQ); Mr. Chester A. Vaughan (JSC); Mr. Charles W. Murphy (Rockwell International) Contractor Advisor; Mr. James A. Thoma (KSC) - NASA Advisor; Mr. James B. Lansing (KSC) - Executive Secretary.

Formation of such a committee is an established procedure following an incident involving damage to a flight vehicle. Some of the first actions of the committee were to obtain all records and documentation pertaining to the incident for study and to ask that fueling or defueling operations of the Space Shuttle involving hypergolic propellants be suspended.

The committee expects to release an interim report of findings by October 6, and a final report should be presented by October 13, 1981. (KSC RELEASE NO. 262-81, 9-23-81)

<> Kennedy Space Center engineers are seriously considering towing the damaged Space Shuttle Columbia from the launch pad to its hangar in the wake of a propellant spill Tuesday that contaminated one of the spaceship's forward steering engines.

If that happens, the October 9 launch could be delayed a month or more.

A 20-foot-long swath of the Columbia's heat protection tiles also were soaked by the acidlike nitrogen tetroxide, and by 3 p.m. Wednesday 266 tiles were removed from the Orbiter nose.

If repairs to the Shuttle can be made on the pad, engineers predict a week to two-week launch delay. But if the fully assembled spaceship has to be dismantled, the launch could be postponed more than a month.

The decision to tow the Shuttle back to the Vehicle Assembly Building and then the Columbia to the Orbiter hangar for repairs won't be made until Friday, Page said.

But schedules and the procedures for rolling the Shuttle back to its hangar started Wednesday in case officials decide repairs are too big for the pad.

NASA engineers speculate a repair job in the Orbiter hangar would be necessary if the Shuttle workers found extensive damage to the steering engines (Reaction Control System) at the Columbia's nose.

"It would take serious damage (to the Reaction Control System mechanism) to move it back," said John Presnell, who represents Johnson Space Center's Orbiter Project Office at KSC. (TODAY, 9-24-81)

<> Lt. Gen. Thomas P. Stafford (USAF-Ret.), former head of R & D for the Air Force and former astronaut, said yesterday that consideration should be given to putting the Air Force in charge of operating the Space Shuttle.

Testifying before the House Space Subcommittee on the future of the U.S. space program, Stafford said that the Air Force has the skills to carry out those operations but would need a higher budget to do so. He acknowledged that there would be criticism of the Defense Department "taking over" the civilian program, but said he did not think that would be a problem.

Noting that NASA or a private or semi-private corporation might also qualify to run the Shuttle, Stafford recommended that we "re-examine the existing management of our entire space program and re-acquire the ability to complete programs rapidly. Serious considerations should be given to management arrangements which are responsive to urgent needs and provide effective and rapid action."

Stafford testified that space is "vital" to U.S. national defense and that the U.S. "must be capable of conducting effective space operations during all conditions of conflict." (DEFENSE DAILY, 9-24-81, p. 92, Vol. 118, No. 12)

September 25: Like a fiery bullet blazing through the twilight sky, a sophisticated communications satellite was launched into space on a two-stage Delta rocket Thursday at Cape Canaveral Air Force Station.

Aside from a minute leak of fuel from the rocket, the 7:09 p.m. launch was flawless, said NASA engineers.

The fuel seepage - about five drops a minute - was not a hazard to the launch of the second Satellite Business Systems satellite which left the pad 15 minutes later than scheduled.

The Payload Assist Module, a motor designed to put the satellite in a temporary orbit around the Earth, also fired without problem.

"It came through with flying colors," said Albert Smith, an engineer with Satellite Business Systems.

Engineers had postponed the satellite launch, originally scheduled for September 3, after the Payload Assist Module failed in test firings.

Repair of the solid-fuel motor proceeded faster than anticipated and the launch was pushed forward from October 4 to Thursday.

On Saturday, the satellite will be transferred into its permanent orbit 22,240 miles above the Earth.

It will travel at 6,876 miles an hour in an orbit synchronous with the Earth's. This keeps the satellite over a particular area of the United States.

From there the satellite will serve about 25 corporate customers with high-speed communications relays across the country.

Aside from teletype printing, the satellite can relay voice and visual images from one plant to another.

"This second satellite will mean a whole lot more business. It will double our capacity," Smith said.

The first of the SBS satellites was launched in November and the third should be launched aboard the Shuttle in 1982.

Smith estimated the cost of the mission is about \$37 million, plus development costs for the satellite which was built by Hughes Aircraft Co. in California. (TODAY, 9-25-81)

September 26: Officials at the Kennedy Space Center in Florida announced yesterday that repairs needed on the space shuttle Columbia because of a propellant spill Tuesday would be done at the launching pad and that the craft could be ready for flight by late October or early November.

If it had been decided to roll the shuttle back to its hangar, the delay would have been even longer beyond the original October 9 launching date.

Project engineers determined that about 340 heat-resistant tiles came loose when the spilled nitrogen tetroxide destroyed the adhesive that bonds them to the shuttle's aluminum hull. All the affected tiles were situated near the shuttle's nose and, the engineers said, were easily accessible to technicians working on platforms erected around the vehicle. The platforms were being enclosed so that temperatures and humidity could be controlled in the re-application of the tiles.

A spokesman for the Rockwell International Corporation, the prime shuttle contractor, said that the work of cleaning, regluing and retesting the tiles would begin early next week and continue around the clock. The lightweight silica tiles themselves were not damaged, only the bonding material. Nearly all of the Columbia's exterior is covered with the tiles, about 31,000 of them, which protect the vehicle from the frictional heat of re-entry into the earth's atmosphere. (THE NEW YORK TIMES, 9-26-81)

September 28: The 12 percent across-the-board cut in civil outlays in FY '82 to be requested by President Reagan in his March budget request is not expected to be applied to the \$2.2 billion Space Shuttle development and production program, which the Administration protected in its earlier revisions, DEFENSE DAILY has been told. Details of the proposed civil cuts are expected to be released early this week. Currently listed exemptions include entitlement programs and Veterans Administration hospital care.

The President in March requested \$5.895 billion in outlays for NASA in FY '82; a 12 percent cut from that would total \$706 million. A full exemption of the Shuttle would leave NASA facing a \$445 million cut. (DEFENSE DAILY, 9-28-81, p. 112, Vol. 118, No. 14)

<> Work crews put the final touches Sunday on the platforms, electrical outlets and duct work needed to repair the fuel-damaged tiles of the space shuttle Columbia before its second launch.

Space agency officials said replacement of 338 of the shuttle's 31,000 heat-resistant silica tiles will not begin until Tuesday.

The tile replacement begins a week after the accident in which nitrogen tetroxide spilled while filling fuel tanks for the shuttle's 14 small rocket thrusters that allow it to maneuver in space.

No new launch date has been set to replace the scheduled October 9 launch, but guesses by space agency officials are late October or early November. (SENTINEL STAR, 9-28-81,

September 28-30: Senator Proxmire (D-WI) is offering an amendment to increase the public debt to only \$995 billion thereby avoiding the trillion dollar figure, discussed in an all-night talkathon various ways the Federal Government could save money, one of which was the elimination of a fourth Shuttle Orbiter. (NASA OFFICE OF LEGISLATIVE AFFAIRS, LEGISLATIVE ACTIVITIES REPORT, 9-28/30-31, p.1)

September 30: One painstaking step is being taken at a time as the Space Shuttle's protective eggshell of heat protection tiles is being washed, baked, examined and reexamined by a team of specially trained technicians.

The scene is a modest, gray, aluminum-sliding workshop in the shadow of the Kennedy Space Center's Mobile Vehicle Assembly Building.

As many as 60 men and women are giving 352 lightweight tiles some very personal care after they were soaked during a leak of a highly corrosive propellant last week.

The nitrogen tetroxide that spilled down the side of the Columbia didn't damage the tiles themselves, but it ate away at the glue that keeps them bonded to the spaceship.

Although only three tiles were glued back on to the Orbiter and 10 were awaiting reattachment Tuesday, 349 tiles already gone through the first of at least seven steps before they are finally bonded to the aluminum skin of the Columbia.

And 131 of the brittle ceramic-like tiles were already at the end of the line -- outfitted with a felt backing called a Strain Isolation Pad.

As each tile was carefully removed from the Columbia in the days following the propellant leak, they were brought to the Rockwell International workshop where they were examined, labeled and stored.

Each of the Columbia's almost 32,000 tiles are numbered and have their individual place on the ship. When it comes to putting them back on, tiles are called by number, said Roger Loeffler, Rockwell supervisor for the preparations.

A 24-hour operation, tiles are first stripped of any remaining adhesive backing. They are washed in a de-ionized water -- a solution absent of impurities.

From there tiles are waterproffed and baked in an oven at 400 degrees for two hours.

Technicians carefully watch through the oven's glass windows as about 20 of the white-coated low temperature tiles or black-coated high temperature tiles bake.

In all, there are three different tile bakings for waterproofing and curing with temperatures as high as 1,400 degrees, Loeffler said.

The tiles, which are designed to protect the Columbia from heat as high as 2,300 degrees as it plummets through the atmosphere for landing, cannot be bonded directly to the ship's aluminum surface. They would crack as the aluminum expands and contracts.

That's where the felt Strain Isolation Pad comes in.

Technicians first spread a coating of a high-strength glue to the surface of the tile.

Using spatulas and even syringes, they tediously apply the deep red glue to the surface of the tile. Every nick and dent in the tile is covered. Then the pad is fitted over the tile's surface and clamped in place.

Later, when the tile is brought to the Orbiter, that same glue, called Room Temperature Vulcanizing adhesive, is used to hold the tile to the spaceship.

"It's similar to silicon glues, like bathtub sealant," Loeffler said of the adhesive, made by General Electric.

Loeffler said he expects to process as many as 30 or more tiles a day but added some slightly nicked tiles will take more time than others.

The tile reattachment is the only work that remains in the aftermath of the propellant spill. The cleaning of a forward steering engine compartment was finished Tuesday, said Mark Hess, space center spokesman. (TODAY, 9-30-81, p. 16A)

OCTOBER 1981

October 1: The lick-'em and stick-'em job of replacing heat-protection tiles on space shuttle Columbia moved slowly Wednesday following the installation of a new access platform at the launch pad.

The painstaking, round-the-clock work to reglue about 360 tiles that either fell or were removed after a fueling accident last week began Tuesday. The regluing was halted late in the day to bolt on a new platform for workers at the 193-foot level.

Technicians reported only four tiles were in place at 4 a.m. Wednesday.

The accident has delayed the October 9 launch by several weeks. A new launch date in late October or early November is to be announced soon, possibly next week, officials said. (SENTINEL STAR, 10-1-81)

<> Planning Research Corporation (PRC), of 7600 Old Springhouse Road, McLean, Virginia, has won an extension to an existing contract to provide design engineering support for the Space Shuttle program at the John F. Kennedy Space Center.

The contract renewal is for a total of \$29,468,899, bringing the value of the contract to a grand total of \$194,509,387 to date. The cost plus fixed fee contract is in its eighth year, and the term of the renewal extends from May 20, 1981, through May 19, 1982.

PRC provides design engineering and construction management for the Space Shuttle program, its ground support facilities and projects of the KSC Design Engineering Directorate. Some of the projects for which PRC has provided support include construction of the Vehicle Assembly Building, Launch Complex 39, the Mobile Launcher Platforms and their Crawler Transporters and various payload handling equipment at the space center. (KSC NEWS RELEASE NO. 265-81, 10-1-81)

October 2: Confident they have isolated all the contamination from last week's propellant leak, Shuttle engineers were busy replacing damaged heat protection blankets in a forward engine cavity Thursday.

Four of 26 blankets removed from the Reaction Control System were replaced. The blankets, manufactured at a Kennedy Space Center workshop, protect inner engine parts from the extreme temperature in space.

One problem technicians at the launch pad found with the malfunctioning valve at fault was a buildup of a contaminant called iron nitrate.

To prevent iron nitrate buildup again, propellants, such as nitrogen tetroxide, will be placed through a filter until they are ready to be loaded into Orbiter propellant tanks.

Reloading the highly combustible propellants into the Columbia should resume Tuesday, said Mark Hess, a space center spokesman.

Other work at the pad Thursday included installation of a camera to record the Shuttle's slight northward drift at liftoff.

Engineers want to measure the extent of the movement that is due to the asymmetry of the Orbiter, its fuel tank and solid rockets. (TODAY, 10-2-81)

October 3: An Air Force major general will assume the top position in the Space Shuttle office in November, NASA announced Friday, adding to speculation of greater military involvement in the program.

Maj. Gen. James Abrahamson has been named NASA Associate Administrator for the Office of Space Transportation Systems and is the only associate administrator tapped directly from the Air Force, said Mary Fitzpatrick, NASA spokesman in Washington, D.C.

Abrahamson, appointed by NASA Administrator James Beggs, will join four other associate administrators directing different arms of the space agency.

Rep. Bill Nelson, D-Melbourne, said the choice of Abrahamson came after "NASA surveyed a landscape of excellent managers. One at the top of their list was Gen. Abrahamson."

Commissioned an Air Force second lieutenant in 1955 and a veteran of the Vietnam War, Abrahamson has served since July 1980 at Air Force Systems Command at Andrews Air Force Base, Md.

No stranger to the space program, Abrahamson was a member of a NASA committee to assess Space Shuttle management in 1979 and was selected to be an astronaut in the Air Force's manned orbiting laboratory program from 1967 to 1969.

Nelson predicted Abrahamson's Air Force and NASA background will be an asset to the program. "The military uses of the Shuttle are an extremely important part of the national mission of the Shuttle."

Military leaders directly involved with NASA operations here predicted greater Air Force involvement in the Shuttle program by 1986 when flights from Vandenberg Air Force Base, California, are operational.

Air Force Col. Marvin Jones, commander of the Eastern Space and Missile Center at Patrick Air Force Base said Abrahamson's appointment "emphasizes the importance we in the Air Force put in Shuttle. We will be the predominant users on the West Coast. This (the Shuttle program) is where the Air Force is moving."

Five defense missions are on the Shuttle schedule for launch from Vandenberg in 1986.

Abrahamson, 48, succeeds John Yardley, who left NASA in May to become president of McDonnell Douglas Astronautics Co., a division of McDonnell Douglas Corp. (TODAY, 10-3-81)

<> Its repairs ahead of schedule, the space shuttle Columbia should be ready for a second mission by early November, launch director George Page said Friday.

Although NASA still officially is considering a launch date later this month, Page said at a news conference he was personally eliminating any chance for next shuttle ascent that soon.

"Early November looks very, very possible," he said. "The late October date looks optimistic."

Page said NASA will announce a specific date in a week.
(SENTINEL STAR, 10-3-81)

October 5: President Reagan has cut the FY '82 NASA budget by \$367 million to \$5.755 billion, which is projected to cut outlays by \$257 million to \$5.638 billion. R & D has been cut by \$311 million to \$4.592 billion; Construction by \$25 million to \$80 million and RP & M by \$31 million to \$1.083 billion. The overall reduction is 6 percent, half of the 12 percent reduction ordered in the non-defense budget by the President, reflecting continued full funding of the Space Shuttle. The \$257 million reduction in NASA's outlays represents a 4.4 percent reduction. (DEFENSE DAILY, 10-5-81, p. 150, Vol. 118, No. 19)

<> The pilot who first broke the sound barrier in 1947 told a crowd at the International Space Hall of Fame that the U.S. Air Force deserves the credit for his success.

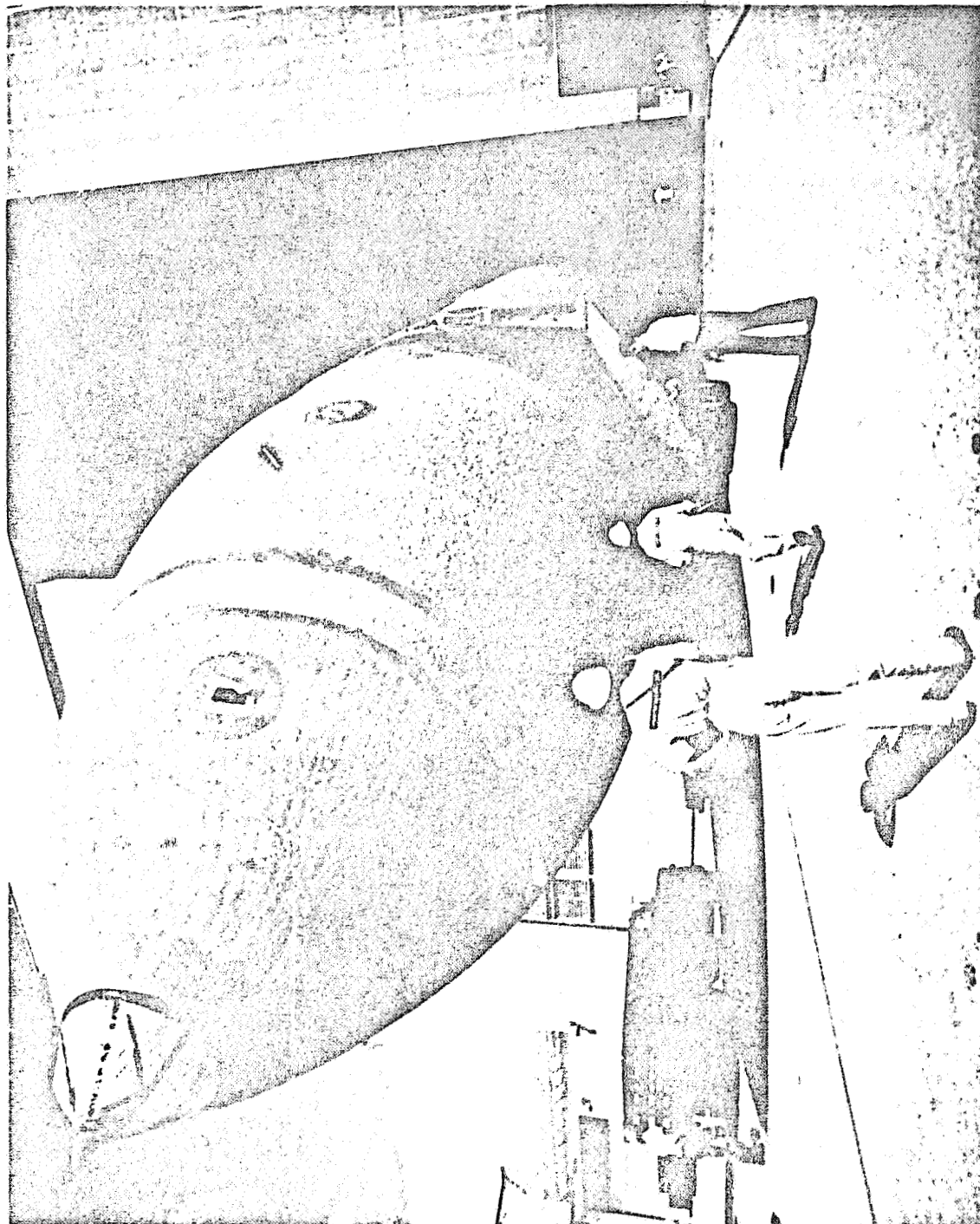
"They taught me to be a fighter, test and research pilot," said Chuck Yeager, of Cedar Ridge, California. But he added that to be famous, a pilot doesn't have to be good -- only survive.

Yeager, one of seven inducted during the weekend at Alamogordo, New Mexico, said he'd "love to fly a (Space) Shuttle, but I had my fun in other aircraft."

Yeager broke the sound barrier in the Bell X-1 at more than 670 mph. He eventually achieved a speed of more than 1,000 mph and an altitude of more than 70,000 feet in the X-1.

Others inducted who were not present were astronauts Alan Shepard, who retired as a Navy rear admiral and lives in Deer Park, Texas; Scott Carpenter, who retired from the Navy

ORIGINAL PAGE 13
OF POOR QUALITY



A lighter weight external tank enters the VAB on October 5, 1981, in preparation for the STS-3 mission which began at KSC on March 22, 1982.

as a commander and lives in Canoga Park, California; Gordon Cooper, who retired as an Air Force colonel and lives in Glendale, California, and Wally Schirra, who retired as a Navy captain and now lives in Inglewood, California.

Gus Grissom, America's second man into space, was inducted posthumously. (TODAY, 10-5-81, p. 12A)

October 5: International Business Machines Corporation, of 7900 Astronaut Boulevard, Cape Canaveral, Florida, has won a three year renewal of an existing contract at the John F. Kennedy Space Center.

