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# Chronology of KSC and KSC Related Events for 1984

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**John F. Kennedy Space Center**

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# CHRONOLOGY OF

# KSC AND KSC-RELATED

# EVENTS FOR

# 1984

# SELECTED

By Ken Nail, Jr.

New World Services, Inc.

ARCHIVIST

# FOREWORD

In his third State of the Union address, President Reagan told NASA to develop a permanent manned space station in 10 years. The President also ordered the Department of Transportation to help private firms launch rockets, thus introducing the commercialization of space. There were five space shuttle and six expendable vehicle launches in 1984.

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 month; items are by date of the published sources. Actual date of the event may be indicated in parenthesis, when the article itself does not make that information explicit.

Materials were researched and prepared for publication by Historian-Archivist Ken Nail, Jr., with the assistance of Elaine Liston, both of New World Services, Inc., EG&G subcontractor for library operations.

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## JANUARY 1984

**January 4:** NASA's John F. Kennedy Space Center awarded EG&G, Florida, Inc. (Cocoa, Florida) a $81,242,495 contract to begin its second year as Base Operations Contractor at KSC. This award is the first of two priced, one-year options on the initial contract, awarded in December 1982. The cost-plus-incentive/award contract covers the period from January 1, 1984, through December 31, 1984. [Tucker. NASA/KSC NEWS RELEASE No. 2-84, Jan. 4, 1984.]

**January 6:** The space shuttle Challenger was moved from its processing facility to the Vehicle Assembly Building between 9:13 and 9:51 p.m. EST. The 300 yard journey followed a check of its center of gravity and a determination that its weight was 187,000 pounds. ["Challenger Travels 300 Yards to VAB," TODAY, p. 12A, Jan. 7, 1984.]

**January 9:** NASA announced it had reached a preliminary agreement with Transpace Carriers Inc. (Greenbelt, Maryland) to be the exclusive marketers of the Delta rocket. TCI will then arrange for the rocket launch services and pay NASA to use its facilities at Kennedy Space Center or Vandenberg Air Force Base in California. [Mecham. TODAY, pp. 1A & 14A, Jan. 10, 1984.]

**January 10:** Aerospace giants McDonnell Douglas Corp. and Lockheed Corp. confirmed their plans to bid on the multimillion dollar solid rocket booster assembly and refurbishing contract held by United Technologies Corp. [Stein. THE ORLANDO SENTINEL, pp. D-1 & D-2, Jan. 11, 1984.]

<> NASA officials first decided to place protective blankets over portions of the Space Shuttle Challenger's thermal tiles and later rejected the plan. The new material -- called Advanced Flexible Reusable Surface Insulation or AFRSI -- was introducted as an update on earlier protective blankets, but has come loose and frayed during flight. The material is used extensively on Discovery, the newest Shuttle.

Kennedy Space Center officials delayed moving to the launch pad the three satellites that are to fly aboard Challenger on February 3. Rollout to the pad of the entire Shuttle was expected to take place at midnight January 12.

Discovery was towed back to an Orbiter processing hangar from storage in the VAB; it showed signs of being cannabalized for spare parts that were transplanted into Challenger. [Yacenda. TODAY, p. 20A, Jan. 11, 1984.]

**January 12:** Still on target for February 3 launch, space shuttle Challenger was removed from its giant assembly building January 12 and sent on its way to its seaside launch pad. Challenger was strapped atop a land crawler that began its five-hour, 3 1/2-mile journey at 4:30 p.m. ["Challenger Taken Out to Launch Pad," THE ORLANDO SENTINEL, p. B-2, Jan. 13, 1984.]

**January 13:** NASA now believes that the fuel leaks in the Auxiliary Power Units that caused two small fires in the Space Shuttle Columbia after its landing last month were the result of cracks in fuel injector tubes in the APU turbine system and that the seal problem which had been blamed was the result of the leaks....Percy Baynes, director of the Space Shuttle Orbiter program in NASA's Office of Shuttle Operations, said the cracks were caused by age and corrosion....He said that engineers believe that three new APUs installed on the Shuttle Challenger will prevent a similar problem during the upcoming tenth Shuttle mission. ["NASA Attributes APU Leaks to Age/Corrosion," DEFENSE DAILY, p. 63, Jan. 13, 1984.]

**January 16:** The only major problem connected with the mock final countdown to the next Shuttle launch was the dense fog which socked in the Cape Canaveral launch site. The fog would have hindered a KSC emergency landing, meaning the launch would have been scrubbed.

After the countdown simulation, the shuttle astronauts - Vance Brand, Robert Gibson, Bruce McCandless, Ron McNair, and Bob Stewart - reviewed procedures they would have to follow to save their lives should something go drastically wrong prior to liftoff.

Shuttle pilot Robert "Hoot" Gibson's main concern was the shuttle's brakes, some of which have locked up and disintegrated following several recent missions...."We don't have the bottom line on the brakes. They're not meeting our reuse criteria," Gibson said. [Yacenda. TODAY, pp. 1A & 12A, Jan. 17, 1984.]

**January 19:** Senator William Proxmire (D-Wis.) gave his monthly "Golden Fleece" award for wasting the taxpayers money to NASA for spending $780,000 on free trips for 2,288 "special guests" to Kennedy Space Center to watch space shuttle launches. Proxmire called the trips "a lobbying campaign for NASA." The agency said that most of the people involved were government officials responsible for the space program. ["NASA Gets 'Golden Fleece' For VIP Trips to KSC," DEFENSE DAILY, p. 96, Jan. 19, 1984.]

**January 23:** Technicians successfully completed a modification to crucial auxiliary power units aboard the Space Shuttle Challenger, NASA officials said. The February 3 launch schedule for the tenth shuttle mission remained firm. The modification was prescribed to head off the possibility of another fire like the small blaze that struck during the latest flight of Columbia. Following the modification, workers began three days of loading hydrazine aboard the shuttle in preparation for a "hotfire" test of the power units. The test was rescheduled from January 24 to January 26. [Yacenda. TODAY, p. 11A, Jan. 24, 1984.]

**January 25:** President Reagan, in his third State of the Union address, told NASA to develop a permanent manned space station in 10 years. He also called for easing constraints on private-sector investment in space. He said he would invite some friendly nations to participate in the space program "so we can strengthen peace..." [Wright. THE ORLANDO SENTINEL, p. A-1, Jan. 26, 1984.]

Robert H. Gray, the head of KSC's Space Station and Advanced Projects Office, called Reagan's announcement "super." "It came off just the way we wanted it....It's the good and the right thing to do." Gray said his office's activities would continue planning on the station. At least in the beginning, he said, any additional staffing of the space station project would probably come from transfers within the spaceport's current workforce. Any major jump in jobs

would probably come in the 1990s, and would be coming from support activities or activities associated with space station spin-offs, Gray said. [Yacenda. TODAY, p. 16A, Jan. 26, 1984.]

<> President Reagan's long-awaited statement supporting development of a permanent, manned space station drew swift and strong praise on the Space Coast.

"I feel pretty good tonight," said Kennedy Space Center Director Richard G. Smith. "I'm exceedingly pleased. It was a right and good decision to make."

Smith said the president's decision to back a space station, which would cost at least $8 billion to develop during the next decade, indicated White House confidence in NASA's work.

"It was a bold step to take, particularly when the budget still faces problems," Smith said.

The spaceport's chief called the orbital station "a key" to further private expenditures in space, and said a plan to have the federal Department of Transportation monitor commercialization of space launch services bore NASA's complete support.

Smith said KSC's role in the project -- beyond launching station components aboard the space shuttle -- still must be determined.

But he predicted the space station program will have little initial impact on employment levels at KSC and that long-range project activities in the 1990s will determine job growth at the center...."The space shuttle is still our No. 1 priority," Smith said. [Yacenda. TODAY, pp. 1A & 16A, Jan. 26, 1984.]

**January 26:** The United States is a decade ahead of the Soviet Union in space and President Reagan's commitment to a manned orbiting factory-laboratory will keep it that way, said NASA Administrator James M. Beggs. "The President's program leaves no doubt that the United States means business in

expanding our presence in space," Beggs said at a Washington press conference. "The bold and imaginative program will maintain U.S. leadership in space well into the 21st century." In his State of the Union speech, Reagan granted NASA's most fervent wish when he directed the agency to develop a manned station within ten years. [Jean. THE ORLANDO SENTINEL, pp. A-1 & A-7, Jan. 27, 1984.]

**January 28:** President Reagan said that the manned orbiting space station he has proposed would open opportunities for greater commerce, and he encouraged international participation in the project. The president wrote to Japanese Prime Minister Yasuhiro Nakasone to ask Japan to participate in the space station work, a Japanese foreign ministry official said. In his weekly radio address to the nation, Reagan said that "by reaching for exciting goals in space, we'll serve the cause of peace and create a better life for all of us here on earth." ["Reagan Praises Space Station," TODAY, p. 18A, Jan. 29, 1984.]

**January 30:** The 15 members of the U.S. Air Force Aerospace Rescue and Recovery team took part in a fifteen-minute training exercise at the turning basin near the shuttle launch site. The team was lead by Sgt. Mark Judy and Master Sgt. Tony McFarr, both of Patrick Air Force Base, Florida. [Shealy. TODAY, pp. 1B & 3B, Jan. 31, 1984.]

<> The odds favor acceptable weather for Challenger's launch and landing at KSC, according to Major Don Greene, meteorological expert at Patrick Air Force Base. "Climatologically speaking, we have a 66 percent chance of good weather at launch and landing." The long-range forecast includes the possibility of another cloud-bearing frontal system arriving on the Space Coast either February 3d, launch day, or February 4. [Stanley. TODAY, p. 1A, Jan. 31, 1984.]

<> Space agency officials reported all systems "Go" for the scheduled February 3 liftoff of the Space Shuttle Challenger; barring mechanical or meteorological glitches, launch is set for 8:00 a.m. EST. KSC spokesman Mark Hess said shuttle workers over the past two days finished installing the small explosive charges used to release various vehicle components in flight. Countdown was expected to pick up at 2:00 a.m. EST on February 1. [Yacenda. TODAY, p. 1A, Jan. 31, 1984.]

**January 31:** The five-man crew of the shuttle Challenger arrived at the Kennedy Space Center as preparations continued smoothly for its launch at 8:00 a.m. EST February 3. Vance Brand, Bruce McCandless, Robert Stewart, Robert Gibson, and Ronald McNair arrived in four jets after a four-hour, 40-minute flight from Houston, landing on the 3-mile runway at the Kennedy Space Center where they hope to land the Challenger at dawn on February 11. "We're hoping the weather will cooperate real well, and we will have the honor of being the first to land at KSC," said mission commander Vance Brand, who commanded an earlier shuttle flight and is the only veteran of space travel on the crew. After arriving at the space center and greeting onlookers, Brand and pilot Robert Gibson practiced landing on the runway in a jet modified to mimic handling of the shuttle. [Jean. THE ORLANDO SENTINEL, p. B-1, Feb. 1, 1984.]

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Pam Biegert, Federal Woman of the Year.

**FEBRUARY 1984**

**February 1:** A crowd of 250,000 was predicted for shuttle mission 41-B -- the tenth in the program -- according to Brevard County Sheriff's Department spokesman, Ron Clark. Cocoa Beach Area Chamber of Commerce spokeswoman Margaret Waldie said her office has been taking an average of 25 calls a day for the past two weeks from people trying to make hotel reservations. [Keefer. THE TRIBUNE, p. 1A, Feb. 1, 1984.]

<> NASA Administrator James Beggs was quoted as saying there may be a couple of months slip in the opening of the Vandenberg Shuttle base. ["Beggs Sees Possible Slip in Vandenberg," DEFENSE DAILY, p. 182, Feb. 2, 1984.]

**February 2:** President Reagan approved a $7.491 billion FY'85 budget for NASA, an increase of $274 million or 3.9 percent over FY'84, including $150 million to initiate development of an $8 billion permanently manned space station, expected to be in orbit by 1992. Significantly, the President's five-year budget projections include a real growth in the NASA budget of 1 percent a year over the FY'86-FY'89 period, NASA Administrator James Beggs announced. [NASA Budget Boosted 3.9% to $7.491 billion in FY'85," DEFENSE DAILY, p. 179, Feb. 2, 1984.]

<> The congressional Office of Technology Assessment (OTA), claiming impartiality on the President's space station initiative, delivered an ostensibly devastating attack on the way NASA is going about planning and development of the space station and asserting that a station able to meet all identified needs can be built for $2 billion compared to NASA's $8 billion station, which it added could cost $25 to $30 billion "by the end of this century." ["OTA Charges Space Station Flawed Without Space Goals," DEFENSE DAILY, p. 201, Feb. 6, 1984.]

<> The U.S. Crane Certification Bureau Inc. (Taft, Florida) a private firm, was fined $12,000 for billing NASA for 911 hours of work it never performed. In December, the company pleaded guilty to two fraud charges. Assistant U.S.

Attorney Stephen Calvacca said he will recommend that the company be barred from receiving any NASA or government contracts because of the conviction. ["Company Fined $12,000 for Lying About NASA Work," THE ORLANDO SENTINEL, p. B-6, Feb. 3, 1984.]

<> Challenger's astronaut crew of Vance Brand, Robert Gibson, Robert Stewart, Ronald McNair, and Bruce McCandless were described as looking forward to having a good time on their eight-day flight. "They've been in training for some time for this flight," said shuttle program manager Glynn Lunney. "They feel comfortable with it." Brand and Gibson made more practice landings at the Kennedy Space Center's huge landing strip where they are scheduled to bring Challenger home February 11. They later joined mission specialists for T-38 jet aircraft acrobatics, another daily regimen of prelaunch activities. McCandless and McNair spent much of their day reviewing the flight plan for the 10th shuttle mission and the first of 10 this year. Engineers pronounced the Challenger in ideal condition on its seaside launch pad 39A. [Jean. THE ORLANDO SENTINEL, pp. A-1 & A-11, Feb. 3, 1984.]

**February 3:** Roberta Wyrick, 29-year-old Rockwell employee, became the first woman ever to serve as a test conductor during a U.S. space shot. Wyrick, a resident of Cocoa, was in touch with the Challenger's crew from the moment they boarded the orbiter. She was responsible for relaying information from the shuttle to project engineers and to the NASA test director in charge of the operation. "Once you're initiated you get to do it again," said Wyrick, who has served as test conductor before for Shuttle landings at Edwards Air Force Base in California. She was also assigned to act as test conductor during prior missions to handle any Return-to-Launch Site landing. [Yacenda. TODAY, p. 3A, Feb. 3, 1984.]

<> NASA plans to name an associate administrator to head up a space station development management office within the next six months. The agency says all eight centers will play a role in space station development efforts and it plans to designate a lead center within a few months. Administrator James Beggs, testifying before a House panel, said that it "will undoubtedly be Johnson." ["Space Station Mangement," AEROSPACE DAILY, p. 202, Feb. 3, 1984.]

<> Following the launch of 41-B, Martin Marietta paid out more than $400,000 in accrued vacation, final salary and severance pay to hundreds of its former workers who had processed external fuel tanks on all previous shuttle flights. As part of the changeover in shuttle processing operations at KSC, a contingent of top management from the Michoud Division of Martin Marietta finalized its affairs here. Of the 317 persons Martin Marietta employed at KSC, more than 200 elected to join SPC winner Lockheed Space Operations Co. Others took voluntary retirement or accepted company transfers. Company officials claimed very few found themselves jobless. [Stanley. TODAY, p. 2B, Feb. 5, 1984.]

<> Flint and Lorraine Dille, grandchildren of Buck Rogers creator John Flint Dille, were on hand for the launch of the Challenger mission which features the first use of NASA's MMU's (Manned Maneuvering Units). The MMU's are roughly similar to those first used in the original Buck Rogers comic strip. "It was spectacular," Lorraine Dille said. "You can watch it a hundred times on TV, but the feel of the power and the crackling noises made it really amazing. It took the fantasy and turned it into a reality." [Seel. TODAY, pp. 1A & 20A, Feb. 4, 1984.]

<> Dr. P. Yankalbe, minister of public health from the African country of Chad, a spectator at the Challenger's fourth launch, applauded American know-how. "It was spectacular. I'm very happy to be able to observe the success of American technology," Dr. Yankalbe said. "We've always watched it on television, and I never thought I'd be so lucky to see it in person," Yankalbe said through an interpreter. He said he was much impressed that the launch took place exactly at 8:00 a.m. as planned. He had arrived at the site just an hour before and said he was surprised it took only moments before the event was over. [Skolnick. TODAY, p. 2A, Feb. 4, 1984.]

**February 4:** The final major changeover of the massive job of poreparing the space shuttle for flight was completed at 8:00 a.m. EST, 24 hours after the successful launch of 41-B, the 10th shuttle mission. The last segments of shuttle processing work were turned over to Lockheed Space Operations Co. from former processing contractors Rockwell International, United Space Boosters Inc., and Martin Marietta. The switchover involved 2500 workers primarily engaged in orbiter processing, the biggest single chunk in the SPC switch. All told, about 6700 KSC contractor

employees were affected by the change from 15 former incumbent companies to the Lockheed team. NASA shuttle management and operations chief Tom Utsman praised the job done by employees of the outgoing shuttle processing contractors. "I wish he had said those things a couple of months ago," commented one Rockwell official. [Yacenda. TODAY, p. 2B, Feb. 5, 1984.]

<> SRB recovery ships Freedom and Liberty returned to Port Canaveral a little after 11:00 a.m. EST, each towing a booster. The recovery effort was the first conducted by Morton Thiokol under the new shuttle processing contract. Thiokol replaced United Technologies' United Space Boosters Inc. All regular crew members of the two ships had formerly performed the same work for USBI. [Yacenda. TODAY, p. 20A, Feb. 5, 1984.]

**February 5:** The $30 million Westar VI satellite was found healthy but in the wrong orbit and useless as problems continued to plague the Space Shuttle's 10th mission. In addition a metallic balloon to be used as an in-space rendezvous target exploded as it was being inflated. NASA was forced to cancel the two-day exercise in which Challenger was to attempt a series of orbital meetings with the free-flying balloon from as far away as 140 miles. Mission officials planned to go ahead with the February 6 Palapa B-2 Indonesian satellite despite the Westar VI setback. [Yacenda. TODAY, pp. 1A & 10A, Feb. 6, 1984.]

<> Thirteen years ago, Apollo 14 astronauts Alan Shepard and Edgar Mitchell landed on the moon. [Jarrett. A SUMMARY OF MAJOR NASA LAUNCHES, KSC HR-1, p. B-28, Jul. 1980.]

**February 6:** Everything went smoothly for the first official workday of about 2500 workers at the company now handling Shuttle processing. Stuart Shadbolt, spokesman for Lockheed Space Operations Co., said the day progressed "very well, very quietly." ["First Day Smooth for Lockheed Staff," TODAY, p. 2B, Feb. 7, 1984.]

**February 7:** Jim Dubay, president and general manager of EG&G Florida Inc. -- the company that operates Kennedy Space Center -- "has agreed to shave off his full beard for a

$5,000 pledge" to the Brevard Health Telethon on February 12, said Ed Knadle. EG&G is one of several sponsors for Brevard County's first heart telethon which will be televised on TV channel 43, WMOD. [Salamon. TODAY, p. 1B, Feb. 7, 1984.]

<> "This may be one small step for Neil, but it's a heck of a big leap for me," said Astronaut Bruce McCandless, first to use the manned maneuvering unit in an untethered spacewalk. The reference was to Neil Armstrong's words upon becoming the first man to step on the surface of the moon on July 20, 1969. [Jean. THE ORLANDO SENTINEL, p. A-1, Feb. 8, 1984.]

**February 9:** Kennedy Space Center prepared for the February 11 landing of Challenger at the spaceport by readying hundreds of workers, a fleet of high-tech vehicles and an Air Force rescue and recovery team. [Stanley. TODAY, p. 8A, Feb. 9, 1984.]

<> Air Force meteorologists said the prospects for the Challenger's Feb. 11 landing at KSC were improving, since a trough of low pressure passing through east Texas and Arkansas during the night had weakened considerably and stalled. The system probably won't reach Florida until after the shuttle landing. They forecast generally acceptable conditions, with just a 20 percent chance of rain at landing time. Flight managers have the option of bringing the shuttle down at 7:10 a.m. Feb. 12 at KSC or shifting the landing site to Edwards Air Force Base in California. ["Forecast Looks Go for Landing Here," TODAY, p. 1A, Feb. 10, 1984.]

**February 10:** A Philadelphia couple on their honeymoon became Kennedy Space Center Tours' 20 millionth bus boarders, and received several prizes including special passes to view the shuttle's first landing at KSC's three-mile-long landing facility. Joseph Pawko and Marybeth Daley of Philadelphia were married February 4 and arrived in Florida the next day. On the 10th they were surprised by George Meguiar, manager of the tours, who announced their achievement to them as they purchased tickets for the bus tour. [Kimura. TODAY, p. 1B, Feb. 11, 1984.]

