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Chronology of KSC and KSC Related Events for 1988

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NASA

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Events for
1988
Selected

by Ken Nail, Jr.
Archivist
New World Services, Inc.

FOREWORD

This Chronology is published to fulfill the requirements of KMI 2700.1 (as revised) to describe and document KSC's role in NASA progress.

Materials for this Chronology were selected from a number of published sources. The document records KSC events of interest to historians and other researchers. Arrangement is by date of occurrence, though the source cited may be dated one or more days after the event.

Materials were researched and prepared for publication by historian-archivist Ken Nail, Jr., of New World Services, Inc., EG&G subcontractor for KSC Library Services. An index has been included for added convenience to researchers, and each entry has been headlined.

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CONTENTS

JANUARY

January 3: DISCOVERY DELAYED 2 TO 3 MONTHS

The failure of a rocket booster nozzle will delay the scheduled June 2 launch of Discovery by two to three months, according to Gerald Smith, chief of the solid rocket booster project at Marshall Space Flight Center in Huntsville, AL. The current design of the boot ring - used to anchor one end of the nozzle to the booster's casing - is inadequate, officials said. "It's a possibility leaning toward a probability," that the current design won't be used, said John Thomas, solid rocket motor redesign manager for NASA. The launch delay will be held to no more than three months, if the design used in tests on August 30 can still be used, officials said. ["Shuttle Shot Delay May Be 8 to 12 Weeks," **FLORIDA TODAY**, p. 1A, Jan. 4, 1988.]

January 4: NOZZLE RING DAMAGE SEVERE

NASA's redesigned solid rocket booster sustained more severe damage than at first thought; serious design flaws could indicate further serious delays for the Shuttle Program. John Thomas, NASA's head of the booster redesign team, said engineers who disassembled the booster during the weekend found "sharp breaks" in the nozzle's carbon outer boot ring and had been ripped apart in six places. Investigators are studying reasons other than design flaws to explain the test failure.

"It appears to be the design flaw at this point, but it's hard to say until the investigation is completed," said David Winterhalter, NASA's director of systems engineering and analysis. Thomas said it would take "several more days" before engineers finished a detailed review of the test evidence. NASA may decide to swap the failed boot ring design for the one which was tested successfully in August and if that decision is made, the segments could be shipped to Kennedy Space Center for stacking in early March with a possible launch in September.

Winterhalter said "that's attractive in that we have the existing pieces and schedule-wise it's a good option. But we don't want to move ahead too fast." [Glisch, **THE ORLANDO SENTINEL**, pp. A-1 & A-5, Jan. 5, 1988.]

<> DELAY WON'T AFFECT KSC

"I don't see how eight to 12 weeks is going to affect us," said KSC spokeswoman Lisa Malone concerning the effect the Dec. 23 test failure of the SRB will have on Kennedy Space Center. Also today, an internal NASA report prepared by a group of safety experts concluded that the agency still lacks the engineers, guidelines or leadership to ensure Shuttle safety; it concluded that safety was taking a back seat to schedule pressures and costs. "As one worker put it, 'Their words say safety, but their actions say don't worry about it'," the committee report concluded. [Halvorson, **FLORIDA TODAY**, p. 1A, Jan. 5, 1988.]

January 5: HOT GASES REACH O RING

Engineers from NASA and Morton Thiokol Inc. discovered that hot gases reached an O ring seal in a critical rocket joint in the Dec. 23 SRB test failure. NASA officials expressed only minor concern because the O ring had stopped the gas and was not damaged, but they conceded that the seal should not have been exposed at all to the gas. David Winterhalter, in charge of the booster program for NASA, said that the agency was studying it to see why it happened and that "we do not believe it is harmful." [Sanger, **THE NEW YORK TIMES**, p. 1, Jan. 6, 1988.]

January 6: NASA TO USE BACKUP PART IN MARCH TEST

John Thomas, chief of the booster redesign team for NASA, said that the agency has decided to use a backup design for a failed component in the SRB. NASA plans to push for a March 20 full-scale test firing of the rocket. Thomas said the March test firing will not take place till engineers have ascertained the cause of the Dec. 23 test failure. "What we're continuing to do," said Thomas, "is to look at the hardware and crank out the data that we hope will tell us what happened. What we've got to do is understand all the possible failure modes." [Glisch, **THE ORLANDO SENTINEL**, pp. A-1 & A-10, Jan. 7, 1988.]

<> EG&G RETAINED FOR BOC

NASA's John F. Kennedy Space Center awarded EG&G Florida Inc., a one year, $144.88 million extension to its existing contract for base operations services for 1988. Under the contract, EG&G will continue to provide institutional and technical support services such as utilities, facilities, administrative services, technical operations and health and protective services at KSC. This is the sixth one-year extension to the base operations contract first awarded to EG&G in Jan. 1983. EG&G Florida is part of the Government Services Division of EG&G Inc., based in Wellesley, Mass. ["KSC Keeps EG&G As Base Operator," **FLORIDA TODAY**, p. 16C, Jan. 7, 1988.]

<> DISCOVERY'S MAIN ENGINES

The first of Discovery's main engines arrived at Kennedy Space Center tonight and will be installed Jan. 10. The other two engines are expected in the next two weeks. Each of the engines has been test-fired three times at NASA's National Space Technology Laboratories near Bay St. Louis, Mississippi. [Halvorson, **FLORIDA TODAY**, p. 1A, Jan. 8, 1988.]

January 7: SpaceCRAFT FLAW LESS SERIOUS

A key component of the solid rocket booster tested Dec. 23 probably did not fall off during the firing but rather just after the test ended, so industry and Space officials do not view the problem as being as serious as first thought. J. R. Thompson, Marshall Space Flight Center Director, said engineers found evidence that an abrupt change in booste pressure in the nozzle seconds after the test firing may have caused the 8-foot diameter boot ring to drop off. In any event, the incident would

not have affected a Shuttle mission. [Wilford, **THE NEW YORK TIMES**, p. 1, Jan. 8, 1988.]

January 11: DISCOVERY DELAYED TILL JULY/AUGUST

Discovery's launch from Kennedy Space Center has been delayed from six to ten weeks from its originally scheduled June 2 launch date, according to NASA Spaceflight chief Rear Admiral Richard Truly. The delay is due to the need to replace a booster nozzle component which failed in the test-firing on Dec. 23, 1987. "I believe we are six to ten weeks from our previous planning date" of June 2, Truly said. "That puts the next Shuttle flight in the August time frame." A firm date will not be set till investigators finish their work on the Dec. 23 test. [Fisher, **THE ORLANDO SENTINEL**, p. A-1, Jan. 12, 1988.]

January 16: SOVIETS TOUR KSC

Soviet educators joined American colleagues for a tour of Kennedy Space Center which included the launch pads, industrial facilities and the astronaut training facilities. The first Soviet delegation to the United States since the Reagan-Gorbachev summit in December included: Edgar Vladimirovich Linde, minister for higher education in Latvia; Leonid Ivanovich Kiselovski, president of Byelorussian State University in Minsk; and Vladimir Pavilovich Shevchenko, president of Donetski State University in Gonetz. The visit was sponsored by the American Association of Colleges and Universities. [Greenberg, **FLORIDA TODAY**, p. 1B, Jan. 17, 1988.]

January 21: FLORIDA SPACEPORT PROPOSED

The Florida Governor's Commission on Space recommended that the existing launch complexes at the Cape Canaveral Air Force Station should be transformed into a "Florida Spaceport" to be used by private companies for processing and launching commercial payloads. The commission, established by Governor Bob Martinez, met at the Patrick Air Force Base Officer's Club today. [Bixler, **FLORIDA TODAY**, pp. 16C & 15C, Jan. 22, 1988.]

<> FLORIDA SPACE CAMP

Rod Collins, who headed the U. S. Space Camp in Huntsville, Alabama, has been named to supervise the start-up of Florida Space Camp to be located near Kennedy Space Center, according to Space Camp Foundation Executive Director Edward Buckbee. "There isn't a person better qualified or more experienced in Space Camp operations than Rod Collins." The camp is expected to open April 3. ["Huntsville Director Will Launch Florida Space Camp Near KSC," **FLORIDA TODAY**, p. 4A, Jan. 22, 1988.]

January 22: SHUTTLE RUNWAY IMPROVEMENTS

Kennedy Space Center's Shuttle landing facility will undergo extensive modifications under a $635,000 contract awarded by EG&G Florida Inc. today to Jensen Construction Co. (Des Moines, Iowa). Work is scheduled to begin Jan. 26 with a mid-March completion date expected. NASA said

the modifications will "enhance landing safety by reducing...tire wear during landing operations" at the Space center. The work is expected to reduce the likelihood of emergencies at the 15,000-foot runway, where a brake failure and tire blowout placed Discovery in danger during an April 1985 landing at KSC. "Cross grooves" at either end of the runway will be smoothed out on two 3,500-foot sections. [Halvorson, **FLORIDA TODAY**, p. 4A, Jan. 23, 1988.]

January 24: DISCOVERY MAIN ENGINES INSTALLED

By late evening, Discovery's third main engine was installed in the Orbiter Processing Facility at Kennedy Space Center. The second main engine's installation was begun at 8:15 a.m. having been moved by fork lift out of the Vehicle Assembly Building and moved to the OPF, according to Space center spokeswoman Lisa Malone. The first of the 1 and 1/2 ton engines was installed on Discovery last week. The three engines had successfully completed flight readiness tests at the National Space Technology Laboratory] at Bay St. Louis, Mississippi. Nevertheless, Malone asserted, "there will be a 20-second flight readiness firing of the whole main propulsion system, including the main engines, on the launch pad, probably this summer. Discovery's launch, previously announced for June 2, will come no earlier than July 15. [Cohen, **FLORIDA TODAY**, p. 1A, Jan. 25, 1988.]

January 25: THIRD SRB TEST PLANNED

NASA has decided to conduct a third test of the Shuttle's solid rocket booster prior to the launch of Discovery now predicted to come in early or mid-August. David L. Winterhalter, director of systems engineering and analysis for the Space agency, said that flaws would be intentionally induced in two tests of the SRBs. He said that an earlier design of the rocket nozzle which had successfully passed tests in August 1987 would be used for the first flight and that aft sections of the rocket would be shipped to Kennedy Space Center in early March. ["Third Test Planned for Shuttle Booster," **THE NEW YORK TIMES**, p. 21, Jan. 26, 1988.]

January 26: STRUCTURAL "VARIATIONS" FOUND IN SHUTTLE

Structural "variations" were found in three of seven "aft skirt assemblies" by engineers using new ultrasound scanning methods, according to NASA spokesman Ed Medal at Marshall Space Flight Center in Huntsville, Alabama, where the discoveries were made. Medal said it was too early to characterize the "variations" as flaws. "What they've got to do is understand what's being seen in ultrasound to determine if there's a problem," he said. Medal also said that only seven of thirty booster aft skirts had been tested to date but that all would be. [Leary, **THE NEW YORK TIMES**, p. 10, Jan. 27, 1988.]

<> MEMORIAL DESIGN REVEALED

The unveiling of the final design for the Astronauts Memorial will take place at the National Press Club in Washington, but Brevard County residents can view the entire announcement program via satellite transmission to the Galaxy Theater at Spaceport USA. Two of the four

artists who created the winning design will be on hand at the Kennedy Space Center attraction to meet the public. [Halvorson, **FLORIDA TODAY**, p. 2A, Jan. 27, 1988.]

January 27: AUGUST LAUNCH FOR DISCOVERY

NASA's Associate Administrator for Space Flight, Rear Admiral Richard B. Truly, told a Congressional hearing that the new launch date for Discovery was August 4. NASA now plans to conduct three full-scale test firings of the SRB's before Discovery's launch. Two will be conducted with simulated manufacturing flaws to see whether such flaws would affect safety; two such firings were conducted in 1987. Speaking before a Congressional hearing, Truly said that a recent review of the program "has clearly demonstrated that we have struck the proper balance between our first priority of safety and quality, while still maintaining our commitment to return the Space Shuttle to flight just as quickly as we can reliably do so." [Leary, **THE NEW YORK TIMES**, p. 8, Jan. 28, 1988.]

January 28: CHALLENGER COMMEMORATION

Kennedy Space Center workers and others paused today for 73 seconds to remember the seven Challenger astronauts who died two years ago. Just prior to Space center flags being lowered to half-staff, KSC Director Forrest S. McCartney spoke to fellow employees over closed circuit television and the center's public address system.

"As we make preparation to return the Space Shuttles to flight this year, it is appropriate to take time out to remember the men and women of the Challenger crew. Dick Scobee, Mike Smith, Ron McNair, Judy Resnik, Ellison Onizuka, Greg Jarvis and Christa McAuliffe lost their lives in the difficult task of learning about and stretching the abilities of humankind to work in Space," McCartney said. "As we go back to our varied tasks," McCartney continued, "let us draw inspiration from the people we honor today. And let us remember that the greatest tribute we can pay them will be the successful launch of STS-26 and the resumption of a regular flight schedule." [Vosburgh, **THE ORLANDO SENTINEL**, pp. A-1 & A-13, Jan. 29, 1988.]

January 31: THIRTIETH EXPLORER I ANNIVERSARY

Explorer I was launched aboard a Jupiter C rocket from Cape Canaveral thirty years ago today. The 30 1/2 pound satellite, which was launched at 10:48 p.m., followed by 84 days the launching of Sputnik 1, the world's first satellite on Oct. 4, 1957, by the Soviet Union. The man who ordered the launch was Major General J. Bruce Medaris, now 85 years old and a semi-retired priest in the Anglican Church. [White, **FLORIDA TODAY**, pp. 1A-2A, Jan. 31, 1988.]

February 4: SDI TEST DELAYED

An important test for the Strategic Defense Initiative was delayed when a potential problem was discovered in the second stage of its Delta launch vehicle. The test was not immediately rescheduled. [Halvorson, **FLORIDA TODAY**, p. 8A, Feb. 5, 1988.]

<> Shuttle LANDING PRACTICE

The Commander and Pilot of Discovery's first post-Challenger mission arrived at Kennedy Space Center to begin Shuttle landing practice in the Shuttle Training Aircraft, a modified Gulfstream II. Shuttle liftoff is now expected no earlier than August 4. [Halvorson, **FLORIDA TODAY**, p. 8A, Feb. 5, 1988.]

February 5: DELTA LAUNCH DELAYED

Bad weather postponed the launch of a Delta rocket with a military payload till early next week, according to NASA officials. Experts also continued to work on a second stage engine problem. Under new rules, the launch cannot occur till the bad weather passes. The new guidelines resulted from the loss of an Atlas Centaur rocket launched by NASA in a thunderstorm last year. [Glisch, **THE ORLANDO SENTINEL**, p. A-7, Feb. 6, 1988.]

February 6: PRESS SITE MAY BE SCRUBBED

"It's a possibility," that the Kennedy Space Center press site and VIP viewing stands may have to be abandoned for safety reasons, according to Charles Hollinshead, KSC's Public Affairs Director. The issue is being debated as a result of safety studies now under way at the Eastern Space and Missile Center, south of KSC.

"Right now," said Hollinshead, "the Air Force is showing us their studies and taking into consideration what happened with 51-L," the Challenger mission which ended tragically. Two concerns are a catastrophic failure - such as an explosion - right after liftoff and other critical, hazardous malfunctions - such as the loss of one of two main engines or a solid rocket booster failure - early in the flight.

The current placement of the "impact line" - a boundary surrounding KSC areas where access is limited to essential personnel during Shuttle launches - is being debated. ESMC officials are urging NASA to consider moving the safety perimeter - or "impact line" - farther west, well away from the press site. That might cause denial of access to VIPs and media to the current access and, Hollinshead said, "Certainly we hope that won't happen." [Halvorson, **FLORIDA TODAY**, pp. 1A-2A, Feb. 7, 1988.]

February 8: DELTA LAUNCHED SUCCESSFULLY

An unmanned 116-foot Delta rocket was launched from pad 17B at Cape Canaveral Air Force Station today at 5:07 p.m. The rocket carried a three-ton military satellite in a mission designed as a test for the Strategic Defense Initiative program of the Department of Defense. The launch was seen as an important step in rebuilding confidence in the American Space program.

A significant change in the decision process that was first used in Delta 181 was formation of a management team to advise James L. Womack, Launch Director, on whether to launch or hold at any point in the countdown. The advisory group focused on weather, personnel fatigue, external distractions and other factors that might escape the notice of the launch team.

John T. Conway, Director of Payload Management & Operations at Kennedy, was the Advisory Team Leader. Members were Robert B. Sieck, director of Kennedy Shuttle Launch Operations, George F. Page, Lockheed Space Operations Co. Chief Technical Adviser, and Gerald W. Longanecker, Director of Flight Projects at Goddard Space Flight Center. USAF Capt. Thomas R. Strange, an Eastern Space and Missile Center Meteorologist, was the weather adviser. Page formerly was Director of the Shuttle Program at Kennedy Space Center and also was Director of Expendable Vehicle Operations, Womack's job. The advisory group did not overrule NASA or contractor launch teams at any point during the 135 minute countdown which included three planned holds. [Broad, **THE NEW YORK TIMES**, p. 1, Feb. 9, 1988, [Kolcum, **AVIATION WEEK & Space TECHNOLOGY**, pp. 16-17, February 15, 1988.]

February 10: NOZZLE BOLTS

The August 4 liftoff of the Discovery may be delayed pending the outcome of a debate between NASA and Morton Thiokol Inc. over the necessity to replace 72 bolts inside the nozzle of each solid rocket booster as a safety measure. NASA said the replacement is being considered because the bolts on hand are threaded all the way to the bolt head instead of having a smooth bolt shank. The agency said the smooth shank might be preferred to assure that new, special washers under the bolts seal properly, preventing leaks which might otherwise occur along the path of the bolt threads. ["NASA Debates Move to Replace Bolts in Nozzles of Shuttle Rocket," **THE NEW YORK TIMES**, p. 7 (National Edition), Feb. 11, 1988.]

February 11: SUCCESSFUL BOOSTER TEST

A solid rocket booster with intentionally flawed joints was successfully tested today at Marshall Space Flight Center in Huntsville, Alabama. John McCarty, Director of the Propulsion Lab at MSFC, described the test as "100 percent successful." The test was the second of ten scheduled firings to check the effects of in-flight stresses on the redesigned booster joints. Project Manager Charles Vibbart said, We are attempting to show that even if there is some malfunction, we do not get leakage." ["Changes in Rocket for Shuttle Are Tested for Safety Margin," **THE NEW YORK TIMES**, p. 14, (National Edition), Feb. 12, 1988.]

<> NEW NATIONAL SPACE POLICY

The Reagan Administration announced today a new national Space policy which urges NASA "to venture into the solar system by first preparing new technologies for sending people to the Moon and Mars." It also lays out an increased role for commercial Space ventures. NASA Administrator Dr. James Fletcher said, "The policy clearly establishes that, for the first time, the United States has a long-range goal of expanding human presence and activity beyond Earth orbit into the solar system." The Administration has requested $11.3 billion for NASA in the fiscal year beginning Oct. 1, 1989. The budget includes $100 million to begin a $1 billion program to study technologies for establishing a scientific base on the Moon. The program, designated Pathfinder by the Administration, envisions a Moon base perhaps by the year 2000 and a manned mission to Mars early in the 21st century. [Broad, **THE NEW YORK TIMES**, p. 14, (National Edition), Feb. 12, 1988.]

Feb. 16: SHUTTLE ESCAPE SYSTEMS

Two Shuttle astronaut escape systems remain to be tested by NASA, according to Arnold D. Aldrich, director of the agency's Space Transportation System Office. He said the choice was between a rocket system which would remove astronauts one at a time through the hatch and a pole that would extend out from the hatch and allow crew members to slide out beneath the Shuttle. [See April 11 entry.] Capt. Frederick H. Hauck, Commander of the first post-Challenger mission, said astronauts would probably prefer the pole system, "because it does not involve having explosives added to the cockpit." Both systems will be extensively tested in the next few weeks to determine if one will be used when Discovery is launched in August. [Leary, **THE NEW YORK TIMES**, p. 17, (National Edition), Feb. 17, 1988.]

Feb. 17: SUN COAST SERVICES CONTRACT

Sun Coast Services Inc. (Titusville, FL) was awarded a $2.5 million concession agreement to provide food services to Kennedy Space Center. The agreement runs through Feb. 15, 1991, and has three 3-year options. ["KSC Concessionaire Chosen," **FLORIDA TODAY**, p. 8C, Feb. 18, 1988.]

February 22: HAWAII CHOOSES LAUNCH SITE

Hawaii's Department of Business and Economic Development released an Arthur D. Little Inc. study showing Palima Point on the island of Hawaii as the best possible launching site of seven which had been considered. The Little study said that the site was the only one in the U. S. from which both polar and equatorial launchings could take place. ["Science Watch: Hawaii Chooses Spaceport Site," **THE NEW YORK TIMES**, p. 17, Feb. 23, 1988.]

<> FOURTH THIOKOL TEST PLANNED

The fourth of six planned firing tests for the Shuttle's solid rocket booster nozzle-to-case joint has been planned for Feb. 24, according to Morton Thiokol Inc. officials. The test will evaluate deliberately flawed insulation adhesive and a damaged O-ring gasket. Rocky Raab,

company spokesman, said the test "will allow engineers to evaluate the fail-safe performance of the redesigned joint." NASA engineers also confirmed today that a redesigned booster had been successfully test-fired earlier this month. ["Thiokol Plans 4th Booster Test Wednesday," **FLORIDA TODAY**, p. 4A, Feb.23, 1988.]

February 23: LOOSE INSULATION FOUND

A piece of loose insulation found in a spare solid rocket booster will not affect Discovery's August 4 launch, according to NASA officials. The loose insulation was found recently at Morton Thiokol Inc.'s Utah plant said Royce Mitchell, a NASA booster official. Though engineers won't make a final determination for several days, the flaw is presently attributed to the processing of that particular booster section and not a more general problem which could affect the safety of Discovery's boosters. [Fisher, **THE ORLANDO SENTINEL**, P. A-6, Feb. 24, 1986.]

February 24: NEW CBS NEWS FACILITY

Stottler Stagg & Associates (Cape Canaveral, FL) was awarded a contract for an unspecified amount to design a new facility for CBS News at the Kennedy Space Center press site. The facility is expected to be completed in time for the August 1988 launch of Discovery. ["SSA Receives A Contract," **FLORIDA TODAY**, p. 2F, Feb. 25, 1988.]

<> FOURTH BOOSTER TEST/SUCCESS

"Indications are that we had a good test," said Royce Mitchell of the fourth redesigned solid rocket booster test which took place in Utah at the Morton Thiokol Inc. facility. Mitchell, who heads NASA's redesign team, also said, "We did not get any gas leakage (from the joint) to the outside world." He said the object of the just completed test was to determine whether the revamped case-to-nozzle joint would work properly even though engineers deliberately damaged it prior to the firing. Final test results are expected in a few days. [Halvorson, **FLORIDA TODAY**, p. 9A, Feb. 25, 1988.]

March 1: KSC/BCC AGREEMENT

Kennedy Space Center Director Forrest McCartney and Brevard Community College President Maxwell King signed an agreement today to establish an examination center to test entry-level Space Shuttle workers at the community college. NASA spokesman Marvin Williams said the center would ensure that entry-level technicians and inspectors would have the qualifications needed to do Shuttle work. The model for the program which is already underway is the Federal Aviation Administration's licensing program for aircraft mechanics. [Halvorson, **FLORIDA TODAY**, p. 11A, March 2, 1988.]

March 4: BOOSTER ASSEMBLY BEGINS

Assembly began on one of two redesigned solid rocket boosters today at Kennedy Space Center, officials said. Assembly of both boosters is expected to be completed by the end of April and KSC workers should then be able to roll Discovery out to the launch pad by May 24. KSC spokesperson Lisa Malone said, "Basically we're getting ready to begin stacking (booster segments) at the end of the month." [Halvorson, **FLORIDA TODAY**, p. 2A, March 5, 1988.]

<> NATIONAL RESEARCH COUNCIL REPORT

The National Research Council reported today that NASA has many groups assigned to assess the safety of launching Shuttles, but its efforts are fragmented and lack objective measures for evaluating the hazards. Alton D. Slay, chairman of the committee, said, "We find absolutely no show-stoppers." In further remarks Slay said, "Space travel will always entail risks - it cannot be reduced to zero. The key to minimizing those risks is to identify the most likely hazards or failures and to take steps to eliminate them, or control them if they cannot be eliminated." [Leary, **THE NEW YORK TIMES** (National Edition), p. 7, March 5, 1988.]

March 7: NASA ROCKET PLANT

Within three weeks NASA is expected to decide whether to build an automated, government-owned rocket plant worth 3,000 jobs to Kennedy Space Center or the other sites being considered. NASA's Spaceflight chief Admiral Richard Truly said that "locating a facility at Kennedy Space Center is a very serious option." The impact of such a plant on the environment and endangered species in the Merritt Island National Wildlife Refuge and the cost of transporting rocket fuel-materials from the West Coast may block KSC from being chosen. Other sites under consideration include the National Space Technologies Lab (Bay St. Louis, MS) and an abandoned nuclear facility at Yellow Creek in northeast Mississippi. [Fisher, **THE ORLANDO SENTINEL**, pp. A-1 & A-7, March 8, 1988.]

<> SECURITY CONTRACT AWARDED

Specialty Maintenance & Construction Inc. (Lakeland, FL) was awarded an $849,500 contract to build a new security patrol building at Kennedy Space Center. The one-story, 10,000-square-foot building will be constructed in the LC-39 area at the corner of Schwartz and Contractor roads. The contract requires that the work be completed within 150 days. ["Security Contract Awarded," **FLORIDA TODAY**, p. 16C, March 8, 1988.]

March 10: BOOSTER PARTS IN ACCIDENT

Three booster rocket segments en route from Morton Thiokol in Utah to Kennedy Space Center were aboard a train that collided with a car in Biloxi, MS.; two passengers in the car were killed. Thiokol spokesman Rocky Raab said that the segments were believed to be undamaged but would undergo careful tests at the Space center March 11. Commenting on the fatal accident in Biloxi, Raab said, "It's unfortunate. It seems we can't turn around without some news event happening." The train crushed the car carrying Victor Carriere, 67, and his wife, Suzie, 59. Russell Bardos, NASA's Shuttle propulsion director in Washington, said that the accident might increase support for the idea of building a booster plant near Kennedy Space Center's canals or in Mississippi to lessen the risks of transporting the segments on often dangerous and deteriorated rail lines. [Glisch, **THE ORLANDO SENTINEL**, pp. A-1 & A-8, March 11, 1988.]

March 11: BOOSTER SEGMENTS ARRIVE

Booster segments for August's launch of Discovery arrived at Kennedy Space Center this morning and will undergo a week of thorough testing to assure that no damage was sustained when the train they were on was involved in an accident in Biloxi, MS. Two persons died in their car when it was struck by the train. After the crash, the train's crew gave the segments a "visual inspection" and found no obvious damage. Public information officer Pat Phillips said that the segments had been "fairly well packaged and protected en route." The segments will be unloaded next week and inspected further, said Phillips; "we can go to x-rays if necessary," she said. [Mittman, **FLORIDA TODAY**, p. 2A, March 12, 1988.]

March 15: KSC INVITES EDUCATORS

Educators across the country were invited to take advantage of educational opportunities at Kennedy Space Center via satellite. Raymond Corey, Chief of KSC's Education and Awareness Branch, issued the invitation in a video conference broadcast live to schools throughout the nation. "The management at Kennedy Space Center," Corey said, "realizes that we are helping to educate the work force of the future, just as you educators are doing in your classrooms every day. We want to support what you're doing." KSC Launch Director Robert Sieck and other Space center officials also took part in the video conference. The broadcast conference was the fourth in a series designed to inform teachers about NASA programs and was made available through the Westar-4 satellite, launched aboard a Delta rocket from Cape Canaveral Air Force Station in February 1982. [Halvorson, **FLORIDA TODAY**, p. 6A, March 16, 1988.]

March 16: KSC TO HIRE 100 TECHNICIANS

Kennedy Space Center was given special permission from NASA headquarters to hire an additional 100 technicians for quality control and Shuttle processing, according to a NASA spokesman. Gene Thomas, head of the Office of Safety, Reliability, Maintainability and Quality Assurance, said he hopes to hire an additional 20 to 30 employees with backgrounds in aircraft maintenance and safety. Thomas indicated he thought the hiring freeze might be lifted by April, but Hugh Harris, KSC spokesman, said that no such date had been set. [Mittman, **FLORIDA TODAY**, p. 5A, March 17, 1988.]

March 21: BOOSTER TEST-FIRING

A deliberately damaged solid rocket motor held up to liftoff pressures in a test-firing today at Marshall Space Flight Center in Huntsville, AL. "The initial indications are that all went well," said NASA spokesman Ed Medal of the test on a shortened version of the SRB motor. "The proof in the pudding will come when we take apart the motor and inspect it." The test-firing was the third in a series of six. [Halvorson, **FLORIDA TODAY**, p. 4A, March 22, 1988.]

<> OASIS INSTALLATION IN DISCOVERY

Oasis instrumentation to record the environment experienced by Discovery during the STS-26 mission is undergoing installation and checkout in the Orbiter's payload bay. OASIS is designed to collect and record a variety of environmental measurements during various in-flight phases of the Orbiter. The primary device is a large tape recorder being mounted on the aft port side of the Orbiter. The recorder can be commanded from the ground to store information at a low, medium, or high data rate. After Discovery's mission is over the tapes will be removed for analysis. [Diller, **NASA/KSC NEWS RELEASE NO. 88-15**, March 21, 1988.]

<> NEW SHUTTLE SENSORS INSTALLED AT KSC

A new system of instruments was installed aboard Discovery to measure aerodynamic stresses on the Shuttle during its August flight. The OASIS system consists mainly of a large tape recorder that will be used to study the effects of temperature, pressure, vibration, sound, acceleration, stress and strain on the Shuttle. The information is expected to be useful in designing future Space Shuttles. The OASIS system was designed by Lockheed Engineering and Management Services Co. The system of 101 sensors and tape recorder will be tested during June 15's flight readiness firing of the Shuttle's main engines at LC 39B. [Halvorson, **FLORIDA TODAY**, p. 4A, March 22, 1988.]

March 25: SPACEPORT FLORIDA/GOV. MARTINEZ

Florida Governor Bob Martinez came to Launch Complex 26 at Cape Canaveral Air Force Station to begin his campaign for a "Spaceport Florida" - a state sponsored commercial launch facility. "We are embarking on a mission to build Spaceport Florida, America's firs' private-sector highway to Space. Our goal is to launch one commercia

mission each month from Spaceport Florida," he said. "At the current rate of $45 million per launch, this would directly inject $540 million per year into our state's economy." Martinez asserted that facilities at CCAFS and Kennedy Space Center give Florida "several clear advantages" over Hawaii and other states considering developing launch facilities for the emerging commercial Space industry. [Halvorson, **FLORIDA TODAY**, p. 1A, March 26, 1988.

March 28: LAUNCH PREPARATIONS ON TIME

"We're well on our way with the test program," said John Thomas, chief of NASA's booster redesign team. "I don't see anything" in the test results so far that would preclude an August 4 launch of Discovery. Nevertheless, three full-scale booster firings remain to be done. Stacking of the booster segments began at Kennedy Space Center today and that process now includes extra tests and measurements to prevent problems. Thomas said, "We do have a very ambitious processing flow down at the Cape, and we could always stub our toe." [Fisher, **THE ORLANDO SENTINEL**, p. A-3, March 29, 1988.]