The cost plus fee contract is for a value of \$27,996,434, bringing the total value of the contract to \$84,355,534 to date. Under the contract, IBM performs systems engineering and software development services in support of the Space Shuttle Launch Processing System at Kennedy Space Center and at Vandenberg Air Force Base in California.

The term of the contract extension runs from October 1, 1981 through September 30, 1984. (KSC NEWS RELEASE NO. 278-81, 10-5-81)

October 6: Space Shuttle launch director George Page, who has been called a pessimist by some, said last week that the two-week turn-around time that has been the goal for the Space Shuttle is "probably optimistic." He said there was no doubt that NASA would continue to reduce the turn-around time for the vehicle as it proceeds into the operational phase, but, "I don't think we'll ever get to two weeks " (DEFENSE DAILY, 10-6-81, p. 156, Vol. 118, No. 20)

<> Kennedy Space Center workers had three visitors Monday, but two of them -- Space Shuttle astronauts -- were kept hidden from the press.

It was the silent but impressive external fuel tank for the third Shuttle mission that space center officials revealed to photographers and reporters as it was unloaded from a covered barge.

The tank left its New Orleans, Louisiana, plant last Tuesday for the long ride to the KSC turning basin. From there it was towed to the Vehicle Assembly Building where it will be inspected and tested.

It's not that the 154-foot long tank didn't make a pretty picture. Stripped of its white insulation, the fuel tank for the third Shuttle flight is an apricot color.

That flight is now scheduled for no earlier than February.

Aesthetic considerations aside, eliminating the insulation material stripped 600 pounds off the tank and added that much weight capacity to future Shuttle payloads. Engineers found the additional insulation was unnecessary.

The tank, to be filled with liquid hydrogen and liquid oxygen, will fuel the Columbia's three main engines and fall into the Indian Ocean from 73 miles up.

Meanwhile, astronauts Joe Engle and Richard Truly informally addressed launch pad crews and inspected the Orbiter between 11:45 a.m. and 3 p.m., said Dick Young, space center spokesman.

On NASA's reason for sequestering the astronauts from the press, Young explained, "They were looking for a situation where the crew could talk to the launch team without feeling they were in a goldfish bowl. They just wanted to be completely relaxed and natural."

Repairs to the Shuttle continued Monday with 241 of the Columbia's heat protection tiles reglued by the afternoon in the wake of a propellant leak last month.

Space center officials said 118 heat tile cavities remain to be filled.

Because of the propellant spill, the October launch was postponed to early November. (TODAY, 10-6-81)

October 8: The second launch of the Space Shuttle has been rescheduled for November 4, 1981.

A decision on the new launch date was made by NASA management following an assessment of work to be completed on the Orbiter Columbia.

Previously scheduled for launch on October 9, from the Kennedy Space Center, Florida, the delay was caused by a spill of oxidizer propellant on September 22, which damaged over 360 thermal protection tiles.

Replacement of the tiles is proceeding well and measures have been taken to prevent a repetition of the spill caused by the malfunctioning quick disconnect valve. (KSC RELEASE NO. 81-160, 10-8-81)

October 9: The Space Shuttle will lift off November 4 barring any problems later this month when caustic propellants are reloaded into the Columbia, NASA officials announced Thursday.

The launch that will start astronauts Joe Engle and Richard Truly on a five-day mission is scheduled for 7:30 a.m.

Officials conferring by telephone with Washington and other NASA centers -- including Kennedy Space Center -- agreed they could finish repairs to the Columbia's heat protection tiles by Sunday.

The Shuttle was previously scheduled to fly today. But a September 22 propellant leak down the side of the Columbia played havoc with the adhesive bond on 376 tiles and the October 9 date was scrubbed.

Space center engineers said Thursday the new date gives them plenty of time to trouble shoot any problems that may arise before launch. (TODAY, 10-9-81, p. 1A)

<> Prime crew astronauts Joe Engle and Dick Truly visited KSC early this week and said, "We're awfully proud of each and every one of you. From what we've heard and what we can see, you've turned around and got your spirits up and gotten your work done ahead of schedule."

The two referred to the efforts to clean up and recover after an oxidizer spill which forced the removal of hundreds of tiles and more than two dozen thermal blankets from inside the orbiter's Forward Reaction Control System.

Tile rebonding efforts early this week were running significantly ahead of schedule, with 215 tiles applied to the orbiter by Monday morning. At that time, there had been 369 tiles removed, leaving 154 cavities to be filled.

The tiles remaining, however, were expected to take somewhat longer to bond because they were in areas less accessible or were of complicated shapes and sizes. In a press briefing last week, Launch Director George Page said that he hoped to have the majority of tile rebonds finished by October 13.

"The whole world is watching us to see how we recover from this and get back in stride, and we're proud of all of you for the way it's gone," said Engle.

Truly added, "We'll be ready for the flight as soon as the vehicle is," and summarized the events of the mission plan. (SPACEPORT NEWS, 10-9-81, p. 1, Vol. 20, No. 20)

<> An atmospheric research satellite which will study the production and distribution of ozone was launched by a KSC team earlier this week from Vandenberg Air Force Base in California.

The Solar Mesosphere Explorer, or SME, lifted off at 4:27 a.m. PDT (7:27 EDT) on Tuesday. A Delta rocket carried the spacecraft into orbit.

The SME launched from California carries five scientific instruments to monitor conditions related to ozone production and distribution of the mesosphere, that region of the atmosphere located 19 to 50 miles above the Earth.

Satellites have already discovered evidence that the ozone layer, which protects us from harmful radiation, is being depleted. The SME research satellite should help us better understand the processes which create ozone and affect its distribution. (SPACEPORT NEWS, 10-9-81, p. 3, Vol. 20, No. 20)

<> There's a group of bright young scientists among the thousands of Brevard County students who returned to school this fall. They completed a summer work-study experience which would be the envy of untold numbers of young people across the country.

The ten academically talented students spent nine weeks of scientific experimentation at Kennedy Space Center as participants in the Summer High School Apprenticeship Research Program, or SHARP, for short.

The purpose of the SHARP program is to provide selected students with "first-hand" experiences in research and development environments in order that each may explore tentative career choices.

Brevard County students who participated in the SHARP program were: Brenda Anderson and Everette Jordan, Cocoa High School; Andrew Aurigema, Eau Gallie High School; Sheila Cannan and Brian O'Connell, Cocoa Beach High School; Melani Furtado, Melbourne Catholic High School and now at Brevard Community College; Lisa Guilianelli, Melbourne High School; Willie Brown and Curtis Keels, both of Titusville High School, and David Voor, Astronaut High School. (SPACEPORT NEWS, 10-9-81, p. 6, Vol. 20, No. 20)

<> Who says lightning never strikes in the same place twice?

According to KSC lightning expert Jim Stahlmann of PRC, thunderbolts have zipped the lightning mast atop Pad 39A three times, and the Pad's water tower once, since April of this year. "Studies have shown that up to 6 strikes can be expected per square kilometer per month in the summer time here at KSC," Stahlmann says.

Eventually, lightning will strike the pad while the Shuttle is there, and when it does the vehicle will be protected. Lightning usually hits the pad high point, the top of the fiberglass mast, and passes harmlessly through a cable threaded through the top of the mast to grounding points 1,000 feet away on either side.

The mast provides a "cone of protection" for the vehicle and the pad service structures.

Although the Shuttle is safely harbored while on the pad, it is susceptible to damage from strikes during its ascent to orbit. For this reason, reliable lightning warnings are necessary.

Forecasts are provided by a round-the-clock team of Air Force meteorologists at the Cape Canaveral Forecast Facility located in the Range Control Center on CCAFS.

The Shuttle will not lift off if the electric fields at the launch site exceed one kilovolt per meter or if its flight path will take it into dangerous weather. (SPACEPORT NEWS, 10-9-81, p. 7, Vol. 20, No. 20)

October 10: The delay in the launch of the space shuttle's second test mission will make it extremely difficult to make the shuttle's first operational launch in September 1982, a top NASA official said Friday.

"The slip from September 30th to October 9th to November 4th makes it extremely difficult to make launch number five in September of next year," said Michael Weeks, acting associate administrator for state transportation systems.

The shuttle's first mission, delayed two years by many problems, was launched April 12, while a propellant spill in September forced postponement of the second mission's launch.

"We've got our work cut out for us," Weeks said. "We've never had to launch an identical vehicle before, but eventually it will be easier than launching Gemini or Apollo spaceships."

Weeks was at the space center to discuss the progress of Challenger, to be delivered here June 30, 1982, and to discuss the overall space shuttle program.

Weeks said he thought the program was getting good support from the Reagan administration.

"I think Mr. Reagan is supporting the shuttle quite well in these difficult budget times," he said.

The official said he was very pleased with the progress which had been made in repairing the Columbia from the spill of the toxic fuel. He said that the November 4 launch date leaves a couple of days for problems if they occur.

As of Friday, 366 of the 377 damaged shuttle tiles had been replaced. (SENTINEL STAR, 10-10-81)

<> Kennedy Space Center Tours had announced that records have been broken this year for tours, running 26.5 percent ahead of last year with an attendance of more than two million.

Effective October 8 the last daily tour will leave at 4:30 p.m. (TODAY, 10-10-81)

October 12: They were the mice that roared.

Fifty self-proclaimed S.O.B.s, determined to twist the huge, powerful arm of NASA and convince anyone who would listen to "save our beach."

No one got very excited when U.S. Rep. Bill Nelson, D-Melbourne, rose at a March 1980 Titusville Chamber of Commerce breakfast to tell his listeners that NASA might close or limit access to SR 402, the only Brevard entrance to Playalinda Beach.

They needed to protect the Space Shuttle from saboteurs, Nelson explained.

But, people talked. And the more they talked, the more they questioned Nelson's warning.

By June 1980, they decided it was time for action.

It started with a meeting of 50 people, most of them Titusville business leaders.

They vowed to use bumper stickers, brochures and if it came down to it, demonstrations.

They proclaimed July 31 "Take an S.O.B. to City Hall Day."

One S.O.B. volunteered to organize a "Screech on the Beach" with his fellow S.O.B.s as the screechers and NASA as the screechees.

On "S.O.B. Day," more than 300 newly converted activists jammed Titusville city hall for a spirited meeting.

One attorney got a roaring round of applause when he told them that every law firm in North Brevard had volunteered to help in the search for legal guns to level on NASA.

The group sent a polite "thanks but no thanks" to Nelson, who had suggested a federally funded shuttle bus that would have allowed NASA to more closely monitor the beachgoers whose trip to North Brevard's only beach would bring them within three miles of the launch pad.

S.O.B. Chairman Hank Evans said a shuttle bus would be a waste of federal tax money, a nuisance to beachgoers and a program dangling at the end of a federal shoestring during hard financial times.

Private vehicular access to Playalinda was threatened when NASA officials determined they needed a 3 1/2 mile security zone around the launch site whenever a Shuttle is on the pad. They had estimated that by 1986, there might be an orbiter on the pad every day of the year.

The S.O.B.s put NASA on the hot seat, demanding to know "Why 3 1/2 miles?"

But NASA couldn't tell them. The answer was shrouded in secrecy -- "national security."

Chuck Hollingshead, public affairs director for the Kennedy Space Center, said the security report was secret because it described the Shuttle's vulnerable points and suggested ways to eliminate them.

The S.O.B.s continued to insist that NASA should worry more about the Shuttle's vulnerability from the ocean, not the beach road.

"No self-respecting saboteur would come in by land, they would come from the ocean," one S.O.B. complained.

Probably true, Hollingshead said, explaining that the security perimeter would be protection against, not professional saboteurs, but from spur-of-the-moment rifle-toting crazies.

The bitter feud went on until September 6 when KSC Director Dick Smith announced that NASA's plans to provide security for the Shuttle had been altered to allow private vehicular access. With the exception of periodic, short closures when the Shuttles are fueled, launched or landed, the beach road would stay open.

To satisfy security requirements, a checkpoint would be set up at the edge of the security zone on SR 402 and guards would randomly search vehicles heading for the beach. Roving patrols would make sure no one stopped between the checkpoint and the beach, Smith said.

Those security measures remain in force today.

George Morford, chief of launch operations and physical security at KSC, said the compromise is working.

"The public has been 100 percent cooperative. We haven't had any incidents," he said.

Searches are limited to larger vehicles, such as vans and recreational vehicles, because weapons large enough to damage the Shuttle are too conspicuous to hide in a standard passenger car, he said.

All incoming vehicles are stopped by a guard who asks if the occupants have any weapons. Some who do are allowed to continue because the weapon is too small to hit the Shuttle which sits on the pad three miles away, Morford said.

The beach snack bar and ranger station are off-limits when a shuttle is on the pad because they lie within the 3 1/2-mile security zone.

While jubilant over the compromise, the S.O.B.s say they consider the victory temporary.

A bank account, opened last year to finance the fight, remains open.

Evans said he can round up plenty of S.O.B.s at the first sign that beach access is threatened.

"I think the fact that we won the first time will cause a greater number of people to get involved next time," he said. "If anything happens, we'll be ready. We still have the bumper stickers." (TODAY, 10-12-81, p. 1B)

<> A leak of highly poisonous fumes stalled a propellant filtering operation at the Shuttle launch pad Saturday evening, Kennedy Space Center officials reported Sunday.

There were no reported injuries or any damage to the Shuttle. The launch of the second mission of the Columbia is still scheduled for November 4.

The 140 Shuttle workers evacuated from the pad were not exposed to the fumes and were able to return to work within 45 minutes of the 5:15 p.m. accident, said KSC spokesman Dick Young.

The vapors of nitrogen tetroxide escaped from a valve minutes before a filtering process was to begin at a propellant storage facility on the southeast corner of the pad.

Only a small amount of gas was vented out of the storage tank within a few seconds.

"It was a momentary thing. It just went into the air and dissipated," Young said.

Young said the venting of the vapors Saturday occurred when the propellant became overloaded in a faulty valve.

That valve was replaced Sunday and the weekend filtering of propellants for the Columbia's maneuvering engines should be completed sometime today. (TODAY, 10-12-81)

<> Rep. Bill Nelson took his message to the Reagan administration Friday, and the Melbourne congressman claims he may have changed Budget Director David Stockman's mind about NASA budget cuts.

Holding a press conference in Orlando Monday, Nelson said he met with Stockman for 15 minutes and found the president's budget director receptive to keeping space exploration probes and other non-Shuttle programs alive.

As for the Shuttle program, Nelson said the administration is still committed to funding \$1 billion a year for the next three years and that any cuts to NASA's budget would neither affect the Shuttle nor the 12,000 workers at Kennedy Space Center. (TODAY, 10-13-81, p. 12A)

<> The last of 376 heat protection tiles that were removed from the Space Shuttle Columbia because of a fuel spill was reattached early Monday.

"The last tile went on at 4:15 a.m.," said Kennedy Space Center spokesman, Dick Young.

The tiles, which protect the Columbia from the fiery heat of reentry into the atmosphere, came unglued from the spaceship after a caustic propellant spilled down its side during fueling September 22.

Since Friday, launch crews have been filtering propellants, trying to remove iron contaminants that damaged a valve and caused the leak. The filtering process continues today.

The only work remaining on the Columbia, scheduled for launch November 4, is minor patchwork and testing of the tiles' adhesion, Young said. (TODAY, 10-13-81, p. 12A)

October 14: Hughes Aircraft Co. has announced plans to build a new satellite assembly plant near Titusville, Florida, to build the new generation of larger satellites, which are difficult to ship across country for launching from Kennedy Space Center.

The company currently manufactures communications and weather satellites in its factory at El Segundo, California. It said those satellites average seven feet in diameter, while the new generation of satellites are up to 14 feet in diameter.

Hughes said that the establishment of the new facility will not have a negative impact on its El Segundo operation, which currently employs 6,000 people in the design and construction of satellites.

Among the new large satellites for which Hughes is bidding, is the Intelsat VI, in competition with Ford Aerospace. (DEFENSE DAILY, 10-14-81, p. 199, Vol. 118, No. 25)

October 15: The Space Shuttle Columbia will have a dry runway for landing when it returns from orbit next month unless more rain falls on the Rogers Dry Lake bed, NASA officials said Wednesday.

Storms two weeks ago left as much as 10 inches of standing water on the lake bed, but most of it has evaporated. All that remains are two puddles beside the main runway connected by a thin stream less than an inch deep across the approach, NASA spokeswoman Sharon Wanglin said.

"The backup runway is dry today," she said Wednesday. "At this point there is not a problem. That's the situation unless we get more heavy rain."

The tentative launch date for the Columbia's second flight is November 4. (TODAY, 10-15-81)

October 18: Moving gingerly to avoid a repetition of last month's disastrous spill, technicians at the Kennedy Space Center Saturday began pumping vitriolic rocket fuel into the onboard tanks of the space shuttle Columbia.

"They're not in any hurry, nor do we want them to be," NASA spokesman Rocky Raab said.

Crews began about noon the six-day task of filling Columbia's tanks with liquid nitrogen tetroxide and hydrazine. Reporters were not on hand to witness the event and NASA's own information team was absent.

Raab said there would be "some interval" between the time the fuel flow began and the first flow into Columbia's tanks.

"It is a step-by-step process with checking all along the way," he said.

Raab said additional precautions had been taken since the September 22 spill of nitrogen tetroxide that caused 379 of Columbia's heat-shielding thermal tiles to peel off its aluminum skin. That resulted in pushing back the launch date for the shuttle's second orbital journey from October 9 to November 4.

One of the precautions was replacement of the shutoff valve that failed to halt the flow of nitrogen tetroxide, as it was designed to do. Raab said the valve was replaced "with one of similar design."

The propellant being loaded into the tanks fuels the small rocket thrusters used to maneuver the Columbia in space. When combined, hydrazine and nitrogen tetroxide are self-igniting into a hot gas, producing the needed thrust. (THE MIAMI HERALD, 10-18-81)

<> It was part of a dream come true for Robbie Zinni and his family.

The 9-year-old Texas boy with incurable leukemia was greeted by astronaut Ellison Onizuka at Kennedy Space Center Saturday morning and given a tour of the center's control room and a close look at the Space Shuttle's launch pad. (TODAY, 10-18-81, p. 1B)

October 21: Representatives of companies that might be interested in bidding on a future contract to do all shuttle processing for NASA have been invited to watch the complete cycle of preparation of the Space Transportation System for its third mission, KSC Director Richard G. Smith announced today.

Smith said that qualified companies have been invited to assign a limited number of their own managers and engineers to observe and assess the steps required from the time the orbiter returns to KSC after its second trip in space until it is returned after its third mission. The group of observers will have no active role and no official responsibility for shuttle processing operations.

The invitation is an effort to give potential bidders every opportunity to learn what it takes to prepare the shuttle for flight in order to assure knowledgeable competition when NASA solicits proposals for a Shuttle Processing Contract (SPC) next fall.

The plan evolved after recent discussions with industry representatives invited to KSC to assist in planning activities. Smith asserted that NASA is "anxious to demonstrate that a viable competition with the hardware developers is a realistic possibility." He said, "NASA is prepared to alter its traditional role of involvement in day to day shuttle operations and redirect its resources to other activities more in keeping with the NASA research and development mission."

The new contract will cover refurbishment after flights of Space Transportation System orbiters in preparation for their next missions, checkout and assembly of the other elements of the Space Shuttle such as the External Tank and Solid Rocket Boosters, and responsibility for support operations materials, including maintenance and operation of facilities.

The SPC is the second of three comprehensive contracts that NASA intends to establish at KSC as the most effective and economical method of conducting Shuttle missions when the system becomes operational subsequent to the first four developmental flights. The first contract, covering base operations, or institutional support services, is scheduled to be awarded about one year from now. The third, the Cargo Processing Contract, is not currently scheduled but is intended to follow the other two. (KSC RELEASE NO. 289-81, 10-21-81)

<> In order to reduce the excessive overpressure experienced during the maiden voyage of the Space Shuttle in April, NASA has added two water suppression systems to the mobile launch pad -- one which will spray water directly into the exhaust plume as the Solid Rocket Boosters ignite to absorb the shock wave generated, and the second, a series of water troughs that will be suspended around each booster. Approval to add the latter system was given by NASA-Headquarters about two weeks ago. Marshall Space Flight Center was assigned to come up with solutions to the overpressure problem.