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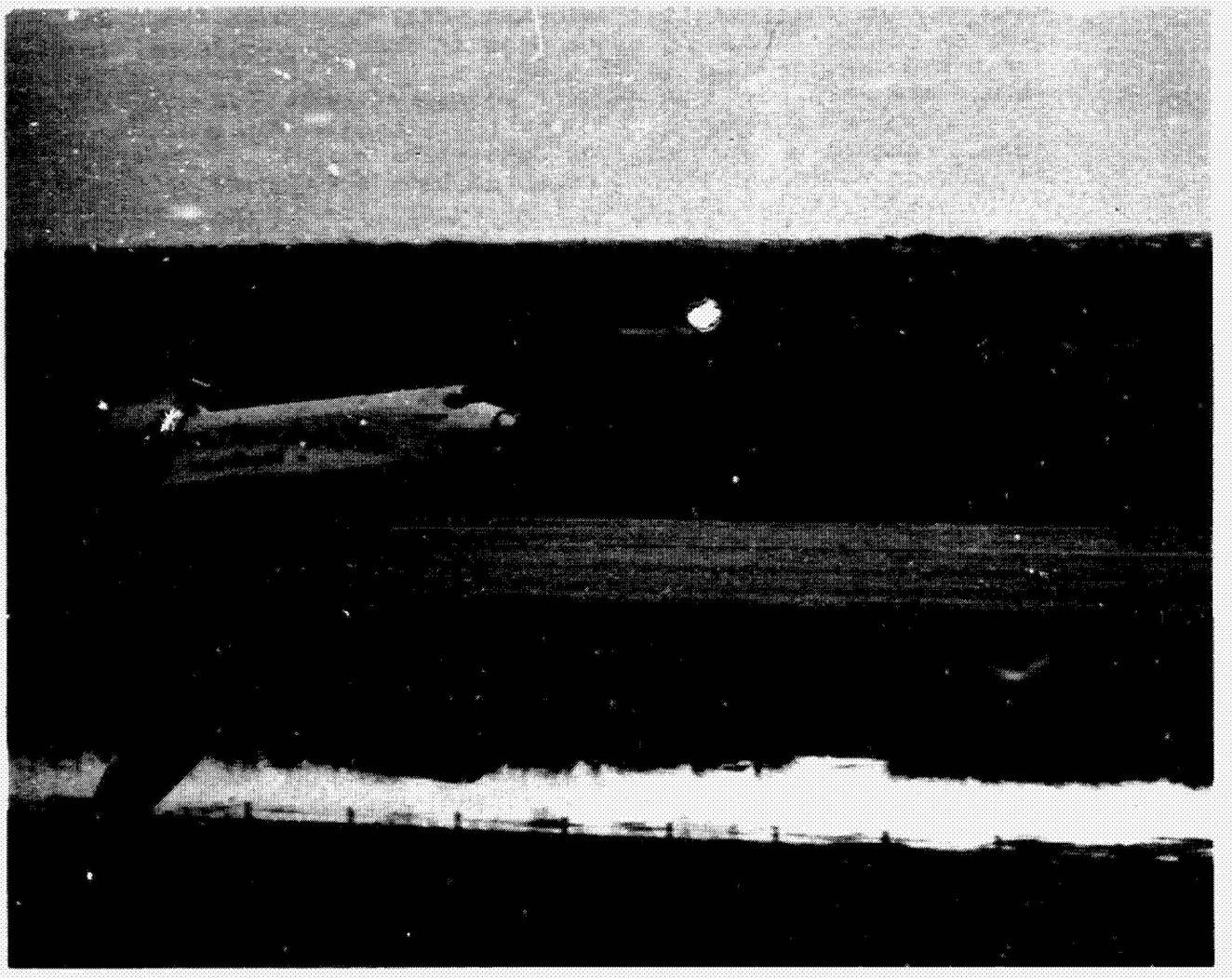

Space Shuttle Orbiter Challenger touches down on the runway at KSC at 7:16 a.m. on Feb. 11 for a historical ending to a shuttle mission.

**February 11:** "Welcome to Kennedy Space Center," the long, crimson carpet said to the five shuttle astronauts as they stepped from their craft 39 minutes after touchdown, back on Florida ground following eight days in space. Challenger's first KSC landing came at 7:16:06 a.m. EST. "OK, Houston, wheels are stopped," was mission commander Vance Brand's brief comment on landing. "Roger that, Challenger, welcome home. Fantastic job," replied John Blaha at Mission Control in Houston. Descent to KSC began an hour before and half a world away with the firing of Challenger's re-entry rockets over the Indian Ocean.

Challenger's nosewheel glided down within 2 1/2 inches of the centerline running the length of KSC's concrete shuttle landing strip, put there with precision by Brand. The craft's nosegear touched down on time as planned, literally to the second. The craft's speed at touchdown was 218 mph - about 30 mph slower than in the rarified air of the high California desert where the shuttle usually has landed until now. The Challenger used 10,700 feet of the 15,000-foot-long runway before coming to a stop - a comfortable margin, NASA officials said.

The unpowered cratt escorted by a small T-38 jet, swept wide to the north out over the Atlantic. As it did, Challenger exposed its broad underside of black tiles which seemed to turn silver in the sunlight. Challenger then straightened its course, approaching KSC's Runway 15 from the northwest, descending steeply as if riding a bannister to the ground. As the DC-9 sized Challenger settled onto the runway, twin plumes of white vapor formed at the craft's wingtips, sweeping back like a wake around a ship. The plumes were the result of turbulence coming off the craft's wingtips as they cut through the early morning fog. [Yacenda. TODAY, pp. 1A & 20A, Feb. 12, 1984.]

**February 12:** Ken Coffey, KSC shuttle mechanical systems officer, said the Challenger would be ready for launch in a record 53 days, thanks to its first-ever Cape landing, which will shave about a week from the turnaround time. There was less damage to the orbiter from re-entry heating than had been expected, he said, but 31 thermal tiles nevertheless will have to be replaced. They were damaged mostly by flying debris at launch and landing. Both right-hand brakes malfunctioned after landing, as on all earlier flights. One brake will have to be replaced and the other repaired, Coffey said. The only other problems were hazy windows and tires that were scraped when they hit the concrete runway.

The orbiter is very clean, in better shape than any of the others," Coffey said. No problems were encountered with the shuttle's three auxiliary power units, which control the ship's hydraulic system. The Columbia had problems with two of its hydraulic units when it landed in December. [Jean. THE ORLANDO SENTINEL, p. A-12, Feb. 13, 1984.]

**February 13:** Engineers checking the launch platforms in the cargo bay of the space shuttle Challenger said they found no clues to the failures of two communications satellites to reach their proper orbits after their deployment as part of the shuttle mission 41-B. ["Scrubbed Cargo Jeopardizes July Shuttle Flight," TODAY, p. 1A, Feb. 14, 1984.]

<> A secret military payload set for launch on the space shuttle in July was cancelled, and the mission will be scrubbed without it, Air Force and NASA officials said. Air Force Lt. Col. Sam Martin, a Pentagon spokesman, said in a telephone interview that the secret payload will not be flown on the July mission, but he declined to identify the payload or say when it would be flown. ["Scrubbed Cargo Jeopardizes July Shuttle Flight," TODAY, p. 1A, Feb. 14, 1984.]

<> NASA Administrator James Beggs said that he believes the space shuttle will be able to return its operating costs by the 1988-89 period. Beggs said he expects the shuttle to earn about $675 million in FY'85 up from $270 million in FY'84, but operating costs will be about $1.7 - $1.8 billion. ["Beggs Sees Shuttle Break Even Point By End of Decade," DEFENSE DAILY, p. 242, Feb. 13, 1984.]

<> One of three recovery parachutes on each of the shuttle's two solid rocket boosters failed to open following Challenger's launch February 3. The malfunction resulted in the boosters dropping into the Atlantic at 75 mph, compared with the 60 mph planned impact velocity. Initial inspection of the boosters' aft skirts showed minimal damage occurred during splashdown. ["Parachute Problem Damages Boosters," AVIATION WEEK & SPACE TECHNOLOGY, p. 18, Feb. 13, 1984.]

**February 20:** On the twenty-second anniversary of his becoming the first American to orbit the Earth, Senator John Glenn (D-Ohio) came in fifth in the 1984 presidential caucuses in Iowa. [Groer. THE ORLANDO SENTINEL, p. A-1, Feb. 22, 1984.]

**February 21:** NASA officials decided to replace Challenger's robot arm. Installation of the spare arm was expected to be completed by the end of the week without interrupting preparations for the next mission. During the last mission, astronauts had to cancel a test simulating the movements of the Solar Max Satellite when the robot arm would not move properly to the left and to the right, said KSC spokesman Jim Ball. He said the replacement had performed satisfactorily when checked out on the ground. Technicians were unable to duplicate the trouble experienced by the robot arm on the 41-B mission.

A "round the clock" investigation by McDonnell Douglas failed so far to disclose why the company's satellite booster rockets malfunctioned, marooning two communications satellites in uselessly low orbits. [Fisher. THE ORLANDO SENTINEL, p. A-9, Feb. 22, 1984.]

<> Commander Vance Brand, speaking in a press conference at Johnson Space Center in Houston, Texas, said the first shuttle landing in Florida went so well he would have no hesitation landing at the space center in daylight or in darkness. He said the only problem was that the shuttle ran through a flock of small birds as it approached the 15,000-foot runway and one was smashed. The astronaut said feathers were found imbedded in tiles coating the skin of the spacecraft. During the landing four small airplanes violated space center airspace, AVIATION WEEK AND SPACE TECHNOLOGY reported, prompting NASA and the Federal Aviation Administration to begin reviewing security procedures for launches and landings. One of the planes, a single engine Cessna, flew directly over Challenger after it landed February 11, the magazine reported. Two FAA aircraft assigned to patrol the space center airspace intercepted all but the Cessna. All the intercepted aircraft were believed to be on sightseeing or photography flights. But NASA and the FAA are concerned about the possibility of a terrorist attack from a light aircraft. "Our security people are concerned because we have responsibility for the shuttle. It's a national resource," said Mark Hess, a space center spokesman. "It's our responsibility to protect it." [Fisher. THE ORLANDO SENTINEL, p. A-9, Feb. 22, 1984.]

**February 23:** NASA announced a two-day delay in the launch of space shuttle Challenger due to orbital logistics. "We've been targeting April 4th, knowing all along that the folks at the Johnson Space Center (in Houston) would have to coordinate the launch with the configuration of the Solar Maximum Satellite," Hess said. After running data about the repair mission and the position of the orbiting satellite through a computer, NASA officials decided the orbiter would have a better chance of tracking down the satellite if launch occurred on April 6, Hess said. [Stanley. TODAY, pp. 1A & 20A, Feb. 24, 1984.]

**February 24:** President Reagan ordered the Department of Transportation to help private firms launch rockets that will compete with the space shuttle for business. Reagan enthusiastically described space as a "new world" offering rich business opportunities in communications, geological exploration and manufacturing. Transportation Secretary Elizabeth Dole said non-government throwaway rockets - the industry calls them "expendable launch vehicles" - still have "enormous commercial possibilities," despite the development of the shuttle. She said DOT will attempt to reduce the red tape confronting companies interested in getting into the launching business....[Mecham. USA TODAY, pp. 1A & 16A, Feb. 25, 1984.]

**February 29:** The Kennedy Space Center Exchange Council released a request for proposals for concessionaire operations of a commercial service station on the Center. The request for proposal provides for submission of sealed offers by April 20, 1984. The concessionaire contract will cover the period from July 1, 1984, through June 30, 1989. Co-Op Oil Co. (St. Petersburg, Florida) has operated the service station since 1978. The Exchange Council is a non-appropriated fund activity operated for the welfare and morale of KSC employees. [NASA/KSC NEWS RELEASE No. 50-84, Feb. 29, 1984.]

<> NASA confirmed that the maiden flight of the space shuttle Discovery would be delayed at least two weeks because the craft had been cannabilized of an important component -- a pod which contains one of two orbital steering rockets -- for use aboard its sistership Challenger. Discovery had been scheduled for launch June 4, but work schedules have been geared now for a June 19 launch and sources said that date could slip even further. Several other key components had also been taken from Discovery for use aboard

Challenger, including a main engine and all three auxiliary power units used to drive flight surfaces during launch and landing. But NASA and contractor sources said the piece likely to delay the launch is a pod, located near the tail of the craft, which contains the Shuttle's left orbital maneuvering system rocket. [Yacenda. TODAY, pp. 1A & 16A, Mar. 1, 1984.]

## MARCH 1984

**March 5:** The flawless launch of a 2-ton satellite by the European-built Ariane rocket had Old World space officials sipping champagne and demanding an end to the U.S. government subsidy which they say makes the space shuttle unfair competition in the commercial space race...["Europeans Want U.S. to End Shuttle Subsidy," TODAY, pp. 1A & 12A, Mar. 6, 1984.]

**March 6:** Center Director Richard G. Smith designated March as Safety Belt Month at KSC. [Memorandum to all KSC employees from R.G. Smith, Mar. 6, 1984.]

**March 14:** The shuttle Challenger, heading toward a projected April 6 launch date, retraced its tracks from a Kennedy Space Center orbiter processing hangar to the VAB. It was the fifth time this shuttle has made the 300-yard trek as the first step on its way to the launch pad, 39-A. Workers began towing the 75-ton Challenger from its hangar shortly after 10:00 p.m. EST and completed the trip forty minutes later, according to KSC spokesman Mark Hess. Rollover had been delayed a few hours due to lengthly weighing and balancing activities which took longer than planned. KSC spokesman Jim Ball said that officials expected to have the orbiter "soft-mated" to the rest of the shuttle launch vehicle by early Thursday (March 15), after which electrical and mechanical connections would be made to complete a "hard mate" of Challenger. Rollout to the pad was anticipated to begin at about midday on Sunday (March 18). [Yacenda. TODAY, p. 8A, Mar. 15, 1984.]

**March 15:** Scratches on the exhaust nozzle of a booster rocket scheduled to send a satellite to high orbit from the shuttle forced engineers to return the booster to the factory. Jane Logan, spokeswoman for Telesat Canada (Ottawa), confirmed that the perigee kick motor portion of the PAMs (Payload Assist Modules) had been returned to the booster manufacturer, McDonnell Douglas Astronautics Co. (Huntington Beach, California). But Logan said her company had until April 26 to come up with a flight-ready PAM before being forced to postpone its June 19 launch. Logan said Telesat Canada engineers discovered the scratches - termed "surface anomalies," or obnormalities - on the PAM nozzle while

examining the spacecraft at Kennedy Space Center. McDonnell Douglas spokesman Jeff Fister said investigators were unable to determine if "random" scratches found on the Anik PAM bore any relationship to the nozzle failures that almost certainly struck PAMs attached to Western Union's Westar VI and Indonesia's Palapa B-2 during shuttle mission 10 (41-B). "In fact, the evidence says it doesn't," Fister said of the Anik problem. Fister said the scratches, discovered in February but never made public, were only "a few thousandths of an inch" deep and may be production-related flaws. [Yacenda. TODAY, p. 8A, Mar. 16, 1984.]

**March 19:** Challenger began its 3-mile rollout to launch pad 39A just before 1 a.m. EST, NASA officials said. The rollout, originally scheduled for 8:30 p.m. March 18, was forced back after engineers discovered several loose connectors during weekend tests. Maintenance managers delayed the rollout so engineers could conduct additional interface tests, according to Kennedy Space Center spokesman, Jim Ball. Engineers discovered the problems March 17 during a routine, pre-rollout probe of crucial electrical and mechanical connections between Challenger and its external tank and solid rocket boosters. The 4 1/2-hour delay for the rollout will push back the Challenger's pre-flight schedule by "roughly" the same time interval, Ball said. Workers had scheduled a "hot-firing" test today of the Orbiter's auxiliary power units. Ball said that test would be delayed about six or seven hours. ["Shuttle Rollout Starts Late," TODAY, p. 10A, Mar. 19, 1984.]

<> KSC spokesman Rocky Raab said a seven-minute "hot-fire" test of Challenger's three auxiliary power units was successful. Those units drive the hydraulics that operate the shuttle's flight control surfaces, landing gear and other key flight components during launch and landing. Raab called the test "standard procedure," because all three APU's have been replaced since Challenger's last mission in early February. [Yacenda. TODAY, p. 1A, Mar. 20, 1984.]

<> NASA reconfirmed an April 6 launch for the Challenger after giving thought to a delay of several days for the six-day mission. The space agency had considered a three-day delay to expand its launch window and increase the probability of tracking the spacecraft's 154-foot external fuel tank as it lands in the Pacific Ocean off the coast of Hawaii Island. But NASA Administrator James Beggs and Shuttle Director Lt.

Gen. James Abrahamson decided to stick to the original schedule, which calls for liftoff at 9 a.m. EST, a NASA spokesman said. [Mecham. TODAY, p. 4A, Mar. 20, 1984.]

**March 21:** "No difficulties were encountered" during Challenger's countdown demonstration test at KSC, according to spokeswoman Weida Tucker Brewington. All five crewman for the 41-C mission - commander Bob Crippen, pilot Dick Scobee and mission specialists Terry Hart, George Nelson and James van Hotten - were aboard Challenger for the test. Crippen said, "The Kennedy launch team continues to demonstrate the professionalism they are known for. We are looking forward to doing it again on the 6th" of April. The thirteenth shuttle mission will be the third such flight for Commander Crippen. [Yacenda. TODAY, pp. 1A & 16A, Mar. 22, 1984.]

<> An 11-by-14-inch painting by a Cambridge (Mass.) artist, the late Tom O'Hara, may be among the cargo of the Challenger, scheduled for launch April 6. O'Hara, who died January 10, 1984, "always wanted to fly in space," said a friend and fellow artist, Richard Newton of Champaign, Ill. O'Hara participated in a NASA art program and did several paintings depicting scenes from space shuttle missions. NASA officials are considering a request by Newton that one painting - on loan from the O'Hara family - be aboard the Challenger in April, on O'Hara's birthday...O'Hara's painting, an untitled abstract, shows two forms floating in zero gravity. ["Space Booster's Painting Could be Shuttle Cargo," USA TODAY, p. 5A, Mar. 21, 1984.]

<> Nine Egyptian government officials and trade union representatives toured Kennedy Space Center. The Egyptians' visit to Florida was sponsored by the Communication Workers of America. ["Rocket Shot," (photograph by Michael R. Brown), TODAY, p. 3B, Mar. 23, 1984.]

**March 26:** The space shuttle's main engines, designed to fly 55 missions without an overhaul, have failed to hold up under repeated use - the hallmark of shuttle transportation - a published report said March 25. Senior engineers with the National Aeronautics and Space Administration said their doubts over the engines' invincibility will not jeopardize the scheduled April 6 mission of the space shuttle Challenger. But they said engine wear is such a severe and chronic problem that a complete redesign of major components

may be necessary and could cost up to $1 billion over the next 10 years. Rocketdyne, a division of Rockwell International, the engines' builders, "simply did not anticipate all the problems that they encountered," said engineer Michael Billett, who completed a $125,000 study for NASA on engine erosion. Records maintained by Kennedy Space Center show that extra work associated with the engine problems have doubled or tripled engine maintenance - costing NASA millions of dollars. [UPI, "Shuttle's Engines Are Wearing Out Fast," THE ORLANDO SENTINEL, p. 1C, Mar. 26, 1984.]

**March 27:** Lt. Gen. James A. Abrahamson, director of the space shuttle program for NASA, was chosen by Defense Secretary Caspar Weinberger to head a $26 billion search for a high-tech missile defense system. Abrahamson's appointment, effective April 15, "won't have any effect on the day-to-day operations" at Kennedy Space Center, NASA spokesman Mark Hess said. Abrahamson, he said, "was the kind of administrator who personally got involved" with KSC operations. "He came down here when we were having problems with leaks in the engines before the sixth mission. He also went out on the SRB recovery boats one time to get a first-hand look at what that operation was about." ["Pentagon Picks Shuttle Chief to Pilot 'Star Wars' Defense," TODAY, pp. 1A & 14A, Mar. 28, 1984.]

**March 28:** A recent study for NASA indicated that a coal gasification plant at KSC would save $750,000 to $1 million per shuttle launch, according to Peter Minderman, director of engineering development at Kennedy Space Center. The plant would enable the space center to produce all its own electricity and the liquid hydrogen needed to fuel the shuttle main engines. Two concepts for coal gasification were studied and each would cost approximately $150 million, according to Gary Gutkowski of Merritt Island, who is the project engineer. ["Proposed KSC Plant Could Save $1 Million Per Shuttle," THE TRIBUNE, p. 5A, Mar. 28, 1984.]

<> NASA, The Cyprus Corp. and its subsidiary Astrotech began discussions about the corporation financing a fifth space shuttle. Astrotech, which will officially open its satellite-processing facility on April 5, would process the payloads locally if an agreement is reached on the private ownership of a shuttle according to Robert J. Goss, president of Astrotech. The current NASA estimate for the purchase of a shuttle is approximately $2 billion. The

Titusville Astrotech facility - at 1515 Chaffee Drive - is the nation's first privately owned facility for payload processing. [Zeorlin. THE TRIBUNE, p. 5A, Mar. 28, 1984.]

**March 29:** Wind gusts clocked at 60 mph forced Kennedy Space Center officials to remove dozens of technicians from the oceanside launch pad 39A where they were working on the orbiter Challenger. The midnight to 8 a.m. shift was not allowed on the pad, NASA spokesman Mark Hess said. Workers resumed most normal operations at 10 a.m., he said. "It was a precautionary measure to protect people working at heights and trying to move around large structures," Hess said. The shuttle was not damaged, he said, and the work stoppage won't delay the 8:59 a.m. April 6 launch date. [Stewart and Stanley. TODAY, p. 1A, Mar. 30, 1984.]

## APRIL 1984

**April 2:** Work continued on schedule for launch as the official countdown begins at 3:00 a.m. EST on April 4. "We're in good shape," said NASA spokesman Mark Hess. Access to Playalinda Beach closed at 6:30 p.m. EST and was expected to reopen an hour after Challenger lands on April 11. [Fisher. THE ORLANDO SENTINEL, pp. B-1 & B-6, Apr. 3, 1984.]

<> Three days before the launch of shuttle mission 41-C, NASA spokesman Mark Hess spoke hopefully of the expectations for a landing at KSC. "We're basically doing the same things we did before. The weather or some significant problem with the orbiter would be the only reasons why we'd go to California." Edwards Air Force Base in California is the backup landing site. [Stanley. TODAY, p. 1A, Apr. 3, 1984.]

**April 3:** Challenger's five-member crew for mission 41-C arrived at KSC for their April 6 launch. Skies were cloudy on their arrival but good weather was predicted for the 8:59 a.m. EST Friday liftoff. "I'm real excited. We've been looking forward to this for some time," said mission specialist Terry Hart after the crew arrived from JSC in three T-38 jets.

Flight Commander Bob Crippen, 46, is making his third shuttle flight. The other crew members are rookies - pilot Dick Scobee, 44, and mission specialists James "Ox" van Hoften, 39; George "Pinky" Nelson, 33; and Hart, 37. [Fisher. THE ORLANDO SENTINEL, pp. B-1 & B-5, Apr. 4, 1984.]

**April 4:** Two West Germans in Titusville for the launch April 6 of the shuttle Challenger were seriously injured in a head-on collision north of Kennedy Space Center, where they had hoped to get a look at the shuttle on its launch pad. Authorities identified the couple as Helmut W. and Barbursula Seebach of Hamburg, West Germany. A Holiday Inn employee said the West German couple was touring Florida and had been in Titusville only a few hours. They apparently heard about the scheduled launch and wanted to see it so

they drove to Titusville from Jacksonville. Just after checking in, the couple left in their rented car to get a look at the shuttle. The accident occurred a short time later on State Road 402 near the space center. ["West Germans Hurt On Way to See Shuttle," THE ORLANDO SENTINEL, p. C-10, Apr. 5, 1984.]

**April 5:** Boeing Services International Inc. has received a $2.8 million contract extension from NASA's Kennedy Space Center, Florida, to provide support for shuttle cargo operations. The cost-plus-fixed-fee contract extension covers the period from April 1 through September 30, 1985, and brings the total value of the award to $4.8 million. The company will continue to provide technician support to aid in the installation and checkout of payloads to be installed in the shuttle orbiter, including all Spacelab payloads. It will also be responsible for any modifications made to the racks and pallets on which Spacelab experiments are loaded before being placed in the orbiter and for maintenance and modifications made to ground support equipment for the experiments. ["Shuttle Cargo Support Contract Extension Goes to Boeing Unit," AEROSPACE DAILY, p. 206, Apr. 5, 1984.]