<> JOURNALIST MARY BUBB DIES, 67

Mary Bubb covered the American Space program since 1957 for a variety of local publications in addition to Reuters, The Associated Press and United Press International. She died in her sleep at her home in Cape Canaveral today after several illnesses. Despite failing health, she filed a story Friday (March 25) on Florida Governor Martinez's visit to the Space Coast to unveil his plans for a commercial Spaceport. The last launches she covered were of five Pershing missiles March 21 from Cape Canaveral. Bubb, 67, is survived by sons Rodger and Dennis. [Lafferty, **THE ORLANDO SENTINEL**, pp. D-1 & D-6, March 29, 1988.]

March 29: SLATTERY WINS QUALITY/SAFETY AWARD

Kenneth Slattery, an employee of Bendix Field Engineering Corp. employee at NASA's Merritt Island Tracking Station, was selected as a Manned Flight Awareness Honoree. The selection is considered NASA's highest award to a contractor employee for commitment to quality and Safety and was made by the Goddard Space Flight Center Manned Flight Awareness Program (Greenbelt, MD). ["Space Firm Employee Honored," **FLORIDA TODAY**, p. 2B, March 30, 1988.]

<> STRIKE COUNTDOWN BEGINS

Astronaut rescue teams, firefighters and nurses at Kennedy Space Center are threatening to strike when their contracts expire at midnight March 31. Union president Sid Hereford said no progress was being made in talks between EG&G Florida Inc. and his union, the Transport Workers Union Local 525. Hereford said, "We already have picket signs ready and it looks like we're going to have to use them." EG&G spokeswoman Laurie Statmore stated that "we're still talking, so the company is optimistic that we'll be able to come to agreements.

But we do have a strike plan. We have looked into it and at this point we feel we can fulfill all our requirements using management personnel." [Halvorson, **FLORIDA TODAY**, p. 1A, March 30, 1988.]

<> TITUSVILLE'S AEROSPACE CONSTRUCTION

Lockheed Space Operations Co. and Grumman Technical Services Inc. will both build major facilities near Titusville, FL, in late 1988. The buildings will house hundreds of new employees, company officials said today. Lockheed plans to erect a three-story, 88,000 square-foot building next to its present plant, south of Titusville, according to company spokesman John Williams. It will cost $3.5 million.
Grumman plans to move its headquarters into a one-story 40,000-square foot building constructed in the 371-acre Meadowridge development south of Titusville. Ground-breaking is scheduled for June 1; the construction is expected to be completed by December, said Joel Taft, Grumman spokesman. [Brown, **FLORIDA TODAY**, p. 1A, March 30, 1988.]

March 30: EXTERNAL TANK ARRIVES

The external fuel tank for Atlantis, scheduled for the second-post Challenger flight, arrived at Kennedy Space Center today. It was towed into the turn basin near the Space center's Vehicle Assembly Building. ["Shuttle Fuel Tank Arrives," cutline, **FLORIDA TODAY**, p. 1B, March 31, 1988.]

March 31: KSC DISCOVERS BOOSTER FLAW

Technicians at Kennedy Space Center detected four flaws in a Shuttle booster rocket segment today. John Thomas, head of the Space center's booster redesign program, described the flaws as minor but as "something we'd just as soon not have." He said the flaws should be capable of repair at KSC.

Technicians found insulation inside the booster casing had separated, or "debonded," from the bottom edge of the casing. Thomas said the accident had "absolutely no correlation" with the accident that occurred when a car crashed into the train carrying the segment in Biloxi, MS, March 10. [Halvorson, **FLORIDA TODAY**, p. 1A, April 1, 1988.]

<> Space CENTER STRIKE AVERTED

A walkout by astronaut-rescue teams and firefighters at Kennedy Space Center was averted today by the tentative agreement to a three-year contract between the Transit Workers Union Local 525 and EG&G Florida Inc. KSC nurses also agreed tentatively to a new two-year agreement also with EG&G Florida Inc. [Halvorson, **FLORIDA TODAY**, p. 1A, April 1, 1988.]

April

April 1: BOOSTERS HANDLE STRESS

The Shuttle's redesigned solid rocket boosters passed a structural load test today at Marshall Space Flight Center, according to MSFC spokesman Ed Medal. "This test demonstrated a capability greater than that test prior to the first Shuttle launch," he said. ["Shuttle Booster Apparently Can Take Stress, Test Shows," **THE ORLANDO SENTINEL**, p. A-17, April 3, 1988.]

April 3: FISHERMAN CATCHES FUEL TANK

Part of a solid-fuel rocket booster was brought into Port Canaveral today as part of a local scallop fisherman's haul. The debris was identified as part of a Delta rocket booster. Cape Canaveral Volunteer Fire Department chief Dave Sargeant said the 1,000-pound piece could have ignited if heated.

The 75-foot Triton II, operated by Canaveral Seafoods, netted the motor about 5 p.m. on March 31 while scalloping 22 miles east of the port, according to Coast Guard Petty Officer Dan Brosseau. A Patrick Air Force Base spokesman identified the debris as a Castor 4 rocket motor used primarily on Delta rockets. [Hammond, **FLORIDA TODAY**, p. 1B, April 4, 1988.]

<> NASA WANTS FEDERAL ARREST AUTHORITY

NASA expects Congress to act this week on its request to give all NASA security guards federal arrest authority which would empower them to use deadly force in the line of duty. Only 40 of Kennedy Space Center's 240 guards are deputized by Florida law enforcement agencies. NASA General Counsel John O'Brien said, "The individuals involved would at least be assured of some measure of additional legal protection if, (deadly force) is necessary." [Halvorson, **FLORIDA TODAY**, P. 1A, April 4, 1988.]

<> NO DELAY DUE TO INSULATION

Insulation was found to have separated from the rocket casing on the bottom edge of one of the four segments that make up the right solid rocket booster. NASA spokeswoman Lisa Malone said that "there was no evidence the debonding extended beyond the edge. It can be repaired here with no impact on the [launch] schedule." She said that similar debonding problems had been found in the past and repair work had proceeded in parallel with other work. The debonding problem was discovered when technicians began to assemble the two boosters for Discovery's expected August 4 launch. ["NASA: Insulation Woe Won't Delay Shuttle Flight," **FLORIDA TODAY**, p. 4A, April 4, 1988.]

<> Space CAMP OPENS IN TITUSVILLE

A hundred students and their parents were on hand south of Titusville when the country's second Space camp opened after months of

preparations. The camp is located on Grissom Parkway; its Director Deborah Barnhart said, "Everything has gone better than we could have expected. Here we are on opening day and the camp is mostly sold out." [Brown, **FLORIDA TODAY**, p. 1B, April 4, 1988.]

April 4: DISCOVERY'S ENGINES INSPECTED

Engine pumps aboard the Discovery at Kennedy Space Center were removed for inspection today. If the pumps have to be replaced, NASA may have to delay the August 4 launch of the Shuttle. Jerry Berg, NASA spokesman, said that engineers had recently discovered that critical bolts inside high pressure oxidizer turbopumps on two engines had shifted out of position during test-firings. KSC officials said the inspection effectively used up the remaining "contingency" time built into the processing schedule for Discovery. [Halvorson, **FLORIDA TODAY**, p. 6A, April 5, 1988.]

<> KSC WORKER KILLED IN ACCIDENT

Lorie Laubenheimer, 29, a Kennedy Space Center worker was killed in a car-bus accident on NASA Causeway. Five Spanish tourists who were also on the bus were injured and treated at Jess Parrish Memorial Hospital (Titusville, FL). Laubenheimer, a Merritt Island resident, had been employed with EG&G Florida Inc., base operations contractor at Kennedy Space Center, since October 1987.

The tour bus, operated by TW Services Inc., was traveling west on NASA Causeway when the accident occurred, according to NASA spokesman Hugh Harris. Laubenheimer had been traveling south on C Avenue. The driver was not identified and no citations were issued. [Halvorson, **FLORIDA TODAY**, p. 1B, April 5, 1988.]

April 5: KSC UNION RATIFIES CONTRACT

Firefighters and rescue teams at Kennedy Space Center voted for a labor contract with BOC contractor EG&G Florida Inc. that includes a ten percent increase in salaries over ten years and improved medical benefits. Transport Workers Union Local 525 President William Pippin said that 79 union members cast ballots. The new contract is retroactive to April 1 and runs to April 1, 1991. [Mittman, **FLORIDA TODAY**, p. 1B, April 6, 1988.]

April 6: PROBLEMS MAY FORCE LAUNCH DELAY

Kennedy Space Center's Deputy Director Tom Utsman continues to believe that the August 4 launch date is achievable but that technical problems "certainly are going to make that target [date] a small bull's eye." Rollout to the launch pad has already been delayed from May 24 to June 1. NASA spokesman Hugh Harris said that officials had expected several days of delay in the preparation for liftoff. "Although there are problems, we haven't given up on early August," Harris said. ["Shuttle Problems May Force Delays," **THE NEW YORK TIMES** (National Edition), p. 16, April 7, 1988.]

April 7: OFFICE ANNEX OPENED

Kennedy Space Center Director Forrest S. McCartney today opened a new $3 million office annex expected to house 167 employees who had been displaced years ago from the Vehicle Assembly Building at the start of the Shuttle Program. The employees had worked in trailers and other temporary facilities till the opening of the new building. Specialty Maintenance and Construction Inc. (Lakeland, FL) built the new 34,000-square foot, steel structure. Technicians, quality control inspectors and management personnel are expected to start moving in soon. In addition to offices, the building includes lockers, a lunch room and conference rooms. [Mittman, **FLORIDA TODAY**, p. 10A, April 8, 1988.]

<> MCCARTNEY INTERVIEW

"There is absolutely no pressure on me to try to reduce costs that would impact the safety of the Space Shuttle," KSC Director Forrest S. McCartney said in an interview today with the **FLORIDA TODAY** newspaper. "If we look at the work that remains to be done and the rate at which we have been accomplishing that work, we will have to increase our rate to make the August 4 target date." [Mittman, **FLORIDA TODAY**, p. 1A, April 8, 1988.]

April 11: CREW ESCAPE SYSTEM/POLE

NASA selected a 9.8 ft. telescoping pole crew escape system for Space Shuttles, enabling the astronauts to bail out of the vehicle under controlled conditions below an altitude of 20,000 feet. Modifications to Discovery and fit checks for a prototype pole are expected to be completed this week. Actual flight hardware will be installed in July. [Scott, **AVIATION WEEK & Space TECHNOLOGY**, p. 31, April 11, 1988.]

April 12: PATTERN OF UNBONDING ON SRB

Evaluation of the rubber insulation on the solid rocket booster segments at Kennedy Space Center has shown a pattern of unbonding where the insulation has not adhered to special adhesive on the metal casing; the insulation is being re-glued. "The unbond situation is not serious, said Morton Thiokol spokesman Rocky Raab. He said the unbonding is not a new problem and Morton Thiokol remains confident that its repair procedure will be effective. [Mittman, **FLORIDA TODAY**, p. 4A, April 13, 1988.]

April 14: Space CONGRESS THANKS CITIES

City officials from Cocoa Beach and Cape Canaveral, Florida, were honored tonight for their efforts in aiding the Space Congress the past 24 years. Spokeswoman Leslie Niehouse said that the occasion was intended to express the appreciation of the Space Congress for the communities' support "for all of these years." [Brown, **FLORIDA TODAY**, p. 10A, April 15, 1988.]

<> AUGUST 4 LAUNCH DATE HOLDS

NASA is sticking to its August 4 launch date after an all-day meetin in Houston at the Johnson Space Center. "The unanimous consensus of the management council is that although there are no pressing technical issues which seriously jeopardize our target of an August launch, a lot of hard work remains to be done," said Rear Admiral Richard Truly, NASA Associate Administrator for Space Flight. "We are optimistic about an August launch date and intend to make another careful launch date reassessment at our meeting in May." [Mittman, **FLORIDA TODAY**, p. 10-A, April 15, 1988.]

April 15: THIRD BOOSTER FIRING SET

NASA scheduled a third full-scale test firing of its redesigned solid rocket booster for April 20. It will be the first to occur at Morton Thiokol's Wasatch Operations Test Site in Brigham City, Utah. ["New Booster Faces 3rd Test Firing Wednesday," **FLORIDA TODAY**, p. 9A, April 16, 1988.]

April 19: WIND TOPPLES KSC TRAILER

Three painters were injured at Kennedy Space Center today when a violent wind turned over their work trailer near Launch Complex 39B. "There had to have been some strong winds, because (the squall) completely destroyed the trailer," said Doyle Lowe, project manager with contractor Olson Electric Co. (Daytona Beach, FL). The injured workers were identified at Jess Parrish Memorial Hospital (Titusville, FL) as John Silvers, William Leber and David Brewer. [Halvorson, **FLORIDA TODAY**, p. 1A, April 20, 1988.]

<> NEW ROCKET PLANT SITE

Kennedy Space Center was among the finalists for a government-owned, contractor-operated facility for building Shuttle solid rocket boosters. Competitors include an abandoned Tennessee Valley Authority nuclear plant site at Yellow Creek, Mississippi and NASA's National Space Technology Laboratories at Bay St. Louis, Mississippi. Melbourne Congressman Bill Nelson said that "Florida will have its fair shot. I have already had discussions with Admiral (Richard) Truly about that." White House approval for NASA to build the plant came April 18." [Lunner, **FLORIDA TODAY**, p. 1A, April 20, 1988, and Fisher. **THE ORLANDO SENTINEL**, p. A-3, April 19, 1988.]

<> GARDNER QUESTIONS SECOND SPACEPORT PLAN

Rep. Winston "Bud" Gardner (Titusville, FL) questioned the wisdom of Governor Bob Martinez's request for state money to develop a second launch facility; "I know it may sound like blasphemy, but I think it is hard to justify spending $500,000 on something like trying to build another Space center in Brevard County in addition to the one we already have." [Brown, **FLORIDA TODAY**, p. 1B, April 20, 1988.]

April 20: TEST-FIRING CONDUCTED WITH FLAWS

NASA said today that a redesigned solid rocket booster with purposely added flaws in critical seals was test-fired at a Morton Thiokol Inc. test site near Brigham City, Utah. The two-minute firing occurred with small holes in seals between the rocket's sections to simulate manufacturing flaws. According to preliminary test data, the SRB project manager Royce Mitchell said "we had a very successful test. So far, it looks excellent." [Leary, **THE NEW YORK TIMES**, (National Edition), p. 10, April 21, 1988.]

<> DELTA ROCKET DEBRIS

Two pieces of Delta rocket debris that washed ashore in Cocoa Beach, FL, were picked up by Kennedy Space Center officials, said Pat Phillips, a NASA spokeswoman. The chunks were found behind the Aladdin Beach Motel at SR 520 and SR A1A. One piece appeared to be part of a motor casing from a Delta solid rocket booster. The other was about 2 feet long and 16 inches wide, Phillips said. Both pieces were apparently from a Delta rocket that was deliberately destroyed by range safety officers in May 1986 after its main engine failed about 70 seconds into flight. ["Delta Rocket Washes Up On Beach," **FLORIDA TODAY**, P. 1B, April 21, 1988.]

<> DISCOVERY TO CARRY WORKER AUTOGRAPHS

When Discovery launches later this year, the signatures of all 16,000 Kennedy Space Center's workers will ride into Space with the Orbiter. The autograph book idea came from John Archibald, a management systems analyst with Lockheed Space Operations Co. "It was kind of a funny thing," Archibald said. " I went over to see the astronauts when they were here, and (Discovery Commander) Rick Hauck mentioned that he wished we could all be with them, that they could take everyone along with them on the flight.

"And I thought, we can't go physically, but the next most personal thing anybody has is their signature. And if we could all sign a log book showing the astronauts that we were willing to take a part of ourselves along with them, it would be a good morale booster for us and the crew."

The book will have two hundred signatures per page and bear the slogan written by Archibald: "The KSC team is with you from liftoff to landing." Space Center Director Forrest S. McCartney called the Archibald plan "a great idea. If you think enough of something to sign your name on it, you think enough of it to make it go." [Halvorson, **FLORIDA TODAY**, p. 4A, April 21, 1988.]

<> E'PRIME & ECKLER FORM JOINT VENTURE

Ralph Eckler, Titusville manufacturer of automobile components, has joined with E'Prime AeroSpace Corp. to build, market and launch small rockets for educational, scientific, commercial and military uses. The new company will produce several sounding rocket classes, handling payloads ranging from 30 to 250 pounds. [Carey, **THE ORLANDO SENTINEL**, p. C-1, April 21, 1988.]

April 21: NOZZLE PART INTACT

A critical new nozzle part has remained intact following yesterday's solid rocket booster test-firing, NASA officials said today. The part - a carbon ring - had been of concern because a differently designed ring had failed during the last booster test-firing in December 1987. [Fisher, **THE ORLANDO SENTINEL**, p. A-12, April 22, 1988.]

April 22: LAUNCH SITE MAY CLOSE

Safety concerns may force the closing of Discovery's launch site later this year and deny access to the majority of Kennedy Space Center's 16,000 workers. NASA and the Air Force are considering closing the KSC grounds to all but about 2,000 essential workers, according to Public Affairs Director Charles Hollinshead, who added that though such a closure was a possibility, "I doubt that it will happen." [Halvorson, **FLORIDA TODAY**, p. 1A, April 23, 1988.]

April 26: NEW LAUNCH DATE IN AUGUST

Complexities in the new booster assembly process have caused workers to fall ten days behind and will require that NASA pick a new launch date, perhaps August 13, according to Shuttle Program Director Arnold Aldrich. Speaking of the assembly process, Aldrich said, "It's a lot more time-consuming. There's a lot more steps, and because it's the first time everyone is moving cautiously to be sure they completely understand the procedure and do it well." He said that he remains confident that NASA will launch the first post-Challenger mission "sometime in August." Arnold spoke at the 25th annual Space Congress in Cocoa Beach, Florida. [Glisch, **THE ORLANDO SENTINEL**, p. A-3, April 27, 1988.]

April 27: VAFB Shuttle SITE MOTHBALLED

The Vandenberg Air Force Base (CA) Shuttle launch facility will be formally closed next year. The Pentagon will try to find other users for its launch facilities. The Challenger explosion together with major safety concerns about the launch site, forced the Air Force to put the facility into "caretaker status." Safety concerns included bad weather, a launch control building just 1,200 feet from the pad, which could put 175 workers in danger in case of an accident, and a closed main engine exhaust duct that could trap volatile gases and cause an explosion. [Glisch, **THE ORLANDO SENTINEL**, p. A-9, April 28, 1988.]

<> CERNAN: PROGRAM LACKS PURPOSE

Eugene Cernan, Commander of the Apollo 17 mission, told the 25th Space Congress that NASA's Space activities have not focused on a common objective since the Apollo days. "The Space Shuttle missions," he said, "have been nothing but a series of events." Cernan went on to say that NASA needed to gain more political support. "We do not need to be ashamed of our accomplishments. NASA has been timid about marketing itself." He suggested that the Space program needed to be elevated by the President to a Cabinet-level department. Cernan also advocated the idea of civilians in Space. "I believe very strongly that there is a place in Space for everybody. Certainly it is not a joy ride. We ar

a long way from doing that." He said that the best morale booster for education and motivator for students to be interested in Space would be letting a teacher fly on a Shuttle mission. [Mittman, **FLORIDA TODAY**, p. 1A, April 28, 1988.]

<> KSC ROCKET FACTORY PROMOTED

Florida state employees spent the day in Washington promoting the idea of a rocket factory at Kennedy Space Center. Other sites in the running for the $1.2 billion factory and its 1,000 permanent jobs are an abandoned Tennessee Valley Authority nuclear power plant in Mississippi and NASA's National Space Technology Laboratories at Bay St. Louis, Mississippi. [Lunner, **FLORIDA TODAY**, p. 4A, April 28, 1988.]

<> MORGAN WINS ACHIEVEMENT AWARD

Stephen Morgan, Executive Director of the East Central Space Business Roundtable, was awarded the Space Congress's annual achievement award for his efforts promoting Space activities in Florida. Morgan was responsible for forming the Florida Governor's Commission on Space which recommended a study on the construction of a launch facility for private industry. Morgan also helped establish the Space Research Institute at the Florida Institute of Technology in Melbourne, FL. [Mittman, **FLORIDA TODAY**, p. 4A, April 28, 1988.]

April 28: ASTRONAUTS READY TO FLY

Astronaut office chief U. S. Navy Captain Daniel Brandenstein said that the astronaut corps is ready and eager to fly. Brandenstein and fellow astronaut Stephen Hawley spoke to the press at the 25th annual Space Congress in Cocoa Beach, Florida.

"Over the past two years," Brandenstein said, "we have been working with the Space team in NASA and the contractors trying to get the Shuttle flying again. There have been a lot of changes and improvements made and we feel confident that the August time frame looks very good. What we have settled on is a significant improvement over what we had in the past because we had nothing. In the current Shuttle we cannot put in an escape system that is the answer to every and all contingency situations."

"We are confident that the clearances are adequate," astronaut Hawley said. "Obviously it would be a very bad day if we ever had to use a system like that. The alternative that has been designed is a practical, economical and feasible alternative. It would not be a pleasant experience to have to us it, but if we got into that situation we have confidence that it would work." [Mittman, **FLORIDA TODAY**, p. 2A, April 29, 1988.]

April 29: BEGGS AT Space CONGRESS

Former NASA Administrator James Beggs spoke to 460 persons at the annual banquet of the Missile, Space and Range Pioneers which marked the final event of the 25th Space Congress. He urged more emphasis and investment in science and technology saying, "To invest is like putting money in

the bank." He remarked that the Space program had been through a rough period but will return with renewed vigor. Beggs served as NASA Administrator from July 1981 till February 1986. ["Place Emphasis on Technology, Beggs Urges," **FLORIDA TODAY**, p. 2A, April 30, 1988.]

May 2: UCF COMMENCEMENT: JOHN YOUNG

John Young today expressed the hope that he would fly again to reporters prior to delivering a commencement address at the University of Central Florida (Orlando, FL). He also expressed his belief that the Shuttle Program is, finally, back on track. "There's a lot of pressure to get it up on time," he said, "but there's also an awful lot of pressure, even more pressure, to get it right. As long as we pay more attention to doing it right than doing it as fast as we can, we'll be able to operate successfully. The key to the whole thing is people. If you've got the right people in the right locations and the right jobs, you can make sure everything's done right."

He praised the work being done at Kennedy Space Center and said, speaking of Director Forrest McCartney, "I can't think of a better guy to have in there than the general. I think the morale of the working people over there has picked up tremendously and they can see the light at the end of the tunnel (to) get Discovery out to the launch pad and get things going again...So things are coming along just fine." "Young: Pressure to Succeed Will Launch Space Shuttles," **FLORIDA TODAY**, p. 6A, May 3, 1988.]

<> TPS FACILITY OPENED

Kennedy Space Center's new Thermal Protection System Facility opened today with Director Forrest McCartney cutting the ceremonial ribbon. The new building on which construction was begun in 1985 will eventually replace Rockwell International's tile processing operation in Downey, CA. That manufacturing operation will be phased in by mid-1991. Officials wanted the complicated process closer to home to reduce the waiting period and costs for replacements. McCartney said, "It makes sense from a time standpoint and from a dollars standpoint." Currently about 80 Rockwell employees work in the building, but as the number of Shuttle flights increases, NASA officials estimated that the number of employees would double. [Mittman, **FLORIDA TODAY**, p. 6A, May 3, 1988.]

May 3: SEPTEMBER DISCOVERY LAUNCH?

NASA Administrator James C. Fletcher conceded today that Discovery's launch could come as late as early September, though the Space agency was "looking" at August 25. "Our expected plan is to fly in August," Fletcher told the American Institute of Aeronautics and Astronautics. "Whether it slops over into early September I think is not important. We will fly this summer." ["Space Shuttle May Not Fly Until Early September," **NEW YORK TIMES** (National Edition), p. 11, May 5, 1988.]

May 4: DRUG ABUSE/KSC

Rep. Bob Walker (R-PA) urged Congress to pass an amendment to penalize NASA contractors if their workers were caught with drugs on the job. Walker claimed 10 to 23 percent of NASA's Shuttle workers used drugs on the job. "That is certainly not a situation that we want to see

continue...We're dealing with human lives...with major expenditures of money. It is time to make the work places drug-free," Walker said.

Rep. Bill Nelson (D-Melbourne, FL) said Walker's estimates were inflated and did not apply to Kennedy Space Center. "According to Gen. (Forrest) McCartney they've got the situation well-policed," Nelson said. John Williams, director of public affairs for Lockheed Space Operations Co. in Titusville, said his company was unaware of the Walker proposal. Hugh Harris, director of public affairs for KSC, said NASA has not implemented a drug-testing policy. [Lunner and Mittman, **FLORIDA TODAY**, p. 1A, May 6, 1988.]

<> BUDGET IMPACT ON KSC

If NASA's proposed $11.5 billion budget received Congressional approval, Kennedy Space Center would receive:

*$15 million to begin construction of a Space station processing facility. The $67 million building would be built over three years. Construction would start in 1989.

*$4.6 million to refurbish KSC's Shuttle launch pad 39A.

*$2.8 million to upgrade KSC's Orbiter Maintenance and Refurbishment Facility.

*$2.3 million to modify a utility annex at LC 39. [Cole, **FLORIDA TODAY**, p. 4A, May 5, 1988.]

<> COMMERCIAL SPACEPORT RFP'S

The Florida Department of Commerce has listed requests for proposals to contractors who would outline operational, economic and financial goals for the proposed Spaceport Florida. In addition guidelines were sent to more than 200 firms expressing interest in the project. Program Manager Chris Shove expects 15 to 20 proposals to be submitted. The state will review the applications, pare the list by June 6 and begin oral interviews June 13. [Klotz, **FLORIDA TODAY**, p. 5A, May 5, 1988.]

<> LAUNCH PAD ESCAPE EXERCISES

Seven astronauts ran through a test of emergency crew escape methods on a Shuttle launch pad today. NASA reported that the test was very successful. Astronaut Kathryn Thornton said, "We felt it was a very good test. I am very confident that if a disaster like this happened we would get off the pad and be taken care of." Among the key changes tested during the drill was a $1.5 million upgrade to equipment that included new oxygen masks, more fire detection sensors and seven escape baskets wrapped in fireproofed blankets. As in previous tests, no astronauts were allowed to ride in the slide-wire escape baskets to the ground 1,200 feet away, even though the baskets have been part of the Shuttle escape procedures since the beginning of the program. [Glisch, **THE ORLANDO SENTINEL**, p. A-12, May 5, 1988.]

May 5: ROCKET JOINTS PASS TESTS

Engineers inspected both the aft and center joints between segments of the solid fuel booster and found that both worked as designed during the April 22 full-scale test firing, said Dove Mobley, NASA deputy project manager for the redesign program. ["Booster Rocket Joints Easily Pass 1st Qualifying Tests," **FLORIDA TODAY**, p. 12A, May 6, 1988.]

<> VIEWING SITES AGREEMENT

NASA and the Air Force are working to ensure that VIPs and the media will be able to observe Discovery's launch from Kennedy Space Center and that the Space center's 16,000-member work force will not be denied access to the center during launch operations. "I'm very optimistic that we are going to solve this problem in the next week to 10 days," said William Sheehan, NASA's chief of communications. "The resolution will be to leave everything the way it is." He said NASA's own studies, by contrast to ones done for the Air Force, indicate that there is little chance people in the viewing areas would be hit with Shuttle debris in the event military safety officers were forced to destroy a Shuttle early in flight. [Halvorson, **FLORIDA TODAY**, p. 12A, May 6, 1988.]

<> SRB ASSEMBLY/SAFETY PLANS

An explosion in the Henderson, Nevada, manufacturing plan where solid rocket booster fuel is made with ammonium perchlorate heightened concerns about safety at Kennedy Space Center and Cape Canaveral Air Force Station. According to Gene Thomas, Director of Safety, Reliability and Quality Assurance at KSC, NASA has taken every precaution to avert such an explosion. In addition to the booster fuel, NASA and the Air Force store other potentially dangerous products at CCAFS facilities, including thousands of gallons of volatile liquid rocket fuel.

Thomas said that during the assembly process, all but 12 to 20 essential workers are evacuated from the assembly area of the VAB. Usually there are several hundred people in the area, he said. Smoking, welding or any other activity that can create sparks or flames are prohibited during assembly.

Brevard County safety officials say they still don't know what kinds of hazardous materials NASA and the Air Force store at their facilities. "We only have a general idea that there are incredibly dangerous fuels, incredibly dangerous chemicals in use out there as with any industrial area," said Fred Crounse, a county civil defense spokesman. [Lafferty, **THE ORLANDO SENTINEL**, pp. A-1 & A-4, May 6, 1988.]

May 6: DISASTER SIMULATION DRILL/KSC

A simulated crash landing on Kennedy Space Center's Shuttle landing facility featured the rescue of five would-be astronauts. The 66-minute exercised was termed a success despite minor communications problems, according to Ron Phelps, KSC Landing and Recovery Director. "All the different organizations involved were quite happy with what we went

through, and based on that, we think we had a good test," he said. The exercise was the second this week at the Space center; on November 4 astronauts and workers practiced escaping a launch tower during a moc fire. [Halvorson, **FLORIDA TODAY**, p. 1A, May 7, 1988.]

May 8: FIVE PROTESTERS ARRESTED/KSC

NASA security guards arrested five persons for trespassing on Kennedy Space Center property after a Mother's Day "peace" rally. Those arrested were Peg McIntire, Dorothy Smith, Willa Elam (who was arrested in January 1987 at Patrick Air Force Base), Wendy Loomas and Karen Morian. They were taken by bus to the Brevard County jail in Sharpes, FL, where they were held on trespassing charges. Bail was set at $250; all were released May 9. [Bumpus-Hooper, **THE ORLANDO SENTINEL**, pp. B-1 & B-6, May 9, 1988, and Bumpus Hooper, **THE ORLANDO SENTINEL**, p. D-1, May 10, 1988.]

May 10: NASA SHOULD BUILD PLATFORMS

NASA should build several small unmanned Space platforms "as soon as possible" as a bridge to a more elaborate Space station in the 1990's, according to a report today by the National Academy of Sciences. The report also called for higher priority to be given to microgravity experiments aboard the Space Shuttle. Paul W. Todd, an official of the National Bureau of Standards, headed the 13-member panel which wrote the 55-page report. [Broad, **THE NEW YORK TIMES**, (National Edition), p. 11, May 11, 1988.]

<> ROCKET TEST SUCCESSFUL

Royce Mitchell, NASA's project manager for the booster redesign program, said that the recent test-firing of a full-size booster rocket was "the best so far" in qualifying the rocket for the launch of Discovery, scheduled now for late August-early September. Further test-firings are scheduled for June and July, 1988. ["Booster Rocket Testing Successful, NASA Says," **THE NEW YORK TIMES**, (National Edition), p. 13, May 11, 1988.]

May 13: SMITH SIGNS WITH JLC

Former Kennedy Space Center Director Richard G. Smith has joined the JLC AeroSpace Corp. (Orlando, FL), an aeroSpace consulting company, as a senior vice president. After a brief period with Astrotech International Corp. (Pittsburgh, PA), Smith has been doing independent consulting. His responsibilities with JLC will be in Space systems. [Hinman, **THE ORLANDO SENTINEL**, p. B-1, May 14, 1988.]