During the STS-1 launch, several milliseconds after the Shuttle's Solid Rocket Boosters were ignited, a pressure "pulse" bounced back up through the holes in the Shuttle's mobile launch platform, causing excessive stress loads on the Orbiter's aft heat shield and flight control surfaces.

Concern was later expressed that the overpressure could damage the Remote Manipulator System or the imaging radar on the OSTA-1 scientific package schedule to go on STS-2. (DEFENSE DAILY, 10-21-81, p. 238, Vol. 118, No. 30)

<> NASA has announced a \$28 million contract renewal to I.B.M. The contract will include the systems engineering and software development services in support of the Space Shuttle Launch Processing Systems at the Kennedy Space Center and Vandenberg Air Force Base in California. (TODAY, 10-21-81, p. 14C)

October 22: Technicians are so far ahead of schedule preparing the Space Shuttle for launch, they're all getting the day off Sunday.

Fueling the Columbia's rear and forward maneuvering engines with propellants should be completed this morning, said space center spokesman Rocky Raab.

The fuel, combined with nitrogen tetroxide, provides the combustion needed to power engines while the Columbia is in orbit.

Working about 11 hours ahead of schedule, all Shuttle launch crews at Pad 39A will get a day off Sunday so "the team can prepare themselves and be fresh for the pre-countdown activities next week," Raab said.

One of these pre-countdown activities will start Friday as liquid hydrogen and liquid oxygen are loaded into storage containers on the pad. (TODAY, 10-22-81, p. 12A)

October 23: Everyone in NASA agrees that the operational era of shuttle will be unlike any other period in the agency's history. Traditionally a research and development organization, the agency had devoted a great deal of innovative thinking to trying to determine the best way to direct an operational system such as the Space Shuttle.

One of the most difficult problems is determining whether a traditional hardware contractor would be most efficient at the operational tasks or whether a company concerned with day-to-day operations of more traditional transportation systems would provide a more economical approach.

The answer to such a question could well remain unknown if those companies were reluctant to compete for the contract because of their unfamiliarity with shuttle processing and fear that there is no way to compete equally with companies having spacecraft processing experience.

To solve this apparent conundrum, a number of qualified companies are being invited to KSC to observe the complete process of preparing the Columbia for its third flight.

Center Director Richard Smith says that the selected companies will assign a limited number of their managers and engineers to observe and assess the steps required from the time the orbiter returns to KSC after its second mission until it is launched once again.

The plan evolved after recent discussions with industry representatives invited to KSC to assist in the planning activity. Smith says, "NASA is anxious to demonstrate that a viable competition with the hardware developers is a realistic possibility. NASA is prepared to alter its traditional role of involvement in day to day shuttle

operations and redirect its resources to other activities more in keeping with the NASA research and development mission."

Smith said that NASA is convinced of the necessity to streamline STS operations and that there is significant opportunity for the government to reduce its costs.

The overall plan to streamline operations and to reduce costs is to have only three major contracts at KSC. The first covering base operations or institutional support services, is scheduled to be awarded about a year from now. The shuttle processing contract could be awarded as soon as the summer of 1983, and the third contract, for cargo processing, is not scheduled but is expected to follow the other two.

"By making the (three major) contractors as self-sufficient as possible," Smith said, "the government should be able to reduce the number of daily contacts and approvals now required in direction of the work, give the contractors more direct responsibility and incentive and hold them more strictly accountable for their performance and results. This should bring about lower costs to the government and industry payoff would be through incentive fees."
(SPACEPORT NEWS, 10-23-81, pp. 1 & 7, Vol. 20, No. 21)

<> Eighteen NASA senior executives, including three from KSC, were awarded Presidential Rank Awards in a ceremony in Washington, D. C. last week. Center Director Richard Smith was named a Distinguished Senior Executive and George Page and Thomas Utsman, Director of Shuttle Operations and Director of Technical Support, respectively, were named Meritorious Senior Executives.

The awards are presented each year under the authority of the Civil Service Reform Act of 1978, on the principle that employees should be compensated based on their performance. The awards include a lump sum payment. (SPACEPORT NEWS, 10-23-81, p. 2, Vol. 20, No. 21)

<> Astronauts Joe Engle and Richard Truly have waited a long time for their chance to fly into orbit.

But they're no rookies.

Engle and Truly are among the first to fly America's new hybrid spacecraft as one of two crews which manned the Orbiter Enterprise during a 1977 series of approach and landing tests that verified its aerodynamic characteristics.

They twice brought the prototype orbiter to a gliding touchdown at Edwards Air Force Base after it was released from atop a 747 carrier aircraft high over the California desert.

Having served as the backup crew for the first orbital flight of the Space Shuttle, Engle and Truly have received extensive training for their mission.

They have "flown" sophisticated simulators mimicking all phases of a Shuttle mission and practiced runway approaches and landings in aircraft modified to perform like an orbiter.

Joe H. Engle, 49, will be the Commander aboard Columbia on its second orbital flight. Engle has already flown in space three times as test pilot of an X-15 rocketplane. He earned his astronaut wings by soaring above 50 miles, generally considered the threshold of outer space.

A colonel in the Air Force, Engle has flown over 135 types of aircraft and he makes a hobby of flying vintage World War II planes.

He joined NASA in 1966 and was backup lunar module pilot for the Apollo 14 mission.

Engle was born in Abilene, Kansas, and graduated from the University of Kansas with a Bachelor's degree in aeronautical engineering. He and his wife, Mary Catherine, have two children.

Navy Captain Richard H. Truly served as a pilot aboard the carriers Intrepid and Enterprise. He joined the USAF Manned Orbiting Laboratory Program in 1965 and transferred to NASA in 1969 when the MOL was cancelled.

Truly served on the astronaut support crews for the Skylab and Apollo-Soyuz manned flights and was a "capcom" (capsule communicator) during those missions.

He will be the Pilot aboard Columbia for STS-2.

Truly was born in Fayette, Mississippi, and graduated from Georgia Institute of Technology in 1959 with a Bachelor's degree in aeronautical engineering.

Truly and his wife, Colleen, have three children.
(SPACEPORT NEWS, 10-23-81, p. 6, Vol. 20, No. 21)

<> RCA engineers are confident this one won't get away.

The communications satellite to be launched November 19 from Cape Canaveral Air Force Station will take the spot in the sky once reserved for the satellite that disappeared into space almost three years ago.

RCA's Satcom 3-R standing for replacement -- was unveiled by that company's engineers Thursday.

Standing about 9 feet high and weighing in at 2,400 pounds, the satellite will supply cable television customers with expanded service.

Customers include Home Box Office and the Christian Broadcast Network. "There is a vast demand for more channels and this satellite can provide that," said Bill Palme, RCA launch director.

The satellite has a total of 28 channels. Each channel is equipped to handle one television station.

The satellite will circle the globe from 22,300 miles in an orbit that is synchronous with the rotation of the Earth.

Palme said engineers still aren't sure what happened to Satcom 3, just minutes after a motor fired that was designed to put the satellite in permanent orbit.

He said it either slipped into space or crashed to the ocean below.

"We never did find it," Palme said.

The motor that failed in the first satellite was manufactured by Aerojet Co. and RCA purchased the important component from Thiokol Corp. for the replacement satellite.

Aerojet no longer makes that particular kind of motor, Palme said.

Satcom 3-P was built at a cost of \$25 million and like the satellite that disappeared, it is insured for about \$80 million. The Delta rocket that will carry the satellite into space costs another \$25 million. (TODAY, 10-23-81)

October 25: It was the first reunion of America's manned space program, but the only astronaut to show up was Deke Slayton, the one who didn't get into space until 13 years later.

The other five former astronauts apparently were too busy to attend the get-together, which took place Saturday in a NASA park not far from where they launched into the hearts of America as heroes of the Mercury program.

According to Slayton, U.S. Senator John Glenn couldn't get away from Washington where he was embroiled in debate over the sale of AWACS planes to Saudi Arabia. Businessmen Alan Shepard and Walter Schirra had work to do in Houston and Denver, respectively. Gordon Cooper and Scott Carpenter were somewhere on the West Coast.

The only other Mercury astronaut, Virgil "Gus" Grissom, was one of three astronauts killed in a 1967 launch pad fire.

Their absence, however, didn't spoil the party. An estimated 200 people arrived to relive the days of Redstone and Atlas rockets, the emotional launch of Shepard, the first American in space, and the ticker-tape hoopla that followed Glenn's orbits of the planet.

"In those days, everybody thought this was a once-around adventure, that we'd do it this time and that would be it," said Charlie Donlan, who was second in authority on the program.

"People didn't comprehend what it was all about," he said.

Slayton talked briefly about his own days as an astronaut before comparing today's NASA pilots with those of the early 1960s.

"When I was scrubbed from the Mercury mission it was the worst feeling in the world," he said. "Disappointed? That's putting it mildly. I didn't know that I would get back into space. Back then, nobody thought that far ahead."

Slayton, 57, is the only Mercury astronaut still working for NASA. He is manager of the Orbital Test Flight program for the space shuttle and plays a crucial role in selecting astronauts to man the space plane. At the picnic, he wore a red T-shirt that read: "Chief."

"What's different about today's space program is that we have different categories of astronauts, scientists and Ph.Ds who will handle the shuttle cargo. But there are still some great test pilots around."

Competition among astronauts to get on the shuttle is just as intense as it was throughout the Mercury, Gemini and Apollo programs, Slayton said.

"Everyone wants to fly every flight. It's like a football team. No one wants to sit on the bench."

When asked about the performance of astronauts John Young and Robert Crippen aboard the maiden shuttle voyage last April, he said: "They did a good job. That's nothing unusual. That's what we expect from all the astronauts."

Slayton also said Young, a veteran of five space flights, probably would not go into space again, although the Orlando native had expressed a desire to do so. "I'd be very surprised if John flew again," he said. "There are too many young people anxious to get up there."

As the picnic progressed, nostalgia flowed as heavily as the beer that was provided in several kegs.

"The high point of the program for me was when we lifted that Redstone off with Al Shepard," said Cal Moser, a Mercury engineer who now works for Martin Marietta on the shuttle's external tank.

"I just looked at that thing and tried to realize that there was actually a man inside that little capsule. I saw guys with tears in their eyes who I never expected to see cry."

W.J. "Kappy" Kapryan was one of the top NASA officials who questioned Shepard after his flight. "When he walked in the room and saw him sitting there everything was silent, kind of hushed. It was sort of a holy moment. Nothing will ever replace it."

In one sense, this was merely a reunion of memories. Many of the people attending the picnic have remained at the space center through all American space activity.

"We go from contractor to contractor. Our (identification) badges change, but the faces don't," Moser said. "We're space bums. We do a lot to stay in the area." (SENTINEL STAR, 10-25-81, pp. 1-B & 7-B)

October 26: Shuttle countdown working group is refining the launch countdown for the second space shuttle mission, and Clyde V. Netherton, working group chairman, said the approach for Space Transportation System 2 will continue to be one of research and development despite some procedural changes.

National Aeronautics and Space Administration closely analyzed the first shuttle countdown in preparation for the second count, Netherton said. The first count "did well but there were too many activities between T-12 and T-8 ... We need to loosen this period," he said.

"Fuel cell activation was one example. We took it out of that time slot and will start the system for STS-2 in parallel with external tank cryogenic loading. This also will reduce the fuel cell running time.

"Connecting ordnance and the range safety validation tests disrupted the countdown flow more than anything else. We should be doing this in the Vehicle Assembly Building, but we'll do it on the pad 6.5 days before launch."

Ordnance, range safety and fuel cell activities are the most significant changes between STS-1 and STS-2, Netherton said. Countdown time will remain the same, 73 hr. (AVIATION WEEK & SPACE TECHNOLOGY, 10-26-81, p. 24, Vol. 115, No. 17)

- <> Loss of the actual grapple test is more of a disappointment than a significant loss of data. The grapple test was to have been the most operationally oriented element of the manipulator tests during the flight. Actual grappling will now be delayed until Mission 3, when astronauts Marine Col. Jack R. Lousma and USAF Col. Charles G. Fullerton are to use the arm to extract the induced environment contamination monitor from the payload bay.

The Mission 2 test was canceled when an end effector completing qualification tests necessary for first flight failed to successfully complete a test in which the end effector's movable carriage is pulled down to form a hard contact between the arm and its target, when an actual target is present.

In order to locate the problem, the test end effector had to be disassembled, and this in turn delayed completion of the qualification requirements necessary to clear the end effector mounted in the orbiter for actual use, Spar said. None of the other manipulator exercises planned over three days of testing in space are affected. The problem is not expected to cause any changes in plans to use the end effector operationally in the third flight, although some end effector design improvements could result. (AVIATION WEEK & SPACE TECHNOLOGY, 10-26-81, p. 24, Vol. 115, No. 17)

- <> Shuffle 3,000 people -- tops in their professions -- into Kennedy Space Center, seat them as close to center stage as possible and watch their eyes pick up a permanent gleam.

Once they are showered with Shuttle dust, most guests invited to view the spectacle of a launch from an exclusive NASA grandstand become space enthusiasts for life.

And they are guests who, when impressed, make the news.

With the theory that seeing is believing, NASA officials have mailed private invitations to politicians, celebrities, educators and business and civic leaders throughout the United States.

In April the list included John Denver, Gov. Jerry Brown and Pat Boone. (TODAY, 10-26-81, p. 1A)

<> The troops will be out November 4, searching for anything suspicious in the air, land or sea.

The delicate, multibillion-dollar Space Shuttle will be protected by Kennedy Space Center security officers, the FBI, the Federal Aviation Administration, Florida Marine Patrol, Brevard County Sheriff's Department, U.S. Fish and Wildlife Service, Florida Highway Patrol, U.S. Coast Guard and auxiliary and the U.S. Air Force.

While northern Brevard County won't resemble a maximum security jail, Shuttle guards will be out in full force. The area will be the center of attention for most of the nation when the Shuttle takes to the sky for a second time. And with all that attention comes a security risk and, consequently, a need for tight protection.

More than 200 KSC security officials, plus officers from at least eight other policing agencies will ensure no authorized aircraft, boats, vehicles or pedestrians venture near the Space Shuttle, said George Morford, chief of launch operations, security branch.

They hope the launch won't be a repeat performance of April's even, when, to the surprise of onlookers, a private, unauthorized airplane buzzed by the Shuttle minutes before takeoff.

As a result, the FAA, which had only one aircraft guarding restricted airspace in April, has increased its strength to two planes for the November event, Morford said. A KSC helicopter will also circle the area.

While Secret Service officers won't be guarding the spaceship, they will be on hand if President Reagan or other top government officials fly in for the launch, he said.

The multiple agencies will communicate through use of a command center at KSC. Air to ground communications -- bogged down by some confusion last spring -- will be strengthened by use of more administrative personnel, Morford said.

Officers will patrol Playalinda Beach, which will again be closed to beachgoers three days before the launch up through launch day. Mosquito Lagoon and the Banana River will also be watched carefully for waterborne intruders.

Traffic is the most time-consuming concern of the officers. Although about 8,000 bus, trailer and car passes (excluding the media) will allow visitors onto KSC -- about 3,000 less than in April -- security officials still expect traffic backlogs.

Visitors at the space center are expected to reach 45,000 plus about 3,000 media representatives.

Cars stacked up for miles on SR 3 and U.S. 1 last April 10, which turned out to be the day the launch was scrubbed and rescheduled.

To solve that problem, security will open a third gate to check through vehicles with permits. The gate, off the NASA Causeway, is between Cape Canaveral Air Force Station and KSC.

The two KSC gates will open at midnight, two hours earlier than last time, to avoid stackups of early-arriving vehicles.

Since the launch is scheduled for 7:30 a.m. on a Wednesday, about 10,000 KSC employees will be filing to work at the same time as visitors, causing an even greater traffic jam than during the April 12 Sunday launch.

To avoid the crowds, visitors with vehicle permits are advised to arrive at KSC around midnight and no later than 4 a.m., Morford said. (TODAY, 10-26-81, p.1B)

October 27: A malady that struck Brevard County school children in epidemic proportions last April is expected to resurface next week.

The symptoms include difficulty sleeping, increasing excitement and the tendency to speak in acronyms used by aerospace engineers. Like VAB, OPF, STS-2, LCC.

The problem is Shuttle fever and school officials acknowledge there's little they can do about it.

So they'll hold school as usual November 4 -- the day the Space Shuttle Columbia is expected to begin its second mission about 7:30 a.m.

That's what school officials did on the scheduled maiden launch day April 10.

The space bug hit hard that day causing the school absentee rate to top 90 percent in some schools -- even though the launch was scrubbed.

Many elementary children went to school as usual, but the older students apparently were smacked by Shuttle fever. (TODAY, 10-27-81, p. 1B)

October 28: Citrus production -- one of Florida's oldest industries -- is stepping out of its time warp this winter with the help of NASA space technology.

After decades of old-fashioned and erratic transmission of weather predictions, some Florida citrus growers will have access to direct freeze warnings relayed by satellites.

Computers that give a colorful picture of data collected by one of NASA's satellites are being set up in five Florida counties and one Georgia county.

The computers will offer citrus growers as much as eight hours notice of an impending crop-killing frost, said Dr. J. David Martsolf of the Institute of Food and Agricultural Science of the University of Florida.

With the notice, growers can switch on their heaters and fill their wells in time to salvage some of their fruit.

About 50 agricultural agents and citrus growers gathered for a seminar at Kennedy Space Center Monday and Tuesday to learn how to operate the computers.

"Growers feel they're starving for weather information," said Fred Crosby of the National Oceanic and Atmospheric Administration at Ruskin Weather Station.

Crosby mans a central computer that is the direct link to the satellite's thousands of transmissions. From Ruskin, information is filtered immediately to Florida's five computers through telephone lines.

County extension agencies in Homestead, Fort Pierce, Bartow, Tavares and Madison will operate computers in the experimental project this winter.)

Citrus growers in the counties containing those cities, plus Orange County, will be able to call their extension agents and obtain up-to-the-hour weather forecasts.

Other Florida counties, including Brevard and Indian River, are expected to participate within a few years if local and federal funds become available. (TODAY, 10-28-81, p. 1B)

October 29: The countdown for the second launch of the Space Shuttle Columbia, which is scheduled for 7:30 AM EST, Wednesday, November 4, is slated to begin at 1 AM Saturday, October 31. Space shuttle launch director George Page said Monday that "right now it doesn't look like we're going to have any problems that are going to slow us up" in making the launch. Landing at the dry lakebed at Edwards, if all goes as planned, will be at 11:40 AM EST, Monday, November 9. The weather outlook for Cape Canaveral and Edwards remains good. (DEFENSE DAILY, 10-29-81, p. 282, Vol. 118, No. 36)

October 31: It sounds ominous: a toxic chemical mist from the Shuttle blastoff, composed of ingredients such as hydrochloric acid and aluminum oxide, drifting toward an unprotected throng of more than a thousand people.

The thought was enough for NASA to move VIPs four miles away from the second Shuttle launch, a half-mile farther back from where they watched the first launch.

NASA has even begun selling anti-mist covers to people who park their cars close to the launch site. Even though diluted, the acid in the mist still is strong enough to eat into a car's finish.

Scientists are also increasing their monitoring program of the mist as part of a program to minimize the environmental damage it could cause.

But what about reporters, who will be only 3 1/2 miles from the Shuttle pad at an unprotected spot which could be bathed with the mist from Wednesday's 7:30 a.m. scheduled launch.

"You're expendable," said NASA spokesman David Garrett. "It's just like being a war correspondent. You take your chances."

That means if the winds are blowing in the right direction following the launch, reporters may suffer from temporary red skin blotches and respiratory irritations.

Following the first Shuttle liftoff, scientists found a symptom of the acid mist -- spotted vegetation four miles north of the launch pad.

If the wind had been blowing from the east or northeast, rather than from the south, the mist would have spotted the hides of reporters, VIPs and their cars located 3 1/2 miles from the pad.

So this time the VIPs are being moved back and the reporters are being warned.

"You're here for an operational purpose," Garrett said in explaining the double standard. "The VIPs are guests we bring in. They're observers."

And should reporters or their cars be injured in the line of duty, NASA will assume no responsibility, Garrett stressed.

The new precautions aside, NASA officials say the acid mist from the first Shuttle launch was even less than the computers predicted. But even so, they are stepping up their environmental monitoring of the chemical mist to study its impact on the sensitive 240,000-acre Merritt Island National Wildlife Refuge.