<> Mission specialist James van Hoften nearly flew into trouble about 8:30 a.m. EST when one engine of his T-38 jet shut down during takeoff after apparently colliding with a bird. Van Hoften noticed a flock of birds as he raced down the 15,000-foot runway at 161 miles an hour, and an instant later the right engine in the twin-engine jet flamed out. He braked and safely stopped about a third of the way down the runway, where Challenger will land at 8:10 a.m. EST on April 12. Bird remains were found on the nose landing gear, and technicians planned to remove the engine to check for damage, said NASA spokesman Rocky Raab. [Fisher. THE ORLANDO SENTINEL, pp. A-1 & A-8, Apr. 6, 1984.]

<> Astrotech International Inc. opened the nation's first commercial space payload service at a Titusville industrial park where the firm will prepare satellites for flight aboard the shuttle. Astrotech President Robert Goss told an afternoon press conference he expects plenty of demand for the service that NASA has provided at Kennedy Space Center until now. "We're confident that these facilities, and our expertise gained through prior participation in the U.S. space program, will make us an integral part of many future satellite launches," said Al Rockwell, chairman and chief

executive of Cyprus Corp., Astrotech's parent company. During the meeting Astrotech signed a formal agreement with NASA that calls for the space agency to provide certain equipment, facilities and services to Astrotech, who will reimburse NASA for them. Rockwell said the support and guidance from NASA and KSC officials was an important part in the project's success thus far. [Hodges. TODAY, p. 16C, Apr. 6, 1984.]

<> Air Force forecasters said the weather should cooperate for the 8:58 a.m. EST launch of the space shuttle Challenger, although they monitored potentially troublesome winds in the upper atmosphere that were expected to disperse by launch day. Air Force forecaster Major Donald Greene predicted scattered clouds and good visibility at the space center, but added that he is keeping close watch on the upper atmospheric winds that could damage the shuttle. The winds, measured at 70 mph at 75,000 feet by weather balloons have been diminishing since April 4, he said. "Things are going well. (The weather situation) is not unusual or out of the ordinary," Greene said. [Fisher. THE ORLANDO SENTINEL, p. A-1, Apr. 6, 1984.]

**April 6:** The space shuttle Challenger made its steepest ascent into orbit yet with only one firing of its orbital maneuvering system engines and reached its highest ever altitude of 305 miles. The "direct insertion" of mission 41-C launch was conducted to save fuel needed for extensive rendezvous and deorbit rocket firings later in the mission. [Jean. THE ORLANDO SENTINEL, p. A-8, Apr. 6, 1984.]

<> History's first satellite rescue mission [41-C] got off to a spectacular start as the space shuttle Challenger shot through cloudless blue skies and into orbit. Launch from Kennedy Space Center's pad 39A came exactly on time at 8:58 a.m. EST, and followed a countdown marred only by a few last-minute-but minor glitches with some electronic gear aboard the orbiter. Some 50,000 people packed North Brevard to watch Challenger start its fifth space mission. Some slow-moving traffic was reported before and after the launch but no major problems occurred, according to Maude LaPlante of the Brevard County Sheriff's Department. [Yacenda. TODAY, pp. 1A & 14A, Apr. 7, 1984.]

<> The twin solid-fuel rockets that helped boost the space shuttle Challenger into orbit parachuted into the Atlantic Ocean 150 miles east of Cape Canaveral and were recovered. NASA reported the two 19-foot rocket casings, jettisoned from the shuttle after two minutes of flight, landed in the water within sight of the two waiting recovery ships Liberty and Freedom. The ships attached lines to the boosters and began towing them back to Port Canaveral for refurbishment and use on a subsequent flight. ["Twin Boosters Are Recovered From Atlantic," TODAY, p. 2A, Apr. 7, 1984.]

**April 10:** The space shuttle Challenger astronauts retrieved the orbiting Solar Max satellite 307 miles out in space and returned the malfunctioning satellite to the cargo bay, where they repaired it on April 11. Challenger commander Robert Crippen maneuvered the Challenger near the orbiting satellite where astronaut Terry Hart used the ship's 50-foot-long Remote Manipulator System to reach out and grab it. The encounter marks the first retrieval of a satellite in space and opened up the possibility of widespread satellite retrieval missions in the future, with significant potential cost savings. ["Solar Max Retrieved by Shuttle in Historic Encounter," DEFENSE DAILY, p. 237, Apr. 11, 1984.]

<> NASA spokesman said that the timing of Challenger's return to KSC depended on the success or failure of repair efforts on the recovered Solar Max now in the orbiter's cargo bay. If successful, Challenger would return at 8:10 a.m. EST, April 13. If repair efforts fail, Challenger's return could be at 7:58 a.m. EST on April 12 or 13. [Lafferty. THE TRIBUNE, pp. 1A & 4A, Apr. 11, 1984.]

**April 13:** Veteran astronaut Robert Crippen set the Challenger down safely at Edwards Air Force Base, California, at 8:38 a.m. EST, after the landing was diverted from Kennedy due to poor weather. The next flight in the shuttle program, its twelfth, was scheduled for June 4 but was delayed two weeks to June 19 because of cannibalization of Discovery's components for Challenger's just completed flight. Discovery's June launch will mark its debut as the third orbiter in the shuttle fleet. ["Challenger Down Successfully/Next Shuttle Flight June 19," DEFENSE DAILY, p. 258, Apr. 16, 1984.]

**April 14:** The Challenger returned to Earth in better shape than after any previous mission following its race to catch and repair an ailing satellite, space agency officials said. "It's in real fine shape," ground operations manager Fritz Widick said at a news conference at Edwards Air Force Base, California, as crews prepared the 98-ton shuttle for its return to Kennedy Space Center. "If all goes well, we plan to fly out Tuesday morning and no later than Wednesday." [TODAY Wire Services, TODAY, pp. 1A & 20A, Apr. 15, 1984.]

**April 18:** Kennedy Space Center awarded Railroad Track Construction Corp. (St. Augustine, Florida) a $1,224,653 contract to maintain the space center's railroad system. The contract made Railroad Track Construction Corp. responsible for the maintenance, repair and replacement of the signals, switches, rails and ties that constitute the Space Center's 42 miles of railroads which are operated by EG&G. Rail transport is used to relocate the solid rocket booster segments as well as other shuttle and industry related hardware. The cost plus fixed fee award formalizes a letter contract initiated in the fall of 1983 and covers the period from October 10, 1983, to October 9, 1984, and includes an option for a one-year extension. [Varnes. NASA/KSC NEWS RELEASE No: 86-84, Apr. 18, 1984.]

<> Challenger returned to Kennedy Space Center strapped to its 747 carrier jet, five days after bad weather forced it to land in California rather than Florida. The piggyback pair landed at 10:09 a.m. EST after a 3-hour and 20-minute flight from Kelly Air Force Base in San Antonio, Texas, where they stayed overnight. The cross-country flight began April 17 at Edwards Air Force Base in California. NASA officials said that the loss of time might delay the orbiter Discovery's June 19 maiden flight by only two or three days rather than five or six as originally estimated. No official rescheduling was announced. An orbital maneuvering system pod must be removed from Challenger and installed on Discovery. The pod was borrowed from Discovery to replace one that was damaged during Challenger's mission in February. ["Challenger Returns by Piggyback to KSC," THE ORLANDO SENTINEL, p. C-2, Apr. 19, 1984.]

**April 23:** NASA officials are considering ending as many as the next 11 shuttle missions at Edwards Air Force Base in California so the space agency can devise safer landing methods at Kennedy Space Center. The frequency of bad

weather at KSC is a main reason behind the possible switch. "We review these things before every mission, just to see if there is anything unusual" that would prohibit a KSC landing, said Ron Grave, deputy manager for shuttle operations integration at Johnson Space Center. "It is not unusual for us to reconsider this type of thing." [Fisher. THE ORLANDO SENTINEL, pp. A-1 & A-7, Apr. 24, 1984.]

<> Eight old launch sites at Cape Canaveral Air Force Station, used during the 1960s, have been designated national historic landmarks. The eight launch pads - including Complex 14 where astronaut John Glenn started the first orbital flight by an American - were named landmarks by the Department of the Interior last week, U.S. Rep. Bill Nelson announced at a press conference. As national historic landmarks, the launch sites cannot be torn down, said Ted Moorehead, an aide to the Melbourne congressman. Moorehead said federal dollars would be provided for the pads' upkeep. The launch sites are:

* Complexes 5 and 6, where the two manned Mercury-Redstone flights began.

* Complex 26, which is part of the Air Force Museum.

* Complex 13, where Atlas-Agenas launched deep space probes.

* Complex 14, where manned Mercury-Altas flights originated.

* Complex 19, where manned Gemini flights were launched.

* Complex 34, where Apollo-Saturn 1 and Apollo-Saturn 1B Earth-orbit test flights were launched.

* And the old Mercury mission control building.

Among those sold for scrap were the towers at Complex 19, where 20 men were placed into orbit; Complex 14; and Complex 34. The remains of Complex 26, where America's first satellite was launched, are in danger of rusting away. The push to preserve the old gantries dates back to the early 1980s when a TODAY editorial campaign urged they be designated historic sites. The last Apollo launch tower at Kennedy Space Center was to be sold as scrap, according to initial plans. Instead, a battle that lasted more than a year resulted in it being dismantled and stored for preservation. The Interior Department first studied the possibility of designating the entire Air Force Station a

national historic landmark, but chose not to because some parts of the station were still in use, Moorehead said. "You can't very well function out of a museum," he said. Several of the launch pads now are open to the public. Because parts of the Air Force Station are restricted, military officials still are considering whether they can open the other launch complexes for public tours. [Thomas. TODAY, p. 1B, Apr. 25, 1984.]

<> Kennedy Space Center announced that it had awarded Fairchild Weston Systems, Inc.'s Data Systems Division (Sarasota, Florida) a $4,317,000 contract for the Launch Equipment Integration System (LEIS) to be used at Vandenberg Air Force Base, California. The contract calls for Fairchild Weston to design, assemble, install and checkout the LEIS to be used in the launch control center. The LEIS consists of a remote control 400-channel programmable signal conditioning and pulse-code modulation data acquisition system. This system will provide real time data to test controllers in the firing room. The information received will indicate the amount of accoustical and environmental stress occurring to the space shuttle, flight hardware and pad structures in relation to current operations at the launch pad. The LEIS will also provide support during shuttle quick-response testing solid-rocket booster stacking operations, and other launch related activities. The firm fixed price contract was awarded March 12, 1984, and calls for all work to be completed by May 1985. The equipment will be built in Sarasota, and delivered and tested by Fairchild Weston at Vandenberg AFB. [Varnes. NASA/KSC NEWS RELEASE No. 87-84, Apr. 23, 1984.]

**April 24:** A proposal made by managers at Johnson Space Center in Houston could divert as many as five missions this year from the Kennedy Space Center, sending them to landings at Edwards Air Force Base in California. Eugene Kranz, director of shuttle mission operations at Johnson, said "several open issues" need to be resolved before managers feel comfortable landing the spaceplane at KSC. Those issues primarily revolve around KSC's notoriously unreliable weather. Spokesman Jim Kukowski at NASA headquarters in Washington cited the following as specific concerns Johnson engineers say they want satisfied before proceeding with KSC landings:

* Demonstration of a satisfactory crosswind landing capability. The strongest crosswind the shuttle has ever landed in is 10 mph, and engineers would like to see how the shuttle lands in crosswinds as strong as 18 mph.

* Correction of nosewheel steering deficiencies, to further check the shuttle's lateral control under less than ideal landing conditions.

* Demonstration of automatic landing capability, which could assist in bringing down the spaceplane in less than ideal conditions. The "auto-land" system is scheduled for its first test in August at Edwards.

* Upgrading of weather forecasting at KSC.

Engineers say they prefer to clear up unknown landing variables on the extra-long dry lakebed runways at Edwards rather than in the tighter confines of KSC's swamp-surrounded concrete strip. KSC spokespersons said they were unaware of the changes being considered at Johnson. "Our principal concern is our inability to forecast the weather there (KSC) in our de-orbit time," Kranz told TODAY. But he called managers' proposal to re-route the next several flights to Edwards "a judgmental thing." Kranz also said that if program contingencies, such as a tight post-flight turnaround timetable, demand a KSC landing, "then we have to step up and accept some of those risks" entailed in a KSC touchdown. Landing at Edwards adds about a week to NASA's orbiter turnaround schedule, and costs something over a half-million dollars extra. Modifications are being implemented jointly by NASA and Air Force weather watchers in the meteorological forecasting procedures used at the spaceport, Kranz said. Those improvements include better displays for tracking storms, a network of small reporting stations scattered around Kennedy to keep track of local weather conditions, and improved communication between KSC and Mission Control in Houston. As for testing the Orbiter's crosswind landing capability, Kranz said mission managers will simply watch the weather at Edwards and bring the orbiter down on a runway experiencing the right conditions. "I want to get a crosswind landing as soon as I can," he said. [Yacenda. TODAY, pp. 1A & 20A, Apr. 25, 1984.]

**April 25:** U.S. Rep. Bill Nelson charged that the Defense Department should help pay for a space station or a fifth shuttle if it expects to back out of an agreement to launch its payloads exclusively from the shuttle. An Air Force request to buy at least 10 redesigned unmanned rockets for more than $1 billion beginning in 1988 veers from U.S. policy that makes the shuttle the government's only launch vehicle after 1986, the Melbourne [Florida] Democrat said. The change would affect financing of the shuttle program and the Air Force should be forced to chip in elsewhere to make

up for the loss of business, Nelson told military and space industry officials at the 21st Space Congress in Cocoa Beach, Florida. [Fisher. THE ORLANDO SENTINEL, pp. B-1 & B-8, Apr. 25, 1984.]

<> NASA is already feeling the pressure of increased competition in space and unless its operations are streamlined "we're not going to survive," Gerald Griffin, director of Johnson Space Center in Houston said Wednesday in Cocoa Beach. The private aerospace industry in the United States also must become more daring if it expects to keep up with competition from companies and governments elsewhere in the world, said Dick Smith, Director of Kennedy Space Center. Griffin, Smith and several other officials outlined plans for improving the shuttle program and making the U.S space effort more efficient during a panel discussion at the 21st annual Space Congress. The three-day symposium in Cocoa Beach ends today. [Fisher. THE ORLANDO SENTINEL, pp. C-1 & C-5, Apr. 26, 1984.]

**April 26:** NASA's dreamers want to plan a space station so flexible and adaptable that its design could later evolve into such greater wonders as a moon base, space industrial park or a hotel for space tourists. The design for the permanently manned space station also will have to be simple enough that the orbiting structure can be used by a variety of businesses and several foreign countries, and be easily improved with technological advances. NASA officials, who have asked for $150 million next year to start planning the station, shared their ideas and dreams at the last session of the 21st annual Space Congress in Cocoa Beach, Flo ida. They said the design work should take three years and the station, to be assembled in modules like "tinker toys," is planned for operation by 1994. [Fisher. THE ORLANDO SENTINEL, pp. B-1 & B-7, Apr. 27, 1984.]

<> Kennedy Space Center will continue to serve as the primary landing site for routine shuttle missions, said U.S. Rep. Bill Nelson (D-Melbourne, Florida) at a news conference called to dispel rumors that Edwards Air Force Base, California, would replace KSC as the shuttle's designated landing site. Nelson said he received the personal assurances of Jesse Moore, NASA's acting associate administrator for spaceflight, and Hans Mark, deputy administrator of NASA, that the shuttle schedule would remain unchanged. "The story is untrue," Nelson said of reports that the next 11 flights would be scheduled for

California landings. "Now there is a basic reason for landing at KSC," Nelson said later, "and that is cost." Designating California as the prime landing site might entail dispersing part of KSC's work force to Edwards. In addition ferrying the shuttle from Edwards to KSC lengthens the time between missions and delays the program's goal of becoming economically self-sufficient. Officials at Johnson Space Center said earlier this week that they had proposed switching from KSC to Edwards until a better weather forecasting system was developed for KSC and until shuttle landing equipment was improved.

The NASA press office in Washington repeated its earlier statement that it has yet to receive the request from Johnson. Nelson said that Edwards will be used as the primary landing site for experimental shuttle missions but that routine flights will continue to be scheduled for Kennedy landings. [Reidy. THE ORLANDO SENTINEL, p. A-3, Apr. 27, 1984.]

## MAY 1984

**May 2:** The space shuttle Discovery won't land here after its week-long inaugural flight in June because a dry lake bed in California allows more room for error for the untested spaceship, NASA officials said. The space agency also announced that the two satellites lost in February may be rescued during a November mission if agreements between the owners and insurance companies can be worked out. NASA spokesman Jim Kukowski said, "I don't know why" the Discovery landing had been originally scheduled at KSC. "I know it sort of surprised a lot of us when KSC popped up." [Fisher. THE ORLANDO SENTINEL, p. C-1, May 3, 1984.]

**May 3:** NASA officials are negotiating to shift some space shuttle planning and control work to Kennedy Space Center from Johnson Space Center in Houston gradually during the next decade as the program matures. KSC Director Dick Smith said that details should be announced within a few months but the changes won't mean many more jobs at the space center. All mission control, planning and support operations won't be moved to KSC for "quite some time, if ever" because of the large amount of facilities and personnel involved. NASA Administrator James Beggs called the moves "a change in the center of gravity of shuttle operations" that will take place over the next five to ten years. The idea has been discussed for a decade, but the negotiations began recently because the shuttle program has become operational instead of experimental. More launches - up to 24 a year - mean a greater focus on KSC, Smith said. Johnson Space Center's recent designation as headquarters for development of proposed $8 billion space station is another factor.

Smith compared the generally increased focus on KSC to the handling of a new commercial aircraft. A designer or manufacturer such as Boeing remains heavily involved in the operation of a new plane during the first few years, but gradually the airline takes over full operation. "The shuttle program is maturing" into its own operational phase, Smith said. That requires streamlining operations and holding down costs and personnel to keep NASA competitive for payload deliveries, Smith said. "I would hope if there is any growth (because of the changes) it would be very minor," he said. Smith said officials from both centers still disagree on some areas but negotiations are "open and friendly. Cool heads prevail," he said. Griffin, who spent

four years until 1981 at KSC as deputy director, agreed that negotiations are going "pretty smoothly." Smith expects no dramatic changes at KSC in the next 10 years, but "it will be upgraded and modernized...and more efficient," he said. "A rapid change would carry with it a substantial risk I think would not be prudent to take." [Fisher. THE ORLANDO SENTINEL, pp. A-1 & A-10, May 4, 1984]

**May 5:** Air Force Lt. Jim Ramsey and members of the 655th Aerospace Test Group launched a model rocket at 9:34 a.m. EDT to commemorate the 23rd anniversary of Alan Shepard's "Freedom 7" launch on May 5, 1961. The model launch occurred near Complex 5-6 at the Air Force Space Museum. "We were thrilled to have been able to do that," Capt. John London of the 655th said the next day. "As our guys were leaving, they were talking up a 25th anniversary and of doing it BIG. They'd like to get Shepard here, and build a bigger, better model - one that would go higher and go up slower." The builder of the model was Lt. Ramsey who was a month and half old when Shepard's launch took place. The firing button in the original blockhouse was used to ignite the model rocket motor. Captain Jim Tippins of the 655th ran wire from the "launch pad" through the original cable tray right up to the button on the blockhouse console control panel. May 1961 launch team members who were there, and their jobs then include:

Frank Childers (calibration lab), Ray Clark (range liaison officer), Paul Donnelly (spacecraft test conducter), Ray Godtrey (Pan Am range support), Norris Gray (Pan Am fire chief), Walt Kapryan (spacecraft project engineer), Bob Murkshe (RCA range support), Ike Rigell (chief of electrical networks), and firing button pusher Karl Sendler (chief of electronics). [Salamon. TODAY, p. 1B, May 8, 1984.]

**May 8:** Minor problems in processing the new orbiter Discovery delayed the Shuttle's move to the Vehicle Assembly Building for a few days, NASA spokesmen said. Discovery will be moved to the VAB May 12 to begin attaching the external fuel tank and twin rocket boosters, NASA spokesman Dick Young said. A malfunctioning ground support system that had to be replaced added to the delay in processing, Young said; he also said that NASA should have an FRF test date to announce later in the week. Depending on a successful test of the engines, the date for Discovery's maiden voyage will be confirmed; the tentative date is June 19. ["Discovery's Move to VAB is Postponed," TODAY, p. 4A, May 9, 1984.]

**May 12:** The shuttle Discovery was moved to its new nest in the Vehicle Assembly Building after a delay of 12 1/2 hours. KSC workers now will begin attaching the external fuel tank and twin rocket boosters to the orbiter. Discovery's maiden voyage remains scheduled for a June 19 launch date - depending on a successful engine test. ["Discovery in VAB," TODAY, p. 20A, May 13, 1984.]

**May 13:** Workers ran into more delays getting the new space shuttle Discovery ready for its maiden flight next month when they fell behind schedule processing the orbiter in the Vehicle Assembly Building. After its arrival in the VAB late on May 12, technicians were expected to begin attaching the reusable rocket plane to its tall external fuel tank and twin solid rocket boosters. NASA spokesman Hugh Harris said problems getting the shuttle's landing gear firmly locked in place threw the schedule off again. [UPI, "Work on Discovery Meets With More Delays," THE ORLANDO SENTINEL, p. B-6, May 14, 1984.]

**May 14:** Weekend delays in preparing the new space shuttle Discovery for its maiden flight June 19 forced Kennedy Space Center officials to revamp their processing schedule, a KSC spokesman said. "In a practical sense, it (the rollout from the VAB) won't be Thursday (May 17)," said Rocky Raab, KSC spokesman. Discovery's electronic and mechanical systems are scheduled to be tested at 7:30 a.m. EDT today, officials said. Afterward, three remaining tests will be rescheduled, Raab said. A countdown dress rehearsal with the shuttle crew must be squeezed into the astronauts' final training, Raab said. A flight readiness firing of the shuttle's engines will add to the schedule since this is the orbiter's first flight. And the shuttle's onboard propellant tank and fuel storage propellant must be put on the orbiter. The six-person crew scheduled to take part in the initial voyage are: Henry Hartsfield, Michael Coats, Judith Resnick, Steven Hawley, Richard Mullane, and Charles Walker. ["Space Shuttle's Move to Launch Pad Changed Due to Orbiter Delays," TODAY, p. 4A, May 15, 1984.]

