Chronology of KSC and KSC Related Events for 1993

Ken Nail, Jr.

Technical Memorandum 109196

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Sherikon Space Systems, Inc.
Kennedy Space Center, FL

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FOREWORD

This 1993 Chronology is published to fulfill the requirements of KMI 2700.1 (as revised) to describe and document KSC's role in NASA's progress.

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

Materials were researched and prepared for publication by Historian-Archivist Ken Nail, Jr. (Sherikon Space Systems, Inc.). The 1992 Chronology includes an index beginning on page 272. For the added convenience of researchers, each entry has been headlined.

Comment on the Chronology should be directed to the John F. Kennedy Space Center, LIBRARY-E, Kennedy Space Center, Florida, 32899.

Walter L. Covington
Center Services

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JANUARY

January 2: **A BUSY NEW YEAR BEGINS**

According to KSC spokesman **Mitch Varnes**, "the first three weeks of the new year will be pretty busy." Endeavour will be launched on its STS 54 mission on January 13 and, then, "we'll have (Endeavour's) landing here on the 19th." A number of pre-launch activities still remain on the schedule including the installation of EVA spacesuits and servicing of payloads. [Halvorson, FLORIDA TODAY, p. 2A, Jan. 3, 1992.]

[] **CREATIVE MANAGEMENT CONTRACT AWARD**

"We're absolutely ecstatic about this contract," said CMT President **Jacob Dixon**, referring to the award recently of a $7 million contract with his Creative Management Technologies Inc. (Cocoa Beach, FL). The new contract is for support services to McDonnell Douglas Space Systems Co. at Kennedy Space Center. CMT will perform administrative support services for McDonnell Douglas facilities at KSC and Cape Canaveral Air Force Station and will provide employment for 51 people. ["Cocoa Beach Firm Wins Contract," FLORIDA TODAY, p. 10E, Jan. 3, 1993.]

January 4: **STS 54: ENDEAVOUR READIES FOR LAUNCH**

At Launch Complex 39B, technicians have opened the crew compartment of Endeavour and its payload bay doors which have been extended to accommodate payload access platforms. Endeavour has been powered up for the final pre-launch processing before the youngest Shuttle begins its STS 54 mission on January 13. Work in progress: aft main engine compartment closeouts; launch countdown simulation exercise; solid rocket booster electrical checks; solid rocket booster thermal curtain installation; TDRS battery charging; IUS battery checks; preparations for IUS Simulated countdown and the installation of EVA spacesuits. Work scheduled: EVA spacesuit installation on third shift tonight; IUS countdown simulation beginning the second shift tomorrow; TDRS/IUS payload stray voltage checks on January 6; DXS interim servicing; ordnance connections/hypergolic tank pressurization January 7; start of launch countdown for STS 54 at 12:01 a.m. January 10. Mission managers currently have no issues to resolve or concerns about the launch. [Banke, FLORIDA TODAY, p. 4A, Jan. 5, 1993; Space Shuttle Status Report, Jan. 4, 1993.]

[] **KRISTOFFERSON RETIRES FROM PA**

Karl Kristofferson (Public Affairs) today ends 30 years of government service with his retirement as news chief at the KSC Press Site. "If I could figure out a way to revoke his retirement, I would," said **Dick Young**, KSC's Chief of Public Information. "He is a polished writer, a great editor, and I'm going to miss him.

I may have to go back to work." Kristofferson said, "I've been here almost 30 years; that's enough. This will be the first time in a long time that I've been unemployed and it already feels pretty strange." [Halvorson, FLORIDA TODAY, p. 1A, Jan. 4, 1993.]

[] **STS 54: EVA SPACESUITS INSTALLED**

At Launch Complex 39B, technicians have installed EVA spacesuits in Endeavour in preparation for the STS 54 launch on January 13. Additional work completed: launch countdown simulation exercise; solid rocket booster electrical checks and thermal curtain installation. Work in progress today: aft main engine compartment closeouts; removal of aft compartment access platforms and portable lights; removal of main engine protective covers; loading Orbiter mass memory unit software; star tracker inspections; fuel cell purges; external tank purges; external tank electrical checks; TDRS battery charging; IUS simulation countdown; EVA spacesuit checkout in Orbiter airlock; launch countdown preparations in Firing Room 3. Work scheduled: TDRS/IUS stray voltage checks; range safety command checks; DXS interim servicing; removal of main engine compartment access platforms; ordnance connections; hypergolic tank pressurization; closing payload bay doors; beginning of launch countdown on January 10 at 9 a.m. [SPACE SHUTTLE STATUS REPORT, Jan. 5, 1992.]

[] **MAGLEV LINE FOR KSC?**

John Morena has a vision; the Executive Director of American Maglev Star Inc. wants to build a 15 mile maglev train system from Kennedy Space Center south. The project is designed - by Drs. **Gordon Danby** and **James Powell** - to demonstrate the technical capability of superconducting technology and would include a research and development facility as well. Estimates of costs suggest that the high-speed rail system would cost $8 to $10 million per mile. [Merx, FLORIDA TODAY, p. 16C, Jan. 6, 1993.]

[] **PLAYALINDA BEACH ACCESS ROAD**

The new access road to Playalinda Beach will not be completed until the spring of this year. Shuttle launches during 1992 and delays on railroad electrical work has put off an official completion date till May 3, according to **Wendell Simpson**, Canaveral National Seashore Superintendent. "Such delays," he said, "are not unusual for this type of project because we are doing much more than just building a road. Simpson continued, "I know people have been waiting for this for a long time, and we get people coming in from all over the state and country to see our beach. That amount of visitors will definitely have an impact on the economy of Titusville." [White, STAR-ADVOCATE, Jan. 6, 1993.]

January 6: **STS 54: PURGES COMPLETED**

Endeavour continues to undergo preparations for its upcoming STS 54 mission. At Launch Complex 39B, fuel cell and external tank purges have been completed. Other completed tasks include: aft main engine compartment closeouts/flight door installation; removal of main engine protective covers; loading Orbiter mass memory unit software; star tracker inspections; electrical checks of both the external tank and the solid rocket boosters; SRB thermal curtain installation; IUS simulated countdown; EVA spacesuit checkout in Orbiter airlock. Today, technicians' tasks include: aft main engine compartment confidence testing; installation of flight crew equipment items and the crew escape pole; range safety command checks; launch countdown preparations in Firing Room 3; TDRS battery charging; IUS/TDRS power-on stray voltage checks and payload closeouts; and Diffuse X-Ray Spectrometer interim servicing. Scheduled work: ordnance connections; hypergolic tank pressurization; external tank closeouts; solid rocket booster closeouts; IUS battery voltage checks; beginning launch countdown at 9 a.m. January 10; astronaut arrival at 3:30 p.m. and payload bay door closing at 8 p.m. January 10. [Banke, FLORIDA TODAY, p. 8A, Jan. 7, 1993; SPACE SHUTTLE STATUS REPORT, Jan. 6, 1993.]

January 7: **STS 54: ESCAPE POLE INSTALLED**

At Launch Complex 39B, technicians have installed the crew escape pole in Endeavour. The pole was designed after the 1986 Challenger accident to enhance astronaut chances of survival in a Shuttle accident. Other tasks completed: range safety command checks; TDRS battery charging; IUS/TDRS power-on stray voltage checks; DXS interim servicing; external tank and reactant system purges. Ordnance connections are underway as is hypergolic tank pressurization. Scheduled work for STS 54 includes: external tank closeouts; solid rocket booster closeouts; IUS battery voltage checks; final payload closeouts; start of launch countdown at 1 p.m. January 10. The crew of STS 54 is expected to arrive at 3:30 p.m. and the payload bay doors will be closed at 8:45 p.m. on the 10th. [SPACE SHUTTLE WEEKLY STATUS REPORTS, Jan. 7, 1993.]

[] **STS 55: COLUMBIA IN OPF BAY 2**

OPF Bay 2 workers have completed their fuel cell checkout of Columbia as they ready the Orbiter for its STS 55 mission scheduled for February. Workers have also completed a freon coolant loop checkout, main engine installation and the Spacelab tunnel installation. Work in progress: troubleshooting payload bay door latching; installation of main engine heat shields; functional testing of waste containment system; testing of OMS/RCS redundant electrical system. Work scheduled: payload bay door cycle and latch tests; installation of Spacelab D-2 laboratory module; mating of the external tank to the STS 55 solid rocket boosters

(on January 13.) Engineers are troubleshooting a difficulty in latching the payload bay doors. As a result Spacelab D-2 installation has been rescheduled from today until Monday (January 11). The initial troubleshooting will focus on the strongbacks attached to the doors. It is not clear at this time whether there might be a direct schedule impact. In the VAB, the left forward booster segment which was destacked immediately before the Christmas holidays has been restacked and leak checks have been successful. [SPACE SHUTTLE WEEKLY STATUS REPORTS, Jan. 7, 1993.]

[] **DISCOVERY: STS 56 PROCESSING**

Discovery's drag chute hardware has been removed and inspected during the Orbiter's stay in OPF Bay 3. As part of the processing activities prior to Discovery's STS 56 mission, the forward reaction control system has been removed and the waste management system has been flushed and drained. Work in progress: inspections of the 17-inch quick disconnect; liquid oxygen main propulsion system leak checks; reinstallation of the wheel and tire assembly; Orbiter hydraulic servicing; Ku-band antenna testing; radar altimeter testing; potable water servicing; tile removal and replacement/tile repairs. Scheduled work includes: hypergolic deservicing this weekend; reconfiguration of the payload bay for ATLAS-2 and humidity separator flow performance testing. [SPACE SHUTTLE WEEKLY STATUS REPORTS, Jan. 7, 1993.]

January 8: **STS 54: TANKS PRESSURIZED**

Endeavour's hypergolic propellant tanks have been pressurized for its STS 54 mission and final ordnance operations have been completed. Work in progress today: checkout of the solid rocket booster forward and aft skirts; launch countdown preparations; removal of protective covers from the reaction control system thrusters; preparing the crew compartment for flight; preparing the hazardous gas detection system for launch; removal of service platforms from the pad area; moving the booster flame deflectors to the launch position; standard pre-launch inspection of the launch pad; closeouts of the TDRS and IUS payload. Work scheduled: STS 54 launch team on station in firing room 3 for the start of the countdown at the T-43 mark; flight crew arrival at the Shuttle Landing Facility; closing of payload bay doors; launch on January 13 at 8:52 a.m. EST. The weather outlook for the launch of STS 54 continues to suggest a 70 percent chance of favorable weather at launch time. The primary weather concern is the potential for thunderstorm debris clouds in the area. [SPACE SHUTTLE STATUS REPORT, Jan. 8, 1993; Halvorson, FLORIDA TODAY, p. 4A, Jan. 9, 1993.]

[] **STS 55: COLUMBIA**

Main engine heat shields have been installed and the left forward assembly of the left solid rocket booster for Columbia's STS 55 mission have been stacked. Work in progress today: preparations to install the Spacelab D-2 payload; tests of the payload bay doors; functional test of the Orbiter's waste containment system; electrical redundancy test of the orbital maneuvering and reaction control systems. Scheduled work includes the installation of the Spacelab D-2 payload into the Orbiter's payload bay January 11 and rollover to the VAB targeted for early in February. [SPACE SHUTTLE STATUS REPORT, Jan. 8, 1993.]

[] **STS 56: DISCOVERY PROCESSING**

All flight tires have been installed on the main and nose landing gears of Discovery in preparation for its upcoming STS 56 mission. Today, workers are conducting pulse purges of the main propulsion system; preparing to remove APU ferry flight plugs; conducting a voltage test of the fuel cells; troubleshooting the Ku-band antenna and inspecting the 17-inch umbilicals. Scheduled work includes inspections of the orbital maneuvering system thrusters and removal of the main engine heat shields. [SPACE SHUTTLE STATUS REPORT, Jan. 8, 1993.]

January 10: PAYLOADS GETTING SCARCE

Budget cuts have caused several science experiments to be canceled which would have flown aboard the Space Shuttle in the mid-1990s. The next big assignment for the Space Transportation System is hauling Space Station components into space starting in 1996. Congress and/or President Clinton may create other delays in implementing the Space Station. **Bob Tucker** whose office decides which payloads will fly aboard the Shuttle says, "There haven't been any new payload starts...because we're shifting to Space Station." [Date, THE ORLANDO SENTINEL, pp. A-1 & A-6, Jan. 11, 1993.]

January 11: ENDEAVOUR: AT LC39B

The crew of STS 54 arrived at Kennedy Space Center's Shuttle Landing Facility yesterday at 3:30 p.m. Endeavour's payload bay doors were closed last night in preparation for launch January 13. Navigation aids have been activated and the pad at LC 39B has been washed down and inspected for debris. The Orbiter's mass memory has been checked out as has been the main engine controller. Work in progress today: launch countdown operations in Firing Room 3; cryogenic reactamt loading operations will continue until 4:30 p.m.; main engine final preparations; IUS battery voltage checks; communications system activation; inertial measurement unit checkout; potable water microbial sample; commander and pilot Shuttle Training Aircraft flights; astronaut fit checks of launch and entry

suits. Tasks remaining to be done: demating the Orbiter mid-body umbilical; installation of flight crew mission items and personal effects; closeout tail service masts; retraction of rotating service structure; final launch pad debris inspections; payload mid-deck late stowage including rodents; IUS guidance system calibration; activation of inertial measurement units; checking of main engine steering (gimbal checks) and external tank fuel loading beginning at 12:32 a.m. January 13. Weather continues to rate 70 percent favorable for launch. The five-member crew of STS 54 includes: Commander **John Casper**; Pilot **Donald McMonagle**; Mission Specialists **Gregory Harbaugh**, **Susan Helms** and **Mario Runco**. [Halvorson, FLORIDA TODAY, p. 1A, Jan. 11, 1993; Halvorson, FLORIDA TODAY, p. 5A, Jan. 13, 1993; SPACE SHUTTLE STATUS REPORT, Jan. 11, 1993.]

{} **STS 54: ENDEAVOUR READIED**

Workers at Launch Complex 39B have completed cryogenic reactant loading operations for Endeavour's STS 54 mission. Other completed tasks include: retracting Orbiter mid-body umbilical and activation of the communications system and the navigation aids. Work in progress today: launch countdown operations in Firing Room 3; retracting rotating service structure at 11 a.m.; closeout of tail service masts; final launch pad debris inspection; payload mid-deck late stowage including rodents; activation of inertial measurement units; OMS gimbal profile; alignment of IUS Redundant Inertial Measurement Unit (RIMU); Shuttle Training Aircraft flights by STS 54 Commander and Pilot and countdown status briefings for the STS 54 crew. Tanking should begin at 12:32 a.m. tomorrow. The astronauts will be awakened at 4:02 a.m. and leave for the pad at 5:37 a.m.. The crew access hatch will be closed and sealed at 7:22 a.m. [SPACE SHUTTLE STATUS REPORT, Jan. 12, 1993; Halvorson, FLORIDA TODAY, p. 1A, Jan. 10, 1993.]

[] **BOC SETTLEMENT LOOMS**

NASA management said today that a hearing on the BOC has been delayed "to allow the [three protesting parties] to reach an accord," according to Public Affairs Chief **Hugh Harris**. GSA officials suggested three scenarios which might provide a end to this unusual procurement effort:

a) Protestors will conclude they don't have a strong case after reviewing material and querying KSC officials. They'll settle by dropping the protest.
b) Protestors will convince KSC - through their investigations - that it was the space center's mistake, and KSC could settle by opting to ask for another round of bids.
c) KSC, the protestors [EG&G Florida, Inc. (the incumbent); Westinghouse Electric Corp. and BAMSI Inc.] and Lockheed Space Operations Co.

(announced winner of BOC competition in November 1992) would agree to subcontract work on the contract. This is considered least likely of the three scenarios.

[Liden, FLORIDA TODAY, p. 1A, Jan. 12, 1993.]

January 12: **SPACE STATION WORK CONTINUES IN 1993**

"We are quickly approaching the point in space exploration where astronauts will be conducting valuable research on a permanent basis," according to Space Station Director **Richard Kohrs**. "In the years to come, we are going to use the Space Shuttle to give us additional research capability and confidence in the techniques to be used aboard Freedom." Beginning with the first Shuttle flight in January and ending with the eighth mission in December, astronauts will conduct spacewalks, materials and life sciences research in the Spacelab scientific laboratories and small-scale experiments to prepare for long-duration stays in space aboard Freedom. [NASA Release 93-10, Jan. 12, 1993.]

[] **LIBERTY STAR RESCUES CUBANS**

The NASA ship Liberty Star rescued 3 Cuban refugees afloat in the Atlantic on inner tubes. Liberty Star was at sea to support for tomorrow's STS 54 Endeavour launch and pick up one of the spent solid rocket boosters after the liftoff. The three starving and dehydrated Cubans - **Raciel Garcia Laguna**, 30, **Jose Sainz Balmacedas**, 22, and **Gerardo Pepe Gonzalez**, 39 - were all natives of the Cuban province of Matanzas. The three were transferred to the Coast Guard cutter Matagorda to receive medical attention; Matagorda Commander **John Kaptinski** said, "They are suffering from severe dehydration, and for the last four days they drank their own urine." [Halvorson and Weiss, FLORIDA TODAY, p. 1A, Jan. 13, 1993; "Crew of NASA Ship Picks Up 3 Cubans," THE ORLANDO SENTINEL, Jan. 13, 1993.]

January 13: **LAUNCH OF STS 54**

The Space Shuttle Endeavour performed a normal launch and ascent to orbit this morning at 7:59:30 a.m. CST, following a few minutes long delay to allow extra analysis of high-altitude winds and their predicted effect on Endeavour. After reaching a 164 by 160 nautical mile orbit, the crew activated the Diffuse X-Ray Spectrometer to allow ground commanding of the instrument to begin from the Goddard Space Flight Center (Greenbelt, MD). The crew's main focus for the remainder of today will be the deployment of the Tracking and Data Relay Satellite-F scheduled for about 2:12 p.m. CST after the satellite is checked out and powered up. Among the many persons viewing the launch was the first American launched into space 32 years ago, **Alan Shepard**. [Halvorson, FLORIDA TODAY, p. 5A, Jan. 13, 1993; Halvorson, FLORIDA TODAY, p. 1A-2A, Jan. 14, 1993;

Broad, THE NEW YORK TIMES, p. A13, Jan. 14, 1993; Date, THE ORLANDO SENTINEL, p. A-4, Jan. 14, 1993; Shields, THE ORLANDO SENTINEL, Jan. 14, 1993; "Endeavour Helps Lift NASA Into New Year," USA TODAY, p. 4A, Jan. 14, 1993; MISSION CONTROL CENTER, STS 54 STATUS REPORT #1, Jan. 13, 1993.]

January 14: **STS 55: COLUMBIA PROCESSING WORK**

In Orbiter Processing Facility Bay 2, technicians continue to process Columbia for its upcoming STS 55 mission. Completed tasks include: ammonia boiler servicing; water spray boiler leak checks; Spacelab potable water sampling; installation of external tank door latches; solid rocket booster stacking and leak checks in the VAB; external tank mating to solid rocket boosters. The Spacelab D-2 interface verification test is currently underway. Ammonia boiler sampling and external tank door latch cycling is also in progress. Scheduled tasks include: Spacelab D-2 IVT; removal and replacement of the helium regulator valve in the aft compartment; installation of the Spacelab tunnel adapter and preparations for aft closeouts. [SPACE SHUTTLE STATUS REPORT, Jan. 14, 1993.]

January 15: **STS 55: EXTERNAL TANK WORK**

An external tank latch pull test has been completed as part of the preparations of Columbia for its STS 55 mission. The tank was mated to its solid rocket boosters on January 13. Other completed work includes: ammonia boiler GSE servicing and sampling; water spray boiler leak checks; installation of external tank door latches and solid rocket booster stacking and leak checks. Workers are proceeding with cabin depressurization valve checks; ammonia boiler servicing and the Spacelab D-2 interface verification test (IVT). The verification test is scheduled to run through tomorrow. Work continues to remove and replace a helium regulator valve in the aft compartment; install the Spacelab tunnel adapter; complete the avionics bay closeout; stow the Ku-band antenna and prepare for aft closeouts. [SPACE SHUTTLE WEEKLY STATUS SUMMARY, Jan. 15, 1993.]

[] **DISCOVERY: COMPUTER TASKS COMPLETED**

In OPF Bay 3, technicians have completed the removal and replacement of Discovery's mass memory unit #2 and have reloaded the MMU #2 software. They have reinstalled the general purpose computer and finished main engine drying. STS 56 work in progress: preparations for main engine removal; fuel cell and PRSD system testing; OMS pod thruster checkout; auxiliary power unit lube oil deservicing; solid rocket booster stacking in the Vehicle Assembly Building. Scheduled work: main engine removal; aft main propulsion system leak and functional checks; retest of MMU #2; installation of the remote manipulator arm;

head-up display system checkout; S-band air-to-ground antenna testing; auxiliary power unit leak and functional testing; installation of drag chute mortar and chute retractor and the of the chute itself. [SPACE SHUTTLE WEEKLY STATUS SUMMARY, Jan. 15, 1993.]

January 18: **STS 54 LANDING AT KSC**

Nearly six days after the launch of Endeavour on its STS 54 mission, the Orbiter is preparing to return home tomorrow morning. Endeavour is now scheduled to land at the SLF at 7:02 a.m. EST. The deorbit burn to bring the Shuttle back to Earth is planned to occur at 6:02 a.m., an hour before the landing on Kennedy Space Center's runway. The second of two KSC landing opportunities tomorrow is at 8:38 a.m. EST. Endeavour also has a chance to land at Edwards Air Force Base (CA) at 10:05 EST. Flight controllers are aiming to bring Endeavour in on the initial KSC landing opportunity. If the weather cooperates on the first try, Endeavour will reenter Earth's atmosphere over the South Pacific and head eastward toward the three-mile-long Shuttle Landing Facility. Endeavour will pass over Baja California, Mexico, southern Texas and the Gulf of Mexico before reaching the west central Florida coast. Mission Commander **John Casper** will then guide the Shuttle high over Orlando and Titusville before landing the Orbiter at Kennedy Space Center to conclude its third mission of Endeavour and the 53rd Space Shuttle mission. Endeavour's next mission will be STS 57 scheduled for late spring of this year. [NASA/KSC Release No. 7-93, Jan. 18, 1993.]

January 19: **CEA, INC. WINS KSC CONTRACT**

CEA, Inc. (Canton, MA) has been awarded a $1,473,935 contract to install fiber-optic, copper audio and coaxial cable as a part of an underground communications system at Kennedy Space Center. Work began January 6 and is expected to be completed by January 5, 1994. The contract calls for the installation of cable between the Space Station Processing Facility (SSPF) and other payload processing and launch support facilities at KSC. This is the eleventh such contract of its type at the space center and is part of a long-range plan to upgrade the center's communications capabilities.

Under the contract, links will be made to the Communications Crossconnect Facility (CXT), a satellite switching station of the Communication Distribution and Switching Center in KSC's Industrial Area. The CXT will serve as a communications hub with cable linking it to the SSPF, the Operations and Checkout Building, the Payload Hazardous Servicing Facility, the Hypergol Support Building, the Vertical Processing Facility, and the SSPF Chiller Building. Coaxial audio cable will be installed between the SSPF and the Engineering Development Laboratory. In the long term, most KSC facilities will be linked by fiber-optic cable, which carries digitized communications data at a much higher

capacity than the X-band copper wire currently in place. Fiber-optic cables now in use at KSC allow high-speed computers to relay Space Shuttle and payload processing information to the Launch Control Center, improving the efficiency of Shuttle processing and launching operations. [NASA/KSC Release No. 4-93, Jan. 19, 1993.]

January 20: **COLUMBIA: STS 55 PROCESSING**

The Spacelab D-2 interface verification test (IVT) has been completed in preparation for Columbia's STS 55 mission which is to begin late next month. The Orbiter's payload bay has been cleaned and its ammonia boiler serviced. Work in progress today: installation of the Spacelab tunnel; hydraulic test of flight controls; positioning of flight control elements for rollover of Columbia to the VAB; Orbiter/external tank door functional test; Orbiter aft compartment closeouts; Orbiter mid-body closeouts. Scheduled work: payload bay door radiator inspections and the crew equipment interface test (CEIT).

Endeavour (OV-105) touched down at 08:38:17 a.m. EST yesterday. landing approximately 1,500 feet from the Runway 33 threshold about three feet right of the centerline, and rolling out approximately 8,700 feet. "From a pilot's point of view, it was an excellent landing," said NASA Space Flight Chief **Jeremiah W. Pearson III**. Brake and tire wear was normal, except for a cut 5/16th-inch deep and two plys of scuffing on the right inboard tire. There were 57 debris impacts, with 13 greater than one inch. Four to five tiles are expected to be replaced. Endeavour arrived at OPF Bay 1 at about 3 p.m. yesterday where deservicing of the vehicle is presently underway. [Halvorson, FLORIDA TODAY, p. 1A-2A, Jan. 20, 1993; SPACE SHUTTLE STATUS REPORT, Jan. 20, 1993.]

[] **DRAG CHUTE MODIFICATIONS**

When Endeavour landed at Kennedy Space Center last September, its drag chute was fully deployed, but, because, it opened slightly to the right of the tail, the Orbiter was pulled to the left. Commander **Robert L. "Hoot" Gibson** had to steer the Orbiter back to the runway midline. Discovery will use a modified drag chute on its March flight (STS 56); the chute will open to only 90% of its capacity. **John Kennedy**, Drag Chute Manager for Johnson Space Center said, "We're looking to see if it gets better, and how much better." He also said the full chute would be used on Columbia's next flight (STS 55); subsequent flights will use the modified chute. [Date, THE ORLANDO SENTINEL, p. A-13, 1993.]

January 22: **WEEKLY ORBITER UPDATES**

Columbia's ammonia boiler servicing has been completed in OPF Bay 2. Other tasks completed: water spray boiler servicing; installation of Spacelab tunnel; Spacelab Interface Verification Test (IVT). Work in progress on Columbia: external tank door test cycles; Orbiter aft main engine compartment closeouts; reaction control system trickle purge; routine thermal protection system tile work. STS 55 processing work scheduled: avionics bay closeout; astronaut crew equipment interface test (CEIT); main propulsion system closeouts; aft structural leak check; Orbiter composite pressurization test; tile closeouts; Ku-band antenna testing and stowage; rollover to the VAB and external tank/solid rocket booster closeouts in VAB. [SPACE SHUTTLE WEEKLY STATUS SUMMARY, Jan. 22, 1993.]

[] **DISCOVERY: STS 56 PROCESSING**

Discovery is undergoing processing for its STS 56 mission in Orbiter Processing Facility Bay 3. Work completed: head-up display system checkout; tests of S-band air-to-ground antenna; auxiliary power unit leak and functional checks. Work in progress: preparations for left OMS pod removal; connections of waste containment system; Ku-band antenna testing; stacking of solid rocket boosters in the Vehicle Assembly Building and main propulsion system functional testing. Work scheduled: main engine installation; right OMS pod functional test; forward reaction control system installation; solid rocket booster stacking; Ku-band antenna testing continues; potable water servicing; drag chute installation; crew hatch seal leak check; testing of flight deck data display systems; auxiliary power unit lube oil servicing. [SPACE SHUTTLE WEEKLY STATUS SUMMARY, Jan. 22, 1993.]

[] **ENDEAVOUR: OPF BAY 1**

Endeavour, just returned from its third mission, STS 54, is being readied for its STS 57 mission in OPF Bay 1. Work in progress: preparations to open the payload bay doors; ordnance safing; preparations for hypergolic deservicing; tile waterproofing for the upcoming mission; installation of window covers; dumping of flight data recorders. Scheduled work: opening of payload bay doors; post-flight mechanical inspections; waste containment system functional check; drag chute hardware removal; wheel and tire removal; TACAN post-flight checkout; preparations for DXS and IUS airborne support equipment removal. [SPACE SHUTTLE WEEKLY STATUS SUMMARY, Jan. 22, 1993.]

January 24: **30TH SPACE CONGRESS SPEAKERS**

Planners for the 30th annual Space Congress (Cocoa Beach, FL) have drawn up a preliminary list of speakers for the event:

General Merrill McPeak, Air Force Chief of Staff
General Charles Horner, Commander in Chief of U.S. Space Command (Colorado Springs, CO).
Samuel Durrance, Shuttle Payload Specialist with the Center for Astrophysical Science at Johns Hopkins University (Baltimore, MD).
Daniel S. Goldin, NASA Administrator.
Jeremiah W. Pearson III, NASA Space Flight Chief.
Miles "Mike" Ross, former Deputy Director of Kennedy Space Center.
Lee Scherer, former Director of Kennedy Space Center, now a consultant to General Dynamics Launch Services.
JoAnn Morgan, Director of Payloads Projects Management at KSC.
John Mannix, Chief of NASA's Office of Commercial Space.
Richard Kohrs, Director of Space Station Project Office, NASA.
Robert L. Crippen, Director of Kennedy Space Center.
James E. Beggs, former Administrator of NASA and Chairman of Spacehab Inc. (Washington, D.C.)

["Speakers Line Up For Annual Space Congress," FLORIDA TODAY, p. 9E, Jan. 24, 1993.]

[] **STS 55 CREW ARRIVES TODAY**

The seven-member crew of Columbia's STS 55 mission arrive today at Kennedy Space Center to look over the Orbiter and inspect it for sharp edges and to practice using the foot and hand holds to determine whether they are in the proper places for flight. The STS 55 crew includes: Commander **Steven Nagel**; Pilot **Terrence Henricks**; Payload Commander **Jerry Ross**; Payload Specialists **Hans Schlagel** and **Ulrich Walter**; Mission Specialists **Bernard Harris** and **Charles Precourt**. Next month, the crew will return to KSC for emergency egress training. [Banke, FLORIDA TODAY, p. 2A, Jan. 24, 1993.]

January 25: **AMBASSADOR SHUTTLES TO KOREA**

At Spaceport USA, the Shuttle Ambassador replica is being dismantled for shipment to Korea. A new replacement replica is being built now in Apopka (FL) by Guard-Lee Inc. and will be on site at the Spaceport by the end of 1993 or early 1994, according to Spaceport Marketing Supervisor **Tom Blair**. The vehicle will be named by Florida school students in a state-wide contest in the fall of 1993. [Halvorson, FLORIDA TODAY, p. 1A, Jan. 25, 1993.]