May 15: SPACEPORT GETS WARHOL ART

A set of silk screens by the late pop artist Andy Warhol was unveiled today at a ceremony at Spaceport USA presided over by Kennedy Space Center Director Forrest S. McCartney. The two prints depict Apollo astronaut Edwin "Buzz" Aldrin standing on the surface of the moon and

May 16: TDRS UNLOADED AT KSC

A 5,000-pound Tracking and Data Relay Satellite (TDRS) was unloaded at Kennedy Space Center today. The TDRS will replace the one lost on January 28, 1986, in the Challenger explosion. KSC spokesman George Diller said, "Everybody is real pleased to have it here. It's another milestone toward launch. Known officially as TDRS-3, the satellite arrived at the Shuttle Landing Facility (SLF) aboard a C-5 cargo plane which had taken off from Los Angeles late Sunday night (May 15). When launched from Discovery later this year, the TDRS-3 will join TDRS-1 which has experienced a failure in one of its antenna and has been only partially operational since late 1986. [Halvorson, **FLORIDA TODAY**, p. 1A, May 17, 1988.]

May 18: TRULY FLIES TO KSC

NASA'S Associate Administrator for Space Flight, Rear Admiral Richard Truly, flew to Kennedy Space Center today to meet with Director Forrest S. McCartney, Marshall Space Flight Center Director J. R. Thompson and Johnson Space Center Director Aaron Cohen. They discussed the progress being made in preparing Discovery for launch later this year. Aviation Week & Space Technology reported this week that the new launch date will be August 29. Other sources say the launch will occur the next day, August 30. The SRB stacking is expected to be completed May 26; mating of Discovery with its boosters and external tank is expected to be completed in the VAB on June 8 and a test-firing of the main engines is planned for July 17. [Halvorson, **FLORIDA TODAY**, p. 8A, May 19, 1988.]

May 19: INDIAN CAMP GROUND EXCAVATED

An ancient Indian camp ground has been excavated at a site which may be converted for use as a new VIP viewing area for Space Shuttle launches. Ten men have dug up thousands of pottery shards, animal bones, tools and the remnants of campfires and posts used for primitive homes. Most items date from 500 B.C., though a few date from 4,000 to 6,000 B.C. The items will be studied for three months then turned over to state curators. Some of the artifacts will eventually be on display at Spaceport USA and at the Brevard Historical Museum in Cocoa, Florida. A Kennedy Space Center spokesman indicated that though there are at least fifteen other archaeological sites none will be excavated unless NASA needs to use the property for its purposes. [Lancaster, **THE ORLANDO SENTINEL**, pp. D-1 & D-6, May 5, 1988 and "Past May Meet Future at KSC Dig Site," **THE ORLANDO SENTINEL**, p. D-8, May 20, 1988.]

May 25: NO JOINT MARS TRIP

NASA Administrator James Fletcher says the Space agency has no money to pay for this country's participation in a joint mission to Mars with the Soviet Union. The mission was recently proposed by General Secretary Mikhail Gorbachev of the U.S.S.R. [Glisch, **THE ORLANDO SENTINEL**, p. A-3, May 26, 1988.]

May 26: DISCOVERY'S BOOSTERS ASSEMBLED

Workers at Kennedy Space Center today finished stacking the major segments of the two solid rocket boosters which will help launch Discovery later this year. The work began on March 28 and progressed slowly in order to ensure that new field joints and critical O ring seals were not damaged in the stacking processes. Nose cones will be put in place this weekend.

NASA spokeswoman Lisa Malone said that the completed booster work "keeps us on track for a late June rollout to the pad," although officials have also said that milestone could slip into July because of lagging work on the Shuttle. [Glisch, **THE ORLANDO SENTINEL**, p. A-18, May 27, 1988.]

May 29: NEW LAUNCH RULES

Sweeping changes have been made to the launch rules under which Discovery will be launched later this year. "Nobody is afraid to say anything, be it grass roots or the management level," said Bob Sieck, Discovery's launch director. "There is very open communication between all levels of this program now. That's the major lesson learned [from Challenger]. We're not going to let that happen again."

NASA re-examined 2,500 Shuttle systems and created a special 20-person launch team, led by veteran astronaut Robert Crippen, who will give the final "go" after a series of meetings are held to discuss all aspects of Shuttle safety. NASA's new safety boss George Rodney, a member of Crippen's team, will hold separate talks with his experts before main liftoff meetings to ensure all concerns are adequately discussed.

Nearly all key meetings with managers will be held "face-to-face" at Kennedy Space Center for better communication. Shuttle systems must pass a 2,500 item checklist which includes 283 items in the last 30 seconds. More readings on booster rockets and main engines are among the new items.

Launch temperatures must be much warmer than prevailed when Challenger was launched. Proposed rules say that liftoff is cancelled if the temperature has not averaged between 40 to 50 degrees during the 24 hours prior to launch. Heaters wrapped around critical booster rocket O-rings must be at a constant 85 degrees to keep them in proper working condition.

There will be no launch if lightning strikes 10 miles from the pad; few, if any, clouds may be over the launch site and the winds must be mild. Safety chief George Rodney said, "the first launch is going to be tough. I anticipate difficulty, but I believe we have done everything you can think of it make the system as good as you can make it. [Glisch, **THE ORLANDO SENTINEL**, pp. A-1 & A-8, May 30, 1988.]

May 31: TDRS/IUS MATED

The Tracking and Data Relay Satellite (TDRS) and its Inertial Upper Stage Booster were mated today by workers at Kennedy Space Center. The mated payload will be carried aboard Discovery when it is launched in August. [Halvorson, **FLORIDA TODAY**, p. 2A, June 1, 1988.]

<> BREVARD SPACE SCIENCE INSTITUTE

The Florida Senate approved the expenditure of $2.5 million annually from Challenger license plate revenues in support of a Space science institute in Brevard County. The institute will be operated by Florida Institute of Technology and would be located near Kennedy Space Center. [Willmoore, **FLORIDA TODAY**, p. 1A, June 1, 1988.]

June 1: PROTESTORS SEEK JURY TRIALS

Five women arrested on charges of trespassing at Kennedy Space Center last month have requested jury trials and asked that their trials be consolidated to save money for Brevard County taxpayers, according to defendant Wendy Loomas. All five women said they would represent themselves. [Bumpus-Hooper, **THE ORLANDO SENTINEL**, pp. B-1 & B-7, June 2, 1988.]

June 2: EDUCATIONAL VIDEO SHOT AT KSC

Kenneth Ahmie, a section chief in the design engineering office at Kennedy Space Center, was featured in an educational video tape being made out at Launch Pad 39B. "Our Native American Heritage," filmed by Roy Williams for his company Instructo-Vision, shows 15 Native Americans and non-Indian professionals talking about their careers in science, engineering and medicine. [Mittman, **FLORIDA TODAY**, p. 4A, June 3, 1988.]

June 6: THIOKOL LEAVING BOOSTER BUSINESS

Morton Thiokol Inc. announced today that it will not bid for the contract to build a new, advanced rocket motor for the Space transportation system. Rather, it will leave the booster business when the next generation of more powerful rockets comes on line in the 1990s. Edwin Garrison, Thiokol's group vice president for aeroSpace, said the decision not to bid was based in part on the company's desire t concentrate more fully on the program to redesign the current generation of booster rockets made by the company in its plant in Brigham City, Utah. He added that the decision also would "materially benefit NASA's key objectives and is in the best interest of America's Space program." Thiokol spokesman Rocky Raab said that the company remains interested in bidding on other solid-fuel rockets, including those which might be used on unmanned versions of the Shuttle. ["Thiokol: No Bid to Build New Rocket," **THE ORLANDO SENTINEL**, pp. A-1 & A-4, June 7, 1988.]

June 7: ROCKET FUEL CRISIS

The loss of the Pacific Engineering and Production Company rocket fuel plant in Henderson, Nevada, raised serious implications for the future of the Space program in general and the Shuttle Program specifically. The May 4 explosion reduced by half the American capacity for producing the fuel, leaving only a single other producer - Kerr-McGee Chemical Corporation, also of Henderson, Nevada. The Kerr-McGee plant has suspended operations pending a safety inspection ordered by federal officials. [Ironically, a Soviet rocket fuel plant also exploded May 12 in Pavlograd, 500 miles south of Moscow. Western analysts project a possible delay in Soviet solid-propellant missile programs of 3 to 6 months.]

Rocket fuel shortages are expected to become severe in 1989 and remain serious into the 1990s and the launchings of both military rockets an

Space Shuttles are likely to be impacted for the next two to three years. Officials said that it will probably take two years for new manufacturing plants to be built and operating.

The Department of Defense and the National Aeronautics and Space Administration have held meetings daily to set launch priorities and to allocate the scarce ammonium perchlorate, the catalytic agent in solid-fuel rockets. On June 8, the House Committee on Science, Space and Technology opens an investigation into the fuel shortage.
The fuel shortage is not expected to affect plans for the August launch of Discovery or the initial Titan 4 flights, according to Lieutenant Colonel Rick Osborn, Air Force spokesman. He said there is enough fuel on hand for five Shuttle launchings and four Titan 4 missions.

In addition to the Shuttles and Titan 4's, about 80 other military, scientific and commercial programs also require the fuel in the United States, as does the Ariane program of the European Space Agency. No foreign producers make enough of the fuel to replenish the international shortage, according to government officials. [Wilford, **THE NEW YORK TIMES**, (National Edition), pp. 1 & 9, June 8, 1988, and **AVIATION WEEK & Space TECHNOLOGY**, p. 15, May 23, 1988.]

<> SHUTTLE LANDING SIMULATED/KSC

Three astronauts successfully made a mock emergency landing at the Shuttle landing facility at Kennedy Space Center to conclude a comprehensive rehearsal for the launch of Discovery on August 31. The launch team and mission control in Houston rehearsed the final three hours of countdown to launch and a simulated launch failure culminating in the emergency landing at KSC. Robert L. Crippen, an astronaut who is now deputy director of Shuttle operations, described the rehearsal as an "excellent exercise."

Astronauts participating in the exercise at Kennedy Space Center were Loren Shriver, James Weatherbee and Franklin Chang-Diaz. Observing at Johnson Space Center in Houston, TX, were Discovery Commander Frederick H. Hauck and the four members of his crew. ["Astronauts Simulate Emergency Shuttle Landing," **THE NEW YORK TIMES** (National Edition), p. 9, June 8, 1988.]

<> FLORIDA COMMERCIAL SPACEPORT

Florida's state legislature earmarked $2.5 million a year for a Space research center to be located near Kennedy Space Center and included $500,000 in the state budget to study how to establish the nation's first commercial Spaceport. [Willmoore, **FLORIDA TODAY**, pp. 1A-2A, June 8, 1988.]

June 10: DISCOVERY PLANS ON TRACK

Bob Sieck, Kennedy Space Center's Shuttle Launch Director said today that when Discovery moves from the Orbiter Processing Facility (OPF) to the Vehicle Assembly Building (VAB), it will be ready to fly. "The most challenging task we have is the documentation that goes with having the vehicle overhauled for the past two years." Astronaut Robert

Crippen, who along with Sieck met with reporters today, said that procedures followed by management and launch and flight support teams during a mock countdown June 7 have been fine tuned so team players understand their responsibilities.

"There are no dramatic differences from what we have done in the past," Crippen said. "If there has been a change it is in the degree of documentation about who will be responsible." Sieck said a late-August launch date was optimistic and that "given where we are today, we have a shot at it." [Mittman, **FLORIDA TODAY**, p. 1A, June 11, 1988.]

June 11: ASTRONAUT CHARLES BOLDEN/TITUSVILLE

Astronaut Charles Bolden, speaking to the Space Coast Chapter of the National Technical Association's Space Camp Awards Ceremony in Titusville, FL, said that the date of Discovery's launch is not as important as understanding the risks and continuing to strive for Space exploration. "It would be very easy for all of us connected with the Space program to say, 'I'm not going to work over there tomorrow because it's dangerous and we could hurt people and we might lose somebody else.'" Bolden said. "But if you believe in what you are doing, it's very important to stick to it."

"I'm confident," he said, "that we are doing the right kinds of things and we're not rushing. That's why I say we'll fly in August or September. I thin when we fly is not as important as doing it and doing it right. We're getting there." [White, **FLORIDA TODAY**, p. 1A, June 12 1988.]

June 12: GORDON HARRIS

Gordon Harris, former chief of public affairs at Kennedy Space Center (1963-1974) died today at the home of his son David in Huntsville, Alabama, after a long battle with lung cancer. Known as the "Voice of NASA" during the 1960s, Harris became head of public affairs at the Space center in 1963 following careers in journalism and military public affairs. Harris was to be buried June 16 in Nashville. He is survived by his wife Bernice, sons David and Thomas, six grandchildren and three great-grandchildren. A memorial service for Harris was scheduled in Cocoa Beach, Florida, for June 28 at St. David's by the Sea Episcopal Church. [Mittman, **FLORIDA TODAY**, p. 1A, June 14, 1988, and "Memorial Service Set for Harris," **FLORIDA TODAY**, p. 1B, June 27, 1988.]

<> SEPARATE TRIALS FOR PROTESTORS

Brevard County Judge Peter Haddad ruled today that the five women arrested at a Kennedy Space Center protest demonstration in May must be tried separately. The five women are Willa Elam, Wendy Loomas, Marjorie McIntyre, Dorothy Smith and Karen Morian. Haddad also denied three motions to dismiss the charges against the defendants who were charged with trespassing. [Nagy, **FLORIDA TODAY**, p. 1B, June 14, 1988.]

June 14: BARBARA MORGAN VISITS BREVARD

Teacher-in-Space runner-up Barbara Morgan joined twenty other elementary school teachers at a NASA-sponsored Space education workshop in Cocoa

Beach today. Morgan was Christa McAuliffe's backup during the Challenger crew's training. Morgan indicated she might be on hand for Discovery's launch if it does not conflict with her school duties. "I remember when they launched the chimp into Space," Morgan said. "I just remember reading about it in **WEEKLY READER**. I remember thinking, 'Why'd they launch a chimp? They should have launched a kid. Kids are a lot smarter than chimps.'" ["Teacher-in-Space Finalist Visits," **FLORIDA TODAY**, p. 1A, June 15, 1988 and Klotz, **FLORIDA TODAY**, p. 12A, June 15, 1988.]

<> AUGUST LAUNCH POSSIBLE/MCCARTNEY

Kennedy Space Center Director Forrest McCartney asserted today that an August launch for Discovery remained a possibility, but said that three things must occur before that takes place: all documentation must be completed; a complete analysis of the fourth SRB test [see below] must be undertaken and a fifth test must be successful. McCartney said, "We're now in the process of closing out the Orbiter and checking on the documentation - some of which is two years old by now." [Klotz, **FLORIDA TODAY**, p. 12A, June 15, 1988.]

<> FOURTH SRB TEST

The fourth test of the Shuttle's solid rocket booster was an apparent success, according to NASA and the SRB manufacturer Morton Thiokol. "All indications are we had an excellent test," said Royce Mitchell, manager of NASA's solid rocket booster project. The test was conducted in a new $22 million facility built by both NASA and Morton Thiokol. Mitchell went on to say that "the new facility worked great and the motor performed very, very well." A fifth test is tentatively set for late July, with a deliberately flawed booster that will push the rocket motor to its limits, Morton Thiokol officials said. [Mittman. **FLORIDA TODAY**, p. 1A, June 15, 1988, Gurwell and Hoversten, **USA TODAY**, p. 3A, June 15, 1988, and Fisher, **THE ORLANDO SENTINEL**, p. A-3, June 15, 1988.]

<> CHARLES WALKER IN COCOA BEACH

Astronaut Charles Walker told a gathering of aeroSpace officials at a Space station workshop in Cocoa Beach today that a successful flight by Discovery will help the country "cleanse itself" from the trauma of the Challenger tragedy and engender new support for Space exploration. "It was much like somebody just beginning to learn to ride a horse," said Walker. "Remember, the Space Shuttle had only launched for five years, only 24 flights. We were still relatively new at what was going on with the Space Shuttle and the accident happened. If you fall off and don't get back on and ride soon, you're not going to want to ride again. You're going to be too afraid.

"We as a nation, are going to have to launch a Shuttle again, to get a crew into Space and back successfully. When that happens at the end of this summer, I think all of the sudden we will have cleansed ourselves of the trauma of the accident and we'll say 'This is the way it was. This is what's right. We can do this. There will be a lot more very positive support for Space that will then spring forth again from that event," Walker said.

"They've done plenty of things that would have been necessary anyway," said Walker of the recovery of the Shuttle system. "It's absolutely going to be a safer, more efficient vehicle when it gets back in the air. It would have been better if we didn't have to wait this long, but it's a complex system." Referring to the Space station, Walker called it "a goal we can't keep at arm's length for the next eight years. It has to [be] particularly pursued with a great deal of dedication and discipline." [White, **FLORIDA TODAY**, p. 13A, June 15, 1988.]

June 15: SpacePORT FLORIDA STUDY PROPOSALS

Florida's Department of Commerce narrowed its list of Spaceport Florida study proposals to four companies: Briel Rhame Poynter & Houser Architects-Engineers Inc. (Melbourne, FL); Pan American World Services (Cape Canaveral, FL); TranSpace Carriers (Lanham, MD); United Engineers and Constructors Inc. (Denver, CO). [Klotz, **FLORIDA TODAY**, p. 6A, June 16, 1988.]

June 16: DRUG TESTS FOR KSC

Random drug testing of 500 Kennedy Space Center civil service workers will begin late this year, according to Ray Sparnon, who directs NASA's program for a drug-free workplace. The KSC Director, his deputy, the launch director and top engineers, inspectors and security workers are among 2,000 NASA workers across the country who have been selected for testing because of their crucial positions.

NASA has also pledged to encourage its contractors voluntarily to begin programs because of the close working relationships between civil service and contractor employees in the Space program, Sparnon said. That program will not necessarily have to include drug testing. Both Lockheed Space Operations Co. and EG&G Florida already have drug programs that emphasize education, with assistance to employees having drug problems. [Fisher, **THE ORLANDO SENTINEL**, pp. A-1 & A-6, June 17, 1988.]

<> HARRINGTON SUCCEEDS GAY

James Harrington, deputy director for Space Shuttle operations at Kennedy Space Center, has been named to replace that office's director, Charles Gay, who recently retired. Harrington reports to Tom Utsman, Director of Space Transportation System Management and Operations. The new director has an electrical engineering degree from the University of Miami; he joined KSC as a senior test supervisor in 1966 to work on the Apollo lunar landing program. ["Harrington Named Operations Director," **FLORIDA TODAY**, p. 5A, June 17, 1988.]

June 20: DISCOVERY READY FOR ROLLOVER

A sign hanging between the OPF and the VAB read "OV-103 Come On Over," the day before Discovery rolled over to the Vehicle Assembly Building for mating with its external tank and boosters. Weather was a concern early and did cause a one day delay till June 21. [Mittman, **FLORIDA TODAY**, p. 1A, June 21, 1988.]

<> PLAYALINDA ROAD CLEARS COMMITTEE

The House Appropriations Committee approved $6.6 million in funding for construction of a new access road to Playalinda Beach north of Titusville, FL, according to Melbourne Democrat Rep. Bill Nelson. Construction of the road would shorten the amount of time that beach access would be restricted due to the need to protect Shuttle launches. [Horgan. **FLORIDA TODAY**, p. 1B, June 21, 1988.]

June 21: RETOOLED DISCOVERY ROLLS TO VAB

Discovery, having spent 600 days undergoing modifications, finally rolled over to the VAB at Kennedy Space Center where it will be mated with its external tank and solid rocket boosters. Rollout to the launch pad may occur late next week. Described as "squeaky clean" by Shuttle processing chief John Talone, Discovery may still meet the late August or early September launch target. Talone said, "We've done a lot of work - hard work. This was like a rebirth. This was like saying we're back in business and we mean to stay in business.

KSC Director Forrest McCartney said, "More than anything else, it's a testimony to the fact that people have worked hard to make this reality. Everything we see says it was a very good job. I don't know of any single thing about the that Orbiter we're concerned about." More than 500 persons saw Discovery make the 25 minute trip from the Orbiter processing facility to the VAB. [Glisch, **THE ORLANDO SENTINEL**, pp. A-1 & A-7, June 22, 1988.]

<> SHUTTLE DOCUMENTATION COMPLETED

The rollover of Discovery from the Orbiter Processing Facility to the Vehicle Assembly Building was delayed till today due to the thousands of processing documents which had to be completed. By June 20, workers had reduced the number of pages to be completed to 178, from more than 1,000 pages 10 days ago, according to Frank Jones, lead engineer for the thermal protection system. [Mittman, **FLORIDA TODAY**, p. 4A, June 21, 1988.]

June 22: DISCOVERY'S STACKING DELAYED

A malfunctioning landing gear delayed the planned stacking of Discovery with its booster and external tank today, NASA spokesmen said. Engineers and technicians made repeated trips in and out of the landing gear doors in an effort to get the gear to retract. When the problem is resolved, Discovery will be hoisted by crane to a vertical position. The process of hooking up the fuel lines and other equipment between the vehicle and its boosters and tank takes about 20 hours. On June 24, a five-day test of the connections will begin prior to the July 1 rollout to the launch pad, a six-hour trip. [Mittman, **FLORIDA TODAY**, p. 1A, June 23, 1988.]

June 23: LANDING GEAR PROBLEM CORRECTED

Discovery's landing gear problem [see above] was resolved late tonight and the landing gear doors were closed by workers in preparation for

stacking June 24. Mechanical systems worker Ken Fore said that the problem does not affect astronauts' controls for releasing the landing gears and does not pose a threat to astronaut or vehicle safety. The system had been a backup in case the doors failed to open by gravitational pull during a normal approach to the runway, he said. A similar problem had arisen in Columbia and Atlantis and never caused a failure during landing. Resolving the problem took two days due to delicate adjustments and repeated tests. Rollout is still expected for July 1. [Mittman, **FLORIDA TODAY**, p. 1A, June 24, 1988.]

June 24: DISCOVERY STACKED

For the first time in more than two years the VAB's 250-ton overhead crane was used to hoist a Shuttle vertically for assembly with its external tank and solid rocket boosters. That hoisting operation was completed late in the evening and Discovery was prepared to undergo five days of tests that will determine if all connections are working. Rollout has been expected to occur July 1, but processing problems may delay that event. [Mittman, **FLORIDA TODAY**, p. 1A, June 25, 1988.]

June 26: MERCURY ASTRONAUTS AT Space CAMP

Mercury astronauts Alan Shepard and John Glenn and Betty Grissom (widow of astronaut Virgil "Gus" Grissom) toured the temporary facilities of the U. S. Space Camp in Titusville. The camp is sponsored by the Mercury 7 Foundation which was set up in 1984 by the original Mercury astronauts. The Foundation's goal is to elevate the standard of education in America through efforts like Space Camp and give scholarships to college and graduate school students who demonstrate academic excellence, creativity and motivation. [White, **FLORIDA TODAY**, p. 1A, June 27, 1988.]

June 27: DISCOVERY CEREMONY ANNOUNCED

Kennedy Space Center plans a public ceremony to celebrate Discovery's arrival at the launch pad on July 3. Center Director Forrest S. McCartney will present Discovery Commander Frederick Hauck with more than 100 pages of KSC employee signatures which will be carried aboard the Shuttle when it is launched in early September. "It is really just an occasion to say thank you to the people who have been working so hard to get to roll out," said KSC spokesman Hugh Harris. The signatures were the idea of Lockheed Space Operations Co. employee John W. Archibald III, a management systems analyst. The public will be allowed to drive by the pad between 8:00 a.m. and 11:00 a.m. the morning of the rollout. [Mittman, **FLORIDA TODAY**, p. 1A, June 28, 1988.]

<> LAUNCH MANIFEST ANNOUNCED

The U. S. Department of Transportation announced the first "U. S. Commercial Launch Manifest" today. The manifest lists 19 launches, three fourth of which will take place from Cape Canaveral. "Our future is as bright as it's ever been," said Don Maclean, a McDonnell Douglas launch operations manager at the Cape. "We have added people - we now have about 200. If all this materializes, the work force could increase by 25 percent." [Lunner and Klotz, **FLORIDA TODAY**, pp. 1A - 2A, June 28 1988.]

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1 MILLION VISITORS FOR DISCOVERY LIFTOFF

A million visitors and journalists are expected to arrive in Brevard County for the launch of Discovery in late August or early September. To cope with the influx of visitors, Brevard County Administrator Tom Jenkins has formed a group of government officials and commercial leaders who will brainstorm ways of coordinating services. The Space Shuttle Launch Task Force will organize everything from camp ground accommodations to convenience store hours and will work with Arnold Richman, KSC Chief of Visitor Services. [George, **FLORIDA TODAY**, p. 16C, June 28, 1988.]

June 28: DISCOVERY LAUNCH: SEPT. 4

NASA announced today that Discovery's liftoff will occur September 4. Officials said that minor problems along with slow-moving work and new safety procedures caused the delay. Rear Admiral Richard Truly, Associate Administrator for Spaceflight, said that rollout may come July 3. Truly said, "Hard work by a lot of people is paying off and the Shuttle Program is coming along nicely. "Still to come are a 20-second firing of Discovery's three liquid-fuel main engines on the pad July 24 in an overall test of Shuttle systems and the final full-scale firing of the Orbiter's redesigned solid rocket booster in Utah on July 25. Major problems during either of these tests could delay launch indefinitely. [Glisch, **THE ORLANDO SENTINEL**, p. A-3, June 29, 1988, and "NASA Delays Shuttle Launching for Third Time, Until September," **THE NEW YORK TIMES** (National Edition), p. 12, June 29, 1988.]

June 30: DISCOVERY ROLLOUT DATE UNCERTAIN

The decision on when to roll Discovery out to the launch pad will be based on the progress of the Shuttle interface test now underway. That testing has usually been completed while the Shuttle is in the Vehicle Assembly Building. Workers will be permitted to drive by the launch pad the morning after rollout. [Mittman, **FLORIDA TODAY**, p. 1A, June 30, 1988.]

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TWO PROTESTORS CONVICTED

Protestors Willa Elam and Wendy Loomas were convicted today of trespassing at Kennedy Space Center. State prosecutor James Carter asked that the two be fined $25,000 as part of their sentence. That amount, said Carter, was approximately what EG&G Florida Inc., security contractor at KSC, expended to "protect the Space center from demonstrators and to take pictures and prepare other material for the charges." Carter went on to say, "Your honor, you've sentenced Ms. Elam to six months in jail before. I don't think she has learned from her actions." [Bumpus-Hooper, **THE ORLANDO SENTINEL**, pp. B-1 & B-5, July 1, 1988.]

JULY

July 1: JAIL FOR ELAM & LOOMAS

Protestors Willa Elam and Wendy Loomas were sentenced to jail terms of one year and nine months respectively. Brevard County Judge Peter Haddad did not announce his decision on the prosecutor's recommendation that Elam and Loomas pay $33,408 in restitution and $640 each in court costs. Protestor Dorothy Smith, in a non-jury trial this morning, was also convicted of trespassing and ordered to pay a $500 fine and spend 30 days in jail. Smith refused to pay the fine. Brevard County prosecutor Norm Wolfinger said, "They demonstrated a complete disregard for the law. They could easily demonstrate their views without crossing a security line. You can't criticize people for their views about disarmament but that doesn't give them a license to pass on their views to you with the accompanying expense to the public."

Protestor Marjorie McIntyre pleaded no contest to the charge of trespassing and received a $500 fine. Karen Morian was convicted by the jury which took 16 minutes to render its verdict; she was sentenced to six months in jail. [Sellers, **THE ORLANDO SENTINEL**, pp. D-1 & D-5, July 2, 1988, "5th Woman Guilty of KSC Trespassing," **THE ORLANDO SENTINEL**, p. B-2, July 7, 1988, and Brown, **FLORIDA TODAY**, p. 1B, July 7, 1988.]

<> LAST TEST BEFORE ROLLOUT

Jim Harrington, Chief of Shuttle Processing, announced today that Discovery will be rolled out to Pad 39B at 12:01 a.m. on the Fourth of July. The last necessary tests were performed today; these were to insure that Discovery's systems were connected properly to its twin redesigned booster rockets and the external tank. The holiday rollout will require the presence of between 500 and 1,000 Kennedy employees with the remaining 15,000 having the weekend off. Kennedy workers will also have the rare opportunity to drive by the launch pad with their families after it reaches the pad.

The midnight rollout was scheduled to accommodate weather forecasts. The whole ceremony will be illuminated by floodlights as Discovery emerges from the Vehicle Assembly Building and heads for the pad. Center Director Forrest S. McCartney will preside and present Discovery crew member David Hilmers with a 107-page book signed by 15,240 Space center employees. The book will accompany the five member crew into Space. Besides Hilmers, the crew includes Commander Frederick Hauck, Pilot Richard Covey and Mission Specialists John Lounge and George Nelson. [Glisch, **THE ORLANDO SENTINEL**, p. A-4, July 2, 1988, and Mittman, **FLORIDA TODAY**, p. 1A, July 2, 1988.]

<> EXTRA DAY AT PLAYALINDA

Calvin Burch, Kennedy Space Center's chief of security operations, gave beachgoers an extra day at Playalinda Beach east of Titusville, Florida. NASA bent its rules which call for closing access to the beach one day before rollout by allowing access till sundown July 3. Burch said, "We trying to be a good neighbor." [Lafferty, **THE ORLAND SENTINEL**, p. A-4, July 2, 1988.]

July 4: DISCOVERY ROLLS OUT

Discovery rolled out of the Vehicle Assembly Building at 12:50 a.m. today amid the cheers of 2,000 workers and officials. Astronaut Robert L. Crippen told the crowd, "This is a proud day. This is what I call a happy Fourth of July." Discovery crew member David Hilmers said, "It is the mark of a great nation, of its greatness, that it can rise again from adversity. And with Discovery, rise again we shall. As the applause faded, Hilmers added, "What more fitting present can we make to our country than this, on the day of its birth. America, the dream is still alive."

Center Director Forrest S. McCartney presented Hilmers with a 107-page book bearing the autographs of 15,240 workers at Kennedy Space Center which will be carried aboard Discovery. The cover of the book bore the phrase, "with you from liftoff to landing." [See LAST TEST BEFORE ROLLOUT, July 1, 1988.] Discovery was finally bolted down at 8:42 a.m. today and from 8:00 a.m. through 11 a.m., badged employees and their families were permitted to drive by the crawlerway to Launch Pad 39B to view the Shuttle. Thousands of workers took advantage of the opportunity. [Broad, **THE NEW YORK TIMES**, (National Edition), pp. 1 & 24, July 5, 1988.]

July 6: DISCOVERY MISSION 'SAFEST EVER'

A NASA task force report says that the agency has experienced a "positive change in attitude" and that the agency was to be commended for building a new liftoff decision-making team that provides solid safety reviews and oversight. The committee also remarked on "deficiencies in people, skills, management systems and independent oversight functions." Louis Polaski, a committee member, said some of these problems could be traced to budget constraints. "I think," Polaski said, "the next flight will be [the] safest flight ever. But after that, we wonder if it will be [back to business as usual]. They're very thin in personnel. The program is stretched. They have a good first team, but when somebody gets sick or leaves, there's a hole and something could slip by." [Glisch, **THE ORLANDO SENTINEL**, pp. A-1 & A-4, July 6, 1988.]