<> Air Force Undersecretary Edward C. Aldridge, Jr., smashing a bottle of California wine, dedicated the USA's second launching site for space shuttle flights at Vandenberg Air Force Base, California. [Marshall. USA TODAY, p. 3A, May 15, 1984.]

**May 16:** The $8.5 million addition to the Kennedy Space Center's Visitors Center continued on its construction schedule and most of it should be ready for its opening on June 1, said Public Relations Manager George Meguiar. The new complex houses two theaters, a second restaurant, a ticket center and 10,000 square feet of additional exhibit space. "We had just a few normal construction problems," Meguiar said. He said the center has no immediate plans for further construction to accommodate the almost 2 million people who visit the center each year. Kennedy Space Center is the fourth most popular tourist attraction in Florida behind Disney World, Busch Gardens and Sea World. TWA Services Inc. operates the Visitors Center and the bus tours. [Shipley. THE TRIBUNE, p. 2A, May 16, 1984.]

**May 17:** Electrical testing problems on the space shuttle Discovery forced NASA officials to delay the new orbiter's rollout to the launch pad until 3:30 a.m. EDT on May 19th. "We have had some difficulty in the last several days with pins in electrical connections," said NASA spokesman Rocky Raab. Those electrical parts play a crucial role in transmitting signals from the shuttle to ground stations, he said. Technicians had resolved most of the problems, according to NASA spokesman Jim Ball, but more tests were continuing to insure Discovery's electrical system was working properly. Meanwhile, a cargo processing team prepared a communications satellite scheduled to be deployed from Discovery's cargo bay on the second day of its seven-day mission. [Mingle. TODAY, p. 1A, May 18, 1984.]

**May 23:** NASA is considering test-firing the Discovery's three main engines one day early on June 1, launch officials said. Crews loading fuel into Discovery are working six to eight hours ahead of schedule. They may complete their task on the 24th, making it possible to move up the test-firing, NASA spokeswoman Leslie Vock said. The final date for the 20-second test-firing will be set later, Vock said. "It all depends on how the rest of the operation goes." Workers loaded propellants into reaction control system tanks and the orbital maneuvering system tanks, she said. NASA technicians also completed final checks of Discovery's payloads in preparation for loading them into the cargo bay the day after the test-firing. [Williams. TODAY, p. 1A, May 24, 1984.]

**May 24:** Astrotech International Corp., which recently opened a plant in Brevard County, authorized McDonnell Douglas Corp. to begin work on the design and development of the Delta

Transfer Stage, a new upper stage for the space shuttle, the company announced. Astrotech allocated an initial $1 million to McDonnell Douglas for the project. The two firms are entering into final contract negotiations and expect to reach a definitive agreement within 90 days for a total budget of $50 million. [Hodges. TODAY, p. 16C, May 25, 1984.]

**May 25:** Martin Marietta Aerospace Corp. (Denver, Colorado) was awarded a $3.7 million NASA contract for a new communications system linking the space shuttle's Launch Complex 39's facilities. Additionally, the company received a $2.7 million contract to extend the new system to the industrial area at Kennedy Space Center. [Kassak. TODAY, p. 18C, May 26, 1984.]

**May 29:** Businessland Corp. (Merritt Island, Florida) won a $147.786 NASA contract to supply small computers for various work stations at Kennedy Space Center. The computers will help to reduce the engineering workload of KSC's main computer by shifting some of the job to desktop units. The small computers will allow local transmission of text and data, which can either be processed by them or relayed to a main-frame computer. [Kassak. TODAY, p. 14C, May 30, 1984.]

<> Kennedy Space Center workers directed the space shuttle Discovery through a rehearsal of engine tests in preparation for a real exam later this week to determine the orbiter's launch date. The 2:49 p.m. EDT simulation went "fine" and was completed without incident, said NASA's Rocky Raab. The Flight Readiness Test is designed to detect flaws that could hinder a launch, NASA officials said. "If there are any bugs in the system, it gives you a chance to work them out," said NASA spokesman Jim Ball, adding the flight test is basically a "confidence run." [Mingle. TODAY, p. 6A, May 30, 1984.]

**May 31:** Citing equipment problems, NASA postponed two 1984 shuttle flights until early 1985, leaving five missions for this year. The schedule will be further adjusted after a test-firing of Discovery's engines on June 2, when the space agency will set a final date for the orbiter's first flight in late June. NASA postponed the second flight of Spacelab from November to January, and the launch of the second

Tracking and Data Relay Satellite from December to February. The latest delays were mainly due to malfunctions in two types of booster engines that send satellites into higher orbit after they are released from the shuttle, said NASA spokesman Dave Garrett from Washington. Problems with the boosters, called Inertial Upper Stages and Payload Assist Modules, "really played havoc with some of our scheduling," Garrett said. The new schedule shows that payloads have been reshuffled to work around the availability of booster engines and various time constraints. Garrett played down the financial impact of the changes. "I don't think it's a big setback for us. We have (just) done some juggling around with our schedule." [Fisher. THE ORLANDO SENTINEL, pp. A-1 & A-7, June 1, 1984.]

## JUNE 1984

**June 1:** Fairchild Weston Systems Inc. (Sarasota, Florida) won a $3.8 million NASA contract for the delivery, installation, checkout and test of a permanent measurement data acquisition system for Launch Complex 39 at the Kennedy Space Center. The new system is a replacement of the current acoustic system used during the Apollo launches. [Kassak. TODAY, p. 16C, Jun. 2, 1984.]

**June 2:** The test-firing of Discovery's three main engines was declared the most successful of any shuttle, although an analysis of test results were not expected to be completed before June 4th. The 18-second test at launch pad 39-A took place at 11:01 a.m. EDT. Restrained by hold-down posts, the shuttle lifted slightly off the pad before dropping back in place. When the engines were cut, the Discovery rocked for about a minute, settling at a northward tilt of about 1 foot, said Launch Manager Robert Sieck. The tilt - known as the "twang effect" - normally follows initial engine thrust, and corrects itself, Sieck said. NASA spokesman Rocky Raab said launch managers planned to set a firm date for Discovery's maiden flight by the morning of June 5th. Thomas Utsman, director of shuttle management and operations, said preliminary data showed no leaks or equipment failures, and that, the test countdown went smoothly. "I think it shows the maturity of the hardware," he said. [Shimabukuro. TODAY, pp. 1A & 20A, Jun. 3, 1984.]

**June 4:** National Park Service officials said they will switch alignments of State Road 402 and a nearby railroad track to keep Playalinda Beach open 75 percent of the time despite stepped-up space shuttle launches. But unless alternative funding is found, the change cannot be completed before 1991.

The beach, part of the Canaveral National Seashore, is on NASA property. S.R. 402 reaches the beach in the middle of NASA's 3-mile security zone around the shuttle launch pad. A NASA announcement earlier this year that the beach may be closed premanently to the public by 1988 as space shuttle launches increase was greeted by public outcry. [McLaughlin. THE ORLANDO SENTINEL, p. B-1, Jun. 5, 1984.]

<> NASA officials pushed back this week's planned launch of an Atlas Centaur expendable rocket. They also hedged on setting a firm date for the maiden liftoff of the Discovery later in June. Sources at NASA Headquarters in Washington said, however, that June 21 or June 22 were likely dates for Discovery's departure, with June 22 the more probable launch date. Officials now have set departure of the expendable Atlas Centaur and its payload from Cape Canaveral Air Force Station's pad 36B for 7:03 p.m. EDT June 9. [Yacenda. TODAY, p. 1A, Jun. 5, 1984.]

**June 5:** Although some technical bugs have yet to be worked out, NASA officials said the space shuttle Discovery will debut with a Kennedy Space Center launch at 8:43 a.m. EST Friday, June 22. The shuttle is scheduled to land Friday, June 29, at 6:35 a.m. PDT at Edwards Air Force Base in California. But NASA officials also said the launch date would be reassessed in about a week, when the full results of June 2's flight readiness test have been analyzed. [Yacenda. TODAY, p. 1A, Jun. 6, 1984.]

**June 6:** Kennedy Space Center Tours, known for years by millions of visitors to America's best-known space center, is no more. The organization - owned and operated by TW Services Inc. (also known as TWA Services) - goes on, but under a new name: NASA Kennedy Space Center's Spaceport USA. [Yacenda. TODAY, p. 2B, Jun. 7, 1984.]

**June 8:** Replacement of one of three main engines forced NASA officials to delay Discovery's inaugural flight by at least three days. Agency officials announced the mission would depart from Kennedy Space Center no earlier than June 25, pushed back from the June 22 date announced June 5. Shuttle managers decided this morning to replace the No. 1 engine after a heat shield attached to a preburner device on the engine was found to be partially debonded. Officials said work began right away to change out the engine and will continue night and day throughout the weekend. Officials, do not plan to conduct another test firing of Discovery's main engines prior to launch. [Yacenda. TODAY, pp. 1A & 16A, Jun. 9, 1984.]

**June 9:** The $30 million INTELSAT V satellite was lost in space following a perfect launch atop an Atlas-Centaur rocket from Cape Canaveral Air Force Station. NASA officials were

unable to pinpoint the cause of the failure that sent the INTELSAT V-F9 spacecraft into a severe tumble prior to restart of the second stage Centaur engine. Initial indications pointed to restart of the second stage Centaur engine. Allan McCaskill, INTELSAT launch vehicle program manager, said there was nothing that could be done to save the satellite, which never separated from the Centaur stage and wound up tumbling in a useless orbit of 92 miles by 765 miles in altitude. "We're disappointed, not crippled," McCaskill said about the affect of the satellite's loss on INTELSAT's international telephone and television broadcasting operations. [Yacenda. TODAY, pp. 1A & 20A, Jun. 10, 1984.]

**June 10:** Investigations into why a $30 million international communications satellite tumbled out of control focused on a new control system flown for the first time. The system consists of 14 small jets intended to keep the upper stage of the Atlas-Centaur booster rocket flying straight. Launch conductor Skip Mackey said that fuel filter in one of the jet thrusters may have become clogged, causing the Centaur and the attached Intelsat 5 satellite to spin out of control 23 minutes after it was launched the night of June 9. Allan McCaskill of the International Satellite Communications Organization said "nothing can be done to salvage" the satellite. It was the first satellite launch failure since September 1977 when another Atlas-Centaur malfunctioned. [Associated Press. THE ORLANDO SENTINEL, p. B-4, Jun. 11, 1984.]

**June 11:** NASA officials, pleased with the weekend transfer of a new main engine to the shuttle Discovery, began testing the mechanical and electrical connections for the three main engines. The "new" main engine came to Discovery from its sister ship Challenger.

Technicians also completed testing of mechanical and electrical connections between the shuttle and two of its major cargoes, a Navy SynCom 4 satellite and a pallet carrying a solar panel that will be extended to 105 feet in length in space. KSC spokesman Mark Hess said managers planned to close Discovery's payload doors for the last time before flight early June 12. [Yacenda. TODAY, p. 4A, June 12, 1984.]

**June 12:** Kennedy Space Center expanded its existing contract with the PRC Systems Services Co. (Cocoa Beach, Florida) by $3,114,227. Under the basic contract, PRC provides engineering support for the Directorate of Engineering Development for future shuttle programs, Centaur programs, and multi-programs that include drafting and illustration, cost estimation and special studies associated with mission space developments. The contract expansion provides 56 additional man-years of services in support of the Department of Defense's operating requirements at Vandenberg Air Force Base in California, Kennedy Space Center, and the Cape Canaveral Air Force Station. The new award brings the aggregate value of the overall contract to $40,806,682. The basic contract period extends from October 1, 1983, through September 30, 1984. [Peebles. NASA/KSC NEWS RELEASE No. 117-84, Jun. 12, 1984.]

**June 13:** A communications satellite, a solar panel and a large camera were secured in space shuttle Discovery's cargo bay as the crew prepared for a practice countdown. The rehearsal is scheduled for a practice on June 14. Commander Henry Hartsfield and pilot Michael Coats practiced landings in a jet outfitted to handle like the shuttle. The other crew members, mission specialists Judy Resnik, Steve Hawley and Richard Mullane and payload specialist Charles Walker, reviewed flight plans for the mission, scheduled for June 25. [Associated Press. THE ORLANDO SENTINEL, p. C-5, Jun. 14, 1984.]

**June 14:** A dress rehearsal countdown test with Discovery's six-person crew aboard went off with only minor problems. Mock main engine ignition came three minutes late when a software glitch temporarily shut down the count at about T-4 minutes. "I think we're very fortunate. We have a great crew. We had a good time training. And we're ready to go," commented mission specialist Judith Resnik whose flight will make her the second Amercian woman to go into space. Hank Hartsfield, commander for this 12th shuttle mission (Flight 41-D) had some strong remarks to make about the designated landing site at Edwards Air Force Base, California. "That's where I wanted to land for the first flight of all new vehicles."

Passing lightning storms delayed the astronauts meeting with media representatives at the foot of launch pad 39A where Discovery stands. [Yacenda. TODAY, p. 17A, Jun. 15, 1984.]

**June 15:** NASA has named a Failure Review Board to investigate the Atlas-Centaur 62 launch that failed to place an Intelsat communications satellite into the proper orbit on June 9, 1984. Dr. Milton A. Silveira, NASA's Chief Engineer, NASA Headquarters, will head the investigative board. J. Robert Lang, head of Hypergolic Systems Section, Fluid Systems Division at KSC was named to the FRB. Named to the Contractor's Investigation Team was James L. Womack, who has responsibility for controlling Data/Facilities at Kennedy; he is Chief of Centaur Operations Division. [Kukowski and Peto. NASA/KSC NEWS RELEASE No. 84-79, Jun. 15, 1984.]

**June 18:** Discovery will make its maiden flight on June 25, NASA officials decided during an all-day meeting. Launch time for the flight is set for 8:43 a.m. EDT from KSC's pad 39A. "There was no change. It still looks good for the 25th," KSC chief spokesman Hugh Harris said. "Everyone looks ready to support a launch date on the 25th." Mark Hess, another spokesman, reported that preparations were proceeding on-schedule for the planned liftoff. Under the current schedule, the terminal countdown should pick up at 3 a.m. EDT on the 23rd with the call to stations for the six-member launch team. ["Discovery to Launch as Scheduled," TODAY, p. 1A, Jun. 19, 1984.]

**June 20:** The Martin Marietta Aerospace Michoud Division in New Orleans earned a superior performance rating by NASA for its space shuttle launch processing work which includes processing the shuttle's external tanks and operating the propellant facilities at Kennedy Space Center. NASA also recognized Martin Marietta for its effective administration and business systems. [Kassak. TODAY, p. 14C, Jun. 20, 1984.]

<> "Space," the movie based on James Michener's bestselling novel, will be filmed on location at Kennedy Space Center next month. Paramount Network Television Productions has reserved rooms at the Holiday Inn in Cocoa Beach from July 24 for 25 production crew and cast members, who will be filming scenes for the upcoming movie "Space," starring James Garner. Directed by Lee Philips and Joseph Sargent, the $35 million made-for-television movie will be aired on CBS in early 1985, said Gillian Reef, Paramount Pictures publicist. The five-part mini-series is an adaptation of Michener's novel detailing the lives of fictional people involved in the American space program from World War II to 1973, Reef said. [Smith. THE TRIBUNE, pp. 1A & 5A, Jun. 20, 1984.]

**June 21:** Forecasters predicted that the weather for the maiden launch of Discovery will be good on June 25. Technicians loaded the last ordnance, or small explosives needed for flight safety and vehicle separation tanks on Discovery. The launch pad sound-suppression system, which dumps 300,000 gallons of water atop the launch pad just prior to engine ignition, also was readied. [Yacenda. TODAY, p. 5A, Jun. 22, 1984.]

<> Manpower makes up a large portion of the space center's budget, and 90 percent of KSC's budget goes to the local economy, Center Director Richard Smith, told local business leaders at a community breakfast recently at the KSC Visitors Center. Smith briefed the business representatives on space shuttle operations, the Expendable Vehicles Program, and the role that KSC would play in the development of the Space Station. ["KSC Budget Benefits Area," STAR GAZER, p. 6, Jun. 21, 1984.]

**June 22:** Four of the five men and the one woman scheduled to fly aboard Discovery on the 25th arrived at KSC at 4:05 p.m. EDT Friday, completing a three-hour flight from Houston's Ellington Air Force Base in their T-38 jet trainers. The sixth member of the crew, paying passenger Charles Walker, had flown in about two hours earlier aboard a larger Gulfstream II Shuttle Training Aircraft. "As far as I know, everything is going well with the flight," said mission commander Henry Hartsfield, Jr., immediately after touching down at KSC's shuttle runway. "Last I heard, the bird was in good shape," he said. "I can tell you one thing. The crew's ready to go. They've been nipping at my heels for the last year. Now they're seeing the end in sight. And they're really ready to go." Hartsfield said the crew "fought the thunder storms" for awhile on the way from Houston. "But we managed to stave our way through," he added.

All other elements preceding start of the terminal countdown were advancing smoothly, after engineers encountered and resolved difficulties with Discovery's two on-board mass memory computer units. One of the critically important units had to be replaced with a spare when tests revealed it had a hardware problem. The replacement unit checked out fine, but then the orbiter's second memory unit began performing inconsistently. Engineers said they understand the problem sufficiently well to know that it poses no flight hazard. Program managers decided to fly with the unit as it is, officials said. Other final preparations

prior to picking up the count included purging reactants from Discovery's electricity-producing fuel cells, and installation of flight doors on the forward skirt sections of the shuttle's twin solid rocket boosters. Final preparations were also performed on two of Discovery's major cargoes. Technicians charged the batteries on the Navy telecommunications satellite that the shuttle is scheduled to ferry into space. And a device that will process biological materials during the mission was flushed out. Walker will operate that device, called a Continuous Flow Electrophoresis System, for McDonnell Douglas during his stay aboard the Discovery. [Yacenda. TODAY, pp. 1A & 12A, Jun. 23, 1984.]

**June 23:** Computer Specialties Inc. (Melbourne, Florida) won a NASA maintenance contract for the IBM Personal Computers which will be installed at various locations at Kennedy Space Center. [Kassak. TODAY, p. 8C, Jun. 23, 1984.]

**June 24:** Shuttle program managers said they are looking at two, and possibly more, alternative shuttle landing sites in Florida, and flight programs could be developed to use them by February. Shuttle Operations Manager Glynn Lunney said officials were looking at Cecil Naval Air Station in Jacksonville, about 160 miles north of Kennedy Space Center, as the primary backup site. Also under consideration is Homestead Air Force Base near Homestead, south of Miami, about 250 miles from the spaceport. Other alternatives, including MacDill Air Force Base in Tampa, Orlando International Airport, and Miami International, were looked at, but probably would be rejected because of location or conflict with civilian air traffic. Shuttle Program Operations Manager Jay Honeycutt said alternative flight plans could be developed and put into flight computer programs as early as February. [Yacenda. TODAY, pp. 1A & 8A, Jun. 25, 1984.]

<> A private plane flew into the restricted area at the pad where Discovery stood ready for launch. It was intercepted by a NASA security helicopter and trailed until it was out of the vicinity of Kennedy Space Center. The plane, a blue and white Cessna 140, was seen at 9 a.m. EDT flying up the Atlantic Ocean beach from south to north, only 10 to 20 feet above the water - a technique used by drug runners to evade radar, spokesman Hugh Harris said. The helicopter flew within 200 feet of the intruder to get an accurate

identification, and followed it to a point north of Daytona Beach. Law enforcement authorities were notified. [AP. THE ORLANDO SENTINEL, p. A-4, Jun. 25, 1984.]

**June 25:** NASA officials carefully monitored changing weather patterns on the 24th but predicted clear skies for today's 8:43 a.m. EDT debut of Discovery. "Things look quite well" at the pad, said Jesse Moore, acting chief of the shuttle program. "The processing is going great. The crew is ready, the cargo is ready and the only concern is with the weather." A front moving into the Cape Canaveral area from the west on the night before launch was expected to bring dry weather and a few clouds, said Air Force forecaster Capt. Art Thomas. However, if it rained during the night it could have left enough moisture in the air to trigger early morning fog, he said. Weather at contingency landing sites around the world indictated no problems, said Thomas. [Fisher. THE ORLANDO SENTINEL, pp. A-1 & A-4, Jun. 25, 1984.]

<> The debut of the shuttle Discovery was scrubbed just nine minutes before liftoff and technicians worked into the night to prepare it for launch on the 26th. NASA officials rescheduled the mission to start at 8:43 a.m. EDT but warned that meeting the timetable would depend on the weather and an analysis of why the backup computer malfunctioned. The computer was replaced with one pulled from the Challenger, which was in a space center hangar undergoing preparations for a mission in November.

NASA officials estimate that each day's delay costs from $1.5 million to $2 million. The launch-day problem arose with a glitch that was detected with 32 minutes left in the countdown. When a more serious failure came 10 minutes later, officials realized the problem was major. NASA officials decided they couldn't pinpoint the problem and fix it within the 43-minute launch window and called it quits. "It was pretty much unanimous," said Tom Utsman, director of shuttle operations and management. "I don't know of anybody who would have felt comfortable flying today." [Fisher. THE ORLANDO SENTINEL, pp. A-1 & A-6, Jun. 26, 1984.]

**June 26:** With two of Discovery's three engines already ignited, a computer system sensed engine trouble and stopped the spaceplane's first launch just four seconds from liftoff. Hydrogen fumes beneath the untried orbiter then ignited in

three short bursts but the flames were doused quickly by an automatic water spray. The five men and one woman in the crew, strapped on their backs 140 feet above the fire, were "not in any danger," NASA officials said. Commander Henry Hartstield said, "There was never any great apprehension or concern among the crew," although they "were prepared to bail out" and slide down a 1,200-foot escape wire in baskets.

"The crew was very quiet" during the action, said Hartstield, 50, who piloted the fourth mission. "We were all just listening to the communications loop and the launch team kept us very much aware of what was happening. There was never any great apprehension or concern." Hartsfield said the crew was "very interested in the conversations concerning the fire. We were prepared to bail out if necessary." Utsman said the ground launch crew "acted with dispatch in a cool and professional manner. I think the crew was not in any danger" that had not been planned for, Utsman said. If the emergency systems had not been in place and working "it could have been a very dangerous situation for the crew." Mission planners said their monitors indicated the danger at the pad wasn't serious enough to evacuate the crew using the emergency baskets. They are designed to take astronauts from the top of the launch tower to the safety of a concrete bunker. Crew members were released for the weekend while technicians sorted out the problems. But early afternoon Judy Resnik, 35, and Steve Hawley, 32, were on a plane for Houston.