[] **COLUMBIA'S PAYLOAD DOORS REPAIRED**

Several weeks ago workers discovered a problem with the payload bay doors of Columbia; the 60-foot-long doors wouldn't close properly. Now workers have replaced a dry lubricant on several pins which guide the doors into a closed position. The lubricant has successfully passed tests. KSC spokesman **George Diller** said the replacement and testing "means we understand what caused the problem and we're cleared to press on. But we've still got a lot of work to do." STS 55 is currently targeted for liftoff on February 25. ["Workers Fix Columbia's Payload Doors," FLORIDA TODAY, p. 2A. Jan. 26, 1993.]

January 26: **STS 55: SPACELAB D-2 MISSION**

The Space Shuttle Columbia remains in OPF Bay 2 where it is being prepared for its STS 55 mission which features the Spacelab D-2 payload. Completed work: payload bay door test cycles; tire leak check; Ku-band antenna stowage; crew equipment interface test (CEIT); Spacelab laboratory module closeouts; avionics bay closeouts; payload bay door radiator stowage. Work in progress: crew compartment closeouts and closing of crew access hatch; Orbiter aft main engine compartment closeouts; main propulsion system closeouts; Orbiter mid-body closeouts; thermal protection system tile closeouts. Scheduled work includes: an aft structural leak check/Orbiter composite pressurization check; weight and center of gravity determination; installation of the vehicle on the Orbiter transporter; closing payload bay doors and rollover to the VAB on February 2 or 3. ["Columbia's Engines Will Get Attention," FLORIDA TODAY, p. 2A, Jan. 25, 1993; SPACE SHUTTLE STATUS REPORT, Jan. 26, 1993.]

January 27: **STS 55: FUNCTIONAL TESTING**

In OPF Bay 2, Columbia has undergone functional tests of its external tank doors and of the payload bay doors. The avionics bay has been closed out, as well. Work in progress today: Spacelab module positive pressure check; crew compartment closeouts/closing of the crew access hatch; Orbiter aft main engine compartment closeouts; Orbiter mid-body closeouts; thermal protection system tile closeouts. STS 55 work scheduled: removal of the BREMSAT GAS canister;

closing of payload bay doors; aft structural leak check/Orbiter composite pressurization test; weight and center of gravity determination; installation of Columbia upon the Orbiter transporter; rollover to the VAB; mating to external tank and solid rocket boosters. [Halvorson, FLORIDA TODAY, p. 2A, Jan. 27, 1993; Banke, FLORIDA TODAY, p. 4A, Jan. 28, 1993; SPACE SHUTTLE STATUS REPORT, Jan. 27, 1993.]

January 28: **STS 55: SPACELAB D-2 CLOSEOUTS**

Spacelab D-2 closeouts were completed in OPF Bay 2 today; Columbia continues to undergo preparations there for its upcoming STS 55 mission. Work in progress: removal of the BREMSAT GAS canister; Spacelab module positive pressure leak check; crew compartment closeouts/closing of the crew access hatch; main landing gear strut hydraulic fluid level checks; Orbiter aft main engine compartment closeouts; main propulsion system closeouts; thermal protection system tile closeouts; Orbiter mid-body closeouts. STS 55 work scheduled: installation of aft flight doors; waste containment system electrical verification checks; aft structural leak check/Orbiter composite pressurization test; closing payload bay doors for flight; weight and center of gravity determination; installation of Columbia upon the Orbiter transporter; rollover to the VAB. [Banke, FLORIDA TODAY, Jan. 28, 1993; SPACE SHUTTLE STATUS REPORT, Jan. 28, 1993.]

[] **ASTRONAUTS REMEMBERED IN TITUSVILLE**

"The facts are that we lose more people crossing the street every day than have been lost in all of space exploration. We have to remember the price that has been paid, but we don't want to stop moving forward," said STS 47 Pilot **Curtis Brown Jr.** at the annual ceremony to honor astronauts who died during space exploration efforts. The Titusville ceremony has been handled annually since the Challenger accident of January 28, 1986. Lockheed Media Relations Chief **J. B. Kump** said, "There are the lives we come to celebrate today. They already paid the price for a better future for all of us." The even honored **Gregory Jarvis, Ellison Onizuka, Ronald McNair, Judith Resnik, Christa McAuliffe, Michael Smith** and **Dick Scobee**; **Virgil "Gus" Grissom, Edward White** and **Roger Chaffee**. [Fiorini, FLORIDA TODAY, p. Jan. 29, 1993.]

January 29: **BOC PROTESTS SETTLED**

NASA announced today that the protests of EG&G Florida, Inc., BAMSI Inc., and Westinghouse KSC Company, Inc. have been settled on the Kennedy Space Center (KSC) Base Operations Contract (BOC) procurement. NASA had selected Lockheed Space Operations Co. on Nov. 17, 1992, for negotiations leading to award of the BOC. The three companies protested the selection to the General Services Administration Board of Contract Appeals in early December. Settlement

was prompted by the determination that certain deficiencies in the agency's activities occurred during the original proposal submission and discussion phase of the procurement. This resulted in a deficiency in certain critical information which remained unrequested and therefore, unavailable for NASA's source evaluation board to fully consider and evaluate.

As part of the settlement, NASA will rescind its original selection. An amendment to the BOC solicitation also will be issued. Each of the four competitors then will have the opportunity to submit a revised proposal. Selection of an awardee is expected to occur sometime during the late summer. The BOC provides a variety of services to KSC, primarily in the area of management, operation, maintenance and engineering for KSC facilities and utilities, technical and administrative support operations, and health, fire and security services. The BOC will be a cost-plus-award fee contract, with an incentive fee feature, for an initial period of 4 years with three priced 2-year options. EG&G Florida, Inc., the incumbent contractor, will continue to provide base operations support during the recompetition period. [Date, THE ORLANDO SENTINEL, pp. C-1 & C-6, Jan. 29, 1993; Liden, FLORIDA TODAY, p. 1A-2A, Jan. 30, 1993; Liden, FLORIDA TODAY, p. 1A, Jan. 30, 1993; NASA RELEASE: 93-18, Jan. 29, 1993.]

[] **STS 55: PROCESSING UPDATE**

Technicians working in OPF Bay 2 have removed the BREMSAT GAS Canister from Columbia and installed the vehicle's aft flight door as part of the STS 55 processing cycle. The workers have also conducted closeouts of the aft main engine compartment and of the crew compartment. Work in progress today: Spacelab module positive pressure leak check; aft main engine compartment positive pressure leak check; Orbiter crew hatch functional check; crew access hatch closed for rollover; waste containment system electrical verification checks; landing gear strut hydraulic fluid level checks and leak checks; Ku-band antenna stowage; thermal protection system closeouts. Scheduled work: final payload bay cleaning; closing of payload bay doors; Orbiter composite pressurization test; weight and center of gravity determination; installation of Columbia upon the Orbiter transporter; rollover to the Vehicle Assembly Building. [Halvorson, FLORIDA TODAY, p. 8A, Jan. 30, 1993; SPACE SHUTTLE WEEKLY STATUS SUMMARY, Jan. 29, 1993; Halvorson, FLORIDA TODAY, p. 1A, Jan. 31, 1993.]

[] **DISCOVERY: PROCESSING FOR STS 56**

Workers in OPF Bay 3 have completed OMS pod functional checks on Discovery as they ready it for its next mission, STS 56. Other completed tasks include: initial auxiliary power unit lube oil servicing; auxiliary power unit leak and functional check; drag chute installation and tests of S-band air-to-ground antenna.

Work in progress today: sleep station installation; preparations for payload installation; preparations for main engine installation; radiator functional checks; waste containment system functional checks; potable water servicing; Ku-band antenna testing; vertical tail closeouts; OMS pod removal; tile water proofing; stacking solid rocket boosters in the VAB. Scheduled activities: heads up display system checkout; main engine installation; payload bay cleaning; heat shield installation; checks of air data system; TACAN checkout; crew hatch seal leak check; main computer display system checkout; removal and replacement of spare general purpose computers; liquid hydrogen system leak and functional check; potable water servicing; forward reaction control system installation; testing of cockpit data display system; auxiliary power unit lube oil servicing. [SPACE SHUTTLE WEEKLY STATUS SUMMARY, Jan. 29, 1993.]

[] **ENDEAVOUR: STS 57 PROCESSING**

Endeavour is in OPF Bay 1 being readied for its next mission, STS 57. The Diffuse X-Ray Spectrometer has been removed from Endeavour's payload bay; other removals include the IUS airborne support equipment and the drag chute hardware. Technicians have also completed inspections of the payload bay door radiator. Work in progress: nose landing gear hydraulic leak checks; fuel cell checkout; payload bay door inspections; radiator functional checks; main propulsion system leak and functional checks; thruster inspections. STS 57 work scheduled: hypergolic system deservicing; main engine removal; installation of wheels and tires; TACAN system testing; S-band air-to-ground system testing; radar altimeter testing; forward reaction control system functional checks; OMS/RCS electrical checks; auxiliary power unit leak checks; air data system functional check. [SPACE SHUTTLE WEEKLY STATUS SUMMARY, Jan. 29, 1993.]

January 31: **NASA Buys Retrieval Ships**

The recently revived NASA "meatball" logo now rides aboard the two solid rocket booster retrieval ships, Freedom Star and Liberty Star which are based at Hangar AF at Cape Canaveral Air Force Station. Both vessels had originally been built for USBI Inc., sold to Lockheed Space Operations and operated under a lease arrangement with NASA. The purchase price for NASA was $7.25 million; the lease, according to KSC spokeswoman **Lisa Malone**, as $1.7 million annually. ["Retrieval Ships Bought by NASA," FLORIDA TODAY, p. 10E, Jan. 31, 1993.]

[] **KSC READY TO RECEIVE SPACEHAB**

The Spacehab module is expected to be moved to Kennedy Space Center on February 2; it will be housed in the Operations & Checkout Building to await

installation in the cargo bay of the Space Shuttle Endeavour for mission STS 57. ["Spacehab to Move to KSC," FLORIDA TODAY, p. 10E, Jan. 31, 1993.]

FEBRUARY

February 1: **COLUMBIA: STS 55 CLOSEOUTS**

The Space Shuttle Columbia continues to undergo processing for its STS 55 mission while in OPF Bay 2. Work completed to date: Spacelab D-2 closeouts and leak checks; aft compartment closeouts and leak checks; payload bay door closure; Orbiter structural leak check; avionics bay closeouts; Orbiter mid-body closeouts and crew compartment closeouts. Work in progress: Orbiter weight and center of gravity determination and installation of the vehicle upon the Orbiter transporter. STS 55 work scheduled: rollover to the Vehicle Assembly Building between 4 a.m. and 8 a.m. tomorrow; mating to the external tank/solid rocket booster stack also tomorrow; the Shuttle Interface Test (SIT) and rollout to Launch Complex 39A at 8 a.m. February 7. Engineers are evaluating data on the strength of a titanium weld in the high pressure fuel turbopump on main engine number 3. A decision on whether the pump should be changed will probably be made tomorrow. The work would be done in parallel with other work while Columbia is in the Vehicle Assembly Building. The potential for schedule impact will be assessed if the work is to be done. [Halvorson, FLORIDA TODAY, p. 1A, Feb. 1, 1993; SPACE SHUTTLE STATUS REPORT, Feb. 1, 1993.]

[] **RODDENBERRY RECEIVES NASA MEDAL**

Gene Roddenberry, creator of the Star Trek television series, posthumously received NASA's Distinguished Public Service Medal on January 30. The medal was presented to his widow, **Majel Barrett Roddenberry**, by NASA Administrator **Daniel S. Goldin** in a ceremony at the Smithsonian Institution's National Air and Space Museum in Washington, D.C. Roddenberry is credited with popularizing the exploration of space through the original Star Trek television series, six motion pictures and the spin-off television series Star Trek: The Next Generation. His vision of a positive future for the human race, as well as the social and artistic content of the series, have enjoyed enormous success and popularity since the original Star Trek premiered on television in 1966. The impact of his program was recognized in the U.S. space program as the first Space Shuttle was named Enterprise after the spaceship in Star Trek. Many people, including astronauts and others involved in the space program, cite Star Trek as being an early influence on their lives. The citation accompanying the medal reads: "For distinguished service to the Nation and the human race in presenting the exploration of space as an exciting frontier and a hope for the future." Gene Roddenberry died in October 1991. [["NASA Honors Late `Star Trek' Creator," FLORIDA TODAY, p. 9E, Feb. 14, 1993; NASA Release: 93-019, Feb. 1, 1993.]

February 2: **WEIGHT & GRAVITY DETERMINATION**

Columbia's weight and gravity determination for its upcoming STS 55 mission has been completed in OPF Bay 2; the Orbiter is now atop the Orbiter Transporter being readied for rollover to the VAB between 1 and 2 p.m. this afternoon. A soft mating to the external tank and solid rocket booster stack is scheduled for tonight in the Vehicle Assembly Building; a hard mating will be completed tomorrow. A Shuttle Interface Test (SIT) starts February 4 and rollout to Launch Complex 39A is set for 8 a.m. February 7. Engineers have determined that the titanium weld in question on Columbia's # 3 main engine fuel turbopump has acceptable strength for flight. A changeout of the pump in the VAB will not be necessary. [SPACE SHUTTLE STATUS REPORT, Feb. 2, 1993.]

February 3: **STS 55: ROLLOVER COMPLETED**

The Space Shuttle Columbia has completed its rollover to the VAB looking toward a February 7 rollout to Launch Complex 39A for its STS 55 mission. The Orbiter arrived in the VAB transfer aisle at 2:38 p.m.; first motion from the OPF came at 2:11 p.m. In the VAB an Orbiter left main landing gear door limit switch was replaced; the vehicle was raised for stacking beginning at 2 a.m. this morning and a soft mate to its stack was completed at 11 a.m. Technicians are now working to establish a hard mate of Columbia to its external tank and solid rocket boosters, to establish connections with mobile launch platform tail service masts and external tank/solid rocket booster battery installation. Scheduled work includes: establishing electrical connections with the stack tomorrow; replacement of main engine #1 hydraulic accumulator; SIT February 4-6; rollout to LC 39A on February 7 at 8 a.m.; terminal countdown demonstration test February 11-12; launch readiness review February 8 and flight readiness review on February 11. Launch is planned for February 25 barring unforeseen delays. [SPACE SHUTTLE STATUS REPORT, Feb. 3, 1993.]

[] **STARNES, BUILDER OF KSC, DIES**

Retired Maj. Gen. **William L. Starnes**, 73, who supervised the construction of Kennedy Space Center for the Army Corps of Engineers died today in San Antonio, Texas. Starnes became a NASA engineer in the late 1950s. In the fall of 1962, he came to Brevard County to assist in the development of the Cape Canaveral District in 1963; he was district engineer from 1964 through 1966. Starnes's deputy, retired Col. **J. Newton Cox** (Orlando, FL) said, "Gen. Starnes was there during the most crucial days of forming the (Corps) team, getting the total construction project started and placing the important early construction, such as the Titan 3 Complex, the Vertical Assembly Building, launch pads 39 A & B, administrative facilities, and numerous support buildings." Survivors include his

wife, Mary Dee Starnes (San Antonio) and sister, Mildred Lundberg (Melbourne, FL). [Bailey, FLORIDA TODAY, p. 3B, Feb. 5, 1993.]

[] **ATLAS CENTAUR TO LAUNCH IN MARCH**

"Atlas Centaur should soon return to the reliable system we've seen in the past," said **Forrest S. McCartney**, former Director of Kennedy Space Center. He lead the oversight board which investigated an August 22 accident in which one of two Centaur upper stage rocket engines failed to start causing the failure of a Galaxy 1R cable TV satellite mission to fail. McCartney continued, "I think we're very confident we have identified the problem, and the problem lends itself nicely to a solution." A valve will have to be redesigned and procedures changed before a suspect engine pump is allowed to fly again. General Dynamics officials are hoping for a March launch of their next mission. [Banke, FLORIDA TODAY, p. 4A, Feb. 4, 1993.]

February 4: **STS 55: COLUMBIA HARD MATED**

Technicians have completed the hard mating of Columbia with its external tank and solid rocket booster stack; they have also completed external tank/solid rocket booster battery installation and established connections with tail service masts. Work in progress for STS 55: establishing electrical connections with Space Shuttle stack; validating checks of mechanical connections and changeout of main engine #1 hydraulic accumulator. Scheduled STS 55 work: Shuttle Interface Test (SIT); rollout to LC 39A; TCDT; launch readiness review and flight readiness review. [SPACE SHUTTLE STATUS REPORT, Feb. 4, 1993.]

[] **PEGASUS SET TO ARRIVE AT KSC**

A NASA B-52 aircraft carrying the Orbital Sciences Corporation Pegasus rocket is set to arrive at KSC on February 7 looking toward a February 9 launch from under the wing of the B-52. [Halvorson, FLORIDA TODAY, p. 1A, Feb. 8, 1993; KSC Release No. 10-93, Feb. 4, 1993.]

February 5: **STS 55: MECHANICAL CONNECTIONS VALID**

In Vehicle Assembly Building Bay 3, Columbia's mechanical connections have been validated. The hard mating of Columbia to its external tank/solid rocket booster stack has also been completed. Work in progress today: the Shuttle Interface Test (SIT); changeout of #1 main engine hydraulic accumulator; final Pad A validations for Space Shuttle arrival. STS 55 scheduled work: rollout to Launch Complex 39A February 7 no earlier than noon (based on a preliminary weather forecast); KSC Launch Readiness Review; STS 55 astronaut arrival at KSC on February 9; STS 55 Flight Readiness Review February 11; and Terminal

Countdown Demonstration Test (TCDT). [Halvorson, FLORIDA TODAY, p. 2A, Feb. 6, 1993; SPACE SHUTTLE STATUS REPORT, Feb. 5, 1993; Amended.]

[] **DISCOVERY: STS 56 PROCESSING**

The Space Shuttle Discovery is being processed for its upcoming STS 56 mission in OPF Bay 3. Completed tasks: installation of main engines; initial ammonia boiler servicing; payload bay door inspections and cycle tests; radiator inspections; fuel cell testing; range rate radar receiver testing. STS 56 work in progress: left OMS pod installation; SUVE interface verification test; potable water servicing; S-band air-to-ground transmitter checks; TACAN testing; payload bay cleaning; preparation of payload bay for ATLAS-2 payload installation; stacking solid rocket boosters in the VAB. Scheduled tasks: fuel cell changeout and ATLAS-2 payload installation; installation of forward reaction control system; MSBLS checkout; checkout of data display systems on the flight deck; ammonia boiler servicing; main engine electrical interface checks; OMS/RCS flight control checkout; brake anti-skid test; deployment of remote manipulator arm for testing; liquid hydrogen system leak and functional tests; checkout of Orbiter crew cabin and payload bay lighting system. [SPACE SHUTTLE STATUS REPORT, Feb. 5, 1993; Amended.]

[] **ENDEAVOUR: STS 57 PROCESSING ACTIVITIES**

The Space Shuttle Endeavour has been undergoing processing activities supporting its upcoming STS 57 mission targeted for April. The Orbiter's wheels and tires have been installed; checks have been made of the nose landing gear hydraulics and the Spacehab has been installed in the CITE stand in the Operations and Checkout Building. Work currently in progress in OPF Bay 1: main engine removal; preparations for ammonia boiler servicing; fuel cell testing; forward reaction control system functional testing; waste management maintenance; tile water proofing; air data system functional testing; TACAN testing; window polishing; structural inspections and Ku-band antenna inspections. STS 57 work scheduled: Spacehab CITE testing; Orbiter power system validations; testing of flight control hydraulics; installation of Spacehab water lines; installation of the remote manipulator arm; OMS pod functional tests; payload bay door latch installation; heads up display system testing; Ku-band radar testing; tire pressure checks. [SPACE SHUTTLE STATUS REPORT, Feb. 5, 1993.]

February 8: **STS 55: ROLLOUT OF COLUMBIA**

The Space Shuttle Columbia began its rollout to Launch Complex 39A with first motion from the VAB coming at 12:35 yesterday; the Orbiter was harddown on the pad by 6:01 p.m. Columbia had undergone its STS 55 Shuttle interface test in the VAB and the of its #1 main engine accumulator. Work in progress:

establishing electrical connections between LC 39A and Columbia; powering up the Orbiter; connecting the mid-body umbilical (OMBUU); hydraulic servicing of main engine #1 accumulator. STS 55 scheduled tasks: testing of #1 main engine hydraulic accumulator; validating pad connections with Space Shuttle Columbia; inertial measurement unit (IMU) alignment; KSC launch readiness review; astronaut arrival at 9:00 p.m. February 9; flight readiness review Feb. 11; terminal countdown demonstration test (TCDT), Feb. 11-12. Meanwhile, the ATLAS-2 and Spartan payloads for the STS 57 mission are being transported from the Operations and Checkout Building to OPF High Bay 3 this morning and are scheduled to be installed into Discovery this afternoon. SSBUV arrives for installation tomorrow. [SPACE SHUTTLE STATUS REPORT, Feb. 8, 1993.]

February 9: **COLUMBIA AT LAUNCH COMPLEX 39A**

Electrical connections have been established between Columbia and Launch Complex 39A. The Orbiter has been powered up in anticipation of the STS 55 mission. The Orbiter mid-body umbilical unit (OMBUU) has been connected and the # 1 main engine hydraulic accumulator has been tested. STS 55 work in progress: a Flight Readiness Test of main engines and aerosurfaces; KSC Launch Readiness Review and astronaut arrival set for 9 p.m. Work scheduled: inertial measurement unit (IMU) alignment; STS 55 Flight Readiness Review; Terminal Countdown Demonstration Test (TCDT) and hypergolic propellant loading this weekend. Rollout began at about noon February 7 and was hard down at Launch Complex 39A six hours later. In OPF Bay 3, installation of the ATLAS-2 into Discovery's payload by (for STS 56) was completed at 6:10 p.m. yesterday; Spartan will be installed today. In the VAB, mating of the external tank to the solid rocket boosters is set to occur tomorrow. [Halvorson, FLORIDA TODAY, p. 1A, Feb. 7, 1993; Halvorson, FLORIDA TODAY, p. 5A, Feb. 9, 1993; SPACE SHUTTLE STATUS REPORT, Feb. 9, 1993.]

[] **STS 56: PAYLOADS INSTALLED**

KSC's payload processing team today completed installing the STS 56 payloads into the Shuttle Discovery's 60-foot-long payload bay, including the Atmospheric Laboratory for Applications and Science-2 (ATLAS-2), the SPARTAN and the Shuttle Solar Backscatter Ultraviolet (SSBUV) payloads. "This event marks the culmination of a year-long effort to prepare these important payloads for flight. They will increase our knowledge of the Earth's atmosphere and its interaction with the sun," said **Mike Kinnan**, STS 56 payload processing manager. ATLAS-2 is managed by the Marshall Space Flight Center (Huntsville, AL) and features six experiments that will perform studies in atmospheric and solar physics. This marks the second of 10 ATLAS flights planned over an 11-year period, which is the length of one solar cycle. SPARTAN is sponsored by the Goddard Space Flight Center (GSFC)(Greenbelt, MD), and contains several solar wind

investigations. SSBUV, also sponsored by GSFC, consists of two getaway special canisters that will check the calibration of ozone sounders on orbiting satellites. Early next week, workers will conduct an interface verification test of connections between the payloads and Orbiter. In addition, the five-member flight crew will visit KSC later this month for the routine Crew Equipment Interface Test. These significant events indicate KSC is on target for the third scheduled Shuttle launch of the year. Discovery's launch is targeted for late March. A five-member flight crew will fly aboard Discovery for the nine-day mission. [KSC Release No. 13-93, Feb. 9, 1993.]

February 10: **STS 55: ISSUES & CONCERNS**

A question has arisen about the configuration of the turbine blade tip seal retainers in the high pressure oxidizer turbopumps on Columbia's main engines. There are two versions of this component - an old version and a newer one. Each has different inspection requirements. On engines using the older version of the tip seal retainers, there is a requirement to remove the pumps and inspect the position of the retainers before each flight. This requirement does not exist for the newer version of the retainers. Although all indications are that the pumps on Columbia's main engines have the new seal retainers, in reviewing the paperwork associated with the engines, it could not be conclusively determined which version of the retainers had been installed in the engines.

Therefore, as a precautionary measure, a decision has been made to remove and replace the pumps on all three main engines. The purpose of the tip seals is to minimize the flow of gas around the tips of the turbine blades to enhance pump performance. The retainers hold these seals in place. Columbia was moved to Complex 39's Pad A February 7, and changeout of the high pressure oxidizer turbopumps will be accomplished at the pad. Spare pumps are available. A final work schedule has yet to be developed but removal, replacement and checkout of the pumps is expected to begin immediately and will require approximately 20 days. In addition, approximately 12 days of work will be required to complete the flow. At this time, launch of Columbia on the STS 55 mission is not expected prior to early March.

A review of the pumps on Orbiters Discovery and Endeavour is in work and those on Discovery will be changed out after rollover from the Orbiter Processing Facility. This work will be accomplished while the vehicle is in the vertical position in the Vehicle Assembly Building or at the launch pad. Discovery's next launch - on the STS 56 mission - is tentatively scheduled for late March. [SPACE SHUTTLE STATUS REPORT, Feb. 10, 1993.]

[] **STS 55: STATUS**

At Launch Complex 39A, Columbia has undergone a Flight Readiness Test of the vehicle's main engines and aerosurfaces in preparation for its STS 55 mission. The mission is now delayed due to a concern about each engine's turbopump tip seal retainers. The KSC Launch Readiness Review has been completed and the astronauts have arrived for the Terminal Countdown Demonstration Test. Work in progress: preparations to remove high pressure oxidizer turbopumps; preparations in Firing Room 1 for TCDT countdown; potable water microbial sampling; astronaut fit check of launch and entry suits; astronaut M113 orientation and driver training and astronaut emergency egress classroom training. Scheduled work for the STS 55 mission: a Flight Readiness Review February 11; the TCDT begins tomorrow; the high pressure oxidizer turbopumps will be removed February 13. [Banke, FLORIDA TODAY, p. 1A, Feb. 11, 1993; SPACE SHUTTLE STATUS REPORT, Feb. 10, 1993.]

February 11: **STS 55: REVIEW COMPLETED**

NASA managers today completed their review of the flight readiness of Shuttle Mission STS 55, a mission dedicated primarily to the German Space Agency for research in life and microgravity sciences. Because of a decision reached yesterday to remove and replace Columbia's high pressure oxidizer pumps, a launch date for the mission was not set. Managers are still assessing the time it will take to perform the work and resume launch preparations. **Tom Utsman**, Director of the Space Shuttle Program, said a launch date for STS 55 would be set the last week in February. At the conclusion of the FRR, managers recommended February 25.

The pumps being replaced feed super cold oxygen to the Shuttle's three main engines. They are being removed because a search of processing paperwork could not conclusively determine that the pumps are equipped with a newer version of turbine tip seal retainers. The tip seals minimize the flow of gas around the tips of the turbine blades to enhance pump performance and the retainers hold the seals in place. The major payload for Columbia and her seven-member crew is the pressurized Spacelab module - designated Spacelab D-2 - which will allow the astronauts to conduct a wide range of experiments in the microgravity environment of space. Some 90 experiments are planned during the vacation. This will be the 14th flight of the Space Shuttle Columbia and the 54th mission of the program. [Halvorson, FLORIDA TODAY, p. 6A, Feb. 10, 1993; Note to Editors: N93-7, Feb. 11, 1993.]

February 12: **STS 55: PROCESSING ACTIVITY**

Astronaut pre-launch safety training has been completed in anticipation of the STS 55 mission which has now been delayed. Work in progress: terminal countdown demonstration test; inertial measurement unit alignment; preparations for changeout of oxidizer turbopumps; hatch seal decay check; crew compartment cleaning. The major scheduled activity is the changeout of the suspect turbopumps. [SPACE SHUTTLE WEEKLY STATUS SUMMARY, Feb. 13, 1993; Banke, FLORIDA TODAY, p. 1A, Feb. 15, 1993; Banke, FLORIDA TODAY, p. 8A, Feb. 14, 1993.]

[] **STS 56: DISCOVERY MISSION PROCESSING**

In Orbiter Processing Facility Bay 3, technicians have concluded a large number of tasks with regard to Discovery's upcoming STS 56 mission: SUVE Interface Verification Test; airlock crew hatch functional test; potable water servicing; installation of forward reaction control system; S-band air-to-ground transmitter checks; installation of main engines; TACAN testing; potable water sampling; payload bay cleaning, door inspections and door cycle tests; stacking solid rocket boosters in the VAB; radiator inspections; fuel cell testing; range rate radar receiver testing; MSBLS Checkout. STS 56 work in progress: tile repair; tile waterproofing' remote manipulator arm installation; configuring payload bay for Spacelab; payload bay door radiator repair. STS 56 work scheduled: OMS/RCS cross-feed connections; ATLAS/SPARTAN Interface Verification Test; OMS thruster inspections; air data system functional test; main engine electrical interface checks; potable water servicing; fuel cell changeout; remote manipulator arm testing. [SPACE SHUTTLE WEEKLY STATUS SUMMARY, Feb. 13, 1993.]

[] **STS 57: ENDEAVOUR PROCESSING**

The Space Shuttle Endeavour remains in OPF Bay 1 where it is being processed for its next mission - STS 57. Technicians have completed a lengthy list of processing tasks: main engine removal; installation of wheels and tire; checks of nose landing gear hydraulics; fuel cell testing; forward reaction control system functional test; TACAN testing; waste management system drain and flush; waste containment functional test; tile water proofing; Orbiter power system validations; Ku-band antenna inspections; air data system functional testing; OMS pod functional tests; payload bay door latch installation; heads up display system testing; Ku-band radar testing; tire pressure checks. STS 57 work in progress: air data system functional test; main engine electrical interface checks; potable water servicing; fuel cell changeout; remote manipulator arm testing. Work scheduled to be done for STS 57: installation of drag chute mortar and retractor; ammonia boiler servicing; replacement of thruster R1R; installation of Spacehab tunnel

adapter; potable water servicing; external tank door latch pull test. [SPACE SHUTTLE WEEKLY STATUS SUMMARY, Feb. 13, 1993.]