<> BOLDEN RIDES BASKET ESCAPE SYSTEM

Astronaut Charles F. Bolden, Jr. twice rode a safety basket at 50 miles an hour down a 1,200-foot slide wire pad escape system at Kennedy Space Center. Two safety workers rode with him on the second trip. The test was the first time the basket had been ridden by people, for all previous tests had been run using sandbags and dummies for ballast.

After a simulated emergency was declared, Bolden, a Lieutenant Colonel in the United States Marine Corps, went from the Discovery's cabin level to the basket for the descent which was stopped by the system's brakes. A net stretched across the basket's path served as a backup stopping mechanism. Safety personnel George Hoggard and Albert Bumgarden accompanied Bolden on the second test ride. ["Escape System Is Tested," **THE NEW YORK TIMES** (National Edition), p. 24, July 12, 1988.]

<> LAUNCH VIEWING SITE CONTRACT

Butler Construction Co. (Rockledge, FL) was awarded a $300,500 contrac' to build the first phase of a Kennedy Space Center launch viewing site for special guests and dignitaries. Construction will take place along the Banana Creek about two miles north of the Vehicle Assembly Building. [Mittman, **FLORIDA TODAY**, p. 2A, July 7, 1988.]

July 7: TDRS LOADED INTO CANISTER

The Tracking and Relay Satellite, identical to one lost on Challenger, was loaded today into the payload canister/transport vehicle for the trip to the pad following Discovery's flight readiness firing now set for July 31. "We're ready to go. When we get the Orbiter all ready to go, we'll be all set," said NASA mission engineer Mike Kienlen. McDonnell Douglas spokeswoman Pat oliver said, "We've been preparing for this moment for the last 2 1/2 years. We're elated. It's been great to have a payload in here again. Our people are feeling great about it. It's been far too long." [White, **FLORIDA TODAY**, p. 2A, July 8, 1988.]

<> LOCKHEED'S WILDLIFE DONATION

Lockheed Space Operations Co. announced today that it will donate $20,000 to the National Wildlife and Fish Foundation in order to learn more about endangered species at Kennedy Space Center. Lockheed President Doug Sargent and the company's vice president for communications Hud Englehart, presented the first of four $5,000 checks to the U. S. Fish and Wildlife Service's Tom O'Shea. Space Cente Director Forrest S. McCartney, who attended the KSC ceremony, said, "We've got 140,000 acres of what I call pristine wildlife refuge. This is a perfect example of how you can have development of modern technology as well as preservation of endangered animals." [White, **FLORIDA TODAY**, p. 2A, July 8, 1988.]

July 8: COLUMBIA MOVES TO OPF

Columbia made the short trip to the Orbiter Processing Facility from the Orbiter Maintenance and Refurbishment Facility after a three-day delay due to inclement weather. The Orbiter had been stripped of its engines, maneuvering systems, hatches and numerous tiles when it left the OMRF at 10:30 a.m. for the thirty minute trip to the OPF, where more advanced Shuttle processing will be undertaken. [Klotz, **FLORIDA TODAY**, p. 4A, July 9, 1988, and Mittman, **FLORIDA TODAY**, p. 2A, July 7, 1988.]

July 9: SRB JOINT ACCIDENT

Discovery's early September launch should not be impacted by today's accident at the Morton Thiokol plant in Brigham City, Utah; workers switched hoses and pumped air at too great pressure into cavities between three O-rings in the booster's center joint. The Space between the primary and secondary O-rings was to have got 1,000 pounds per square inch of pressure, and 100 pounds in the Space between the primary and a safety O-ring added after the 1986 Challenger explosion. [Hoversten & Mittman, **FLORIDA TODAY**, p. 1-A, July 12, 1988, Fisher, TH

ORLANDO SENTINEL, pp. A-1 & A-6, July 12, 1988, and Wilford, **THE NEW YORK TIMES**, (National Edition), pp. 21 & 24, July 12, 1988.]

July 11: Orbiter FUELING BEGINS

Workers wearing protective clothing began loading highly toxic propellants into the Orbiter today; the task, which is expected to be completed late July 12, involves loading monomethylhydrazine and hydrogen tetroxide for use by the orbital maneuvering and reaction control systems onboard the Orbiter. The external tank is expected to be fueled July 22. [Mittman, **FLORIDA TODAY**, p. 4A, July 12, 1988.]

<> NASA STUDIES UNMANNED Shuttle LAUNCH

NASA is studying the possibility of launching Columbia without a crew next year, using old, unmodified solid rocket motors to help alleviate a potential shortage of ammonium perchlorate oxidizer. The short duration mission would launch a Department of Defense satellite. Such an automated mission would require a Shuttle modification to install a braking parachute to assist in landing. ["NASA Studies Unmanned Space Shuttle Missions," **AVIATION WEEK & Space TECHNOLOGY**, p. 27, July 11, 1988.]

July 15: LEAK DETECTED IN DISCOVERY ENGINE

A pad technician detected the odor of nitrogen tetroxide, a component of Discovery's fuel for orbital maneuvers, during launch preparations today. The leak rate was reported to be 15 parts per million, considered very minor, and later was reported to have dropped to 3 or 4 parts per million. That drop made difficult the detection of the leak's source. Testing valves and sniffing devices were being used to learn the source of the leak. When first detected, engineers believed the leak to be located in one of three places: a power valve, an oxidizer tank filter or a jet thruster. ["Space Shuttle Steering Engine Has a Leak; Source Is Sought," **THE NEW YORK TIMES** (National Edition), p. 10, July 16, 1988, Mittman and Banke, **FLORIDA TODAY**, p. 1A, July 16, 1988.]

<> PADS TRANSFERRED AT CAPE

NASA agreed today to transfer ownership of Launch Complex 17 and East Coast Delta launch operations to the Air Force as part of the Space agency's response to White House directions to get out of the unmanned launch business. The agreement was signed by NASA Administrator James Fletcher and Air Force Secretary Edward Aldridge, Jr. McDonnell Douglas Astronautics Co. already has completed negotiations with the Air Force and plans at least eight launches from Pad 17 between 1989 and 1992. [Mittman, **FLORIDA TODAY**, p. 4A, July 16, 1988.]

<> Space WEEK 1988

Brevard County marked both the 19th anniversary of the Apollo 11 mission (July 16) and the beginning of Space Week '88 with exhibitions at the Miracle City Mall (Titusville, FL) and the Merritt Square Mall (Merritt Island, FL). BCC Planetarium was the sight of showings for two films:

"Our Home in the Milky Way" and "The Space Shuttle: An American Adventure." [Queen, **FLORIDA TODAY**, p. 4A, July 16, 1988.]

<> GENERAL DYNAMICS AT PORT CANAVERAL

General Dynamics Corp. plans to import and, perhaps, build satellites at Port Canaveral, according to port officials and Cape Canaveral city officials. The aeroSpace company has leased a 15,000-square-foot warehouse at Port Canaveral and expects to benefit from a proposed expansion of the port's duty-free trade zone. Thomas Brown, director of Cape operations for General Dynamics denied, however, that the warehouse had been rented to import satellites. He said further that "we aren't importing anything. We have no plans to import anything. We have no plans whatsoever related to that trade zone." Local business persons speculated that General Dynamics may not yet want to reveal its plans and has denied activity at the port because it is competing with other aeroSpace companies for payload contracts. [George, **FLORIDA TODAY**, p. 12C, July 16, 1988.]

July 16: LEAK'S SOURCE FOUND

The source of a toxic gas leak was found in the upper portion of the oxidizer tank in Discovery's reaction control system. Technicians worked round the clock to determine whether the leak could be repaired while Discovery is on the launch pad. A rollback from the pad could mean a launch delay of one to two months, according to Charles Hollinshead, director of public affairs at Kennedy Space Center. He said, further, that engineers were assessing the possibility of removing the engine pod on the launch pad, though it has never been attempted before. [Cole, **FLORIDA TODAY**, pp. 1A-2A, July 17, 1988, and Broad, **THE NEW YORK TIMES** (National Edition), pp. 1 & 12, July 17, 1988, Glisch, **THE ORLANDO SENTINEL**, pp. A-1 & A-7, July 18, 1988.]

<> ALDRIN REVISITS PAD 39A

Edwin "Buzz" Aldrin, Apollo 11 crew member, revisited LC 39A today while at Kennedy Space Center. Aldrin, Neil Armstrong and Michael Collins began the first lunar landing mission from 39A on July 16, 1969. Pads A & B have since been converted for use in the Shuttle Program. Aldrin now heads a research and engineering consulting firm in Los Angeles, CA. ["39A Holds Memories for 'Buzz'," **FLORIDA TODAY**, p. 6A, July 18, 1988.]

July 17: GO AHEAD FOR FRF

"Engineers have stabilized the leak and feel it is safe to proceed with the flight readiness firing," said Chuck Hollinshead, director of public affairs at Kennedy Space Center. The firing test is scheduled for July 25. Discussions about repairing the leak and avoiding a roll back to the OPF continued. [Mittman and Banke, **FLORIDA TODAY**, pp. 1A-2A, July 18, 1988.]

July 18: VIDEO CAMERA (BORESCOPE) LOCATES LEAK

Jack Harper used a Cobra borescope to locate the nitrogen tetroxide leak in Discovery's steering system. Harper, a Lockheed engineer, operate

the 10-foot-long, snakelike device for six hours July 16, according to Les Schrontz, Director of Reliability and Quality Assurance for Lockheed Space Operations Co.

Using the borescope, and a "sniffer," the leak was found in a seal in a line that vents pressure from the tank when the oxidizer is loaded into the tank. Schrontz said the leak appeared as intermittent brownish smoke around the metal seal, about the size of an average fingertip. "It is not a crack in a weld or on the line," he said.

After finding the leak's source, workers drained the nitrogen tetroxide from the line and filled it with helium to keep the oxidizer from escaping. They are trying to find a way to repair the leak without needing to roll back to the OPF. Harper said, "I came in (on Saturday) and everybody thanked me, but they can keep the pay if we can just keep it on the pad and not roll back. All of us out here feel that way." [Mittman, **FLORIDA TODAY**, p. 4B, July 19, 1988.]

<> Space COMMISSION REPORT

Florida Governor Bob Martinez has received the final report of his Commission on Space; it included 16 suggestions. Among the suggestions were recommendations: (1) that the state make a long-term commitment to developing Space commerce; (2) that the state's public education system be bolstered by Space curricula and programs for teaching teachers about Space; (3) that Florida's higher-education system be strengthened through more and better-coordinated Space research and academic programs; (4) to encourage the development of a commercial Spaceport. [Hinman, **CENTRAL FLORIDA BUSINESS** (a section of **THE ORLANDO SENTINEL**), p. 11, July 18-24, 1988.]

<> DISCOVERY'S LEAK: FIVE OPTIONS

NASA is considering five options with regard to the leak detected in Discovery July 16 and three of them require rolling the Orbiter back to its Kennedy Space Center hangar. The options include:

*Fixing the leak at the pad.

*Returning Discovery to the hangar and replacing its left-hand orbital maneuvering system pod, the source of the leak.

*Returning to the hangar and taking the pod to the hypergolic maintenance facility at KSC, where the steering systems are tested, for repairs.

*Returning Discovery to its hangar and repairing the leak there.

*Flying without fixing the leak. "Right now, that isn't even being discussed, to my knowledge," according to Bob Lang, KSC director of safety and reliability. That option has been considered seriously by non-NASA experts. [Mittman and Banke, **FLORIDA TODAY**, pp. 1A-2A, July 19, 1988, Glisch & Fisher, **THE ORLANDO SENTINEL**, p. A-1, July 17, 1988.]

July 19: DECEMBER LEAK EVIDENCE?

Bob Sieck, Launch Operations Director at Kennedy Space Center, said today that "a pressure check made on the oxidizer tank in an engine compartment in late December and a second reading was taken about two weeks later. There was a pressure drop of about 16 pounds per square inch between the two points," he said. Although acknowledging that the pressure drop might have alerted engineers, Sieck said there was no conclusive evidence that workers acted improperly.

"We are reviewing all procedures and documentation and equipment associated with that event," Sieck said. "We are looking at the people who performed that test. These two data points may still have been within specifications. And I wouldn't preclude the fact that we have other data that says the integrity of the joint was confirmed. Until a final review it is pure speculation that a requirement was violated and not reported," he said. ["NASA Aide Says Clue Might Have Pointed to Leak," **THE NEW YORK TIMES**, (National Edition), p. 8, July 20, 1988, Fisher, **THE ORLANDO SENTINEL**, pp. A-1 & A-7, July 20, 1988, Mittman, **FLORIDA TODAY**, p. 6A, July 20, 1988.]

<> KSC TO HIRE 200 WORKERS

"Roughly about 200 people will be hired because of the tile situation on Columbia," Thomas Utsman, Director of Shuttle Management and Operations, said today. "We just had more tile work than we anticipated on Discovery and Atlantis." About 2,000 tiles need replacement on Columbia, Discovery had 1,000 tiles replaced and Atlantis needs 550. The money for the workers' salaries - $8.2 million - will come from the Shuttle Program Office budget in Washington, D. C. Among the 200 new workers will be three dozen engineers, and tile workers and quality control inspectors. [Mittman, **FLORIDA TODAY**, p. 1A, July 20.]

July 20: INFORMATIONAL PICKETING BY TGS WORKERS

TGS Technology workers and sympathizers staged protests at Cape Canaveral Air Force Station, Kennedy Space Center and at Patrick Air Force Base to indicate their complaints against TGS Technology Inc. and its parent company, Pan American World Services. The employees have been without a contract for 3 1/2 years and are members of the International Association of Theatrical Stage Employees union. [Klotz, **FLORIDA TODAY**, pp. 8C & 7C, July 21, 1988.]

July 21: SHUTTLE LEAK SOLUTIONS

Engineers at Kennedy Space Center continued looking at a number of possible fixes for Discovery's leak in its reaction control system. One of the solutions requires using a thin tube with an expandable balloon on the end to plug the leak in a manner similar to the way heart surgeons perform angioplasties. Center Director Forrest S. McCartney said, "We've got people looking at the prudent and safe thing to do."

Engineers at Marshall Space Flight Center in Huntsville, AL, and at Johnson Space Center in Houston, TX, are also trying to come up with ideas to repair Discovery. Engineers at Johnson, for instance, are

considering ways to enter the Shuttle's cargo bay and cutting holes through the rear of the bay and the engine compartment to reach the leak, then enshrouding it in some way.

At Marshall, engineers are building a mock-up of the "snake" to test the angioplasty technique. Bob Schwinghamer, Director of Marshall's Processing Laboratory, said two heads were being developed for the snake. "The snake with the balloon on the end would have to run through this tortuous path like an angioplasty procedure. The balloon would be filled with an epoxy, and when it reached the leak it would be expanded. Plugging it up would not interfere with any of the normal operations. It wouldn't compromise anything. It would be 6 inches long instead of 28 feet." Engineers hoped to settle on a solution by this weekend. ["Balloon on Thin Tube Is Seen As Solution to Shuttle's Leak," **THE NEW YORK TIMES** (National Edition), p. 24, July 22, 1988, Banke, **FLORIDA TODAY**, p. 1A, July 22, 1988, Glisch, **THE ORLANDO SENTINEL**, p. A-11, July 23, 1988, Wilford, **THE NEW YORK TIMES** (National Edition), p. 7, July 23, 1988.]

<> LAUNCH PAD DELAYS

Preparation work at the launch pad is still incomplete and that may delay the flight readiness firing, according to a Kennedy Space Center spokeswoman. Managers were undecided about whether to delay the firing for 24 hours. Workers are checking mechanical and electronic connections and making sure no leaks exist, among other things. Delaying the test would mean a practice dry run with all launch control personnel would start Saturday morning (July 23) rather than today. Managers have also not decided when to begin loading liquid hydrogen and liquid oxygen into the external tank; the operation is usually scheduled 72 hours before the FRF. [Mittman, **FLORIDA TODAY**, p. 7A, July 22, 1988, Mittman, **FLORIDA TODAY**, pp. 1A-2A, July 23, 1988.]

July 22: WORKERS TREAT KSC COMPUTER VIRUS

NASA has just finished repairing damage caused by a computer virus which can automatically duplicate and embed itself within a computer's operating instructions. It was eradicated before it could cause serious harm, according to NASA spokesman Charles Redmond. "Some people did lose documents, but they were reconstructed. Everything was recoverable." Purging and restarting NASA's 80 infected systems took about five days, he said. There had been no reports of the virus at Kennedy Space Center. [Klotz, **FLORIDA TODAY**, p. 2A, July 23, 1988.]

July 24: KSC READIES FOR FRF

Before the test firing can take place, Kennedy Space Center workers must complete a practice countdown that started yesterday and ends today. They must also complete tests on the external fuel tank. The tank will be filled during the practice, which begins tonight; then it will be drained again. A 72-hour countdown must also be begun leading to ignition of the three main engines.

Concerning the flight readiness firing, Launch Director Bob Sieck said, "In terms of risks or concerns, about the only thing would be if a valve

would get stuck either open or closed and it would give you trouble (safely shutting down the system) because you are fully loaded with liquid hydrogen and liquid oxygen and you want to get all of that ou of the system and purged. That is really the only risk from a danger standpoint.

"We have thought of every contingency that can go wrong," Sieck said, "and developed procedures and, in some cases, software to accommodate them." Analysis of test data should take about two days, he said. "There will be a real time data analysis available within minutes. We will have a pretty good feel on the performance of the system. It will be a very quick look, enough to tell everybody we think it was a really good firing, with the caveat that every piece of data has not been totally analyzed." [Mittman, **FLORIDA TODAY**, pp. 1A-2A, July 24, 1988, "Practice Countdown Continues for Test of Discovery at KSC," **FLORIDA TODAY**, p. 2A, July 25, 1988.]

July 25: LOCKHEED JOB OPENINGS

Lockheed Space Operations Co. has begun interviewing prospective employees for some 200 jobs it needs to fill. Most in demand are technicians to work on Atlantis's and Columbia's heat-resistant tiles. About 20 engineers and 50 inspectors are also wanted, according to Lockheed spokesman Stuart Shadbolt. NASA plans to spend about $8 million for the additional employees, according to Space center spokesman Dick Young. ["Lockheed to Fill 200 Jobs," **FLORIDA TODAY**, p. 16C, July 26, 1988.]

<> ASTRONAUT HALL OF FAME

An Astronaut Hall of Fame, endorsed by the Mercury 7 Foundation, will be built on an 18-acre site in the Vector Space development park southwest of NASA Causeway, the highway leading to Kennedy Space Center. It will be housed in a 25,000-square-foot building expected to serve as the permanent home of Space Camp Florida.

The U. S. Astronaut Hall of Fame evolved from discussions four years ago when six of the original Mercury astronauts and the widow -Betty Grissom - of the seventh formed the Mercury 7 foundation to promote excellence in education, said Alan Shepard, president of the non-profit organization. "We had been thinking about something we could do with some of the mementos that we had collected personally that really didn't belong in the Smithsonian or any of the other formal museums across the country."

When it first opens, the Hall of Fame will feature only items belonging to America's first astronaut corps, such as photos, log books and other memorabilia. Shepard predicted artifacts gathered by later astronauts will be added as the facility becomes better known as a tourist attraction. [Brown, **FLORIDA TODAY**, pp. 1A-2A, July 26, 1988.]

July 26: FEDERALLY EMPLOYED WOMEN HONORS

The Space Coast Chapter of Federally Employed Women (FEW) presented three awards in ceremonies at the Cocoa Beach Hilton today. Tina

Phillips was honored as "Member of the Year" and retired Air Force Lt. Gen. Forrest S. McCartney (KSC Director) was presented the Distinguished Service Award and a $1,500 scholarship was given to Maggie Omega Cameron. ["Chapter Honors Three at Ceremony," **FLORIDA TODAY**, p. 2D, July 27, 1988.]

<> NO BOOSTER PLANT FOR BREVARD

NASA decided to build its proposed solid rocket booster factory in northeast Mississippi - Yellow Creek - at an abandoned nuclear facility, rather than in Brevard County, FL. Titusville Area Chamber of Commerce president Joe Catrambone said, "We had hoped for it, but we were very much concerned about the environment. We're very careful and cautious about that. Fortunately, I think we're in a position to pick and choose" what companies to go after. NASA said the Mississippi site was chosen because it would cost between $50 to $100 million less to build a plant there and the site is the least environmentally sensitive. Roads and other important features are also already in place. [Fisher, **THE ORLANDO SENTINEL**, p. A-4, July 27, 1988, Lunner and Klotz, **FLORIDA TODAY**, pp. 1A-2A, July 27, 1988.]

July 28: BREVARD GETS ROCKWELL DIVISION

Brevard will be home this fall to the Rockwell International Corp. division that makes spare Shuttle parts. The company will relocate workers, spare parts and the computers which track the parts to Rockwell offices at Kennedy Space Center and Cape Canaveral, said Janet Dean, an official with Rockwell's Space Transportation Systems Division in Downey, CA. "We want to be able to do the work more quickly and at a lower cost for the customer [NASA]," said Dean. The exact relocation date depends on the date of Discovery's launch, she said. [George, **FLORIDA TODAY**, p. 16C, July 29, 1988.]

<> NASA'S WEATHER FORECASTING

A National Research Council report said that NASA's weather forecasting capabilities were "poorly organized" during launches and landings and this put Shuttles at risk. The report recommended that NASA:

*Equip planes to measure cloud electricity, wind velocity and turbulence.

*Install radars and ocean platforms to detect sudden changes in wind.

*Build more lightning-detection systems.

*Use satellites to analyze weather.

Charles Hosler, Penn State meteorologist and NRC panel chairman, said NASA for years gave a low priority to forecasting, despite launching from a thunderstorm-prone area. "They'd had so many glitches with the Shuttle they didn't worry about weather," he said. The report went on to say: "The Space program has been relatively lucky with respect to weather hazards. In view of our recent temperature effects on O-rings and triggered lightning strikes, our run of good luck may have ended."

John Ernst, Director of NASA's Weather Support Office, said, "The report identified some areas that needed attention. We've had a jump start on some of those. It shows we're on the right track." [Hoversten, **US TODAY**, P. 3A, July 28, 1988, Fisher, **THE ORLANDO SENTINEL**, p. A-3, July 28, 1988, Hoversten, **FLORIDA TODAY**, p. 1A, July 28, 1988, Klotz, **FLORIDA TODAY**, p. 6A, July 28, 1988.]

July 29: DISCOVERY'S TEST-FIRING DELAYED, AGAIN

The test-firing of Discovery's main engines has been delayed till August 4 because of problems with sensors and an oxygen pump during fueling operations today. NASA spokesman Karl Kristofferson attributed the problems in part to the lack of use of the ground support equipment during the 2 1/2 year layoff since the Challenger accident in January 1986. "I know if you leave your car sitting in the garage for a few weeks without starting it, funny things happen," he said. One of the oxygen pumps didn't work at all, the other was working erratically." Technicians worked to fix what appeared to be "an electrical problem." Pat Phillips, NASA spokeswoman said, "We ran a test on those pumps last week and they worked perfectly."

Pending the outcome of an investigation of the problems with ground support equipment, NASA said that the countdown demonstration test would not resume any earlier than July 31. That delay helped push the FRF back to August 4. "Any time you have to stop, it frustrates you," said Sterling Walker, Chief of Mechanical Systems at Kennedy Space Center. Repair of the leaking hydrogen line at the pad was expected to take 15 hours.

NASA engineers have recommended cutting a hole in Discovery's cargo bay to gain access and fix the leak in the reaction control system which was discovered July 14. Once they cut through they would encase the leak in a clamshell-like device filled with a sealant. Other alternative solutions remain under consideration.

"I don't think anybody has a handle on when it will launch until they decide what they are going to do to fix the leak," Kristofferson said. [Mittman, **FLORIDA TODAY**, p. 6A, July 26, 1988, Wilford, **THE NEW YORK TIMES** (National Edition), p. 9, July 28, 1988, Banke, **FLORIDA TODAY**, p. 1A, July 29, 1988, White, **FLORIDA TODAY**, pp. 1A-2A, July 30, 1988, Glisch, **THE ORLANDO SENTINEL**, p. A-12, July 30, 1988, Wilford, **THE NEW YORK TIMES**, (National Edition), pp. 1 & 8, July 30, 1988.]

July 31: CAUTION GUIDES LAUNCH PLANS

"We want to fly, and we're going to fly," said James F. Herrington, Director of Shuttle Operations at Kennedy Space Center. "But we're not going to fly until we're ready, and the key word is ready." The Shuttle Program's Deputy Director, Robert L. Crippen, has said, "You'll probably see more 'holds' at T minus 9 than you've seen in your entire life." "I think we've established an atmosphere through the program that facilitates communications," Crippen added, "People talk openly about engineering problems. I hear about them every day, everything from plugs and tires to the leaking thrusters. We've debated lots of problems. I do not know of anybody that has anything that's a potentia for big concern."

Dick Young, KSC spokesman, said "I don't remember any of this [extraordinary caution] in Apollo. We said we were going to the moon and we went. Of course, the Shuttle is a more complex machine." [Wilford, **THE NEW YORK TIMES**, (National Edition), pp. 1 & 14, August 1, 1988.]

July 31: LEAK, PUMP FIXED

The countdown resumed for Discovery's flight readiness firing after engineers repaired a hydrogen leak and a troublesome oxygen pump. When the FRF is completed, engineers must still cope with a small gas leak in the reaction control system. ["Countdown On - Leak, Pump Fixed," **THE ORLANDO SENTINEL**, p. A-3, August 1, 1988.]

August 1: COUNTDOWN TEST COMPLETED

Kennedy Space Center workers completed a wet countdown test today; problems encountered with ground support equipment caused the test to run for a week rather than the usual two days. NASA spokesman Karl Kristofferson said, "Tests...are geared to check out the ground equipment, procedures and flight hardware. Problems are expected, but these tests help engineers locate problem areas and determine where improvements should be made before we get into a launch situation."

Workers will begin inspecting Discovery August 2; troubleshooting will continue for a minimum of 16 hours. Shuttle Launch Director Robert Sieck said that the tentative target for the flight readiness firing of Discovery's main engines remains 7:30 a.m. August 4. Robert L. Crippen, Deputy Director of Shuttle Operations, said, "The launch team did a superb job on the countdown demonstration test and accomplished most of the objectives." The problem leak in the reaction control system will not be repaired till after the FRF.

The week-long test went as follows:

*11:33 p.m. July 24: Test begins.

*3:30 p.m. July 25: Test goes on hold. Workers needed more time to prepare the Shuttle's main engines for a later test, the flight readiness firing, now scheduled for 7:30 a.m. Thursday.

*3:30 p.m. July 26: Test begins again, after workers fixed several problems including tears in plastic bags that insulate the liquid hydrogen lines.

*Wednesday: Test halted again because of a faulty valve in a line that feeds liquid oxygen to a system that generates electricity for the Orbiter.

*11 a.m. Thursday: Test begins again. At 6:55 p.m. workers begin to fill the external tank with liquid hydrogen and liquid oxygen. A leak in a liquid hydrogen line was discovered late Thursday or early Friday. And a problem developed with a pump in the liquid oxygen storage tank.

*Friday and Saturday: Test is on hold all day as workers tried to fix the problems.

*Noon Sunday: The countdown starts again. A second leak was discovered in the liquid hydrogen line late Sunday night. Although workers stopped loading liquid hydrogen the countdown test continued.

*6:50 a.m. Monday [Aug. 1]: Test ends, although not all parts were complete because of leak problems. [Banke, **FLORIDA TODAY**, p. 6A, August 2, 1988, and Wilford, **THE NEW YORK TIMES** (National Edition), p. 48, August 2, 1988.]

August 2: AUGUST 4 FOR FRF

Discovery's main engines will fire for 19.6 seconds starting at 7:30 a.m. August 4. "This is probably the most critical operation we perform here on the ground at Kennedy. This is a shakedown of the entire system," said Bob Sieck, Shuttle Launch Director. Tested in the firing will be the main engines, the redesigned boosters, the launch software, ground support equipment, communications links and the launch team itself. Technicians will be particularly interested to watch the booster joints as Discovery strains. That same bending motion was a contributor to the Challenger joint leakage and the new joints have been designed to hold more tightly together as the booster moves.

NASA also announced that the leak in Discovery's reaction control system will be repaired on the pad by cutting a small hole in the upper right rear corner of the cargo bay and plugging the leak with a clamshell device and use of a sealant. (The sealant is the same type used to repair leaks in lines subjected to high pressures or temperatures in the petro-chemical and nuclear power industries.) Officials also said that if the fix fails, Discovery will have to be rolled back to a hangar for repairs and that would mean weeks of delay.

A final full-scale booster firing takes place later this month in Utah and is the last critical test of hardware prior to Discovery's launch in late September. [Fisher, **THE ORLANDO SENTINEL**, pp. A-1 & A-6, August 3, 1988.]

<> SHUTTLE REPAIRS

Kennedy Space Center workers continue to look for the source of the leak in the hydrogen line used to fill the external tank. The leak is believed by NASA managers to be located in the tail service mast that holds lines leading from the storage tank into the Shuttle. A test has been initiated to see whether indeed the leak is related to the low temperatures.

The repair in the reaction control system is expected to take one to two weeks, according to Karl Kristofferson, NASA spokesman. The clamshell device option was selected over the balloon device (designed to work like an angioplasty procedure in a human heart) because the former was further along in development and testing. That testing will continue for another week before the repair is attempted in case there are difficulties with the device. [Beecken and Mittman, **FLORIDA TODAY**, pp. 1A-2A, August 3, 1988.]

August 3: PRESS SITE CREW DOUBLES FOR LAUNCH

To meet the expected throng of assembled journalists on hand for the launch of Discovery, the 12-member KSC public affairs staff will double with the addition of temporary employees from other centers and help from NASA retirees. The FRF will be viewed by between 300 and 500 journalists and about a hundred community leaders. "A lot of our people currently on board have never covered a Shuttle mission before," said NASA spokesman Dick Young. "This gives us a useful opportunity to bring them up to speed and let them see how we do things." [Klotz, **FLORIDA TODAY**, p. 2A, August 4, 1988.]

August 4: FRF FIZZLES

When computers showed that a fuel valve on one of Discovery's mai engines didn't close fast enough, the FRF came to a halt two seconds before ignition. Engineers could not say immediately whether the valve itself was at fault or whether the sensor which monitored the valve's activity was not operating correctly. Joseph Lombardo, NASA's Main Engine Chief at Marshall Space Flight Center said, "I'll tell you up front we don't have the answers right now, but we're trying to recover."

If the valve is at fault it will be replaced; if the sensor was at fault, software may be rewritten to revise operational parameters. If the one-inch-wide valve has to be replaced, the FRF could be delayed as much as a week. Lombardo said that a spare valve unit is available and that there would be no problem in changing out the troublesome one in engine 2. It is the replacement and testing that would cause the delay of up to a week.

At the point where the test shut down, the valve was to have been open no more than 20 percent; computers showed it 24 percent open. Lombardo said it was not likely that the rules would be changed to allow proceeding with ignition if the valve is more than 20 percent open. "I think our test philosophy is still sound," he said. It marked the third such engine shutdown in the Shuttle Program; the first time was in August 1984 for Discovery's first flight and the second was a July 1985 flight of Challenger. There had been no previous shutdowns during launch pad engine tests since 1981.

The earliest date for a rescheduled FRF is Sunday, August 7; engineers need at least 72 hours to make any repairs and give workers some time off, according to Discovery's Ground-Processing Director, John Talone. "People have been working pretty rough, pretty hard. And there are some disappointments, as you can see," Talone said. "There's a certain amount of frustration because we thrive on getting things done and done completely." Talone also reaffirmed the possibility of a September launch.