NASA officials said they aren't sure what malfunctioned and whether it was a problem with the fuel valve or the first computer channel. Workers will probably have to remove the engine heat shield, make the necessary repairs, check and fix any water or other damage, reattach the shield and go through another 2 1/2-day countdown, NASA officials said. Utsman said he didn't think the failure reflected badly on the shuttle because it was the first orbiter-related problem since the engine leaks early last year postponed the debut of Challenger for two months. "We have launched six in a row, I believe, without a hitch," he said. "I would hope that our customers would realize again that as in any new venture we're going to have failed components." [Fisher. THE ORLANDO SENTINEL, pp. A-1 & A-6, Jun. 27, 1984.]

> Preliminary work to get Discovery ready for another launch attempt began almost immediately following the shuttle's aborted liftoff. But most of the early work had to do with

what is termed "safing" operations - making the pad secure for further work, scheduled to begin on the 27th. Shortly after the launch was stopped, workers drained the shuttle's external tank of half a million gallons of super-cold liquid hydrogen and liquid oxygen. Residual propellants in the tank were allowed to boil off overnight. At 4 p.m., the rotating service structure, which rolls forward to surround and protect the orbiter on the pad, was put back in place. [Yacenda. TODAY, p. 12A, Jun. 27, 1984.]

<> TWA Services Inc. opened the 440-seat IMAX theater in the Visitors Center at Kennedy Space Center. Stottler, Stagg & Associates (Cape Canaveral, Florida) designed both the IMAX theater and the center's 500-seat Galaxy theater which is scheduled to open in October. Both theaters will be used for multi-media presentations, press conferences and film demonstrations of actual launches. The project represents a portion of the center's $8.5 million expansion program. [Kassak. TODAY, p. 14C, Jun. 27, 1984.]

**June 27:** When the space shuttle Discovery deploys its solar panel during the course of its 41-D mission, the panel will join some 5,261 other man-made objects in space:

| Description | Number |
|---|---|
| Orbiting debris | 3,799 |
| Orbiting satellites | 1,347 |
| Deep-space probes | 59 |
| Deep-space debris | 56 |

[Loeb. USA TODAY, p. 1A, May 29, 1984.]

<> NASA officials now believe the Discovery won't be taking its first trip into space before July 16. The delay, forced by the aborted launch on the 26th, also means Discovery's second mission will be postponed, officials said. Technicians continued tests to determine what halted the launch. Technicians tested the No. 3 engine's main fuel valve, although engineers still don't know if the problem was with the valve or - considered more likely - a computer command to the valve. Additional checks for water and heat damage to the craft were also proceeding, although NASA said there appeared to be little damage done to the vehicle by the aborted launch or the brief but intense pad fire that followed. Officials decided to open the cargo bay doors to check for water. KSC spokesman Hugh Harris said that (on the 29th) main fuel valve checks would continue and all

three engine heat shields would be removed to inspect thermal blankets for water and to test engine components. [Yacenda. TODAY, p. 14A, Jun. 29, 1984.]

## JULY 1984

**July 2:** Failure to launch Discovery on its maiden mission (41-D) marked the first turnaround following a scrub after main engine ignition. The generic scrub/turnaround plan calls for a 14-day interval before another launch is attempted, but that plan can be adapted to specific missions. As of late last week, it was undetermined if the valve failure was caused by a software program or a hardware fault, and NASA had not rescheduled a launch date. [Kolcum. AVIATION WEEK & SPACE TECHNOLOGY, p. 16, Jul. 2, 1984.]

<> Engineers located a problem that may have been responsible for the June 26 aborted launch of Discovery. The problem, uncovered by troubleshooting activities in the past few days, concerns a small area of loose insulation found on a super-cold liquid hydrogen fuel line leading to the No. 3 main engine, officials said. Engineers believed that inert gaseous nitrogen pumped into the engine compartment prior to launch to prevent fire may have condensed to a liquid state due to contact with the bare line. The liquified nitrogen then could have dripped down onto a hydraulic device - called an actuator - that opens the main fuel valve leading to the No. 3 engine, freezing it into place. The loosened insulation was found on the flange of the engine's low-pressure fuel pump, which handles liquid hydrogen at a temperature of minus 423 degrees Fahrenheit. Testing at a contractor facility, Hydraulic Research, Textron in Valencia, California, indicated that the loose insulation could have been a factor in the aborted launch. [Yacenda. TODAY, p. 1A, Jul. 3, 1984.]

**July 3:** Kennedy Space Center workers installed a replacement engine while technicians discovered a leaky hydraulic pump fitting on one of the craft's three auxiliary power units.

The pump on the No. 3 auxiliary power unit will be replaced toward the end of the week, and should not further hinder Discovery's already delayed first launch, said KSC spokesman Jim Ball. [Yacenda. TODAY, p. 10A, Jul. 4, 1984.]

**July 4:** Officials at Kennedy Space Center and Cape Canaveral Air Force Station will help launch the upcoming television mini-series "Space" in mid-July. James Garner and other stars of the $35 million production of "Space" are scheduled to film portions of the movie July 22-31 at the Mercury Control Center at KSC and at the Air Force Space Museum on Complex 26 at Cape Canaveral Air Force Station, officials said. Based on the novel by James Michener and produced by Paramount Network Television Productions, the five-part 13-hour television movie will give a fictional account of the American space program from post-World War II through 1973, said Gillian Rees, Paramount publicist. Ed Harrison, a NASA public relations officer, said arrangements have been made to allow Paramount crews to film inside the Mercury Control Center, last used during the actual launch for the Gemini IV mission in 1964. [Smith. THE TRIBUNE, p. 2A, Jul. 4, 1984.]

**July 5:** KSC workers completed the installation of the No. 3 engine and began testing it immediately thereafter said KSC spokeswoman Weida Tucker-Brewington. Among the first checks planned for the new engine include programming the shuttle's mass memory computer to instruct the No. 3 engine control computer to open the motor's main fuel valve. The failure of that valve during the June 26 launch attempt forced a flight computer to shut down all three main engines just as they were beginning to ignite. Results of that test could be a major factor in program managers' selection of a target launch date. Additional electrical and mechanical tests, as well as critical leak checks, will follow. The checks will further certify the new engine's flight-readiness, NASA said.

Inspections inside and outside Discovery so far have revealed no evidence of water damage as a result of attempts to extinguish the hydrogen fires that broke out under Discovery following the aborted liftoff, Tucker-Brewington said [Yacenda. TODAY, p. 13A, Jul. 6, 1984.]

**July 6:** Kennedy Space Center spokesman Jim Ball said work crews have been instructed to prepare for a possible rollback of the shuttle from the launch pad to the Vehicle Assembly Building. Such a rollback might be required to ready the craft for a different mission than it was to begin last week.

"There has been no decision as far as I know," KSC chief spokesman Hugh Harris said. "We do a lot of advance planning that says, 'What do we do this way or another...' Whenever you have several options, you take your pick and decide which way it will go." Harris said a rollback would "not necessarily" be required it a major switch is made in the shuttle's cargo. That may be possible to do on launch pad 39A, where Discovery now sits, Harris said. [Yacenda. TODAY, p. 6A, Jul. 7, 1984.]

<> About 200 aerospace workers walked off the job earlier this week at Cape Canaveral Air Force Station in a strike against a NASA contractor, General Dynamics, and Kennedy Space Center officials said the strike would have no immediate effect on any NASA projects. The strike began when 4,400 General Dynamics employees - who are represented by the International Association of Machinists and Aerospace Workers - voted to reject a company proposal to replace a contract which expired April 29. Negotiations began March 12. It is the first strike against Convair since 1960. [Williams. TODAY, p. 14C, Jul. 6, 1984.]

**July 7:** A microscopic, broken wire in a backup computer forced NASA to scrub the first launch of Discovery on June 26, a spokesman for the computer's manufacturer said. The broken wire was an integrated circuit within one of the Discovery's five identical computers, which control all the ship's functions, including communications, navigation and guidance, said Joe Militano, spokesman for International Business Machines. "Engineers isolated the problem to an opening in an integrated circuit in a memory core unit in the computer's input-output processor," Militano said.

Jim Ball, a spokesman for Kennedy Space Center, said knowing what caused the delayed launch is interesting - but it will not have any impact on the shuttle's next liftoff date, which is scheduled to be announced on July 9. "We were hopeful we would get an explanation for what happened," Ball said. "But it doesn't have a lot of impact on us." ["Bad Computer Wire Forced Discovery's First Liftoff Setback," TODAY, p. 1A, Jul. 8, 1984.]

**July 9:** Workers continued going through the motions of preparing the yet-to-fly Discovery for its first launch, but NASA officials declined to set a new launch date for the craft. Indications point toward a late-August launch, with

a mission combining cargo from what was to be the June flight and a second flight slated for August 29. Earlier, officials said Discovery would not be launched before July 16.

One of the customers for the second mission, Satellite Business Systems Inc. said NASA has asked how early their satellite could be ready and were told August 20. SBS officials said they had no idea what NASA would decide, but a company informational handout said: "NASA is currently planning to combine the first and second Discovery flights for a mission on August 20, 21, 22 or 23." Meanwhile, workers began a daylong series of tests checking Discovery's three main engines for leaks. [Yacenda. TODAY, p. 1A, Jul. 10, 1984.]

<> NASA's Kennedy Space Center plans to issue RFP's this month to McDonnell Douglas Technical Services Co. for Spacelab launch site operations and for planning, developing and operating Space Shuttle Cargo Integration Test Equipment (CITE). The former work will include operating and processing the Spacelab engineering model and flight hardware and overall project management of the Spacelab project at KSC. ["McDonnell to Get RFPs for Spacelab Operations/CITE," DEFENSE DAILY, p. 30, Jul. 9, 1984.]

**July 10:** The International Brotherhood of Teamsters formally launched its campaign to represent the 600 to 700 employees of Lockheed Space Operations Co., the prime contractor at Kennedy Space Center. Culminating a five-month effort, Teamsters Local 385 in Orlando filed a petition with the National Labor Relations Board asking it to conduct an election among Lockheed employees, who process space shuttle orbiters for reuse by NASA.

The organizational effort is aimed at electrical and mechanical technicians and quality-control workers employed by Lockheed when the company replaced Rockwell as prime shuttle processing contractor last October. [Michael. THE ORLANDO SENTINEL, pp. D-1 & D-2, Jul. 11, 1984.]

**July 12:** Hughes Aircraft Co. officials confirmed they are expanding their plans for their Titusville, Florida, satellite assembly plant, doubling the anticipated number of employees to 1600. The company last year announced plans to

build a 360,000-square-foot satellite testing and assembly complex on 370 acres it owns on the northeast corner of U.S. 1 and SR 405. The need for about 800 employees was estimated once the company began operations. There might be a delay in the anticipated 1986 start-up for the facility according to division President Dr. Albert "Bud" Wheelon. [Williams. TODAY, p. 16C, Jul. 13, 1984.]

<> Discovery will stay grounded until at least August 24, when it is scheduled to fly carrying cargo merged from two separate missions, NASA officials said. Acting Shuttle program chief Jesse W. Moore said the new flight plan should preserve NASA's launch schedule for the rest of the year. "We believe we have a solution here that maximizes customer requirements," Moore said in Washington, D.C. "This plan puts the program back on schedule by October 1," Moore said.

Beginning October 1, the agency has plans to launch one shuttle mission each month.

NASA would have announced a combined mission earlier, but a key satellite booster rocket made by McDonnell Douglas failed a test July 9, casting doubts on two potential payloads.

But McDonnell Douglas spokeswoman Susan Flowers said the test of the rocket's nozzle went "well beyond" the length of maximum stress in actual usage and the erosion seen was "well within" normal limits. The test results, therefore, "were not expected" to affect planned satellite deployments, Flowers said. [Yacenda. TODAY, p. 1A, Jul. 13, 1984.]

**July 13:** Kennedy Space Center workers completed the first step for removing the space shuttle Discovery from launch pad 39A. KSC spokesman Jim Ball said technicians completed disconnecting the major cargoes that were supposed to fly on Discovery in late June and planned to transfer those payloads to the change-out room within the pad's rotating service structure in the evening. Rollback to the VAB was expected to begin at 6 a.m., July 14th. [Yacenda. TODAY, p. 5A, Jul. 14, 1984.]

<> An agreement was reached that could end the 11-day strike by 4,200 General Dynamics' Convair Division workers involved in the nation's cruise missile programs, union and company officials said. About 200 aerospace workers walked off the job at Cape Canaveral Air Force Station. But both General Dynamics and Kennedy Space Center officials said at that time the strike would have no immediate effect on any NASA projects. The 200 local Convair employees work on Atlas Centaur rockets, but the walkout had no effect on the already-delayed launching of the space shuttle Discovery, said NASA spokesman Hugh Harris. ["Convair Division's 11-Day Walkout Nearing Solution," TODAY, p. 8C, Jul. 14, 1984.]

**July 14:** Discovery began its 3 1/2-mile trip from its launch pad to the Vehicle Assembly Building aboard the crawler transporter at 5:35 a.m. EDT. The six-hour trip from pad 39A to the VAB at Kennedy Space Center marked the second time NASA has had a shuttle rollback. Columbia had to be taken off the launch pad before the ninth mission in October, 1983, for replacement of a section of a booster rocket nozzle lining. [Hall. TODAY, p. 1A, Jul. 15, 1984.]

**July 15:** Striking Convair Division machinists voted overwhelmingly on the 15th to accept a new contract, ending their 13-day old work stoppage, union and company officials said. William Rauch, IAM chief negotiator and Rockledge resident, said 70 percent of the union's 200 Brevard workers voted for the latest offer. ["Convair, Union Settle 13-Day Machinist Strike," TODAY, p. 12C, Jul. 16, 1984.]

**July 16:** The launch Monday of a scaled-down replica of Apollo 11 at Kennedy Space Center marked the beginning of a week-long celebration of the 15th anniversary of the first lunar landing and other U.S. space exploration successes. More than 100 KSC workers viewed the launch to 500 feet of the 3 1/2-foot Saturn V rocket above a field near the KSC press site. It parachuted undamaged into a nearby parking lot.

The rocket - 1/1000th the size of a real Saturn V - was built during the last two months by Harris Corp. employee Greg Winter and Air Force Lt. Jim Ramsey, who works with space shuttle payloads. Just prior to liftoff, a recording was played over the outdoor speakers of President Kennedy's

May 1961 speech, which set the goal of placing a man on the moon before 1970, and the countdown was timed to match that of the actual Apollo 11 mission.

Meanwhile, more than 150 tourists attended the cutting of a 4-foot-long cake inside Spaceport USA, the KSC visitors center. Those gathered recalled their memories of the first lunar landing. "I got up at 3 a.m. to watch the astronauts land on the moon," said George Bogler of Chicago. Ilja Belick of Zurich, Switzerland, said the lunar landing occurred at 2 a.m. Swiss time. "It was very fantastic. The whole family woke up and watched it on TV," he said. "It was a big dream for everyone, and it had become reality." [Dickerson. TODAY, pp. 1B & 3B, Jul. 17, 1984.]

<> Workers disconnected Discovery from the cylindrical external tank portion of the space shuttle launch vehicle, in preparation for lowering the craft onto its own wheels. On July 17, the craft was expected to be towed to a processing hangar from the Vehicle Assembly Building. Once back in the hangar, workers would begin preparing Discovery's cargo bay to accept its new cargo, NASA said. [Yacenda. TODAY, p. 9A, Jul. 17, 1984.]

**July 17:** George Low, former head of the nation's manned space program and president of Rensselaer Polytechnic Institute, died at his home in Troy, New York, at the age of 58. ["Former Apollo Developer Dies at 58," TODAY, p. 11A, Jul. 18, 1984.]

**July 18:** The NASA Group Achievement Award was presented to seventeen Lockheed personnel by Kennedy Space Center Director Richard Smith. The honorees, Orbiter Processing Facility technicians and inspectors, were cited for completing modification to the orbiters Challenger and Discovery ahead of schedule and without overtime. Those recognized were: Richard Benziger, group supervisor, Chester Barber, Robert Barrett, Ronald Cochran, Chico Crowe, David Ely, Daryl Fite, Scott Gillespie, Jack Harper, Robert Kelly, Robert McCandless, Richard Melloh, Douglas Olds, Paul Seiffert, Brady Smith, Neil Warren and David Young. ["OPF Personnel Recognized for Orbiter 'Mods'," STAR GAZER, pp. 1 & 6, Aug. 2, 1984.]

**July 19:** A joint Air Force and NASA research effort to study the effects of lightning strikes on flying craft is being conducted at KSC using French-developed techniques to "trigger" lightning events. Knowledge gained from the research will be directly applicable to winged spacecraft like the space shuttle, which has electronic flight control systems, and to the design of lightning protection systems for KSC facilities. KSC's Technology Projects Office, the focal point for meterological research activities at KSC, is funding the center's participation with the Air Force's Wright Aeronautical Laboratories. The KSC-hosted lightning project will complement other research programs being conducted by other NASA centers, the Air Force and other organizations. [Ball. NASA/KSC NEWS RELEASE No. 135-84, Jul. 19, 1984.]

<> Four of seven crew members scheduled to fly aboard Challenger next April when the shuttle carries Spacelab 2 rehearsed experiments at Kennedy Space Center as part of a mission sequence test. "This simulates what they are going to do in orbit," said NASA spokeswoman Lisa Malone. Tony England, who will work as a mission specialist, said the majority of the 13 experiments will deal with astrophysics. "We will study the entire sun, stars, deep space and the environment around Challenger," England said during a news conference. [AP. "Challenger Crew Simulates Tests for Spacelab 2 Mission," TODAY, p. 13A, Jul. 20, 1984.]

**July 20:** In a White House ceremony, President Reagan celebrated with the Apollo astronauts the 15th anniversary of the first moon landing and declared July 20 as "Space Exploration Day." Commander Neil A. Armstrong, lunar module pilot Edwin E. "Buzz" Aldrin and command module pilot Michael Collins joined Reagan in an East Room ceremony commemorating the landing of the "Eagle" on the moon, a quarter-million miles from Earth, on July 20, 1969. "The footprints on the moon showed us that America's future can be determined by our dreams and our visions," Reagan said. "The shuttle and our space station will help make those dreams come true." ["Reagan Leads Ceremony Honoring Moon Landing of Apollo 11 Astronauts," TODAY, p. 10A, Jul. 21, 1969.]

**July 23:** The space shuttle's cargo bay was electrically and mechanically reconfigured in the Orbiter Processing Facility following the orbiter's return to the Vehicle Assembly Building from the launch pad July 14. The orbiter was destacked from the external tank and solid rocket boosters

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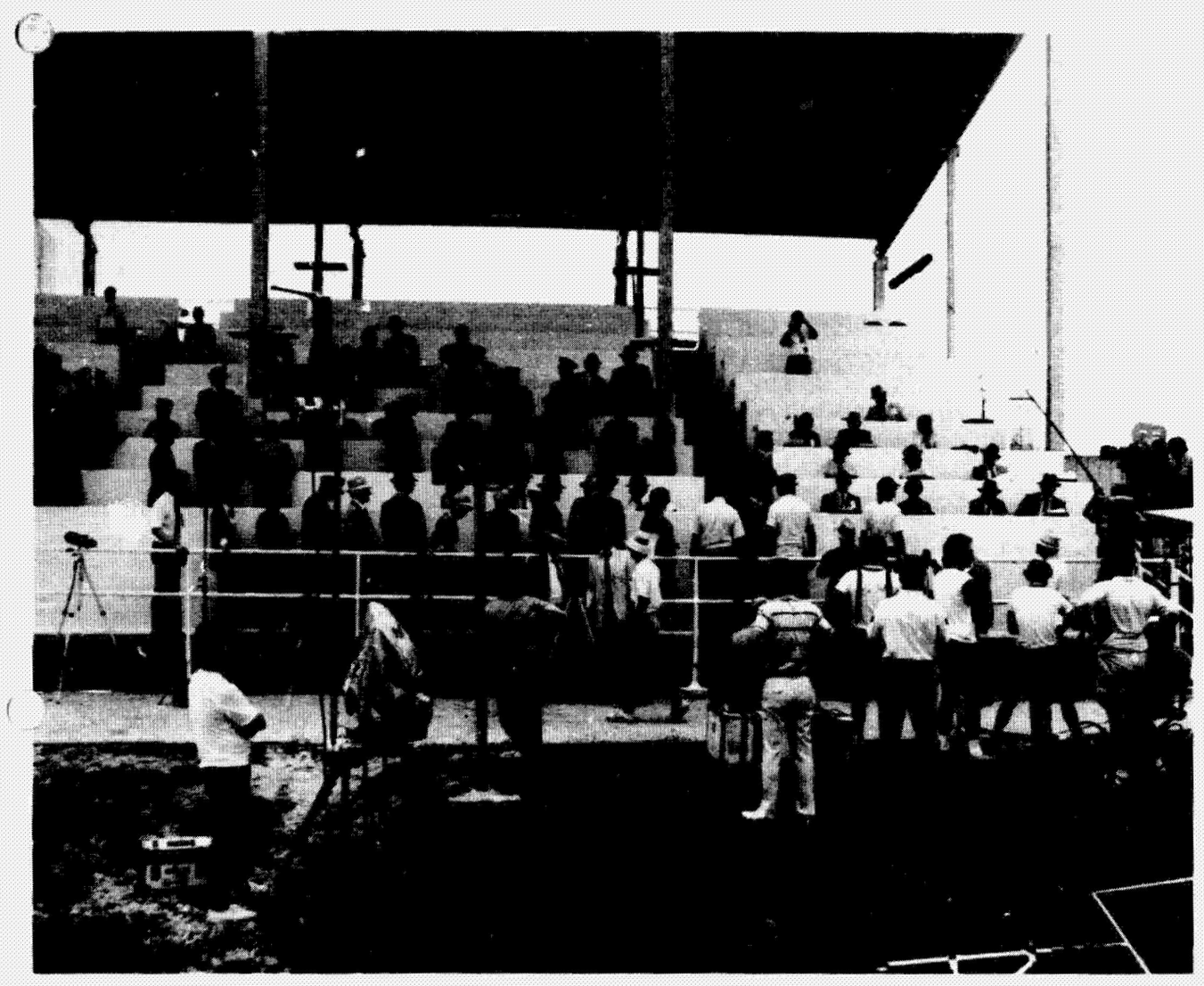

Paramount filming of the CBS miniseries "Space" by James Michener was telecast in mid-April 1985 and starred James Garner, Michael York and Bruce Dern.

in the VAB early last week, and payload bay doors were opened after it was moved to the processing facility. By midweek, access stands had been erected around Discovery, which was prepared for a new cargo manifest following the June 26 abort. ["Cargo Bay of Discovery Being Reconfigured," AVIATION WEEK & SPACE TECHNOLOGY, p. 20, Jul. 23, 1984.]