February 15: **CHALLENGER PHOTOS RELEASED**

NASA today released photographs of the rear of the Challenger crew cabin which was surrounded by scaffolding. The photos, published for the first time today, showed parts of the airlock hatch window frame the astronauts passed through. New York artist **Ben Sarao** sued under the Freedom of Information Act to have the photographs released. The photographs themselves become public documents after their release to Sarao, who said, "I did it to help people understand what happened to that structure, and to help them learn how to build better ones." Dr. Thomasz Wierzbicki, an engineer at the Massachusetts Institute of Technology who has written considerably about the Challenger cabin said, "This is a tremendous asset. Any information on the damage is telling you the story of what happened, and that can help you think about improving the design." The pictures were made after the cabin was recovered from the Atlantic off Cape Canaveral. The seven members of the crew were killed in the explosion of the Space Shuttle Challenger January 28, 1986. [Banke and THE NEW YORK TIMES, FLORIDA TODAY, p. 1A, Feb. 14, 1993; "NASA Releases Challenger Photos," THE ORLANDO SENTINEL, Feb. 14, 1993; "NASA Releases Photos of Challenger's Crew Cabin," FLORIDA TODAY, p. 1A, Feb. 15, 1993.]

[] **DEBUS AWARD TO BILL NELSON**

"Because of his continuing support of the space program, **Bill Nelson** is the ideal choice for the [fourth Debus Award.], said **George English**, Director of the Executive Management Office at Kennedy Space Center and on the board of directors of the National Space Club which sponsors the Debus Award annually. Nelson was formerly a member of the House of Representatives representing the Space Coast and chaired the House subcommittee for space science and applications. He also flew aboard STS 61C as a payload specialist. Floridians who have contributed to the national space program are eligible for the award; it was established in 1990 and was named for the first Director of Kennedy Space Center, **Kurt H. Debus**. ["Fourth Debus Award Goes to Bill Nelson," FLORIDA TODAY, Feb. 14, 1993.]

[] **BIONETICS WINS SAFETY AWARDS**

Kennedy Space Center Director **Robert L. Crippen** presented two safety awards to The Bionetics Corp. for the company's work on its Life Sciences Support Contract at KSC. Bionetics received the Accident Prevention Certificate and the Center Director's Plaque, the latter of which is the most prestigious safety award

given to a space center contractor. ["Bionetics Corp. Earns Two Safety Awards," FLORIDA TODAY, Feb. 14, 1993.]

February 16: **STS 55: #1 TURBOPUMP REMOVED**

At Launch Complex 39A, pad workers have removed Columbia's #1 liquid oxygen turbopump and have hoisted engine #1's replacement turbopump to the aft main engine compartment. Work in progress: removal of main engine #2 high pressure liquid oxygen turbopump; troubleshooting main engine #2 hydraulic yaw actuator; crew compartment cleaning. Work scheduled: hoisting engine #2 turbopump to the main engine compartment tonight; changeout of main engine #3 liquid oxygen turbopump tomorrow night and changing out of Orbiter refrigerator/freezer. The turbopump changeouts are proceeding according to schedule. The Interface Verification Test (IVT) for ATLAS/SPARTAN was successfully completed with Orbiter Discovery over the weekend. The Crew Equipment Interface Test (CEIT) with the STS 56 astronauts scheduled for tomorrow. [SPACE SHUTTLE WEEKLY STATUS SUMMARY, Feb. 16, 1993; Banke, FLORIDA TODAY, p. 4A, Feb. 17, 1993.]

[] **SPACEPORT USA LABOR CONTRACT**

Labor union employees have culminated weeks of negotiation with the signing of a contract agreement with TW Recreational Services which operates Spaceport USA. TW spokeswoman **Elaine Richner** said, "We know it was a difficult decision for the employees to make. We appreciate their working together to reach an agreement that was acceptable to both parties without any work stoppage." [Hahn, FLORIDA TODAY, p. 20C, Feb. 17, 1993.]

February 17: **STS 55: #1 PUMP IN/#2 OUT**

Pad technicians at LC 39A, have completed the removal from Columbia of main engine #2 high pressure liquid oxygen turbopump and installed a replacement main engine #1 high pressure liquid oxygen turbopump. Work in progress for STS 55: hoisting engine #2 turbopump to the aft main engine compartment; turbopump inspections in VAB main engine maintenance facility; troubleshooting main engine #2 hydraulic yaw actuator; inspection of main engine heat shields; crew compartment cleaning. STS 55 work scheduled: lower main engine #3 turbopump tonight and hoist its replacement to the aft main engine compartment and to install new Orbiter refrigerator/freezer units by February 23. The changeout of Columbia's main engine liquid oxygen turbopumps is running somewhat ahead of schedule today. The two pumps which were removed from the main engines have been examined and, as was expected, the correct seal retainers were installed. [SPACE SHUTTLE WEEKLY STATUS SUMMARY, Feb. 17, 1993.]

February 18: **STS 55: CHANGEOUTS ON SCHEDULE**

Changeout work for Columbia's main engine liquid oxygen turbopumps is running on schedule today: All three pumps removed from Columbia have now been examined and, as was expected, the correct seal retainers had been installed. The next phase of work, which is securing the new pumps to the engine power heads, is scheduled to take six days. The installation of new main engine liquid oxygen high pressure turbopumps in the aft main engine compartment for STS 55 has been completed. Inspections of the turbopumps removed from Columbia have been completed in the VAB main engine maintenance facility. Technicians have finished troubleshooting main engine #2 hydraulic yaw actuator. Work in progress for STS 55: establishing aft compartment access for turbopump securing; inspection of main engine heat shields and crew compartment cleaning. Scheduled activities include: securing main engine liquid oxygen high pressure turbopumps; installation of new Orbiter refrigerator/freezer units and main engine heat shields. [SPACE SHUTTLE WEEKLY STATUS SUMMARY, Feb. 18, 1993.]

[] **CLINTON: REWORK STATION, AGAIN**

In his address to a joint session of Congress last night, President **Bill Clinton** said he would ask for a 6% increase in NASA's budget but would ask that the space agency redesign Space Station Freedom once more. The reworking was provoked by recent cost overruns reportedly totaling $500 million. "The administration is committed to preserving the jobs, but also to confronting the cost overruns and the mismanagement problems," according to Vice President **Al Gore's** press spokesperson, **Marla Romash**. [Banke, FLORIDA TODAY, p. 1A-2A, Feb. 13, 1993; Banke, FLORIDA TODAY, p. 8A, Feb. 14, 1993; Eisler, FLORIDA TODAY, pp. 1A-2A, Feb. 18, 1993; Halvorson, FLORIDA TODAY, p. 1A-2A, Feb. 6, 1993; Halvorson, FLORIDA TODAY, p. 1A, Feb. 9, 1993; Halvorson, FLORIDA TODAY, p. 5A, Feb. 12, 1993; Holton, THE ORLANDO SENTINEL, pp. A-1 & A-6, Feb. 6, 1993; Holton, THE ORLANDO SENTINEL,pp. A-1 & A-12, Feb. 18, 1993.]

February 19: **STS 55 PROCESSING**

The STS 55 launch team is getting the day off February 21 and no work is planned for Columbia. New turbopumps have been installed int Columbia's aft compartment and the heat shields have been inspected. Pad technicians are occupied in mounting turbopumps to main engine power heads. STS 55 work scheduled: main engine heat exchanger leak checks; start of securing turbopumps; crew compartment cleaning continues; opening the payload bay doors on February 22; removal of GAS can experiments for battery changeouts; experimenting with film magazine removal; installation of Orbiter refrigerator/freezers' potable water

sampling and heat shield installation. [SPACE SHUTTLE WEEKLY STATUS SUMMARY, Feb. 19, 1993.]

[] **COLUMBIA PUMPS A-OK**

"We're still confident that was the right decision to make," said **John Plowden**, Rocketdyne Division Manager at Kennedy Space Center. Plowden referred to the decision to replace all three of Columbia's main engines when a problem was thought to exist concerning an older version of turbopump blade tip retainer seal. The decision to change the engines brought with it a three-week delay in the launching of STS 55. Costs of the delay are not yet available though they are expected primarily to reflect the costs of overtime labor, according to KSC officials. [Banke, FLORIDA TODAY, Feb. 11, 1993; Banke, FLORIDA TODAY, p. 1A, Feb. 12, 1993; Banke, FLORIDA TODAY, p. 1A, Feb. 19, 1993; Date, THE ORLANDO SENTINEL, Feb. 11, 1993.]

[] **STS 56: CEIT & IVT**

In OPF Bay 3, the Crew Equipment Interface Test and the ATLAS/SPARTAN Interface Verification Test have both been completed in the processing flow for STS 56, Discovery's next mission. STS 56 tasks completed: hydrogen propulsion system leak check; MSBLS checkout; payload bay door bulb seal repair; remote manipulator arm installation; water spray boiler servicing and checkout; potable water servicing; OMS/RCS electrical checks; fuel cell changeout and checkout and forward reaction control system checkout. Scheduled mission work: ammonia boiler servicing; OMS/RCS cross-feed connections; final radiator inspections; crew hatch functional check; air data probe/system functional check; potable water servicing; Orbiter/external tank door functional test; flight controls functional check; closeouts of crew compartment; final payload bay doors cleaning and closing; tile closeouts; closing of payload bay doors and removal of strongbacks; final nose gear/main landing gear tire pressure checks. Special topics: as a result of the turbopump inspection requirement, Discovery's engines will be removed next week in the Orbiter Processing Facility. They will be reinstalled in the Vehicle Assembly Building using other engines presently in the main engine maintenance facility. Two of the turbopumps recently removed from Columbia will be used, and the third one from the remaining engine has already been inspected and reinstalled. [SPACE SHUTTLE WEEKLY STATUS SUMMARY, Feb. 19, 1993.]

[] **STS 57: ENDEAVOUR PROCESSING FLOW**

Endeavour is being processed for STS 57 in OPF Bay 1; tasks recently completed there include: main propulsion system checkout and remote manipulator arm electrical connections. Work in progress for the mission: OMS pod functional

testing; mid-body closeouts; tile repair; water spray boiler servicing; preparations in payload bay for Spacehab installation; Spacehab electrical testing in the O & C Building and stacking of solid rocket boosters in the VAB's High Bay 3. Scheduled work: ammonia boiler servicing; tunnel adapter installation; auxiliary power unit lube oil servicing and Spacehab installation. [SPACE SHUTTLE WEEKLY STATUS SUMMARY, Feb. 19, 1993.]

February 20: **NEW ENGINES FOR DISCOVERY**

Discovery will receive the three main engines intended for Endeavour's STS 57 mission in late April. "The bottom line is we now have a requirement to inspect all pumps before flight. And it's quicker to change out the engines rather than the pumps," said **George Diller**, Kennedy Space Center spokesman. Columbia's replacement engines are expected to be installed shortly to allow for a final round of testing next week. Diller added, "Along about Thursday or Friday (Feb. 25 or 26) all of the work associated with the replacement operation will be done. [Halvorson, FLORIDA TODAY, p. 4A, Feb. 20, 1993.]

[] **SPACEPORT USA EXPANSION**

"After a few slow years, we had moderate growth in attendance in 1992 and, from what we know so far, we expect that trend to continue," said Marketing Director **Tom Blair**. "We're excited because we expect the Center for Space Education to increase interest and the number of school groups coming here," Blair added. AMF President Jim DeSantis noted that construction on the Center is expected to begin in March with completion scheduled for the following year. "The center is going to be a show-place for cutting-edge technology. We are going to become a destination for educators. The space program is still the best the country has to offer. We're taking a very broad approach. Students and teachers will see the results of good work and can see it in context. This center will be a very appropriate living memorial to the astronauts." [White, FLORIDA TODAY, p. 1A-2A, Feb. 20, 1993.]

February 22: **STS 55: LAUNCH SECOND MID-MARCH**

All replacement turbopumps have been mounted to their main engine power heads and the pumps have been checked for leaks in preparation of Columbia for its STS 55 mission now set for the second week of March. Work in progress: liquid oxygen high pressure turbopump connections and securing; main engine heat exchanger leak checks; opening payload bay doors; preparation to install new Orbiter refrigerator/freezers; preparation of main engine heat shields for installation; resumption of crew compartment cleaning. STS 55 work scheduled: installation of refrigerator/freezer units; removal of GAUS experiment film magazine for servicing; potable water sampling; installation of main engine heat

shields; removal of GAS can experiments for battery servicing and Flight Readiness Test of main engine/aerosurfaces next weekend. [SPACE SHUTTLE DAILY STATUS-STS 55, Feb. 22, 1993.]

[] **KSC: EFFECT OF CLINTON BUDGET**

"I'm very encouraged by what I've seen so far," said Kennedy Space Center Director **Robert L. Crippen** about the new Clinton budget proposals. "This budget is supportive of the kind of things we're doing at KSC. Whatever the final design turns out to be, the Space Station is going to be prepared for launch at KSC and the Shuttle is going to launch the Space Station from KSC." Crippen said that meanwhile, NASA managers and those at KSC will have to continue to find ways to operate less expensively and more efficiently. "The old philosophy of 'If it aint broke don't fix it' isn't true anymore. You can't sit still," Crippen said. He also expressed gratitude to local legislators and business leaders for the effort these groups made to save the Space Station from budget elimination. [Banke, FLORIDA TODAY, p. 2A, Feb. 23, 1993.]

February 23: **STS 55: PAYLOAD BAY DOORS OPEN**

The Space Shuttle Columbia remains at Launch Complex 39A where changeout of its main engines and their turbopumps continues. Tasks completed: mounting turbopumps to main engine power heads; leak checks of high pressure turbopumps; main engine heat exchanger leak checks; opening payload bay doors. Work in progress: liquid oxygen high pressure turbopump connections and securing; installation of new Orbiter refrigerator/freezer units; preparation of main engine heat shields for installation; removal of GAUS experiment film magazine for servicing. STS 55 work scheduled: testing of Orbiter refrigerator/freezer units tonight; potable water sample tomorrow; installation of main engine heat shields February 25; removal of GAS can experiments for battery servicing February 26; Flight Readiness Test of main engines/aerosurfaces February 27-28. [SPACE SHUTTLE DAILY STATUS-STS 55, Feb. 23, 1993.]

[] **BOC EXTENDED FOUR MONTHS**

NASA announced today that the Kennedy Space Center's Base Operations Contract (BOC) currently held by EG&G Florida, Inc. has been extended for a four-month period. The contract extension exercises four, one-month priced options on their current contract, which will extend it from March 1 through June 30, 1993. The extension's potential value is $68,442, 687. It is expected that an additional contract option to cover the time between June 30 and award of the new Base Operations Contract will be negotiated with EG&G Florida, Inc. [KSC Release No. 14-93, Feb. 23, 1993.]

[] **COLUMBIA LAUNCH DATE NEXT WEEK**

NASA managers may announce early next week whether Columbia can meet the launch target date of March 13. Replacement of three turbopumps on the main engines and their testing must be completed before a date can be set, according to KSC spokesman **George Diller**. "So far the schedule is going exactly as it was laid out, and we haven't had any surprises," he said. Discovery's main engines will be removed this week as part of inspection efforts prior to Discovery's STS 56 mission. That mission has been delayed from late March to the first week of April. [Banke, FLORIDA TODAY, p. 2A, Feb. 23, 1993.]

February 24: **STS 55: GAUS REMOVED FOR SERVICING**

Technicians at Launch Complex 39A have removed the GAUS experiment film magazine for servicing. Other tasks leading to Columbia's STS 55 launch are currently in progress: liquid oxygen high pressure turbopump connections and securing; troubleshooting enhanced Orbiter refrigerator/freezer unit; potable water sampling; GAS can experiment removal preparations for battery charging. STS 55 work scheduled: removal of GAUS experiments; reinstallation of GAUS film magazine; flight readiness test of main engines/areosurfaces; installation of main engine heat shields beginning February 28; loading of Orbiter mass memory units and helium signature leak checks at the beginning of next week. [Banke, FLORIDA TODAY, Feb. 25, 1993; SPACE SHUTTLE DAILY STATUS - STS 55, Feb. 24, 1993.]

[] **COLUMBIA EXPERIMENTS NEED BATTERIES**

Because the STS 55 mission has been delayed three weeks, technicians will need to replace or recharge batteries on two experiments at the pad; this type of work has never been done on the launch pad, according to **George Diller**, KSC spokesman. He said that the payload bay doors were opened to support the operation on February 22. Two new refrigerator/freezer units should be installed in the Orbiter's middeck by early today. [Banke, FLORIDA TODAY, p. 4A, Feb. 24, 1993.]

February 25: **STS 55: GAUS REMOVAL**

Technicians at Launch Complex 39A are continuing STS 55 prelaunch preparations; they have removed the GAUS experiment film magazine for servicing and completed potable water microbial sampling. Work in progress: conclusion of high pressure turbopump connections and securing; troubleshooting enhanced Orbiter refrigerator/freezer units; GAS can experiment removal preparations; hydraulic fluid particle sampling. STS 55 work scheduled: final turbopump leak checks; removal of GAS experiments for battery charging;

reinstallation of GAUS film magazine; flight readiness test of main engines/aerosurfaces; installation of main engine heat shields; loading Orbiter mass memory units; helium signature leak checks. [SPACE SHUTTLE DAILY STATUS-STS 55, Feb. 25, 1993.]

[] **REDESIGN OF SPACE STATION**

NASA Administrator **Daniel S. Goldin** has named Dr. **Joseph F. Shea** to oversee the redesign of the Space Station and has provided new policy direction for Space Station contract cost management during the design transition. Shea has been appointed Assistant Deputy Administrator of the agency and will be directly responsible for leading NASA's efforts to develop options for the redesign of the Space Station, its mission and management structure. A candidate also will be named, shortly, to establish and chair a blue ribbon panel of outside experts to review and assess NASA's redesign concept and approach.

"I have asked Joe Shea to come back to NASA to head the redesign effort. He has recently been serving as the Acting Chair of the NASA Advisory Council and brings a wealth of knowledge and experience to this critical task," Goldin said. "Joe will be responsible for assembling a team that will involve a variety of individuals from across NASA and our international partners and will call upon the expertise of individuals both within and outside of the government and academia. The NASA/contractor Space Station team also will be called upon and Joe will work with **Dick Kohrs** [Richard Kohrs] to assure access and insight to ongoing program activities. This team will truly reflect the cultural diversity of the agency and country," Goldin added. Kohrs is Director of the Space Station Program Office. Goldin also announced agency-wide measures to conserve resources and restrict new spending during the redesign transition. In general, no new awards or new work modifications which relate to the current Space Station program, including support service contracts, will be solicited or issued. Work on existing contracts is not to be accelerated and Space Station contractors are being advised to discontinue overtime and any further staffing increases. [NASA Release: 93-038, Feb. 25, 1993.]

February 26: **STS 55: TURBOPUMPS INSTALLED**

At Launch Complex 39A, technicians have completed main engine turbopump installation, connections and securing aboard Columbia for its delayed STS 55 mission. Work in progress: turbopump pressurized leak checks; turbopump electrical checks; GAS can experiment removal and testing of secondary Orbiter refrigerator/freezer units. Scheduled STS 55 work: actuator connections; reinstallation of GAUS film magazine; primary Orbiter refrigerator/freezer interface verification test (IVT); main engine heat shield installation; flight readiness test (FRT); loading Orbiter main memory units; installation of

contingency EVA spacesuits into airlock; beginning the stowage of crew equipment in the crew cabin; helium signature leak check and hypergolic propellant loading. [SPACE SHUTTLE WEEKLY STATUS SUMMARY, Feb. 26, 1993.]

[] **DISCOVERY: SSME'S REMOVED**

The main engines of Discovery have been removed for inspection while the Orbiter remains in OPF Bay 3 being processed for its upcoming STS 56 mission. Other completed tasks include: external tank door functional test; landing gear functional test; OMS/RCS flight control checks; OMS/RCS system leak checks; final check and securing of Orbiter flight controls; final payload bay door cleaning; thermal protection system tile work; remote manipulator arm checkout; MSBLS testing; Ku-band antenna testing; potable water supply system leak checks; tests of air data probe. Mission work in progress: Orbiter aft main engine compartment closeouts; crew module closeouts; payload bay closure; crew hatch closure; structural leak checks; final tile work. Scheduled STS 55 work: landing gear strut pressurization; completion of tile closeouts; weight and gravity determination; installation of Orbiter upon its transporter; rollover to the Vehicle Assembly Building. [SPACE SHUTTLE WEEKLY STATUS SUMMARY, Feb. 26, 1993.]

[] **STS 57: TESTING AND CLOSEOUTS**

Endeavour remains in OPF Bay 1 for continuation of processing for the Orbiter's STS 57 mission in April. The vehicle has completed RMS and OMS/RCS flight control functional testing. Other completed tasks include: elevon and rudder speed brake closeouts; ammonia boiler servicing and Spacehab tunnel adapter installation. STS 57 work in progress: installation of Orbiter Spacehab water heaters and leak checks of the Orbiter Spacehab coolant lines; potable water servicing; Ku-band antenna testing; radar altimeter troubleshooting; bulb seal repair; power control assembly fuse implications; stacking of solid rocket boosters in the VAB High Bay 3. STS 57 work scheduled: installation of Spacehab into canister; transporting Spacehab to OPF and installation; auxiliary power unit #1 lube oil servicing; auxiliary power unit #1/#2 controller testing; OMS/RCS electrical redundancy checks; potable water system leak check; MSBLS system testing; reinstallation of radar altimeters; star tracker door testing; remote manipulator arm elbow and wrist heater testing; tile waterproofing. [SPACE SHUTTLE WEEKLY STATUS SUMMARY, Feb. 26, 1993.]

[] **STS 55: MARCH 14 LAUNCH DATE SET**

NASA managers today set March 14, 1993, as the launch date for the Shuttle Mission STS 55 which will see Space Shuttle Columbia and her seven-member

crew fly a mission dedicated to the German Space Agency. The major payload for STS 55, the pressurized Spacelab module - designated as Spacelab-D2 for this flight - will allow the astronauts to conduct a wide range of experiments in the microgravity environment of space. Some 90 experiments are planned during this mission. The launch window on March 14 extends from 10 a.m. until 12:30 p.m. EST. Following launch, Columbia's crew will be divided into two teams, each working a 12-hour shift, so that science operations can be carried out around the clock. The Spacelab-D2 mission duration is planned for 9 days and will conclude with a landing at Kennedy Space Center's Shuttle Landing Facility. This date was chosen primarily because it was the first open date on the Eastern Range during this time, according to KSC spokesman **George Diller**. [Banke, FLORIDA TODAY, p. 2A, Feb. 26, 1993; Halvorson, FLORIDA TODAY, p. 6A, Feb. 27, 1993; KSC Release No. 16-93, Feb. 26, 1993.]

February 28: **GODDARD AWARD TO MCCARTNEY**

Former Kennedy Space Center Director **Forrest S. McCartney** will receive the Robert H. Goddard Memorial Trophy for 1993; the Goddard award is given annually by the National Space Club at its dinner in Washington, D.C. McCartney's citation reads: "For his significant contribution to national security and prestige in his efforts as Director of Communications Satellite Programs, Director of the M-X System Program Office, the Commander of Ballistic Missile Organization, the Commander of the Space and Missile Systems Center and the Director of Kennedy Space Center." ["McCartney to Receive Annual Goddard Award," FLORIDA TODAY, p. 9E, Feb. 28, 1993.]

MARCH

March 1: **STS 55: GAUS RE-INSTALLED**

Columbia continues to undergo pre-launch processing at Launch Complex 39A. Leak checks of liquid oxygen high pressure turbopumps have been completed and the main engine heat shields have been installed. The GAUS experiment film magazine has been re-installed ad the GAS cans have been removed for experiment battery charging. Work in progress: alignment of Orbiter inertial measurement units (IMUs); main engine eyelid installation; GAS can experiment battery charging at Hangar S. STS 55 work scheduled: contingency EVA spacesuit installation tonight; flight readiness test (FRT) tomorrow; helium signature leak check; stowage of flight crew equipment into crew cabin; hypergolic propellant loading; aft compartment closeouts; reinstallation of GAS can experiments; primary Orbiter refrigerator/freezer interface verification test (IVT). [SPACE SHUTTLE DAILY STATUS-STS 55, March 1, 1993.]

March 2: **STS 55: SPACESUITS INSTALLED**

At Launch Complex 39A, technicians are readying Columbia for its STS 55 launch on March 14. The interface verification test of the primary Orbiter refrigerator/freezer unit has been completed successfully. Other work completed for STS 55: alignment of the guidance system for the Inertial Measurement Units (IMU) and installation of contingency extravehicular activity (EVA) spacesuits into the Orbiter airlock. STS 55 work in progress: a flight readiness test (FRT) of the main engines and their flight controls and contingency EVA spacesuit checkout. STS 55 work scheduled: helium signature leak check; stowage of flight crew mission items into crew cabin; hypergolic propellant loading; aft compartment closeouts; reinstallation of the GAS can experiments. [SPACE SHUTTLE DAILY STATUS-STS 55, March 2, 1993.]

[] **ORBITER UPDATES**

Discovery is scheduled to rollover from OPF Bay 3 to the Vehicle Assembly Building transfer aisle this afternoon at approximately 5 p.m. as preparations for STS 56 continue. Mating to the external tank/solid rocket booster stack will occur overnight. The two-day Shuttle Interface Test will follow. Installation of Discovery's three main engines is targeted to start on March 8. (The engines were removed in the OPF because of the turbopump seal retainer issue.) A rollout to Launch Complex 39B will occur sometime in the mid-March time frame with a more definite date to be determined later. STS 57 preparations of Endeavour continue in OPF Bay 1. The Orbiter is awaiting the transfer of its Spacehab-1 payload from the Operations & Checkout Building and subsequent installation tomorrow. [SPACE SHUTTLE DAILY STATUS-STS 55, March 2, 1993.]

March 3: **STS 55: HYDRAULIC LINE REPLACED**

At approximately 6:30 p.m. last night, during the STS 55 main engine Flight Readiness Test, a hydraulic flex hose broke which caused hydraulic fluid to spray inside the aft compartment around the main propulsion system and in the vicinity of main engine number 2. The line was capped five seconds after the rupture occurred. This line supplies hydraulic pressure to the LH^2 umbilical retract actuator associated with external tank separation. An assessment of the remedial action to be taken is under evaluation. Impacts, if any, to the March 14 launch date could be known later today. The ruptured hydraulic line has been replaced. Work in progress: hydraulic fluid cleanup in aft main engine compartment; examination of main engines and main propulsion system including lines, transducers, fittings, electrical connectors and thermal blankets in the aft main engine compartment. The reinstallation of the GAS can experiments has been scheduled for March 4. STS 56: Discovery's rollover from OPF Bay 3 to the VAB transfer aisle occurred last night at 5:41 p.m. and the Orbiter was hoisted for mating to the external tank/solid rocket booster stack at 1:50 this morning. STS 57: Installation of Spacehab into Endeavour has been rescheduled for tomorrow morning to allow some payload bay work to be completed. [SPACE SHUTTLE DAILY STATUS-STS 55, March 3, 1993; Halvorson, FLORIDA TODAY, pp. 1A-2A, March 4, 1993; Date, THE ORLANDO SENTINEL, March 4, 1993.]

[] **STS 55: HYDRAULIC HOSE RUPTURE UPDATE**

At approximately 6:30 p.m. last night, near the conclusion of the main engine portion of the Flight Readiness Test, a 3/8-inch hydraulic flex hose broke which caused hydraulic fluid to spray inside the aft compartment around the main propulsion system and in the vicinity of main engine number 2. This line provides hydraulic actuator pressure to retract the LH^2 umbilical plate before external tank door closure. A preliminary assessment of the remedial action to be taken shows that launch could occur no earlier than March 16. A more definite date may be available at the end of the week after a full assessment of the work to be done has been completed. Discovery's rollover from OPF Bay 3 to the VAB transfer aisle for further STS 56 processing occurred at 5:41 p.m. last night and the Orbiter was hoisted for mating to the external tank/solid rocket booster stack at 1:50 a.m. this morning. The soft mate process is complete; the hard mating is in progress. STS 57: Installation of Spacehab into Endeavour has been rescheduled for this morning to allow some payload bay work to be completed. [SPACE SHUTTLE DAILY STATUS-STS 55, March 3, 1993.]

March 4: **STS 55: HYDRAULIC LINE REPLACED**

At Launch Complex 39 technicians have replaced the ruptured hydraulic line into the aft main engine compartment of Columbia; launch of STS 55 will now occur no earlier than March 16, a further delay of two days. Work in progress on Columbia: reinstallation of the GAS can experiments; GAS can interface verification testing (IVT); hydraulic fluid cleanup in aft main engine compartment; examination of main engines and main propulsion system including electrical connectors and harnesses, solenoid valves and thermal insulation within the aft compartment; removal, inspection and cleaning of #2 main engine heat shields; failure analysis of the ruptured hydraulic hose. STS 55 work scheduled: GAS can (GAUS) experiment mirror changeout tomorrow; RKGM experiment film magazine reinstallation tomorrow; closing payload bay doors tomorrow night; flight readiness test; helium signature leak checks; hypergolic propellant loading March 8-9; reinstallation of the enhanced Orbiter refrigerator/freezer (EORF) March 10. [SPACE SHUTTLE DAILY STATUS-STS 55, March 4, 1993.]

March 5: **OZONE STUDY DELAY POSSIBLE**

Discovery's STS 56 mission, presently scheduled for April 3, may be pushed back to mid-April because of delays in launching Columbia's STS 55 flight. If launched on time, Discovery has an opportunity to study ozone depletion in the northern hemisphere; "It would be good for us to go as soon as possible," said **Tim Miller**, a NASA scientist working on the environmental mission. "It would increase our chances of being able to address the key issue of ozone depletion in the northern hemisphere." Columbia's problems with hydraulic hoses may push its launch beyond March 16 and, if so, there are other complicating factors. The launch dates of March 18 and 19 have already been booked for an Air Force Delta 2 liftoff and that will involve tracking and safety services provided by the Air Force's Eastern Test Range. In addition, a commercial Atlas has booked March 22 and March 23 as launch dates. If these events go as scheduled, Columbia has March 25 available for launch. If Columbia is launched that late then Discovery's launch would revert to mid-April based on launch safety rules which require three weeks between Shuttle launches. [Halvorson, FLORIDA TODAY, pp. 1A-2A, March 6, 1993; Date, THE ORLANDO SENTINEL, March 6, 1993.]