Discovery's STS-26 mission Commander Capt. Frederick H. Hauck said in a statement released to the press: "Although we were disappointed today's test did not go full term, we were impressed with the professional manner in which the launch team responded to the situation. We maintain high confidence we'll get a good mission off in the near future." [Glisch, **THE ORLANDO SENTINEL**, pp. A-1 & A-15, August 5, 1988, Mittman, Halvorson, Banke, **FLORIDA TODAY**, pp. 1A-2A, August 5, 1988, Wilford, **THE NEW YORK TIMES**, (National Edition), p. 10, August 5, 1988.]

<> SHARP STUDENTS AT KSC

Eleven Brevard County students participated in Kennedy Space Center's Summer High School Apprenticeship Research Program (SHARP). The eleven were: Devin MacKenzie (Rockledge High School), Michelle Fanton (Eau Gallie High School), Susan Fosnot and Temiko Graves (Astronaut High School), Travers Johnson, Katerina Lent, Denise Lewis (Merritt Island High School), Tony Martin, Michelle Mazion, April Turne (Titusville High School) and Melissa Thorn (Melbourne High School).

Participants must have good grades and an interest in math, science or engineering to be considered for the program. Students work 40 hours a week for eight weeks and earn about $1,100. NASA installations throughout the United States participate in the program. ["SHARP Students Earn KSC Experience," **FLORIDA TODAY**, p. 2B, August 5, 1988.]

<> FUEL LINE VALVE TO BE REPLACED

NASA decided today to replace a hydrogen fuel line valve that stopped yesterday's test-firing of Discovery's main engines. The repair will take approximately three days, Associate Administrator for Space flight Richard Truly said, "We are opting for a procedure which will give us additional confidence to move forward to the flight readiness firing." [Mittman, **FLORIDA TODAY**, p. 1A, August 6, 1988, Glisch, **THE ORLANDO SENTINEL**, P. A-3, August 6, 1988, Wilford, **THE NEW YORK TIMES** (National Edition), p. 6, August 6, 1988.]

August 7: FAULTY VALVE REPLACED

A one-inch hydrogen valve and the sensor that indicates whether it is open or shut, was replaced today inside Discovery's reaction control system compartment. Kennedy Space Center spokeswoman Lisa Malone said that "Everything is going perfectly so far. We might set a new date for the test firing tomorrow, if everything continues to go well." Tests on the replacement valve remain to be done. ["Shuttle's Faulty Valve Replaced," **THE NEW YORK TIMES** (National Edition), p. 7, August 8, 1988.]

August 8: BOOSTER TEST/AUGUST 18

Morton Thiokol announced today that it will conduct the last of five full-scale test-firings of the redesigned solid rocket booster on August 18 at 3 p.m. at the company's plant in Brigham City, Utah. That would mark the last major test prior to the resumption of Shuttle flights. [Mittman, **FLORIDA TODAY**, p. 1A, August 9, 1988.]

August 9: FRF COUNTDOWN RESUMES

The countdown for the five-time postponed flight readiness firing resumed tonight at Kennedy Space Center; the firing is scheduled to occur at 7:30 a.m. August 10. Though tests indicated that the most recent delay had been caused by a faulty sensor for a valve, the entire valve and sensor unit was replaced prior to beginning the countdown. Shuttle managers also decided to alter the computer instructions so that a similar sensor malfunction would not interrupt the FRF. After the test, engineers will make a final decision on how to fix the leak in the reaction control system on board Discovery. [Wilford, **THE NEW YORK TIMES**, (National Edition), p. 8, August 10, 1988 and Mittman, **FLORIDA TODAY**, p. 1A, August 10, 1988, Fisher, **THE ORLANDO SENTINEL**, p. A-3, August 9, 1988.]

August 10: ENGINES PERFORM FLAWLESSLY

NASA said Discovery's main engines performed flawlessly during the 20-second flight readiness firing that took place yesterday at 7:30 a.m. It was the first test in three years of an Orbiter's main engines and

the ground and launch support equipment. The first engine to fire ran 21.6 seconds, as planned, and the last one fired 19 seconds. All three were shut down simultaneously. "We really had a super test," said astronaut Robert Crippen, Chief of Discovery's Launch Approval Team. "There were a lot of objectives, but the final thing we were after was a total test of the system. We proved it works and it works well." Crippen also said he thought the chances of launching in late September still remained, though other NASA officials say the launch will slip till October.

Thomas Utsman, Director of Shuttle Operations and Deputy Director of Kennedy Space Center, said the test showed that Discovery was "a very good bird." Utsman said, "It was a very smooth countdown to launch and a very successful operation. We had some minor problems as we do in any count." After the external tank was loaded, sensors detected what may have been a slight nitrogen leak in the area where a pipe runs from the external tank to the Orbiter, presumably coming from the nearby aft fuselage. The leak was detected about three hours before ignition, but was not considered reason to halt FRF preparations. Utsman said that engineers didn't understand the problem, if there was one, and would examine the area in the next few days.

In addition to the nitrogen leak, Utsman indicated that pumps on the ground support equipment for liquid oxygen were not functioning properly, but engineers collected enough data to pinpoint the problem. He said, further, that a launch processing system console broke down, but a backup computer was brought on line to handle the work load. Talmadge Webb, director of Launch Control Center Operations, after the FRF remarked that the recently replaced valve worked properly. Kennedy Space Center Director Forrest S. McCartney said, "I can't say enough about how smoothly everything went. This is a key test to get back to flying."

NASA Administrator James Fletcher said, "Super job, super team. I can't begin to say how well everything has been going. I know this past week was a disappointment, but that is why we have the flight-readiness firing to pick up any problems." Launch Director Bob Sieck said, "We should be looking to launch countdown with a very high degree of confidence." Norm Carlson, NASA Test Director, said of the firing, "There's no doubt about it. Morale has improved 100 percent in the last eight hours. It's great to finally get this part of it behind us."

A week from now, KSC workers will attempt to repair the leak in the orbital maneuvering system (OMS). They will cut through two bulkheads at the rear of the Shuttle about a foot from the site of the leaking tube. Then they will insert a clamshell-device and clamp it over the faulty section and pump a sealant inside the clamp. "We feel quite comfortable that will seal the leak," according to Utsman. [Glisch, **THE ORLANDO SENTINEL**, pp. A-1 & A-8, August 11, 1988, Mittman and Banke, **FLORIDA TODAY**, pp. 1A-2A, August 11, 1988, Wilford, **THE NEW YORK TIMES** (National Edition), p. 13, August 11, 1988, White, **FLORIDA TODAY**, p. 2A, August 11, 1988.]

August 11: ENGINES INSPECTED

Workers returned to the launch pad today to inspect Discovery's engines following yesterday's test firing. KSC spokeswoman Lisa Malone said, "Engineers have said this is the cleanest flight-readiness firing we have had. [Workers] will look for anything that might have changed since the flight-readiness firing," she added. [See August 12 item.] She also said that the repair of the leak in the reaction control system will begin August 17 and that the repairs should take about a week. However, because the repair job can continue while other work is done, a day-for-day delay in launch is not expected, according to Gary Coultas, Assistant Manager of the Orbiter Projects Office at Johnson Space Center in Houston, Texas. [Mittman, **FLORIDA TODAY**, p. 1A, August 12, 1988, Glisch, **THE ORLANDO SENTINEL**, p. A-4, August 12, 1988, Banke, **FLORIDA TODAY**, p. 2A, August 11, 1988.]

<> BREVARD GETS SPACEHAB INC. FACILITY

Spacehab Inc., which has just signed a $170 million agreement with NASA for the Shuttle to fly its research laboratory on six missions, will open a payload processing facility in Brevard County before the first flight in 1991. Spacehab Inc. was founded five years ago and recently announced that former NASA Administrator James Beggs had been made chairman of the company. Spacehab intends to build a facility to prepare payloads for flight near Kennedy Space Center. [Hinman, **THE ORLANDO SENTINEL**, pp. A-1 & A-6, August 12, 1988.]

August 12: ACCESS PLATFORM REALIGNED

The mid-body umbilical unit on the access platform was found to be misaligned following the successful flight readiness firing August 10. The problem was corrected in time to receive Discovery's payload. [Mittman, **FLORIDA TODAY**, p. 2A, August 13, 1988.]

August 15: TDRS PAYLOAD TO PAD

The Tracking and Data Relay Satellite (TDRS-3) was delivered to Discovery on the pad early this morning. The three and one-half hour trip began at midnight. It will be kept in a payload changeout room while engineers fix a leak in Discovery's reaction control system. TDRS-3 will be deployed on the first day of Discovery's mission and will join TDRS-1 which was launched from Challenger in 1983. [Bellido, **FLORIDA TODAY**, p. 1A, August 15, 1988, White, **FLORIDA TODAY**, p. 2A, August 14, 1988.]

<> LIMITS ON GUESTS, JOURNALISTS

The number of journalists and guests allowed to view the launch of Discovery from special VIP and Press Site areas may be limited due to new evidence of the possible dangers of debris falling from a Shuttle explosion. Viewing sites may be moved farther from the launch pad, according to a senior NASA official. Journalists viewing from the present press site may have to "accept the risk" of being hit by debris, said the official. It is not yet known how current planning may affect those persons with car passes. Jim Funkhouser, Director of the Public

Services Division at NASA Headquarters, said that once a decision has been made, NASA will distribute car passes and special invitations to those who can be accommodated. [Fisher, **THE ORLANDO SENTINEL**, pp. A-1 and A-8, August 16, 1988.]

<> SHUTTLE RESCUE DRILLS

A military contingent of 156 persons took part in a one-day exercise practicing rescue operations in the waters off Cape Canaveral, FL. "The validation exercise was a complete success. This gives us confidence that we will be able to support an astronaut bailout if necessary," said Col. George Phillips, Rescue Director. The military participants were joined by twenty NASA observers as well as members of the Drug Enforcement Agency who patrolled the area in high-speed boats. [Mittman, **FLORIDA TODAY**, p. 8A, August 16, 1988, "Crews Rehearse Astronaut Rescue," **THE NEW YORK TIMES** (National Edition), p. 22, August 16, 1988.]

<> TDRS LOADING DELAYED

Discovery's TDRS-3 payload (also known as TDRS-C) is at the launch pad but will not be loaded until the nitrogen tetroxide leak in the reaction control system is repaired. Engineers tentatively plan to test and verify the satellite's electronic systems with ground control stations on September 4, according to Kennedy Space Center spokesman George Diller. [Mittman, **FLORIDA TODAY**, p. 8A, August 16, 1988.]

<> LEAK REPAIR CREW ARRIVES

A crew of 12 veteran technicians arrived at Kennedy Space Center today from Rockwell International in California. They brought with them tool boxes and detailed blue prints to enable them to fix the leak in the reaction control system on Discovery. The site of the problem is a half-inch deep inside a compartment which holds one of the Orbiter's maneuvering engines. To reach it the technicians will "climb scaffolding and crawl on their stomachs to cut two holes about 15 inches in diameter in the upper right corner of Discovery's rear cargo bay bulkhead, using a special router. An attached plastic bag will catch metal filings from the cutting operation and help prevent contamination of the cargo bay....Two more holes will be sliced through the top of the compartment, allowing technicians to reach through with both arms and use a device like a clamshell and a sealant to plug the leak. Remote-control cameras and mirrors will help the workers see. Engineers finally will run pressure checks to determine if the leak is jammed shut." [Glisch, **THE ORLANDO SENTINEL**, p. A-7, August 17, 1988.]

August 18: BOOSTER TEST AN A+

NASA's final official test of Morton Thiokol Inc.'s redesigned solid rocket booster was proclaimed a complete success today, though there will be several more weeks of Shuttle checks and management reviews before a date is set for Discovery's liftoff. Engineers were so anxious for the test results that they ran up to the booster while it was still being sprayed with water to cool it and wound up getting drenched themselves. "This is extremely good news," said Royce Mitchell, NASA's

Booster Manager. "It's a super day for the Space program and a good feeling overall. We've got pressure where we wanted to get it, and we did not get pressure where we did not want to get it." Bob Sieck, Launch Director at Kennedy Space Center, said that "it performed as planned for the full duration as far as we could see. Given the built-in flaws, we would expect engineering's inspection will bear that out."

At Kennedy Space Center, technicians from California's Rockwell International plant made more progress in their repair work on the leak in Discovery's reaction control system. They made preparations tonight to clamp shut the leak with a clamshell-like device full of sealant used in nuclear power plants. The leak was expected to be plugged by August 19. [Groer and Glisch, **THE ORLANDO SENTINEL,** pp. A-1 & A-20, August 19, 1988, Mittman, **FLORIDA TODAY,** pp. 1A-2A, August 19, 1988, Banke, **FLORIDA TODAY,** p. 4A, August 19, 1988, Leary, **The New York Times** (National Edition), p. 7, August 19, 1988.]

<> LIGHTNING BLIMP

Kennedy Space Center's continuing weather research was enhanced today by the launching of a tethered blimp that will help study lightning. Paul Goetsch, Director of the Lightning Study Program, said the blimp was built originally for U. S. Customs Service's drug interdiction program. The blimp is owned and operated by LTA International (Melbourne, FL). It is 85 feet long and 25 feet in diameter; it contains 20,000 cubic feet of helium. [Banke, **FLORIDA TODAY,** p. 4A, August 19, 1988.]

August 19: LEAK PLUGGED

The leak in Discovery's reaction control system was plugged today, according to Kennedy Space Center spokesman Hugh Harris; testing to make sure the repair was effective will begin next week. NASA spokesman Karl Kristofferson said that initial data indicated the seal was working and that it would be monitored for several days. If all tests are successful and the results of the August 18 test-firing of the solid rocket booster in Utah remain positive, then Discovery may yet be launched in September. [Mittman, **FLORIDA TODAY,** p. 6A, August 20, 1988, "Gas Leak in Space Shuttle Is Repaired on Launching Pad," **THE NEW YORK TIMES** (National Edition), p. 7, August 20, 1988.]

August 22: E'PRIME AEROSPACE LAUNCH

E'Prime AeroSpace (Titusville, FL) will launch the first privately owned rocket from Cape Canaveral no earlier than October 6, depending on when Discovery is launched. Jim Mizell, Chief of Operations for E'Prime, said its LOFT-1 vehicle will carry four experiments to an altitude of four miles where they'll drop by parachute for recovery in the Atlantic Ocean. The payloads are from the University of Alabama in Huntsville; Weber State College of Ogden, Utah; Brookwood High School of Snellville, Georgia; and Utah State University in Logan, Utah. [Mittman, **FLORIDA TODAY,** p. 2A, August 23, 1988.]

August 25: BOOSTER WILL PERFORM SAFELY

"All the data is indicating that we had a very good [final SRB] tes and the hardware that's been disassembled to date looks great." said Ed Medal, NASA spokesman for Marshall Space Flight Center in Huntsville, Alabama. "Upon inspecting it, it showed that everything worked as predicted and expected. We did get gas pressure to the primary O-ring, but that O-ring held tight and did not allow it to blow by. In fact, it didn't even show any heat damage."

"It was as near perfect a test as you can imagine," said Morton Thiokol spokesman, Rocky Raab. Announcement of a late September launch date for Discovery could come August 26. There will be a sixth test firing in December; it will be performed in a facility which simulates the same stresses the booster experiences at ignition, at liftoff and during flight.

At Kennedy Space Center, all non-essential workers were cleared from launch pad 39B today while hazardous fuel was loaded into Discovery. Additionally, workers continued to prepare Discovery to accept its TDRS payload on August 29. [White, **FLORIDA TODAY**, p. 1A, August 26, 1988, "Critical Rocket Test Is Lauded by Maker As Virtually Perfect," **NEW YORK TIMES**, p. 9, August 31, 1988.]

<> SPACEPORT USA ART COLLECTION

Galaxy Center, at Spaceport USA, currently houses the largest collection of Space art in the country, including the 70-piece exhibit "The Artist and the Space Shuttle." The entire collection includes about 170 works [Klotz, **FLORIDA TODAY**, p. 2A, August 25, 1988.]

August 26: TGS CONTRACT SETTLEMENT

Union employees of TGS Technology Inc. have a new contract after three and one-half years of working without one. Dick Fague, a member of the bargaining committee, said the 125 workers from locals 666 and 780 of the International Alliance of Theatrical Stage Employees had ratified the three-year contract at a tonight's meeting. Robert Forster, President of Technology Inc., said he was pleased that the workers had approved the agreement which resulted from concessions by both labor and management. "Basically, we wanted labor peace for the upcoming Shuttle launch and thought it would be in the best interests of NASA and the Air Force to have a settlement," he said. [Carey, **THE ORLANDO SENTINEL**, pp. B-1 & B-6, August 27, 1988, Klotz, **FLORIDA TODAY**, p. 12C, August 27, 1988.]

<> CUTS IN O-RINGS FOUND

Federal authorities are investigating suspicious cuts found in some O-ring seals intended for use in Shuttle solid rocket boosters. The rings were detected by visual inspection, x-ray and laser measurements before they ever left HydroPak Inc.'s manufacturing plant in West Jordan, Utah. James Dockstader, Vice President for Operations at HydroPak, termed the cuts as very obvious and appeared to be deliberate. He said, further that no damaged seals had been sent to the SRB manufacturer, Morton

Thiokol Inc. [Boffey, **THE NEW YORK TIMES** (National Edition), p. 5, August 27, 1988.]

<> ASTRONAUT GEMAR AT LA CITA

Astronaut Sam Gemar told the Sertoma Club in Titusville, FL, that the United States must maintain its preeminence in Space and that the country might already have lost its lead. "I try to encourage people to let their government leaders know where they stand on Space, whether it's pro or con," he said. Gemar, a Captain in the U. S. Army, joined NASA as an astronaut in 1985 and completed his training in July 1986. ["America's Space Lead Vital, Astronaut Says," **FLORIDA TODAY**, p. 2B, August 26, 1988.]

August 28: SPACE COAST WEATHER & DISCOVERY

Discovery was prepared to meet the possibility of harsh weather resulting from a tropical depression that might hit the Space Coast today. "Right now, we're taking precautions. They've walked down the whole pad looking for any debris or anything loose so they can secure it or remove it before the storm hits," according to Kennedy Space Center spokesman Karl Kristofferson. He also said that should winds reach 50 mph, NASA management would have to decide whether to move Discovery back to the VAB. The poorly defined storm did not, in fact, hit the Space Coast. [White, **FLORIDA TODAY**, p. 1A, August 28, 1988.]

August 29: LAUNCH DATE SET IN TWO WEEKS

NASA intends to wait till after the Sept. 13 and 14 flight readiness review before setting a new launch date for Discovery, according to NASA spokesman Jim Cast. "In the meantime we are still looking at the last week in September" for a launch, said NASA's National Space Transportation System Director Arnold Aldrich. Karl Kristofferson, KSC spokesman, said that "I think it probably has to do with the hydrogen leak they are trying to resolve." The flight readiness firing [FRF] data showed small amounts of hydrogen gas in an area near fuel lines leading to the Orbiter. Discovery's primary payload, a Tracking and Relay Data Satellite similar to one destroyed on Challenger in 1986, was successfully loaded into the Orbiter's payload bay at Kennedy Space Center. The ten-hour operations involved 50 workers. [Mittman, **FLORIDA TODAY**, p. 1A, August 30, 1988.]

August 31: 330 NEW JOBS AT KSC

Kennedy Space Center will hire 330 additional persons in September, officials said today. Among the new hires will be 235 engineers, 34 quality assurance inspectors, 23 administrators, and 39 clerical workers. When all the positions are filled, NASA will have approximately 2,500 employees at Kennedy Space Center by the end of the 1988-1989 fiscal year. [Klotz, **FLORIDA TODAY**, p. 1A, Sept. 1, 1988.]

<> NEW PAD AT CAPE

McDonnell Douglas Astronautics Co. is considering plans to build a new launch pad at Cape Canaveral Air Force Station. "It's really, truly,

a maybe. I'm just not confident, especially with the cutbacks we're all having at the Department of Defense," said Lyle Holloway, Director of McDonnell Douglas's Florida Test Center. [George, **FLORIDA TODAY,**

September 3: DELAYS IN PAYLOAD TESTS

Workers had difficulty beginning a test of Discovery's TDRS payload's electrical connections today. "It's been slow," said Kennedy Space Center spokesman George Diller. "We had hoped to start earlier but we had some communications problems we had to work around." [White, **FLORIDA TODAY**, p. 2A, Sept. 4, 1988.]

September 5: WORKERS GET LABOR DAY OFF

No work was planned for today, but testing and practice sessions will continue throughout the week while Discovery's crew is at Kennedy Space Center. Sunday night a test was completed which showed that the TDRS payload's electrical connections were "plugged in correctly," according to KSC spokesman Dick Young. ["Shuttle Workers Get Holiday Off," **FLORIDA TODAY**, p. 6A, Sept. 5, 1988.]

September 6: DISCOVERY CREW ARRIVES AT KSC

Discovery's five crew members - Commander Rick Hauck, Pilot Richard Covey, and Mission Specialists David Hilmers, Mike Lounge and George "Pinky" Nelson - arrived at Kennedy Space Center to take part in a series of final prelaunch tests, including a major countdown rehearsal and emergency crew escape drills. Said Hauck, "It's really hard to believe that, at least on the calendar, we could be less than three weeks from launch. We are and we're ready."

The crew spoke briefly to the press shortly after landing their T-38 training jets on the Shuttle landing facility at KSC. Pilot Richard Covey said that "unlike a lot of other folks who come to Florida, we did not come to buy lottery tickets." The crew expressed its appreciation to KSC workers for preparing the Orbiter for the four-day mission. "We are looking forward to borrowing their Spaceship for a week," said Mission Specialist Nelson. [Glisch, **THE ORLANDO SENTINEL**, p. A-9, Sept. 7, 1988, Mittman, **FLORIDA TODAY**, p. 1A, Sept. 7, 1988, and "Shuttle Crew to Rehearse Countdown," **USA TODAY**, p. 3A, Sept. 7, 1988, Mittman, **FLORIDA TODAY**, p. 1A, Sept. 8, 1988.]

September 8: CREW PRACTICES COUNTDOWN

Discovery's crew completed a practice countdown today at Kennedy Space Center in preparation for their late September launch. "You really get the feeling this train is about to leave the station and we're ready to get on board," commented Mission Specialist Mike Lounge. Unlike previous crews which wore shirt-sleeve coveralls, Discovery's crew practiced in bright orange pressurized flight suits. Commander Rick Hauck said, "The suits are not comfortable and are not built for comfort. You just cannot expect to be comfortable strapped on your back for three or four hours. You put up with it." The new suits are required should the crew have to bail out in the early minutes after launch. Other crew gear for this flight includes a parachute, oxygen tank, life raft and survival supplies, all of which are strapped onto the suits just prior to entering the crew cabin.

The crew clambered aboard the Shuttle at 7:30 a.m. and emerged three hours later. The test encountered minor delays due to the lengthened suiting up procedure and a communication problem with ground support equipment. [Glisch, **THE ORLANDO SENTINEL**, p. A-6, Sept. 9, 1988 and Mittman, **FLORIDA TODAY**, p. 1A, Sept. 9, 1988, "Cumbersome Flight Suits Cut Launch 'Window' 1/2 Hour," **FLORIDA TODAY**, p. 3B, Sept. 24, 1988.]

September 12: FEWER JOURNALIST TO VIEW LAUNCH

NASA and the U. S. Air Force announced today that because of safety concerns, some journalists will not be allowed to watch Discovery's launch from the Space center's press site. The excluded journalists will be moved to a public causeway seven miles from the launch site. Boaters will also be prohibited from entering the Banana River north of the Merritt Island Barge Canal.

NASA's statement said, "All credentialed media will be able to work from the LC-39 press site except for the hours just before launch and the launch itself. During that period, media with an immediate need for the facilities at the press site will be allowed, and all others will view the launch from the causeway which will be equipped with countdown clock, audio commentary and video monitors. [Mittman and Hammond, **FLORIDA TODAY**, pp. 1A-2A, Sept. 13, 1988, Mittman, **FLORIDA TODAY**, p. 6A, Sept. 14, 1988, Glisch, **THE ORLANDO SENTINEL**, pp. A-1 & A-6, Sept. 13, 1988.]

<> CANDIDATES AT LAUNCH?

Republican presidential nominee George Bush may attend the launch of Discovery later this month, according to campaign aide Brett Wacker. Democrat nominee Michael Dukakis has not indicated whether he will attend. ["Special VIP," **FLORIDA TODAY**, p. 1A, Sept. 13, 1988.]

September 13: DISCOVERY CLEARED FOR LAUNCH

An expert panel of the National Research Council overseeing the redesign of the Shuttle's solid rocket boosters said today that there were no safety concerns which would prevent Discovery from being launched. The report was considered especially important because flaws in the SRBs were blamed for the Challenger accident on January 28, 1986. [Wilford, **THE NEW YORK TIMES** (National Edition), p. 15, Sept. 14, 1988, Mittman, **FLORIDA TODAY**, p. 6A, Sept. 14, 1988.]

<> NEW SHUTTLE LEAK

A new hydrogen leak discovered in the Shuttle's main propulsion system was the object of an intense search today, according to Kennedy Space Center spokeswoman Lisa Malone. "We do not know where it is, but we have to find it and fix it before proceeding with the helium signature leak check of the main propulsion system and main engines," she said. Besides working to discover the source of the leak, workers finished installing two of the Shuttle's three gaseous oxygen flow control valve poppets which had been removed last week when metal debris was found on them. During the FRF, two of the valves did not close as quickly as anticipated. [Mittman, **FLORIDA TODAY**, p. 1A, Sept. 14 1988.]

September 15: HYDROGEN LEAK FOUND, STOPPED

Kennedy Space Center workers stopped two small hydrogen leaks detected last week by operating two valves, according to KSC spokesman George Diller. "We are still looking at data, but it appears we have isolated the problem and we have confidence it is not going to be an obstacle leading to launch preparation," he said. Further leak tests were to be conducted later tonight. [Mittman, **FLORIDA TODAY**, p. 8A, Sept. 16, 1988.]

<> GILBERT SUSPENDS JSC OPERATIONS

Hurricane Gilbert disrupted work at Johnson Space Center in Houston today as it bore down on the Texas coastline, thirty miles away. The center's 9,000 employees were granted administrative leave to look after their families and property. The presence of the hurricane kept NASA from releasing the long-awaited launch date for Discovery. [Banke, **FLORIDA TODAY**, p. 1A, Sept. 16, 1988, Mittman, **FLORIDA TODAY**, p. 1A, Sept. 15, 1988, Glisch, **THE ORLANDO SENTINEL**, p. A-15, Sept. 15, 1988.]

September 16: DISCOVERY FLIES ON 29TH

NASA announced today that Discovery will be launched September 29 from Pad 39B at Kennedy Space Center. The time of launch is set for 9:59 a.m.; there is a three-hour launch window. The announcement came at NASA headquarters following a meeting between Administrator James Fletcher and Associate Administrator for Space Flight Rear Admiral Richard Truly. ["Sept. 29 Launching Date Set for Redesigned Space Shuttle,"**THE NEW YORK TIMES** (National Edition), p. 5, Sept. 17, 1988, "Discovery Launch Set," **THE ORLANDO SENTINEL**, p. A-1, Sept. 17, 1988, and Mittman, **FLORIDA TODAY**, pp. 1A-2A, Sept. 17, 1988.]

September 19: NO LEAKS IN DISCOVERY

Tests run over the weekend showed that there were no significant leaks in Discovery's main propulsion system, said a Kennedy Space Center spokeswoman. A small hydrogen leak had been noted 10 days ago, but said Lisa Malone, "The tests went very well. It looks as though the leak is within specifications and everything is fine."

A gyroscope, one of five on the Tracking and Data Relay Satellite now on board Discovery, was found to be out of alignment. The unit housing the gyroscope was removed today and returned to the manufacturer - Hamilton Standard (Parmington, Connecticut) - for analysis. KSC spokesman George Diller said the move would not delay KSC's work schedule or the Sept. 29 launch of Discovery. [Mittman, **FLORIDA TODAY**, p. 1A, Sept. 20, 1988.]

September 21: NASA WATCHES HURRICANE HELENE

It is too early to know what impact, if any, Hurricane Helene might have on Discovery's launch scheduled for September 29. NASA spokesman Karl Kristofferson said, "They're not really concerned about it but if it [the launch] gets five days away and somebody says it's coming, they'll get very concerned." Helene is presently more than 2,700 miles

from Florida and gathering strength. To guard against damage from the high winds of a hurricane, NASA's emergency plan calls for a rollback of the Shuttle prior to winds reaching 48 mph to prevent damage to the Orbiter. The decision could also be to keep the Orbiter on the pad, enclosed by the rotating service structure and weather protection doors. [Glisch and Bell, **THE ORLANDO SENTINEL**, pp. A-1 & A-12, Sept. 22, 1988.]

<> SHUTTLE GETS NEW VALVE PART

An actuator that opens and closes an oxygen valve was removed from Discovery September 20 and returned to its manufacturer - Rocketdyne - according to Kennedy Space Center spokesman George Diller. A replacement was installed today and will be tested September 22. NASA said that the changeout will not affect the launch date.

Workers also closed out the aft compartment for flight, installed heat shields around the main engines, washed down the surface of the mobile launch platform and prepared to wash down the launch pad surface and the flame trench, performed a simulated countdown of the TDRS booster rocket, and completed a test of TDRS ground support stations to ensure control centers around the country can communicate with each other. [Banke, **FLORIDA TODAY**, p. 3B, Sept. 22, 1988.]

<> PROTESTORS AVOID PAYING RESTITUTION

Four protestors convicted of trespass on NASA property will not have to pay approximately $11,000 in court costs and restitution. Restitution was not required when State Attorney James Carter could not produce a key witness and court costs, according to Judge Peter Haddad, were obviated by his sentence of extended jail time. [Kohlman, **FLORIDA TODAY**, p. 1A, Sept. 22, 1988.]

September 22: DISCOVERY'S RINGS ARE OKAY

An outdated piece of hardware inadvertently used in the final test of the redesigned Shuttle booster rocket was not installed in those boosters now attached to Discovery. Paperwork and x-rays were re-examined; the x-rays themselves were enhanced by computer and this confirmed that the booster parts are the never model. NASA spokesman Ed Medal said, "Everything we've seen indicates the redesigned rings are in (Discovery's) boosters."

Workers also completed installing the heat shields surround the main engines and made a final inspection of the thermal blankets on the cargo bay doors. The batteries on the Tracking and Data Relay Satellite were charged and more testing was to be done of the inertial upper stage booster rocket. [Mittman, **FLORIDA TODAY**, p. 3B, Sept. 23, 1988, "NASA Reports Shuttle Rocket Has New Rings," **THE NEW YORK TIMES** (National Edition), p. 11, Sept. 23, 1988.]

September 24: GREEN RIBBON ON LAUNCH PAD FENCE

Brevard County's Chambers of Commerce today placed a large green ribbon on the fence surrounding Discovery at launch complex 39B. The ribbon is symbolic of the support shown throughout the county for the launc

and is the largest of thousands displayed in Brevard. Receiving the ribbon was Deputy Director Thomas Utsman, who said, "It's hard to realize after 2 1/2 years of hard, hard work that we're only six days from flying and everything is still green for us. We really appreciate the fact that the community is getting behind us. I think you'll see a sea of green come Thursday." The green ribbon was the idea of Faye Savasta of Rockledge, FL. [White, **FLORIDA TODAY**, p. 3B, Sept. 24, 1988.]