**July 25:** Filming on the Space Coast ended for the television miniseries "Space," which is based on James Michener's novel of the same name. The motion picture industry and television have not been strangers to Brevard County and the space center. In 1967, Don Knotts and Arthur O'Connell starred in a space-oriented farce called "The Reluctant Astronaut" which was shot in part at Kennedy Space Center.

The biggest movie ever filmed at KSC was "Marooned," featuring Gregory Peck, David Jansen, Gene Hackman, and James Franciscus, was made in 1969 at the Titan Launch Complex and used several dozen local residents as extras. Two other movies, which used space as the central theme were "One Night in Heaven" and "Stowaway to the Moon." Both were filmed by 20th Century Fox during the late 1960s and also included area residents in bit parts. The movie version of Tom Wolfe's best-seller The Right Stuff was not filmed in Brevard County in part because it creators decided that the county had changed too drastically in its appearance since the early 1960s. [See the 1983 KSC Chronology for further details.]

Several television series have utilized the Space Coast either on film or in an episode's story line; among these have been "Lassie;" "I Dream of Jeannie;" "Star Trek;" and "Six Million Dollar Man." [Lancaster. TODAY, p. 1B, Jul. 26, 1984.]

**July 30:** Space Center officials scheduled Discovery's "rollover" to the Vehicle Assembly Building for about 8 a.m., August 2. "Everything is going swimmingly," said KSC spokesman Dick Young. NASA officially says Discovery's inaugural launch will occur no earlier than August 24; contractor sources say August 29 is the current target date. Discovery's cargo bay doors were to close on the 31st in anticipation of the rollover two days later.

Meanwhile, pre-installation testing of two satellites - Hughes Communications' Leasat I and AT&T's Telstar 3-C - that will fly aboard Discovery was completed successfully last week. A third satellite, Satellite Business System's SBS-4, was moved into KSC's Vertical Processing Facility and installed in a support rack. Checkout of the craft is set to begin on the 31st, KSC spokeswoman Lisa Malone said. All three satellites will be placed into the large cargo transport canister August 4 and taken to LC 39A on the 5th for installation on the 10th. [Yacenda. TODAY, p. 12A, Jul. 31, 1984.]

**July 31:** The head of the nation's space agency testified that each launch of the space shuttle costs $150 million to $200 million, while the most that each flight can earn back is $71 million. "The $80 million difference is in fact a subsidy?" asked Rep. Robert S. Walker, R-Pa. "I would prefer to phrase it differently," said James M. Beggs, the administrator of NASA. "It's not a subsidy, it's a continuation of our philosophy to recover our costs over a time period." [AP. TODAY, p. 12A, Aug. 1, 1984.]

<> KSC Director Richard Smith has told employees to expect changes in the center's organization. "Increased efficiency in management of shuttle processing and base operations contracts, additional support of Vandenberg Air Force Base operations (expected to launch shuttles from late 1985), demands of the STS-Centaur schedule and the space station will have a bearing on the KSC organizational structure," he said. Smith pointed out that KSC had greater engineering expertise in some specialized areas than other NASA centers, which will be important to space station development. "We will need to provide increasing support for design of facilities and ground support equipment," he added. Smith believes his center may have to accept more responsibility for shuttle mission functions currently performed by the Johnson Space Center to relieve JSC so that it can concentrate on the space station. [Harris. SPACEFLIGHT, p. 301, July/August 1984.]

## AUGUST 1984

**August 2:** Seven major Shuttle Processing Contract and NASA Logistics activities currently located at five separate KSC locations will be housed under one roof in the fall of 1985. NASA approved the design and concept for an entirely new logistics facility to be built on Contractor Road south of the Launch Equipment Shop. ["Logistics to Get New Home," STAR GAZER, p. 8, Aug. 2, 1984.]

<> Discovery was towed by an aircraft tractor from the Orbiter Processing Facility to the Vehicle Assembly Building at 12:30 a.m. EDT. NASA initially planned the rollover for late on the morning of August 2, but later moved up their estimate to about 4 p.m. August 1. However, problems in weighing and balancing Discovery held up the move and officials finally settled on the 12:30 a.m. EDT schedule. [Yacenda. TODAY, p. 10A, Aug. 2, 1984.]

**August 7:** Former astronaut Jack Lousma won Michigan's Republican Senate primary Tuesday, defeating former Rep. Jim Dunn by a wide margin, and said he had "launched" his campaign "into orbit" against Democratic incumbent Carl Levin. With 1,251 of Michigan's 6,630 precincts reporting, Lousma, who flew on Skylab and piloted the third space shuttle mission, had 77,508 votes or 66 percent, while Dunn had 39,430 votes or 34 percent. ["Former Astronaut Wins Michigan Senate Primary," TODAY, p. 12A, Aug. 8, 1984.]

**August 8:** NASA, whose fastest turnaround of the shuttle has been two months [shuttle 10-11], is working to cut the near-term shuttle launch processing turnaround capability to 35 workdays, NASA space flight chief Jesse Moore told Congress last week....["NASA Working Towards 35-Day Turnaround for Shuttle," DEFENSE DAILY, p. 205, Aug. 8, 1984.]

<> NASA announced that the space shuttle Discovery will make its first spaceflight on August 29, carrying payloads from two missions that were combined after earlier attempts to launch were aborted. Launch time is set for 8:35 a.m. EDT,

and the flight will end six days later at Edwards Air Force Base in California. Rollout to pad 39A was expected to occur in the early morning hours of August 9. [Fisher. THE ORLANDO SENTINEL, p. A-9, Aug. 9, 1984.]

**August 9:** The launch of a three-nation package of satellite snoopers was scrubbed by problems with a computer in West Germany and rescheduled for 10:42 a.m. EDT, August 11.

NASA spokesman Dick Young said it would take at least 30 hours to resolve a problem with a computer disc drive at the German Space Operations Center at Oberpfaffenhofen near Munich. The computer is needed to determine the precise initial orbit of the attached British and German spacecraft and the precise time to fire an onboard rocket that kicks them into their final trajectories. The U.S. craft separates earlier. [Jean. THE ORLANDO SENTINEL, p. 1B, Aug. 10, 1984.]

<> NASA officials pronounced the space shuttle vehicle Discovery "hard down" on pad 39A at 6:43 a.m. EDT at the conclusion of its return journey from the Vehicle Assembly Building. That trip started a half-hour earlier than expected at 11:36 p.m. August 8. The rollout went smoothly and technicians immediately began making various electrical, fluid, pneumatic and mechanical connections between the shuttle and the pad. Shuttle main engine checks, using pressurized, inert helium to ferret leaks, also began and should run through August 11. Launch is scheduled now for 8:35 a.m. EDT on August 29. [Yacenda. TODAY, p. 13A, Aug. 10, 1984.]

**August 10:** Measurements taken after Discovery's return to Pad 39A showed that the shuttle and the mobile launch platform it rests atop were three inches from where they should have been. So it was up and out again, with a crawler-transporter lifting the shuttle and mobile launch platform and shifting them to the correct spot. "They just rolled it out one MLS (Mobile Launch Platform) length and rolled it back," said KSC spokesman Rocky Raab. All the measurements taken following the August 9 move indicated the shuttle's location was within normal tolerances, he said. [Yacenda. TODAY, p. 1A, Aug. 11, 1984.]

**August 11:** A leak in an air-conditioning hose postponed the launch of a Delta rocket carrying a three-nation scientific satellite package from Cape Canaveral Air Force Station. Workers were scheduled Aug. 12 to begin cleaning the contamination on the spacecraft from the leak and hope to have the craft ready for launch Aug. 15, said NASA spokesman Jim Ball. The Delta mission was set to launch Aug. 9, but was postponed by a computer hardware problem at a tracking station in West Germany. ["Leak in Hose Delays 3-Pack of Satellites," TODAY, p. 20A, Aug. 12, 1984.]

**August 13:** A triggered lightning research project is under way at KSC in an attempt to better understand the lightning environment and to develop protection for aircraft and avionics. William Jafferis of Kennedy, a project manager, said results also may help in the design of cage-like structures that could protect such operational areas as fuel farms at the space shuttle launch site. Shuttle mission rules currently call for clearing the launch pad if there is lightning within five miles. Shuttle orbiters have been designed to withstand a 200-kiloamp stroke for a duration of two milliseconds. ["NASA Studies Ways to Prevent Damage from Lightning Strikes," AVIATION WEEK & SPACE TECHNOLOGY, p. 66, Aug. 13, 1984.]

**August 15:** Discovery moved closer to an August 29 launch with a successful countdown rehearsal, while NASA prepared for another satellite rescue mission in November. Officials said in Washington that the space agency hopes to sign an agreement with insurance underwriters by August 16 for the retrieval of an Indonesian satellite, one of two put into wrong orbits last February when their booster engines malfunctioned.

The countdown demonstration test was marred by problems that postponed the crew's participation for three hours. The computer glitch in the No. 1 engine was corrected, and the countdown concluded with a simulated engine firing at 2 p.m. "We had a good run today," Cmdr. Henry Hartsfield told reporters. "We're pleased with the way everything went. I hope that's our last practice."

The mock countdown began at 6:10 p.m. EDT August 14, and the glitch occurred before midnight when a computer system in the No. 1 engine, called a controller, did not program properly. The countdown continued off and on, and by early on the afternoon of the 15th, the computer had accepted a

different set of software. NASA spokesman Rocky Raab said he did not know if the same problem would have occurred during a real countdown because the launch software is different. [Fisher. THE ORLANDO SENTINEL, p. B-1, Aug. 16, 1984.]

**August 16:** A week and six minutes late, an international trio of scientific satellites successfully lifted off from Cape Canaveral atop a Delta rocket at 10:48 a.m. EDT. The launch, first ever of three satellites from as many countries aboard a single rocket, provided a spectacular beginning to a complex mission that will study how cosmic particles enter and interact with Earth's magnetic field.

Liftoff of the three Active Magnetospheric Particle Tracer Explorers was six minutes after the appointed time of 10:42 a.m. The latest delay in launching the three craft was caused by a ship entering the restricted offshore test range, and by a faulty instrument reading. Both problems, which cropped up late in the countdown, were quickly resolved allowing the shot to get off just four minutes before the day's brief launch opportunity ran out at 10:52 a.m. [Yacenda. TODAY, p. 1A, Aug. 17, 1984.]

<> Insurance underwriters have signed agreements with NASA for a space shuttle crew to retrieve an Indonesian satellite that was put into the wrong orbit in February of this year. "We're going to have the first used-satellite sale," James Barrett of International Technology Underwriters said. [TODAY-GNS. TODAY, p. 7A, Aug. 17, 1984.]

**August 17:** United Space Boosters Inc. won the competition for the contract to process space shuttle twin solid rocket boosters, NASA announced. The new five-year contract calls for USBI to assemble, refurbish and perform limited manufacture of 84 sets of the reusable boosters. USBI's estimate for the cost-plus-incentive fee contract is approximately $274 million.

Two potential, unpriced 2-1/2-year contract extensions would call for the company to process another 120 booster sets. Under a separate $21 million contract, USBI also will build a new booster assembly plant on Kennedy Space Center property, NASA said. The company, part of United

Technologies' Norden Systems Division, has performed booster work for NASA since 1977, the start of the shuttle program. It currently employs about 700 workers at KSC.

Defeated in their bids for the 10-year booster assembly and refurbishment contract worth a potential total of about $1 billion, were two competing teams headed by McDonnell Douglas Booster Assembly Co. of Cocoa Beach, and the Lockheed Corp. of Burbank, California. NASA's Marshall Space Flight Center in Huntsville will continue to administer the booster work performed by USBI, but NASA said the company will move all booster-related operations to KSC, keeping only management in Huntsville. USBI officials said it is unclear how many jobs may be opened up at KSC as a result of the contract award. The number will depend on how many job transfers will be made during the move. [Yacenda and Hodges. TODAY, pp. 1A & 16A, Aug. 18, 1984.]

**August 19:** A dozen security guards were treated for exposure to a toxic gas leak near the Solid Motor Assembly Building at Cape Canaveral Air Force Station. An Air Force spokesman said the workers were exposed to the fumes when the wind shifted to the north sometime after 8:10 p.m. The origin of the leak or the nature of the chemical fumes that seeped into the air were not known early on August 20th. The Air Force spokesman did say the chemical was an oxidizer - an odorless, colorless gas which is used in rockets.

Seven of the guards were transported to Wuesthoff Memorial Hospital in Rockledge between 11 and 11:20 p.m., said hospital spokesman Fred Pike. The other five workers - who a hospital spokeswoman said were Pan Am World Services security guards - were taken to Jess Parrish Memorial Hospital in Titusville and were in satisfactory condition early on the 20th. The guards taken to Wuesthoff were being treated for exposure and were under observation for possible complications said Pike.

Hospital officials said none of the 12 exhibited external burns or injuries. Some of the seven at Wuesthoff also were Pan Am guards. The others worked for McDonnell Douglas Technical Services Corp. Gay Rhodes, administrative supervisor at Jess Parrish, said the five guards were brought to that hospital about 10 p.m. They were suffering from respiratory troubles, apparently caused by inhaling fumes, she said. [Feibus. TODAY, p. 1A, Aug. 20, 1984.]

**August 20:** Engineers working during the weekend succeeded in duplicating a problem that delayed a pretend countdown last week involving the yet-to-fly shuttle Discovery. Launch officials said the glitch, which held up a simulated countdown for three hours on the 15th, stemmed from computer software programmed for the engine control computer on Discovery's No. 1 main engine.

Engineers have been less successful in replicating a problem that aborted Discovery's liftoff June 26. It was the second launch cancellation in two days. NASA Launch Director Bob Sieck said officials were ready to fly Discovery on August 29 even though engineers are unable to duplicate the problem that delayed the opening of a main fuel valve on the shuttle's No. 3 engine. [Yacenda. TODAY, p. 10A, Aug. 21, 1984.]

<> Air Force investigators concluded that "pinhole corrosion" in a safety feature caused a poison gas leak at Cape Canaveral Air Force Station on the night of August 19 that sent 12 civilian security guards to the hospital. Two of those injured were hospitalized in serious condition, although that condition had improved to satisfactory by the evening of the 20th.

Lt. Col. J.W. Jamba, the Patrick Air Force Base safety officer assigned to study the incident, concluded that the nitrogen tetroxide came from a corrosion-caused pinhole in a safety feature in the pipe, called a "burst disk." [Yacenda. TODAY, pp. 1B & 3B, Aug. 21, 1984.]

**August 21:** Southern Comfort Builders Inc. (Merritt Island, Florida) has won two NASA contracts totaling $757,233. The contracts include the modifying and installing of new air conditioning units in four buildings at Cape Canaveral Air Force Station and installation of a new lighting system atop the S Building at the Air Force Station. [Kassak. TODAY, p. 14C, Aug. 22, 1984.]

**August 26:** After failing twice in June to get the shuttle Discovery off the ground, NASA officials believe they have done everything possible to prevent another failure when the liftoff occurs at 8:35 a.m. EST on the 29th. The six-member crew arrived at Kennedy Space Center from Houston, Texas, at

4:35 p.m. in three T-38 jets and a Gulfstream jet. Playalinda Beach closed at 8 p.m. in advance of the 43-hour countdown expected to begin at 11 p.m. The beach was expected to be reopened two hours after launch.

"We fully intend to go," said Cmdr. Henry Hartsfield, a veteran of the fourth shuttle flight. "We're anxious to get going." [Fisher. THE ORLANDO SENTINEL, pp. B-1 & B-5, Aug. 27, 1984.]

**August 27:** With the prelaunch countdown proceeding smoothly, all signs pointed toward an on-time liftoff of the space shuttle Discovery from Kennedy Space Center at 8:35 a.m. EDT on August 29th. Air Force weather watchers predicted a positive forecast for the launch. Mission commander Henry Hartsfield and shuttle pilot Michael Coats, spent part of the day flying practice approaches to the spaceport's 3-mile-long shuttle runway in a shuttle training aircraft. The rest of the crew - mission specialists Judy Resnik, Steve Hawley, and Richard Mullane, along with commercial payload specialist Charlie Walker - viewed material they must be familiar with during their flight.

Beginning at 3 p.m., the area around the spaceport's ocean-side pad 39A was cleared so that super-cold, super-volatile liquid oxygen and liquid hydrogen could be loaded into Discovery's onboard tanks, which supply the craft's electricity-producing fuel cells. [Yacenda. TODAY, p. 1A, Aug. 29, 1984.]

**August 28:** A computer timing problem delayed again the first flight of the shuttle Discovery. Liftoff was rescheduled for 8:35 a.m. Thursday (Aug. 30), 24 hours after it had been set to go up on the 29th. The delay this time was brought on by a problem in the electronic system that jettisons the ship's booster rockets and fuel tank when they are empty.

NASA officials said the problem occurred because the computer software and the events controllers are both new. [Fisher. THE ORLANDO SENTINEL, pp. A-1 & A-11, Aug. 29, 1984.]

**August 30:** Discovery finally lifted off at 8:41 a.m. EDT, six minutes later than planned for its inaugural flight. After a one-day delay in launch, three minor computer failures occurred. Then three private planes flew so close to the launch site that NASA delayed the countdown till the planes had been chased away.

"We are happy," said shuttle operations director Tom Utsman, "that the crew has finally left town." [Gyllenhaal. THE MIAMI HERALD, pp. 1A & 2A, Aug. 31, 1985.]

<> Discovery is scheduled to land at Edwards Air Force Base in California at 9:34 a.m. EDT on September 5. [Yacenda. TODAY, pp. 1A & 20A, Aug. 30, 1984.]

## SEPTEMBER 1985

**September 5:** Technicolor Government Services Inc. won the photographic and optical services contract from the Air Force and NASA for work at the Eastern Space and Missile Center and Kennedy Space Center. The incumbent contractor, Technicolor begins its new contract October 1. The basic award is for fiscal year 1985 with two options extending the work through fiscal year 1987. The combined value of the contract and options is $17 million. Technicolor Government Services is based in North Hollywood, California. [Kassak. TODAY, p. 14C, Sept. 5, 1984.]

<> At one point, shuttle mission 41-D officials discussed landing Discovery at Kennedy Space Center because of an apparent oxygen leak, but that was "strictly contingency," said space center spokesman Dick Young. Kennedy Space Center officials notified the landing and recovery director, who presides over a skeleton crew that remains at the space center for such contingencies, but the problem was resolved before any crew members were called out. Discovery made an on-time landing at Edwards Air Force Base in California at 9:38 a.m. EDT. [Fisher. THE ORLANDO SENTINEL, pp. A-1 & A-9, Sept. 6, 1984.]

**September 6:** A last-minute decision to insert gap filler between belly tiles on the space shuttle Challenger may further delay preparations (for a few days to a week) of the veteran spaceplane for its scheduled October 1 flight, NASA said. The decision to insert the gap fillers was made by program managers at Johnson Space Center in Houston late on the 5th and made for the third postponement this week in moving Challenger from a processing hangar to the Vehicle Assembly Building. [Yacenda. TODAY, pp. 1A & 16A, Sept. 7, 1984.]

**September 10:** The Boeing 747 jumbo jet carrying the 74-ton Discovery landed on the spaceport's 3-mile-long-runway at 11:38 a.m. EDT, Monday, September 10. Just as the 747 set its main landing gear down, a gust of wind caught the aircraft and lifted its left wing and landing gear several feet off the ground. Reacting quickly, the plane's pilot was able to hold a straight course through the wind. The landing proceeded without further incident.

Meanwhile, work continued on Discovery's sister ship, Challenger. That craft, set to fly NASA's next mission in early October, was towed from a processing hangar into the VAB over the weekend. The rollover came a week-and-a-half late. KSC spokesman Rocky Raab said work has begun to remove one of Challenger's three main engines. The craft's No. 3 liquid-fired powerplant is being pulled because it contains power-enhancing turbopumps with blades believed to be susceptible to premature deterioration, Raab said. "It's a matter of convenience to do it in the VAB," he said, explaining why the job had not been done sooner. Once inside the VAB, Challenger was hoisted into a vertical position by a powerful crane and attached to the rest of the shuttle launch vehicle.

Technicians also replaced two crucial on-board relay boxes, swapping them for newer versions. The boxes, called master events controllers, carry out such important functions as exploding launch pad hold-down bolts and separating the shuttle's twin solid rocket boosters and external tank. Problems in getting the new controllers to relate properly to flight computer programming led to a one-day postponement of Discovery's liftoff on August 29. That problem is supposed to be corrected, Raab said. [Yacenda. TODAY, pp. 1A & 12A, Sept. 11, 1984.]

**September 12:** Workers at Kennedy Space Center continued preparing Challenger for its next flight, now set for early October. The Shuttle Interface Test, which checks electrical and mechanical connections between the various shuttle components, revealed what officials termed a "discrepancy" with a cable leading to one of the craft's twin solid rocket boosters. But NASA said the problem would not delay rolling the shuttle out to pad 39A, September 13, beginning at about 9:30 a.m. EDT. [Yacenda. TODAY, pp. 1A & 12A, Sept. 13, 1984.]

**September 13:** Challenger returned to launch pad 39A minus its No. 3 engine; it made the 3-1/2 mile trip in just under seven hours, arriving at 5:10 p.m. EDT, according to KSC spokesman George Diller. The engine was removed earlier in the week so technicians could replace potentially defective blades in two high-pressure turbopumps. Since additional testing remains on one of the pumps, KSC engineers chose to reinstall the engine on the pad.

Once on the pad, workers began attaching ground-to-ship cables and conduits, and preparing the craft for a test-firing of its on-board hydraulics-driving auxiliary power units early on the morning of the 14th, followed by a test countdown and an engine ignition test scheduled for the 15th. [Yacenda. TODAY, pp. 1A & 20A, Sept. 14, 1984.]

**September 15:** Shuttle flight and ground teams successfully completed a mock launch countdown, clearing the way for the impending departure of Challenger in early October. Mock ignition of Challenger's main engines came on time at 11 a.m. EDT.

The test came just two days after the shuttle was brought to launch pad 39A. That's the shortest interval yet between rolling the shuttle to the pad and staging the countdown simulation. The mission, labeled Flight 41-G by NASA, is Challenger's sixth and 13th in the shuttle program.

Asked at a padside press conference if he knew when Challenger would go, Crippen replied, "It'll be ready when the launch team tells us it's ready. But whenever it is, we'll be ready to go." Joining Crippen on the October flight [his fourth] will be mission specialist Sally Ride, the first American woman in space. Ride and Crippen flew together aboard Challenger in June 1983, and the upcoming flight marks the first time two experienced shuttle fliers are to make a second flight together. [Yacenda. TODAY, pp. 1A & 20A, Sept. 16, 1984.]

**September 17:** NASA set October 5 as the launch date for the next shuttle mission, 41-G, an eight-day flight in which Challenger will carry a record seven astronauts. [Associated Press. THE ORLANDO SENTINEL, p. B-3, Sept. 18, 1984.]