[] **STS 55: HOSE REMOVAL FROM AFT**

At Launch Complex 39A, the GAS can experiment has been reinstalled into Columbia's payload bay. An evaluation has been completed of the hydraulic fluid contamination in the aft main engine compartment. Work in progress on STS 55: removal of hydraulic flex hoses from Columbia's aft compartment; failure analysis of the hydraulic hose; installation of heat shield carrier panels on engines 1 & 3; preparation for the helium signature leak test and preparations to close the payload bay doors tonight. Scheduled tasks: X-rays of hydraulic flex hoses; reinstallation of the enhanced Orbiter refrigerator/freezer late today; helium signature leak

check; loading of hypergolic propellants on March 7 and 8; a flight readiness test of the main engines on March 9. Launch Schedule Note: Space Shuttle managers and engineers are continuing to assess the launch schedule impact attributable to inspections of the hydraulic flex hoses and clean-up and inspection of the aft engine compartment and number two main engine. At the present time, it appears unlikely that we will be able to meet the previously targeted launch date of March 16. A better launch day estimate should be available by March 9. [SPACE SHUTTLE DAILY STATUS REPORT, March 5, 1993.]

[] **STS 56 & STS 57 PROCESSING WORK**

Discovery (STS 56): The mating of liquid hydrogen and liquid oxygen connection lines between the external tank and the Orbiter have been completed. Installation of main engines begins March 8. Work in progress: continuation of Orbiter/external tank mating and preparation for installing the main engines into Discovery. Endeavour (STS 57): In the Orbiter Processing Facility, technicians have completed the mechanical installation of Spacehab into Endeavour's payload bay. Work in progress: electrical connections between Spacehab and Endeavour; aft compartment closeouts; testing of main landing gear. [SPACE SHUTTLE DAILY STATUS REPORT, March 5, 1993.]

March 6: **MALONE TO BE NEWS CHIEF**

Today, **Lisa Malone** becomes Kennedy Space Center's first female news chief. She was the first female launch commentator and has served as editor of the Spaceport News, and as a public affairs specialist. She began her career at KSC as a co-op student in KSC's Public Information Office. The space center's public information chief **Dick Young** said Malone was chosen because of her "experience, judgment and talent." [Halvorson, FLORIDA TODAY, p. 1B, March 6, 1993.]

[] **ATLAS LAUNCH DELAYED FOR TESTS**

The General Dynamics Atlas which was to be launched March 22 will now be delayed for testing purposes. "We just need more time to complete our testing," said company spokeswoman **Julie Andrews**. On August 22, a failed Atlas launch was traced to an upper stage engine valve which performed improperly just prior to launch. That launch was the second failure in 18 months for General Dynamics which has decided to perform additional prelaunch engine tests for the upcoming liftoff. Andrews said, "We have a very high degree of confidence that we've found the problem and have taken the proper corrective action. We're anxious to get back to launching again." [Halvorson, FLORIDA TODAY, p. 4A, March 6, 1993.]

March 8: **STS 55: HELIUM CHECK COMPLETED**

The helium signature leak check of Columbia's main engines and the main propulsion system was completed at Launch Complex 39A on March 6. The payload bay doors have been closed for flight and there was a successful bench functional check of EORF this morning. STS 55 work in progress: loading of OMS/RCS fuel and offline X-rays of hydraulic replacement hoses. STS 55 work scheduled: reinstallation of the enhanced Orbiter refrigerator/freezer (EORF unit); reinstallation of hydraulic hoses March 9; flight readiness test today. Engineers are discussing the failure analysis of the failed hydraulic hose from Columbia and what impact this might have on upcoming activities, if any. Discovery's three main engines for STS 56 will undergo installation starting today and running through March 10; The mating of the external tank to the solid rocket booster stack for Endeavour's upcoming STS 57 flight is occurring today. [SPACE SHUTTLE DAILY STATUS-STS 55, March 8, 1993.]

[] **STS 55: HYDRAULIC HOSES DEFECTIVE**

The rupture of Columbia's hydraulic hose in the aft main engine compartment is being blamed on a manufacturing error, according to NASA officials. Space agency inspectors found that the hose had come from a group (lot) manufactured by Titeflex Division (Springfield, MA) between March and July 1977, according to KSC spokesman **James Hartsfield**. He said that tests showed that hoses from that period were prone to problems because of a manufacturing process in use then. [Halvorson, FLORIDA TODAY, p. 2A, March 9, 1993.]

[] **STS 55: LAUNCH NOW SET FOR MARCH 25**

Liftoff of Columbia upon its STS 55 mission will come March 25, despite the likelihood that the Orbiter would be ready for launch on March 19. KSC spokesman **Dick Young** explained, "We had asked for an earlier date but we were constrained by earlier missions." Preparations for Discovery's STS 56 mission continue in the Vehicle Assembly Building; rollout to Launch Complex 39B is expected to occur on March 13. [Halvorson, FLORIDA TODAY, P. 2A, March 7, 1993; Halvorson, FLORIDA TODAY, p. 1A, March 9, 1993.]

March 9: **HOSE PROBLEM DATES TO 1977**

STS 55 issues and concerns: The failure analysis from Columbia's ruptured hydraulic hose indicated that it was due to a change in the manufacturing process that occurred during a short period of time in 1977. Spare hydraulic hoses and hoses from Atlantis will replace suspect hoses from Columbia. All have been checked by lot number, passed inspections, high pressure checks and X-rays. Officials are exploring several schedule options with regard to the STS 55 and

STS 56 launches. No decisions are expected today. NASA is continuing to process both Columbia and Discovery to support launches at the earliest possible dates.

Storable hypergolic propellants have been loaded into Columbia at Launch Complex 39A; the enhanced Orbiter refrigerator/freezer (EORF) has also been installed. STS 55 work in progress: reinstallation of hydraulic hoses; hydraulic system servicing for a flight readiness test and auxiliary power unit leak checks. Scheduled: the flight readiness test mentioned above for March 10 and external tank purges. [SPACE SHUTTLE DAILY STATUS-STS 55, March 9, 1993.]

March 10: **STS 55: HOSES REINSTALLED**

At Launch Complex 39A, technicians have reinstalled Columbia's hydraulic hoses in the Orbiter's aft main engine compartment. A flight readiness test (FRT) of the main engines' flight controls is in progress. STS 55 work scheduled: conclusion of the flight readiness test on March 13; enhanced Orbiter refrigerator/freezer (EORF) interface verification test (IVT) tomorrow night; Orbiter aft confidence test also tomorrow night; begin aft compartment closeouts, avionics bay closeouts and external tank purges on March 12. Discovery's rollout from the Vehicle Assembly Building to Launch Complex 39B has been scheduled for 8 a.m. March 13. [SPACE SHUTTLE DAILY STATUS-STS 55, March 10, 1993; SPACE SHUTTLE DAILY STATUS-STS 55, March 11, 1993.]

March 11: **AIR FORCE TO LAUNCH NASA TETHERED PAYLOAD**

The first flight of NASA's Small Expendable-tether Deployer System (SEDS) is scheduled to be launched aboard a U.S. Air Force Delta 2 rocket from Cape Canaveral Air Force Station, FL, no earlier than March 18. The SEDS tether system will be a secondary payload on the Delta 2 launch vehicle. The launch window opens 10:55 p.m. and extends until 11:22 p.m. EST, if the launch occurs on March 18, according to Air Force officials. The tether deployment process is planned to begin about 60 minutes after the Delta 2 launch and end approximately 1 hour and 40 minutes later. SEDS is intended to demonstrate a low-cost method for using a tether to deploy small payloads, such as satellites, to higher orbits or downward toward Earth's atmosphere. It also is being flown to expand the limited amount of existing data on the dynamics of tethered bodies in space. [Launch Advisory: "NASA Tethered Payload to be Launched by Air Force," March 11, 1993.]

[] **NASA CHANGES ORGANIZATION**

A series of organizational changes to improve the focus on programs and enhance external relationships were announced today by NASA Administrator **Daniel S.**

Goldin. In a move to strengthen the top-level management of the agency, Goldin has named **John R. Dailey** as Acting Deputy Administrator. Dailey has been serving as Associate Deputy Administrator since November 1992 after retiring from a highly distinguished 36-year career in the Marine Corps. The Administrator also announced that Dr. **Joseph Shea**, recently named as Assistant Deputy Administrator for Space Station Analysis, will have oversight of all Space Station related development activities.

The organizational changes particularly target NASA science and exploration programs and the agency's relations with American industry, academia, government and non-government laboratories, and international partners. "Science and exploration are what NASA is all about," the Administrator said. "These changes will reestablish that focus." New program offices for Life and Microgravity Sciences and Applications and for Advanced Concepts and Technology have been formally established and will report directly to the Administrator.

The official formation of the Office of Planetary Science and Astrophysics and the Office of Mission to Planet Earth also are being implemented effective today. The plan to form these offices out of the former Office of Space Science and Applications was announced in October 1992. Named as Associate Administrator for Life and Microgravity Sciences and Applications is Dr. **Harry C. Holloway**, Deputy Dean of the Uniformed Services University of the Health Sciences (Bethesda, MD). Dr. Holloway has performed extensive study into the impact of extreme environments on human adaptation. He has been Chairman of the NASA Aerospace Medicine Advisory Committee since 1988 and a member of NASA's U.S./U.S.S.R. Joint Working Group on Space Biology and Medicine.

Assisting Dr. Holloway in setting up this new organization will be Dr. **Bonnie J. Dunbar**, a NASA astronaut since 1981. Dr. Dunbar is a veteran of three space flights and has logged more than 761 hours in space. Dunbar most recently served as Payload Commander for Shuttle mission STS 50, conducted during the summer of 1992. She received her doctorate in Biomedical Engineering from the University of Houston in 1983 and a master of science degree in Ceramic Engineering from the University of Washington in 1975. Dr. **Arnauld E. Nicogossian** will become Deputy Administrator for Space Flight Activities, Life and Microgravity Sciences and Applications. He is presently Chief Medical Officer in NASA's Office of Space Flight and has been with NASA since 1972.

In announcing the new organization for Life and Microgravity Sciences and Applications, Goldin said it is critical to the President's stated objective for a strong and productive space program, which includes development of a Space Station. He said, "The President wants the current Space Station redesigned as part of a program that is more efficient, effective and capable of producing greater

returns on our investment. The redesigned Space Station must provide for significant long duration space research in materials and life sciences during this decade. To assure the right emphasis in the redesign effort and also within NASA," the Administrator said, "I am elevating Life and Microgravity Sciences and Applications to report directly to the Administrator, and I am bringing all the elements together into a strong organization.'

The decision also was recommended in a NASA study led by **Roy Estess**, Director of Stennis Space Center which reviewed the agency's life sciences activities. "Applications is also a key element of this new organization," Goldin said, "because providing benefits here on Earth must be an important consideration." The Administrator pointed out additionally, "Turning back the pages of NASA's history, the agency's greatest scientific research in life sciences was during the Skylab program, in which there was a similar emphasis placed on the activity in an organizational sense."

Dr. **Wesley Huntress** will become Associate Administrator for Planetary Science and Astrophysics. He was named as acting in that position in October and previously had been Director of the Solar System Exploration Division since 1990. Prior to joining NASA in 1988, he had a distinguished 20-year career at the Jet Propulsion Laboratory (Pasadena, CA). The new Mission to Planet Earth (MTPE) Office will be headed by Dr. **Shelby G. Tilford**, named as the Acting Associate Administrator. The MTPE office will consist of divisions for flight systems, for operation, data and information systems, and for science.

The Administrator also has taken measures to strengthen NASA's space programs and the commercialization of technology. The Office of Advanced Concepts and Technology has been formally established with **Gregory Reck** as Acting Associate Administrator. Reck served as Director of the Space Technology Program at NASA Headquarters before his selection to this post and has over 20 years of experience in technical research, management and oversight of various technology programs.

In the Office of Aeronautics, Dr. **Kristin A. Hessenius** has been named as Deputy Associate Administrator. She has been the Director of Aeronautical Research in the Office of Aeronautics. Prior to coming to NASA Headquarters, Dr. Hessenius was Deputy Director of Aerophysics at NASA's Ames Research Center (Mountain View, CA). In 1992, she was one of 10 women honored by the National Aviation Club for outstanding contributions to the field of aviation. Administrator Goldin has named **Deidre A. Lee** as Associate Administrator for Procurement. She has been acting in that position since early January and had been Deputy Associate Administrator of Procurement since September 1992. She has an extensive background in a variety of military and government procurement positions.

Procurement reform is a vital element in NASA's new management approach. [NASA RELEASE: 93-044, March 11, 1993.]

March 12: **STS 55: COLD FRONT APPROACHES**

STS 55 mission work was suspended at Launch Complex 39B for the period covering the third shift tonight through first shift on tomorrow. An approaching cold front will produce squalls and thunderstorms with the possibility for hail between midnight tonight and noon tomorrow with the highest potential for severe weather occurring at about 6 a.m . Work at the pad is scheduled to resume at 4 p.m. March 13. STS 55 work completed: the flight readiness test of main engines/flight controls and the Orbiter aft confidence test. Work in progress: main engine compartment closeouts; avionics bay closeouts; external tank purges; washdown of the mobile launcher platform and testing of the enhanced Orbiter refrigerator/freezer (EORF). Scheduled work for STS 55: ordnance installation and connections; hypergolic tank pressurization and a washdown of the LC 39B pad surface and the flame trench. [SPACE SHUTTLE WEEKLY STATUS SUMMARY, March 12, 1993.]

[] **DISCOVERY ROLLOUT RESCHEDULED: MARCH 15**

Rollout of Discovery has been rescheduled for 6 a.m. March 15 due to weather concerns for tonight and tomorrow. Meanwhile preparations for the Orbiter's STS 56 mission continued with a number of tasks completed: installation of main engines; installation of main engine heat shields and the Shuttle interface test. STS 56 scheduled work: moving the rotating service structure around the vehicle after it is harddown on the pad; extending weather protection panels after hard down; establishing vehicle access and electrical connections with the Launch Complex 39A pad; opening payload bay doors to establish access and a terminal countdown demonstration test set for March 17-18. [SPACE SHUTTLE WEEKLY STATUS SUMMARY, March 12, 1993.]

[] **ENDEAVOUR PROCESSING CONTINUES IN OPF BAY 1**

The Space Shuttle Endeavour remains in Orbiter Processing Facility Bay 1 where the vehicle is being readied for its STS 57 mission which features Spacehab-1 and EURECA 1-R. Installation of Spacehab-1 is complete as is auxiliary power unit lube oil servicing. Work in progress: Spacehab interface verification test (IVT); crew hatch functional check and electrical interface checks between the external tank and the solid rocket boosters in Vehicle Assembly Building (VAB) bay 3. STS 57 work scheduled: crew equipment interface test (CEIT); Spacehab closeouts and closeouts of the Orbiter midbody next week. [SPACE SHUTTLE WEEKLY STATUS SUMMARY, March 12, 1993.]

[] **STS 55: MARCH 21 SET FOR LAUNCH DATE**

NASA managers today set March 21, 1993, as the launch date for STS 55 which will see Columbia and its 7-member crew fly a mission dedicated to the German Space Agency. The major payload for STS 55, the pressurized spacelab module - designated as Spacelab-D2 for this flight - will allow the astronauts to conduct a wide range of experiments in the microgravity of space. The launch window on March 21 opens at 9:52 a.m. EST. Following launch, the crew will be divided into two teams working 12-hour shifts so space operations can be carried out around the clock. The Spacelab D2 mission duration is planned for 9 days and will conclude with a landing at Kennedy Space Center's Shuttle Landing Facility.

Columbia's launch date will have an influence on the next mission to be flown. Space Shuttle Discovery, flys the Atlas 2 payload on STS 56, now targeted for sometime around April 7. The actual launch date for STS 56 will be set at a flight readiness review meeting which will be held approximately two weeks before launch. "The Shuttle team has done a great job in addressing and closing issues such as the hydraulic flex hose problem and putting together a new plan for processing activities" said Shuttle Program Director **Tom Utsman** who was formerly Deputy Director at KSC. "Also the cooperation we've received from the United States Navy, the United States Air Force and Hughes Space and Communication Company made the March 21st launch of Columbia possible." [KSC Release No. 22-93, March 12, 1993; Date, THE ORLANDO SENTINEL, March 13, 1993.]

March 15: **HIGH WINDS DELAY STS 55 PAD WORK**

The highest wind at the Shuttle Landing Facility on March 13 was 63 miles per hour and at Pad 39A the peak gust was 71 mph. While the high wind precluded any work by the launch team from the pad structures on the 13th, there was no damage to the vehicle and only minor damage in the area around the launch pad. During the day of March 13, the Complex 19 freeze protection plan was implemented and Columbia's heaters were turned on. The lowest temperature over the weekend was 32 degrees March 14. Tasks completed: external tank purges and enhanced Orbiter refrigerator/freezer (EORF) interface verification test (IVT). Work in progress: ordnance installation and connections and hypergolic tank pressurization. STS 55 work scheduled: resumption of aft main engine compartment closeouts tonight; resumption of avionics closeouts tonight; washdown of mobile launcher platform, pad and flame trench; installation of flight doors on the aft compartment; arrival of astronauts and start of countdown at 4:00 p.m. March 18. [SPACE SHUTTLE DAILY STATUS-STS 55, March 15, 1993.]

[] **STS 56; 57 PREPARATIONS**

Discovery's rollout from the Vehicle Assembly Building - the first step on its STS 56 journey - began at 7:28 a.m. today. The astronauts are scheduled to arrive at 3:30 p.m. today to begin the required launch pad safety training and for the terminal countdown demonstration test (TCDT) to be conducted March 17 and 18. In Orbiter Processing Facility Bay 1, astronauts of the STS 57 crew completed the crew equipment interface test (CEIT) for Endeavour March 13. The payload bay doors are to be closed on March 18. Rollover to the Vehicle Assembly Building is set for March 25. [Halvorson, FLORIDA TODAY, p. 1B, March 16, 1993; SPACE SHUTTLE DAILY STATUS-STS 55, March 15, 1993.]

March 16: **WEATHER FAVORABLE FOR STS 55**

The preliminary weather forecast for STS 55 suggests that the chance of meeting launch weather criteria is 60% on launch day and rising to 70% with a one-day delay. Wind is expected to be between 10-18 knots. Ordnance installation and connections for the STS 55 Columbia configuration have been completed as has been the hypergolic tank pressurization. Work in progress for Columbia's mission: aft main engine compartment closeouts, inspections and photo documentation; the compartment will also be cleaned again; avionics bay closeouts; washdown of the mobile launcher platform; testing of data link between the Orbiter mid-deck refrigerator/freezers (EORF) and Spacelab D-2 module and final crew compartment cleaning. Scheduled work: washdown of the pad and flame trench; installation of flight doors on the aft compartment and the performance of the final aft confidence test; aft positive pressure check; astronaut arrival March 17; commencement of countdown on March 18. [SPACE SHUTTLE DAILY STATUS-STS 55, March 16, 1993.]

[] **STS 56; 57 UPDATES**

Discovery's rollout from the VAB began at 7:28 a.m. yesterday. Pad arrival occurred at 1:49 p.m. with hard down atop the launch pad pedestals coming at 2:28 p.m. The astronauts of the STS 56 crew will begin launch pad safety training today. The terminal countdown demonstration test starts tomorrow, ending at 11 a.m. March 18. STS 57's external tank/solid rocket booster stack is being relocated today to VAB High Bay 1 to permit planned modification work to begin in High Bay 3. [SPACE SHUTTLE DAILY STATUS-STS 55, March 16, 1993.]

[] **NASA UNDERSTANDS ENDEAVOUR'S POWER SURGE**

When Endeavour lifted off on its STS 54 mission, there was a sudden burst of power at 1 minute 7 seconds into the flight. NASA's engineers now think they

know why the power surge occurred. According to the Shuttle Program's Deputy Director **Brewster Shaw**, it is believed that "a piece of the nonflammable insulation used to separate the booster's four, fuel-loaded segments broke off, traveled down the rocket's interior and shot out the nozzle." The power jump was three times the largest previously recorded. These surges have been more frequent during the last 15 Shuttle launches and an investigation is underway to find out why. [Date, THE ORLANDO SENTINEL, March 16, 1993.]

March 17: **STS 55: HEATER PROBLEM**

Yesterday afternoon it was discovered that the secondary heater associated with Columbia's main engine #1 fuel valve was inadvertently left on after testing due to a failed indicator. This resulted in the overheating of the associated fuel valve actuator. An inspection of the actuator showed some damage to soft rubber-like components within the unit. There was no damage to the main engine fuel valve. The actuator was removed and replaced last night. An abbreviated flight readiness test of main engine #1 will run today. While aft main engine compartment closeouts will not be finished until after the countdown begins, there is no impact to the March 21 launch date for STS 55. The chance of meeting launch weather criteria improved to 70%.

The mobile launcher platform has been washed down and testing of the data link between the Orbiter mid-deck refrigerator/freezers and Spacelab D-2 module has been completed. Work in progress: flight readiness test of main engine #1; washdown of LC 39B pad surface and flame trench; final crew compartment cleaning and astronaut arrival at 8:30 p.m. STS 55 work scheduled: resumption of main engine compartment work and avionics bay closeouts; start of the countdown March 18 at 4 p.m.; installation of flight doors on aft compartment and performance of the final aft confidence test at 12:01 a.m.; aft positive pressure check and loading of cryogenic reactant (PRSD). [Halvorson, FLORIDA TODAY, p. 6A, March 17, 1993; Banke, FLORIDA TODAY, p. 2A, March 18, 1993; SPACE SHUTTLE DAILY STATUS-STS 55, March 17, 1993.]

[] **STS 56: TCDT COMMENCES**

The countdown for the Terminal Countdown Demonstration Test (TCDT) began at 8 a.m. today and will conclude at 11 a.m. tomorrow. The astronauts are continuing with safety training and are having briefings on the status of Columbia and Spacelab D-2. The commander and pilot are flying the Shuttle Training Aircraft. Yesterday the crew had fit checks of their launch and entry suits. [SPACE SHUTTLE DAILY STATUS-STS 55, March 17, 1993.]

March 18: **STS 55: LAUNCH SET FOR MARCH 22**

The Air Force's decision to scrub the launch of its Delta 2 from Cape Canaveral Air Force Station will force a one-day delay in the launch of Columbia on its STS 55 mission. The mission will now commence during a window which runs from 9:51 a.m. and 12:21 p.m. on Monday, March 22. Countdown for the mission began on schedule today at 4 p.m. and preparations for the launch at 39B have continued without incident. The Delta launch has been rescheduled for between 10:51 and 11:18 p.m.; weather forecasts suggest a 90 percent chance of favorable weather, though high winds remain a concern. The Delta will deploy a Navstar Global Positioning Satellite and a $10 million NASA science experiment. [Banke, FLORIDA TODAY, p. 1A, March 19, 1993.]

[] **DELTA SET TO LAUNCH TONIGHT**

The Air Force is ready tonight to launch its Delta 2 rocket from Cape Canaveral Air Force Station; the mission is to deploy a Navstar Global Positioning Satellite and a small NASA experiment called the Small Expendable Deployer System. The deployer is basically a 12.4-mile tether and is a smaller version of the unsuccessful tether experiment flown on Atlantis last year. [Banke, FLORIDA TODAY, p. 1A, March 18, 1993.]

March 19: COLUMBIA/SPACELAB PROCESSING HISTORY

Processing of the Space Shuttle Columbia began after the KSC landing of Columbia's previous mission, STS 52. The Orbiter was towed to Bay 2 of the Orbiter Processing Facility (OPF) on November 1, 1992, for deservicing and preparations to reconfigure its payload bay for the STS 55 mission. The Spacelab D-2 experiments arrived at KSC in July 1992 to begin integration into the Spacelab racks. Installation of the racks into the laboratory module followed in September. The Mission Sequence Test which replicates the mission activities, including flight crew participation, was run last November. The Spacelab D-2 laboratory module was installed into the payload bay of Columbia on January 11, 1993, while the Orbiter was in the OPF. An interface verification test (IVT) between the Spacelab and Columbia was conducted January 16 to verify all connections.

Meanwhile, in the Vehicle Assembly Building (VAB), build-up of the solid rocket boosters on mobile launcher platform 3 occurred in November and December of last year. The external tank arrived at KSC by barge on September 29, 1992, and was transferred to a test cell in the VAB for checkout and final preparations. It was mated to the solid rocket booster stack on January 12, 1993. The external tank/solid rocket booster stack was fully assembled and tested by January 12. After 77 work days in the OPF, Columbia was transported to the VAB on February 2 and mated to the awaiting external tank/solid rocket booster stack. The two-day Shuttle interface test to verify vehicle connections began on February

5. Rollout of the Space Shuttle Columbia from high bay 3 of the VAB to Launch Pad 39A occurred on February 7.

During launch preparations on the pad, a question arose concerning whether the correct set of turbine blade tip seal retainers had been installed inside main engine liquid oxygen high pressure turbopumps. As a result, a precautionary decision was made to replace these pumps. On February 14, work began to changeout the turbopumps from each of the three main engines and installation was completed by Feb. 25. Another unplanned event at the pad involved a ruptured hydraulic line in the aft main engine compartment. This occurred on March 2 during the flight readiness test and a decision was made to remove and inspect all 12 hydraulic lines in the aft. Nine lines were reinstalled in addition to three precautionary lines. This work was finished on March 9, and the flight readiness test was completed March 10. As of March 21, a total of 41 work days will have been spent at the launch pad creating 123-work-day flow for STS 55 processing activities. [KSC RELEASE NO. 26-93, March 19, 1993.]

[] **COLUMBIA LAUNCH POSTPONED**

The launch of Columbia was postponed 24 hours after a planned launch of an Air Force Delta II rocket at Complex 17 was scrubbed due to high winds. The countdown clock at LC 39A is currently in a 24-hour hold at T-35 hours and will resume counting at midnight tonight. The launch window on March 22 opens at 9:51 a.m. EST. A second launch opportunity is available on Tuesday if necessary. Aft compartment closeouts and the checkout of navigational aids are complete. STS 55 work in progress: installation of aft compartment flight doors; aft compartment confidence test and positive pressure leak test; checkout of flight controls. Pyrotechnic initiator checks are set for 8 a.m. tomorrow; at noon technicians will begin loading cryogenics reactants. The probability of favorable weather at launch time remains at 70%. [SPACE SHUTTLE DAILY STATUS-STS 55, March 19, 1993; Banke, FLORIDA TODAY, March 19, 1993.]

[] **SHUTTLE PROGRAM ADJUSTMENTS**

NASA's Associate Administrator for Space Flight, **Jeremiah W. Pearson III** today announced that **Leonard Nicholson** is leaving his current position as Space Shuttle Program Manager to take over the key Johnson Space Center (Houston, TX), the position of Acting Director of Engineering. As a result of this action, **Brewster Shaw**, currently Deputy Director for Space Shuttle Operations (Kennedy Space Center, FL), will take over the duties formerly performed by Nicholson in the position of Director of Space Shuttle Operations. Johnson Space Center Director **Aaron Cohen** has assigned current Director of Engineering **Henry Pohl** to a new position on his staff, where he will be responsible for leading JSC's support of the agency's effort to redesign the Space Station. Pohl will spearhead the center's

efforts and serve as a focal point for JSC support to Assistant Administrator **Joseph Shea** who was appointed by NASA Administrator **Daniel S. Goldin** to oversee the redesign. Shaw will move from Kennedy Space Center to JSC. In addition to his current duties, he will direct the day-to-day management and execution of the Shuttle Program, including detailed program planning, scheduling and Shuttle systems configuration management.

As Acting Director of Engineering at JSC, Nicholson will be responsible for managing the work of eight functional divisions and providing support to program and project offices for current and future space flight programs assigned to JSC, including the Shuttle and Space Station. JSC's Engineering Directorate also performs complete in-house design, development and testing of certain government-furnished equipment and maintains expertise in test facilities and computational complexes. JSC Flight Crew Operations Director **David Leestma** has appointed astronaut **Linda Godwin** (Ph.D) to replace **Loren Shriver** as Deputy Chief of the Astronaut Office. Shriver is being reassigned to the Space Shuttle Program Office to assist in the management of this program. "I'm very pleased to make these appointments," said Pearson. "These are extremely talented individuals whose knowledge and experience in space flight make them excellent choices for these key positions." [NASA RELEASE: 93-49, March 19, 1993; Holton, THE ORLANDO SENTINEL, pp. A-1 & A-16, March 3, 1993.]

March 20: **STS 55: FLIGHT DOORS INSTALLED**

Columbia's aft flight doors have been installed in anticipation of its March 22 liftoff on the STS 55 mission. Also completed were the aft confidence test and an aft positive pressure leak check. Meanwhile, technicians continue testing pyrotechnic initiators by means of the PC resistance test and are loading cryogenic reactants. STS 55 work scheduled: retracting Orbiter mid-body umbilical unit (OMBUU) tonight; beginning the chilldown of the Orbiter refrigerator/freezer units; loading time critical life sciences experiments; retracting the mobile service structure; configuring cockpit switches for launch; beginning fueling of the external tank at 1:32 a.m. March 22; ingressing astronauts at 7:07 a.m. March 22. Weather forecasts remain positive. [SPACE SHUTTLE WEEKLY STATUS SUMMARY, March 20, 1993.]

[] **STS 56: TCDT COMPLETED**

Discovery is harddown at Launch Complex 39B awaiting the launch of Columbia's STS 55 mission and the commencement of its own STS 56 flight. The Orbiter completed its terminal countdown demonstration test (TCDT) on the 18th and the helium signature leak check was completed yesterday. Discovery also underwent an inertial measurement unit (IMU) warm-up and calibration yesterday. There is no work planned on Discovery over the weekend. STS 56 work scheduled:

loading of storable hypergolic propellants; leak check of the Orbiter mid-body umbilical; a flight readiness test and the installation of contingency EVA spacesuits. German Space Agency spokesman **Rudolf Teuwsen** had said earlier in the week, "We'd better not slip beyond Tuesday. We wouldn't be slipping, we'd be skidding." Several of Columbia's experiments are time critical. [Halvorson, FLORIDA TODAY, p. 6A, March 20, 1993; SPACE SHUTTLE WEEKLY STATUS SUMMARY, March 20, 1993.]

[] **DELTA SCRUBBED AGAIN**

The Air Force again failed to launch its Delta 2 rocket from the Cape Canaveral Air Force Station. Launch commentator **Ray Adams** said, "We have decided it is unsafe to launch and we have scrubbed it for the evening." The proximate cause of the scrubbing was a low temperature in the helium system of the rocket's first stage; it was 15 degrees colder than Air Force launch rules allow. The earliest possible chance for a third try to launch the rocket would be April 17. An attempt to launch Thursday was scrubbed due to low cloud cover. [Banke, FLORIDA TODAY, p. 1A, March 20, 1993.]