September 25: DISCOVERY SET FOR COUNTDOWN

NASA proceeded without a hitch toward starting Discovery's countdown to launch today. A small crew of pad workers installed explosive devices on Discovery's payload - the Tracking and Data Relay Satellite (TDRS) - which will be used to separate the satellite from its booster after it is deployed. KSC spokesman George Diller said, "We don't see anything now that would preclude us from picking up the count." Nevertheless, launch officials are continuing to keep a close watch on Hurricane Helene. [Halvorson, **FLORIDA TODAY**, p. 3B, Sept. 25, 1988.]

<> COUNTDOWN SCHEDULE

The major steps after the countdown clock is started include the following:

*T-minus 27 hours: An eight-hour built-in hold begins. During the hold, final work will be done on Discovery's primary payload.

*T-minus 19 hours: A second eight-hour hold begins. By this time, workers are ready to roll back the Shuttle's service structure.

*T-minus 11 hours: A built-in hold of 19 hours and 39 minutes begins. When the clock begins again, the rotating service structure is removed for the last time.

*T-minus 3 hours: A two-hour hold begins. The external fuel tank is loaded with its 500,000 gallons of liquid hydrogen and liquid oxygen. Shortly after the T-minus-3 mark, the astronauts are scheduled to leave their crew quarters for the trip to the pad.

*T-minus 20 minutes: A 10-minute hold begins. All computer programs are verified for use. Launch team members signal the launch director they are ready.

*T-minus 9 minutes: The final 10-minute hold takes place. During this time the final launch approval is given after a check of all program, mission and operational elements.

*T-minus 7 minutes, 30 seconds: The access arm astronauts use to get into the Shuttle is moved.

*T-minus 31 seconds: The ground computers order the Shuttle's computers to finish the countdown.

*T-minus 6.6 seconds: The main engines start and build up to full thrust.

*T-minus 0: The solid rocket boosters are fired and the Shuttle lifts off. [Banke, **FLORIDA TODAY**, p. 3B, Sept. 25, 1988.]

<> CROWD ESTIMATES FOR LAUNCH

Crowd estimates for the launch of Discovery on Sept. 29, range from 500,000 to 3 million, though most estimate something around 1 million. That estimate could go higher, however, if NASA encounters a delay till the week-end when people are off work and children are out of school. "I don't think the people in this community can fully understand or grasp what we're going to go through, and what I'm talking about just getting to work in the morning," said Titusville Mayor Truman Scarborough. [Lafferty. **THE ORLANDO SENTINEL**, p. A-16, Sept. 25, 1988.]

<> HOSPITALS ON FULL ALERT

Jess Parrish Memorial Hospital (Titusville, FL) is the primary medical facility for Shuttle crews ; the hospital has background information on each crew member. If the astronauts need care not available at Jess Parrish, they will be stabilized and moved, probably to Shands Hospital (Gainesville, FL) though Florida Hospital (Orlando, FL) and Holmes Regional Medical Center (Melbourne, FL) are ready for potential use in an emergency. [Banke, **FLORIDA TODAY**, p. 11B, Sept. 26, 1988.]

September 26: COUNTDOWN CLOCK STARTS

The countdown to launch of Discovery started this morning at 8 a.m., a delay of about eight hours because engineers fell behind while doing final safety checks on the Orbiter. According to NASA spokeswoman Lisa Malone, the delay will not affect the expect 9:59 a.m. launch time because extra time had been built into the count. Hurricane Helene, still out in the Pacific Ocean, is no longer considered a threat to the launch. [Glisch, **THE ORLANDO SENTINEL**, p. A-5, Sept. 26, 1988.]

<> LAUNCH WEATHER GUIDELINES

NASA changed its weather criteria following both the Challenger accident and the loss to lightning of an Atlas-Centaur in 1987. Some of the restrictions which must be adhered to now include:

*Lightning - There can be no lightning within 10 miles of the launch pad 30 minutes before launch. Additionally, the potential for lightning also must be within certain guidelines when measured five miles away from the pad 15 minutes before liftoff.

*Precipitation - The countdown will stop if there is rain at the launch pad or in a Shuttle's flight path.

*Clouds - There are a series of guidelines that specify the various types of clouds - ones with the potential for creating lightning - the Shuttle cannot fly through. The Shuttle will not launch if the potential for lightning is present.

*Wind - Wind cannot be greater than 28 mph or, if it is blowing generally from the south, no greater than 19 mph. A launch cannot occur within 30 minutes of excessive winds at high altitudes.

*Temperature - Before the external tank can be loaded, the average temperature for the preceding 24-hour period must be above 41 degrees; the countdown will be halted if the temperature is above 99 degrees or the temperature is less than 37 degrees with a wind greater than 6 mph or a temperature less than 47 degrees with a wind less than 6 mph. [Banke, *FLORIDA TODAY, p. 1A, Sept. 26, 1988, Broad, THE NEW YORK TIMES (National Edition), p. 16, Sept. 28, 1988, Broad, THE NEW YORK TIMES (National Edition), p. 12, Sept. 29, 1988.]

<> DISCOVERY CREW ARRIVES

Discovery's five astronauts arrived at Kennedy Space Center today as the Shuttle went through the early stages of its countdown just a few miles away. The crew, which will spend the next few days relaxing and attending briefings, was clearly eager to resume manned Spaceflight after nearly three years. "The Mission Control team is ready. I know the launch control team here in Florida is ready, the bird is ready and we're ready. I'll tell you, we're excited. We can't wait to do this. This is a tribute to the tens of thousands of people that have put in an awful lot of work over the past 2 1/2 years to get us to this point," said Commander Rick Hauck.

Discovery's countdown continued without problems after starting at 8 a.m., about eight hours later than planned so engineers could finish safety checks on the Spacecraft. The delay won't affect the Shuttle's launch time because NASA had deliberately added about a day of extra contingency time in the countdown to allow for minor problems. Checks on the main engines and electrical systems continued. Tomorrow workers will begin loading the Shuttle's fuel cell storage tanks with liquid oxygen. [Banke, **FLORIDA TODAY**, p. 1A, Sept. 26, 1988, Wilford, **THE NEW YORK TIMES** (National Edition), p. 15, Sept. 26, 1988, Glisch, **THE ORLANDO SENTINEL**, p. A-4, Sept. 27, 1988, Halvorson, **FLORIDA TODAY**, pp. 1A-2A, Sept. 27, 1988, Wilford, **THE NEW YORK TIMES** (National Edition), p. 24, Sept. 27, 1988.]

September 27: LAST-MINUTE PROBLEMS

Test results from the inertial upper stage - the booster rocket set to deliver the Tracking and Data Relay Satellite [TDRS] to orbit - will be analyzed to see whether a cut in an O-ring found on another such IUS exists on the one now in Discovery's payload bay. "We're concerned because we want to take every step, uncover every stone to make sure we've done everything humanly possible to check any discrepancy we get," said Parker Counts, Chief of the Upper-Stage Office at Marshall Space Flight Center in Huntsville, AL.

Engineers also were studying an abrasion in the nozzle of one of Discovery's front orbital steering system engines. The head of NASA's launch approval team, astronaut Bob Crippen, said the abrasion was not thought serious. "In general," he said, "the picture is very good for going flying," with the only weather concern the possibility that low-

level winds will exceed NASA's new, stricter liftoff limits. [Broad, **THE NEW YORK TIMES** (National Edition), pp. 1 & 15, Sept. 26, 1988, Wilford, **THE NEW YORK TIMES** (National Edition), pp. 1 &13, Wilford, **THE NEW YORK TIMES** (National Edition), p. 13, Sept. 28, 1988, Glisch & Fisher, **THE ORLANDO SENTINEL**, pp. A-1 & A-14, Sept. 28, 1988, Halvorson, **FLORIDA TODAY**, pp. 1A-2A, Sept. 28, 1988.]

<> PRESS CONTINGENT HUGE

Extensive preparations have been made to accommodate the press here at Kennedy Space Center for the launch of Discovery September 29. "We had 2,700 press people for Apollo 11 and the first Shuttle launch, and this has the promise of being much larger," commented KSC spokesman Dick Young. Two-story studios for launch and prelaunch broadcasts have been made ready for network anchormen Bernard Shaw [CNN], Tom Brokaw [NBC], Peter Jennings [ABC] and Dan Rather [CBS]. The work of preparing these studios has occupied 315 people from the networks and they will have to begin packing up within minutes after the launch coverage is completed due to demands on the time of people and equipment in this presidential election year. [Cohen, **FLORIDA TODAY**, p. 4B, Sept. 28, 1988, Gerard, **THE NEW YORK TIMES** (National Edition), p. 13, Sept. 28, 1988.]

September 28: RECOVERY SHIPS TAKE POSITIONS

The solid rocket booster [SRB] recovery ships Liberty Star and Freedom Star leave Port Canaveral today to take up their positions 150 miles out in the Atlantic Ocean to await Discovery's launch. A policy change since the Challenger accident requires that launch be delayed if the seas are too rough to accommodate recovery of the boosters. In charge of retrieving the boosters is Anker Rasmussen, Manager of Marine Operations. The ships' schedule follows:

*About 2 p.m. today, the ships depart through Port Canaveral.

*Two hours later, the ships reach their destination and can remain there up to 20 days.

*About seven minutes after launch, the two boosters will splash down in the Atlantic.

*After parachute lines are attached aboard, four divers will enter the water and plug the open end of the booster, which is about 100 feet under water.

*Water will be pumped out of the booster till it moves from a vertical position bobbing in the water to a horizontal one which is more manageable.

*Eight hours after launch, the recovery ships will be ready to tow the boosters back to Port Canaveral.

*About 34 hours after launch, the two ships will enter the port, passing by Jetty Park (in Cape Canaveral, FL).

*About 38 hours after launch, the ships and boosters return to their slips at Cape Canaveral Air Force Station. [Banke, **FLORIDA TODAY**, p. 4B, Sept. 28, 1988.]

<> PORTABLE TOILETS FOR KSC

Comfort House Inc. (Winter Park, FL) will be providing 160 portable toilets to Kennedy Space Center for the launch of Discovery. The company has provided toilets for each of the previous 24 Shuttle launches. Jean Jonas, Comfort House spokeswoman, said, "We're just so excited we can take part." [Nagy, **FLORIDA TODAY**, p. 4B, Sept. 28, 1988.]

<> VIPS EXPECTED FOR LAUNCH

NASA expects some 2,000 celebrities and government officials to attend tomorrow's launch. The guest list includes the following persons: Daryl Hannah, John Travolta, John Denver, astronauts B. J. Weitz (Deputy Director of Johnson Space Center), Charlie Bolden (Pilot of STS-61C), Gene Cernan, Dr. Mae Jemison, Sultan Al Saud (Saudi Arabia and payload specialist on STS-51G), and former payload specialist Charles Walker. Dan Brandenstein (who will fly NASA's launch day weather plane) and 250 extended family members of the STS-25 crew.

Other confirmed VIPs include Florida Gov. Bob Martinez, NASA Administrator James Fletcher, Deputy Administrator Dale Myers, Associate Deputy Administrator Willis Shapley, U. S. Senators John Glenn, Jake Garn, Albert Gore, Bob Graham, Charles Grassley, Robert Kasten and Daniel Evans. Florida Congressmen Bill Nelson, Dan Mica and Larry Smith are also expected to attend. [Clark, **FLORIDA TODAY**, p. 5B, Sept. 28, 1988.]

September 28: ATLANTIS WAITS IN WINGS

The Space Shuttle Atlantis continues to undergo preparations for its Department of Defense mission. Atlantis is in the Orbiter Processing Facility for routine work and may be moved to the Vehicle Assembly Building as early as Oct. 7, according to Kennedy Space Center spokeswoman Lisa Malone. The crew will include Commander Robert Gibson, Pilot Guy Gardner, and Mission Specialists Richard Mullane, Jerry Ross and William Shepherd. ["Atlantis Waits in Wings for Flight," **FLORIDA TODAY**, p. 6B, Sept. 29, 1988.]

September 29: DISCOVERY SET FOR LAUNCH

All systems are go for the first Shuttle mission since the Challenger accident on January 28, 1986. "It's been a long 2 1/2 years to get to this point," said Rear Admiral Richard Truly, NASA's Associate Administrator for Space flight. "The Space Shuttle is ready to fly. The payload - the Tracking and Data Relay Satellite - is ready to fly," he said. Barring bad weather or last-minute equipment problems, Discovery should lift off between 9:59 a.m. and 12:29 p.m. "We're not going to bend the weather rules one iota," Truly said. "If we don't make the weather criteria, we're not going to launch." Fueling began today at 1:40 a.m.

Two small problems that cropped up during a flight review Sept. 27 were assessed, and neither stand in the way of the launch. A small cut was discovered Sept. 26 in an O-ring seal in the igniter of an upper-stage

booster that will be used on a February Shuttle flight. The quarter-inch long flaw is in the same type of upper stage that will be used to deploy Discovery's TDRS payload. The second problem was a small scratch in a thruster rocket in Discovery's Reaction Control System, which steers the Orbiter. [Halvorson and Banke, **FLORIDA TODAY**, p. 1A, Sept. 29, 1988, Fisher & Glisch, **THE ORLANDO SENTINEL**, pp. A-1-A-12, Sept. 29, 1988, Wilford, **THE NEW YORK TIMES** (National Edition), pp. 1 & 12, Sept. 29, 1988.]

September 29: DISCOVERY MAKES THRILLING LIFTOFF

Nearly three years of frustration ended for NASA and its contractors when Discovery lifted off LC 39B at 11:37 a.m. today. "Wow! That really was something," NASA Administrator James Fletcher told the launch firing room team, who had erupted in cheers at every milestone Discovery reached before the Shuttle reached a safe orbit. Fletcher commented further, "All I can say is the nation owes you a lot. This is the first of a new era" for the manned Space program.

Liftoff came an hour and 40 minutes late because of upper-level wind conditions, which eventually required a waiver of NASA's newly tightened launch rules. The weather problem ironically, involved conditions "too good for liftoff." Winds at 40,000 feet were blowing at only about 11 mph out of the northeast. Discovery's computers were programmed to handle winds at a seasonal norm of 28 to 34 mph, out of the west. The winds had been watched all through the night and, said KSC's Deputy Director Tom Utsman, finally it was determined that the Orbiter could safely launch. Contributing to their decision was the fact that the winds had become more stable and changed directions. "It did require a waiver, but it was thoroughly researched," said Utsman. "It was not a result of a judgment, but the result of a refined engineering analysis."

The launch was anything but routine in that the firing room team cheered as each critical milestone in the liftoff was achieved - especially the successful separation of the solid boosters. The launch drew some 250,000 people to Brevard County, far below initial projections of a million or more. No major traffic or crowd control problems were reported. There was a brief commotion when a wayward small private plane flew into NASA's launch airSpace and dangerously close to the launch pad. It circled the VAB twice before heading out to the launch pad at 2,100 feet, according to Air Force officials. The plane was intercepted by a NASA helicopter and ordered to land at nearby Space Center Executive Airport. Federal Aviation Administration spokesman Randy Myers, said the flight would be investigated and that the pilot - who was not identified - might lose his license.

Some video taped replays of the launch showed an odd-looking flame at the base of the left booster rocket shortly after launch, but NASA technicians who viewed the tapes said it was not abnormal. Morton Thiokol vice president Allan McDonald said that the first telemetry data showed that the boosters fired properly. They will undergo inspection at Kennedy Space Center beginning September 30. [Broad, **THE NEW YORK TIMES** (National Edition)**THE NEW YORK TIMES** (National Edition), p. 10, Sept. 30, 1988, Fisher, Glisch & Lafferty, **THE ORLANDO SENTINEL**, pp.

& 26, Sept. 30, 1988, Fisher, **THE ORLANDO SENTINEL**, p. A-30, Sept. 30, 1988, Halvorson, Banke, Mittman, **FLORIDA TODAY**, p. 2S, Sept. 30, 1988, "Liftoff! Transcript of Discovery's Flight," **FLORIDA TODAY**, p. 8S, Sept. 30, 1988, Nagy, **FLORIDA TODAY**, p. 9S, Sept. 30, 1988, Wilford, **THE NEW YORK TIMES** (National Edition), pp. 1 & 10, Sept. 30, 1988, "Shuttle Mission 26 Launched: Astronauts Return to Space As Discovery Soars Into Orbit," **AVIATION WEEK & Space TECHNOLOGY**, pp. 16-18, Oct. 3, 1988.]

<> WFTV HELICOPTER AT KSC

Orlando television station WFTV's helicopter made an emergency landing at KSC after Discovery's liftoff. It landed a mile north of the NASA Causeway and about five feet west of the Indian River shoreline. WFTV news director Chris Schmidt said that the helicopter was returning to the station's Orlando newsroom when the Pilot was forced to land the vehicle. "I think for some reason they had an engine failure, so they auto-rotated and set it down on NASA property. A representative of Bulldog Airlines, employer of the Pilot, said that "It was a precautionary landing, that's all. (The Pilot) did a good job of getting it down. If it had gone any further, it would have been serious. He did an excellent job and we're real proud of him." Mechanics worked on the helicopter for four hours after its landing and subsequently flew it back to Orlando. [Jones, **FLORIDA TODAY**, p. 9S, Sept. 30, 1988.]

<> NO PROBLEMS AT PAD

Just after Discovery's launch, pad workers at LC 39B began preparing the pad for Atlantis, tentatively scheduled for rollout in mid-October. "There's only a couple of weeks until the next bird comes out, so there's an emphasis on getting this pad ready," said Bill Warren, NASA Site Director. Larry Schultz, Chief of NASA's Launch Structures Section, said, "The pad looks excellent after the launch - minimum damage to any of the systems." [Lafferty, **THE ORLANDO SENTINEL**, p. A-30, Sept. 30, 1988.]

September 30: LAUNCH DECISION CORRECT

Discovery's launch yesterday was, in part, the result of a waiver signed by Robert Crippen, which allowed the Orbiter to fly into winds far less volatile than predicted. Forecasters had suggested that winds at 20,000 to 30,000 feet would be up to 100 mph; weather balloons found winds of only 10 to 25 mph. The problem: Discovery's computers had been programmed to compensate for 100 mph, therefore Crippen's waiver was required.

"It was a very small matter," Joseph Sutter, a member of the AeroSpace Safety Advisory Panel that oversees NASA, said today. "With all the scrutiny NASA is under, they aren't going to make any mistakes. I don't think it's the same old arrogant, sloppy NASA that existed leading up to Challenger." [White and Beecken, **FLORIDA TODAY**, p. 1A,

October 1: BOOSTERS RETURN TO PORT CANAVERAL

Other than some discoloration and blackening caused by the flames of liftoff, the two solid rocket boosters which lofted Discovery to its mission showed little obvious damage. They were given an "A-double-plus" by Rocky Raab, spokesman for Morton Thiokol Inc. which built the rockets. Raab said he'd seen no evidence that the joints were leaking. On October 3, workers will remove any remaining explosive chemicals from the rockets. "Then it takes more than three days to strip the thermal protection materials on the joint and the motor," Raab said. He went on to say that the first joint should be removed in about two weeks. "The booster parts go to USBI; all the motor parts go back to Utah," Raab said. Morton Thiokol Inc.'s main manufacturing plant is in Brigham City, Utah. [Banke, **FLORIDA TODAY**, p. 3B, Oct. 1, 1988, Lafferty and Glisch, **THE ORLANDO SENTINEL**, p. A-12, Oct. 2, 1988, Lafferty, **THE ORLANDO SENTINEL**, p. A-4, Oct. 3, 1988.]

<> READYING ATLANTIS FOR LAUNCH

Shortly after the successful launch of Discovery, workers began to ready pad 39B for Atlantis'ss mid-November mission. Workers washed the area affected by Discovery's engine blast and replaced some damaged lights; otherwise pad damage was described by NASA spokeswoman Lisa Malone as minimal. The crawler-transporter was returned to the pad to pick up the mobile launch platform for delivery to the Vehicle Assembly Building October 3 and stored there for Discovery's next mission, STS-29, early next year. The solid rocket boosters for that mission will be assembled atop the platform in the third week of October.

Tanker trucks containing liquid hydrogen and liquid oxygen will arrive at Kennedy Space Center this week to refill storage tanks depleted by the Discovery launch. Discovery is expected back aboard its 747 carrier plane - in a one-day flight - on October 8. Atlantis is expected to be rolled over from the Orbiter Processing Facility to the VAB no earlier than Oct. 14. Leak checks and work on the Atlantis's TPS continued today in the OPF. Columbia remains in an OPF hangar and had its side crew hatch installed and will be moved to another hangar shortly to accommodate the returned Discovery. [Banke, **FLORIDA TODAY**, p. 3B, Oct. 1, 1988, Lafferty, **THE ORLANDO SENTINEL**, p. A-17, Oct. 4, 1988.]

<> CONGRESS APPROVES BEACH ROAD

Construction for a new road to Playalinda Beach could begin next year because Congress has appropriated $6.6 million for its design and construction. [Hammond and White, **FLORIDA TODAY**, p. 2B, Oct.2, 1988.]

October 3: DISCOVERY LANDS AT EDWARDS

Discovery's mission, which began at Kennedy Space Center Sept. 29, came to a successful conclusion with a perfect landing in the desert at Edwards Air Force Base, California. Touchdown came at 12:37 EDT and the crew was greeted by Mission Control which told the men, "Welcome back, Discovery - a great ending to a new beginning." Vice Presiden

George Bush greeted the astronauts as they emerged from Discovery. [Fisher, **THE ORLANDO SENTINEL**, pp. A-1 & A-17, Oct. 4, 1988.]

<> E'PRIME SCRUBS COMMERCIAL LAUNCH

E'Prime AeroSpace Corp. (Titusville, FL) has postponed its Oct. 6 launch of a sounding rocket from Cape Canaveral Air Force Station, according to both company and Air Force officials. The scrubbing was caused by hardware and paperwork problems. E'Prime will pay the Air Force about $24,400 for the use of a launch pad and minimal support crew for two launches. ["Titusville Firm Scrubs Launch," **FLORIDA TODAY**, p. 2B, Oct. 4, 1988.]

<> ATLANTIS LAUNCH DATE OPTIMISTIC

The November 17 launch date for Atlantis is "optimistic," according to Conrad Nagel who is in charge of prelaunch operations. He said the date is "under review" and hopes to launch before Thanksgiving, November 24. One thing slowing work is the shortage of experienced workers, he said. "Right now we have a lot of people who have come on board in the last two to three years. Those people are gaining experience with each day that passes. And as we have experienced people, we are going to see some of our manpower problems go away." Another problem is the completion of the post-Challenger modifications being made on both Atlantis and Columbia, in addition to the ones made on Discovery. "Once we complete these," said Nagel, "and get into what I call a more routine flow of the Orbiters through the processing...we're going to see less pressure in terms of having experienced resources available to do Orbiter processing."

Finally, Nagel said, "We've got a very tight schedule and we're going to work that schedule. And right now I think that the fact we got a good flight off on Discovery would lead us to be very optimistic about the schedule we have between now and next summer." The following missions have these tentative dates:

*Discovery, Feb. 18, 1989
*Atlantis, April 28, 1989
*Columbia, July 1, 1989
*Discovery, Aug. 10, 1989
*Atlantis, Oct. 12, 1989
*Columbia, Nov. 13, 1989
*Discovery, Dec. 11, 1989
*Atlantis, Feb. 1, 1990

[Banke, **FLORIDA TODAY**, p. 3B, Oct. 4, 1988.]

October 4: DISCOVERY SUSTAINS LITTLE DAMAGE

NASA announced today that Discovery came through its mission in excellent shape and suffered only slight damage to a few of its heat-resistant tiles - the thermal protection system. "The vehicle looks beautiful," said John Talone, Director of Shuttle Processing. "It looks as good, or better, [than] any vehicle we've ever brought in here. It's clean as can be." Inspectors found only slight damage under the right

wing where six tiles were "gouged" about 1 and 1/4 inches deep. Talone suspected that the damage might have occurred during liftoff by flying debris, perhaps from the external tank or from cork wrapped around the booster joints for extra weather protection. Film will be analyzed to see whether any debris can be spotted hitting the Shuttle. Talone also said that the Shuttle's brakes performed well. "In the past we've seen cracks or something" after touchdown, he said. "We've seen nothing. They look good in every way." [Glisch. **THE ORLANDO SENTINEL**, pp. A-1 & A-4, Oct. 5, 1988, Halvorson, **FLORIDA TODAY**, p. 1A, Oct. 5, 1988, Wilford, **THE NEW YORK TIMES** (National Edition), p. 54, Oct. 5, 1988.]

<> EXPERTS TO CHECK BOOSTERS

Myron Uman, Director of the National Research Council group that oversees the booster program, said today that the boosters appear in good shape following the STS-26 mission. "Divers went into the water and looked around and didn't find any evidence of flame on the outside," he said. "They pulled them out of the water and everything looked good." After the panel sifts through the booster inspection data, it will issue a report no later than mid-November, Uman said.

Meanwhile, Martin Marietta AeroSpace has evaluated the external fuel tank that it manufactures for the Shuttle Program. The tank separated from Discovery as expected nearly nine minutes after liftoff, vented its remaining liquid oxygen through three valves, causing the tank to tumble as it fell into the Pacific Ocean southwest of Hawaii - right on target. [Banke, **FLORIDA TODAY**, p. 5A, Oct. 5, 1988.]

October 5: DISCOVERY TO RETURN

Discovery is set to return to Kennedy Space Center no earlier than Oct. 8 and perhaps not till Oct. 9, depending on the weather. Atlantis is scheduled to be moved to the Vehicle Assembly Building Oct. 15 for mating with its solid rocket boosters, according to KSC spokesman George Diller. Next week, technicians will work on Atlantis's heat-resistant tiles and check the Orbiter's main propulsion system. Columbia will be moved from its present hangar in the Orbiter Processing Facility to make room for Discovery. [Mittman, **FLORIDA TODAY**, p. 8A, Oct. 6, 1988.]

October 7: COLUMBIA MOVES OVER

Columbia was moved from its hangar in the Orbiter Processing Facility to another hangar to make room for the returning Discovery. The trip of several hundred feet took about 20 minutes from the OPF to the Orbiter Maintenance and Refurbishment Facility. During Columbia's three-month stay in the OPF, technicians modified its electrical systems, ran electricity through its systems and serviced its plumbing. They also reinstalled some equipment removed when the Orbiter was put in storage two years ago. Several missing systems still must be returned to the Columbia which is scheduled to carry a military payload to Space July 1, 1989. [Banke, **FLORIDA TODAY**, p. 1A, Oct. 8, 1988.]

October 8: DISCOVERY RETURNS HOME

Discovery returned to Kennedy Space Center today at 7:04 p.m. after a day-long trip from California. About 6,000 Space center workers and

their families were on hand for the arrival. Special car passes were issued to allow access to the area.

Returning with the Shuttle and its carrier was a KC-135 aircraft. This plane is ordinarily used to produce brief periods of weightlessness by flying giant arcs in the sky. Today, however, it served as Discovery's "pathfinder," flying about 30 minutes ahead of the carrier to check for turbulence and precipitation which could damage the returning Shuttle. Weather conditions at KSC were constantly monitored throughout the flight. [Banke, **FLORIDA TODAY**, pp. 1A-2A, Oct. 9, 1988.]

<> ATLANTIS BEARS MILITARY PAYLOAD

Atlantis is scheduled to carry an unidentified military payload when it is launched in November. The five crew members are all military personnel: Navy Commander Robert Gibson, Commander, third mission; Air Force Lt. Col. Guy Gardner, Pilot, first mission; Air Force Col. Richard Mullane, Mission Specialist, second mission; Air Force Lt. Col. Jerry Ross, Mission Specialist, second mission; Navy Commander William Shepherd, Mission Specialist, first mission. This will be the first of 12 military missions scheduled over the next five years. Conrad Nagel, who is in charge of processing Atlantis, said, "Like most DOD missions, we're not going to talk about anything associated with the payload or payload area that might be classified." Because this flight is a classified mission, said Nagel, "we have had to limit access in most areas of the vehicle" and this has slowed processing work. [Mittman, **FLORIDA TODAY**, p. 1A, Oct. 9, 1988, Banke, **FLORIDA TODAY**, p. 5A, Oct. 9, 1988.]

<> MAGELLAN ARRIVES AT KSC

The Venus probe Magellan arrived today at Kennedy Space Center in a special truck called the Payload Environmental Transport System (PETS). The Spacecraft will be launched next year from Atlantis and is one of a series of important science payloads NASA will launch to the planets in the coming years. "We want to learn about the origin and evolution of the solar system, how the planets came into being and why they are so different," said Magellan Project Manager John Gerpheide of the Jet Propulsion Laboratory in California. [Banke, **FLORIDA TODAY**, p. 5A, Oct. 9, 1988, and Banke, "Special Truck Hauled Magellan," **FLORIDA TODAY**, p. 5A, Oct. 9, 1988.]

October 10: BOOSTERS IN GOOD CONDITION

Discovery's boosters came through the launch on Sept. 29 in good condition according to initial reports from NASA. "Everything is very, very good," said Ed Medal, spokesman for Marshall Space Flight Center. "The three field joints on the right-hand motor have been disassembled and they are the same as those on the left-hand motor; no gas reached any of the O-rings." [Mittman, **FLORIDA TODAY**, p. 1A, Oct. 11, 1988, "8 O-Rings Joints Fine, NASA Says," **FLORIDA TODAY**, p. 6A, Oct. 13, 1988, "No Damage Is Found on Shuttle Rocket Seals," **THE NEW YORK TIMES** (National Edition), p. 23, Oct. 11, 1988.]

<> ENGINEERS FIX SENSOR

Engineers have fixed the sensor that caused computers to halt a critical flight readiness firing August 4. Rocketdyne spokesman John Plowden said that materials in the sensor that measure the movement of a liquid hydrogen valve was affected by super-cold temperatures and the magnetic properties of the material were subtly altered. That caused the sensor to read improperly. The problem was fixed by changing the criteria that outlines what condition the vehicle must be in to launch. Atlantis will fly under the same hardware conditions as Discovery did, but modifications will be made for Discovery's next launch. [Banke, **FLORIDA TODAY**, p. 4A, Oct. 11, 1988, "Report on Shuttle Booster - Left O-Rings Make An A," **THE ORLANDO SENTINEL**, p. A-1, Oct. 11, 1988.]

October 11: ATLANTIS'S ROLLOVER DELAYED

Atlantis will rollover from the OPF to the Vehicle Assembly Building no earlier than October 21 because more work needs to be done on the Orbiter. NASA spokeswoman Lisa Malone said, "This schedule is tight. We are continually assessing the work schedules as we always do." Work needs to be completed on the thermal protection system, or heat-resistant tiles. The payload bay needs to be cleaned and checked. The payload bay doors have to be closed. The landing gear has to be checked and a leak check of the entire system has yet to be completed. When Atlantis finally does rollover to the VAB, it will join its external fuel tank and solid rocket boosters. No date has been given for the rollout to launch pad 39B. [Mittman, **FLORIDA TODAY**, p. 6A, Oct. 12, 1988.]

October 12: E'PRIME LAUNCH SET

E'Prime AeroSpace Co. plans to launch its LOFT-1 rocket on Oct. 27. The company has an agreement to use Cape Canaveral Air Force Station Facilities to launch a small, suborbital rocket. The payload, which will be carried up to 20,000 feet and then dropped by parachute into the ocean for recovery, includes four experiments and manufacturing materials for a Rhode Island firm planning to market "Space dolls." ["E'Prime Launch Set for Oct. 27," **FLORIDA TODAY**, p.5A, Oct. 13, 1988.]