<> Kennedy Space Center renewed its contract with Jess Parrish Memorial Hospital; under the agreement, astronauts, ground support personnel and KSC visitors would be flown directly to Titusville's hospital helipad and treated by a special emergency room trauma team in case of a launch or landing accident. Dr. Luis Quintero, emergency room medical director, said preparation for space disasters largely consists of studying the characteristics of chemicals used at KSC.

In the 3-1/2 years the hospital has served as KSC's primary medical facility, disaster drills have been held prior to every shuttle launch. The drills will continue in the two years for which the agreement has been renewed, Quintero said. [Heller. TODAY, p. 2B, Sept. 18, 1984.]

**September 19:** Jeff Tuttle, an employee of Thiokol Inc., was bruised September 15 by falling equipment after a device used to put tension on tie-down posts that hold the boosters in place came apart, NASA and contractor officials said. Tuttle, who normally is based at the West Coast shuttle launch site at Vandenberg Air Force Base, California, had been undergoing several weeks of training at Kennedy Space Center when the accident occurred. He was examined and released from an area hospital, officials said, the same day he was struck on his right leg by the metal head on the hydraulic equipment. The tool - estimated to weight about 50 to 70 pounds - toppled when the tensioner came apart, said Lockheed Space Operations Co. spokesman Stuart Shadbolt. "No one was struck by any of the high-speed projectiles that came out of the bolt," he said.

Examination of the machinery that disintegrated revealed a bolt within the device - known as a stud-tensioner - broke due to a form of corrosion. Work continued on stacking the left-hand booster rocket, although hold-down stud-tensioning work was halted altogether until a cause for the problem was determined. Troubleshooting of the tensioning tools revealed two safe devices and one with a weak bolt similar to the device that failed on the 15th, NASA officials said. Stacking work on the right hand booster resumed on the 18th when engineers determined that it was safe to finish the job, NASA said. Tuttle returned to work on the 17th, his next shift, officials said. [Yacenda. TODAY, p. 3B, Sept. 20, 1984.]

<> The Air Force Inspector General said a review of allegations of quality control problems at the Vandenberg space shuttle launch complex found that the safety of the site had not been compromised and neither the number nor the significance of the discrepancies "are inordinate for the size and complexity of this project". A summary of the Inspector General's report said the allegations were "extracted directly" from management reports "used by the Air Force to identify and track the correction of problems." Further, the report explained, "there was a lack of good communication between the program management and a

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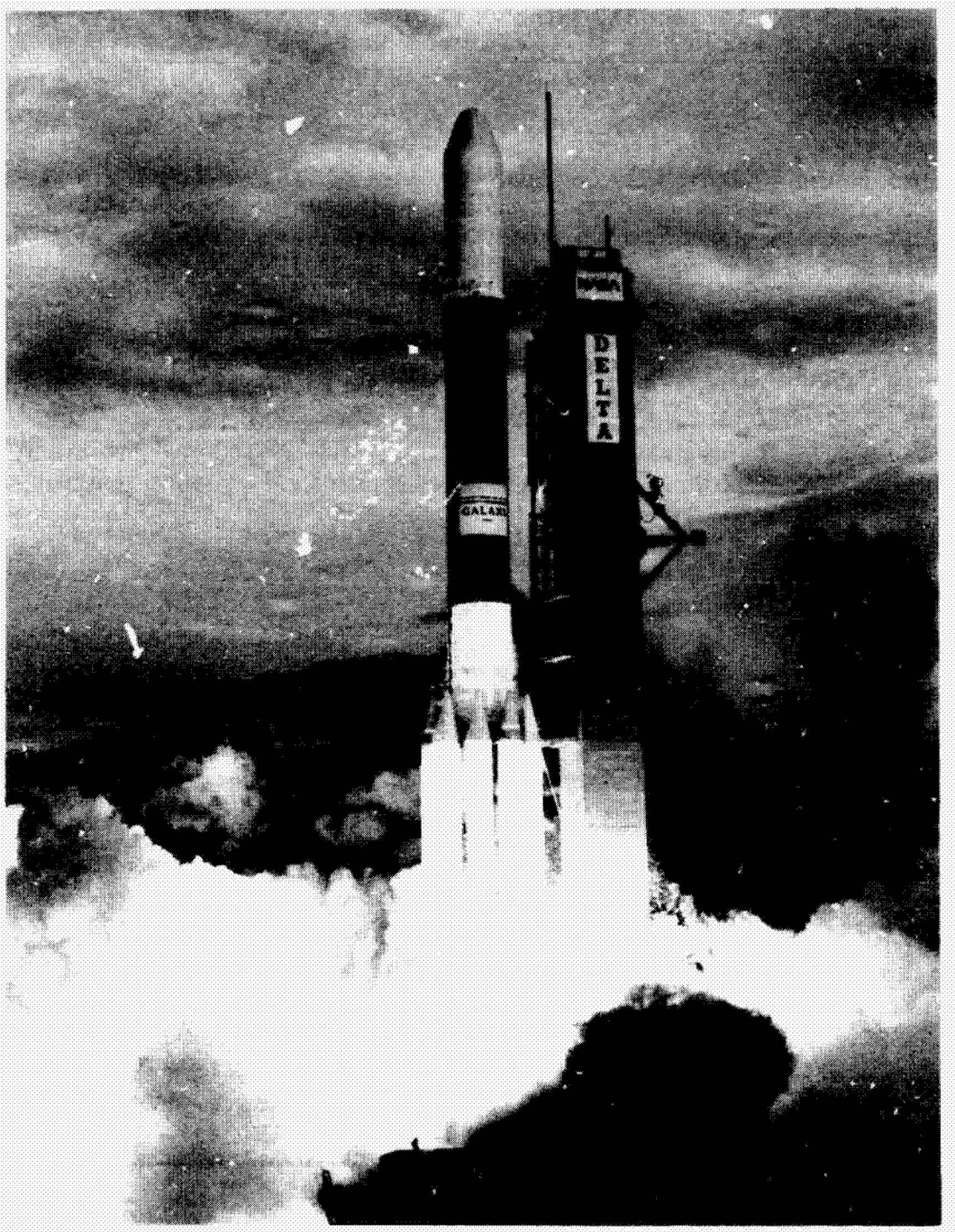


Delta-176 lifts off from pad 17B carrying Galaxy-C, the last commercial communications satellite scheduled for launch by a Delta rocket.

significant portion of the quality assurance work force." ["Air Force Says Vandenberg Shuttle Site Safety Not Compromised," DEFENSE DAILY, p. 91, Sept. 20, 1984.]

**September 21:** The last commercial payload scheduled to be launched atop a Delta rocket successfully lifted off from Cape Canaveral Air Force Station's pad 17B, heralding the approaching end of NASA's long-lived Delta program. Hughes Communications' Galaxy III satellite went off exactly on time at 6:18 p.m. EDT. This launch was the 176th liftoff in the 24-year history of the Delta, which is built by McDonnell Douglas Aeronautics Co. of Hungtington Beach, California. Better than 94 percent of those launches have been successful, including the last 42 missions, since 1977, making the Delta the most reliable multistaged rocket ever built.

NASA recently decided to turn the rocket over to commercial operation, leaving just five Deltas in the agency's stockpile. One NATO military payload, to be launched from Cape Canaveral on October 18, and two government weather satellites remain scheduled, leaving two other Deltas available for new payloads before Transpace Inc. of Greenbelt, Maryland, takes over. [Yacenda. TODAY, p. 20A, Sept. 22, 1984.]

**September 23:** Workers at Kennedy Space Center completed the changeout of a leaky liquid oxygen seal on Challenger in preparation for the planned October 5 launch of shuttle mission 41-G. The work was performed at launch pad 39-A and involved a seal that is connected to the line used to transfer liquid oxygen from the orbiter's external tank into the shuttle vehicle. The seal was subsequently retested and engineers have verified that it is working properly, a KSC spokesman said. ["Workers Change Liquid Oxygen Seal on Orbiter Challenger," AEROSPACE DAILY, p. 125, Sept. 25, 1984.]

**September 24:** Lockheed Space Operations Co. (Titusville, Florida) defeated a union organizing challenge, winning an winning an election in which more than 72 percent of the eligible workers voted against all four unions on the ballot. The result was a loss for the International Brotherhood of Teamsters, which spent seven months trying to organize about 900 of Lockheed's 5,000 employees in Brevard

County. Lockheed Space Operations, a subsidiary of Burbank, California-based Lockheed Corp., services NASA's space shuttles, processing the craft for reuse.

Teamsters officials were unavailable for comment. [Kilsheimer. THE ORLANDO SENTINEL, p. 1D, Sept. 25, 1984.]

**September 25:** Donald Engen of the Federal Aviation Administration met with U.S. Rep. Bill Nelson (Melbourne Dem.) and U.S. Rep. Norman Mineta (Calif. Dem.), head of the House Aviation Committee, to discuss additional penalties for pilots who stray into restricted areas surrounding Kennedy Space Center during shuttle operations. According to Nelson, Engen has agreed to a "vastly expanded" restricted area around the launch and landing site, and to the issuance of Notices to Airmen, setting out specific restrictions prior to each shuttle operation. [Yacenda. TODAY, p. 1B, Sept. 26, 1984.]

**September 26:** Top space agency officials met and formally cleared the shuttle Challenger and its record seven-member crew for launch October 5 on the most ambitious Earth observation mission in 10 years. Charles Redmond, a spokesman for NASA, said a flight readiness review turned up no problems that would affect the planned launch. ["NASA Says Challenger Crew Ready for Launch," THE ORLANDO SENTINEL, Sept. 27, 1984.]

<> An arbitrator awarded $780,000 in disputed severance pay to 106 Kennedy Space Center workers who were former employees of contractor McGregor-Werner Inc. New York arbitrator Leonard Irsay found the employees were improperly denied severance pay called for in union contracts with McGregor-Werner when work the company was performing for NASA was turned over to replacement KSC ground services contractor EG&G last summer. [Yacenda. TODAY, pp. 1B & 3B, Sept. 27, 1984.]

**September 27:** NASA donated a 4-acre site east of the visitors information center (also known as Spaceport USA) for the last remaining Apollo-era launch tower and a model Saturn 5 rocket, announced U.S. Rep. Bill Nelson (D-Mel.) at a 1 p.m. news conference. With a home for the tower secured,

area historic societies are gearing up to raise the estimated $15 million needed for a monument for the tower that helped send men to the moon.

Preliminary plans for the site call for an area under a mock mobile launch platform for exhibits. An elevator is planned to take visitors to the top of the launch tower. [Hall. TODAY, p. 2B, Sept. 28, 1984.]

## OCTOBER 1984

**October 1:** NASA officials said preparations for the launch of Challenger mission 41-G on October 5 were proceeding on schedule. The terminal prelaunch countdown is set to pick up at 1 a.m. EDT October 3 with the traditional call to stations for launch teams. The shuttle crew of Robert Crippen, Jon McBride, Sally Ride, Kathryn Sullivan, David Leetsma, Marc Garneau and Paul Scully-Power were scheduled to arrive at KSC on the afternoon of October 2. The flight of the Challenger is expected to conclude with the second scheduled KSC shuttle landing. [Yacenda. TODAY, p. 1A, Oct. 2, 1984.]

**October 2:** Incomplete paperwork nearly forced NASA officials to postpone the planned October 5 launch of the space shuttle Challenger. But program managers decided they could catch up with a backlog in shuttle engineering documentation by liftoff - 7:03 a.m. EDT - clearing the way for the pre-launch countdown to pick up on time at 1 a.m. EDT on October 3.

"We're proceeding as planned," said Kennedy Space Center chief spokesman Hugh Harris. "Nothing really happened except that a lot of work needed to be done." While the paperwork problem was being worked, the seven crew members of 41-G flew into KSC from Houston, Texas.

During a press conference, mission commander Robert Crippen thanked KSC workers "for getting Challenger ready in record time." Crippen is about to make a record fourth shuttle flight. The second shuttle veteran, mission specialist Sally Ride, was greeted with a kiss from her astronaut husband, Steve Hawley. "I now know that we are currently operational because I've been coming down here quite a bit lately," said Ride. "I came down to see Steve take off five weeks ago, and now he's here to see me go." Hawley flew aboard Discovery on August 30. [Yacenda. TODAY, pp. 1A & 18A, Oct. 3, 1984.]

**October 5:** Challenger's launch at 7:03 a.m. EDT from KSC's pad 39A was visible in Jacksonville in the north and Miami to the south. Some people on the Space Coast saw the shuttle's twin solid rocket boosters drop from 44 miles up.

"All in all, we feel very good. And we think probably this is a harbinger for the future on how well things can go," said shuttle management director Tom Utsman. "Things went very smoothly, especially compared with the last one," said launch director Bob Sieck, referring to the trouble-plagued inaugural launch of shuttle Discovery. "We think we're off and running on our progress toward once a month (launches)." [Yacenda. TODAY, pp. 1A & 20A, Oct. 6, 1984.]

<> Among those witnessing Challenger's liftoff was tennis player Billie Jean King, who was invited by astronaut Sally Ride - America's first woman in space, who embarked on her second voyage. Judy Resnik, America's second female space traveler, was also on hand. Others gathered in the predawn air were Canadian Minister of Science and Technology Thomas E. Siddon; Sir Godfrey and Lady Nancy Agnew of London; Ambassador and Mrs. Allen E. Gotlieb of Canada; Col. Gilbert Raye of the National Security Council; and U.S. Rep. Nick Rahall, D-W.Va. ["Billie Jean Watches With Few Other VIPs," p. 3A, Oct. 6, 1984.]

<> Canada's newly named Minister of Science and Technology, reflecting the conservative tone of the country's recently elected Tory government, called for increased cooperation between Canada and the United States in the space program. "I think we've always been able to get along in a cooperative way," said Minister Tom Siddon during an impromptu news conference at KSC. "We have to trust our neighbors a little bit more."

But Siddon, at KSC to see off Marc Garneau, the first Canadian to go into space, noted that Canada continues to advocate "the peaceful uses of space." Siddon wouldn't predict the level of future funding for Canada's small, 25-year-old space program. "Today is a day for celebration," said Siddon in regard to Garneau's historic ride on the space shuttle Challenger. [Yacenda. TODAY, p. 3A, Oct. 6, 1984.]

**October 6:** The retrieval operation for mission 41-G's solid rocket boosters was one of the smoothest and fastest ever, according to Anker Rasmussen, manager of Marine Operations for Morton Thiokol. "This has to be one of our three fastest operations to date. We don't keep precise records

on past times, but when you consider the northern launch inclination (most shuttle missions are launched in a more eastern direction), this was a great time."

Following separation of the SRBs, just over two minutes into the mission, they parachuted into the Atlantic Ocean approximately 140 miles due east of Jacksonville, Florida. "It took us about half an hour to reach the SRBs," Rasmussen said. "We were about seven miles from one and nine miles from the other....From the time we began work on the SRBs until we had them in tow was about four hours."

The Freedom Star and Liberty Star entered Port Canaveral just before sunrise, at 6:40 a.m. EDT, on October 6. Arrival was timed so that it would take place with benefit of daylight. "We had to keep our speed down so that we wouldn't get there before the sun came up," Rasmussen stated. "We returned to Hangar AF (at Cape Canaveral Air Force Station) seven hours earlier than I had originally expected." [Granath. STAR GAZER, p. 1, Oct. 18, 1984.]

**October 9:** Construction continued on new headquarters for the Lockheed Space Operations Company, winner of NASA's shuttle Launch Processing Contract. According to Lockheed, "the building will feature a special aluminum clad facade over a structural steel frame...and will include paved parking for 250 cars." Some 180 Lockheed employees will work in the new facility in Titusville, Florida. ["$3.3 Million Lockheed Shuttle Facility," SPACETIME, p. 14, Oct. 9, 1984.]

**October 12:** Kennedy Space Center plans to issue space station ground operations RFPs October 31. Separate RFPs will be issued for an overall analysis of the ground operations and system test activities associated with the elements of the space station system and of the approaches for proprietary operations associated with commercial customer activities, and for an analysis of space station mission requirements at KSC.

The former study will include definition of requirements for new facilities, modifications to existing facilities, support equipment and services, impact to on-going launch site activities, manpower and cost estimates. The mission requirements study will support the Mission Assessment Function for KSC, and will include: determining the ground

processing requirements; developing a computer simulation model of the overall KSC operations activities for the station project; and developing a ground operations database. ["Kennedy to Analyze Ground Operations Requirements for Station," DEFENSE DAILY, p. 214, Oct. 12, 1984.]

**October 13:** Mission Commander Robert Crippen brought the unpowered shuttle Challenger down on Kennedy Space Center's concrete runway just eight seconds late, at 12:26:37 p.m. EDT, completing history's second round-trip space flight. "The third time is the charm," Crippen radioed to Mission Control in Houston as Challenger began its unpowered drop from space nearly an hour before touchdown. His two previous KSC landing attempts were aborted because of bad weather, sending Crippen and his crew to Edwards Air Force Base in California.

Evidence of heavy braking, in the form of smoke coming from the shutle's main landing gear, could be seen as the craft rolled down the 15,000-foot runway past NASA guests and reporters.

Challenger's seven-person crew, which included Crippen's co-pilot, Jon McBride, mission specialists Sally Ride, Kathryn Sullivan and David Leetsma, and payload specialists Marc Garneau and Paul Scully-Power, emerged from the craft 33 minutes after landing. Greeting the crew was the Florida spaceport's red welcoming carpet, used only once before, in February, bearing the words, "Welcome to KSC." KSC officials added a little extra touch to this welcome, with a yellow sign that read: "The grass is always greener at KSC than it is on the West Coast." Several patches of green sod were placed at the foot of the gangway descending from Challenger to emphasize the point.

Crew members looked fit, cheerful and steady on their feet as they came down the gangway to solid ground. Among those on hand to greet Challenger's returning voyagers was Steve Hawley, who had turned out to welcome home his wife and fellow astronaut, Sally Ride.

Challenger traced a path south above the Indian River from New Smyrna Beach, where the ship crossed over the coast from out over the Atlantic Ocean. The first view of Challenger from the spaceport came with the craf' still heading south at 50,000 feet. Several bursts of white smoke, telltale

signs that the crew was using the ship's steering rockets to trim its trajectory, revealed the shuttle's presence. Challenger disappeared in an invisible haze as it completed its final approach loop over central Merritt Island. When the craft suddenly reappeared, it was dropping like a dive bomber straight for the southeast end of the 300-foot-wide runway.

"Hey, you did good. Way to go," Capsule Communicator Richard Richards told Crippen from Houston after landing. "It was a great, great flight," said payload specialist Scully-Power, an Australian-born, naturalized American oceanographer. "It was the most fantastic flight. Given a few hours and a couple of beers, I could probably describe it," he said. Garneau, who made history by becoming the first Canadian to fly in space, called his experience a "voyage extraordinaire," speaking in his native French language. "It's everything you could ever imagine it to be," he said.

Ride, who made her first space trip in June 1983 with Crippen as commander on that flight as well, said her leader was right. The second time, she said, turned out to be as fantastic as the first. [Yacenda. TODAY, pp. 1A & 20A, Oct. 14, 1984.]

**October 15:** A scorched pod housing and one of the Challenger's steering rockets represented the only significant damage to the shuttle during its recent eight-day mission, NASA officials said. The Orbital Maneuvering System pod was damaged by the heat of re-entry to Earth's atmosphere on October 13, when the seven astronauts aboard made the second shuttle landing ever at Kennedy Space Center.

The damage occurred where a 3-foot strip of protective thermal blanket was ripped off Challenger's right-hand maneuvering rocket pod during launch October 5. "With the exception of the OMS pod, this orbiter was in the best condition of any to date," Challenger Flow Director James Harrington said. Other damage included about three dozen heat tiles that must be replaced, and an equal number that sustained repairable damage. Brake damage, which has occurred during virtually every landing so far, was characterized by officials as "normal minor damage" in the form of cracked pads and washers.

As for Challenger's brakes, officials from manufacturer B.F. Goodrich said engineers found "three or four" of the shuttle's main landing gear brakes damaged by the touchdown, with that damage conforming to the patterns observed after prior touchdowns. Goodrich Product Engineer John Warren said several different factors may be responsible, but that deflection of the shuttle's wheel axles is believed to be the culprit. [Yacenda. TODAY, pp. 1A & 12A, Oct. 16, 1984.]

**October 16:** EG&G Florida in Cocoa won an addition to its base operations contract by NASA at the Kennedy Space Center to plan and design new logistics concepts in support of the planned space station. The contract includes a six-month study of techniques in advanced data collection for inventory management on a manned space station planned to be operational in the early 1990s. EG&G will also conceptualize an overall, highly advanced system to be considered for the supply, maintenance and logistic support activities needed for future manned space stations. [Kassak. TODAY, p. 14C, Oct. 17, 1984.]

**October 17:** News that Saturn V moon rocket designer Arthur L. J. Rudolph had renounced his citizenship and returned to Germany following accusations linking him with Nazi wartime atrocities was greeted with surprise by those who worked with him. "I can only tell you one thing. He was an engineer. He had nothing to do with political prisoners," said Karl Sendler of Cocoa Beach, Florida, one of those who knew Rudolph at the main V-2 research center at Peenemunde in Germany and later in this country.

But Sendler said he didn't know Rudolph while he was assigned to direct V-2 rocket production at the Mittelwerk (Central Works) underground factory in central Germany, where the atrocities are said to have taken place. "I was in Mittelwerk once. It was the first time in my life that I saw someone in a concentration camp uniform. But I was told that the security measures were strictly done by security forces," Sendler said.

Sendler, an electronics and tracking expert, said he had little direct contact with Rudolph, a rocket engineer, even after the scientists were brought to this country following World War II. But Sendler recalled Rudolph - who was based at the Army's Redstone Arsenal and afterwards at NASA's

Marshall Space Flight Center, both in Huntsville, Alabama - as a dedicated worker. "I would even say that he was a nut. He didn't know when to stop," Sendler said, noting that Rudolph never gave the impression of being "a politician." [Yacenda. TODAY, p. 6A, Oct. 18, 1984.]

**October 18:** The space shuttle Discovery was towed from its orbiter processing hangar at Kennedy Space Center to the nearby Vehicle Assembly Building early this morning. The 300-yard tow took an estimated half hour to complete, according to KSC spokeswoman Weida Tucker-Brewington. ["Shuttle Towed to Building for Assembly," TODAY, p. 7A, Oct. 18, 1984.]