NASA sent a small plane into the exhaust cloud following the first Shuttle launch to measure the cloud's diameter and dispersion time. Officials now are trying to figure out a new path for the plane's second flight.

"We're going to try to get the plane in quicker this time," said Bill Brannan, director of NASA's office of environmental management. "We're going to go through the cloud twice and under it twice."

Following the first launch, Brannan said, the plane flew at a high elevation to measure the contrail of the Shuttle. But since the contrail dissipates far above the ground and poses no environmental danger, the plane for the second launch will concentrate more on the large blastoff cloud which lingers over the ground and causes the mist, Brannan said.

Two or three more launches need to be monitored before scientists analyze long-term impacts from the toxic cloud on the wildlife refuge, Brannan said.

But for now, the only major damage scientists said occurred to the refuge from the first launch was within a few thousand feet of the launch pad where the blastoff fireball charred the surrounding area, Brannan said.

From the first launch, scientists learned that their second major environmental concern before launch -- the effect of the noise on surrounding bird populations -- was not a major problem.

"They got up, flew around, and then came back and sat down," said Paul Tost, also with the office of environmental management.

But scientists from NASA and the U.S. Fish and Wildlife Service will keep the same bird-monitoring program for the second launch, Tost said. That means four nests will be watched.

A camera will be trained on an eagle's nest five miles from the launch site, and biologists will watch a colony of wading birds seven miles from the site.

Two other bird colonies within four miles of the launch complex will be examined following blastoff.

The major difference from the first Shuttle launch in April and Wednesday's launch is that the birds were nesting in April but will be more scattered about for this launch.

"The eagles aren't on their nests," Tost said. "They are fussing around in the area, but unless one lays an egg in short order, we don't anticipate they'll be housekeeping during the launch." (TODAY, 10-31-81, p. 1A)

NOVEMBER 1981

November 1: The Space Shuttle Columbia already may seem a bit routine to some on the Space Coast, but in Lima, Ohio, it's far away, exciting and big news.

That's what is making Jimmy Flannery a celebrity in his mid-western hometown. He's going to see the launch, compliments of President Reagan and NASA.

Jimmy, you see, is 12 years old and determined.

He wanted more than anything to see the Space Shuttle Columbia launched and made up his mind to stop at nothing to realize his dream.

After all, seeing a launch is very important when you have your heart set on being an astronaut some day.

In April, James was in South Florida with his brother and widowed mother, visiting relatives. The family drove north for the first launch attempt.

The young Shuttle fan was disappointed to learn that they'd need vehicle passes to enter the space center. He was even more disappointed when the launch was scrubbed. The family didn't return for the successful launch two days later.

To get the vehicle pass he so desperately wanted for Wednesday's planned launch, Jimmy Flannery went straight to the top -- the White House.

He wrote to the President, who forwarded his letter to NASA officials in Washington, who eventually sent Jimmy the vehicle pass.

His mother Carol, a Lima postal employee, admits that she was only humoring her space-loving son when she mailed the letter to Reagan in August.

"I figured it (the letter) would get lost in the shuffle. I didn't think he'd get any response," she said.

For weeks, Jimmy asked over and over if he'd received any mail. He finally got the long-awaited letter three weeks ago.

"I was flabbergasted and he was in seventh heaven," Mrs. Flannery said.

"I guess we should never underestimate the power of a 12-year-old," she said.

Jimmy said he simply told the president that he'd missed the first launch and that "I kind of like space."

That, according to his mother, is an understatement.

"The walls of his bedroom are covered with anything to do with the Shuttle or with space," she said. "His drawings come home from school and they're all space.

"He does eat, sleep and dream space," Mrs. Flannery said.

Jimmy's science teacher at Shawnee Middle School in Lima will attest to that.

"That (the Shuttle) is all he talks about," teacher Mike Bishop said. "If I could get him as tuned in to other things I teach, he'd be super.

"We're all excited about it," Bishop said. "The only homework he'll have is a report to the class on the Shuttle."

James is due to arrive in Titusville Tuesday with his mother and 15-year-old brother William.

There won't be any motel bills to pay at the Penny Pincher Inn where they are registered, according to Jean Miller, director of reservations and sales for the motel.

"We just felt that if the president can give him a pass, we can give them a complimentary room," Miller said. (TODAY, 11-1-81, p. 4A)

<> For every set of eyes that sees the launch of the Columbia Wednesday, there is a different view of what this mission will mean for our times.

Industry sees the Space Shuttle as another factory, some in the scientific community speak of it as an extension of Earthbound telescopes and the military is calling the Shuttle the greatest defensive weapon since chain armor.

Launch II of the Columbia won't be strictly the see-if-it-can-fly mission of Launch I. The eyes that will study this launch will take a hard look at performance.

NASA engineers who planned the five-day, four-hour and 10-minute flight of astronauts Joe Engle and Richard Truly, put the most important maneuvers and tests of Shuttle capability at the front end of the schedule.

It's on the morning of the second day in flight the crew will unfurl a 50-foot mechanical arm from the open payload bay for testing purposes.

But the test that would have given generals and college professors reason to hold their breaths, momentarily anyway, will have to wait for the third launch, in March, because of a possible defect in bearing at the arm's fingers.

A simple grappling or holding test onto a knob inside the payload bay by this Canadian-built robot arm would have given any Shuttle user a good indication how well objects can be manipulated and moved through space.

"The arm is essentially going to be the big payoff. It's the bread and butter of the Shuttle," said Dr. Edwin Strother, Florida Institute of Technology professor of physics.

It is the arm, with a lifting potential greater than 60,000 pounds, that could loft an interplanetary probe into space.

Another satellite that the robot arm could hoist into space is the Department of Defense's inertial upper stage -- a solid rocket motor that would put military payloads into high Earth orbit.

"Ultimately the successful operation of that (robot arm) system is the key," said Colonel Marvin Jones, commander of the Air Force's Eastern Space and Missile Center. (TODAY, 11-1-81, p. 1A)

November 2: The worst kept secret at Kennedy Space Center has to be the location of the third overseas emergency landing site for Flight 2 of the Space Shuttle.

One site, Air Force Col. Jim Bogart said Sunday, is the U.S. Naval Air Station at Rota, Spain. A second site, he said, is the Hickam Air Force field at Honolulu International Airport, Hawaii.

The location of the third site, Bogart told an informal gathering of reporters, is "not releasable."

But as the reporters quickly pointed out, a space agency press kit plainly states that the third site is Kadena Air Base at Okinawa, an island of Japan.

"The government of Japan agreed to provide an emergency landing area in territorial properties of Japan," Bogart said, carefully.

A slightly embarrassed Hugh Harris of NASA explained, "Japan didn't want a commitment to be a planned landing spot but it was willing to help in an emergency." (TODAY, 11-2-81, p. 10A)

<> Brisk autumn winds coming out of the south could stand in the way of the Space Shuttle Columbia's scheduled launch Wednesday morning, NASA officials said Sunday.

While U.S. Air Force weather forecasts compiled Sunday indicated winds would not be great enough to delay Columbia's second voyage into space at 7:30 a.m. Wednesday,

Kennedy Space Center engineers said they aren't writing the weather off until 45 minutes before liftoff.

That's when John Young, commander of the first Shuttle, will supply a final forecast from a Gulfstream II aircraft 38,000 feet up.

It would take 27 mile-an-hour winds from the south to stand in the way of the launch itself, said Clyde Netherton, chairman of the Shuttle countdown working group.

But Netherton said greater than 11-mile-an-hour winds across the KSC runway also would force engineers to scrub the launch because NASA wants to be well prepared for an emergency landing should the mission fail in the first four minutes after liftoff. (TODAY, 11-2-81, p. 1A)

November 3: Astronauts Joe Engle and Richard Truly arrived in Brevard County Monday "more than ready" for Wednesday's launch of Space Shuttle Columbia.

Waving and smiling to reporters at the Patrick Air Force Base landing strip after their 1 hour, 40 minute flights from Houston in T-38 NASA training jets, Truly said what space center officials were reporting throughout the day -- "the Shuttle is more than ready to go."

U.S. Air Force weather forecasters said the outlook for Wednesday's launch looks "go" too. As of Monday evening, meteorologists were forecasting scattered clouds, 11 to 12 mile-an-hour winds from the southeast and only a 10 percent chance of rain for the 7:30 a.m. liftoff.

"It does look good. Even the weather looks good," said John Young, commander of the first Shuttle flight, shortly after his arrival at the Air Force Base. (TODAY, 11-3-81, p. 1A)

<> All systems remained go yesterday for the second flight of the Space Shuttle Columbia -- which will become the first spacecraft ever to fly twice in space -- scheduled for liftoff from Cape Canaveral at 7:30 AM tomorrow.

The 73-hour countdown for the mission began as scheduled at 1 AM EST Saturday. Final countdown begins five hours prior to launch.

Piloted by astronauts Joe H. Engle and Richard H. Truly, the Space Transportation System-2 (STS-2) mission is scheduled to last five days, four hours and 10 minutes. The Shuttle flew for two days and six hours in its maiden flight April 12-14. (DEFENSE DAILY, 11-3-81, p. 16, Vol. 119, No. 2)

<> Two days before Launch II of Space Shuttle Columbia, a key NASA official had a reassuring message: Don't worry about the tiles.

"We ought to have 100 percent confidence" in the tiles, "And I do," Shuttle test manager Donald K. "Deke" Slayton said Monday.

The tiles, which provide a thermal blanket to protect Columbia from the heat of re-entry, were a major cause of concern before and during the spaceship's maiden flight last April.

Despite some broken tiles, and one missing, the blanket of 30,752 tiles did its job. Re-entry was cool and smooth.

At a pre-launch briefing Monday, Slayton was asked about the status of a repair kit that was being prepared should tiles fly off during future flights.

"I don't know if we're doing anything more about it . . . not," he said. "In my opinion, worrying about the tiles is kind of like worrying about the wing spar. You know you don't carry spars (a part which supports the wing) when you go flying.

"...The problems you can get into going out (of the spaceship) to try to do tile repair are astronomic, and we ought to be able to guarantee the crew they don't have to worry about that subject," he added.

"So, I would hope we're not messing around with tile repair kits. But that's just my personal opinion and not necessarily NASA's. I don't know what they're doing with the tile repair kit." (TODAY, 11-3-81, p. 5A)

<> Although fewer Shuttle watchers will jam Kennedy Space Center for Wednesday's launch than in April, law enforcement officials still are preparing for the same problems -- crowds and traffic.

But officials say they don't expect as many crowd problems because the number of visitors receiving precious passes to the space center has been cut almost in half. Only 45,000 passes will be issued this time, compared with 85,000 for Columbia's first liftoff.

But many law enforcement agencies throughout Brevard County are beefing up patrols in an effort to make all that Shuttle traffic flow a little easier before and after launch. (TODAY, 11-3-81, p. 1B)

November 4: The space shuttle spawned a new industry Tuesday: acid-rain car covers.

NASA concessionaires hawked the elastic-edged, plastic covers from the back of a beige panel truck in the press area parking lot. At \$20 each, sales were slow.

"I don't know what they're for, really, I'm just selling them," said Doris Yost, a NASA gift shop employee.

The covers are supposed to protect vehicles from hydrogen chloride fallout spewed by the shuttle during launch. When the chemical residue combines with moisture in the air, it forms hydrochloric acid.

The acid is fairly weak but NASA scientists say it is potent enough to damage the finish on cars, make your eyes burn, or irritate the throat and lungs. (SENTINEL STAR, 11-4-81)

<> The Shuttle Columbia is Go. Astronauts Joe Engle and Richard Truly are Go. Kennedy Space Center launch crews are Go. But the weather can't seem to make up its mind.

A confident Columbia flight test manager Deke Slayton gave a "better than 50-50 chance" the Shuttle will thunder from its pad into space today, but he said gathering clouds and a chance of rain in this morning's forecast could threaten a punctual liftoff of the world's only reusable spacecraft.

"We don't expect a solid cloud deck. We'll be looking for holes in the clouds," said Slayton, who added the launch team would be satisfied with patches of blue and good visibility at the runway and pad.

"It could be a pilot's decision on the weather," Slayton said.

A U.S. Air Force forecast late Tuesday night indicated a 30-45 percent chance of rain in the early morning hours. "I think we're going to get some rain but I don't see it affecting the launch by 7:30," said Pat Mongillo, KSC emergency preparedness officer. (TODAY, 11-4-81, p. 1A)

<> Academy Award - winning director and popular actor Robert Redford said he came to watch the second launch of the Space Shuttle Columbia because he's interested in the marriage of the human spirit and the future of human values.

"With our advanced technology, we're to the point where we have to be impressed with what's happening," Redford said.

Redford said he is both frightened and fascinated by the possibilities the Shuttle offers.

"I'm frightened by the part that's computed, that can't be experimented," Redford said.

But, he said, he feels fortunate in coming to Kennedy Space Center and seeing for himself that which is the face of the future.

"The more you see and understand what it means...the more it means to our particular future."

Redford is interested in this second launch, he said, because of its studies of air pollution, air quality and the ocean. (TODAY, 11-4-81, p. 5A)

<> The problem-plagued Space Shuttle Columbia stood up thousands of disappointed space fans Wednesday morning after coming a suspenseful 31 seconds to liftoff. NASA won't attempt another launch for at least a week.

It was a dirty oil filter and not the weather NASA officials were worried about earlier in the week that prompted Shuttle launch director George Page to scrub the liftoff at 9:35 a.m.

Late Wednesday afternoon Mike Weeks, NASA's acting associate administrator for the Shuttle program, said the space agency would need a week to either repair or replace two of Columbia's Auxiliary Power Units.

The hydrazine-fueled units help steer the thrust of the Columbia's main engines during launch and operate the landing gear and flight control flaps on the wings.

Engineers said they believe either hydrazine or water leaked into the two power system gearboxes and mixed with a lubricant, "causing a waxy substance to form which may have clogged filters in the system," said Hugh Harris, NASA spokesman.

NASA officials said late Wednesday they are considering two options for getting the Columbia back into operation.

Engineers either will drain the lubricants from the gearboxes, flush the system and reservice it, or they'll replace the power units so the Shuttle can fly while NASA studies the faulty parts on the ground.

Weeks said NASA management teams will make that decision within a few days, after engineers can get a look at the complete auxiliary power system. (TODAY, 11-4-81, pp. 1A & 14A)

November 5: Dick Smith's mind was made up.

Smith, Kennedy Space Center director, flashed a thumbs down gesture, ending the suspense that had flickered through the glass-enclosed Launch Control Center since hours before dawn Wednesday.

"I say scrub it," he said softly.

Computers wound down, earphones were yanked off and hands reached for telephones at the space center's firing room.

What started as a flawless countdown ended with a delay of about a week, NASA officials said late Wednesday.

Wednesday was an on-again, off-again day after 7:25 a.m., only five minutes before NASA expected to launch its encore flight of the Columbia.

Before 7:25 a.m., Smith's face was marked with a confident smile as his headphones clattered with words from the Shuttle astronauts, from Houston and from the tier below full of engineers. He and other top officials sat in a locked, glass-plated room with their backs to the Shuttle and their faces to about 75 specialists hidden behind pale blue computer consoles.

The smile, and the confidence, soon faded. (TODAY, 11-5-81, p. 4A)

<> Walter Cronkite paused, sweet roll in hand, to expound his views on space transportation.

It was a little after 5:30 a.m. Wednesday, still dark and the former anchorman was eating a catered breakfast on paper plates in the CBS press box, a large trailer at Kennedy Space Center.

The pre-launch breakfast was scheduled to start at 6 a.m. and although Cronkite would not lead CBS' coverage, aides were urging him to make-up for his spots as a special

correspondent. Except for Columbia's maiden voyage last April, he has covered every one of America's manned space voyages.

Cronkite, who turned 65 the day of the delayed launch, said he will function as the "old expert" for the Shuttle's second flight.

"I expect they're tolerating me, not exploiting me," the fatherly institution grinned.

CBS excluded Cronkite from the first launch shortly after he joined the board of directors of Pan American World Airways. Cronkite accepted the position a few days after his March retirement from the helm of The CBS Evening News -- a position he had held for 18 years.

There's "no bitterness," Cronkite said candidly. "I thought the decision was little bit harsh but I had to agree with it. It was kind of my own mistake and not anybody else's."

The revered journalist resigned from the board last month rather than restrict his reporting of the U.S. space program. (TODAY, 11-5-81, p. 5A)

<> The extended hold slapped on Columbia's launch a mere 31 seconds before liftoff sent hundreds of Shuttle watchers at Kennedy Space Center in a search for snacks and refreshments.

With word of a long delay, the 3,500 people at the VIP site headed for the food and drink stands in hopes of passing the time with some sustenance.

But they found the concession cupboards pretty bare.

Food director Bob Jennings of Canteen of Florida, the space center concessionaire, said the 1,300 sausage and biscuit sandwiches hauled in to feed the hungry crowd also were gobbled up.

Jennings also found his 2,880 Cokes in short supply. All 1,500 fruit pies were sold -- even the last broken one which went for half price at 25 cents.

Also devoured early at the site were 1,000 packages of cheese, Jennings said.

The concessions weren't the only places for lines. Long waits at the portable toilets also were common. At 8:20 a.m., 35 men and 42 women were standing in lines at the portables. (TODAY, 11-5-81, p. 4A)

November 6: Contrary to local reports, the Space Shuttle lifted from its launch pad two days ago "atop a plume of blue-white flame."

So says the launch agency -- a major Detroit newspaper!

The above quote may not be exact, but the Detroit News did have these Page One headlines Wednesday morning:

"Columbia does encore"... "A perfect launch"!

In its haste to meet a printing deadline, the newspaper somehow made the wrong choice of two stories that had been pre-written -- one for a scrub, the other for a launch.

"It didn't take long for 30,000 copies to come off the press and go out on the trucks," said a former TODAY staff member now living in Detroit. We phoned him yesterday after Southern Bell executive Lee Matteson tipped us off to what he'd just heard.

A photo of the front page of the News appeared in yesterday morning's Detroit Free Press, which headlined its own story: "The News knows it printed 30,000 wrong papers."

Some of those got into circulation. We couldn't get to talk to the News's managing editor to find out just how many.

But the News sure did try to recall the liftoff papers.

"They were trying to shoot the tires off the trucks" to get them to stop the delivery, our man said. We assume he was joking. (TODAY, 11-6-81, p. 1B)

- <> With NASA still uncertain about a new liftoff date for the space shuttle, work crews built platforms in the rain Thursday and prepared to analyze oil in the crippled Columbia's auxiliary power units.

The weather remained rainy and windy here as workers were expected to sample the units to determine the degree of contamination in the lubricating oil. Clogged oil filters in two of the three units, which power Columbia's guidance system on landing, forced the cancellation of Wednesday's launch. (SENTINEL STAR, 11-6-81, p. 1A)

- <> A cocoon of steel scaffolding surrounded the space shuttle Columbia as launch crews went back to work Thursday on the grounded spacecraft and Kennedy Space Center officials turned a wary weather eye on Hurricane Katrina.

Launch Director George Page said it would be at least Saturday before officials would know how long it would take to correct the oil contamination problems that halted Wednesday's scheduled launch of the reusable spacecraft.

Page said that the second flight of the Columbia would probably not be possible before next Wednesday and might be delayed until the following week if workers must replace the auxiliary power units that forced the postponement.

Severe weather could add to the delay. Page said that Hurricane Katrina's current course did not appear to pose any threat to work at Launch Pad 39A, but he said space center officials were monitoring the storm's progress. (THE MIAMI HERALD, 11-6-81, pp. 1A & 18A)

- November 7:** A new launch date for the second shuttle mission was expected to be announced today after NASA technicians finished an analysis of the oil in Columbia's power system.

Space agency officials hoped the shuttle could be launched as early as Wednesday morning. But liftoff of the historic encore journey could be delayed another week if they decide Columbia's power units have to be replaced instead of just cleaned.

Columbia's next successful blastoff will enter history books as the first relaunch ever of a manned orbital spacecraft.

NASA spokesman Mark Hess said officials have not decided when a new countdown would start in the event a Wednesday launch is announced nor have officials determined how many built-in holds to insert in the 36 1/2-hour countdown, he said.

The holds are used to rest the launch team for emergency decisions, like the one that canceled last Wednesday's launch with 31 seconds remaining.