October 17: ACTUATOR PROBLEM DELAYS ATLANTIS

A problem with the actuator on Atlantis's left wing has prevented the move of the Orbiter from the OPF to the Vehicle Assembly Building until Oct. 23. The actuator moves a 12-foot- long flap which helps steer the Shuttle during the gliding portion of its flight before landing. It failed to work properly last weekend during routine testing. It will be replaced tonight, using a spare part already in stock at Kennedy Space Center, according to KSC spokeswoman Lisa Malone. The hydraulic lines will be filled and serviced Oct. 19 and a complete test of the actuator's ability to move the wing flap will be conducted later in the week.

Work also is continuing on the heat resistant tiles and other systems are undergoing checks. Despite the hitches, Malone said, "We're still

targeting for November." A firm date may not be set till after the flight readiness review is completed in November, according to NASA Headquarters spokeswoman Sarah Keegan. [Banke, **FLORIDA TODAY**, p. 1A, Oct. 18, 1988, "Atlantis Wing Part Replaced," **FLORIDA TODAY**, p. 7A, Oct. 19, 1988.]

<> FIRE HITS VENUS PROBE/MAGELLAN

The Venus probe Magellan was slightly damaged by an electrical fire tonight about 11 p.m., when battery cables were improperly inserted, according to NASA officials. "It doesn't appear to be a major problem," said John Conway, KSC Payloads Director, who added that a closer examination may yet reveal something more significant. Technicians worried especially about a Spacecraft signal processor which might have been affected.

"The overwhelming evidence says all the damage was within the battery container itself," said Vince Wirth, Magellan Test and Integration Manager. "The only thing we have to live with is the dirt and the soot and the grease and grime that were deposited on the structure." The battery that was ruined was used only on the ground; those included for flight will be installed closer to launch time.

Magellan's April 28, 1989, launch date may not be postponed if no serious damage was sustained. After the accident, the Space agency began to assemble an accident investigation team to determine the accident's cause and, perhaps, recommend procedure changes. [Fisher, **THE ORLANDO SENTINEL**, p. A-3, Oct. 19, 1988, Banke, **FLORIDA TODAY**, p. 1A, Oct. 19, 1988.]

October 19: Space CONFERENCE AT KSC

An update of the Shuttle Program was presented by Launch Director Bob Sieck at the conclusion of a two-day conference at Kennedy Space Center about the U. S. civilian and military activities in Brevard County. The conference started yesterday at Patrick Air Force Base with a classified seminar. The event is directed by the National Security Industrial Association Space Committee. ["Civilian, Military Space Conference Ends Today," **FLORIDA TODAY**, p. 7A, Oct. 19, 1988.]

<> DISCOVERY'S MAIN ENGINE LEAKED

NASA confirmed today that one of Discovery's three main engines leaked during flight. The leak occurred in the line between the combustion chamber and the nozzle, according to NASA spokeswoman Sarah Keegan. Officials don't know whether the leak indicates a generic failure of the main engine system or whether Discovery's engine could be fixed or replaced, Keegan said. The impact on a flight would depend on when the failure took place, she said. The leak had been observed on other flights as well and should not affect the late November launch of Atlantis, officials said. Atlantis will be rolled over to the VAB on Oct. 23 where technicians will inspect an engine aboard the Orbiter to ensure that none of its parts are warped. [Banke, **FLORIDA TODAY**, p. 1A, Oct. 20, 1988, Fisher, **THE ORLANDO SENTINEL**, p. A-3, Oct. 21, 1988.]

<> ARREST POWER FOR GUARDS

Federal arrest authority may be given to Kennedy Space Center security guards if the Senate approves the NASA Authorization Bill for 1989. Presently, KSC guards may carry firearms but have no arrest authority. "They technically have no more arrest authority than private citizens," said KSC Security Chief Gary Wistrand. Forty of the 300 guards at the Space center are deputized. Wistrand said the new language in the Space Act will give NASA security guards more flexibility in protecting the Shuttle fleet and related facilities. It will also reduce liability in situations where deadly force must be used to protect NASA facilities, he said. [Halvorson, **FLORIDA TODAY**, p. 1A, Oct. 20, 1988.]

<> MAGELLAN CLEANUP BEGINS

Workers started cleaning the Magellan Spacecraft after an investigation board released the Venus probe from impoundment tonight. Members of the Magellan Electrical Mishap Investigation Board examined the Spacecraft in the payload facility where the accident occurred. They did not see any damage to the Spacecraft beyond what was announced Oct. 18 - soot and grime that must be cleaned before Magellan can be loaded into Atlantis for its April mission. ["Cleanup of Magellan Begins," **FLORIDA TODAY**, p. 4A, Oct. 20, 1988.]

October 20: LAUNCH LATE IN NOVEMBER

Atlantis may be launched in the last seven days of November, according to NASA managers. A firm date is not expected till a review session scheduled for Nov. 9 and 10 is completed. Meanwhile, Atlantis remains in the Orbiter Processing Facility awaiting a move to the Vehicle Assembly Building. "We're going to roll as soon as we are ready," said spokeswoman Lisa Malone. "If we're ready before midnight Saturday, we will go." Once Atlantis is hoisted vertically onto the mobile launch platform, technicians will examine part of one of its main engines. That part, a plate inside a chamber where liquid oxygen is burned, may have been warped by uncontrolled explosions of leftover gases following a test firing of that engine at Stennis Space Center (Bay St. Louis, MS). A similar even occurred during a test of an engine scheduled for use in Columbia and led managers to call for an inspection of Atlantis's engine. [Banke, **FLORIDA TODAY**, p. 4A, Oct. 21, 1988.]

October 22: ATLANTIS ROLLS OVER TO VAB

Under armed guard, Atlantis rolled over from the Orbiter Processing Facility to the Vehicle Assembly Building beginning at 10:32 p.m. today; the trip took 43 minutes. Conrad Nagel, Shuttle Processing Director, said, "I'm really excited, I'll tell you." Equally enthusiastic was Anthony Alindayo, quality assurance employee with Rockwell International Corp., who said, "This is just super. It's just exciting to see the Spaceship rolling out and know that we're going out to the pad. We're going to see a launch here in about four or five weeks." [Halvorson, **FLORIDA TODAY**, p. 1A, Oct. 23, 1988.]

October 23: NASA QUALITY DAY

Tuesday (October 25) has been set aside as "NASA Quality Day" to reaffirm the agency's dedication to excellence and recognizes NASA's reliance on the creative contributions of its work force. George Rodney, NASA Associate Administrator for Safety, Reliability, Maintainability, and Quality Assurance, and other top NASA managers from NASA centers will present programs on the agency's quality and productivity improvement program activities via satellite to NASA Space centers. "The occasion of NASA's 30th anniversary provides the opportunity to reflect on our past achievements and to rededicate ourselves to excellence for the future," said James Fletcher, NASA Administrator. "Our enthusiasm to accept complex challenges and our ability to work together to overcome difficult obstacles will fuel our ongoing quest for excellence." ["'NASA Quality Day' Reaffirms Commitment," **FLORIDA TODAY**, p. 34, Oct. 24, 1988.]

<> ATLANTIS JOINED TO ET

Atlantis has been hoisted into an vertical position and the attachment of its external tank has begun. Tests to verify connections will be conducted when the Shuttle is attached to the external tank and the solid rocket boosters, according to NASA officials. Rollout to the launch pad is scheduled for this weekend. Prior to rollout, however, workers must inspect one of Atlantis's main engines for possible damage during tests at Stennis Space Center (Bay St. Louis, MS). That inspection could take a week but other work can proceed simultaneously. [Bellido, **FLORIDA TODAY**, p. 3B, Oct. 24, 1988.]

October 25: DISCOVERY CREW RETURNS

Several thousand Kennedy Space Center workers turned out to see the crew of Discovery as it returned to the Space center in keeping with the tradition of American manned Space flight. Mission Specialist George "Pinky" Nelson told the assembled workers: "When we lift off, what's really pushing that thing up is all your good feelings and all the good work that you have done. It's the best ride in the world, and there is not a better way to get out of Florida." Pilot Richard Covey said, "If there's a heartbeat to America's Space program, it's right here."

The crew and Center Director Forrest McCartney exchanged traditional gifts and mementoes of the historic mission during the ceremony. Director McCartney gave the crew framed photos of the liftoff taken by a remote-operated camera near the launch pad. Commander Frederick "Rick" Hauck reciprocated by giving the Director a collage of launch and crew photos which included a crew patch and American flag that flew in Space. Launch Director Robert Sieck and U. S. Rep. Bill Nelson also spoke at the ceremony. [Banke, **FLORIDA TODAY**, p. 1A-2A, Oct. 26, 1988, and see also: Jones, **FLORIDA TODAY**, p. 5A, Oct. 25, 1988, and Halvorson, **FLORIDA TODAY**, p. 2A, Oct. 25, 1988.]

October 26: ENGINE PART PASSES INSPECTION

Kennedy Space Center technicians inspected a suspect plate inside one of Atlantis's three main engines Oct. 25 and declared today that "as

far as we can tell, the plate looks fine," according to NASA spokesman Jerry Berg. "The inspectors didn't get any indication of deformation." Rollout to the launch pad will come no earlier than 12:01 a.m. October 31. In the VAB, workers continued stacking segments of solid rocket boosters for Discovery's next mission, now scheduled for February 19. Workers in the OPF prepared to remove two of Discovery's main engines for post-flight inspection; the third engine will be shipped to its California manufacturer, Rocketdyne, for repairs to the main engine combustion chamber, which developed a leak during the STS-26 mission. [Halvorson, **FLORIDA TODAY**, p. 4A, Oct. 27, 1988.]

October 27: ATLANTIS POWERED UP

Early this morning, Kennedy Space Center workers powered up the Shuttle Atlantis for a series of tests before it is rolled out to Launch Complex 39B. The powering up began at 6 a.m. as part of a series of tests to insure that all connections between the Shuttle and the mobile launch platform are working properly. The tests are the last obstacle to overcome prior to rollout, according to KSC spokeswoman Lisa Malone. Playalinda Beach will remain closed to the public till after the launch next month. [Halvorson, **FLORIDA TODAY**, p. 4A, Oct. 28, 1988.]

<> KSC WORKERS IN MUSCLE EXPERIMENT

Under the direction of Dr. Paul Buchanan, Director of Kennedy Space Center's Biomedical Operation and Research Office, 37 space center workers are subjecting themselves to 16 weeks of specially designed exercises on Nautilus leg extension machines. They are required to exercise three times a week for a varied amount of time. In addition, all participants are allowing doctors to remove small cores of muscle fibers from their thighs to study muscle growth. The four-month regimen is part of an effort to counter bone and muscle loss on long-duration manned missions in Space.

"Even with up to 2 1/2 hours a day with more or less conventional exercise methods you do not stop muscle atrophy," said Buchanan, an aerospace medicine specialist. "None of the methods (including a stationary bicycle) have worked very well. We have managed to preserve cardiovascular function, but we still have a 10 to 15 percent loss of muscle mass in the lower extremities and back." The study is not designed particularly for Shuttle astronauts whose missions are of relatively short duration. "Ten days in Space does not make that much difference," Buchanan said. "There are some losses, but you come back very quickly." [Mittman, **FLORIDA TODAY**, p. 4A, Oct. 28, 1988.]

October 29: ATLANTIS ROLLOUT DELAYED

Atlantis's rollout to the pad has been delayed for one day to November 2; the delay was due to the need to reconnect a loose wire in a fuel line system. The military mission's launch date will be announced but only the launch window will be released to the press. ["NASA Delays Atlantis's Trip to Launch Pad," **THE ORLANDO SENTINEL**, p. A-10, Oct. 30, 1988, Mittman, **FLORIDA TODAY**, p. 1A, Oct. 30, 1988.]

October 30: KSC BREAKS OVERTIME RULES

Overtime work rules were broken 2,000 times by Kennedy Space Center officials in the three months leading up to the launch of Discovery on Sept. 29. That accumulated overtime either equaled or closely approached pre-Challenger levels, especially in critical work areas such as the Orbiter Processing Facility, the Vehicle Assembly Building and Launch Pad 39B. Top Space center officials said, however, that the amount of overtime was acceptable.

"Twenty percent overtime...is about a 48-hour work week. That's six days a week, eight hours a day and that's not our of bounds for the kind of work that we do around here," said Bob Sieck, KSC Launch Director. [Halvorson, **FLORIDA TODAY**, p. 1A, Oct. 31, 1988.]

<> DR. MAE JEMISON IN TITUSVILLE

Astronaut Dr. Mae Jemison was in Titusville today at Jess Parrish Memorial Hospital to sign autographs and chat with people during the hospital's open house in celebration of its 30th anniversary. "Waiting is probably the hardest part of my job, but I still have an awful lot to learn about how the Space Shuttle operates and everything I am doing right now is very interesting," said Jemison, who is one of ten medical doctors who are also astronauts. [Brown, **FLORIDA TODAY**, p. 1A, Oct. 31, 1988.]

October 31: ATLANTIS READY TO ROLLOUT

The Atlantis was ready to be rolled out to LC 39B after a three-inch piece of wire inadvertently lodged between the Orbiter and its external tank was removed today. NASA spokeswoman Lisa Malone said Kennedy Space Center technicians pulled the elusive wire from between a nut and a washer on the lower left side of the fuel tank, where it had been detected Oct. 29. Extra time was allotted for removal of the wire because it was trapped within one of the critical connecting points between the Shuttle and the external tank. [Halvorson, **FLORIDA TODAY**, p. 1A, Nov. 1, 1988.]

November 2: ATLANTIS REACHES PAD 39B

Atlantis pulled to a stop on Launch Complex 39B early this morning as NASA officials said that liftoff could come either Nov. 28 or 29. "What we're looking at is late November, and if we make that I think everyone will be extremely pleased," said Conrad Nagel, who is responsible for preparing Atlantis for launch. "We've got a pretty good chance right now." Launch is set for between 6:32 and 9:32 a.m. for the secret Defense Department mission.

Workers powered up the Orbiter late tonight to insure that all electrical connections between the Orbiter and the pad were working properly. Nagel said that no technical problems now stood in the way of the late November launch. "We're essentially clean going out of the barn. Right now, I would say Atlantis is ready to fly," Nagel said. The processing schedule for this flight began in March 1987. [Halvorson, **FLORIDA TODAY**, p. 1A, Nov. 2, 1988 Banke and Halvorson, **FLORIDA TODAY**, p. 1A, Nov. 3, 1988, "Dawn Over Atlantis," **THE ORLANDO SENTINEL**, (cutline) p. A-1, Nov. 3, 1988.]

November 4: SPACE CONGRESS SELECTS THEME

"Space - A New Generation" has been selected as the theme for next April's 26th annual Space Congress to be held in Cocoa Beach. The theme focuses on the emergence of a new era that includes an increased emphasis on planning, the return to flight of the Space Shuttle and the commercialization on expendable launch vehicles like the Atlas, Delta and Titan rockets. James Fletcher, NASA Administrator, is expected to speak at the annual banquet and Rep. Bill Nelson will present the Congress's opening address. ["Space Congress Selects Theme for April Session," **FLORIDA TODAY**, p. 10A, Nov. 5, 1988.]

<> MCCARTNEY SPEAKS AT PATRICK O CLUB

Kennedy Space Center Director Forrest S. McCartney spoke today to an audience of alumni of Embry-Riddle University (Daytona Beach, FL) at the Officer's Club of Patrick Air Force Base. McCartney told the newly formed alumni chapter that "it was a very devastating thing when we lost the Challenger. It took us 32 months to get back on our feet. But we as Americans must expect that there's no way we can take the risk out of this business. Challenger was a terrible mishap. It was certainly a very sobering experience that set back the Space program. But we're back flying again. The program is stronger than ever. The people are the best team, the best motivated ever. The program is back in good shape." He told the alumni group that since Challenger, the technicians at KSC have received more training, the Shuttle has been redesigned for safety and launches are scheduled almost every month of next year to bring the program back up to speed. [Porto, **FLORIDA TODAY**, p. 10A, Nov. 5, 1988.]

November 7: NASA STUDIES MARSH FIRES

NASA researchers conducted a controlled burn of marshlands two miles

west of the Shuttle landing facility today in an effort to learn how continued destruction of tropical rain forests will affect global weather, according to Merritt Island Wildlife Refuge spokesman Dorn Whitmore. The researchers, who surveyed the fires from a helicopter, took air samples from plumes of smoke rising from the fires. The samples will help scientists study ways that Earth's ozone layer is being influenced by vast amounts of smoke generated from "slash burning" techniques used to clear large portions of tropical rain forests, said Whitmore. He also said that another 10,000 acres will be burned during the winter months. Each section of the refuge is burned about once every four years. [Brown, **FLORIDA TODAY**, p. 2B, Nov. 8, 1988.]

November 8: ATLANTIS'S APU'S PAST TEST

Atlantis's three auxiliary power units passed the last tests in preparation for a late November launch. The Rotating Service Structure around the Shuttle was moved away from the Orbiter for the tests to be conducted. A simulated countdown will begin at 7:40 a.m. Nov. 13 and culminate at 11 a.m. Nov. 14. The Atlantis's crew is expected to arrive Nov. 12. Columbia was scheduled to be moved from the Orbiter Maintenance and Refurbishment Facility early Nov. 9 to the hangar Atlantis had occupied in the Orbiter Processing Facility. On the return of Atlantis following STS-27, Columbia will be returned to the OMRF. [Mittman, **FLORIDA TODAY**, p. 4A, Nov. 8, 1988, Banke, **FLORIDA TODAY**, p. 11A, Nov. 9, 1988]

November 9: WORKER CLEARED IN MAGELLAN FIRE

The Magellan Electrical Mishap Investigation Board cleared a Kennedy Space Center worker of responsibility for the October fire aboard the Magellan Spacecraft. The review board said that the worker was "following the written procedures correctly" when he plugged an electrical line into the wrong socket of a battery being used to test systems on board the Spacecraft, said Jon Busse, chairman of the panel. The board went on to say that the procedures did not allow for easy access to the battery socket which was not visible to the worker so that he was able only to partially connect the plug. "It's an extremely difficult procedure," Busse said. The board recommended that NASA and contractor officials revise procedures to provide easier access and greater visibility of the battery and its connectors. KSC spokesman George Diller said that because a spare test battery was available the damaged one - valued at $87,000 - will not be replaced. [Halvorson, **FLORIDA TODAY**, p. 6A, Oct. 29, 1988, Halvorson, **FLORIDA TODAY**, p. 13A, Nov. 10, 1988, Glisch, **THE ORLANDO SENTINEL**, p. A-6, Nov. 10, 1988.]

November 10: ATLANTIS LAUNCH DATE DISCUSSED

NASA managers and contractor representatives met today with Kennedy Space Center Director Forrest McCartney to discuss the work schedule for Atlantis and whether launch teams are ready for the STS-27 mission. Launch Processing Director Conrad Nagel said the launch will come no earlier than Nov. 30. He said that replacing a malfunctioning valve on one of the Orbiter's auxiliary power units might add an extra day to the schedule. Workers have to drain the hydrazine from the unit, replace the valve and then verify that all systems are working properly

before reloading the toxic fuel. [Mittman, **FLORIDA TODAY**, p. 12A, Nov. 11, 1988, "Atlantis Preparations On Schedule," **FLORIDA TODAY**, p. 13A, Nov. 10, 1988.]

<> ROCKWELL ADDS 250 JOBS

The transfer of Rockwell International Corp.'s Shuttle logistic operations from Southern California to Brevard County in 1989 will mean up to 250 new jobs for area workers. The additional jobs will involve purchasing and inventory management. NASA has awarded a three-year, $419.2 million contract extension to Rockwell for logistics operations, including the purchase and repair of Shuttle Orbiter components and ground support equipment. The logistics support contract will boost Rockwell's employment at Kennedy Space Center to 750. [Hinman, **THE ORLANDO SENTINEL**, p. B-1, Nov. 11, 1988.]

November 11: E'PRIME LAUNCH SET

E'Prime AeroSpace Corp. (Titusville, FL) plans to launch its 10-foot LOFT-1 rocket at 7:30 a.m. Nov. 17, according to company spokesman Jim Mizell. That launch plan was confirmed by Air Force spokesman Col. Ron Rand; the liftoff will take place from launch complex 47 at Cape Canaveral Air Force Station. The rocket will carry a 30-pound payload containing four experiments. E'Prime will pay the Air Force $24,000 for use of the launch facilities and a minimal support crew for two launches and had to take out a $1 million liability insurance policy to cover any potential damage to Air Force property. [Halvorson, **FLORIDA TODAY**, p. 1A, Nov. 12, 1988, Hinman, **THE ORLANDO SENTINEL**, p. C-1 & C-6, Nov. 12, 1988.]

November 12: ATLANTIS CREW AT KSC

The STS-27 crew of Atlantis arrived at Kennedy Space Center today to take part in training and a countdown test. Commander Robert Gibson told reporters that, "It's going to be a busy couple days." When asked about the launch date for the mission Gibson replied, "We're still marching toward the 28th, but there's a possibility of a couple days the other side of that." Gibson and Pilot Guy Gardner have scheduled practice landing approaches on the Shuttle landing facility in jets equipped to handle like a Shuttle. ["Atlantis Crew Comes to Cape for Training," **THE ORLANDO SENTINEL**, p. A-15, Nov. 13, 1988/]

November 13: ATLANTIS CREW TESTS PROCEDURES

The five astronauts who make up Atlantis's crew for the expected Nov. 28 launch took part in a two-day countdown simulation at Kennedy Space Center this week-end. On board the Shuttle the crew will test communications and run through checklists and other launch-day procedures. The crew arrived Nov. 12 from Johnson Space Center for three days of training for the secret Department of Defense mission. The crew is made up of Commander Robert Gibson, Pilot Guy Gardner and Mission Specialists Mike Mullane, Jerry Ross and William Shepherd. "I wish it was launch day," said Commander Gibson. "I hope we can save some of this weather for the next couple of weeks." The astronauts attended briefings and took part in limited tests of the

crew escape system at the launch pad. ["Shuttle Crew Gets Ready for Dry Run," **THE ORLANDO SENTINEL**, p. A-3, Nov. 14, 1988, Klotz, **FLORIDA TODAY**, p. 4A, Nov. 14, 1988.]

<> BREVARD HOSTS AEROSPACE WORKERS

NASA is bringing 250 outstanding aeroSpace workers to Brevard County as part of its Manned Flight Awareness Honoree program, according to Ray Corey, NASA's Director of Education and Awareness at Kennedy Space Center. "These are individuals who have done outstanding work during the period in which the judging occurred. They are all aeroSpace worker, either civil service or contractor. It's honoring these folks for having done exceptional work in whatever their expertise is for preparing manned-flight launches," Corey said. The workers will tour KSC and be welcomed by county chamber of commerce officials who will give them a cocktail party Nov. 15 in Cocoa Beach; the next day they will meet with some astronauts before they leave Nov. 17 or 18. [Jones, **FLORIDA TODAY**, p. 2B, Nov. 14, 1988.]

November 14: ATLANTIS CREW FINISHES TESTS

Normally open broadcast channels were blacked out and commentary by public affairs officials was strictly limited as the crew of Atlantis finished its final tests before launch day at the end of the month. After the tests were concluded, Public Affairs spokesman Hugh Harris said the exercise "really went well" and said that the only troubles were with communication circuits linking the crew with the Launch Control Center. The all-military crew returned to Johnson Space Center later in the day. [Glisch, **THE ORLANDO SENTINEL**, p. A-3, Nov. 15, 1988, "Countdown Test for Shuttle Called Successful," **THE NEW YORK TIMES** (National Edition), p. 16, Nov. 15, 1988.]

November 15: FLIGHT READINESS REVIEW BEGINS

The flight readiness review for the STS-27 mission begins today at Kennedy Space Center; following the review, a firm launch date for the mission will be announced. Atlantis's Launch Processing Director Conrad Nagel said that the Orbiter will have to be launched by Dec. 15 if it is to put the Magellan probe into orbit and on its way to Venus next April. If the launch date slips further, the Shuttle manifest would have to be changed for Discovery to launch Magellan. [Banke, **FLORIDA TODAY**, p. 8A, Nov. 15, 1988.]

<> NASA TO AWARD LOCAL COMPUTER CONTRACT

NASA will award a major computer contract July 1 that could bring hundreds of new jobs to Brevard County. The project, which will be based at Kennedy Space Center, involves the review of components to be installed in the Space station and an upgrade of key equipment that monitors systems on Shuttles prior to launch, said KSC Contracting Officer Linda Pickett. Competing for the lucrative contract are Harris Corp., Lockheed Space Operations Co. and Martin Marietta Communication and Information Systems. [Brown, **FLORIDA TODAY**, p. 8A, Nov. 15, 1988.]

November 16: ATLANTIS TO GO DEC. 1

NASA today announced Dec. 1 as the official launch day for Atlantis. After a lengthy review at Kennedy Space Center, Rear Admiral Richard Truly, NASA Associate Administrator for Space flight, issued a statement: "I've just finished hearing a comprehensive assessment of flight readiness from both government and contractor representatives of all Shuttle elements and systems. I am pleased to report that the Space Shuttle Atlantis is as ready to fly as Discovery was at this same point before its STS 26 mission last September." [Mittman, **FLORIDA TODAY**, p. 1A, Nov. 17, 1988, Glisch, **THE ORLANDO SENTINEL**, p. A-8, Nov. 17, 1988.]

November 17: E'PRIME FIRST COMMERCIAL LAUNCHER

E'Prime AeroSpace Corp. today became the first company to launch a commercial payload from U. S. government facilities at 7:45 a.m. when it sent its LOFT-1 rocket off from Cape Canaveral Air Force Station to an altitude of 14,000 feet. The two-minute mission was not without problems: the rocket's main parachute failed to open and two of its experiments failed. "The next launch will be all successful. You have to have failures to turn into successes," said E'Prime President Bob Davis. [Halvorson and Banke, **FLORIDA TODAY**, pp. 1A-2A, Nov. 18, 1988, and see articles: Halvorson, **FLORIDA TODAY**, p.1A, Nov. 17, 1988, and Klotz, **FLORIDA TODAY**, p. 4A, Nov. 17, 1988.]

November 18: FUEL LEAK TESTS CONTINUE

Atlantis will continue to undergo testing this weekend by launch pad crews, including checks for fuel leaks in the steering equipment. Kennedy Space Center spokesman Dick Young said that launch preparations continue on schedule for a Dec. 1 liftoff. Because STS-27 is to be a Department of Defense mission, the exact time of the launch will not be announced. [Mittman, **FLORIDA TODAY**, p. 4A, Nov. 19, 1988.]

<> REAGAN SIGNS NASA BUDGET

President Reagan today signed legislation authorizing $11.2 billion for NASA and recreating the National Space Council which had been dissolved after the Nixon presidency. The legislation includes $900 million for the Space Station. ["Reagan Signs $11.2 Billion NASA Budget," **FLORIDA TODAY**, p.4A, Nov. 19, 1988.]

<> CIVIL SERVICE, CONTRACTOR AWARDS

Kennedy Space Center officials honored 60 civil service and contractor employees this week during a special two-day NASA Manned Space Flight Awareness Program in Cocoa Beach, FL. "These individuals were selected for their professional dedication and outstanding achievement in support of the Manned Space Flight Program," said Raymond Corey, KSC's Chief of Education and Awareness. Civil service employees honored were: Lois Cox, Polly Gardiner, Josh Travis, Phil Hooper, Ralph Beeson, Dennis Matthews, Mary Brewer, Barbara Duffy, Pamela Bookman, Martha Teague, Richard Hartung, Sarah Archibald and Air Force Major Victor Segall.

Contractor employees honored were Arthur Taylor, Boeing AeroSpace Operations; E. Ann Kreuzinger and J. Lamar Davis, Computer Sciences Corporation; Duane MacEntee, George McConn, Stephen McGovern, Robert Ullius, W. H. McDaniel, T. Louise Gerlach, EG&G Florida, Inc.; David Reed, Honeywell Federal Systems; H. W. "Wes" Woodside Jr., IBM Corporation; Joseph Thomas and Ronald Feidhauser, BAMSI, Inc.; Roy Burton, Grumman Technical Services; and Ronald Jones, Rocketdyne; Mary Baxter, Patricia Daniels, Rodney Davis, Ronald Fussell, David Gardner and Warren Wenner II, McDonnell Douglas Astronautics Co.; Stephen Holmes and Karen Moarie, Rockwell International Corp.; Gordon Morton, Wiltech Corp.; Jay Bonadio, Joan Bray, Kathy Carleton, Tim Hales and Roland LeBon, USBI; Gary Hill, Eagle-Pitcher Industries; Clark Hurd, Morton-Thiokol, Inc.; Thomas Landers, Martin Marietta Manned Space Systems; Kellee Ash, Charles Bass, Michael Ettleman, Rick Flanagan, Mark Gaedcke, Ralph Gregory, John Janokaitis, Jackie Johnson, Patricia Leslie, Robert Neal, Lee Potter, Pete Scobby, J. Allyn Smith and Henry "Tom" Studstill, Lockheed Space Operations Co., and Wayne Kidd, senior manufacturing engineer with Harris Corporation's Government Systems Sector. [Mittman, **FLORIDA TODAY**, p. 2B, Nov. 19, 1988.]

November 20: LAUNCH PREPARATIONS SMOOTH

No technical problems complicated the preparations for the upcoming launch of Atlantis. "Everything is going routine," said KSC spokesman Karl Kristofferson. Two tests were completed over the weekend: a check of the Shuttle's navigational equipment and a leak check in the orbital maneuvering system. Also during the weekend, the Shuttle's internal tanks were filled with liquid hydrogen and liquid oxygen to provide electrical power for Atlantis and the auxiliary power units were serviced. [Liden, **FLORIDA TODAY**, p. 8A, Nov. 21, 1988.]

November 21: ATLANTIS PREP WORK CONTINUES

While Kennedy Space Center officials keep a weather eye on Tropical Storm Keith, preparations for the launch of Atlantis continue. "We are keeping up with it at this time," according to Center spokeswoman Lisa Malone. "It is really too early to tell what the storm will do. We are not making any preparations to bolt anything down, but we do have contingency plans to secure everything at the pad that might blow around." Meanwhile work continued: the orbital maneuvering and reaction control systems' tanks were pressurized to bring them to flight pressure; the fuel cell storage tanks will be purged Nov. 22 in preparation for loading liquid hydrogen and liquid oxygen. [Mittman, **FLORIDA TODAY**, p. 4A, Nov. 22, 1988.]

November 22: KSC WATCHES KEITH

Tropical Storm Keith continues to merit attention from Kennedy Space Center officials as the storm heads across Florida bringing heavy rains and winds. KSC spokesman Karl Kristofferson said, "We do not expect winds at more than 30 knots (35 mph). We are under no alert at this point and there are no plans to roll the vehicle back. We will keep looking at the storm's path, but right now it appears to be more of a rain threat rather than a wind threat." [Mittman, **FLORIDA TODAY**, p. 2A, Nov. 23, 1988.]

November 23: ATLANTIS DRENCHED BY STORM

Part of Atlantis was drenched by tropical storm Keith and workers spent part of the day drying it off. Nearly six inches of rain and winds up to 54 mph hit the Space center during the storm. To dry the Shuttle, launch pad workers blew air into Atlantis's rear compartment, which houses the engines, steering systems and fuel tanks. "Most of the water drained out and nothing was affected," said Lisa Malone, KSC spokeswoman. Power to the Shuttle was turned off while 16,000 KSC employees observed the Thanksgiving Day holiday. [Banke and Mittman, **FLORIDA TODAY**, p. 4A, Nov. 24, 1988.]