March 21: **STS 55: FIRING CIRCUITS TESTED**

At Launch Complex 39A, technicians have completed testing of Columbia's firing circuits and a PIC resistance test of the pyrotechnic initiators in preparation for the Orbiter's March 22 STS 55 mission. Cryogenic reactants have been loaded; the Orbiter mid-body umbilical unit has been retracted and the chilldown of the Orbiter refrigerator freezer units (EORF) is finished. Work in progress: loading of time critical life sciences experiments; removal of Orbiter window covers; retraction of mobile service structure; configuring of cockpit switches for launch; inertial measurement unit (IMU) warm up and calibration; checks of data link between refrigerators/freezers and Spacelab; spacelab clean air purge; microbial clean air purge; astronaut status briefing covering vehicle, payload, weather; Shuttle Training Aircraft (STA) flights by commander and pilot. STS 55 scheduled work: activation of fuel cells; stowage of flight crew personal effects tonight; begin fueling of external tank and ingress astronauts at 7:06 a.m. March 22. [SPACE SHUTTLE DAILY STATUS REPORT, March 21, 1993.]

[] **ENDEAVOUR'S TILE WATERPROOFING COMPLETE**

In Orbiter Processing Facility Bay 1, technicians processing Endeavour for STS 57 have completed thermal protection system tile waterproofing. Other tasks completed include: functional check of the waste containment system; final tire pressure topoff; landing gear test cycling; payload bay cleaning; closure of payload bay doors; crew compartment closeouts; closure of crew access hatch. [SPACE SHUTTLE DAILY STATUS REPORT, March 21, 1993.]

[] **CONTRACTORS HONORED FOR SAFETY**

Lockheed Space Operations Company and McDonnell Douglas Aerospace Division have been honored with safety awards for 1992. Lockheed's safety record annually rated between 90 and 94 percent. Honored along with Lockheed was its contractor team of Grumman Technical Services, Thiokol Corp. and Johnson Controls. McDonnell Douglas's rating for 1992 was 98%. The Central Florida Safety Council also recognized the achievements of McDonnell Douglas by making the company one of eight winners of its 1992 Excellence in Safety Award. ["Two Shuttle Contractors Honored for Safety," FLORIDA TODAY, p. 9E, March 21, 1993.]

[] **LSO EMPLOYEES WIN SNOOPYS**

Astronaut **Mark Lee** recently award Silver Snoopys to eight Lockheed Space Operations Co. employees: **Kip Anderson, Louis Ayala, Sharon Delaune, Gene Greathouse, Cindy Oats, Joseph Sherman, David Rechkemmer** and **Roger Romine**. ["8 Lockheed Employees Win Silver Snoopy," FLORIDA TODAY, p. 9E, March 21, 1993.]

[] **BCC DESIGNS EDUCATION SYSTEM FOR NASA**

Brevard Community College has received a $35,000 research grant from NASA to design "an educational delivery system that will be distributed nationally to benefit the space program." **Bill Martin**, University Liaison Manager of the Technology and Advanced Projects Office of KSC said, "BCC's Instructional Systems Design Project will meet industry needs while developing an educational delivery system that will permit curricula to eventually be distributed nationally, in support of the growth of aerospace education." ["BCC to Design Education System for NASA," FLORIDA TODAY, p. 9E, March 21, 1993.]

March 22: **STS 55: LAUNCH ABORT AT 3 SECONDS**

"I wouldn't call it fear," said astronaut **Steve Nagel** of his aborted launch. "I mean, there's a couple of moments wondering what happened because all you see on board are red lights indicating an engine shutdown. So you know the computers (shut down) the engines, but you don't know why or exactly what went wrong with them." STS 55 Commander Nagel added, "It happened in a second or two. I saw the red light on the right main engine [control panel], followed real quickly by the left red light and then the center, and they were all shut down, in less time than it took me to tell you that."

While igniting Columbia's three main engines which began at T-6.6 seconds the onboard computers initiated a main engine abort sequence. Shutdown was

completed at approximately T-3 seconds at 9:51 a.m. EST today. The reason for the abort appears to be that main engine #3 did not fully ignite due to a liquid oxygen preburner check valve which apparently experienced an internal leak, causing the purge system to be pressurized above the maximum 50 pounds per square inch allowed. Ambient pressure would have allowed the full engine ignition to occur. The onboard computers sensed the higher than allowed pressure in the line and terminated the main engine ignition sequence. Shuttle Launch Director **Robert B. Sieck** said, "Your initial reaction is to make sure there are no (fuel) leaks or that there's nothing that's broken that's causing a hazardous condition. You don't have time to think of anything else." Sieck added, "Really, it was one of those nice boring countdowns until the last few seconds."

While no definite schedule has been developed as yet, the amount of time estimated to pick up the STS 55 countdown once again is about three weeks. Schedule options are under consideration this week. Regarding Columbia, the Orbiter has been safed and the offloading of liquid hydrogen and liquid oxygen from the external tank has been completed. The STS 55 crew returned to Houston at 2:30 p.m. Work in progress includes an external tank liquid hydrogen boiloff and a powering down of the Orbiter refrigerator/freezer units (EORF). STS 55 work scheduled: closing the rotating service structure around the Orbiter on March 23; removing the EORF experiment samples; removing mid-deck experiment lockers; mating the Orbiter mid-body umbilical unit; offloading cryogenic reactants; removing main engine check valves; disconnecting ordnance and Spacelab laboratory module experiment servicing. [Halvorson, FLORIDA TODAY, p. 2A, March 22, 1993; SPACE SHUTTLE DAILY STATUS REPORT, March 22, 1993; Halvorson, FLORIDA TODAY, pp. 1A-2A, March 23, 1993; Date, THE ORLANDO SENTINEL, pp. A-1 & A-4, March 23, 1993; Date, THE ORLANDO SENTINEL, March 23, 1993.]

[] **CREW SAFE DURING ABORT**

"We have safe procedures for the shutdown of the engines, and we could not have lifted off with this valve in the improper position," said NASA's Shuttle Program Manager **Leonard Nicholson**. "And once the valve is in the proper position, we would have been fine. We would have had a normal flight." NASA officials said that the crew had been in no danger during the launch abort. [Halvorson, FLORIDA TODAY, p. 2A, March 23, 1993.]

March 23: **STS 55: POST ABORT WORK**

While Columbia's aft compartment flight doors are being removed today, work in the aft and the planned #3 main engine check valve removal will not begin till March 24 since offloading fuel cell cryogenic reactants will not be completed until late tonight. No manifest option will be chosen until a check valve failure

analysis has been completed. A decision is expected March 25. In the meantime, Launch Complex 39A technicians have completed boiling off external tank liquid hydrogen and have powered down the Orbiter refrigerator/freezer units (EORF). Work in progress includes: closing the rotating service structure around Columbia; tail service mast securing; removal of Orbiter refrigerator/freezer experiment samples; removal of mid-deck experiment lockers; extension of external tank access arm; external tank purge; removal of aft compartment flight doors; tile inspections. STS 55 work scheduled: offloading of cryogenic reactants; #3 main engine check valve removal/failure analysis; ordnance disconnection; removal of heat shields. [Halvorson, FLORIDA TODAY, p. 1A, March 24, 1993; SPACE SHUTTLE DAILY STATUS REPORT, March 23, 1993.]

March 24: **ENDEAVOUR ROLLED TO VAB**

Endeavour has been rolled over to the VAB from the Orbiter Processing Facility and is being mated to its external tank and solid rocket boosters. That done, the vehicle is in for a wait before it can be rolled out to the launch pad. The reason? Both Launch Complex 39A and 39B are presently occupied by Shuttles. Columbia is on 39A and faces a potential three-week delay because of its launch abort. Discovery is at 39B and managers will meet tomorrow to determine when the vehicle can start on its STS 56 mission. [Halvorson, FLORIDA TODAY, March 25, 1993.]

March 25: **DISCOVERY: STS 56 FRR**

The flight readiness review for the launch of Discovery's STS 56 mission was held today with not major issues identified. Shuttle managers will set a target launch date next week after resolution of the problem which caused Columbia's main engine shutdown March 22. The primary STS 56 payload, Atlas 2, will investigate the sun's energy output and the Earth's middle-atmosphere chemical makeup and how these factors affect levels of Earth's ozone, which prevents much of the sun's harmful ultraviolet radiation from reaching the Earth's surface. The 8-day STS 56 mission will be commanded by **Kenneth Cameron** and piloted by **Steve Oswald**. Three mission specialists will round out the five-person crew: **Michael Foale, Kenneth Cockrell** and **Ellen Ochoa**. [LAUNCH ADVISORY: STS-56 FLIGHT READINESS REVIEW COMPLETED, March 25, 1993; Halvorson, FLORIDA TODAY, p. 1A, March 26, 1993.]

[] **STS 55: LEAK CHECKS & TESTS CONTINUE**

Leak checks and associated valve testing on the #3 main engine will continue through March 26. Presently, engineers have not been able to replicate the condition which caused the March 22 launch scrub of Columbia's STS 55 mission.

While preparations are in work to remove the three main engines, a definite engine removal decision will not be made until March 26 or March 29 after manifest issues are decided. Full access has been established into the main engine compartment. Removal of the Orbiter refrigerator/freezer units (EORF) for servicing is underway and technicians at the pad are troubleshooting the suspect valve on main engine #3 and conducting ordnance disconnects. Main engine heat shield removal will be undertaken tomorrow and on Saturday while preparations for removal of the main engines are being made. [SPACE SHUTTLE DAILY STATUS REPORT, March 25, 1993.]

[] **STS 56; 57 PROCESSING**

At Launch Complex 39B, the loading of storable hypergolic propellants into Discovery concluded this morning and the pad is open to normal work. Ins of the contingency EVA spacesuits is scheduled for tonight. On March 26, the STS 56 flight readiness test of the main engines and flight control surfaces is scheduled. In the Mission Briefing Room the flight readiness review is underway. In the Vehicle Assembly Building, the Space Shuttle Endeavour continues preparations for its STS 57 mission; it has been soft mated to the external tank/solid rocket booster stack. Hard mate activities occur next week followed by the Shuttle interface test. [SPACE SHUTTLE DAILY STATUS REPORT, March 25, 1993; Halvorson, FLORIDA TODAY, p. 6A, March 25, 1993.]

March 26: **COLUMBIA ANOMALY RECREATED**

Yesterday, engineers successfully recreated the anomaly which led to Columbia's main engine ignition abort on March 22. Overnight the suspect check valve was removed and is being flown today to 's Canoga Park (CA) facility for disassembly and analysis. Based on test data generated during troubleshooting, a decision has been made not to remove the remaining check valves unless the pending failure analysis deems it necessary. A decision has also been made to remove Columbia's three main engines and replace them with those which had been planned for installation on Endeavour. Troubleshooting of the #3 main engine check valves is complete as are the ordnance disconnects. Work in progress: removal of the Orbiter refrigerator/freezers (EORF) for servicing; removing main engine foam insulation; main engine heat shield removal; positioning of main engines and flight controls for engine removal; inspections of the reaction control system thrusters; offloading of hydrogen from a rail car into the pad storage sphere for top off. [SPACE SHUTTLE WEEKLY STATUS SUMMARY, March 26, 1993; Halvorson, FLORIDA TODAY, p. 2A, March 27, 1993.]

[] **LAYOFFS LIKELY FOR KSC**

Lockheed Space Operations Co. and Thiokol Corp. are both asking their employees to consider taking a voluntary layoff. Memos went out to employees of both companies this week. Lockheed may have to cut as many as 300 employees from its payroll of some 6,000. Thiokol expects to cut about forty persons from its work force of 500. [Reid, FLORIDA TODAY, p. 1A, March 27, 1993.]

March 28: **DELTA LAUNCH ATTEMPT SCHEDULED**

After a one-day delay, the Air Force is expected to launch its Delta 2 tonight. The rocket will be carrying a $50 million military navigation satellite; launch is expected to occur between 10:13 p.m. and 10:41 p.m. Air Force meteorologists predict a 90% chance of favorable weather for tonight's attempt; they expressed concern about electrically charged clouds in the immediate area. The payload - a Navstar Global Positioning Satellite - will be the 23rd in a series of satellites which enable U.S. ships, submarines, fighters, bombers, tanks and troops to determine their position within 50 feet. The system also provides them with a velocity measurement accurate to within a fraction of a mile per hour and the correct time b y a millionth of a second. [Halvorson, FLORIDA TODAY, p. 1A, March 28, 1993.]

March 29: **DISCOVERY: FRT COMPLETED**

Over the weekend tests were performed on Discovery's main engine check valves. These tests are the same as those conducted last week during troubleshooting of Columbia's check valves. The test results are not conclusive on main engine #1. Each of five valves passed its individual test. However, the "combined test," exercising the complete set of five valves, shows some unexplained leakage. These tests are being re-run today. A firm launch date will not be set for Discovery until after these test results are available March 30.

Discovery's STS 56 flight readiness test of the main engines and flight control surfaces has been completed at Launch Complex 39B. Contingency EVA spacesuits have also been installed and checked out. Work in progress: ATLAS-2 payload closeouts; installation of crew escape pole; crew hatch functional check; top off of pad liquid oxygen storage sphere; Orbiter aft compartment closeouts; main engine #1 check valve testing; stowage of flight crew mission items into crew compartment and countdown preparations in Firing Room 3. Scheduled STS 56 work: closure of payload bay doors for flight tonight; mate and leak check of the Orbiter mid-body umbilical unit (OMBUU); ordnance installation and connections; external tank purges and Orbiter aft confidence test. Analysis of Columbia's failed check valve has revealed a small black non-metallic particle which may have come from a seal that is associated with ground support test

equipment used during the valve's manufacturing. [DAILY SPACE SHUTTLE STATUS REPORT, March 29, 1993.]

[] **DELTA'S FOURTH ATTEMPT TO LAUNCH**

The weather, at least is likely to cooperate for the Air Force's fourth attempt to launch its Delta 2 rocket; the payload is a military satellite. Launch time will come between 10:09 and 10:37 a.m. this morning. A third effort to launch the rocket was scrubbed because of high level winds. The Delta launch has also been impacted by the "botched launch" of an Atlas rocket on March 25. That mission began to fall apart some 22 seconds after launch; the rocket's satellite payload was deployed in the wrong orbit when the first stage of the Atlas lost approximately 35 percent of its thrust. [Halvorson [SEE: "Satellite Can't Be Salvaged," FLORIDA TODAY, p. 1A, March 27, 1993; Halvorson, FLORIDA TODAY, p. 1A, March 27, 1993; Halvorson, FLORIDA TODAY, p. 1A, March 28, 1993; Halvorson, FLORIDA TODAY, p. 1A, March 29, 1993.]

March 30: **LAUNCH SCHEDULING: ATLAS, SPACELAB**

NASA announced today that Space Shuttle Discovery with the STS 56/ATLAS-2 payload will be the next mission to fly with launch scheduled for April 6, 1993, at 1:32 a.m. EDT. Space Shuttle Columbia and the STS 55/Spacelab D-2 payload, which experienced a launch scrub on March 22, has been assigned a new target launch date no earlier than April 24. The decision for STS 56 to be the next mission flown came after the main engine team finished analyzing the purge valve which caused the STS 55 launch scrub. The team's investigation concluded that the valve from the number 3 main engine failed to operate properly because of contamination that had been in the valve since it was manufactured. The team also determined that this condition could exist in other engines. A series of tests designed to reveal such a condition has been performed on Discovery and one suspect valve from one engine is being removed and replaced.

"Flying the missions in this order is the most effective use of all our resources," said Shuttle Director **Tom Utsman**. "The opportunity to observe changes in the Earth's ozone during the seasonal transition between spring and summer in the northern hemisphere. At the same time, the launch team at Kennedy will be working to get Columbia back to launch configuration for launch on April 24. NASA is very pleased with the cooperation given by our friends in the German space agency. They have been involved as all possible options are considered. Their willingness to let the STS 56 mission have an early April launch will give the ATLAS folks the chance to collect some very important data on the Earth's ozone." [LAUNCH ADVISORY: ATLAS 2 Launch Date Set, Spacelab D-2 Mission Rescheduled," March 30, 1993; Halvorson, FLORIDA TODAY, p. 1A, March 29, 1993; Banke, FLORIDA TODAY, p. 1A, March 30, 1993.]

[] **DISCOVERY VALVE FAILS TEST**

In repeating the combined test as well as individual leak checks of Discovery's #1 main engine check valves yesterday, one valve did not pass these tests. While it is the same valve which failed on Columbia it is not known at this time if there is any correlation. Overnight it was removed and today it is being flown to Rocketdyne in California for failure analysis. A spare valve is being installed today and will be leak checked tonight. Technicians at Launch Complex 39B have completed ATLAS 2 payload closeouts; closed payload bay doors for flight; installed crew escape pole; performed crew hatch functional check; topped off pad liquid oxygen storage sphere.

STS 56 work in progress: installation of replacement check valve on main engine #1; Orbiter aft compartment closeouts; avionics bay closeouts; mate and leak check Orbiter mid-body umbilical unit; stowage of flight crew mission items into crew compartment; troubleshooting crew cabin instrument panel electrical system; countdown preparations in Firing Room 3. Work scheduled: leak check replacement check valve tonight; ordnance installation and connections; pressurization of hypergolic propellant tanks; external tank purges; final Orbiter aft confidence test; removal of main engine protective covers and installation of aft compartment flight doors. At LC 39A, the changeout of Columbia's three main engines is underway. Yesterday main engine #2 was removed and replaced. Main engine #3 is being removed and replaced today. Main engine #1 is scheduled to be removed and replaced tomorrow. [DAILY SPACE SHUTTLE STATUS REPORT, March 30, 1993; Halvorson, FLORIDA TODAY, p. 1A, April 1, 1993; "Discovery's Woes Perplex NASA," THE ORLANDO SENTINEL, March 30, 1993.]

March 31: **STS 56: REPLACEMENT VALVE INSTALLED**

Technicians at Launch Complex 39B have installed a replacement check valve on Discovery's main engine number one as a result of the STS 55 launch abort. The Orbiter has also been mated with the orbital mid-body umbilical unit (OMBUU). Discovery's STS 56 mission is now scheduled to launch on April 6 between 1:32 and 3:58 a.m. EST. Work in progress for STS 56: pad closed for ordnance installation followed by hypergolic pressurization and fuel cell storage tank purges; aft engine compartment closeouts; launch countdown preparations in Firing Room 3. STS 56 work scheduled: continued troubleshooting on check valves on main engine number 1 when the pad reopens tonight; retest of the crew cabin electrical system; temperature sensor checks on OMS crossfeed line; hydraulic circulation pump retests; external tank purges; crew arrival at 10:00 p.m. April 2; countdown starts at 5:00 a.m. April 3; aft engine compartment closeout for flight also April 3. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, March 31, 1993; Halvorson, FLORIDA TODAY, pp. 1A-2A, March 31, 1993; Halvorson,

FLORIDA TODAY, p. 6A, March 31, 1993; "NASA Books Shuttle Discovery For A Nighttime Liftoff Next Week," THE ORLANDO SENTINEL, March 31, 1993.]

[] **REPLACEMENT TITAN MOVES TO PAD**

At Cape Canaveral Air Force Station, an Air Force Titan rocket is being moved to a launch pad to replace one which had stood on the pad for a year and now needs to be disassembled. Two Titans had been rolled back to their assembly building because over the past 18 months. [Halvorson, FLORIDA TODAY, p. 6A, March 31, 1993.]

[] **ATLAS LAUNCH TO BE INVESTIGATED**

General Dynamics Corp. plans to investigate the unsuccessful launch of an Atlas Centaur from Cape Canaveral Air Force Station last week. Spokesman **Michael Wynne** said, "A preliminary look at the data indicates we have a problem with a much narrower focus than the previous Centaur failure. That could mean a far shorter launch stand-down as we establish the corrective actions necessary to return Atlas to flight." [Banke, FLORIDA TODAY, p. 6A, March 31, 1993.]

[] **STS 55, 57 UPDATES**

Columbia's reaction control system regulator flow checks have been completed along with ordnance disconnects and safing. Work in progress: removal and replacement of main engines; thruster drying and inspections and liquid hydrogen actuator hose leak checks. Work scheduled for the rescheduled STS 55 mission includes continued installation and mating of main engines. KSC are now estimating a target date of April 24 for launching STS 55. Meanwhile, preparations for Endeavour's STS 57 mission continue in the Vehicle Assembly Building. Work in progress today for STS 57: electrical mates between the Orbiter and the external tank and umbilical closeouts and leak checks. Scheduled STS 57 work: SRB hydraulic tests; start of main engine installation on April 12 and rollout to LC 39B targeted for April 19. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, March 31, 1993.]

APRIL

April 1: **STS 56: HAZARDOUS PAD JOBS DONE**

At Launch Complex 39B, technicians have completed their hazardous operations, including the installation of explosive devices which separate the Orbiter from its boosters and external tank after launch; the pad has reopened. Hypergolic pressurization activities are complete as are the fuel cell storage tank purges. STS 56 work in progress: continued leak checks for additional data points on check valves on main engine number 1; testing of crew cabin electrical system; temperature sensor checks on the OMS crossfeed line; hydraulic circulation pump tests; aft engine compartment closeouts; launch countdown preparations. Scheduled tasks: external tank purges; crew arrival at 10:00 p.m.; start of countdown at 5:00 a.m. April 3; aft engine compartment closeout for flight. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, April 1, 1993.]

[] **STS 55; 56 UPDATES**

Ordnance disconnects and safing of Columbia at LC 39A have been completed. Work in progress for STS 55: installation of last (#1) of three main engines; thruster drying and inspections and liquid hydrogen actuator hose leak checks. Scheduled work: continuation of mating and electrical checks on the main engine and reaction control system regulator flow checks. Endeavour continues to be processed for its May STS 57 mission. Completed tasks include: T-O umbilical leak checks; hydraulic circulation and sampling; liquid oxygen monoball closeouts. In progress today are electrical mates between Endeavour and its external tank and umbilical closeouts and leak checks. STS 57 work scheduled: SRB hydraulic tests; beginning of main engine installation and rollout to Launch Complex 39B on or about April 19. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, April 1, 1993.]

April 2: **STS 56: WEATHER A CONCERN**

The extended weather forecast for launch of Discovery on April 6 indicates a 30 percent chance of violating launch constraints due to cloud ceilings below 8000 feet, a chance of showers and thick clouds. The 24 hour delay predicts a 30 percent chance of violation, 48 hour delay a 20 percent chance. At Launch Complex 39B several tasks are now completed: leak checks on valves on the main engines were favorable; crew cabin electrical system test; temperature sensor checks on OMS crossfeed line; ordnance installation; hypergolic fuel tank pressurization. Work in progress today: aft engine compartment closeouts (scheduled to be completed by 4:00 p.m. tomorrow; Orbiter midbody umbilical leak checks; external tank purges and inspections; hypergolic quick disconnect

closeouts; launch countdown preparations. STS 56 work scheduled: crew arrival at 10:00 p.m. tonight; countdown beginning at 5:00 a.m. tomorrow; removal of main engine protective covers; installation of aft compartment doors tomorrow and Orbiter aft confidence test tomorrow. KSC spokesman **Bruce Buckingham** said, "We've got enough time to do all the work we need to do. Given no problems we should be in good shape for Tuesday [launch day]. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, April 2, 1993; Halvorson, FLORIDA TODAY, p. 1A, April 2, 1993; Halvorson, FLORIDA TODAY, p. 7A, April 3, 1993.]

[] **OCHOA: FIRST HISPANIC WOMAN**

Ellen Ochoa, a crew member for Discovery's STS 56 mission, is the first female Hispanic to go into space. "We're all very tickled that finally there is going to be a Hispanic female representing us in space," said **Oscar Gamboa**, KSC's Hispanic Employment Program Director. He added that the Hispanic work force had grown at Kennedy Space Center, as well. "We have better than doubled our numbers here at KSC since 1985. NASA is making a very strong effort to diversify the work force so it reflects what we have in the nation." NASA officials said that Ochoa had all the academic qualifications to become an astronaut. "But I remember she also was a concert flutist and was a very well-rounded person. She handled herself very well in our interviews and just looked like the type of person that we would like representing NASA," said a space agency spokesperson. [Halvorson, FLORIDA TODAY, pp. 1A-2A, April 3, 1993; Halvorson, FLORIDA TODAY, p. 10E, April 4, 1993.]

[] **STS 55: PRE-LAUNCH UPDATE**

As part of the effort to have Columbia ready at the earliest possible date, all three main engines are being removed and will be replaced with ones originally scheduled for use during the STS 57 mission with Space Shuttle Endeavour which is now scheduled to fly in May. The rest of the Space Shuttle missions planned for 1993 will stay in their planned order and schedule. Main engine installation has been completed on Columbia. Thruster drying and inspections and liquid hydrogen actuator hose leak checks have also been completed. Work in progress for STS 55: securing main engines following replacement; hydraulic operations; close rudder speed brake; cavity purges; and preparations to open payload bay doors today to replace GAUSS camera film. STS 55 work scheduled: continuing electrical checks on the main engines; reaction control system regulator flow checks and preparations to enter Spacelab to service experiments. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, April 2, 1993.]

[] **STS 57: ENDEAVOUR IN VAB**

In the Vehicle Assembly Building, technicians have completed electrical mates between Endeavour and its external orbiter. Hydraulic circulation and sampling and liquid oxygen monoball closeouts have also been completed. STS 57 work in progress: Shuttle interface test; T-O umbilical closeouts and leak checks and cavity purge; reposition body flap and rudder speed brake. Scheduled tasks: SRB hydraulic tests; beginning main engine installation April 12 and rollout to pad 39B targeted for April 19. The STS 57 mission, which will involve the first flight of the SPACEHAB commercial payload and the retrieval of the European Space Agency's EURECA satellite, is now set to fly in late May. The remainder of the 1993 schedule is expected to remain unaffected by the problems in launching Columbia on its STS 55 mission. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, April 2, 1993.KSC Release No. 29-93, April 1, 1993.]

April 5: **STS 56; LAUNCH MINUS 1 DAY**

Operations at Launch Complex 39B are running smoothly and without problems for the launch of Discovery's STS 56 mission tomorrow at 1:32 a.m. Late stowage of time critical items is underway this morning. In the afternoon workers will begin to make a final purge of the fuel cell lines, mission control in Houston will configure communications networks and Discovery's purge system will be switched from air to gaseous nitrogen. The countdown clock will enter the planned one hour hold at the T-6 hour mark as last minute checks are made prior to loading the external tank with over 500,000 gallons of liquid hydrogen and liquid oxygen.

Once the pad is cleared of all personnel, tanking will begin at about 5:12 p.m. today and conclude some three hours later. After tanking, the ice team will be deployed to the pad for final assessments of the vehicle. All payloads have been closed out for flight and require no specific monitoring prior to launch. The five-member crew has been divided into two shifts for around-the-clock monitoring of operations aboard Discovery. The blue team includes: Commander **Kenneth Cameron**, Pilot **Stephen Oswald** and Mission Specialist **Ellen Ochoa**. The red team is Payload Commander **Michael Foale** and Mission Specialist **Kenneth Cockrell**. The weather forecast for launch tomorrow indicates a 20 percent chance of violating launch constraints during the window opening at 1:32 a.m. The primary concern is a possible cloud ceiling a the Shuttle Landing Facility. There is a 20 percent chance of violating tanking constraints due to lightning within 5 miles of the pad. The 24 hour and 48 hour delay predictions show a 20 percent and a 30 percent chance of weather constraints violation, respectively.

NASA officials said today that the Space Shuttle Atlantis, currently undergoing extensive modifications in California, will not rejoin the fleet at KSC until late 1994. The delay will allow the Orbiter to be outfitted to fly missions lasting as much as a month. Shuttle Program Director **Tom Utsman** said, "It will provide us with a capability to start using the Space Station very early." Atlantis, he said, will have the capacity to hold fuel for a mission lasting 28 days. It will receive eight fuel tanks to augment the four or five sets of tanks currently installed in the other three Orbiters. The modifications will cost approximately $38.7 million. [Halvorson, FLORIDA TODAY, p. 1A, April 4, 1993; KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT: STS 56 L-1 DAY, April 5, 1993; Date, THE ORLANDO SENTINEL, p. A-4, April 5, 1993; Halvorson, FLORIDA TODAY, pp. 1A-2A, April 6, 1993.]

April 6: **DISCOVERY LAUNCH ABORTED**

The launch of the Space Shuttle Discovery was aborted this morning at T-11 seconds by the onboard computers when instrumentation on the liquid hydrogen high point bleed valve in the main propulsion system indicated off when it should have indicated on. Follow-up analysis showed the instrumentation was faulty and that the valve was in the proper configuration for launch. Managers will be meeting later this afternoon to further evaluate the situation. At this time, the launch team is working under the 48-hour scrub turn-around schedule with the understanding a final decision will be made later today by the mission management team. If the 48-hour scrub turn-around schedule is verified the countdown clock will be recycled to the T-11 hour mark and paced for a T-0 at 1:29 a.m. Thursday, April 8. At this time, there are no plans to rotate the service structure around the vehicle or service the onboard cryogenic fuels. The crew has returned to their quarters in the Operations and Checkout Building and are essentially following their L-2 day timeline.

Initial safing and securing of Discovery has been completed; pad technicians have the secured liquid oxygen and liquid hydrogen system and have begun draining back cryogenic fuels from the external tank. The 48-hour scrub turn-around schedule has been initiated. Work in progress today: vehicle safing and securing; liquid hydrogen boiloff; flight crew equipment destow; re-configuring OMS/RCS crossfeed heaters; main engine purging and re-positioning and re-fill of the water deluge system. STS 56 work scheduled: changing the liquid hydrogen system to an inert gaseous purge; opening pad for non-hazardous work and beginning a change-out of time critical mid-deck payloads. [Kennedy Space Center Space Shuttle Status Report, April 6, 1993.]

April 7: **STS 56; L-1 DAY**

The countdown clock for the launch of Discovery was recycled yesterday to the T-27 hour mark and the count resumed at 6:29 p.m. for launch at 1:20 a.m. April 8. Mission managers are confident Discovery is ready for flight and the problem that caused the abort of the launch attempt April 6 has been understood and fixed. The problem was associated with instrumentation on the high point bleed valve in the main propulsion system. Indications were the valve was in an improper position for launch. Tests conducted yesterday, including five cryogenic cycles of the valve, confirmed the valve was working properly. It will be checked again this afternoon when fast fill of the liquid hydrogen begins. Currently, operations at Launch Complex 39B are continuing without problem. Late stowage of time critical items and mid-deck payloads is underway and should be concluded by 11:00 a.m. All the payloads in the Orbiter's payload bay have been closed out for flight and require no specific monitoring prior to launch.