Meanwhile, work crews inspected the shuttle's twin rocket boosters and fuel tank on launch pad 39A. On the fuel tank, a small amount of insulation was found to be slightly damaged due to icing, Hess said. (SENTINEL STAR, 11-7-81, p. 4-C)

November 8: Space officials Saturday rescheduled the second launch of the space shuttle Columbia for next Thursday.

The two hydraulic system engines that developed oil-pressure trouble seconds before blastoff last Wednesday will be fixed by simply draining contaminated gearbox oil, flushing the system and installing new filters.

"Getting to a Thursday launch is a very tight schedule but one which the mission management team feels can be made," the National Aeronautics and Space Administration announcement said. (THE MIAMI HERALD, 11-8-81, p. 1)

<> ..."Of course we'd like to have flown, but if we had a problem lurking in the bird...we're mighty glad that we found out and held off till we can get it fixed."
--Astronaut Joe Engle, after the delay of Space Shuttle Columbia's launch. (TODAY, 11-8-81, p. 10E)

November 9: National Aeronautics and Space Administration launch team made a last-minute effort here November 4 to override stored launch processing system computer pressure limit criteria for Columbia's fuel cell liquid oxygen system and continue the countdown.

Launch officials were uncertain immediately after being forced to scrub the launch whether to attribute an automatic countdown stop and inability to resume the launch countdown to procedural or software problems.

"I think we will find that the problem is procedural -- that we used the software in a way that was not intended," one engineer said.

One improvement in the launch control processor complex since the initial shuttle launch is the extension of memory capability from 64,000 to 256,000 words of working memory.

This had allowed the use of memory to store all operating formats at one time and call up the appropriate format as needed. (AVIATION WEEK & SPACE TECHNOLOGY, 11-9-81, p. 20, Vol. 115, No. 19)

<> Space shuttle auxiliary power units (APUs), designed as reusable elements to facilitate quick turnaround between missions, became the dominate factor in the postponement of Columbia's second launch. Two of the power units that were not test fired after the STS-1 mission developed lubrication problems.

To facilitate airline-type space operations, the shuttle's Sundstrand APUs are designed for reflight, with refueling the only major service operation between missions. Last week's experience, in which one APU that had been replaced and test fired after the first mission worked properly and the other two did not, will result in reconsideration of how reusable the APUs actually are without oil change and retest after each flight or following long intervals between firings.

The APU that functioned normally had been fired recently because it is a new unit replacing one that malfunctioned in the first flight. (AVIATION WEEK & SPACE TECHNOLOGY, 11-9-81, p. 22, Vol. 115, No. 19)

<> Even though the second Shuttle launch attempt was delayed just seconds before blastoff, astronaut Joe Engle said he is as ready as ever to command the Orbiter Columbia, now scheduled to fly Thursday morning.

"There wasn't ever anybody that wasn't mentally prepared," Engle said Sunday at his home in Houston.

Engle said he felt surprised when the launch was stopped last Wednesday just 31 seconds before liftoff but said, "I'm certainly glad that the problem was found before we were up in the air."

He also said the scrub did not affect his confidence in the Space Shuttle.

"I've never had any lack of confidence in the machine," Engle said.

Meanwhile, Columbia's launch pad was closed to all but essential workers Sunday while the three auxiliary power units that caused the delay were refueled with highly toxic hydrazine. (TODAY, 11-9-81, p. 1A)

November 10: Space officials gave the go-ahead Monday for a second, abbreviated countdown to start this morning, leading to the shuttle Columbia's curtain-call flight.

The clock is to start at 8 a.m., aiming for a 7:30 a.m. Thursday launch of the first spaceship ever to take a repeat trip in orbit.

The first count got to within 31 seconds of liftoff last Wednesday, only to be blocked by clogged filters in two of Columbia's three auxiliary power units.

The units have been cleaned, the spacecraft checked and astronauts Joe Engle and Richard Truly are ready to try again. They will fly here today from their training base at the Johnson Space Center in Houston.

As last week, it appears the weather will be touch and go, with a storm front heading toward Cape Canaveral. Light, intermittent rain was forecast for Thursday morning.

"Right now they're saying the weather should be OK for launch," said space agency spokesman Mark Hess. "That front is expected to move through here on Wednesday and be gone by Thursday."

At the launch pad, Hess said, "everything is running along very smoothly," with pre-count preparations ahead of schedule.

Officials decided that the early portion of the original countdown would not have to be repeated, and instead of a full count with the clock ticking down from 73 hours, the truncated version starts at 35 hours. Three planned holds totalling 12 1/2 hours stretch the count over 47 1/2 hours, compared to 129 1/2 for the original. (THE MIAMI HERALD, 11-10-81)

November 11: With the timing of polished vaudeville comedians, astronauts Joe Engle and Richard Truly returned here Tuesday and quickly lightened any disappointment surrounding the postponement of last week's space shuttle launch.

"We've got to stop meeting out here like this," quipped Truly. He and Engle were greeted for the second time in eight days by a group of reporters, photographers and servicemen after arriving from Houston to prepare for Thursday's launch.

"I'm going to say it one more time -- Columbia is ready. Joe and I are ready. We're going to do it this time." Truly said.

Engle joked to cameramen spread across the airfield at Patrick Air Force Base: "This is it. If you don't get the right pictures this time, it's going to be your last chance. We really are going to go this time."

Engle was referring to last Wednesday's scheduled shuttle liftoff that was cancelled with just 31 seconds remaining in

the countdown when NASA officials discovered unusually high oil pressure in the orbiter's auxiliary power units. (SENTINEL STAR, 11-11-81, p. 1)

<> If any boater is thinking of sneaking into the prohibited waters around Kennedy Space Center for a closer look at the Space Shuttle -- forget it.

The U.S. Coast Guard will be out in full force, along with boats from the Coast Guard Auxiliary, the Marine Patrol, the U.S. Fish and Wildlife Department, and the Brevard County Sheriff's Department.

"People usually understand that (the patrol) is for their own safety," said Lt. Cmdr. Bruce Klimek, in charge of the patrol operation.

"If the Shuttle malfunctions or blows up, we don't want anyone to get hurt," he said.

Basically, the prohibited area includes the east half of the Indian River, the south end of the Mosquito Lagoon, the north end of the Banana River and within three miles offshore between the Mosquito Lagoon to Port Canaveral.

The area is divided into four patrolled sectors: the offshore area, Mosquito Lagoon and Haulover Canal, the Indian River, and the Banana River, Klimek said.

Each sector has at least one Coast Guard boat and three to five auxiliary boats, all staffed by at least three people, he said.

Klimek said a total of 150 Coast Guard people are involved in the operation. (TODAY, 11-11-81, p. 1B)

November 12: After more than 24 hours of holding their breath, Shuttle engineers won a battle against the clock at 12:45 a.m. today and gave a 'Go' for the launch of Columbia no sooner than 10 this morning.

Late Wednesday, the engineers successfully replaced a downed data receiving box near the crew compartment, thanks to the still unbuilt -- and now little lighter -- Shuttle Orbiter Challenger.

- Two of the 36-pound black boxes were flown to Kennedy Space Center at 9:05 Wednesday night from Palmdale, California, where they had been installed in Columbia's successor and sister Shuttle. The boxes were soon installed and working aboard the Columbia.

NASA engineers had their fingers crossed Wednesday night that the space Shuttle Orbiter parts would be the eleventh-hour fix needed to launch the Shuttle late this morning.

Delayed at least 90 minutes from its original 7:30 a.m. launch time, the Columbia's return to Earth orbit depends on whether a suitcase-sized piece of data-receiving equipment works, which was salvaged from the Shuttle Orbiter Challenger.

Earlier Wednesday, engineers found one of seven data-receiving boxes, located near the crew compartment, would not perform backup operations.

The boxes, called multiplexer-demultiplexer units, receive as many as 2,800 different measurements and readings from sensors scattered throughout the Columbia. The boxes translate critical information on the Columbia's health while in space into computer language.

From there the thousands of bits of information are fed to two larger data processing units that organize and relay it to engineers on Earth.

The end result is a neat reading on a computer terminal screen at Houston's Johnson Space Center of things like the status of the Columbia's electrical power cells or temperatures inside the craft.

Although the Columbia could fly without backup systems, NASA wants a fail-safe operation so engineers on the ground won't be in danger of losing valuable information about the spacecraft as it circles the globe 150 miles up.

"The primary system is doing fine. It's a question of tidying up the backup," said L. Michael Weeks, NASA's acting associate administrator for the Shuttle program. (TODAY, 11-12-81, p. 1A)

<> Whether unsure because of last week's launch scrub or bored with it all, many visitors who normally would be jockeying for the best Space Shuttle viewing spots appeared to be staying away Wednesday.

Law enforcement officers spent the day waiting for the traffic crunch that never developed.

Their first brushes with Shuttle-watching mobs in April, when upwards of 750,000 people turned out to watch Columbia's debut, taught them to prepare for a massive onslaught of tourists and residents alike.

Although no one seems to believe the crowd for Columbia's return to space can top the first launch's turnout, officials don't agree on how close the crowd will come to last week's aborted launch, when the crowd was estimated at 300,000-plus. (TODAY, 11-12-81, p. 1A)

<> They could be called Space Age Butlers.

They primp and tuck, dress and undress their "masters," slip on shoes, smooth wrinkles and even stash a sandwich in a spare pocket.

But spacesuit technicians responsible for dressing NASA astronauts prior to a launch do more than give their models the newest high-tech fashions. Overlooking one detail could endanger the astronauts' lives.

Two gold-colored ejection escape suits have been laid out in waiting for Joe Engle and Richard Truly, who will arrive in the suiting-up room of the Operations and Control Building at Kennedy Space Center about 6:30 a.m. today.

A team of suit technicians, including Al Rochford and Jean Alexander, has arrived at KSC from Houston, where it tended to the Engle-Truly team's needs during training.

The suits, with an outer layer of fire-resistant material and an inner layer of netting and rubber, already have been tested and re-tested for dangerous leaks of oxygen.

Engle and Truly will slip into a dressing room where they'll don insulating long underwear. They will then emerge to the spotless but unsterilized "clean room," where they will sit in recliner chairs to change into their 45-pound spacesuits.

Rochford and Alexander, clad in white uniforms and caps to keep the area cleansed, will help Engle and Truly into their awkward garb. Comfort and convenience for the two astronauts are key factors.

"They can do it by themselves," Alexander said, "but it's easier for them with someone helping."

Each astronaut has his personal quirks, which the technicians know and even exploit for the sake of a joke to break the technically overwhelming aura of the hours before launch.

With Engle and Truly, the source of contention was eyeglasses. After days of preparations, technicians couldn't seem to find the right pairs to fit the astronauts. The elasticized bands holding the bifocals were either too loose or too tight, frustrating suit technicians until the glasses sat perfectly on the astronauts' noses.

It became a standard joke with the Shuttle flying duo and the technicians, even on launch day last week. As Engle and Truly readied for their trip to the pad, a suit technician paraded in front of them wearing a floppy overcoat and a pair of huge, plastic, carnival-like sun glasses. He opened the coat to reveal dozens of eyeglasses, offering the astronauts one more chance to buy the pair of their choice.

Forty-four-year-old Rochford, who has suited up astronauts since 1960, enjoys the friendly banter he has exchanged with the astronauts, including Wally Schirra in the Gemini days and Alan Shepard in Apollo 14.

Rochford has helped the flying crews through years of training and donning off-the-shelf spacesuits up to the point where he drops them off in a van at the launch pad before takeoff.

"You have to develop a rapport with the crew. You have to build up a confidence level," he said.

While Rochford remembers the experimental bygone days of spacesuits with clumsy zippers, Alexander can relate only to the Shuttle days.

Alexander applied for the suit technician job 1 1/2 years ago after working as a NASA secretary. The 36-year-old woman is the only female in the space agency's suit-up team.

"They wanted a woman to make the women astronauts more comfortable," she said.

Alexander said her talents were minimal when she was selected -- she had some mechanical ability, which means only that she knew how to turn a wrench and screwdriver. But after more than a year of on-the-job training in Houston, she is ready for her first manned launch today.

Most of the technical aspect of the suiting-up process was completed about 72 hours in advance, when the suits were hooked up to consoles which checked for air and oxygen leaks.

The suits' multiple pockets were filled with a pen and pencil, a flashlight, eyeglasses, a calculator, head set, air sickness bag, knife and even a frozen sandwich to ease hunger if a delay comes up in the launch countdown.

Emergency survival kits were double-checked by technicians and stowed inside the Shuttle Orbiter. And helmets were tested to ensure the astronauts could properly communicate with ground control.

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"We just make sure everything is where it's supposed to be," Alexander said. "We're troubleshooters."

The technician team then took off early Wednesday afternoon to rest before returning to prep the suiting room several hours before launch.

Few problems come up at launch time, Rochford said. The only delay in the first launch occurred when a leak was discovered in Young's helmet. The defective helmet was replaced with a stand-by model.

After helping Engle and Truly dress today, Rochford, Alexander and one other co-worker will keep the astronauts from overheating in the heavy suits as they are driven from the Operations and Control Building to the launch pad.

The crew has 40 minutes to tend to Engle and Truly before they must be completely suited up and ready to depart for their spacecraft.

Booties will be slipped over shoes worn by Engle and Truly to ensure no dirt is trailed into the Orbiter. Their helmets and gloves will be brought to them as they are strapped into their ejection seats.

Alexander will stay in the Operations and Control Building while Rochford accompanies the astronauts to the pad. On arrival, Rochford will hand over spare ventilators and other equipment to suit technician Ron Woods, stationed at the launch pad.

And that -- the suit technicians hope -- will be the last they'll see of Engle and Truly before the two become space-tested veterans returning to share their memories. (TODAY, 11-12-81, p. 3A)

November 13: When a long-awaited goal finally looms in sight, it often loses its allure on arrival, winding up as a white-washed, anti-climactic dud.

But the Columbia, although a patience-tester, was definitely no dud Thursday morning.

The spaceship gave a repeat performance that rivaled its debut, stunning first-time viewers and renewing inspiration in veteran space watchers.

Pessimism and anxious glances at the sky disappeared, replaced with weak-kneed leaps of excitement, raised fists urging the gleaming white ship forward and shrill hoots and whistles of widespread well-wishing.

"Oh, my God. It's like an earthquake," said Kitty Carpenter, 25, of Seattle, as the hefty Columbia's liftoff made the ground tremble along the Indian River.

The Shuttle raised itself up (with the help of NASA officials) on its spiral of smoke and brilliant orange flames, seeming to pose dramatically in midair for the hundreds of media cameras aimed in its direction.

It then coyly disappeared into a thin stream of clouds, reappearing moments later to draw further applause from its audience below. Then it was gone. Seconds later, NASA spokesman Hugh Harris announced it was already approaching Spain.

Thursday's spectacle was the shortest show on Earth -- or above Earth -- but none of the gathered onlookers seemed to leave disappointed.

"The thrill of it going up -- even if it was such a short time -- will last forever," said Scott Bachman, 21, a University of Florida senior, as he watched along the Indian River in Titusville. (TODAY, 11-13-81, p. 4A)

<> An off-shore wind protected Shuttle viewers from a cloud of acid fallout left behind when Columbia blasted off launch pad 39A on Thursday, a space agency spokesman said.

When the Shuttle was scheduled to fly last week, NASA set up car washes and sold plastic car covers to protect automobiles from a possible cloud of contaminants consisting of aluminum with hydrochloric acid attached.

VIPs were moved an extra half mile from the launch site because of the potential acid mist, but the press was left only 3 1/2 miles from the launch site to watch at their own risk.

But this time, said Don Zylstra, favorable winds eliminated the pollution problem "unless you were out there in a fishing boat."

He said: "A north wind carried it (pollutants) away from the launch pad and press viewing sites."

If the winds had been from the east, however, the press may not have been so fortunate. Neither would their cars, as hardly any vehicles in the press parking lot were covered.

But one CBS camera crew came prepared with large plastic trash bags. "You know all those car covers," a cameraman said, "I brought body covers." (TODAY, 11-13-81, p. 3A)

<> ...A faulty fuel cell forced Mission Control on Thursday to consider bringing Columbia astronauts Joe Engle and Richard Truly home on Saturday, instead of the planned return on Tuesday.

Columbia does not face an emergency situation as the two previous U.S. crews did. The ship has two healthy fuel cells, but mission rules dictate that with one fuel cell out Engle and Truly do as many high priority assignments as possible in 54 hours.

NASA said it is possible the mission could go the full five days if the other fuel cells stay healthy. (TODAY, 11-13-81, p. 3A)

<> Columbia's two spent solid rocket boosters splashed down in the Atlantic Ocean about seven minutes after Thursday's launch, but rough seas delayed their recovery by NASA ships.

The 93-ton reusable rocket boosters were bobbing in 12-to-15 foot seas. The ocean was too choppy for divers to go into the water to attach an air hose, called a barb, to the boosters with air so they could be towed back to Port Canaveral, said a spokeswoman for the manufacturer, United Technologies.

The boosters will be refurbished and refilled for use on a future Shuttle flight. The Orbiter Columbia -- the part of the Shuttle that resembles an airplane -- also is reusable, but the spaceship's dominating external fuel tank is not. The tank broke up in the atmosphere and pieces fell into the Indian Ocean.

Radios aboard the boosters helped two NASA vessels find the boosters floating about 158 miles from Kennedy Space Center within an hour after they dropped from the Shuttle, said Sue Butler of United Technologies.

The boosters burned for 2 1/2 minutes before separating from the Columbia on takeoff. As they separated, six parachutes opened to control their descent back to Earth.

Fifty workers aboard the Liberty and Freedom retrieved the parachutes, and planned to hook up the boosters at daybreak today and tow them to Port Canaveral. (TODAY, 11-13-81, p. 3A)

<> One last time, nine minutes before liftoff, launch director George Page held the countdown clock. "Let's take our time and do it right," he told his crew. They did, and blastoff was brilliant.

The delays, the problems, the frustrations will never make the history books. Columbia, soaring once again, did -- the first spaceship ever to return to orbit.

As he surveyed his launch team, Page recalled the power unit problem that stopped the countdown eight days ago, just 31 seconds before liftoff. And the eleventh-hour repair job, completed just after midnight, that made possible a Thursday flight.

"We should have come out of that hold at T-9 minutes before liftoff on time," Page said later. "Except, looking around, I was a little concerned that a lot of people were real anxious to go, and I thought it might be good just to take our time and review any problems we might have and give the guys a chance to catch their breaths."

"We'd been pushing pretty hard there," he said. "We had no magic window to make. It took just 10 minutes. It was a beautiful liftoff."

Columbia cleared its launch tower, and the Kennedy Space Center team had done its job. Crews will clean up the pad and await Columbia's return here in about two weeks -- and then ready the ship for Flight III next March. (TODAY, 11-13-81, p. 7A)

<> Some things might be better the second time around, but not for the hundreds of journalists who descended on Kennedy Space Center Thursday morning.

Only eight days had elapsed between the mission's first scrub and Columbia's liftoff, and the normally prolific press was searching for something new to say.

"It's coming up with a fresh story," said Derek Hayward of television station WTVL in Jacksonville, who was also working on a story about the media. "We already came up with a good one a week ago. If it's delayed again..."

Hayward said finding a new angle is even more difficult for a local station because the New York networks cover the Shuttle launch so thoroughly.

Although NASA reported about 2,400 journalists picked up their security badges, the space agency said it had no way of knowing how many actually showed up for the launch. (TODAY, 11-13-81, p. 5A)

<> On October 9 TODAY editorially called upon the Brevard County Commission to give a proper designation to the nameless road that serves as the main approach to the Kennedy Space Center from I-95 in North Brevard.

On November 5, the commission officially designated the five-mile long divided thoroughfare Columbia Boulevard, to permanently commemorate the name of our nation's first Space Shuttle. (TODAY, 11-13-81, p. 14A)

November 14: Although California's Edwards Air Force Base will lay claim to the Columbia today, its undeniable home is Kennedy Space Center.

And the spaceship will be coming back home possibly as soon as Nov. 24 -- giving NASA workers something to celebrate over their Thanksgiving holiday two days later.

The Shuttle Orbiter will be clamped onto a souped-up Boeing 747 and returned so its proud work crews can ready their masterpiece for a possible March 20 third launch.

The third launch, previously scheduled for March 1, has been pushed back to no earlier than March 20 because of the second delay-plagued mission, said NASA orbiter project engineer Gene Thomas.

Bringing the Shuttle up to a launchable level took seven months last time. This time, NASA will have four months based on preliminary scheduling.