<> F.I.T. BOARD ELECTS MCCARTNEY MEMBER

The board of trustees of the Florida Institute of Technology has elected Kennedy Space Center Director Forrest McCartney to its 22-member governing body for a three-year term. F.I.T. President Lynn Weaver said, "I am very pleased with Gen. McCartney's election to the board of trustees. He has been at the forefront in the development of technology in the Space industry. His unique background makes him ideally suited to work with the board to strengthen the institution." [Mittman, **FLORIDA TODAY**, p. 4B, Nov. 24, 1988.]

<> SATELLITE PROCESSOR AT PORT

Eastern American Teak Corp. has received permission from the Canaveral Port Authority to lease 18.7 acres for a satellite processing facility. "This is an investment deserving of being in Brevard," said Gene Smith, President of Eastern American Teak. "If we are going to stay up front (in Space), we are going to have to compete on a world basis." The company plans to employ 80 persons at first and as many as 600 when launches are being prepared for. The Florida Department of Environmental Regulation must still approve the project. [Harris, **FLORIDA TODAY**, p. 4B, Nov. 24, 1988.]

November 25: FUEL ISOLATION VALVE REPLACED

Kennedy Space Center launch preparation workers tested Atlantis's auxiliary power units and found that a fuel isolation valve did not work properly; it was replaced. Small ordnance devices are to be installed today. Two external tank filling tests that were done before Challenger's launch will not be repeated before Atlantis lifts off. "There is no program requirement or concern with the fact that we are not doing a test for Atlantis," said Conrad Nagel, Shuttle Processing Director. "That's not to say we can't have problems....But I believe that our procedures are in better shape as a result of Discovery, and that our hardware is in better shape on the ground side. I really think we have a good shot at getting off Thursday (Dec. 1)." [Banke, **FLORIDA TODAY**, p. 1A, Nov. 26, 1988.]

November 26: WORK ON SCHEDULE DESPITE WINDS

Despite winds approaching 29 mph at times today, workers continued t' prepare Atlantis for the beginning of the countdown Nov. 28. "The winds are more of a nuisance factor than anything else," said Kennedy Space

Center spokesman Karl Kristofferson. The winds delay the lifting of the crew escape pole 147 feet from the pad to the Orbiter's escape hatch. Workers did connect ordnance devices used to separate components of the Shuttle from each other and work was completed on the rear engine compartment, though inspections remain to be done. [Banke, **FLORIDA TODAY**, p. 1A, Nov. 27, 1988.]

November 28: ATLANTIS CREW ARRIVAL

The five astronauts who make up the crew of Atlantis arrived at Kennedy Space Center at 3:00 p.m. aboard their T-37 jets. Commander Robert "Hoot" Gibson told reporters on arrival that "We're looking forward very eagerly to getting back into Space again. We believe that we're ready to go. The crew is excited about the mission and we're anxious to be under way." The crew will be in isolation for the next two days to avoid exposure to any viruses or illnesses. Mission Specialist Richard Mullane wore a surgical mask while talking to members of his family. The crew also includes Pilot Guy Gardner and Mission Specialists Jerry Ross and William Shepherd.

Air Force forecasters were predicting northerly winds gusting to about 28 mph at launch time; launch temperatures should be in the low 50's with a chance of showers. "Because of winds, there's a 70 percent chance the launch criteria will be broken," according to Capt. Ken Warren, Air Force spokesman. "Right now, it's not looking too good." [Halvorson and Banke, **FLORIDA TODAY**, p. 1A, Nov. 29, 1988, Glisch, **THE ORLANDO SENTINEL**, p. A-3, Nov. 29, 1988.]

<> FEWER JOURNALISTS FOR ATLANTIS

Fewer than 1,100 journalists are expected to attend the launch of Atlantis; all of these will be able to view the launch from the press dome. "Right now, we have no plans to set up an alternative press site," said spokeswoman Lisa Malone. For the Discovery launch Kennedy Space Center hosted 2,400 journalists, photographers and media support personnel. None of the four major networks is expected to send a news anchor; all but NBC will send correspondents. [Halvorson and Banke, **FLORIDA TODAY**, p. 4B, Nov. 29, 1988, and Klotz, **FLORIDA TODAY**, p. 4B, Nov. 29, 1988.]

<> TDRS ARRIVES AT KSC

A Tracking and Data Relay Satellite (TDRS) arrived today at 9:00 a.m. at Kennedy Space Center's Shuttle Landing Facility. The $100 million satellite is the third member of a trio of orbiting communication satellites and is scheduled to be deployed from Discovery during its Feb. 18 mission. The satellite, manufactured by TRW Space & Defense in Redondo Beach, CA, arrived aboard a military aircraft. ["Tracking Satellite Expected at KSC," **FLORIDA TODAY**, p. 4B, Nov. 30, 1988, "Satellite Arrives at KSC," **FLORIDA TODAY**, p. 2A, Dec. 1, 1988.]

<> 1989 FLIGHT SCHEDULE

The following is a list of 1989 missions featuring Orbiter and type of mission:

Feb. 18: Discovery, deploy NASA communications satellite April
28: Atlantis, launch Magellan probe to Venus July 1:
Columbia, Department of Defense Aug. 10:
Discovery, Department of Defense Oct. 12:
Atlantis, launch Galileo probe to Jupiter Nov. 13:
Columbia, deploy Hughes satellite Dec. 11:
Discovery, deploy Hubble Space Telescope

December 1: COUNTDOWN TO LAUNCH CONTINUES

Despite high winds and rain, the countdown for launch of Atlantis continued today at Kennedy Space Center. Meteorologists at the Space center had little encouraging to say about weather prospects for launch day. Capt. Tom Strange, Air Force meteorologist at the Space center, offered, "The best I can say is, it's kind of a wait-and-see situation." NASA managers meeting at KSC decided to continue the countdown and hope for a break in the weather. Aside from weather concerns, the only worry was a couple of broken bolts on a panel on the nose of Atlantis. The panel covers an area where workers can get to the forward steering rockets for maintenance. When the device was being installed, two of the bolts were loose and could not be tightened. On Nov. 30, technicians glued the malfunctioning bolts and managers said the problem was not serious. [Wilford, **THE NEW YORK TIMES** (National Edition), p. 13, Nov. 13, 1988, Wilford, **THE NEW YORK TIMES** (National Edition), p. 10, Dec. 1, 1988, Glisch, **THE ORLANDO SENTINEL**, pp. A-1 & A-12, Dec. 1, 1988, Halvorson and Mittman, **FLORIDA TODAY**, p. 1A, Dec. 1, 1988.]

<> GOVERNORS ARRIVE FOR LAUNCH

Seven state governors are expected to attend the launch of Atlantis tomorrow. They are: Gov. Gerald Baliles (VA); Gov. William Donald Schaefer (MD); Gov. Richard Celeste (OH); Gov. Edward DePrete (RI); Gov. Carroll Campbell (SC); Gov. John McKernan, Jr. (M) and Gov. Robert Orr (IN). Also expected to attend are Sen. John Rockefeller (WV), Air Force Secretary Edward "Pete"Aldridge and astronaut Jon McBride. ["7 Governors Arrive for Launch," **FLORIDA TODAY**, p. 2A, Dec. 1, 1988.]

December 2: ATLANTIS LAUNCHED

The Space Shuttle Atlantis launched this morning at 9:30:34 a.m., with only 90 seconds left in the launch window; the liftoff was delayed for three hours by high winds. "This sets the stage for a very ambitious flight list we have coming up," said Kennedy Space Center spokesman Dick Young. "It is another major step toward a big year in science." NASA Administrator James Fletcher said, "You gave us some heart failure there toward the end, but we got it off. My thanks for another great job." Speaking from the launch control center, Air Force Secretary Edward "Pete" Aldridge said, "Let me tell you that you have made a great contribution to the nation's national security. The payload was extremely important and you did a great job all around." Four hours into flight, NASA spokesman Brian Welch made a brief announcement: "The Atlantis crew members are doing well and all systems of the Orbiter are performing satisfactorily."

The launch was delayed by wind shear. Shortly after 9:00 a.m., NASA cleared Atlantis for launch without resorting to any waivers in the agency's strict weather policy which had been developed after the Challenger tragedy. There was another brief hold at 31 seconds, due to concern about weather conditions at the emergency runway in Spain. Astronaut John Casper flew a NASA jet at the landing site in Zaragoza,

Spain. He reported that a low bank of clouds exceeding NASA's restrictions was clearing out and would be gone in time for Atlantis to make an emergency landing at the site, according to Air Force spokesman Lt. Col. Ron Rand. Two other emergency landing sites overseas were unusable due to bad weather. Launch commentator Hugh Harris, who was in the launch control center, said that Casper relayed his decision on the weather to Deputy Shuttle Operations Director Robert Crippen, the final authority on whether to launch. "Crippen just reported that the conditions were acceptable and he told [Launch Director] Bob Sieck to proceed with the launch," said Harris. "Pilot reports are considered to be some of the best information we get." Officials also relied on frequent weather readings from balloons to determine launch conditions.

"With the favorable data we got the decision was pretty obvious," said J. R. Thompson, Director of Marshall Space Flight Center. "We waited until we got inside our limits and decided to go. We went right down to the end of our [launch] window. It became obvious we were looking good on the weather." The countdown was resumed and the liftoff was safely achieved. Atlantis could be seen clearly for the first four minutes of its eight minute ascent and booster separation at two minutes eight seconds into flight was also easily observed. NASA spokesman Jerry Berg said the boosters came down about eight miles from recovery ships - right on target. No obvious damage was noted by divers who entered the rough seas with winds of 23 to 35 mph. The only difficulty NASA managers noted was the malfunction of a sensor on one of the main engines, a backup sensor was quickly utilized, however. [Halvorson, Mittman and Banke, **FLORIDA TODAY**, pp. 1A-2A, Dec. 3, 1988, Glisch, **THE ORLANDO SENTINEL**, p. A-1 & A-23, Dec. 3, 1988, Lafferty, **THE ORLANDO SENTINEL**, p. A-23, Dec. 3, 1988, Wilford, **THE NEW YORK TIMES** (National Edition), pp. 1 & 10, Dec. 3, 1988.]

<> SMALLER LAUNCH CROWD FOR ATLANTIS

Approximately 125,000 people came to Brevard County to view the Atlantis launch, according to Joan Heller, spokeswoman for the Brevard County Sheriff's Department. The crowd, then, was about half the number of those who came to see Discovery's launch and the renewal of the Shuttle Program. [Bumpus-Hooper, **THE ORLANDO SENTINEL**, p. A-24, Dec. 3, 1988.]

December 3: JOHN E. PRYOR, 70, DIES

John E. Pryor, 70, a NASA manager and retired Air Force colonel, died today at his home in Indian Harbour Beach, FL. Survivors included Pryor's wife, Marjorie; sons, John Pryor [Washington, D. C.] and Michael Pryor [Cocoa Beach, FL]; daughters, Janice Bougher and Laura Jean Pryor [Cocoa Beach] and Karen Rose [Jacksonville, TX]; sister, Kathleen Sullivan [Winchester, MA]; and five grandchildren. Services were scheduled to be held Dec. 6 at Beckman-Williamson Funeral Home [Cocoa Beach.] ["Obituaries: John Pryor," **FLORIDA TODAY**, p. 3B, Dec. 5, 1988.]

<> BUZZING COSTS FHP TROOPERS

Two Florida Highway Patrol troopers who flew an agency plane into restricted airspace for a closer look at Discovery on Sept. 29 will be

suspended up to two days. Major Winthrop Vincent and Sgt. Gary Schluter, the pilot, were headed to Orlando on official business on the morning of the liftoff. They entered restricted airSpace before the launch but left before liftoff. No charges have been filed. Vincent will be suspended without pay for two days and Schluter will be suspended for one day. ["Buzzing Costs FHP Troopers," **THE ORLANDO SENTINEL**, p. A-11, Dec. 4, 1988.]

<> BOOSTERS TOWED TO SHORE

The solid rocket boosters which propelled Atlantis and its crew into Space were towed into Port Canaveral today between 5 and 5:30 p.m. by the recovery ships Liberty Star and Freedom Star. The two ships located and retrieved the boosters 160 miles off shore in rough seas.
Also at Kennedy Space Center, workers washed down LC 39B and prepared to roll Atlantis's mobile launch platform back to the Vehicle Assembly Building. [Halvorson, **FLORIDA TODAY**, p. 1A, Dec. 4, 1988.]

December 4: IUS CHANGEOUT

Replacing the damaged rocket booster for a Tracking and Data Relay Satellite may delay Discovery's scheduled Feb. 18 flight by a few days according to Kennedy Space Center spokesman George Diller. During processing at Cape Canaveral Air Force Station, the nozzle of the inertial upper stage was damaged when a worker accidentally bumped into the $42 million part causing a 4-inch crack. An Air Force official said that a Boeing Aerospace technician "slipped, and as his feet went out from under him, he kicked the thing accidentally." Sid Saucier, Manager of the Space Systems Project Office at Marshall Space Flight Center said, "The nozzle is definitely going to be scrapped. It's gone." A replacement part is on hand at the Air Force Station. Diller said, "We are putting together a recovery plan that, at least on paper, will preserve the launch date." The mishap will be investigated by the Air Force. [Halvorson, **FLORIDA TODAY**, p. 1A, Dec. 4, 1988, "Discovery delay only few days," **FLORIDA TODAY**, p. 2A, Dec. 5, 1988.]

December 5: ATLANTIS TO LAND TODAY

The Air Force announced that the Shuttle will land at Edwards Air Force Base, CA, tomorrow at 6:36 p.m. EST; the five member crew will have completed five days in orbit. "All systems on board the Atlantis continue to perform satisfactorily," according to a NASA statement. The crew was said to be "doing well and beginning landing preparations." By an arrangement announced before the mission, the landing time was not divulged till 24 hours before the end of the mission. The only previous statement about the flight was issued four hours after launch, when NASA said that the Atlantis was in good condition and the crew had been cleared for "orbital operations." [Wilford, **THE NEW YORK TIMES** (National Edition), p. 11, Dec. 6, 1988.]

December 6: TIRE BEARS WATCHING

NASA officials plan to pay special attention tomorrow to a tire under the main landing gear of Atlantis; a week ago, a slow leak of 1.7 pounds per square inch per day had been discovered in the tire prior to

liftoff. "There is always a small amount of leakage in the tire and wheel assembly, whether it is on a car or on any kind of aircraft," said

Beverly Pierce, public relations manager for the tire's manufacturer, B. F. Goodrich Co. (Akron, OH). [Mittman, **FLORIDA TODAY**, p. 2A, Dec. 6, 1988.]

<> NEW SECURITY PATROL HEADQUARTERS

Kennedy Space Center Director Forrest McCartney spoke today at the dedication of the new security headquarters building at the Space center. It will serve as the hub for security operations and house 60 full-time personnel. The facility is 10,900 square feet and is located on a 3.7-acre tract of land at the northeast corner of Contractor and Schwartz roads. The $867,000 building will contain administrative work areas, a communications room, dog kennels, a holding cell, a weapons loading area, a weapons storage area and a meeting room. ["Center to be First Permanent Security Headquarters," **FLORIDA TODAY**, p. 2A, Dec. 7, 1988.]

<> DISCOVERY LAUNCH: FEB. 18, 1989

Damage to Discovery's next payload - the upper-stage rocket of a Tracking and Data Relay Satellite identical to the one launched by Discovery on Sept. 29 - may prevent the Feb. 18 launch of the Shuttle. Processing for Discovery is well in hand, according to John "Tip" Talone, who is in charge of processing for the Orbiter. He said that Discovery could be moved from the Orbiter Processing Facility to the Vehicle Assembly Building as early as Jan. 14. "That looks feasible without having to work anybody over Christmas," he said.

Two pieces of equipment that failed to work properly during Discovery's STS 26 mission have been replaced: the flash evaporator system which cools the Orbiter during launch and landing and the communications antenna that nearly stuck in a deployed position. The thermal protection system's tiles will continue to be closely monitored. "Tiles were within the parameters of what we predicted for a normal turn around," Talone said. [**FLORIDA TODAY**, p. 2A, Dec. 7, 1988.]

<> ATLANTIS LANDS AT EDWARDS AFB

Commander Robert "Hoot" Gibson piloted Atlantis to a perfect landing on the California desert at Edwards Air Force Base today at 6:36 p.m. EST. NASA Administrator James Fletcher, who greeted the returning astronauts said, "It was a great flight, a super flight. It shows we can serve our Department of Defense customers as we have in the past." NASA's Associate Administrator for Spaceflight, Admiral Richard Truly said, "Like all the Shuttle landings I've seen, this one was just beautiful. I'm delighted that barely two months after [Discovery] we've landed the second mission of the new era of the Shuttle Program." [Glisch, **THE ORLANDO SENTINEL**, pp. A-1 & A-10, Dec. 7, 1988, Banke, **FLORIDA TODAY**, pp. 1A-2A, Dec. 7, 1988.]

December 7: MAGELLAN ON DISPLAY

The Magellan Spacecraft was publicly displayed for the first time in one of Kennedy Space Center's "clean rooms." It is scheduled to be launched aboard Atlantis April 28. If the launch schedule slips, the Magellan could be moved to the mission scheduled for October 12, 1989. The Magellan Spacecraft's mission is to reach Venus in August 1990,

orbit the planet eight times a day for 243 days and send information back to ground stations in either Australia, Spain or California. The signals will take from three to fifteen minutes to reach Earth from Venus, a distance of some 56 million miles. JPL scientist Stephen Saunders said that Magellan would send back 100,000 times more information than did Mariner 2. "It will literally take us decades to analyze all the data," he said. [Mittman, **FLORIDA TODAY**, p. 4A, Dec. 8, 1988.]

<> ATLANTIS TILE DAMAGE EXTENSIVE

Atlantis had up to 175 thermal tiles damaged on its STS-27 mission; the damage apparently occurred during liftoff when something loose struck the Orbiter, according to Shuttle Processing Director Conrad Nagel. "The damage comparatively is significant, but it's not a major concern," Nagel said today. "We have to understand why we had this damage and keep it from happening again. He said the heaviest damage was confined to a strip three to four feet in length "down the right hand side, along the line of the fuselage." He said that a single tile in the nose was missing and "it looked like it was popped off by the impact of something." Nagel said that the Atlantis had suffered about twice the damage that Discovery received two months ago. "It appears that between 125 and 175 tiles will have to be scrapped and replaced." In addition scores of tiles with scratches and "dings" will have to be repaired in place.

A solid rocket booster expert said today that strips of cork covering instrumentation on Atlantis's SRB's may have come loose during liftoff and damaged the tiles. The damage was inspected in Space by the Shuttle crew using a television camera on the end of the Orbiter's robot arm. Launch film shows debris falling away from the Shuttle some two minutes and ten seconds into flight, just after the SRB's were jettisoned. Cork also came loose on Discovery's mission under similar circumstances. An investigation team will be in place by the time Atlantis returns from California next week.

The landing recovery team was slowed by high winds at Edwards Air Force Base and is now some eight hours behind schedule, according to Kennedy Space Center spokesman Karl Kristofferson. ["Tiles of Space Shuttle's Heat Shield Endure Heavy Battering," **THE NEW YORK TIMES** (National Edition), p. 11, Dec. 9, 1988, Glisch, **THE ORLANDO SENTINEL**, p. A-3, Dec. 8, 1988, **FLORIDA TODAY**, pp. 1A - 2A, Dec. 8, 1988.]

December 9: TILE DAMAGE INVESTIGATION

NASA is still searching for people to serve on a team investigating the tile damage suffered by Atlantis on the STS-27 mission. The Tile Damage Assessment Team will review film of the Dec. 2 launch; the film shows debris - possibly ice, a strut, or cork insulation from SRB's - moving away from the Shuttle just after the solid rocket boosters separated from the Shuttle and external tank. [Halvorson, **FLORIDA TODAY**, p. 4A, Dec. 10, 1988.]

<> O-RING STOPS DISCOVERY LEAK

The nozzle on one of Discovery's twin solid rocket boosters developed a gas leak during the Orbiter's Sept. 29 launch, but O-ring seals

stopped the leak from escaping the booster's casing and endangering the mission. NASA spokesman Jerry Berg said, "We had a gas intrusion (between the panels), but it did not penetrate the primary O-ring and the O-ring was not damaged or charred." Royce Mitchell, Manager of the Shuttle Solid Rocket Booster Program at the Marshall Space Flight Center, said that such a phenomenon had been seen in rocket firing tests on the ground and was determined to be a "nonproblem." NASA said that the nozzle seals "operated as intended." "There was no burn-through or near burn-through of insulation in any joints." The agency also said that there was no "damage or charring of O-rings."[Halvorson, **FLORIDA TODAY**, p. 4A, Dec. 10, 1988; Wilford, **THE NEW YORK TIMES** (National Edition), p. 10, Dec. 10, 1988.]

December 12: WEATHER DELAYS ATLANTIS RETURN

Atlantis's return to Kennedy Space Center was halted by a front of cloudy, windy weather which could also prevent a return on the 13th. The Orbiter stopped overnight at Kelly Air Force Base in San Antonio where it will remain till the weather clears. Meanwhile the Tile Damage Assessment Team has been assembled and will be headed by John Thomas, Marshall Space Flight Center engineer; Thomas also headed the team which oversaw the redesign of the solid rocket booster following the Challenger accident.

Technicians at Kennedy Space Center have disassembled the two SRB's which had flown with Atlantis and found no indication so far of any malfunction. All six main joints of the boosters have been viewed. The boosters' nozzle joints, more complicated than the other joints, will be examined today and tomorrow. [Fisher, **THE ORLANDO SENTINEL**, p. A-6, Dec. 13, 1988; Mittman, **FLORIDA TODAY**, p. 4A, Dec. 13, 1988.]

December 13: ATLANTIS RETURNS HOME

Atlantis, bolted atop its 747 carrier plane, made a flawless landing on Kennedy Space Center's Shuttle Landing Facility at 2:25 p.m. NASA officials confirmed that more tile was damaged on Atlantis than on any other successful flight since the Shuttle Program began in 1981. John Thomas, Special Assistant to the Marshall Space Flight Center Director, said that more than 700 heat-resistant tiles were damaged and one was lost during liftoff. NASA spokeswoman Lisa Malone said that the tile damage was the worst in the program's history. Orbiters typically return from missions with 200 to 300 tiles damaged. The previous worst case was 500 tiles damaged on an earlier flight, according to Thomas.

NASA also announced the formation of an 8-member Tile Damage Assessment team to learn what caused the Thermal Protection System problem. NASA Safety Chief George Rodney said the damage was "serious because it is a little bit outside our data base. We want to have a good explanation for it before we fly the next time; we want to try and understand it as early as possible." [Lafferty, **THE ORLANDO SENTINEL**, p. A-3, Dec. 14, 1988; Mittman, **FLORIDA TODAY**, p. 1A, Dec. 14, 1988.]

December 14: TILE REPLACEMENT

At least 155 of 298 damaged tiles on Atlantis must be replaced according to Frank Jones, Thermal Protection System Engineer at Kennedy Space

Center. That number may increase if workers find loose tiles or other damage during the post-flight inspection currently going on, said Jones. "We do not think this flight is nearly as bad, although it is one of the worst," said Jones, who has worked every Shuttle mission.

Meanwhile, the theory that cork from the solid rocket boosters might have caused some of the damage has been discounted because the cork in question was located behind the damaged area, according to Rocky Raab, spokesman for Morton Thiokol, the booster manufacturer. "We have almost been completely cleared of causing any damage. However, the jury is still our," Raab said. Jones said, "We will put a concentrated effort on the damaged side."

Conrad Nagel, Processing Director for Atlantis, said today that the flight path that the Orbiter took into orbit might have contributed to the damage sustained by the thermal protection system. The stress put on Atlantis by its northeastward flight path might have loosened parts of the Shuttle, creating debris which hit the tiles. Technicians currently working on Columbia may have to be recruited to work on Atlantis's tile repair in order for the Orbiter to meet its April 28 launch date. "It's going to hurt (Columbia), but the next bird to fly is going to have priority. That's the way it has always been, and will continue to be," Nagel said. [Mittman, **FLORIDA TODAY**, p. 1A, Dec. 15, 1988, Banke, **FLORIDA TODAY**, p. 1A, Dec. 16, 1988.]

December 21: CRACK IN TURBOPUMP FOUND

A crack was found Dec. 18 in a main engine turbopump - on a bearing part - during routine inspections at Kennedy Space Center, according to Launch Processing Director Conrad Nagel. He said that officials had already planned to replace the pumps in any case and that they would be shipped to the manufacturer, Rockwell International Corporation's Rocketdyne division in California, to determine the cause of the crack. Nagel also said that it was too early to tell whether the crack would affect future launchings. ["Crack in Fuel Pump Found in Space Shuttle," **THE NEW YORK TIMES** (National Edition), Dec. 22, 1988, Davis, **THE WALL STREET JOURNAL**, Dec. 21, 1988.]

December 22: WATCH THOSE BOOSTERS!

The National Research Council has advised NASA to keep a wary eye on the manufacturing and development of the solid rocket boosters it uses to help launch the Space Shuttles. The head of the Council, Guyford Stever, said "success breeds confidence and confidence breeds complacency. They have to watch for that. But the people we've talked with at NASA say there isn't going to be any overconfidence on their watch." The panel recommended that NASA strengthen some booster joints, expand test data and confirm boosters' reusability by testing ones already flown. NASA Systems Engineering Chief David Winterhalter said, "I think we've got most of them covered to some extent. We're looking at what we have in our program that will satisfy their suggestions." [Hoversten, **USA TODAY**, Dec. 23, 1988.]

December 23: FHP PILOT CAN APPEAL FLYOVER

The Florida Highway Patrol pilot who flew illegally over Kennedy Space Center Sept. 29 has till Dec. 27 to appeal a 30-day suspension of his

license. The FHP pilot was one of two who overflew KSC airSpace on the day Discovery was launched. The second pilot circled over the Vehicle Assembly Building and a launch pad a few hours before liftoff. His plane was intercepted by a NASA helicopter and escorted out of the area. [Halvorson, **FLORIDA TODAY**, p. 5A, Dec. 24, 1988.]

<> HOLIDAYS SLOW SHUTTLE PREPARATIONS

Kennedy Space Center slowed its Shuttle preparation pace to allow its workers to head home for the Christmas and New Year's holidays. Discovery and Atlantis have been powered down, according to KSC spokesman George Diller, and only a skeleton crew will remain to continue tile work on Atlantis. The investigative report on tile damage to Atlantis from its STS-27 mission is not yet completed. Next week the Tracking and Data Relay Satellite's Inertial Upper Stage booster will be delivered to KSC from Cape Canaveral Air Force Station. Atlantis's No. 3 main engine will be removed so its turbopump can be returned to its California manufacturer. [Halvorson, **FLORIDA TODAY**, p. 5A, Dec. 24, 1988.]

December 27: NEW SHUTTLE IN CAPE CANAVERAL, FL

The newest Shuttle in Brevard County is not found at Kennedy Space Center. Cape Canaveral Volunteer firefighters spent two weeks constructing a 20-foot-long by 12-foot-wide model of the Space Shuttle that they've named "Volunteer." The new Shuttle was erected on the lawn of Cape Canaveral City Hall. Firefighter Glenn Neeb said, "We donated it as a friendly present to the city to keep our relationship open. We appreciate what they've done for us. We wanted to say thank you and Merry Christmas." Cape Canaveral's City Manager Leo Nicholas said of the Volunteer, "It's another example of good will and cooperation between the volunteer fire department and the city." [" 'Volunteer' Makes Perfect Landing at Cape," **FLORIDA TODAY**, Dec. 28, 1988.]

<> "THE BOY FROM MARS"

Spaceport USA will boast a new film at the attraction beginning next fall. The twenty minute movie, "The Boy From Mars," will tell the story of a youngster who was born and raised on Mars - the first child to be born other than on Earth - and his adventure as he visits Earth for the first time. Spaceport USA awarded Zacks and Perrier Inc. (New York City, NY) a $1 million contract to produce the film for its Galaxy Theater. There will be no charge for admission. [Banke, **FLORIDA TODAY**, Dec. 28, 1988.]

<> SHUTTLE DAMAGE ANALYSIS

NASA said today that debris found embedded in Atlantis's tiles appeared to have come from insulation on the external fuel tank and the right solid-fuel rocket booster. Spokesman Ed Medal cautioned that investigators had reached no final conclusions. The investigation was expected to be completed by mid-January 1989 and agency officials are not sure if their findings will affect the launch of Discovery planned now for February 18, 1989. ["Shuttle Damage Analysis Points to Insulation," **THE ORLANDO SENTINEL**, p. A-4, Dec. 28, 1988.]

December 28: TOUR BUS/CAMPER COLLISION

An accident near Spaceport USA occurred today when a tour bus collided with a camper sending 39 people to Jess Parrish Memorial Hospital (Titusville, FL) with mostly minor injuries. The tour bus struck a camper stopped at a traffic light in the westbound lane of a two-lane highway in front of the tourist attraction, about 4:30 p.m., according to Kennedy Space Center spokesman Dick Young. He said, "The light changed and the tour bus driver thought the camper had moved, but it didn't." Four people in the camper and 35 of the tour bus passengers were treated for minor injuries at the Titusville hospital. [**UPI**, Dec. 28, 1988.]

December 29: PILOT APPEALS RULING

A pilot who flew his aircraft over Kennedy Space Center during Discovery's countdown on Sept. 29 has appealed the Federal Aviation Administration's decision to suspend his commercial pilot certification for 30 days, the FAA said today. The appeal means that Florida Highway Patrol Sgt. Gary Schluter will attend a conference with FAA attorneys to explain his actions. "the lawyer [for Schluter] has asked for an informal conference, which is the first step for appeal," said FAA spokesman Roger Myers. ["Pilot Who Flew Over Launch Appeals Ruling," **FLORIDA TODAY**, p.6A, Dec. 30, 1988.]

<> USBI CO. WINS RENEWAL

USBI Co. has won a restructured and extended contract renewal from NASA to process and refurbish solid rocket boosters. The extension runs from Sept. 30 through Sept. 30, 1994, and adds $1 billion to the contract, giving it a total value of $1.6 billion. The original contract was awarded January 1985. The new contract includes payment to USBI for its work in returning the Shuttle Program to flight after the Challenger tragedy. ["USBI Co. Wins Renewal of Booster Contract," **FLORIDA TODAY**, p. 6A, Dec. 30, 1988.]

December 30: HONEYWELL WINS SHUTTLE CONTRACT

A $7.2 million contract to upgrade computer systems containing master Space Shuttle launch, test and processing data has been awarded to Honeywell Federal Systems (McLean, VA), according to Kennedy Space Center officials. ["Honeywell Wins Shuttle Pact," **FLORIDA TODAY**, p. 7A, Dec. 31, 1988.]

SPACEPORT USA ATTENDANCE - 1988

January	165,936	July	368,362
February	225,783	August	347,290
March	268,614	September	190,433
April	241,487	October	216,300
May	197,566	November	213,017
June	269,444	December	196,033

Total Attendance

2,906,538

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16. Abstract

The document is intended to serve as a record of KSC events and as a reference source for historians and other researchers. Arrangement is by day and month and individual articles are attributed to published sources. An index has been added to this edition.

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