Later today, the launch team will begin the final purge of the onboard fuel cell lines, mission control in Houston will configure communications networks, and Discovery's purge system will be switched from air to gaseous nitrogen. The countdown clock will enter a planned hold at 9:39 a.m. at the T-11 hour mark and remain there for 90 minutes. The clock will resume counting at 11:09 a.m. today. The next hold will be the one hour built in hold at the T-6 hour mark at 4:09 p.m. At that time, final checks of the main propulsion system will be made prior to loading the external tank with over 500,000 gallons of liquid hydrogen and liquid oxygen. Once the pad is cleared of all personnel, the clock will again start counting at 5:09 p.m. as tanking begins. This operation takes about three hours. Following tanking, the ice team will be deployed to the pad for final assessments of the vehicle. The weather forecast for launch tomorrow morning indicates a 10 percent chance of violating launch constraints during the window opening at 1:29 a.m. The concern is a possible cloud ceiling below 8,000 feet. There is a chance of violating tanking constraints. The 24 hour and 48 hour delay predictions show a 20 percent and a 40 percent chance of violation, respectively. [Halvorson, FLORIDA TODAY, pp. 1-2, April 7, 1993; KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT: STS 56 L-1 DAY, April 7, 1993; Date, THE ORLANDO SENTINEL, April 8, 1993.]

April 8: **DISCOVERY BLASTS OFF**

In its second launch attempt, the Space Shuttle Discovery lift off from LC 39B right on time at 1:29 a.m. EST. It rose to orbit 140 miles due east of Atlantic City, NJ. "The disappointment is there from the other night, from the scrub, but that goes with this business. You got to have patience and you're going to have disappointments," said Launch Director **Robert B. Sieck**. Discovery is expected to land at Kennedy Space Center on April 16. [Halvorson, FLORIDA TODAY,

p. 1A-2A, April 8, 1993; Halvorson, FLORIDA TODAY, pp. 1A-2A, April 15, 1993; Date, THE ORLANDO SENTINEL, April 9, 1993; Date, THE ORLANDO SENTINEL, pp. A-1 & A-13, April 15, 1993.]

[] **CLINTON PROPOSES NASA INCREASE**

NASA is one of the few federal agencies slated for an increase in President **Clinton**'s budget which has just been submitted to Congress. The president has proposed a 6.5 percent increase in the space agency's budget. NASA's Administrator **Daniel S. Goldin** responded to the news of the budget increase saying, "It represents our independence from old ideas, from old assumptions." He added that spending would be redirected toward "new technology investments." [Eisler, FLORIDA TODAY, p. 1A, April 8, 1993.]

April 9: **ATLAS MISSION A TOTAL FAILURE**

The U.S. Navy conceded today that the recent Atlas mission launched from Cape Canaveral Air Force Station (FL) cannot be salvaged. The communications satellite carried aboard the Atlas was to have been the first of 9; the second will be launched later in the year after General Dynamics finishes investigating the March 25 failure. ["Atlas Mission A Total Failure," FLORIDA TODAY, p. 2A, April 10, 1993; Date, THE ORLANDO SENTINEL, April 10, 1993.]

[] **2000 SHUTTLE JOBS AT KSC TO VANISH**

President **Bill Clinton**'s five-year budget plan for NASA includes the elimination of some 2,000 Shuttle-related jobs at Kennedy Space Center by 1997. KSC Director **Robert L. Crippen** said, "The good news is that we're still working on [the] station, and we're still flying eight flights a year." Crippen spoke after Administrator **Daniel S. Goldin** finished a NASA-network broadcast statement. The Shuttle budget, currently at $940 million annually, is expected to shrink to $900 million by 1997. From three to four hundred cuts in Shuttle processing jobs had already been announced; another four to eight hundred jobs will follow. KSC's **Jay Honeycutt** estimates that an average of 400 workers a year will lose their jobs for a total of about 2000 by 1997. [Date, THE ORLANDO SENTINEL, April 9, 1993.]

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April 13: **STS 55 READIED FOR ANOTHER TRY**

Technicians at Launch Complex 39A have conducted Spacelab power-up and vent checks on Columbia's prime cargo for its STS 55 mission. The Orbiter's payload bay doors have been opened; helium signature leak check preparations have been completed along with a main engine flight readiness test. At the SLF, workers completed tests of the microwave scanning beam landing system (MSBLS). Work

in progress: helium signature leak checks and main engine leak checks. Work scheduled: continuance of engine check valve leak checks after the helium signature tests; liquid hydrogen cavity purge; orbital maneuvering system heater checks; preparations to enter Spacelab to make final service of experiments; external tank purges; begin aft engine compartment closeouts; close payload bay doors for flight. Meanwhile, the Space Shuttle Discovery remains in orbit on its STS 56 mission. Landing is scheduled for Friday, April 16 at 7:33 a.m. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, April 13, 1993.]

[] **ENDEAVOUR PREPARED FOR STS 57**

Main engine inspections of Endeavour have been completed in the Vehicle Assembly Building as the Orbiter continues to undergo preparations for its STS 57 flight. T-0 umbilical closeouts, leak checks and a cavity purge have also been completed. Work in progress: Shuttle interface test; external tank foaming operations; pre-rollout inspections. STS 57 work scheduled: SRB hydraulic closeouts; start of main engine installation on April 16; rollout to Launch Complex 39B targeted for April 22. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, April 13, 1993.]

April 15: **COLUMBIA PREPARED FOR LAUNCH**

Once again, the Space Shuttle Columbia is being readied for launch on its STS 55 mission. The main engine leak checks were completed and were positive. In addition, the orbital maneuvering system heater checks and helium signature leak checks were finished. STS 55 work in progress today: operations to enter Spacelab for final service of experiments; external tank purges; payload bay closeouts; countdown preparations. Scheduled work includes: closing the payload bay doors for flight; beginning aft engine compartment closeouts; ordnance installation; hypergolic fuel pressurization. [KENNEDY SPACE CENTER SHUTTLE STATUS REPORT, April 15, 1993.]

[] **DISCOVERY IN ORBIT**

The Space Shuttle Discovery remains on orbit following launch on April 8 at 1:29 a.m. Landing is scheduled for Friday, April 16, at Kennedy Space Center. There are two opportunities for landing at KSC on Friday - 7:33 a.m. and 9:06 a.m. There is one KSC landing opportunity on Saturday at 7:39 a.m. [KENNEDY SPACE CENTER SHUTTLE STATUS REPORT, April 15, 1993; Halvorson, FLORIDA TODAY, p. 2A, April 15, 1993; Halvorson, FLORIDA TODAY, p. 2A, April 14, 1993.]

[] **STS 57 PROCESSING IN VAB**

The Space Shuttle Endeavour is undergoing final processing for its STS 57 mission while in the Vehicle Assembly Building. Engineers and technicians have completed the STS 57 countdown simulation as well as main engine interface inspections and T-0 umbilical closeouts, leak checks and a cavity purge. STS 57 work in progress today: the Shuttle interface test; SRB hydraulic closeouts; external tank foaming operations; pre-rollout inspections. Work scheduled: main engine installation and rollout to Launch Complex 39B set for April 22. [KENNEDY SPACE CENTER SHUTTLE STATUS REPORT, April 15, 1993.]

[] **SPACELAB MODULE SERVICED: STS 55**

The STS 55 payload test team is concluding its Spacelab D-2 servicing activities today, leading to closing Columbia's payload bay doors for flight on April 16. After Columbia's initial launch attempt on March 21, the team moved to implement a plan which would assure that the Spacelab D-2 experiments would meet all mission success criteria. This meant, replacing some experiment samples and testing other experiments, or their associated flight hardware. The task at hand is to implement the "MVAK" plan, which stands for Module Vertical Access Kit.

The work is performed in three phases. Phase on (April 8) was to destow, or remove the experiment samples which had to be replaced or refurbished. This occupied 40 continuous hours with a team working inside the German Spacelab D-2 laboratory module, as well as in the payload changeout room (PCR) at the launch pad. In some cases, the sample exchanges could be done during Phase 1. Principal investigators were stationed in the PCR and could exchange their experiment samples with fresh ones and the trays were reinstalled the same day. The four elements of the Holographic Optic Laboratory, as well as other materials and life sciences experiments, were removed and taken to Hangar L for a refurbishment process which took approximately four days to complete.

Phase two was "powered maintenance." This was performed on April 12 and lasted 18 hours. This included operation and checkout of video recorders, the experiment water pumps, a turbomolecular pump, two lesser systems, and the Biolabor and Anthrorack experiment racks. Phase 3, which is underway today, involves restowing experiments which were removed for replacement or refurbishment during Phase 1. This work takes about 12 hours. Being restowed today are the four elements of the Holographic Optics Laboratory, the Chemical Garden, and the materials samples taken from the MEDEA experiment. The two Orbiter refrigerator freezer units which support the mission were also removed from the mid-deck for servicing and will be reinstalled April 16. The life sciences samples such as the frog embryos were also removed from the mid-deck and will

be reinstalled one day before launch with fresh samples. Once fresh experiments are aboard Spacelab D-2, another MVAK Spacelab servicing would not be required before the end of May. Launch is presently scheduled for 10:52 a.m. on April 24. [KSC Release No. 37-93, April 15, 1993.]

[] **STS 51: PAYLOAD MILESTONE**

As Discovery continues to orbit the Earth on its STS 56 mission, its next major payload is being readied for launch. A milestone in payload processing for the upcoming STS 51 mission was achieved this week when the Advanced Communications Technology Satellite (ACTS) was mated to its upper stage booster, a Transfer Orbit Stage (TOS). This processing milestone occurred at the Payload Hazardous Servicing Facility (PHSF) and will be followed with integrated tests between the two payload flight elements. The ACTS/TOS combination will be moved to KSC's Vertical Processing Facility (VPF) during the first week of May for testing to assure its compatibility with the Space Shuttle and readiness for integration with Discovery.

ACTS arrived at the Cape Canaveral Air Force Station runway on February 11 aboard a C-5B military aircraft and was taken to NASA's Spacecraft Hangar AO nearby for checkout activities. It underwent a complete set of stand-alone tests before being moved to the PHSF at Kennedy Space Center March 8. ACTS is a communications satellite designed to test an experimental advanced satellite communications concept. ACTS will be deployed from Discovery shortly after launch which is currently targeted for mid-July. [KSC Release No. 36-93, April 15, 1993.]

April 16: **DISCOVERY GETS EXTRA DAY IN SPACE**

The Shuttle Discovery remains on orbit today after NASA managers canceled the scheduled landing because of unacceptable weather conditions at KSC's Shuttle Landing Facility. Landing is now set for 7:38 a.m. EDT at Kennedy Space Center. Deorbit burn is scheduled for 6:34 a.m. tomorrow. Meanwhile, technicians continue to process Columbia for its April 24 launch on its STS 55 mission. Spacelab closeouts and final servicing of experiments have been completed. Workers have also conducted external tank purges and main propulsion system foam insulation work. Work in progress: launch countdown preparations; payload bay closeouts; closing of payload bay doors for flight and aft engine compartment closeouts. STS 55 work scheduled: ordnance installation; hypergolic fuel pressurization; fuel cell storage tank purges; countdown beginning at 4:00 p.m. Wednesday and crew arrival on the morning of April 21. There is a slight chance of precipitation for the STS 55 launch on April 24. There is a possibility that the ceiling for visibility may be below 8,000 feet. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, April 16, 1993; L-4

Day Weather Outlook for STS 55, April 20, 1993; Halvorson, FLORIDA TODAY, p. 1A, April 16, 1993; Date, THE ORLANDO SENTINEL.]

[] **STS 57 PROCESSING**

External tank foaming operations have been completed in preparation for the STS 57 mission of Endeavour. The Shuttle interface test and SRB hydraulic closeouts are also finished. Today, the main engine installation on Endeavour will be underway. STS 57 work scheduled: hydraulic fluid circulation and sample tests and rollout to Launch Complex 39B set for April 26. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, April 16, 1993.]

April 17: **DISCOVERY: READY OR NOT, HERE I COME**

Poor weather continues to plague Kennedy Space Center, but NASA plans to bring Discovery home from its STS 56 mission one way or the other. That usually means a landing at Edwards Air Force Base, CA. Landing Flight Director **Rich Jackson** said, "We'll try to get into the Cape if at all possible." Discovery is short of cryogenics - the liquified gases which help produce water and electricity - and must come home. Possible Edwards landings could come at 9:04 a.m. and 10:38 a.m. EDT. [Date, THE ORLANDO SENTINEL, April 17, 1993.]

[] **DISCOVERY MAKES KSC LANDING**

"A week from now we should be at T minus one hour and counting," said Shuttle Launch Director **Robert B. Sieck** just after Discovery landed at Kennedy Space Center. The countdown he referred to was that of Columbia currently being prepared at the launch pad for its STS 55 mission. In what astronaut **Kevin Chilton** called "a beautiful piece of flying," Commander **Ken Cameron** brought Discovery home to a landing at 7:37 a.m. Landing controllers had been concerned about a strong, 160-mph jet stream of wind Cameron would have to pass through on landing. The mission commander banked steeply and brought the vehicle in without incident. [Date, THE ORLANDO SENTINEL, April 18, 1993; Halvorson, FLORIDA TODAY, p. 1A, April 17, 1993; KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, April 19, 1993; Halvorson and Banke, FLORIDA TODAY, pp. 1A-2A, April 18, 1993.]

April 18: **FREEDOM OVERSIGHT PANEL NAMED**

President **Clinton** has named a group of experts to oversee the reworking of NASA's plan for Space Station Freedom. Chairman **Charles Vest**, President of Massachusetts Institute of Technology, said, "America's future in science and technology and as a world leader in space demands our utmost attention and care. We have assembled a diverse panel of experts that, I believe, will bring the

appropriate measures of insight, integrity and objectivity to this critical task." Panel members include: **Bobby Alford**, Dean of Medicine at Baylor College of Medicine; **Frederick Hauck**, former astronaut and president/chief executive officer of International Technical Underwriters; **Jay Chabrow**, president of JMR Associates; **Lou Lanzerotti**, Chairman, National Research Council's Space Sciences Board; **Paul Chu**, Director of the Texas Center for Superconductivity (University of Houston); **William Lilly**, National Academy of Public Administration; **Ed Crawley**, Professor of aeronautics and astronautics (MIT); former astronaut **John Fabian**, president/chief executive officer of ANSER; **Brad Parkinson**, Professor of aeronautics and astronautics (Stanford University); Major General **James Fain**, Deputy Chief of Staff at Air Force Materials Command; **Robert Seamans**, former NASA Deputy Administrator; **Edward Fort** of the W. M. Keck Foundation; **Lee Silver**, professor of Resource Geology (North Carolina A&T State University; **Mary Good**, retired Chairman/Chief Executive Officer of Allied Signal Corp.; **Albert "Bud" Wheelon**, Senior Vice President of technology for Hughes Aircraft. ["Space Station Freedom Oversight Panel Named," FLORIDA TODAY, p. 9E, April 18, 1993.]

April 19: **STS 55: ORDNANCE INSTALLATION**

"A week from now we should be at T-minus one hour and something, and we're looking forward to that," said Shuttle Launch Director **Robert B. Sieck** about the upcoming STS 55 launch. Deputy Shuttle Program Manager **Brewster Shaw** said, "If somebody's not ready, we will wait until they are, but if everybody's comfortable with flying Saturday (April 24), we'll press on and go fly." Ordnance installation on the STS 55 stack has been completed. The Orbiter's auxiliary power unit catch bottle has been vented and drained. Columbia's hypergolic fuel has been pressurized and the payload bay doors have been closed for flight. The payload by doors have been readied for flight. Spacelab closeouts and the final servicing of experiments have been completed for STS 55. Work in progress today: launch countdown preparations; aft engine compartment closeouts; fuel cell storage tank purges. Work completed: ordnance installation; auxiliary power unit catch bottle vent and drain; hypergolic fuel pressurization; closing payload bay doors for flight; payload bay closeouts; Spacelab closeouts and final servicing of experiments. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, April 19, 1993; Banke, FLORIDA TODAY, p. 1A, April 19, 1993.]

[] **ENDEAVOUR: SSME 3 INSTALLED**

Endeavour's third Space Shuttle Main Engine (SSME) has now been installed while the Orbiter was in the VAB for pre-rollout processing. The hold down post plunger has also been installed. STS 57 work in progress: installation of SSME 1 and 2; hydraulic fluid circulation and sample tests. Scheduled tasks include: heat shield installation; aft securing for rollout and rollout to LC 39B on April 26.

[KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, April 19, 1993.]

[] **LAWRENCE TO HEAD NASA PA**

NASA Administrator **Daniel S. Goldin** today announced the appointment of **Jeff Lawrence**, a senior congressional staff aid with extensive experience in space and aeronautics matters, as the agency's Associate administrator for Legislative Affairs. "With his considerable knowledge of the legislative and appropriations processes, as well as space, environmental and technology issues, Jeff Lawrence is ideally suited to serve as NASA's chief representative to the Congress today," Goldin said. **Mary D. Kerwin**, currently acting head of Legislative Affairs, has been named that office's Deputy Associate Administrator for Programs. Lawrence served on Capitol Hill as Legislative Director for former Rep. **Bill Green** (D-NY). [NASA Release No. 93-70, April 19, 1993; "Jeff Lawrence to Head NASA Legislative Affairs," FLORIDA TODAY, p. 11E, April 25, 1993.]

April 20: **STS 55: TANK PURGES**

At Launch Complex 39A, Columbia has had its fuel cell storage tank purged, its hydraulic systems tested and has had its prime cargo - Spacelab - closed out with a final servicing of its experiments. Work in progress today: launch countdown preparations; aft engine compartment closeouts; Spacelab trace contaminant purge and hypergolic stabilization. Work scheduled: crew arrival at 9:15 a.m. April 21 with the countdown beginning at 4:00 in the afternoon and an aft confidence test and closeouts. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, April 20, 1993.]

[] **STS 57: SAMPLE TESTS**

In the VAB, workers have completed hydraulic fluid circulation and sample tests on Endeavour in preparation for the Orbiter's STS 57 mission. Work in progress today: installation of main engines and hydraulic operations. STS 57 work scheduled: heat shield installation; aft securing for rollout; rollout to Launch Complex 39B on April 26. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, April 20, 1993.]

[] **STS 56: POST-FLIGHT MAINTENANCE**

After its landing on April 17, Discovery was rolled from the Shuttle Landing Facility to the Orbiter Processing Facility Bay 3. There the payload bay door strong back was installed and the Orbiter's thrusters inspected. Work in progress today: Orbiter hydraulic operations; access to aft engine compartment; installation

of main engine locks; aft thruster inspections. Post-STS 56 work scheduled: opening the payload bay doors; payload bay door latch and functional tests; removal of forward reaction and control system access panels; removal of SUVE payload; removal of ATLAS and Spartan payloads. "Discovery looks great," said NASA Manager **Dave King** who is in charge of readying the Orbiter for launch. The Shuttle had 156 tiles damaged during the mission, a slightly higher number than the average of 132 per mission. "It's really nothing major or of any concern," King said. During the mission, a radio channel failed and one of three electricity-generating fuel cells may need replacing because of unexpected voltage readings during the mission. No delay is expected in the timetable for Discovery's next flight, STS 51 which is set for about July. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, April 20, 1993.]

[] **STS 55 CREW ARRIVAL**

The launch of the Space Shuttle Columbia on Mission STS 55 is scheduled for the opening of a two hour and 30 minute window or at 10:52 a.m. EDT on Saturday, April 24. The seven STS 55 flight crew members are scheduled to arrive at KSC's Shuttle Landing Facility at about 9:15 a.m. today. KSC spokesman **Mitch Varnes** said, "We're on target for Saturday. And this time I'm going to get further than T minus three seconds in the countdown." A pre-countdown status briefing will take place at 11 a.m. Varnes will be the NASA Launch Commentator for this mission and had been on duty when Columbia shut down with three seconds left in the countdown; a valve problem forced the Shuttle's computers to order the countdown halted. [KSC Release No. 40-93, April 20, 1993; Banke, FLORIDA TODAY, p. 1A, April 21, 1993; "Columbia Gets Tired of Waiting, Starts Countdown," THE ORLANDO SENTINEL, April 22, 1993.]

[] **PLAYALINDA BEACH CLOSED**

Playalinda Beach will be closed to the public beginning today at dusk due to the Space Shuttle launch planned for Saturday, April 24. Given a successful launch on Saturday, the beach will reopen to the public at 6:00 a.m. on Sunday, April 25. Launch of Columbia is set for 10:52 a.m. Saturday, April 24. The countdown leading to the 55th Space Shuttle flight is set to begin at 4 p.m. on April 21. A closing of Playalinda Beach is required throughout the duration of a Space Shuttle launch countdown. [KSC Release No. 39-93, April 20, 1993.]

April 21: **ENDEAVOUR MISSION DELAYED**

Endeavour's STS 57 mission has been postponed on account of darkness. KSC spokesman **Bruce Buckingham** said, "We've never landed at KSC at night, and if we don't absolutely have to, the question is why should we? The mission will be delayed two weeks so the Orbiter can both take off and land in daylight. Current

plans are for a June 3 launch with a landing at Kennedy Space Center on June 11. The next mission for Endeavour is the Hubble Space Telescope repair flight and Buckingham said the STS 57 launch delay will not impact the December Hubble mission. He said, "We'll still have a lot of time to get the work for the Hubble mission completed." The upcoming mission will carry a crew of 7 astronauts who will retrieve a European satellite deployed originally in August of last year. The astronauts will also deploy a commercial experiment-filled module. [Halvorson, FLORIDA TODAY, p. 5A, April 22, 1993.]

[] **STS 55: COUNTDOWN BEGINS**

Columbia's most recent commander **James Wetherbee** has given current Columbia commander **Steve Nagel** for insuring that Columbia gets off the ground on its second try April 24. "He said he forgot to tell me that when you turn the key, you're supposed to jiggle it to get it started. So now that I know that, I think we'll get going," Nagel joked. NASA Test Director **Bill Dowell** said today that "all three engines look good and we're ready to go in that concern." The mission consists of 88 experiments and will require the crew to work in teams around the clock to complete them all. Crew members include, beside Nagel: Pilot **Tom Henricks**, Payload Specialists **Jerry Ross, Hans Schlegel** and **Ulrich Walter** and Mission Specialists **Bernard Harris, Charles Precourt**. [Halvorson, FLORIDA TODAY, p. 1A, April 22, 1993; Halvorson, FLORIDA TODAY, p. 2A, April 24, 1993.]

April 23: **STS 55: L-1 UPDATE**

Operations at Launch Complex 39A are continuing to run smoothly and without problem for the launch of Space Shuttle Columbia on its STS 55 mission. Launch remains on schedule to occur at the opening of the window at 10:52 a.m. tomorrow, April 24. The countdown clock held at T-11 hours for the next 12 hours and 32 minutes. Rotation of the service structure away from the Shuttle remains set for 11:00 a.m. today. Following RSS rotation, crews will continue with the installation of time critical list checks. Operations will commence to activate the fuel cells. Tonight, Mission Control (JSC, Houston, TX) will configure and check communication links between mission control, Kennedy Space Center and Columbia. NASA Test Director **Al Sofge** said, "The [launch] team is not the least bit hurried. The team is very relaxed, very comfortable and looking forward to the launch."

The countdown clock will enter the planned one-hour hold at the T-6 hour mark as last minute checks are made prior to loading the external tank with over 500,000 gallons of liquid oxygen and liquid hydrogen propellants. Once the pad is clear of all personnel, tanking will begin at about 2:30 a.m. tomorrow.

Following the three-hour tanking procedure, the "ice team" will be deployed to the pad for final assessments of the vehicle. The seven members of the flight crew have been divided into two shifts for around-the-clock operations once in orbit. The blue team consists of commander **Steve Nagel**, Pilot **Tom Henricks**, Mission Specialist **Jerry Ross** and Payload Specialist **Ulrich Walter**. The red team members are Mission Specialists **Charles Precourt** and **Bernard Harris**, and Payload Specialist **Hans Schlegal**. The weather forecast for launch tomorrow is very optimistic with Air Force forecasters allowing a zero percent probability of violating launch constraints during the window that opens at 10:52 a.m. The 24 hour and 48 hour delay predictions show a 10 percent chance of violation each day. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, April 23, 1993; Halvorson, FLORIDA TODAY, p. 1A, April 23, 1993.]

April 24: **STS 55: POSTPONED ANOTHER 48 HOURS**

The launch of the Space Shuttle Columbia with Spacelab D-2 aboard has been postponed for 48 hours, until 10:50 a.m. April 26. While placing Columbia's three inertial measurement units into the operational mode prior to tanking, data was displayed by IMU #2 that is symptomatic of an intermittent power supply problem. Though this IMU was then successfully test cycled five times, there could be no assurance that the unit would not fail during the mission. Should this occur, flight rules call for a precautionary return to Edwards Air Force Base (CA). In order to assure a full duration mission, a decision was made to remove and replace IMU #2. Weather conditions for launch on Monday (April 26) are forecast to remain acceptable with an 80 to 90 percent chance of having acceptable liftoff conditions. There existed a slight chance of showers, mostly offshore with a possible increase in clouds and showers. [KSC Release No. 44-93, April 24, 1993; "L-1 Day Weather Forecast for STS 55," April 25, 1993; Date, THE ORLANDO SENTINEL, April 25, 1993.]

April 25: **SPACE CONGRESS OPENS TODAY**

The 30th Annual Space Congress opens tomorrow at the Holiday Inn in Cocoa Beach (FL). Exhibits will be open from 11 a.m. until 7 p.m. Monday through Friday at the Cocoa Beach Hilton and the Comfort Inn & Suite Resort (also in Cocoa Beach, FL). Exhibits are expected to include: computer graphics demonstrations and displays of the Space Shuttle, Shuttle payloads, Space Station and expendable launch vehicles. The Space Congress is chaired this year by McDonnell Douglas's **George Faenza** and NASA Administrator **Daniel S. Goldin** will speak to the Monday night banquet. ["Four-Day Event Features Industry, Government Experts On Space," FLORIDA TODAY, p. 4E, April 25, 1993; Banke, FLORIDA TODAY, p. 12E, April 25, 1993; "Space Congress Opens Monday," FLORIDA TODAY, p. 12E, April 25, 1993; "Exhibit Halls Open to the

Public," FLORIDA TODAY, p. 12E, April 25, 1993; Date, THE ORLANDO SENTINEL, April 27, 1993.]

[] **COLUMBIA READY TO GO**

The Space Shuttle Columbia is ready to go on its STS 55 mission at last. The window for the launch is from 10:50 a.m. until 1:20 p.m. tomorrow. KSC spokesman **Mitch Varnes** said today, "We'll be testing the unit (IMU) to make sure it works properly and then we'll press on for launch Monday (April 26)." The faulty IMU was one of three located in the nose of Columbia; it was removed and replaced yesterday. **Rudolph Teuwsen**, a spokesman for the German Space Agency said, "We are a bit disappointed [about the Saturday delay], but it would have been far worse to have launched and then had to come back without completing the science." [Halvorson, FLORIDA TODAY, pp. 1A-2A, April 26, 1993.]

April 26: **STS 55: LAUNCHED AT LAST**

"We're extremely relieved that after a very difficult period, we're finally up in orbit. That's the first step," said the Program Manager for the German Space Agency **Heinz Stoewer**. He added, "We're in this for the long-term. We need to really be consistent and constant in our policies. I think this mission will be a success and prove that manned space has an important role in the overall space scenario." At 10:50 this morning, the Space Shuttle Columbia lifted off LC 39A for its 14th mission into space. KSC Launch Director **Robert Sieck** said, "Columbia always seems to be a tough one to get off the pad, but when it does, it flies well." Columbia's launch is the third of eight planned for the year and the 55th in Space Shuttle history. The crew of Columbia includes Commander **Stephen Nagel**, Pilot **Tom Henricks**, Payload Commander **Jerry Ross**, Flight Engineer **Charles Precourt**, Dr. **Bernard Harris** and German scientists **Ulrich Walter** and **Hans Schlegel**. [Halvorson, FLORIDA TODAY, pp. 1A-2A, April 27, 1993; Date, THE ORLANDO SENTINEL, April 27, 1993.]

[] **ADMINISTRATOR GOLDIN ON COLUMBIA'S LAUNCH**

"Today's launch of the Space Shuttle Columbia carries with it a clear signal that the National Aeronautics and Space Administration is deeply committed to the safety and success of our missions. Given the options of assuring success or launching on any given date, there is little question that mission success has, is and always will be our priority. The Space Shuttle's record speaks for itself and is unrivaled in history. I also must commend and thank our German partners for their patience, professionalism and their commitment to the success of this important scientific endeavor." ["Statement by NASA Administrator Daniel S. Goldin," April 26, 1993.]

April 28: **STS 55: COLUMBIA UPDATE**

The Space Shuttle Columbia remains on orbit. Landing is set for about 8:53 a.m. Wednesday (May 5) at Kennedy Space Center. If sufficient onboard cryogenic fuels are available, the mission may be extended one day. The solid rocket boosters are back at Hangar AF (Cape Canaveral Air Force Station) and are on the stands. Initial inspections are in progress and washdown is set for April 29. Both boosters look good with nothing out of the ordinary to report. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, April 28, 1993.]

[] **UPDATES: ENDEAVOUR AND DISCOVERY**

The Space Shuttle Endeavour began its rollout to Launch Complex 39B at 7:22 a.m. today. The vehicle wa hard down at the pad at 2:00 p.m. Technicians have begun launch pad validations. The rotation of the service structure around the Orbiter has been scheduled as have been the opening of the payload bay doors and inertial measurement unit calibrations. Discovery, meanwhile, remains in Orbiter Processing Facility Bay 3 where it is being prepared for its next mission, STS 51. The vehicle's forward reaction control system has already been removed and the drag chute is being removed currently. The Orbiter's MADS recorder has been replaced main engine carrier panels and hat shields have been removed. Discovery's payload bay doors have been opened and the door latch and functional tests have been conducted. ATLAS, Spartan and SUVE payloads have been removed. Today, technicians will be conducting structural inspections of Discovery; deservicing hypergolic fuels and making modifications to auxiliary power unit controllers. The Orbiter is scheduled: to transfer its FRCS to the hypergolic maintenance facility; to have its main engines removed and serviced; remove its fuel cell; to extend the nose cap for thermal system repairs. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, April 28, 1993; Halvorson, FLORIDA TODAY, p. 5A, April 27, 1993.]