The dates are strictly speculative, Thomas added. (TODAY, 11-14-81, p. 3A)

<> A woman barked commands to a manned American spacecraft for the first time Friday, and the astronauts said it sounded "mighty good."

Sally Ride, the first woman to serve as a "cap-com" -- a capsule communicator -- instructed astronauts Joe Engle and Dick Truly from Mission Control as the Shuttle pilots unfolded the ship's robot arm for its first test.

In the first exchange, Truly said, "OK, Sally, we got the arm secured right now. We've got the power on and we're getting ready to turn it on."

Ride: "OK. Sounds good."

Truly: "You sound mighty good too."

Once the arm was successfully deployed, Ride, 30, told Engle and Truly, "OK. That sounds great, and you guys do good work."

Most of the talk was highly technical as the astronauts went through a step-by-step deployment of the \$80 million, Canadian-built arm. Ride has a doctorate in physics specializing in astrophysics and has worked extensively with the Remote Manipulator System, the official name of the device.

"She's an astronaut, she's articulate and she's very familiar with the remote manipulator," said NASA spokesman John Lawrence. "We needed someone who had worked with the system and could talk knowledgeably about it."

Ride is a native of Encino, California, and was one of the first six women accepted into the U.S. astronaut corps in 1978. (TODAY, 11-14-81, p. 3A)

<> While the Columbia was experiencing some spacebound problems Friday, the earthbound launch pad at Kennedy Space Center was left virtually unscathed despite the thunderous thrust of the spacecraft's engines.

After a preliminary look at Pad 39A, NASA officials said structural damage was mainly limited to loss of some fire bricks from the flame trench beneath the Orbiter and destruction of a screen on the pad's external tank arm.

Fist-sized yellow-stained chunks of the bricks were thrown more than 500 feet against a barbed wire fence surrounding the pad.

Another fatality was a television camera stationed by NASA on top of the flame trench and demolished by the Columbia's firey takeoff.

"There's very minimal damage; very superficial," said Merle Oakley, lead design engineer for the launch pads.

"The rest is nothing that can't be washed off and painted up," he said. (TODAY, 11-14-81, p. 10A)

November 15: The television set at Kennedy Space Center was just another tourist attraction Saturday.

Clutching dripping ice cream cones, paper bags of NASA paraphernalia and instamatic cameras, about 500 visitors to the space center gathered around televisions to placidly watch the Shuttle Columbia screech to a halt 3,000 miles away in California.

A few seconds of applause and some wondrous "whoos" rang out at the visitors' center, and a few proud smiles shone through. Then the crowd quietly dissipated.

The exuberance so manifest two days earlier when the Columbia's 6.4 million pounds of thrust gracefully pushed the spacecraft skybound just wasn't to be found at the space center Saturday.

But then again, the launch was live, right in front of the tourists' awed faces. Sending a postcard home sayin' "I was there for the launch," was much more thrilling than mailing one saying "I was at Kennedy Space Center watching the landing on TV." (TODAY, 11-15-81, p. 3A)

<> As Columbia neared its return Saturday, NASA workers were still trying to recover two solid rocket boosters from the Atlantic Ocean off Cape Canaveral, where they have drifted since helping to send the spaceship aloft.

The reusable painted steel canisters were drifting in rough seas about 120 miles from Kennedy Space Center -- about 50 miles closer to shore than the spot where they landed Thursday after peeling away from the Shuttle following the launch.

Recovery divers made "some progress" Saturday as they inserted an air hose called a barb into one of the casings, but they were having difficulty with the second booster. Both must be filled with air so they will float log-like, said Sue Butler, spokeswoman for the manufacturer, United Technologies. (TODAY, 11-15-81, p. 3A)

November 16: Transfer of space shuttle mission control responsibilities from the Johnson Space Center, Houston, to the Kennedy Space Center, Fla., in order to reduce operational costs and make more efficient use of manpower is being discussed with top shuttle managers by Hans M. Mark, deputy administrator of the National Aeronautics and Space Administration.

Mark raised the transfer issue in a NASA internal long-range planning document that was followed by discussion with other headquarters officials.

He characterized the transfer concept as "food for thought" that would stimulate debate.

The document discussed transfer of mission control as early as 1984, but Mark said the actual intent of his comments is to orient the agency thinking toward transfer of mission control to Kennedy if NASA is able to begin operation of large manned platforms or a space operations center in about 10 years.

"No matter how the matter of shuttle operations is finally decided, the Johnson Space Center should phase out of the operational mission during the next three years," according to the advanced planning outline written by Milton Silveira, special assistant to the deputy administrator, and Mark.

"It is very unlikely that it will be possible to control costs of operations if the developmental attitudes that prevail at the Johnson Space Center dominate after space shuttle becomes operational," the outline said. "The operations of the space shuttle, both launch as well as mission control, should be handled by Kennedy Space Center and by Vandenberg AFB, once the West Coast launch facility is complete."

Mark said he believes the transfer of significant Johnson responsibility to Kennedy would become a manpower issue if current manned space station/platform concepts are approved. "This is to start people arguing about the issue. It needs to be discussed in public, and anybody who doesn't want to argue it in public is not participating adequately in the policy discussion," Mark said. (AVIATION WEEK & SPACE TECHNOLOGY, 11-16-81, p. 16, Vol. 115, No. 20)

- <> Contamination in the lubricating oil in two of the three auxiliary power units in the orbiter Columbia would not have affected APU operations if the launch had gone as planned November 4, according to two independent laboratory chemical analyses of the oil.

The second space shuttle launch was delayed because it was feared that pressure buildup in the APU oil lubricating system signaled a potential danger that could become acute on reentry by causing a malfunction in APU startup. However, chemical analyses here and in Rockford, Illinois, where Sundstrand manufactures the units, showed that most of the contamination would have returned to solution -- would have melted -- as the units continued to warm for operation.

The basic concern was that the contamination would plug some of the 10 small jet orifices through which oil is sprayed into each of the APU gearboxes. This oil is used both to lubricate and cool the gearboxes in each of the three APU's. (AVIATION WEEK & SPACE TECHNOLOGY, 11-16-81, p. 24, Vol. 115, No. 20)

- <> Countdown to launch the orbiter Columbia on its second mission absorbed 2 hours 11 minutes of unplanned hold as the count proceeded. The critical ground launch sequencer measurements that caused the launch to be delayed from November 4 to November 12 performed without anomaly.

The biggest problem that developed in the count was a malfunction of one multiplexer/demultiplexer in the orbiter that is part of the data processing system that relays sensor information from the orbiter to ground stations. (AVIATION WEEK & SPACE TECHNOLOGY, 11-16-81, p. 26, Vol. 115, No. 20)

- <> The surprise failure of one of the three electricity-and-water-producing fuel cells on the Space Shuttle Orbiter Columbia soon after launch Thursday was the reason "Friday ordered the flight cut to a "minimum mission" of 54 hours, with landing Saturday afternoon at Edwards AFB, California.

Although normally only one or two of the fuel cells are used at any one time on the mission, rules set in advance of the launch require that if one is out, the mission must be cut

to 54 hours from the planned five days-plus. NASA evaluated an extension of the flight Friday before officially announcing the minimum mission decision.

NASA said that the STS-2 fuel cells, all new, are similar to those used on 25 previous manned U.S. space missions and had never failed before. (DEFENSE DAILY, 11-16-81, p. 75, Vol. 119, No. 10)

<> A snapped towline and rough seas hampered the recovery operation but one of Columbia's two solid rocket boosters was pulled into Port Canaveral early Sunday night.

The other booster that helped send the Shuttle into space Thursday remained in the Atlantic Ocean late Sunday but was expected to be towed into port early today.

Once the boosters are towed into port and anchored by the ships, they pass through the port's locks and up the Banana River to the hangars at the Poseidon dock near Cape Canaveral Air Force Station, where they are then pulled out of the water. (TODAY, 11-16-81, p. 10A)

November 17: After four days of bobbing and drifting in an unusually rough Atlantic Ocean, Columbia's second reusable solid rocket booster was brought into Port Canaveral Monday morning.

The two boosters would normally be brought in together but the rough weather held up operations for such a long time that as soon as the first booster was attached to the towline it was hauled in. (TODAY, 11-17-81, p. 8A)

<> With its perfect landing of the Space Shuttle Columbia Saturday, the excellent condition of its insulation tiles and the successful test of the Remote Manipulator System, as well as operation of the OSTA-1 scientific payload, NASA's Space Transportation chief Michael Weeks said Saturday that he considers the mission 90 to 95 percent successful. (DEFENSE DAILY, 11-17-81, p. 83, Vol. 119, No. 11)

<> George Page, NASA's Shuttle launch operations director, says that he believes the minimum turnaround that can be achieved with the Space Shuttle is between 5 and 8 weeks. The Shuttle was designed for a two-week turnaround, but it has become evident that a longer time will be needed. (DEFENSE DAILY, 11-17-81, p. 85, Vol. 119, No. 11)

<> America will have the capability to knock enemy communications satellites out of the sky with a high-powered laser beam by the end of the century, predicts the Air Force general who heads the Shuttle program.

"It would be Buck Rogers style. We're working on that zapping capability now but the laser's pointing and tracking has to be sufficiently mature," said Major General James Abrahamson, who assumed the post as NASA associate administrator for the Shuttle program Monday.

Abrahamson, who will be officially sworn in next Tuesday, replaces L. Michael Weeks. The Washington-based official was interviewed exclusively by TODAY during his visit to Kennedy Space Center last week.

The Defense Advanced Research Projects Agency should decide by January how it will spend about \$500 million allocated for high-energy lasers that could defend U.S. satellites or shoot down enemy ones.

He said while the Shuttle itself might not be armed with such a laser, it would probably carry the device partly to its orbit.

Hoisted by the robot arm from the Shuttle's payload bay, a small Air Force rocket would actually launch the laser gun into a higher Earth orbit thousands of miles up.

Abrahamson said he wants to keep Shuttle payload secrets out of the hands of the Russians but that may mean Americans will have less access to what traditionally has been an open space program.

It's a fine line, he said, "but frankly there will be some restrictions on access." (TODAY, 11-17-81, p. 1A)

<> Most excited guy we saw the day the Shuttle launched:
ex-NASA bigshot Miles "Mike" Ross. He was deputy director
of Kennedy Space Center for seven of his 10 years there.

Mike resigned in 1980 to be European regional manager for
TRW International, headquartered in Brussels, Belgium.

"It's the first manned launch I've ever seen from outside,"
he told us at the fall reunion that night of the Missile,
Space and Range Pioneers. "It was just great!"

Mike had always been in the Launch Control Center or other
operational area and viewed the launches on TV screens.
(TODAY, 11-17-81, p. 1B)

November 20: The library of the future is here at KSC today.

Sure, it has the familiar stacks of books, racks of
magazines and newspapers, and our favorite library
institutions -- the card catalog and Readers Guide.

But there's something else here that is not so obvious --
the computer.

New computerized information systems recently acquired by
the KSC library are putting vast amounts of data at the
fingertips of librarians and users. This is in addition to
the on-line aerospace technical information system which has
been available here for many years.

Bibliographic searches that used to take hours, sometimes
days, to complete manually can now be completed in minutes,
thanks to the new computer data bases which can be reached
from KSC on special terminals.

The KSC library added the two new data bases to its existing
ones this summer. The first, called Department of Energy/
RECON, is an on-line system providing rapid and easy access
to energy information stored at the Department of Energy's
Technical Information Center in Oak Ridge, Tennessee.

The second new data base is called the Chemical Information System.

It gives the user quick access to basic information about a particular chemical or compound. The information supplied includes things such as molecular structure, other names the chemical is known by, exposure limits, safety, toxicity, disposal methods, transportation and handling procedures. A listing of other sources of information is also displayed.

The Chemical Information System and the DOE/RECON data bases are being used by specialists here at KSC but some organizations which might benefit from the new library services may not be aware they're available, said New World Services' Project Manager Vince Rapetti.

The terminals for accessing the data bases are housed in the documents department across the hall from the library reading room. And if you want to find out more about the capabilities of the system, Bill Cooper, head of the department documents, is the person to see.

There's another data base with far broader applications soon expected to be on-line at KSC. It's Lockheed's DIALOG system and it provides users access to a collection of bibliographic data bases in science, applied science and technology, social science and humanities, and business/economics.

According to an article in the October issue of the Futurist, such services will be commonplace in the libraries of the future. Already, there are about 70 million bibliographic records readily available on-line and nearly 10 million more are being added each year.

"On-line retrieval can closely approach the desirable ideal of putting the inquirer instantly in touch with a substantial part of mankind's collective memory," wrote two British researchers in a book describing the 189 existing on-line bibliographic data bases. (SPACEPORT NEWS, 11-20-81, p. 3, Vol. 20, No. 23)

<> The orbiter Columbia was not the only piece of Space Shuttle hardware to be reused during STS-2. Some parts of the twin Solid Rocket Boosters (SRBs) had been used before.

None of the parts had flown in space during STS-1, but a surprising number of parts were used during the seven static firings of early motors. Seven such static firings were conducted as part of the development and qualification programs at Thiokol's Wasatch Division in Utah.

The nozzle flex bearing on STS-2's left SRB has, in fact been used three times in the past, during firings of development motors one and three, and on qualification testing motor number one.

In addition, two of the cylindrical case segments on the left booster were previously used on development motor number 4.

The right hand SRB was also made up partially of used parts. Two of its cylindrical case segments and an attach segment were used during the test firing of development motor number four.

The first portions of the SRBs used during STS-1 may be reflown as early as the sixth flight of the Columbia, and other parts will be used in subsequent flights. (SPACEPORT NEWS, 11-20-81, p. 8, Vol. 20, No. 23)

November 21: Delays in purging the Space Shuttle Columbia's maneuvering engine fuel tanks at Edwards Air Force Base, California, has had a minor ripple effect.

The reusable spaceship's two-day trip to Kennedy Space Center, originally scheduled to start Monday, has been pushed back to Wednesday at the earliest.

And the Columbia, riding piggyback atop a 747 aircraft, won't touch down on KSC's Shuttle runway until midday Thursday, said Dick Young, NASA spokesman.

The problem, said Les Rienertsen, NASA spokesman at Edwards, "is the earlier than expected return." (TODAY, 11-21-81, p. 10A)

November 23: RCA's Satcom-IIIR domestic communications satellite was successfully launched at 8:37 PM EST, November 19, from Launch Complex 17 at Kennedy Space Center by a McDonnell Douglas Delta 3910/PAM-D vehicle. (DEFENSE DAILY, 11-23-81, p. 114, Vol. 119, No. 15)

<> Amid the scrubs and holds that punctuated the space shuttle orbiter Columbia's second flight in space -- and the inevitable speculation about its spaceworthiness -- one fact is plain. Columbia's second flight itself was ample demonstration that the concept of a reusable space launch vehicle is technically feasible.

The question raised by the entire process -- the scrubbed launch and the minimum length mission -- is whether four test flights are enough to shake down the shuttle before it goes into operational service. Orbital flight testing for the shuttle was compressed as shuttle costs rose, program delays lengthened and the pressure to show some return for the enormous investment in the reusable launch system became overpowering. Columbia's second flight, though not the cripple it may have been painted in the public eye, does emphasize its research and development phase and the wisdom of thorough seasoning in test. (AVIATION WEEK & SPACE TECHNOLOGY, 11-23-81, p. 11, Vol. 115, No. 21)

<> Approximately 20,175 spectators viewed the second space shuttle launch from National Aeronautics and Space Administration grounds here November 12. Another 10,000-12,000 watched the launch from Cape Canaveral Air Force Station, and estimates of public viewers off government land ranged up to 250,000.

NASA spectators numbered about half those present for the first launch April 12. Approximately 25,000 viewers were at Kennedy November 4 when the launch was scrubbed. Most of the congressional delegation here November 4 opted not to return November 12. The same was true of personalities from stage and screen.

NASA said the presence of the shuttle system here has worked to make this year the highest in attendance at the visitors' center since it was established in 1966. Attendance is up 27% over last year and the total expected to visit before the end of the year is 2 million. (AVIATION WEEK & SPACE TECHNOLOGY, 11-23-81, p. 19, Vol. 115, No. 21)

<> Overpressure and sound suppression modifications made to Launch Complex 39A survived the second space shuttle launch November 12 without damage. A full-scale test of the modified water system was conducted successfully 30 hours after launch.

All reports of pad damage as of the middle of last week indicated it was "a little lighter than on the first launch," according to George W. Warren, National Aeronautics and Space Administration site manager. He added that some local areas were hit more seriously, but in critical areas such as cable tray lids, mobile launch platform and fixed service structure, damage was relatively light.

"A half-dozen missions will go off before most areas on the complex will be tested," Warren said. The damage will affect different areas with each launch.

The overpressure piping that surrounds the solid rocket booster flame holes was an area of concern because it had not been tested with a full-scale system before flight. This piping was designed to cascade water into flame holes to suppress noise and deflect ignition overpressure from solid rocket boosters, which had caused an unexpected pressure spike on the first shuttle launch April 12. The overpressure could be critical because it approached design limits on some shuttle attachment points with a measured value of 2.5 psi. on the first flight. Early data, Warren said, show the spike was reduced to 25% of what was experienced on STS-1.

Water bags, which were placed across the flame holes as a trough, parted and were demolished as expected when struck by pressure from the booster ignition. "The only thing that remained was a little bit of the parachute cord" that secured the bags to the mobile launch platform.

"Shreds of the bags were all over the place," Warren said.

There was some surface erosion on the galvanized water pipes, and ablative material on some mechanical joints of the pipes was blown away.

Solid rocket booster hold-down posts were replaced after the first launch, primarily to assess if there was any structural damage. None was found and, although much of the

ablative material was stripped from surfaces of two of the posts in the second launch, they will not be replaced for STS-3, which is the designation for the third launch.

Warren said no substantial damage resulted to the fixed service structure, although some hand rails were bent on the external tank gaseous oxygen vent arm. A few sections of grating were dislodged on the upper level of the fixed structure, and there was some localized dislocation on the mobile launch platform. For example, the blast protection on a large flexible hose was blown off. It had not been affected on the STS-1 launch. (AVIATION WEEK & SPACE TECHNOLOGY, 11-23-81, pp. 24 & 25, Vol. 115, No. 21)

November 24: NASA Deputy Administrator Hans Mark said yesterday that there is no truth in speculation that NASA is considering closing down Johnson Space Center, although there is a possibility that Space Shuttle mission control could be shifted to Kennedy Space Center in the future.

(One report stated that a study had found that NASA may have to close one of its centers, suggesting Cape Canaveral take over operational control of the Space Shuttle, with Johnson Space Center officials opting for a new program.)

In an interview with Defense Daily, Mark said that Johnson is "one of our best centers" and no consideration is being given to closing it down. He said that NASA is, in fact, looking at turning over the Space Station project to Johnson.

He reaffirmed that the Space Station is the most logical next major project for NASA, the logical extension of the Space Shuttle effort. (DEFENSE DAILY, 11-24-81, p. 128, Vol. 119, No. 16)

<> Nearly 2,000 space workers told to go home and wait out the budget crisis are expected back on the job today.

NASA officials Monday picked 270 civil servants to stay on the job while placing another 1,864 on furlough without pay until Congress released funds for a return to normal business.

The 270 people were "absolute essential people" needed to monitor contractors paid for space shuttle work through December 1, said KSC Director Dick Smith. (SENTINEL STAR, 11-24-81)

<> Interesting headline November 17 ("Mission control may land here"), and quite apt. If and when Mission Control Center becomes a space station, it might come down at KSC, but that is the only way it will ever reach Florida. Don't forget that a political decision put it where it is and that Texas politicians will keep it there. No less than Vice President George Bush calls it a "national treasure."

A few years ago Don Fuqua, now chairman of the House committee that authorized NASA budgets, asked why astronauts should remain in Texas during the Shuttle era. Just that query touched off a mini-explosion at Johnson Space Center where the boys spent \$500,000 to convince the committee it would cost too much to move.

Hans Mark's concern about reducing Shuttle costs carries an obvious implication that NASA knows how much those costs are. Not so at Kennedy Space Center, where no one has ever answered my query: what did it cost to launch STS-1? (TODAY, 11-24-81)

November 25: Kennedy Space Center engineers are analyzing a metal cylinder that fell from the sky over southern Africa in March to learn if it was part of a satellite.

A part of the drum-shaped object, smaller than a human fist, was brought to the U.S. by an American missionary who said the metal piece burned small trees and brush upon impact.