**October 23:** Just after midnight, the space shuttle Discovery began its 6-1/2-hour, 3-mile rollout to Pad 39A from the Vehicle Assembly Building. The trip concluded just before 7 a.m. EDT, according to KSC spokeswoman Weida Tucker-Brewington. Discovery's second journey into space is set for November 7, at 8:18 a.m. EST. [Yacenda. TODAY, pp. 1A & 14A, Oct. 23, 1984.]

**October 24:** NASA's Kennedy Space Center plans to issue Requests For Proposals (RFPs) November 15 for analysis of Space Station maintenance activities for processes which might be accomplished in-flight, and of overall maintenance concepts so that "an overall approach for maintainability/maintenance can be established" for the Space Station program. Proposals will be due January 8, 1985. ["KSC Opens Study of Space Station Maintenance Activities," DEFENSE DAILY, p. 278, Oct. 2[illegible], 1984.]

<> Kennedy Space Center awarded Computer Sciences Corporation (Falls Church, Virginia) a $2,111,098 contract extension which brought the total value of the existing contract to $4,264,300. The cost-plus-award-fee contract began October 1 and extends through September 30, 1985. CSC will provide instrumentation and computation services used in support of tests and launches of the Delta, Atlas/Centaur, and Shuttle/Centaur vehicles conducted at NASA facilities at Cape Canaveral Air Force Station. [Malone. NASA/KSC NEWS RELEASE No. 183-84, Oct. 24, 1984.]

**October 25:** NASA's Kennedy Space Center awarded Doster Construction Company, Inc. (Birmingham, Alabama) a $7,496,000 contract for the design and construction of a Hazardous Cargo Servicing Facility. Under the terms of the fixed-price contract, Doster Construction Company is responsible for completing all work on the facility within 420 days after notification to proceed with operations. The Hazardous Cargo Servicing Facility will be located in the space center's industrial area and will be manned by both NASA and contractor employees. The facility will include an airlock, a high bay and a clean room-type section. The structure will be used to process those space shuttle payloads, which due to their hazardous nature, are incapable of being processed in usual facilities. [Varnes. NASA/KSC NEWS RELEASE No. 184-84, Oct. 25, 1984.]

<> With a "superb" practice countdown for the November 7 launch of the space shuttle Discovery now out of the way, mission specialist Joe Allen said he has one concern: deploying the correct pair of satellites and retrieving two ailing counterparts. "I hope we don't get them confused," joked Allen following the test countdown, adding that he hopes the crew comes home "with the right two."

The four-man, one-woman crew was pleased with the countdown, which ended just as Discovery's engines would have been ignited in a real launch. "We really enjoyed working with the launch team," Commander Rick Hauck said. "We're ready. They're ready." The crew also includes pilot David Walker and mission specialists Anna Fisher, Dale Gardner and Allen. [Hall. TODAY, p. 17A, Oct. 26, 1984.]

**October 30:** The launch of the fourth and final NATO III series aboard a Delta rocket has been rescheduled until no earlier than November 13 to provide time for final resolution of a problem with the traveling wave tube amplifiers (TWTAs) aboard the spacecraft. [Malone. NASA/KSC NEWS RELEASE No. 196-84, Oct. 30, 1984.]

<> President Reagan signed legislation that streamlines the government approval process for private launches of space satellites. The bill puts the Transportation Department in charge of a "one-stop shop" for the needed approvals. The secretary must make a determination on applications within six months. In a written statement, the president said the

bill will "signal to private launch operators that this administration stands behind their efforts to open up this new area of space exploration." He said that the new law "is a milestone in our efforts to address the need of private companies interested in launching payloads to have ready access to space." Associated Press. TODAY, p. 6A, Oct. 31, 1984.]

**October 31:** "We're 'go' for the seventh," Kennedy Space Center spokesman Dick Young said following a high-level management review of pre-flight preparations. One late-breaking doubt clouding the launch date was cleared away when engineers verified that Discovery's system of thermal-protection tiles was free of deterioration recently discovered on the older spaceplane Challenger.

Engineers ordered three of Discovery's delicate ceramic tiles pulled to see if any softening of a bump-smoothing compound beneath the tiles had occurred, as was seen a few days earlier on Challenger. Their investigations revealed the rubber-like compound, called "screed," was in proper condition, Young said.

Technicians also conducted several testing operations aboard Discovery, including check-out of the $1.2 million space suits that two astronauts will wear during two separate spacewalks planned. Workers also tested the tightness of Discovery's three main liquid-fueled engines using pressurized, inert helium gas, and began charging the batteries on the Hughes Communication Leasat-1 satellite and the Canadian Anik C-3 spacecraft. [Yacenda. TODAY, p. 11A, Nov. 1, 1984.]

## NOVEMBER 1984

**November 5:** While preparations for the launch [November 7] of the space shuttle Discovery continued smoothly, a secret military mission assigned to Challenger was postponed several weeks because of insulation problems. NASA said technicians will remove as many as 2,800 black heat-protective tiles from Challenger's underside because a smoothing substance underneath them has weakened and must be replaced. Challenger's problem was discovered when tiles came off too easily when they were removed as part of regular testing after the shuttle's last flight in early October.

Workers found softness in a substance called screed, a smoothing material comparable to auto body putty that is put on rough places on the shuttle's aluminum skin. Workers believe the weakening was caused by repeated uses of a tile waterproofing substance and the thermal stress of six spaceflights. Three tiles on Discovery were checked last week and no problems were found. The only hitch in the countdown for Discovery's launch was an on-board computer mass memory unit, which was ordered replaced after it did not respond properly during testing. The replacement work was not expected to affect the launch schedule. [Fisher. THE ORLANDO SENTINEL, pp. C-1 & C-5, Nov. 6, 1984.]

**November 6:** Kennedy Space Center was buzzing with the prospect that pop superstar Michael Jackson might top the list of VIPs attending today's launch of the space shuttle Discovery. The secretive singer and members of his entourage "have expressed an interest in viewing the launch," said Darlene Hunt, a KSC protocol officer. She said a representative for the Jacksons' touring group called November 5 and requested space for 15 people at the VIP viewing site for today's 8:23 a.m. EST launch.

The caller said "there could be a group of 15 and that Michael Jackson could be among them. They wouldn't say definitely whether or not he's coming," Hunt said and she refused to identify the caller, but she said she was told the Jacksons would have to travel from Miami, their last concert date. [Ash. TODAY, p. 13A, Nov. 7, 1984.]

**November 7:** Shifting high-altitude winds accompanying a Central Florida cold front caused shuttle management to delay the planned second flight of Discovery.

The decision to scrub the November 7 launch came at 7:52 a.m. EST, just 31 minutes before Discovery and its five member crew were due to launch. Engineers at Johnson Space Center in Houston calculated that the winds above the Cape Canaveral launch site were behaving far too erratically for the shuttle to pass through safely. Computer models indicated the shearing force of the winds as they changed direction could have inflicted permanent structural damage on the vehicle. "Because of the rapid change in that direction, the maximum roll rate was unacceptable. Wind speeds were not the problem," said Captain Art Thomas, chief Air Force weather forecaster for the shuttle program. [Yacenda. TODAY, pp. 1A & 20A, Nov. 8, 1984.]

<> Early in the morning of November 7 - moments before unpredictable winds forced NASA officials to postpone Discovery's launch until the next day - a spokesman for the Jacksons called and canceled the group's reservations, said Arnold Richman, NASA's chief of visitor services. "I can very definitely say he's not coming now," Richman said. [Ash. TODAY, p. 17A, Nov. 8, 1984.]

**November 8:** Facing moderating high-level winds, the space shuttle Discovery lifted off at 7:15 a.m. EST, just 7/100ths of a second late. "We're looking good," mission commander Rick Hauck radioed to Mission Control in Houston, Texas, just after launching. Shuttle Management Director Tom Utsman termed the launch "very, very successful, spectacular."

The only significant problem cropped up during a hold in the countdown 20 minutes prior to liftoff. A key console that monitors total vehicle integrity went down unexpectedly in KSC's Launch Control Center, forcing teams to quickly switch to alternate systems. It was a problem similar to one that threatened to scrub Discovery's first launch on August 30, but which had not recurred during subsequent testing.

"The team handled that very well with no impact," said Launch Director Bob Sieck, who described Discovery as an "absolutely, 100 percent perfect vehicle at liftoff."

Officials reported none of the troublesome private aircraft intrusions into the flight safety zone that have created problems for several earlier launches. An off-shore sailboat was encountered by a machine gun-toting patrol helicopter, but Utsman said the boat was outside the danger zone and was not bothered. [Yacenda. TODAY, pp. 1A & 20A, Nov. 9, 1984.]

**November 12:** A Cocoa Beach company, under federal scrutiny for possible overbilling of work hours at NASA, has agreed out of court to repay the space agency $105,000. PRC Systems Services Co., the prime design engineering contractor for the space shuttle and ground support facilities at the Kennedy Space Center, reached the agreement this month after negotiations with the U.S. attorney's office in Orlando, Florida. The company had been under investigation since 1979.

U.S. Attorney Robert Merkle said an investigation by PRC and the FBI showed that several employees submitted falsified time cards and billed NASA for $24,000 of work performed on other government contracts. Merkle said the company fired and reprimanded the employees involved in the scheme and formed new guidelines to ensure accurate time reporting. He said the $105,000 paid to NASA settled all claims and interest owed to the space agency. ["Contractor to repay NASA $105,000," THE ORLANDO SENTINEL, p. C-4, Nov. 13, 1984.]

**November 13:** The Bionetics Corp. (Hampton, Virginia) won a $2 million NASA contract extension for laboratory support services at Kennedy Space Center's Biomedical Directorate. Bionetics will continue operating KSC's physiological stress laboratory and provide support for the microbiological laboratory. Bionetics will be responsible for monitoring KSC's natural environment and that of its launch and landing operations. It will support the life sciences research being conducted at Cape Canaveral Air Force Station's Hangar L. [Kassak. TODAY, p. 14C, Nov. 14, 1984.]

<> The last Delta rocket to be launched from Cape Canaveral until mid-1986 lifted off on-time at 7:34 p.m. EST carrying the NATO 3-D telecommunications satellite. Observers on the ground could follow the flight for four minutes.

Built by McDonnell-Douglas Astronautics Co. (Huntington Beach, California), the Delta has scored a 95 percent success rate in its 24 year career. [Yacenda. TODAY, p. 6A, Nov. 14, 1984.]

**November 18:** Two wayward satellites retrieved from the space shuttle cargo bay were described by technicians as being in good shape aside from a few nicks. The Palapa B2 and Westar 6 returned to KSC on November 16 aboard Discovery concluding the first space salvage mission. A few solar cells were nicked when astronauts Joe Allen and Dale Gardner wrestled the satellites into the cargo bay during two space walks. The satellites were moved to a hangar where they will be serviced, including removal of volatile hydrazine fuel used in small control rockets. Later this month, they will be taken to the Hughes Aircraft plant in El Segundo, California, for renovation. ["Rescued Satellites Look Good," TODAY, p. 1A, Nov. 19, 1984.]

**November 20:** Discovery and the two retrieved satellites it carried back from orbit are hardly the worse for wear, NASA said. "It (Discovery) really looks very clean," said NASA official Jim Harrington. "It's hard to tell that the vehicle has even flown two times. It's in excellent shape." Harrington described Discovery's condition as "more favorable" than that seen following 13 previous shuttle flights.

As workers continued servicing Discovery, which landed at KSC on November 16, engineers were able to begin assessing the condition of the Palapa B-2 and Westar 6 spacecraft that came back with the shuttle. "They look remarkably well," NASA Cargo Integration Chief Jim Weir said.

Harrington said no unusual damage occurred to Discovery's thermal protection tiles during the latest flight. Engineers were concerned that an underlying material may have deteriorated as it has on the Challenger. They believe the deterioration occurred because of repeated applications of an intrusive waterproofing chemical called xylene.

Harrington said 3,588 tiles had been removed from Challenger's underside and officials expected that another 400 or so tiles would still have to be pulled and replaced on the craft. [Yacenda. TODAY, p. 12A, Nov. 21, 1984.]

**November 26:** Kennedy Space Center awarded Mohawk Construction and Erectors, Inc. (Titusville, Florida), a $264,987 contract for refurbishing Launch Complex 36 Ready Room Offices at Cape Canaveral Air Force Station. Under the contract's terms, Mohawk will modernize the interior, replace the air conditioning system, and modify walls, ceilings and floor coverings at Complex 36.

The fixed price contract, set aside for award to a small business firm, calls for Mohawk to complete all work within 120 days after receipt of notice to proceed with operations. [Shea. NASA/KSC NEWS RELEASE No. 208-84, Nov. 26, 1984.]

**November 27:** George F. Page, recently retired from the post of deputy director of Kennedy Space Center, was appointed vice president of operations at Transpace Carriers, Inc. ["George G. Page." DEFENSE DAILY, p. 125, Nov. 27, 1984.]

**November 28:** Kennedy Space Center awarded Butler Construction Company (Rockledge, Florida) a $542,900 contract for the construction of an Operations Support Facility. Under the terms of the contract, Butler Construction will provide site clearing and utilities installations for the Operations Support Facility which will be located in the Launch Complex 39 area at KSC. The facility will be used to support Department of Defense operations at the center. The fixed price contract, one set aside for award to a small business, calls for Butler Construction to complete all work on the facility by April 11, 1985. [Varnes. NASA/KSC NEWS RELEASE No. 207-84, Nov. 28, 1984.]

**November 29:** Twenty-three years ago today - on Nov. 29, 1961 - Enos, a 39-year-old chimpanzee, made two Earth orbits in a nearly 3-1/2-hour flight aboard a Project Mercury capsule. He died of a non-space related illness less than a year after his historic flight. [Salamon. TODAY, p. 1B, Nov. 29, 1984.]

<> America's first space traveler, a 27-year-old squirrel monkey named Miss Baker, died at a clinic in Huntsville, Alabama, where she had been treated for a kidney ailment. The one-pound monkey, who made her trip into space 25 years ago, became ill November 25 and died at the small-animal

clinic at Auburn University, said Scott Osborne, deputy director of the Alabama Space and Rocket Center. ["Monkey Dies, 1st American Space Traveler," THE ORLANDO SENTINEL, p. A-13, Nov. 30, 1984.]

## DECEMBER 1984

**December 5:** Kennedy Space Center awarded Holloway Corporation (Titusville, Florida) a contract valued at $2,306,477 for the relocation of existing fire extinguishing equipment. The fixed-price contract was effective November 20, and will extend through September 22, 1985. Under the terms of the contract, Holloway will remove two pumps from the Pad-B pump house, and a one million gallon water tank behind the Operations and Checkout Building. This equipment will be installed in the Hypergolic Maintenance Facility area and will be used in a new fire extinguishing system. The contract agreement establishes that Holloway is responsible for the construction, installation and testing of a complete Hypergolic Maintenance and Cargo Processing Area fire extinguishing system. [Malone. NASA/KSC NEWS RELEASE No. 212-84, Dec. 5, 1984.]

**December 10:** NASA officials said that Costello Construction Company, Inc. (Merritt Island, Florida) has been awarded a $167,000 contract to build a Classified Material Destruction Facility at Kennedy Space Center; the facility will house a new 24-foot-long paper shredder. The 48-by-30-foot complex will be finished in mid-April, and the shredder's first task will be the destruction of documents left behind from the classified space shuttle mission scheduled for approximately January 22, said project engineer Ken Ford.

There will be "quite a bit" to chew after each defense launch, Ford said. "It's enough to keep it really going full time" for weeks. Ground will be broken later this month northeast of the Launch Control Center because "that is where the material that is to be destroyed is generated," Ford said. [Fisher. THE ORLANDO SENTINEL, p. 1B, Dec. 11, 1984.]

**December 11:** Scientists made their 13th unsuccessful attempt in a month to launch a weather satellite from Vandenberg Air Force Base, and officials said the high winds blamed for most of the scrubs could hinder future space shuttle launches there. [AP. TODAY, p. 11A, Dec 12, 1984.]

<> About 2,200 acres of the Merritt Island National Wildlife Refuge were doused with a napalm-like mixture and put to the torch, said Refuge Manager Steve Vehrs. The controlled-burn program is meant to make the KSC landing area much less attractive to tree swallows who, like their human "snowbird" counterparts, enjoy Florida winters, Vehrs said. Vehrs said the burning is supervised by KSC firefighters after a helicopter sprays precise areas with jellied gasoline. He said special care is taken not to burn oak hammocks, pine stands or palm hammocks. [Crook. TODAY, p. 11A, Dec. 12, 1984.]

**December 12:** A weather and search-and-rescue satellite was boosted flawlessly into orbit after more than a month of problems that forced cancellations of 13 launch attempts. And officials of the National Oceanographic and Atmospheric Administration said the satellite showed no evidence of tumbling problems that hampered three of four earlier satellites after they made it into space. [AP. TODAY, p. 4A, Dec. 13, 1984.]

**December 17:** Military and civilian space officials announced January 23 will be the date a top-secret defense payload will be launched from Kennedy Space Center aboard the space shuttle Discovery. And Air Force officials indicated that media speculation about the payload will be subject to investigation. [Yacenda. TODAY, pp. 1A & 16A, Dec. 18, 1984.]

**December 18:** Weida Tucker Brewington, formerly of the Public Affairs staff at Kennedy Space Center, joined the staff at Ebon Research Systems, a Cocoa Technical Services and management consulting firm, as director of marketing development and public relations. [Kassak. TODAY, p. 14C, Dec. 19, 1984.]

<> A study to determine the feasibility of developing a prototype expert weather forecasting system for Kennedy Space Center in support of space shuttle launch and landing is being opened to competition by the center. The contractor will recommend plans, schedules and resources for development of the prototype, with a possible option for follow-on development and test of the system. RFP's are slated for issuance January 11 with due date of February 21. ["Expert Weather Forecasting System for KSC Considered," DEFENSE DAILY, p. 245, Dec. 18, 1984.]

**December 20:** Continuing problems with the space shuttle Challenger's thermal tiles could delay that craft's next flight, now set for mid-to-late February, NASA said. Meanwhile, additional tile and engine work has postponed a move of Discovery from a Kennedy Space Center processing hangar to the Vehicle Assembly Building. KSC spokesman Rocky Raab said the 300-yard move was expected to take place early on the afternoon of December 21.

The latest puzzle hampering engineers' efforts to sort out Challenger's tile problems centers around a rubberlike silicon substance called Room Temperature Vulcanizing - or RTV - used on the orbiter's aluminum skin beneath the protective tiles. "There is a situation we don't understand with the RTV," Raab said. Asked if that would delay Challenger's flight, he said, "There is the potential for that." [Yacenda. TODAY, pp. 1A & 20A. Dec. 21, 1984.]

**December 21:** NASA recognized Ebon Research Systems' Executive Director, Dr. Florence Hicks Alexander, as the Minority Business Person of the Year. Ebon, a small business contractor at KSC, provides engineering integration and support services for processing shuttle payloads and related ground support equipment at KSC. NASA's Administrator, James M. Beggs, presented the award to Alexander at a recent ceremony held in Washington during the annual Minority Business Enterprise Development Week. Nominations for the award were solicited from all NASA centers. ["NASA Honors KSC Contractor," SPACEPORT NEWS, p. 4. Dec. 21, 1984.]

<> Kennedy Space Center awarded EG&G Florida, Inc. (Cocoa, Florida) a one year, $90,433,613 extension to its existing contract for base operations services. The extension covers the period of January 1 through December 31, 1985 and brings the cumulative cost of the original contract to $275,199,168. This is the second one-year extension to the Base Operations Contract awarded to EG&G in January 1983. [Shea. NASA/KSC NEWS RELEASE No. 224-84, Dec. 21, 1984.]

<> The Space Division of Rockwell International in mid-February will open a space shuttle service center in Cape Canaveral. a Rockwell spokesman said. NASA in November extended its space shuttle production contract with Rockwell to include an intermediate and depot-level maintenance support facility for shuttle flights, said Dick Burton, Rockwell public relations director.

"The service center in Cape Canaveral, the latest phase of our contract with NASA, will be used to maintain or repair space shuttle systems and make minor hardware changes that do not require being handled by our division in California," Burton said. The facility will be located in the now vacant International Business Machines Corp. building at 8600 Astronaut Boulevard in Cape Canaveral. [Smith. THE TRIBUNE, p. 1A, Dec. 27, 1984.]

**December 23:** The space shuttles Columbia, Challenger and Discovery were described as the "Nina, Pinta and Santa Maria" of the 20th century by A. R. "Al" Schroter, president of Lockheed Space Operations Co., in the commencement address he gave the graduating class at Brevard Community College. [Herlihy. TODAY, Dec. 24, 1984.]

## Appendix A

NASA Expendable Launches for 1984

| Launch Date | Payload | Launch Vehicle | Launch Site | Mission Remarks |
|---|---|---|---|---|
| March 1 | Landsat 5 | Delta | WSMC* | NOAA earth observation. |
| June 9 | Intelsat V-G | Atlas-Centaur | ESMC** | Intelsat international communications. |
| August 16 | AMPTE | Delta | ESMC | Active Magnetospheric Particle Tracer Explorer. |
| September 21 | Galaxy-C | Delta | ESMC | Hughes commercial communications satellite. |
| November 13 | NATO-IIID | Delta | ESMC | NATO communications. |
| December 13 | NOAA-F | Altas-F | WSMC | NOAA weather satellite. |

*WSMC - Western Space and Missile Center, Vandenberg Air Force Base, Calif.
**ESMC - Eastern Space and Missile Center, Fla.
[NASA ACTIVITIES, December 1984, p. 19.]

## Appendix B

### NASA Space Shuttle Launches for 1984

| Launch Date | Launch Number | Orbiter | Launch Site | Payload | Crew |
|---|---|---|---|---|---|
| February 3 | 41-B | Challenger | KSC* | SPAS-01A<br>Palapa B-2<br>Westar-VI | Brand, Gibson, McCandless, McNair, Stewart. |
| April 6 | 41-C | Challenger | KSC | SMM Repair Mission<br>LDEF | Crippen, Scobee, van Hoften, Nelson, Hart. |
| August 30 | 41-D | Discovery | KSC | LEASAT-1<br>OAST-1<br>Telstar 3-C<br>SBS-D | Hartsfield, Coats, Hawley, Resnick, Mullane, Walker. |
| October 5 | 41-G | Challenger | KSC | OSTA-3<br>ERBS | Crippen, McBride, Sullivan, Ride, Leestma, Scully-Power, Garneau. |
| November 8 | 51-A | Discovery | KSC | Telesat-H<br>LEASAT<br>DMOS<br>retrieved:<br>Palapa B-2<br>Westar IV | Hauck, Walker, Allen, Fisher, Gardner. |

*KSC - Kennedy Space Center, Florida.
[NASA Activities, December 1984, p. 19; (KHR-1A) Major NASA Launches, October 1, 1958 - December 31, 1984.]