[] **WRENCH FOUND IN ENGINE COMPARTMENT**

An L-shaped Allen wrench was found recently in Discovery's engine compartment and had probably been there for 7 1/2 years, according to **Dave King**, NASA manager in charge of preparing Discovery for launch. The wrench was so small - perhaps 2 1/2 inches in length - was too small to have caused any problem for the Shuttle. "It could not have done any damage where it was - or anywhere, for that matter," said King. There was no serial number on the wrench; it is thought to have been inside Discovery since August 1985 which was the Orbiter's last mission before Challenger's accident in 1986. Post-Challenger work rules require that all tools be tied to a worker's wrist when in use and an accident report must be filed when a tool is missing. [Date, THE ORLANDO SENTINEL, April 27, 1993.]

April 28: **AGREEMENT SIGNING SET**

Kennedy Space Center Director **Robert L. Crippen** and Spaceport Florida Authority Executive Director **Edward O'Connor** will sign a formal agreement at noon today to permit the construction of a $34 million Apollo/Saturn V visitor facility as part of the space center's public bus tour. The agreement, which spells out the terms under which Spaceport Florida will help finance the costs of building the new 99,000 square tour facility, will be signed in a brief ceremony at the current Saturn V rocket exhibit since the rocket, will be signed in a brief ceremony at the current Saturn V rocket exhibit, located in the southwest corner of the Vehicle Assembly Building parking lot.

KSC's Saturn V is one of only three remaining flight vehicles left over from the Apollo program. In its present location since the 1976 Bicentennial Exposition on Science and Technology, the rocket has been subject to deterioration to the elements. Plans call for the rocket to be restored and permanently housed in the new building which will be constructed at the Banana Creek launch viewing site north of the Vehicle Assembly Building. In addition, two new theater shows and a number of associated artifacts and exhibits will be included in the facility. The agreement calls for Spaceport Florida Authority to issue bonds to finance the facility construction. A portion of the revenues from the bus tour tickets will be assigned to Spaceport Florida Authority to repay the bonds. The facility will be constructed and operated by KSC's Spaceport USA concession operator, TW Recreational Services, Inc. [KSC Release No. 45-93, April 28, 1993.]

April 29: **STS 57: ROLLOUT COMPLETED**

Endeavour, whose next mission is STS 57, began its first full day on the pad today. The rotating service structure has been positioned around the Orbiter. Work in progress today: launch pad validations; opening the payload bay doors; inertial measurement unit calibrations; main engine securing; heat shield removal. STS 57 work scheduled: mating with Orbiter mid-body umbilical unit; installation of SHOOT payload; preparations to replace fuel turbopump on main engine number 1. The pump is being replaced due to the potential for cracking in the turbine inlet sheet metal. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, April 29, 1993.]

[] **DISCOVERY: STS 51 PREPARATIONS IN OPF 3**

In OPF Bay 3, Discovery has had its forward reaction and control system removed; Ku-band integrated testing has also been completed. STS 57 work in progress today: structural inspections; deservicing of hypergolic fuels; auxiliary power unit controller modifications; transfer of FRCS to hypergolic maintenance facility; helium system leak and functional tests. Work scheduled: removal and

servicing of main engines; TACAN system test; removal of fuel cell; extended nose cap for thermal system repairs. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, April 29, 1993.]

April 30: **STS 57: ENDEAVOUR AT LC 39A**

The Space Shuttle Endeavour has completed launch pad validations for its upcoming STS 57 mission which is targeted for a June 11 launch. The Orbiter's payload bay doors have been opened and hook-up and leak checks of he Orbiter Mid-Body Umbilical Unit have been completed. STS 57 work in progress today: preparations to remove the fuel turbopump from main engine #1; inertial measurement unit calibrations; heat shield removal and installation of SHOOT payload. Scheduled work involves the removal and replacement of the fuel turbopump on main engine #1 on May 3. The pump is being replaced due to the potential for cracking in the turbine inlet sheet metal. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, April 30, 1993; Halvorson, FLORIDA TODAY, p. 9A, April 30, 1993; Date, THE ORLANDO SENTINEL, April 30, 1993.]

[] **LAYOFFS IN WORKERS' FUTURE**

"As we go forward...there are going to be reductions in force. There is just no way to get around it," said Shuttle Project Director **Richard Kohrs** at the 30th Annual Space Congress (Cocoa Beach, FL) today. McDonnell Douglas spokesman **Jim Jannette** said, "Until a decision is made, no one is speculating on what may or may not happen." McDonnell Douglas is a major Space Station contractor. [Hall, FLORIDA TODAY, p. 9A, April 30, 1993.]

[] **DISCOVERY IN OPF BAY 3: KU-BAND TESTING**

Discovery's Ku-band integrated testing has been completed while the Orbiter remains in OPF Bay 3 for processing. The forward reaction and control system (FRCS) has also been removed. Processing work today: structural inspections; deservice hypergolic fuels; auxiliary power unit maintenance facility and helium system leak and functional tests. STS 51 work scheduled: removal and servicing of the main engines; TACAN system test; removal of fuel cell; extension of nose cap for thermal system repairs. Meanwhile, Columbia remains on orbit on its STS 55 mission. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, April 30, 1993.]

[] **APOLLO EXHIBIT GETS NEW FACILITY**

NASA announced today that bonds from the Spaceport Florida Authority will finance the construction of a $34 million facility to house relics from the Apollo

program. The document of agreement will be signed by Kennedy Space Center Director **Robert L. Crippen** and Spaceport Florida Director **Edward O'Connor**. "The agreement will enable us to open the exhibit seven to 10 years sooner than planned," said **Ed Harrison**, Chief of the NASA Visitors Office at Spaceport USA. [Halvorson, FLORIDA TODAY, p. 1B, April 30, 1993.]

MAY

May 3: **STS 55 TO LAND MAY 6**

The Space Shuttle Columbia continued its STS 55 mission today looking toward a May 6 landing at Kennedy Space Center at approximately 9:03 a.m. Should weather become a concern, the vehicle can land one orbit earlier at 7:28 a.m. The STS 55 crew includes Commander **Steve Nagel**, Pilot **Tom Henricks**, Mission Specialists **Jerry Ross**, **Charles Precourt**, **Bernard Harris** and Payload Specialists **Ulrich Walter** and **Hans Schlagel**. [Date, THE ORLANDO SENTINEL, May 1, 1993; KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, May 3, 1993.]

[] **ENDEAVOUR WAITS ITS TURN**

The newest Space Shuttle - Endeavour - is awaiting the start of its June 3 STS 57 mission. Pad workers have finished calibrating the Orbiter's inertial measurement units and installed the SHOOT payload. An interface test between SHOOT and Endeavour has been conducted and the heat shields have been removed from around main engine #1. Preparations are underway today to remove the fuel turbopump from main engine #1 and for loading of the pre-launch onboard propellants. STS 57 work scheduled: removal of the turbopump from engine #1 is set to begin late today. The replacement unit should be installed and torqued to launch specifications by Friday (May 21). The pump is being replaced due to the potential for cracking in the turbine inlet sheet metal. Removal of the 3D Microgravity Accelerometer experiment from Spacehab is scheduled for May 20. Vertical access equipment (MVAK) will be installed May 19; the experiment is being removed in response to concerns of the customer. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, May 3, 1993.]

[] **DISCOVERY READYING FOR STS 51**

Discovery's next mission is STS 51; it is scheduled for the mid-July time frame. The vehicle is currently undergoing pre-rollover processing in OPF Bay 3; technicians there have removed the Orbiter's three main engines and deserviced the hypergolic propellants. Today workers are conducting structural inspections, checking the Orbiter's communications system and cleaning the payload bay and crew module. Scheduled work includes tests of the main engine controllers, a TACAN system test and lubrication oil deservicing. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, May 3, 1993.]

May 4: **STS 57: SHOOT TEST DONE**

Technicians and engineers have completed a SHOOT payload interface verification test on Endeavour on Launch Complex 39B; the Orbiter is being prepared for its upcoming STS 57 mission. Leak checks of gaseous oxygen, liquid oxygen and hot gas systems and main engine nozzle inspections have also been completed. Currently, technicians are conducting main engine leak checks and insulation foaming; removal of the main engine #1 fuel turbopump; a forward/aft reaction control system fuel regulator flow test; retrieving a potable water microbial sample; preparing for hypergolic propellant loading and cleaning the avionics bay filter. STS 57 work scheduled: preparations for removing the Spacehab-3 DMA experiment; removal of the 3-DMA experiment also from Spacehab; hypergolic fuel loading; a flight readiness test and the terminal countdown demonstration test May 13-14. The KSC landing of Columbia at the conclusion of its STS 55 mission is still on track for 9:03 a.m. May 6. Favorable weather for landing is predicted. [DAILY SPACE SHUTTLE STATUS REPORT, May 4, 1993.]

May 5: **STS 55 CONCLUDES AT KSC TOMORROW**

Ten days after its launch from Kennedy Space Center, the Space Shuttle Columbia is preparing to land at KSC tomorrow morning. Landing is set for 9:03 a.m. with deorbit burn coming at 8:02 a.m. The planned landing time is the second of two opportunities Columbia has to touch down at the center's Shuttle Landing Facility. The crew's sleep cycle and a chance for better weather later in the morning led mission managers to bypass the 7:28 a.m. opportunity. Should weather prohibit a KSC landing, Columbia could land at Edwards Air Force Base (CA) at 10:29 EDT tomorrow morning.

Columbia, which is NASA's oldest Space Shuttle in terms of service, launched on its STS 55 mission at 10:50 a.m. EDT. The mission is Columbia's fourteenth and the 55th Space Shuttle mission. During the course of the ten-day mission, the astronauts successfully conducted numerous biomedical and materials science experiments inside the dedicated German Spacelab D-2 module. Columbia will fly next on STS 58, targeted for launch in late summer this year. Tomorrow's expected landing of Columbia will be the 16th KSC landing on the Shuttle Landing Facility. The first was at the conclusion of STS 41B on February 11, 1984, and the most recent was Discovery's STS 56 mission which landed on April 17, 1993. [KSC Release No. 51-93, May 5, 1993.]

May 6: **SHUTTLE LANDS AT EDWARDS**

The Space Shuttle Columbia's STS 55 mission came to a conclusion today with a landing at Edwards Air Force Base, CA.; cloudy weather in Florida forced the

west coast landing. The seven astronauts, including two from Germany, landed at 10:30 a.m. EDT, concluding a 10-day flight. The cost of having to land in California rather than Florida will range between $1 and $3 million. When it came time for NASA to make a decision about where to land the Shuttle, clouds were expected to obscure the Shuttle Landing Facility; that turned out not to be the case at landing time. "When you look at the stability of the weather and take into account the consequences of being wrong, we clearly made the right judgment," said Shuttle Program Manager **Leonard Nicholson**. [Halvorson, FLORIDA TODAY, pp. 1A-2A, May 7, 1993; Date, THE ORLANDO SENTINEL, May 7, 1993; SEE ALSO: KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, May 10, 1993.]

[] **VAB FALL CAUSES MINOR INJURIES**

Two VAB workers fell ten to twelve feet, but escaped serious injury today. They fell from an I beam located some 400 feet above the floor of the building. One worker landed on a cat walk some 10 to 12 feet beneath the beam he was working on and suffered minor injuries which were treated at Jess Parrish Medical Center (Titusville, FL). The other worker was able to grab a beam that was nearby; he, too, suffered minor injuries, but was not hospitalized. A NASA statement said, "In the process of installation on the 41st floor of the VAB, the beam became unstable, causing the workers to fall." [Halvorson, FLORIDA TODAY, p. 7A, May 7, 1993.]

May 7: **ACTS MOVES TO VPF**

Moving only one mile, the Advanced Communications Technology Satellite (ACTS) passed its latest major milestone this morning. The spacecraft was transported from the Payload Hazardous Servicing Facility (PHSF) to the nearby Vertical Processing Facility (VPF) in the KSC Industrial Area. This milestone signifies the end of integrated testing between ACTS and its upper stage booster, a Transfer Orbit Stage (TOS). The tests verified that the two payload elements operate in unison. Prior to mating, each flight element was readied and treated separately, ACTS in Hangar AO on Cape Canaveral Air Force Station and TOS in the PHSF. Now in the VPF, the ACTS-TOS payload will use the unique Cargo Integrated Test Equipment (CITE) for the Interface Verification Test (IVT). This test will demonstrate the payload's compatibility and readiness to be mated with the Space Shuttle Discovery. It will also prove that the payload can be checked out by the astronauts before deployment, and that the planned deployment sequence can be executed as intended. All of these will be repeated after ACTS-TOS is installed into Discovery's payload bay next month. The IVT is scheduled for May 19. The ACTS-TOS payload is scheduled to be moved to Launch Complex 39B on June 22 based on a mid-July targeted launch of STS 51. ACTS

is designed to test advanced experimental satellite communications concepts. [NASA/KSC Release No. 54-93, May 7, 1993.]

May 8: **STS 58: NEXT COLUMBIA FLIGHT DELAYED**

"I think we're going to come out with a schedule that shows a September launch," said KSC's Columbia Processing Manager **Bascom Murrah**. Part of the reason for the launch delay is the unplanned landing in California which cost KSC a week's processing time; in addition there was a month's delay in launching Columbia on its STS 55 mission. Launch dates of September 3 or September 10 are being discussed for the Columbia's STS 58 mission. [Banke, FLORIDA TODAY, p. 1A, May 9, 1993.]

May 10: **COLUMBIA LANDS AT EDWARDS; READIED FOR TRAVEL**

The Space Shuttle Columbia landed May 6 at Edwards Air Force Base, CA; the time was 10:29 a.m. EDT. Post-landing servicing of the Orbiter continues on schedule today. The aerodynamic tail cone will be placed around the Orbiter's engines today. Columbia atop the Shuttle Carrier Aircraft are set to begin their cross-country ferry flight to Florida tomorrow morning. If weather permits, the Shuttle will be flown from California to the Biggs Army Air Field (El Paso, TX), for an overnight stop. The next morning Columbia will leave Texas and head to Florida for a Kennedy Space Center landing at KSC by late afternoon. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, May 10, 1993; Halvorson, FLORIDA TODAY, p. 1A, May 11, 1993.]

[] **STS 57 & 51 PROCESSING ACTIVITIES**

Endeavour is at Launch Complex 39B waiting to start its STS 57 mission in early June. Completed tasks include: mechanical hook-up of the main engine #1 replacement turbo pump; inspections of the external tank/Orbiter aft strut connections; and inspections of tail service mast T-O connections. Pad technicians are securing the main engine #1 replacement turbo pump today; making preparations for loading of pre-launch onboard propellants; undertaking engine insulation foaming operations and inspecting oxygen feedline brackets. STS 57 scheduled work: terminal countdown demonstration test on May 13-14 and the crew arrival at KSC at 4:30 p.m. May 11. Discovery is in Orbiter Processing Facility Bay 3 being readied for its mid-July STS 51 mission. The Orbiter will deploy the ACTS-TOS configured payload and ORFEUS-SPAS. The mission will last almost ten days. In the OPF, workers have completed pre-installation checkouts of main engine controllers; functional checkouts of orbital maneuvering system pods and installation of the waste containment system (WCS). Today workers are making structural inspections of the vehicle and fuel cell single

voltage checks. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, May 10, 1993.]

May 11: **STS 57: RCS TESTED**

Pad technicians at LC 39B have completed regulator flow testing of Endeavour's reaction control system as part of the pre-launch processing for the Orbiter's STS 57 mission. Today, workers are conducting leak checks of main engine #1 high pressure fuel turbo pump; leak checks of main propulsion system; a flight readiness test of the main/engines flight control elements; preparations for hypergolic propellant loading and are awaiting astronaut arrival for the terminal countdown demonstration test. STS 57 scheduled activities include: astronaut launch pad safety training on May 12-13; the terminal countdown demonstration test May 13-14 and, on May 14-15, a helium signature leak check of the main propulsion system. At NASA's Dryden Flight Research Facility at Edwards Air Force Base, the Space Shuttle Columbia is being mated to the Shuttle Carrier Aircraft today. Departure from Edwards is targeted for 3 p.m. EST with an overnight stop at Biggs Army Field (El Paso, TX). If the weather is favorable, Columbia should return home to Kennedy Space Center late tomorrow afternoon. [DAILY SPACE SHUTTLE STATUS REPORT, May 11, 1993.]

[] **STS 57 CREW ARRIVAL**

Endeavour's crew for the STS 57 mission arrived today at Kennedy Space Center. On arrival, Commander **Ronald Grabe**, making his fourth Shuttle flight said, "We're sure glad to be here because it means we're within a month of flight." The rest of the crew includes: Pilot **Brian Duffy**, Payload Commander **G. David Low** and first-time mission specialists **Janice Voss, Nancy Sherlock** and **Peter "Jeff" Wisoff**. [Banke, FLORIDA TODAY, p. 5A, May 12, 1993.]

[] **DISCOVERY: STS 51 PROCESSING**

Discovery's nose cap has been removed during pre-STS 51 processing in Orbiter Processing Facility Bay 3. Work in progress includes: external tank door cycles; power reactant storage and distribution system tests; orbital maneuvering system functional tests; and waste containment system servicing. STS 51 is targeted for launch in mid-July and is expected to last 9 days and 22 hours. The STS 57 mission will include the retrieval of the European Retrievable Carrier, the first flight of SPACEHAB (a laboratory for commercial experiments), the Super Fluid Helium On-Orbit Transfer experiment and a spacewalk. Pre-flight briefings for STS 57 have been scheduled to occur May 18 at the Johnson Space Center. [DAILY SPACE SHUTTLE STATUS REPORT, May 11, 1993; Notice to Editors: N93-26, May 12, 1993.]

May 12: **20TH NAVSTAR LAUNCHED**

The 20th NAVSTAR Global Positioning Satellite was lifted into orbit aboard a $45 million Delta rocket tonight. "It was beautiful, simply beautiful," said Master Sgt. **Bruce Zielsdorf**, a spokesman for the Air Force's 45th Space Wing. The launch came from Cape Canaveral Air Force Station at 8:07 p.m.; its vapor trail was still visible 15 minutes after launch. [Banke, FLORIDA TODAY, p. 6A, May 13, 1993.]

May 13: **COLUMBIA'S FERRY FLIGHT HOME**

The Space Shuttle Columbia, atop its Shuttle Carrier Aircraft, departed Edwards Air Force Base, CA, May 11 and was ferried to Biggs Army Air Field (El Paso, TX) where it remained that night. The following day - May 12 - a weather assessment precluded further flight to Florida and the resumption of the ferry flight was expected to occur today. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, May 13, 1993; Banke, FLORIDA TODAY, p. 6A, May 13, 1993.]

[] **STS 57 PAD PROCESSING**

Endeavour's main engine readiness test has been completed at Launch Complex 39B; pad technicians have also finished cryogenic servicing of the SHOOT payload. STS 57 processing tasks now underway: borescope inspections of the left hand main landing gear bungee mechanism; the start of the terminal countdown demonstration test and the installation of engine number one's heat shield. Workers are also scheduled to begin the prelaunch propellant loading. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, May 13, 1993.]

[] **STS 51: AEROSURFACES REPOSITIONED**

In OPF Bay 3, Discovery's aerosurfaces have been repositioned and the Orbiter's nose cap has been removed. STS 51 processing currently underway: external tank door cycles; power reactant storage and distribution system tests; orbital maneuvering system functional tests; waste containment system servicing; installation of window number 2. The STS 51 mission is set to launch in mid-July with a crew of five. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, May 13, 1993.]

May 14: **STS 57: PAYLOAD STATUS REPORT**

The Orbiting Retrievable Far and Extreme Ultraviolet Spectrometer (ORFEUS) payload has now joined the Advanced Communications Technology Satellite

(ACTS) at the Vertical Processing Facility (VPF). The payload made the journey from the Hangar AM spacecraft checkout facility on Cape Canaveral Air Force station to the VPF located in the KSC Industrial Area on May 11. Yesterday it was removed from its shipping container, and today was hoisted into the west test cell of the VPF high bay. The ORFEUS payload is a German developed payload for stellar and interstellar observations. It consists primarily of the ORFEUS telescope and the Interstellar Medium Absorption Profile Spectrograph (IMAPS) which are mounted on the retrievable Shuttle Pallet Satellite (SPAS). Also aboard the SPAS is an IMAX film camera, the Surface Effects Sample Monitor (SESAM) which is a materials science experiment, and a video television camera which will provide pictures of Discovery from space.

On Monday - May 10 - the ACTS spacecraft attached to its upper stage booster, a Transfer Orbit Stage (TOS), was removed from its transporter. The payload had arrived at the VPF previously on May 7. After inspections and preparations it was hoisted into the VPF west test cell on May 12. ACTS is designed to test advanced experimental satellite communications concepts. Next week, the payloads will independently undergo an interface verification test (IVT) using the unique cargo integrated test equipment (CITE). The test demonstrates the payload's compatibility and readiness to be mated with the Space Shuttle Discovery. It will also prove that the payload can be checked out by the astronauts before its deployment, and that the planned activities for each payload can be executed as intended. The IVT for ORFEUS-SPAS is scheduled next week on May 18 and will be followed the next day by the IVT for ACTS-TOS. And end-to-end test is also scheduled for ORFEUS-SPAS on May 21 which will verify communications capability with the spacecraft. The STS 51 payloads are scheduled to be moved to Launch Complex 39B on June 22 based on a mid-July targeted launch of Discovery. [PAYLOAD STATUS REPORT: ACTS-TOS/ORFEUS-SPAS, May 14, 1993.]

[] **FERRY SAGA CONTINUES**

The Space Shuttle Columbia departed Kelly Air Force Base (San Antonio, TX) today at 8:16 a.m. en route to Columbus Air Force Base (Columbus, MS). At Columbus, the 747 will be refueled and check the weather forecast before proceeding on to Florida. If the weather permits, the vehicle attached above the 747 Shuttle Carrier Aircraft should be arriving at Kennedy Space Center by about 2:00 or 3:00 p.m. today. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, May 14, 1993; Banke, FLORIDA TODAY, pp. 1A-2A, May 15, 1993.]

[] **STS 57: JUNE 11 LAUNCH DATE**

If everything goes according to schedule, the Space Shuttle Endeavour will commence its STS 57 mission on June 11 at 5:14 p.m.; the flight is planned to last for 7 days and 23 hours. At Launch Complex 39B, technicians have completed a number of tasks: preparations for prelaunch hypergolic propellant loading; engine number one heat shield installation; main engine flight readiness test and cryogenic servicing of SHOOT payload. STS 57 processing work underway today includes: the mission terminal countdown demonstration test (scheduled to end tomorrow); flight crew equipment stowage; inertial measurement unit calibrations; aft compartment X-rays; Orbiter/external tank umbilical foaming operations. Workers are scheduled to begin prelaunch hypergolic propellants. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, May 14, 1993.]

[] **DISCOVERY IN OPF BAY 3**

In OPF Bay 3, the Space Shuttle Discovery continues to undergo pre-rollout processing activities. In the OPF, workers have installed the Orbiter's number 2 window; repositioned aerosurfaces and removed the nose cap. Tasks continuing from earlier in the week include: external tank door cycles; power reactant storage and distribution system tests; orbital maneuvering system functional tests; waste containment system servicing; and auxiliary power unit leak and functional checks. Remote manipulator system functional checks are scheduled. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, May 14, 1993.]

May 15: **HARRIS TEAM WINS AWARD**

NASA announced that a Space Station Freedom Manned Flight Awareness Team Award of Merit has been given to Harris Corp.'s Aerospace Division's Audio Visual Distribution System team. The award recognized the team's work on a $35 million contract for the design, development and production of the internal audio communications system aboard Freedom. NASA astronaut **James Halsell** presented to award to team member **A. J. Scott**. ["Harris Team Wins Award for Space Station Work," FLORIDA TODAY, p. 9E, May 16, 1993.]

May 17: **STS 57: LAUNCH TARGET IS JUNE 3**

Endeavour's terminal countdown demonstration test has been completed and the target date for the mission is now June 3. The STS 57 crew returned to Johnson Space Center on May 14. The flight crew equipment has been stowed and inertial measurement unit calibrations are finished. A borescope examination of the vehicle's main landing gear has been completed with a positive result for everything checked. Tasks underway today include: preparations for hypergolic

fuel loading operations; X-rays of the main propulsion system; Orbiter/external tank umbilical foaming operations and closing payload bay operations. Fuel loading and auxiliary power unit leak checks have been scheduled. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, May 17, 1993.]

[] **OPF BAY 3 OPERATIONS FOR STS 51**

Window number 2 has been installed on Discovery. In addition, aerosurfaces have been repositioned and the nose cap has been removed. Current processing tasks include: external tank door cycling; power reactant storage and distribution system tests; orbital maneuvering system functional tests; waste containment system servicing and auxiliary power unit leak and functional tests. Remote manipulator system functional tests have been scheduled. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, May 17, 1993.]

May 19: JOINT CAUSED BIB BANG ON ENDEAVOUR

A loud bang which shook Endeavour last month has been attributed to a flexible joint inside the propulsion system. It is thought to have jammed, followed by a sudden release during a leak check, causing the noise. **Hugh Delgado**, an Endeavour vehicle engineer, said, "I feel very comfortable we now have the most probable cause and that the analysis will verify it." The joint is not expected to be replaced. [Banke, FLORIDA TODAY, p. 5A, May 12, 1993; Banke, FLORIDA TODAY, p. 1A, May 20, 1993.]

May 20: STS 57: LAUNCH READINESS REVIEW

Managers and technicians have completed the launch readiness review for Endeavour's upcoming STS 57 mission. At Launch Complex 39B, technicians have opened the payload bay doors and completed leak checks of the main engine number 1 high pressure fuel pump and of the auxiliary power units. Currently technicians are continuing an analysis of flexible joints in the main propulsion system; they are also installing the main engine number 1 heat shield; installing and checking out the extravehicular mobility units and conducting the Spacehab late stowage demonstration. STS 57 work scheduled: helium signature leak test; making main engine number 1 flight control checks; beginning the mission's flight readiness review and beginning aft compartment closeouts. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, May 20, 1993.]

[] **STS 51 OMS THRUSTER REMOVED**

Technicians in Orbiter Processing Facility Bay 3 have removed a thruster from one of Discovery's orbital maneuvering systems and have made checks of the vehicle's Ku-band antenna system/ Today, the workers made inspections of

flexible joints in the Orbiter's main propulsion system; completed OMS redundancy tests; maid main engine installation preparations and moved the vehicle forward reaction control system (Forward Reaction Control System) to the Orbiter Processing Facility. STS 51 scheduled activities: ORFEUS-SPAS end-to-end test; flight control checkouts; FRCS installation. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, May 20, 1993.]

[] **COLUMBIA: SPACELAB D-2 REMOVED**

In OPF Bay 2, technicians removed the Spacelab D-2 from Columbia and transported the module to the Operations and Checkout Building as part of post-STS 55 mission activities. The workers also performed an hydraulic power up and repositioned the vehicle's elevons. The payload bay doors latch and functional tests were completed, too. Currently, technicians are preparing for hypergolic deservicing; removing GAS cans from the payload bay; performing a draining procedure on the auxiliary power unit catch bottle; making post-mission main propulsion system inspections and making main engine post flight inspections. The SLS-2 mission sequence test is set for May 24-27. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, May 20, 1993.]

May 21: **STS 57: EVA SUITS INSTALLED**

The Space Shuttle Endeavour is at Launch Complex 39B awaiting the start of its STS 57 mission, now targeted for June 3, 1993. Workers have installed and checked out the extravehicular mobility units (spacesuits) in the Orbiter and have conducted liquid hydrogen and oxygen system leak checks. They have also checked the main engine number 1 high pressure fuel pump for leaks. Today pad technicians will take part in a flight readiness review for STS 57; continue an analysis of flexible joints in the main propulsion system; conduct a Spacehab late stowage demonstration and a helium signature test. STS 57 work scheduled: aft main engine compartment closeouts; main engine number 1 flight control checks and hypergolic purges. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, May 21, 1993.]

[] **ACTS-TOS TEST COMPLETED**

In OPF Bay 3, technicians have completed an ACTS-TOS verification test; flight control checkouts; hydraulic flight control system checkouts and integrated drag chute checks. Today workers are conducting inspections of flexible joints in the main propulsion system; main engine installation preparations; forward reaction control system (FRCS) installation preparations; orbital maneuvering system redundant electrical verifications and an ORFEUS-SPAS end-to-end test. The FRCS installation for STS 57 has been scheduled. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, May 21, 1993.]

[] **COLUMBIA: POST-FLIGHT PROCESSING**

Columbia continues to undergo STS 55 post-flight processing in OPF Bay 2. Workers there have removed the GAS cans from the Orbiter's payload bay. They have also removed the Spacelab D-2 module and transported it to the Operations and Checkout Building. They are finished with the auxiliary power unit catch bottle draining and a borescopic investigation of the 17-inch propellant lines and main propulsion system post flight inspections. Currently, OPF technicians are preparing Columbia for hypergolic deservicing; main engine post flight inspections; installations of the waste tank and stowing the Ku-band antenna. Scheduled activities include an SLS 2 mission sequence test May 24-27; accelerometer installation; removal of payload bay door strongbacks; and removal of the dome heat shields. Columbia's next mission - STS 58 - is targeted for early September and is expected to last 14 days. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, May 21, 1993.]