NASA engineers said Tuesday it is most likely a harmless piece of "space junk" -- possibly part of a decayed satellite that disintegrated in the atmosphere.

The Baptist missionary, from Greer, S.C., took the object to the space center Monday. The man, who is on a one-year furlough from Africa, had visited with Rev. Raymond Brendle, pastor of the Grace Baptist Church in Titusville.

The suspected space junk was discovered by native tribesmen who reportedly saw it streak through the sky like a fireball.

He said the man took the object to the space center because he believed it might have been part of the external fuel tank from the Space Shuttle's first mission in April.

But engineers said the metal has a high iron content, leading engineers to believe it's from a satellite, possibly Russian, that began to break up in the upper reaches of the atmosphere.

NASA engineers said the Shuttle tank broke up over the Indian Ocean, east of the African continent.

The intense friction of re-entry would cause most objects to disintegrate in the atmosphere. (TODAY, 11-25-81, p. 10A)

November 26: The space shuttle Columbia completed its piggyback return home Wednesday to the cheers of space workers and their families lining its 3-mile runway.

Tiles intact, the first spaceship to make two trips into orbit and return looked better and arrived back from California three days faster than it did after its first mission in April.

Bolted atop a slim Boeing 747, the stout spaceplane was greeted at the spaceport like a long-lost little brother. Veteran astronaut Deke Slayton, who accompanied the double-decker aircraft in a T-38 chase plane, predicted the third launch would be March 19. It will be from pad 39A, four miles away.

Just after the landing, technicians began work to separate the Columbia from the converted 747, and this was scheduled for completion by 11 p.m. Wednesday.

Work was to proceed around the clock until late morning, when the shuttle is scheduled to be back on the ground for a 2-mile tow to the orbiter processing center, a sort of Space Age garage.

Once inside the garage, the shuttle's payload doors will be braced open and scientific experiments brought back from space will be removed. (SENTINEL (TAR, 11-26-81)

November 27: Twice-launched Spacecraft Department: Titusville reader Chick Stucka adds to Harry C. Shoaf's rundown (printed here several weeks ago) on spacecraft that have been launched twice. Harry had been hearing newscasters wrongly say that the Shuttle was the first. He told how a Project Mercury capsule launched from Wallops Island, Virginia, in November 1960 was launched again in March 1961, and that a Mercury-Atlas capsule was launched in April and July 1961.

"Gemini 2 did it twice," Chick said. "The first time was an instrumentation shot in late 1964. We picked it (the spacecraft) up in the Atlantic, brought it back to a Naval Station at San Juan, serviced it there and flew it back to the States.

"The second time, the Air Force used the same spacecraft for MOL (Manned Orbiting Laboratory) in late 1966. It was recovered off Ascension," said Chick, a BCC employee who at the time worked for the spacecraft manufacturer, McDonnell. (TODAY, 11-27-81, p. 1B)

November 30: Martin Marietta Aerospace's Michoud Division now has the first four lightweight external propulsion tanks for the Space Shuttle under construction, with the first to be delivered in September for use on the sixth Space Shuttle mission, which will be conducted in mid-1983.

The lightweight tank will weight 71,000 pounds, 6000 pounds lighter than the External Tank which flew on STS-1. Actually, Martin believes it can reduce the weight by 6400 pounds, but is leaving a 400-pound margin for contingencies.

One of the weight reductions -- eliminating of 600 pounds of white latex paint on the tanks surface -- was made : result of the STS-1 flight which demonstrated that the ET's thermal protection system would adequately protect the tank without the paint.

In addition, Martin now believes it may be able to cut another 1000 pounds from the ET by removing a large slosh baffle from the liquid oxygen tank. Weight savings may also come from eliminating cable trays which run almost the length of the tank (if electrical cabling is routed through the tank's interior), and by substituting lighter weight composites for some metal parts. (DEFENSE DAILY, 11-30-81, p. 142, Vol. 119, No. 18)

<> Grumman Aerospace Corp. has announced that it will be competing for the Space Shuttle processing contract that NASA plans to award in the summer of 1983.

The contractor selected will be responsible for refurbishing the Space Shuttle Orbiter between flights -- a job NASA now performs with a number of companies as subcontractors -- along with checkout and assembly of the External Tank and Solid Rocket Booster, and maintenance and operations of turn-around facilities at Kennedy Space Center.

Grumman Aerospace president George Skurla said the company views the Shuttle processing contract "as one of the few major civilian space contracts up for bids in the near future and we're taking a long hard look at it." He said the contract would involve employment of over 5000 people at Kennedy Space Center.

The Grumman effort will be headed by Fred Haise, its vice president for space programs and former NASA astronaut.

Companies interested in bidding on the processing contract have been invited to watch the third flight of the Shuttle next March. (DEFENSE DAILY, 11-30-81, p. 144, Vol. 119, No. 18)

<> To Joe Engle and Richard Truly those dramatic 36 orbits in space must have seemed like a pleasure cruise compared with the postflight grilling they began last week at Houston Johnson Space Center. Only a day after reaching earth they found themselves at a ceremonial breakfast with Vice President George Bush, who did a little probing of his own to find out what it was like to fly the shuttle (said Truly: "We were just getting the hang of it" when the flight ended). Next day the astronauts started nine days of more formal debriefings, answering the questions of their engineering colleagues, doing a stint in the flight

simulator to check whether it accurately reflects what happens in space, and reporting to the space center's director, Christopher Kraft, Jr. The preliminary verdict: in spite of problems before and during the flight, Columbia was, in that venerable NASA expression, A-OK. (TIME, 11-30-81, p. 72, Vol. 118, No. 22)

- <> The space shuttle Columbia's second mission may have been cut short, but scientists are ecstatic about the information gathered by the craft's scientific instruments. Because the shuttle flew much lower than typical satellites, its radar produced sharper and more detailed images than satellites can provide. Analysts can use the shuttle "snapshots" to help uncover mineral deposits that may lie beneath the tangled vegetation of the world's unexplored jungles. And the very first pictures processed turned up a major surprise: they showed large surface waves marching like sand dunes across shallow regions of the Mediterranean Sea. For the moment, that discovery has oceanographers baffled. But it has led scientists to hope that more of the earth's secrets will emerge from the shuttle's readings -- and perhaps some explanations as well. (NEWSWEEK, 11-30-81, p. 29, Vol. XCVIII, No. 22)

DECEMBER 1981

December 1: Faced with a possible reduced flight rate for the Space Shuttle Orbiters, NASA has developed a so-called "mixed fleet" launcher concept in which a new unmanned launch vehicle based on recoverable Shuttle Solid Rocket Booster components would be used to augment Shuttle flights when payload space was not immediately available in the Shuttle.

The proposed new unmanned launch vehicle, known as the "SRB-X," would have a payload capability of 65,000 pounds -- the same as the Space Shuttle -- and its Solid Rocket Boosters would be recovered after launch for reuse. (DEFENSE DAILY, 12-1-81, p. 147, Vol. 119, No. 19)

December 2: A cluster of three of the 2.5 million pound thrust Space Shuttle Solid Rocket Boosters combined in an unmanned launch vehicle (SRB-X) could place a 125,000-pound payload into low Earth orbit, according to NASA Deputy Administrator Hans Mark. (DEFENSE DAILY, 12-2-81, p. 156, Vol. 119, No. 20)

<> NASA has concluded that the overpressure on the Space Shuttle during the STS-2 launch last month was about 25 percent of the overpressure experienced on STS-1, which had raised serious concerns about the safety of experiments aboard the Shuttle. A water trough and a water spray system were added to the launch pad for the STS-2 launch, and a NASA spokesman says that the overpressure experienced on STS-1 is considered acceptable, although some permanent launch pad changes will be considered to further reduce the problem. (DEFENSE DAILY, 12-2-81, p. 160, Vol. 119, No. 20)

December 3: The third Intelsat V communications satellite is scheduled for launch by NASA December 9 from Cape Canaveral aboard a General Dynamics Atlas-Centaur launch vehicle. The 4100-pound satellite, built by Ford Aerospace & Communications Corp. using subsystems supplied by an international team, will provide 12,000 simultaneous two-way voice circuits and two color television channels. The spacecraft will be placed in an elliptical transfer orbit ranging from 103 to 22,347 miles, where its apogee kick

motor will fire to circularize the orbit at geosynchronous altitude over the equator at 15 degrees east longitude. The first two Intelsat V spacecraft were successfully launched by Kennedy Space Center on December 6, 1980, and May 23, 1981, respectively. A total of nine Intelsat V's are planned. (DEFENSE DAILY, 12-3-81, p. 163, Vol. 119, No. 21)

<> ...Using a flying "helitorch" to start a controlled burn of about 4,000 acres near the (three-mile-long Space Shuttle) runway, NASA officials hope to eliminate the (tree) swallows' food source and vegetation. With no place to live the birds should congregate farther away from the landing strip, government officials said.

NASA will be aided by the U.S. Fish and Wildlife Service, National Park Service and the Bureau of Land Management.

The burn should last no more than a few hours and is set to begin at 9 a.m., said Dorn Whitmore, spokesman for the U.S. Fish and Wildlife Service.

Whitmore said the burn is accomplished from a helicopter that carefully and precisely drops small amounts of igniting fluid on the shrubs below.

Whitmore said some wildlife will fall victim to the burn. "I'm sure some wildlife will be killed. Certain species will be trapped and killed," he said.

While the swallows don't create a problem for the glide-like Shuttle, they can get lodged in the engines of aircraft. (TODAY, 12-3-81)

December 6: Trailing a sonic boom from Clearwater to Cocoa, the space shuttle Columbia will thunder to its first Florida landing at Kennedy Space Center sometime next summer.

During four scheduled flights in 1982, the shuttle will deploy three satellites in orbit. A second spaceship, the Challenger, will also join the shuttle fleet and fly its first mission late in the year.

A total of 80 launches, including expendable rockets, missiles and shuttle flights, are planned for Florida by NASA and the Air Force in 1982. The unofficial count, published in AVIATION WEEK, includes 50 Poseidon and Trident ballistic missiles to be test-fired from U.S. and British submarines, and nine non-military satellite launches aboard expendable Delta and Atlas-Centaur rockets.

There were only 50 major launches at Cape Canaveral this year, including the shuttle's first two test flights.

The shuttle is scheduled to return to space no earlier than March 19, with Marine Col. Jack Lousma and Air Force Col. Gordon Fullerton at the controls for an ambitious seven-day mission.

"The ship came back in super condition, in better shape than after the first mission," said Jim Harrington, chief of shuttle orbiter operations at Kennedy Space Center. "I've heard nothing that would alter plans for a full seven-day mission. (SENTINEL STAR, 12-6-81, p. 1-A)

December 8: President Reagan yesterday at the White House presented the Distinguished Service Medal, NASA's highest honor, to the astronauts who piloted the second Space Shuttle mission last month, Col. Joe Engle (USAF) and Capt. Dick Truly (USN). The astronauts presented the President with a silver medal commemorating the second flight of the Space Shuttle Columbia, an American flag carried on the flight, photographs of the mission, and a NASA crew patch designed for the mission. The President told the astronauts that he was "thrilled" by their flight and that he is "very proud" to accept the mission mementoes. The President noted that he was particularly amazed by one aspect of the Shuttle mission: that it takes only 20 minutes to get over from Hawaii to landing at Edwards AFB in California. (DEFENSE DAILY, 12-8-81, p. 187, Vol. 119, No. 24)

<> Snuggled in a steel cocoon of electronic gadgetry, the space shuttle Columbia is ahead of schedule for a third flight the week of March 22, space officials said Monday.

"I think we've got a good shot at the latter part of March. We're pressing on with it. In fact, we're a little ahead of the game," said Jim Harrington, shuttle ground operations manager.

Harrington said a faulty fuel cell blamed for cutting short last month's mission will be replaced by next week, and that modifications for the next flight include an extra set of fuel tanks to sustain the orbiter through seven days in space.

The shuttle team now hopes to cut the previous 15 1/2 weeks of postflight maintenance nearly in half, Harrington said.

That would allow the Columbia to be moved to the nearby Vehicle Assembly Building in February for linkup with a new fuel tank and two solid rocket boosters.

The quicker flight preparation is possible mainly because fewer tests have been scheduled, Harrington said.

"The more and more you fly it, the more you learn and the more confidence you derive," he said.

Tests are being conducted only on things that have been modified, failed in flight or needed to be replaced -- such as the faulty fuel cell.

Since November 29, workers have removed 70 tiles and marked more than 100 others having nicks or other minor problems with a tiny shuttle insignia and they will be repaired in place, Harrington said.

No tiles fell off during the second flight -- unlike the first mission -- and only 12 of those removed will actually have to be replaced, he said. (SENTINEL STAR, 12-8-87)

December 9: The fight to save Playalinda Beach is on.

Members of the Save Our Beach citizens group put their protest plans on hold Tuesday long enough to hear what Canaveral National Seashore Superintendent Don Guitch had to say to the Titusville City Council about a proposed 10-year seashore management plan.

When Guiton couldn't promise that North Brevard's only beach would be open more than half the time after NASA opens Launch Pad 39 B in 1986, S.O.B. decided to take action.

The protest group now plans to begin a signature drive to convince the park service not to adopt the 103-page management plan.

At the center of the controversy is the long-dormant launch pad that by 1986 is expected to hurl space shuttles into orbit. It is only about a mile from SR 402, the only beach access, and both sides acknowledge that creates a security problem. (TODAY, 12-9-81, p. 3B)

December 10: Disclosing that NASA has not reduced its Shuttle flight rate in order to meet budget cutbacks, NASA Associate Administrator Dr. Stanley Weiss said yesterday that NASA is still planning to conduct 32 Space Shuttle missions through fiscal 1985, basically the same as planned six months ago. In fact, 34 flights through FY '85 were planned at that time, but since then the availability of the Vandenberg launch site has slipped 14 months, eliminating three of those flights, one of which has been shifted to Kennedy. (DEFENSE DAILY, 12-10-81, p. 204, Vol. 119, No. 26)

<> RCA Americom's Satcom III-R (replacement), launched November 19 from Cape Canaveral, has been placed in its assigned synchronous orbital position at 131 degrees west longitude. When fully operational early next year, the satellite will carry cable television programming currently carried on Satcom 1. (DEFENSE DAILY, 12-10-81, p. 207, Vol. 119, No. 26)

<> The OSTA-1 package of seven scientific experiments carried on the second Space Shuttle mission gathered almost all the Earth-observation data that was sought despite the fact that the mission duration was cut from 5 to 3 days, according to OSTA-1 chief Dr. James Taranik.

A key objective of the \$11.6 million OSTA-1 was to evaluate the ability of the Shuttle Orbiter to serve as a steady platform for Earth-viewing instruments.

Taranik said the STS flight was a success scientifically.

The agency reported that the experimental side-looking radar flown on the mission obtained eight hours of radar pictures and worked "perfectly," meeting all of its objectives. NASA said the radar's ability to penetrate clouds and vegetation makes it "extremely attractive" for mineral resource exploration.

The one experiment that failed was an attempt to photograph lightning storms. Although such storms were spotted, the limited amount of data obtained was of low quality. (DEFENSE DAILY, 12-10-81, p. 206, Vol. 119, No. 26)

December 11: Cosmic dust, solar flares and the effects of weightlessness on plant growth are some of the mysteries that will be explored during the shuttle's third flight in March, NASA scientists said Thursday.

The seven-day itinerary also includes the first lifting chores for Columbia's 50-foot mechanical arm, which was tested successfully last month during maneuvering exercises on the abbreviated shuttle flight.

Scientists also plan to study reactions of the orbiter and payload to temperatures greater than those experienced on Earth; the effects of an orbiter-generated "cloud" of particles and gases, if any exists, and the degree of electrical charging on the \$10 billion spaceship.

Astronauts Jack Lousma and Charles Fullerton are expected to fly the shuttle in various new altitudes to determine the effect of intense heat and cold on the orbiter as it flies into and away from the sun, said Kenneth Kissin, mission manager from NASA's Goddard Space Flight Center in Greenbelt, Maryland.

"It's important for us to know if the payload bay door will open and close in those conditions," Kissin said.

To test the orbiter's thermal capacities, Columbia will be piloted into a "barbecue roll" so that it will be spinning much like an electric rotisserie as it hurtles through space.

The plant growth test, the shuttle's second plant experiment, will allow scientists to observe the effect of weightlessness on lignin, the substance that makes plants stand upright. Four seedlings -- peas, oats, cucumber and pine -- will be stowed in a locker in the crew cabin shortly before takeoff.

The plant test on the last shuttle flight, another zero-gravity experiment, was inconclusive because the mission was shortened from five days to two due to a fuel cell failure.

Kissin characterized experiments to be conducted on the third flight as much more sophisticated and "scientific" than on previous missions.

One test, the Vehicle Charging and Potential experiment, includes the first fast-pulse electron gun to be used in space. The low-powered gun will emit electron charges from the shuttle to change the electronic potential around the ship. This experiment is expected to help spacecraft engineers determine the charging properties of the orbiter and assess electrical changes associated with the experiments.

A sun-oriented experiment will study polarization of x-rays emitted during solar flares.

The Canadian-built robot arm, the star of the second mission, is scheduled to be operated on three different occasions during the flight. (SENTINEL STAR, 12-11-81)

<> NASA has revived its plan to retrieve and repair the orbiting Solar Maximum Mission spacecraft via a Space Shuttle flight in 1983. The SMM retrieval mission is planned as the first extravehicular activity (EVA) on the Shuttle. To simplify the astronauts' task in going to EVA, the agency is giving serious consideration to development of a high pressure space suit. (DEFENSE DAILY, 12-11-81, p. 212, Vol. 119, No. 27)

<> NASA has received bookings from foreign and commercial customers for 109 payloads to be launched by NASA launch vehicles, of which 61 are for the Space Shuttle. Some orders extend into the late 1980's. Six months ago NASA had

booked 28 payloads on the Shuttle (Defense Daily, June 4). Some payloads are double booked on the Shuttle and an Expendable Launch Vehicle. The Shuttle can carry 3 Delta class payloads (e.g., satcoms) per mission.

NASA Payload Bookings

Total	Expendable LV's	Space Shuttle	Double Booked
		Domestic	
59	26	26	7
		Foreign	
50	8	35	7
		Total	
109	34	61	14

(DEFENSE DAILY, 12-11-81, p. 212, Vol. 119, No. 27)

<> The following is a summary of operational Space Shuttle launches planned through FY '87. The four Shuttle development [one in FY '81 and three in FY '82] flights are not included. NASA proposes to maintain the Shuttle launch schedule at 24 launches a year beginning in FY '88.

	FY'82	FY'83	FY'84	FY'85	FY'86	FY'87
Kennedy Space Center						
NASA other U.S. Gov.	-	4	4	5	5	7
DOD	-	-	2	4	5	5
Foreign	-	1	1	1	2	3
U.S. Commercial	<u>1</u>	-	<u>2</u>	<u>3</u>	<u>3</u>	<u>2</u>
Total KSC	<u>1</u>	<u>5</u>	<u>9</u>	<u>13</u>	<u>15</u>	<u>17</u>
Vandenberg AFB						
NASA	-	-	-	-	1	-
DOD	-	-	-	-	<u>1</u>	<u>6</u>
Total VAFB	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>2</u>	<u>6</u>
Grand Total	1	5	9	13	17	23

(DEFENSE DAILY, 12-11-81, p. 212, Vol. 119, No. 27)

December 12: Wrapped in silver foil like enormous Christmas presents, Europe's Spacelab arrived at Kennedy Space Center Friday aboard a plane that would dwarf three jumbo jets.

Like many Christmas presents, Spacelab came unassembled. And before the four boxes were unloaded from the U.S. Air Force C-5 transport, engineers from both sides of the Atlantic were predicting they would have the barrel-like lab ready for its first flight deep inside the Space Shuttle's cargo bay by late 1983.

Spacelab is designed to be a home for as many as four people who will study the Earth and the surrounding cosmos from space.

Landing at KSC's three-mile-long Shuttle runway after an 11-hour flight from Hanover, West Germany, the Air Force transport dramatically lifted its front nose cone exposing the cavernous innards and more than 20 tons of cargo.

"It looks good for '83. We had a lot of soul searching meetings (at NASA and European Space Agency centers)," said John Neilon, who heads Spacelab processing for NASA.

Neilon said after a day's work unloading what is most of the 23-foot-long laboratory, "it should be assembled and looking like something by the first week in February."

A second shipment of Spacelab parts is expected within 10 days.

The biggest hurdle to assembling the \$900 million lab may be a cultural barrier.

Built by 10 European nations but assembled by Americans, Spacelab was born out of an international melting pot of space technology.

"There always is some difficulty in the translating. It's something we'll all be working on," said Richard Smith, space center director.

Just how successful the European venture in space is will depend on economic factors.

Europe's inflation and unemployment woes could put a dent not only in future Spacelab development, it could affect work on the continent's other space venture -- the Ariane satellite launcher. (TODAY, 12-12-81, p. 12A)

December 13: The Space Shuttle's barrel-shaped 12-story-high fuel tanks -- which are destroyed in the atmosphere after each launch -- may be recycled as a spaceship for colonists to Mars in the next century.

While a voyage to the red planet is still speculation, NASA scientists have decided to take one of the 76,000-pound fuel tanks on a day's ride around the Earth in 1983 to see how well it withstands the rigors of getting into space.

Engineers are considering the short-and long-term uses of the tank, which fuels Shuttle main engines in launch. The engineers are proposing the \$10 million tank be saved after every flight.

The external tank isn't the only Space Shuttle component that may get a life after death.

The two-solid-fuel booster rockets, which give the Shuttle its initial fiery kick into space, are reusable but engineers would like to send them up as unmanned satellite launch vehicles after they have served the Shuttle.

Under a \$250,000, one-year contract, Boeing Aerospace Co. engineers are studying the potential of the SRB-X -- a rocket that would offer a cheap alternative and backup to the Shuttle for launching military and commercial satellites.

"The thinking is toward a mixed fleet of expendable rockets and the Shuttle," said Bob Marshall, who heads a NASA team studying the idea at Marshall Space Flight Center in Huntsville, Alabama.

He said a single 119-foot booster rocket -- or more for added thrust -- would be a uniform vehicle that would replace Atlas Centaur and Delta rockets now used.

"That would eventually cut costs," Marshall predicted. "One assembly line could take care of all space vehicles."

He said the first refurbished booster rockets could be ready for launch by 1990 from Kennedy Space Center. (TODAY, 12-13-81, pp. 1A & 20A)

December 14: Modifications to the space shuttle orbiter Columbia progressed last week as engineers and technicians maintained a turnaround schedule designed to prepare the orbiter for its third flight in late March.

The STS-3 solid rocket boosters and external tank also are undergoing final preparations for mating in the Vehicle Assembly Building, and the two elements are scheduled to be joined shortly after January 1, 1982.

Modifications to the orbiter are:

- *Replacement of the fuel cell that caused the duration of STS-2 to be reduced to 54 hours. Another set of fuel cell propellant tanks will be installed to extend the life of the system that generates water and power. STS-3 is scheduled to last seven days.

- *Replacement of a malfunctioning auxiliary power unit.

- *Changing the microwave scanning beam landing system, which was a planned removal and replacement.

- *Changing radar altimeters in the forward section of the cabin, also a planned maintenance activity. (AVIATION WEEK & SPACE TECHNOLOGY, 12-14-81, pp. 18-19, Vol. 115, No. 24)

December 15: In a change of plans, NASA has decided to fly four astronauts on the first operational Space Shuttle mission (the fifth shuttle flight) scheduled for November 1982 on the revised Space Shuttle manifest.

The third Space Shuttle flight is scheduled for mid-to-late March and the fourth and last Shuttle R & D flight for July.

The original plan was to fly the Space Shuttle Columbia with two astronauts until its two ejection seats were removed after flight five. However, NASA now plans to simply deactivate two ejection seats behind the two cockpit seats and on the upper level of the cabin and one in the lower level.

The four-man STS-5 mission is to fly in space for five days, launching the SBS-C and Telesat-E communications satellites.

The second Shuttle Orbiter, Challenger, is not equipped with ejection seats and will have room for a crew of seven. It will carry four men on its first flight, STS-6, which is scheduled for January 1983 from Cape Canaveral. Challenger is to be delivered to Kennedy Space Center from Rockwell's Palmdale, California, plant next June. (DEFENSE DAILY, 12-15-81, p. 231, Vol. 119, No. 29)

<> Dr. Frederick G. Pierce, a former deputy medical director at Kennedy Space Center, died Sunday in Homosassa Springs after a heart attack. He was 59.

Pierce worked at KSC from 1970 to 1974 before opening private general practice in Cocoa Beach for two years.

In addition to his daughter, survivors include his wife, Mary Pierce of Homosassa Springs, and two other children, John Pierce of Beaumont, Texas, and Barbara Haylock of Sparta, N. J. (TODAY, 12-15-81, p. 3B)

December 16: The third in a series of Intelsat V commercial communication satellites roared into space Tuesday night after a four-day delay caused by mechanical problems with the Atlas-Centaur booster rocket.

The satellite is owned and operated by the International Telecommunications Satellite Organization, which already has 14 communication satellites in space. Tuesday's launch went as scheduled at 6:35 p.m.

The Intelsat system handles two-thirds of the world's overseas communications as well as domestic communications for 14 countries. Twelve more Intelsat V satellites will be launched.

Tuesday's mission cost \$75 million. The 4,110-pound satellite can relay 12,000 telephone calls and two color television channels at one time.

A spacecraft motor will be fired in a week to place the satellite in a stationary orbit 22,300 miles above the equator.

A decision will be made later as to whether the satellite will be used over the Atlantic or Indian oceans, company officials said.

Technicians postponed a Friday launch to check oil pressure in the rocket engines and a mission-destruct mechanism required if the launch went off course. Another delay announced Sunday allowed workers to replace a stabilizing system used to counteract winds and keep the rocket on course during launch. (SENTINEL STAR, 12-16-81)

December 17: The non-rocket components of the first Inertial Upper Stage, to be launched this summer atop the Air Force's Titan 34D launch vehicle, has been shipped to the Air Force Eastern Launch Site, Florida, by Boeing Aerospace. The two IUS solid fuel rocket motors, being built by United Technologies Chemical Systems Division, will be shipped to Florida this month and in February, respectively. The Boeing hardware is comprised of the IUS equipment support section, which houses systems for guidance and navigation, telemetry, electrical power, tracking and command, and the IUS Interstage, which will connect the two rocket engines. Boeing says that redundancy and parts quality give the IUS an estimated reliability of 98 percent. The IUS is slated to make its first launch on the Space Shuttle in January 1983. (DEFENSE DAILY, 12-17-81, p. 244, Vol. 119, No. 31)

December 18: NASA's Kennedy Space Center is issuing RFPs for provision of a "turnkey" Shuttle Inventory Management System (SIMS II), a logistics management system which will control material to support the operation of the Space Shuttle. This will include spare parts for ground support equipment, flight hardware and institutional support requirements. The system will support NASA Shuttle management, Air Force Shuttle project management at Vandenberg AFB, development center Shuttle logistics office at Johnson Space Center and Marshall Space Flight Center, contractors at KSC, Vandenberg, Marshall, MAF and Downey, and logistics

personnel at KSC and Vandenberg. The Kennedy Center points out that the "magnitude" of the procurement "will tend to render some otherwise qualified firms incapable" of performing the contract. (DEFENSE DAILY, 12-18-81, p. 250, Vol. 119, No. 32)

December 19: The Space Shuttle Columbia could be America's loudest firecracker next Fourth of July.

The fourth mission of the reusable spacecraft is scheduled for the beginning of July and Kennedy Space Center Director Dick Smith said he'll aim for a launch on America's 206th birthday.

"I went to George Page (Shuttle launch director) and said why don't we really try to push it to the Fourth. I think it would be great," Smith said Friday.

Would a fourth of July Shuttle launch attract the big brass from Washington? Smith, 52, hopes so but he added security concerns in light of revelations of a Libyan assassination squad may restrict presidential travel next year.

He cited the president's recent decision to light the White House Christmas tree from inside, bowing to security precautions.

The fourth Shuttle mission also will be a first as engineers plan to land the spacecraft at the 3-mile-long KSC runway.

NASA wants to test the Shuttle's ability to handle in runway crosswinds at Edwards Air Force Base in California during the third mission before venturing a KSC landing.

No firm date on the third Shuttle mission has been set but Smith said NASA is still looking toward a mid-March flight with astronauts Jack Lousma and Charles Fullerton. (TODAY, 12-19-81, p. 16A)

December 21: Contractor and government workers will take an 11-day vacation from work on the space shuttle system December 23 until January 4, 1982, as most of the modifications have been completed for the next launch of the shuttle, which remains on schedule for late March. The orbiter Columbia will be moved from the orbiter processing facility to the Vehicle Assembly Building.

A total of 70 modifications were scheduled on Columbia after its second flight, and as of late last week, all but 14 were accomplished. One activity last week was the shipment of the orbiter tires to the Rockwell International facility in Downey, California, for a cold soak to verify they will survive in the 200 C environment to which they will be exposed on the third mission.

Also accomplished last week was a flush and oil change of the No. 2 and No. 3 auxiliary power units. The No. 1 unit has been replaced, and it will undergo a functional test this week.

National Aeronautics and Space Administration last week said 378 thermal protection system tiles have been removed from the orbiter, most of them for densification. Of these, 104 have been replaced.

Most of the modifications were accomplished while the orbiter was powered down December 4-16. The primary STS-3 payload -- the NASA Office of Space Sciences experiment package -- is scheduled to be installed in the orbiter cargo bay January 10. (AVIATION WEEK & SPACE TECHNOLOGY, 12-21-81, p. 14, Vol. 115, No. 25)

December 22: The leak of 15 to 20 gallons of nitrogen tetroxide oxidizer being pumped into the Shuttle Columbia September 22 was caused by a design problem in the ground quick disconnect fittings.

NASA has returned the 42 disconnect fittings to Fairchild Stratos, where design modifications will be considered.

The committee investigating the accident has reported that the failure of the quick disconnect fittings was due to an accumulation of iron nitrate in the oxidizer which lodged between the interior components of the fitting, allowing an open path for the oxidizer to spill out.

The report said that the close tolerance of the interior components allowed the contaminant buildup to create the spill.

"The design of the fitting provided a single failure point which had not been recognized prior to the incident," it reported.

The committee recommended a series of protective measures to guard against a similar failure in the future, including elimination of the use of the quick disconnect as a flow shut-off valve and use of protective aprons. (DEFENSE DAILY, 12-22-81, p. 269, Vol. 119, No. 34)

December 23: The failure of fuel cell #1 on the Space Shuttle Columbia during its second flight last month, which led NASA to cut the flight from 5 to 2 days, was caused by corrosion in the fuel cell -- a problem that NASA had not expected to find.

Engineers dismantling the faulty cell Monday at United Technologies Corp. in Windsor Locks, Connecticut, found that aluminum hydroxide had clogged two of the three aspirators that remove water from the fuel cell, and that the third aspirator had a hole in its nozzle. NASA said the source of the aluminum hydroxide, which is caused by the corrosion of aluminum, is not known.

As a result of Monday's finding, NASA has removed the three fuel cells now aboard the Columbia to see if they have a similar corrosion problem. If they do, the third flight of the Shuttle, scheduled for the week of March 22, could be delayed.

Work on the Columbia at Kennedy Space Center is to be halted between Christmas and New Years day to give contractor personnel a vacation.

Astronauts Jack Lousma and Gordon Fullerton are scheduled to fly the third Shuttle flight, which is scheduled for seven days. (DEFENSE DAILY, 12-23-81, p. 275, Vol. 119, No. 35)

<> Two successful flights of the Space Shuttle Columbia, Voyager 2's flyby of Saturn and a perfect launch record were among the highlights of 1981 for the National Aeronautics and Space Administration.

Columbia's two missions, in April and November, marked a new era in space flight. It was the first time that a spacecraft has been launched from and returned to Earth and then reused for a second mission.

More spectacular photographs and new detail and scientific data resulted from the closest approach to the giant ringed planet of Saturn by NASA's Voyager 2 spacecraft late in August.

The Voyager 2 mission added to information already gained about Saturn from Voyager 1 which flew past the planet in November 1980. Voyager 1 is moving out of the ecliptic plane of the solar system while Voyager 2 will travel several billion more miles to a Uranus encounter in January 1986, then on to a rendezvous with Neptune in August 1989.

In addition to the two Shuttle missions, there were 11 other successful launches by the agency. The year's perfect launch record is the fifth in the agency's 23-year history. The launches ranged from weather and communications satellites to environmental monitoring and Sun-Earth energy studies.

Space Transportation System

1981 was the year of the Shuttle. Two successful missions were conducted, in April and November, as the flight testing of the Space Shuttle, a key element in NASA's Space Transportation System, reached its halfway mark.

Astronauts John Young and Robert Crippen flew the Orbiter Columbia during its historic 54 1/2-hour initial mission. The second flight, STS-2, carrying the first payload, the remote manipulator arm was manned by astronauts Joe Engle and Richard Truly.

The new era in manned space flight began April 12 at 8:00 a.m. EST, when the Space Shuttle roared off the launch pad at the Kennedy Space Center, Florida. The two-million-kilogram (four-and-a-half-million-pound) revolutionary

spacecraft was thrust into space by a combination of two solid rocket boosters and a trio of liquid fuel Space Shuttle main engines.

Young and Crippen, during their two days in orbit, carried out a wide ranging series of systems checks to prove the feasibility of the Space Shuttle system.

During the flight, television cameras detected minor damage to the Thermal Protection System (TPS) tiles located on the Orbital Maneuvering System pods. The damage was not deemed serious.

At 10:21 a.m. PST, on April 14, the Columbia landed safely on Rogers Dry Lake at Edwards Air Force Base, California. The first Space Shuttle mission was determined to be an unqualified success.

The Columbia was returned to the Kennedy Space Center in a less spectacular way -- piggybacked atop its 747 carrier aircraft.

STS-2, launched November 12 from Kennedy Space Center, was significant in that it was the first time a spacecraft had been reused. Columbia, piloted by astronauts Joe Engle and Richard Truly, carried a space applications payload and a remote manipulator arm. It landed at Edwards on November 14.

Despite a shortened mission, caused by a failed fuel cell, STS-2 was a success. Over 90 percent of the test objectives were completed by Engle and Truly and data from the OSTA-1 experiment package delighted investigators.

The Remote Manipulator System worked well and the Thermal Protection System again proved itself effective during the fiery entry through the Earth's atmosphere.

An investigation into the fuel cell failure began shortly after the orbiter was ferried back to the Kennedy Space Center from NASA's Dryden Flight Research Facility at Edwards.

Within two weeks after landing, work began on readying the Columbia for its third flight test scheduled for March 1982.

Meanwhile, construction continued on the second orbiter, Challenger, at Rockwell International's plant at Palmdale, California. The newest orbiter is to be delivered to the Kennedy Space Center in mid-1982.

As orbiter construction proceeded, main engine testing continued at full power level (109 percent of rated power level) and external tank production maintained a steady pace.

As the Space Shuttle began to prove itself, a new study began on an unmanned launch vehicle based on solid rocket booster technology. SRB-X would be capable of boosting a 29,490-kg (65,000-lb.) payload into low Earth orbit or 5,443 kg (12,000-lb.) in geosynchronous orbit. (NASA NEWS RELEASE NO. 81-199, 12-23-81)

<> NASA planners have set their sights on an ambitious launch schedule for the coming year: 10 expendable vehicle launches and three Space Shuttle flights, including the first operational mission.

Of the 10 expendable vehicles, seven will be Delta rockets and three will be Atlas Centaurs. One of the Deltas will be launched from KSC facilities at Vandenberg AFB, California, and will carry the only non-communications satellite to be launched this year.

The launch scorecard for 1982 begins in mid-January with RCA-C1, aboard a Delta. February will see another Delta, this one boosting a WESTAR-IV into orbit.

March will be a busy month, beginning with an Atlas Centaur rocket with an INTELSAT V-F-4 satellite for the 106-nation International Telecommunications Organization, and perhaps ending with the launch of the third Space Shuttle mission (STS-3) with its OSS-1 astronomical investigations package on a seven-day flight.

April and May will have a Delta and its INSAT-1A payload and an Atlas Centaur with its INTELSAT V F-5. There are no launches currently listed for June.

July will again have two launches, an earth resources satellite, LANDSAT-D aboard a Delta from Vandenberg AFB, and the fourth Space Shuttle mission (STS-4) from KSC carrying a Department of Defense payload. The action then continues in early August with a Delta rocket and its TELESAT-F payload, also called ANIK-D, a Canadian communications satellite.

Launch teams get what would be a three month break at this point, were it not for a Delta launch in late September. The payload for that launch is WESTAR-V. November will see the fourth Delta in a row, with RCA-E as its payload, and will be highlighted by STS-5, the first operational mission of the Space Shuttle. That flight is listed as carrying two communications satellites, SBS-C and TELESAT-E and their boost stages plus an experiments pallet, OSTA-2. The mission is scheduled to last five days.

The last launch of 1982 is now listed as being an Atlas Centaur, carrying INTELSAT V F-5A, the third Atlas Centaur and INTELSAT combination for the year.

The WESTARS are being launched for Western Union, the RCA satellites are part of the RCA Satcom Network, the SBS series is owned and operated by Satellite Business Systems, the TELESATS are being orbited for Telesat Canada and the INSAT will be launched for India.

The communications satellites missions are classed as reimbursables, meaning that NASA will be reimbursed for the cost of the launch vehicles and launch operations. Communications satellites are placed in stationary orbits at selected points 35,600 kilometers (22,250) miles above the equator. Their orbital speed is synchronized with that of the Earth's rotation and they appear to hang or hover over their assigned duty stations. (KSC RELEASE NO. 321-81, 12-23-81)

December 24: Kennedy Space Center workers exposed to asbestos fibers at a major warehouse haven't complained of discomfort, and cleanup crews plan to spend the holidays mopping up the layer of dust caused by the fallout.

"It was not enough asbestos and they weren't exposed to it long enough for there to be any health hazard," said Dr. Paul Buchanan, a space center physician.

About 40 of the 250 workers at the central supply warehouse are getting physical exams scheduled through the first of the year, Buchanan said.

Those people were exposed briefly to the irritating substance during renovation work to plumbing. As workers sawed the old fixtures, dust with particles of asbestos fell to the floor. As much as an inch of the stuff coated the floor.

"These (the physical exams) are simply to establish a base line, to be cautious. We would be extremely surprised if anybody developed any problems because of this exposure," Buchanan said. (TODAY, 12-24-81, p. 1B)

December 25: Ahead of schedule, the space agency played Santa Claus to the several thousand men and women preparing the Shuttle Columbia for its third flight into Earth orbit.

Since Wednesday and through January 4, Shuttle workers will have a holiday. Meanwhile, the object of their dedication, the Columbia, is being refurbished at a smoother pace than during the weeks between the first and second flights.

"We're ahead of schedule and we're not pushing people like we did in the past. It was taxing to them and their families," said Dick Smith, Space Center director. (TODAY, 12-25-81, p. 20A)

Appendix A

1981 NASA LAUNCH RECORD

Date	Payload	Launch Vehicle	Launch Site	Mission Remarks
February 21	COMSTAR-D	Atlas Centaur	ESMC*	Comsat General Corp. communications.
April 12	Space Shuttle	STS-1	KSC**	First Space Shuttle flight.
May 15	Navy 20 (NOVA 1)	Scout	WSMC***	DOD transit.
May 22	GOES-E	Delta	ESMC	NOAA weather.
May 23	Intelsat V-B	Atlas Centaur	ESMC	Intelsat communications.
June 23	NOAA-C	Atlas-F	WSMC	NOAA weather.
August 3	Dynamics Explorer	Delta	WSMC	NASA scientific.
August 6	FLTSATCOM-E	Atlas Centaur	ESMC	DOD communications.
September 24	SBS-B	Delta	ESMC	SBS communications.
October 6	Solar Mesosphere Explorer	Delta	WSMC	NASA scientific.
November 12	Space Shuttle	STS-2	KSC	Second Shuttle flight. First reuse of a spacecraft.
November 19	RCA-D	Delta	ESMC	RCA communications.
December 15	Intelsat V-C	Atlas Centaur	ESMC	Intelsat communications.

*WSMC - Eastern Space and Missile Center, Cape Canaveral, Fla.

**KSC - Kennedy Space Center, Fla.

***WSMC - Western Space and Missile Center, Vandenberg Air Force Base, Calif.
(NASA NEWS RELEASE NO. 81-199, 12-23-81)