[] **STS 57: LAUNCH ON JUNE 3, 1993**

Launch of STS 57 has been officially set for June 3. The decision came today at the conclusion of a flight readiness review by NASA managers. The mission will see Space Shuttle Endeavour and her six person crew conduct a mission highlighted by the retrieval of the European observation satellite EURECA and the first flight of a commercial spacelab facility known as Spacehab. The June 3 date is based upon successful completion of work in progress to understand the cause of a noise/vibration event experienced during launch pad processing. The launch window on June 3 opens at 6:17 p.m. EDT and extends for 1 hour and 11 minutes. The limited launch window time is based on EURECA retrieval requirements. The mission duration is planned for 7 days. However, it may be extended by 1 day immediately after launch if projections calculated at that time for electrical power consumption permit an extra day in space. The extra day will give two members of Endeavour's crew the opportunity to perform an extravehicular activity (EVA) or spacewalk. The STS 57 EVA will be the second in a series of spacewalks designed to refine training methods and expand the EVA experience level of astronauts, flight controllers and instructors. The STS 57 spacewalk also will assist in refining several procedures being developed to service the Hubble Space Telescope on Shuttle Mission STS 61 in December. Leading the STS 57 crew will be Mission Commander **Ronald Grabe**. Pilot for the mission is **Brian Duffy**. Heading up the science team will be Payload Commander **David Low** who is also designated as Mission Specialist-1. The three other mission specialists for this flight are **Nancy Sherlock** (MS-2), **Jeff Wisoff** (MS-3) and **Janice Voss** (MS-4). This will be the fourth flight of Space Shuttle Endeavour and the 56th flight of the Space Shuttle system. [NASA/KSC Release: 57-93, May 21, 1993.]

May 22: **CRAWLERWAY RENOVATION**

The crawlerway at Kennedy Space Center will get its first complete refurbishment since 1965; the project will be implemented over the next 2 years. The crawlerway has continually withstood weights of up to 18 million pounds over the years so that the limerock is no longer level. NASA will use 280 million pounds of Alabama river rock to cover the crawler transporter's highway. That much rock would cover a football field to a depth of 140 feet; even so the huge quantity of rock will only cover the top layer of the crawlerway. [Halvorson, FLORIDA TODAY, p. 10E & 9E, May 23, 1993.]

May 23: **RED TIGRESS ROCKET LAUNCHED**

The Strategic Defense Initiative Organization, under its new name - Ballistic Missile Defense Organization - launch a Red Tigress rocket this morning at 5:17 a.m. The 15-minute suborbital flight was used to deploy 13 payloads which acted as nuclear warheads and decoys to test the military's ability to determine whether its sensors could distinguish between warheads and decoys in space. [Halvorson, FLORIDA TODAY, May 25, 1993.]

May 24: **STS 57: FRR COMPLETED**

The Flight Readiness Review for STS 57 has been completed with the result that the chosen launch date is June 3, 1993; the launch window extends from 6:17 p.m. until 7:28 p.m. The landing is targeted for 7 days, 23 hours later at Kennedy Space Center at approximately 5:14 p.m. The mission's seven-day length depends upon the cryogenics supplies. Workers at Launch Complex 39B conducted a Spacehab late stowage demonstration; conducted both a helium signature leak test and hypergolic purges. Finally, the pad crew conducted main engine number 1 flight control checks and heat shield installation. Today, the workers continued with aft engine compartment closeouts; continued with analysis of flexible joints in the main propulsion system; preparations for hypergolic pressurization and launch countdown preparations. STS 57 work scheduled includes: ordnance installation; pressurization of hypergolic fuel tanks and external tank purges. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, May 24, 1993.]

[] **STS 51: FRCS INSTALLATION**

In the Orbiter Processing Facility's Bay 3, technicians have installed Discovery's forward reaction control system (FRCS) and have conducted orbital maneuvering system redundant electrical verifications. They have also conducted an ORFEUS-SPAS end-to-end test; main engine installation preparations; integrated hydraulic operations and stacking of the left-hand solid rocket booster in the Vehicle

Assembly Building. Today, technicians are inspecting the flexible joints in Discovery's main propulsion system; making freon coolant loop checks and replacing temperature transducers; conducting Orbiter/payload pre-mate checkouts and stacking of the right-hand solid rocket booster in the Vehicle Assembly Building. STS 51 work scheduled: freon coolant loop servicing and Orbiter/FRCS interface verification checks. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, May 24, 1993.]

[] **STS 58: INSTALLATION OF WASTE WATER TANK**

In Orbiter Processing Bay 2, alongside Discovery, Columbia has had both its accelerometer and waste water tank installed. In other preparations for its next mission - STS 58 - the Ku-band antenna was stowed. Today, workers prepared the Orbiter for hypergolic deservicing; inspected the main engines; opened the payload bay doors and conducted an SLS-2 mission sequence test. STS 58 work scheduled: hypergolic deservicing and the removal of the dome heat shields. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, May 24, 1993.]

May 25: HELIUM SIGNATURE TEST COMPLETED

At Launch Complex 39B, workers have completed a helium signature test and hypergolic line purges on Endeavour. STS 57 processing activities today include: clearing the pad of all non-essential personnel; pressurization of hypergolic fuel and oxidizer tanks; ordnance installation; aft engine compartment closeouts; continued analysis of flexible joints in the main propulsion system and launch countdown preparations. Scheduled activities: external tank purges and final ordnance installation. STS 57 is targeted for launch on June 3 with a KSC landing nearly eight days later at KSC. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, May 25, 1993.]

[] **STS 51: SET FOR MID-JULY**

Freon coolant loop checks and replacement of a temperature transducer (sensor) have been accomplished during Discovery's processing in OPF Bay 3. Orbital maneuvering system redundant electrical verifications,main engine installation preparations and integrated hydraulic operations have also been completed. Currently, technicians are servicing freon coolant loops; conducting Orbiter/payload pre-mate checkouts; potable water servicing; lowering nose landing gear; performing auxiliary power unit leak and functional checks and stacked the right hand solid rocket booster in the Vehicle Assembly Building. Scheduled STS 51 work includes checks to verify the Orbiter/FRCS interface and to determine whether the external tank doors are functional. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, May 25, 1993.]

[] **STS 58: COLUMBIA'S PROCESSING STATUS**

Columbia's payload bay doors have been opened and preparations have been made to deservice the Orbiter's hypergolics and to install the waste water tank. Currently, OPF technicians are configuring the payload bay for receiving the SLS-2. They are also preparing to deservice the Orbiter's hypergolics; remove the dome heatshields; replace the main landing gear tires; conduct the main engine flight inspections and the SLS-2 mission sequence test. STS 58 work scheduled: auxiliary power unit lube oil servicing and a TACAN system test. [KENNEDY SPACE CENTER SHUTTLE STATUS REPORT, May 25, 1993.]

[] **ANALEX: TOP SMALL FIRM AT KSC**

The Brevard Small Business Assistance Council today named Titusville's Analex Space Systems Inc. the premier small business at Kennedy Space Center. "Their performance has been very, very good," said NASA's **Anne Watson**. "It is a very professional company." Last year Analex won KSC's small contractor award. ["Liden, FLORIDA TODAY, p. 18C, May 26, 1993.]

May 26: **STS 57: SPRING MAY BE DAMAGED**

There is a concern among launch managers that a misplaced inspection stamp [penetration verification stamp] on a spring in the high pressure oxidizer turbopump (HTOTP) on Endeavour's main engine number 2. Evidence was disclosed by the engine manufacturer, Rocketdyne, that indicates the misplaced stamp may reduce the strength of the spring. The springs are designed to keep the pump's ball bearings in place. A decision whether to replace the pump or to fly as is, is expected within 24 hours. Meanwhile technicians at Launch Complex 39B have completed the Orbiter's helium signature test; they have also pressurized the hypergolic fuel and oxidizer tanks and installed the mission ordnance. Currently, technicians are conducting aft engine closeouts; analyzing flexible joints in the main propulsion system and preparing for the launch countdown. External tank purges and final ordnance installation will be completed shortly. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, May 26, 1993; Banke, FLORIDA TODAY, p. 6A, May 26, 1993.]

[] **STS 58: KU-BAND ANTENNA DEPLOYED**

In OPF Bay 2, technicians have deployed the Orbiter's Ku-Band Antenna and inspected the vehicle's payload bay radiators. The payload bay doors have been opened and preparations for hypergolic deservicing have been concluded. The waste water tank has also been installed. Today's processing activities include: configuring Columbia's payload bay for part of its STS 58 cargo, the SLS-2. The dome heat shields from the main engines are being removed and the landing gear

tires are being replaced. Main engine post flight inspections continue along with an SLS-2 mission sequence test. Scheduled STS 58 activities: auxiliary power unit lube oil servicing; TACAN system testing; fuel cell single voltage tests and hypergolic deservice operations. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, May 26, 1993.]

[] **TWO MISSIONS TO REPAIR HUBBLE**

An independent task force has recommended that NASA use two Shuttle missions to repair the Hubble Space Telescope. The group believes that NASA may have too much work to do on the HST for one mission and suggests a second mission to take place no later than 6 to 12 months after the December 1993 repair mission. The second mission, the group said, should "complete any unfinished tasks and correct new problems and anomalies which may develop." **Joseph Shea**, an adjunct professor of aeronautics and astronautics at the Massachusetts Institute of Technology, headed the task force. Other members included: MIT professor **Eugene Covert** and former Apollo astronaut **Thomas Stafford**. NASA spokesman **Dave Garrett** acknowledged that the agency is studying the report. [Halvorson, FLORIDA TODAY, p. 1A-2A, May 27, 1993.]

May 27: **STS 57: DELAY NOT OFFICIAL, YET**

The concern still exists regarding a spring in the high pressure oxidizer turbopump on Endeavour's main engine number 2 that has a misplaced inspection stamp (penetration verification stamp). Mission managers are discussing whether or not the misplaced stamp could reduce the strength of the spring which is designed to keep the turbopump's ball bearings in place and reduce vibration. NASA spokeswoman **Lisa Malone** said that, in main engine manufacturer Rocketdyne's California plant, additional tests are underway. A decision on replacing the pump has not yet been made and work continues toward a June 3 launch. Mass memory unit loads and hypergolic fuel tank pressurization have been completed. Today, workers at Launch Complex 39B are completing aft engine compartment closeouts; external tank purges; launch countdown preparations and SHOOT payload health checks. STS 57 work scheduled: installation of aft compartment doors; final ordnance installation; start of the countdown at 11:00 a.m. Monday (May 31); crew arrival set for 3:30 p.m. on the 31st; final servicing of the SHOOT payload with liquid helium and closing of the payload bay doors for flight. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, May 27, 1993; Banke, FLORIDA TODAY, p. 6A, May 27, 1993.]

[] **STS 51: OMS WORK COMPLETED**

The Space Shuttle Discovery remains in Orbiter Processing Facility Bay 3 where the vehicle is being readied for its mid-July STS 51 mission. Completed tasks

include: freon coolant loop checks/temperature transducer replacement; auxiliary power unit leak and functional checks; orbital maneuvering system redundant electrical verifications and aft control checkouts and main engine installation preparations. Today, OPF workers are servicing freon coolant loops; conducting forward reaction control system (FRCS) electrical mates to the Orbiter; external tank doors functional checks; Orbiter/payload pre-mate checkouts; stacking of right hand solid rocket booster in the Vehicle Assembly Building. Orbiter/FRCS checks are scheduled along with the installation of the vehicle's main engines. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, May 27, 1993.]

[] **STS 58: TACAN SYSTEM TEST DONE**

Columbia continues to undergo processing for its next mission - STS 58. The Orbiter's TACAN system has been tested; the payload bay doors have been cycled; the landing gear tires have been changed and the dome heat shields have been removed from the main engines. Today in OPF Bay 2, technicians will configure Columbia's payload bay for the SLS-2 payload; perform liquid hydrogen line leak and functional checks; preparations to remove the main engines; hypergolic deservice preparations; SLS-2 mission sequence test. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, May 27, 1993.]

[] **NASA: TURBOPUMP TO BE REPLACED**

NASA managers have decided to changeout Space Shuttle Endeavour's #2 main engine liquid oxygen turbopump because of an issue which was raised with a part on the pump. The decision to remove and replace the pump will move the launch of Endeavour on Shuttle Mission STS 57, originally set for June 3, to sometime around mid-June. A firm launch date will be set after the replacement pump has been installed and checked out. The specific issue with the turbopump is with one of two springs which are designed to keep the pump's ball bearings in place and in their proper positions. During inspection of the pump, engineers discovered evidence of an inspection etch mark in a high stress region of the spring. While there is data which indicates the spring will work as designed, NASA managers decided to replace the unit since they could not firmly determine that the pump would operate in a safe manner. If a spring were to fail, the rotor position may not be held accurately and the potential exists for higher vibration. Springs are etched for a variety of reasons. They are marked to document individual serial numbers, to verify that materials penetration inspections have been complete, and/or to note that the part has been used in ground test operations. The misplaced etch mark on Endeavour's engine was a penetration verification stamp. The pumps on the main engines to be used on the upcoming flights of Space Shuttle Discovery (STS 51/July 1993) and Space Shuttle Columbia (STS 58/September 1993) will be examined as part of their pre-launch processing.

[[LAUNCH ADVISORY - JUNE 3 LAUNCH OF ENDEAVOUR POSTPONED, May 27, 1993, 6:00 p.m.]

[] **ENDEAVOUR'S DELAY IMPACTS LATER FLIGHTS**

Because of the delay caused by a suspect turbopump in Endeavour, other Shuttle flights will be impacted. Specifically, the December HST repair mission may slip until early January, according to NASA officials. Inspections showed that a small spring inside the turbopump attached to main engine #2 was marked with a quality stamp of approval in the wrong place. NASA spokesman **Mitch Varnes** said, "Although we believe the turbopump may be acceptable, we can't conclusively prove that it is, so changing out the pump is the safest way to go." Meanwhile, NASA is reviewing the quality control practices of Rocketdyne which makes the turbopump. "I think we've gone back to do a very thorough self-reassessment and look in the mirror to make sure that we uncover every issue," said Rocketdyne's **Al Halladen**, vice president in charge of main engines at Rocketdyne. He added, "It's a business where 100 percent is the minimum requirement." Problems with Rocketdyne engine hardware have already played a part in four delays this year. [Banke, FLORIDA TODAY, p. 4A, May 28, 1993.]

[] **FREEDOM SAILS THROUGH BUDGET TEST**

The same subcommittee which two years ago voted to kill the Space Station Freedom Program has endorsed a new NASA budget proposal for the program though with a reduction from $2.1 billion to $1.85 billion. A spokesman for Rep. **Jim Bacchus** (D-Merritt Island), said: "This is the first step to preserving Space Station funding, and it really sailed through. It is a much more positive show of support than we had anticipated." Referring to the smaller budget figure, the spokesman said, "We will be talking to NASA to make sure safety isn't compromised with that lower figure." [Halvorson, FLORIDA TODAY, p. 4A, May 28, 1993.]

May 28: **STS 57: TURBOPUMP REPLACEMENT**

A decision was made last night to replace the high pressure oxidizer turbopump on Endeavour's main engine number 2. Officials could not conclusively determine whether the misplaced inspection stamp on an internal spring could reduce its strength. The spring is designed to keep the turbopump's ball bearings in place and reduce vibration. Also last night, officials determined the most probable cause for the loud noise and vibration in Endeavour's aft compartment last month. Tests conducted at the manufacturing plant proved that a loud noise and vibration could be caused by the ball strut tie-rod assembly, inside the 17-inch liquid hydrogen line. Workers at Launch Complex 39B have conditioned the liquid oxygen portion of the external tank. Today, pad workers will remove the heat shields

around No. 2 main engine; prepare to remove the suspect oxidizer turbopump and the launch team will begin backing out of launch countdown preparations. The turbopump itself will be removed next week. [Date, THE ORLANDO SENTINEL, May 28, 1993; KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, May 28, 1993.]

[] **STS 51; STS 58 UPDATES**

The Space Shuttle Discovery is undergoing pre-rollover preparations in OPF Bay 3 for its upcoming STS 51 mission. Workers have completed functional checks of the external tank doors and connected the forward reaction control system to the Orbiter. Today, work includes: payload interface verification tests; freon coolant loop servicing; and Orbiter/payload pre-mate checkouts. Mating of the external tank to Discovery's solid rocket boosters will occur next week. The STS 51 mission is slated to last nearly 10 days and is expected to commence in mid-July. Columbia is undergoing processing operations for its STS 58 mission, currently scheduled for mid-September. Today, OPF workers in bay 2 are conducting fuel cell voltage tests; configuring the payload bay of Columbia for SLS-2; preparing to remove the Orbiter's main engines and are conducting hypergolic deservice preparations. Scheduled STS 58 activities include: removal of the vehicle's main engines; auxiliary power unit lube oil servicing; hypergolic deservice operations. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, May 28, 1993.]

May 29: LAUNCH DATE DEPENDENT ON PUMP REPLACEMENT

"We're not going to be able to nail down a new launch date [for Endeavour's STS 57 mission] until we can get the [suspect turbopump] removed and replaced," said **Lisa Malone**, Kennedy Space Center News Chief. Replacement is set to begin next week and new certification tests will be conducted. The Memorial Day holiday will cause a pause in the processing efforts at Launch Complex 39B. [Halvorson, FLORIDA TODAY, p. 1A, May 30, 1993.]

JUNE

June 1: **STS 57: ENDEAVOUR'S HEAT SHIELDS REMOVED**

Endeavour's heat shield around main engine number 2 have been removed by workers at Launch Complex 39B; the external tank has also been purged. Today workers will be conducting pressurization checks of the reaction control system and the orbital maneuvering system. They will also prepare to remove and replace the high pressure oxidizer turbopump (also known as HPOTP) from main engine number 2. The removal and replacement of the HPOTP is set for June 3. The STS 57 mission is scheduled to last for 7 days and 23 hours providing the cryogenic supply is sufficient for the mission's duration. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, June 1, 1993.]

[] **STS 51 ACTIVITIES**

Discovery remains in OPF Bay 3 undergoing pre-rollover processing activities. Completed tasks include: functional checks of the external tank doors; FRCS electrical mates to the Orbiter; IMAX/Orbiter interface verification test; orbital maneuvering system redundant electrical verifications and aft control checkouts and main engine installation preparations. Today workers will conduct Orbiter/payload pre-installation testing and Orbiter/payload pre-mate checkouts. STS 51 work scheduled includes: Orbiter/forward reaction control system (FRCS) interface verification checks; installation of main engines; freon coolant loop servicing; external tank/solid rocket booster mate on June 2. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, June 1, 1993.]

[] **STS 58: TACAN TEST**

In OPF Bay 2, work on Columbia's upcoming STS 58 mission continues; the payload bay doors have been cycled; the TACAN system has been tested and the landing gear tires have been replaced. The dome heatshields have been removed from the Orbiter's main engines and fuel cell voltage tests are completed. Today, workers will configure Columbia's payload bay to receive the SLS 2; conduct liquid hydrogen line leak and functional checks; prepare to remove the main engines and conduct hypergolic deservicing operations. Scheduled STS 58 work: removal of main engines; auxiliary power unit lube oil servicing and hypergolic deservice operations. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, June 1, 1993.]

[] **SPACE STAMP CEREMONY AT SPACEPORT USA**

The U. S. Postal Service today unveiled its latest space-theme stamp at Spaceport USA. The $2.90 stamp features the image of a futuristic space plane soaring

through space. Deputy Postmaster General **Michael S. Coughlin** and KSC Director **Robert L. Crippen** were on hand to dedicate the stamp in a ceremony inside the Spaceport Central annex of Kennedy Space Center's visitor's complex. Stamps with space themes have historically been favorites among both philatelists and collectors of space memorabilia. Popular stamps of the past include a 1969 issue commemorating the manned lunar landing and a 1992 joint venture with Russia that culminated in the release of four stamps depicting international cooperation in space exploration. The Titusville Postmaster established a temporary post office facility at the Spaceport to sell the stamp. [NASA/KSC Release No. 60-93, June 1, 1993; Halvorson, FLORIDA TODAY, p. 5A, June 3, 1993.]

[] **PAPERWORK DELAYED ENDEAVOUR LAUNCH**

Paperwork mistakes at Rocketdyne's California plant resulted in a two-week delay in the launch of Endeavour and may yet impact the mid-July launch of Discovery on STS 51, according to a top NASA manager. Shuttle Program Director **Tom Utsman** said that the quality control foul-up was traced to an inadequate paperwork system at Rocketdyne's engine plant in Canoga Park, CA. Utsman added, "We did not have good manufacturing controls, and we're going to correct that." Paperwork problems at Rocketdyne delayed another Shuttle mission earlier this year, according to NASA officials. [Halvorson, FLORIDA TODAY, pp. 1A-2A, June 2, 1993.]

June 2: **STS 57: ENGINE LOCKS INSTALLED**

Endeavour's engine locks have been installed and tests of the microwave landing system have been finished. Today, workers at Launch Complex 39B are conducting operations to remove and replace the high pressure oxidizer turbopump (HPOTP) on main engine number 2; pressurization checks and trickle purge of the reaction control system (RCS) and the Orbital Maneuvering System (OMS). STS 57 work scheduled includes: hypergolic depressurization; securing the newly installed HPOTP and conducting engine and HPOTP checks. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, June 2, 1993.]

[] **DISCOVERY: STS 51 PROCESSING UPDATE**

Orbiter/payload pre-installation and interface verification tests on Discovery in OPF Bay 3 have been completed. Other finished tasks include: functional checks of the external tank doors; forward reaction control system (FRCS) electrical mates to the Orbiter; orbital maneuvering system (OMS) aft control checkouts; and main engine installation preparations. Today, workers will mate the STS 51 tank to its solid rocket boosters in Vehicle Assembly Building high bay 1 and service the freon coolant loop. STS 51 work scheduled: microwave landing system tests;

Orbiter/forward reaction control system interface verification checks; crew equipment interface tests. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, June 2, 1993.]

[] **STS 58: LEAK AND FUNCTIONAL TESTS**

In Orbiter Processing Facility (OPF) bay 2, technicians have completed liquid hydrogen line leak and functional checks on Columbia. Today, STS 58 preparations include: orbital maneuvering system quick disconnect checks; removing and replacing the thruster from the left OMS pod; hypergolic deservicing preparations; configuring the payload bay to receive SLS-2; preparations to remove the main engines and operations to remove the fifth cryogenic tank set. Removal of the main engines and hypergolic deservicing operations are scheduled. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, June 2, 1993.]

[] **CAMERA ON ITS WAY TO KSC VIA GODDARD**

The Jet Propulsion Laboratory's new Wide Field/Planetary Camera, designed to replace the current camera on board NASA's orbiting Hubble Space Telescope, was shipped yesterday to Goddard Space Flight Center (Greenbelt, MD) for testing before being sent on to Kennedy Space Center for integration with the Space Shuttle, according to **Larry Simmons**, WF/PC-2 Program Manager at JPL. "The Wide Field/Planetary Camera-2 was designed to restore nearly all of the original imaging capability lost when an optical flaw was discovered in the Hubble telescope's primary mirror," Simmons said. "We modified the camera's internal relay optics and made several other design changes to enhance WF/PC-2's overall imaging capability." After the camera has been tested at Goddard, it will be delivered in mid-September to Kennedy Space Center, where it will be readied for a December 2, 1993, launch aboard the Space Shuttle Endeavour. The camera is expected to be installed on the orbiting telescope on the third day of astronaut extravehicular activities during STS 61, the first of several Hubble Space Telescope servicing missions designed to replace major components of the space telescope and science instruments. About one month after installation, the new camera will be ready to begin imaging science targets with its three wide-field camera systems and one planetary camera system. The wide-field cameras will provide extraordinary sensitivity for the detection of star clusters and distant galaxies, while the planetary camera will perform high-resolution studies of individual objects, including planets and their satellites, nearby galaxies and other stellar objects. WF/PC-2 will be able to detect objects 100 times fainter than those visible from Earth-based telescopes, with about 10 times greater spatial resolution. The camera also has the unique capability of imaging in the far ultraviolet, a capability that is impossible from ground-based telescopes and limited, at best, from space. The Wide Field/Planetary Camera-2 was designed

and built by the California Institute of Technology's Jet Propulsion Laboratory for NASA's Office of Space Science. [JET PROPULSION LABORATORY PRESS RELEASE, June 2, 1993.]

June 3: **STS 57: TURBOPUMP REMOVED**

A suspect high pressure oxidizer turbopump has been removed from main engine number 2 at LC 39B. In process today: the installation of a new HPOTP on Endeavour's main engine; re-positioning of the Orbiter's body flap and main engines 1 and 3 for HPOTP installation and powerhead checks; pressurization checks and trickle purge of the reaction control system and orbital maneuvering system. STS 57 work scheduled: hypergolic depressurization and engine and HPOTP leak checks. [Halvorson, FLORIDA TODAY, p. 5A, June 3, 1993; Peltz, LOS ANGELES TIMES, June 3, 1993; KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, June 3, 1993.]

[] **STS 51: TANK/BOOSTER MATING**

Technicians in OPF Bay 3 have completed the external tank/solid rocket booster hard mating for the STS 51 mission of Discovery. Also completed: freon coolant loop servicing and Orbiter/payload pre-installation and interface verification tests. Today, workers will implement Orbiter aft compartment closeouts and electrical mating of the external tank and solid rocket boosters in the VAB's high bay 1. STS 51 work scheduled: microwave landing system tests; Orbiter/forward reaction control system interface verification checks and crew equipment interface tests. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, June 3, 1993.]

[] **STS 58: PAYLOAD BAY READIED FOR SLS-2**

Columbia is being processed for its STS 58 mission in Orbiter Processing Facility Bay 2; technicians there have completed liquid hydrogen line leak and functional checks. Today's processing activities include: orbital maneuvering system hypergolic deservice preparations; auxiliary power unit catch bottle drain; removal and replacement of the thruster from the left OMS pod; configuring the payload bay for SLS-2; preparations to remove the main engines and operations to remove the fifth cryogenic tank set. Removal of the main engines and hypergolic deservice operations are scheduled. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, June 3, 1993.]

June 4: **STS 57: TURBOPUMP ATTACHED TO ENGINE**

"Things are going well. We're looking at getting the [turbopump replacement] completed late Tuesday or early Wednesday," said KSC spokesman **Bruce**

Buckingham. Endeavour was brought a bit closer to launch-ready status by the bolting of the replacement high pressure oxidizer turbopump to main engine number 2. Workers at Launch Complex 39B also repositioned the Orbiter's body flap and main engines 1 and 3 and completed HPOTP powerhead checks. Today workers preparing Endeavour for its STS 57 mission are securing the new turbopump to engine number 2 and conducting pressurization checks and a trickle purge of the vehicle's reaction control system and its orbital maneuvering system. STS 57 work scheduled: engine and HPOTP leak checks and a helium signature leak test. Launch is currently targeted for the third weekend in June. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, June 4, 1993; Banke, FLORIDA TODAY, p. 6A, June 5, 1993.]

[] **STS 51: TANK AND BOOSTER MATING**

Freon coolant loop sampling has been completed in OPF Bay 2 where technicians are preparing Discovery for the STS 51 mission. Workers have also completed the external tank/solid rocket booster hard mate and Orbiter/payload pre-installation and interface verification tests. Today, workers are conducting aft compartment closeouts; Orbiter mid-body closeouts; external tank/solid rocket booster electrical checks in the VAB high bay 1 and tests of the microwave landing system. STS 51 tasks scheduled: Orbiter/forward reaction control system (FRCS) interface verification checks; crew equipment interface tests; main landing gear functional checks. The STS 51 mission will have a crew of five and, after its mid-July launch, is set to last 9 days/22 hours. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, June 4, 1993.]

[] **COLUMBIA: PROCESSING UPDATE**

Columbia is being processed for its mid-September STS 58 mission. Technicians have been working on the oldest Space Shuttle in OPF Bay 2 and have removed and replaced a thruster from the left OMS pod. Today, the OPF workers have conducted operations to remove Columbia's fifth cryogenic tank set; conducted orbital maneuvering system hypergolic deservice preparations; commenced an auxiliary power unit catch bottle drain; configured the payload bay for SLS-2; and prepared to remove the vehicle's main engines. This weekend the OPF bay will be closed for hypergolic deservice operations; the main engines will also be removed. The STS 58 crew will number seven persons and is planned to last 14 days. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, June 4, 1993.]

June 5: **COMPUTER CONTRACT COMPLETED EARLY**

Honeywell Inc.'s Space System Division (Clearwater, FL) recently delivered the final shipment of 30 main engine controllers to main engine manufacturer

Rocketdyne. The shipment came two years ahead of schedule and at a final cost of $79 million rather than the $90 million that Rocketdyne had agreed to pay Honeywell. ["Contract Completed Early," FLORIDA TODAY, June 6, 1993.]

June 7: **ENDEAVOUR: TURBOPUMP CHECKS**

Endeavour's new turbopump [HPOTP] has undergone preliminary leak checks and torque checks on main engine number 2. Today, further STS 57 activities are underway: securing the new high pressure oxidizer turbopump (HPOTP) to main engine number 2; reaction control system helium tank pressurization and pressurization checks and trickle purge of the reaction control system and the orbital maneuvering system. STS 57 tasks scheduled are: engine leak checks; engine 2 heatshield installation and a helium signature test. The STS 57 mission duration is planned for 7 days/23 hours if a sufficient cryogenic supply lasts. The target date for launch is June 20 with a June 28 landing at Kennedy Space Center. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, June 7, 1993.]

[] **STS 51: CEIT FINISHED**

Processing work continues for Discovery's STS 51 mission which is expected to commence in mid-July. Workers in OPF Bay 3 have conducted crew equipment interface tests; nose landing gear functional checks; microwave landing system tests; and external tank/solid rocket booster electrical checks in VAB high bay 1. Today workers continued with Orbiter aft compartment closeouts; Orbiter mid-body closeouts; and preparations to replace the Ku-band deploy assembly. STS 57 work scheduled: main landing gear functional tests; closing payload bay doors and aerosurface checks and operations. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, June 7, 1993.]

[] **STS 58: OMS POD THRUSTER REPLACED**

In OPF Bay 2, workers have replaced the thruster from the left OMS pod of Columbia; the eldest of all Shuttles is being readied for a mid-September STS 58 mission. Workers have also finished the auxiliary power unit catch bottle drain and the orbital maneuvering system hypergolic deservice preparations. Today the OPF workers are conduction operations to remove the fifth cryogenic tank set from the Orbiter; configuring the payload bay to receive the SLS-2; preparing to remove the Ku-band deploy assembly and preparing to remove the vehicle's main engines. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, June 7, 1993.]

[] **ENDEAVOUR TO LAUNCH JUNE 20**

NASA managers today set June 20, 1993, as the new launch date for the next flight of the Shuttle system. The STS 57 mission will see Space Shuttle Endeavour and her six person crew conduct a mission highlighted by the retrieval of the European observation satellite EURECA and the first flight of a commercial spacelab facility known as Spacehab. The decision to go with a June 20 launch date follows the completion of work to remove and replace the liquid oxygen turbopump from Endeavour's main engine #2. The pump was changed out because of an issue which was raised with a part on the pump. The decision to remove and replace the pump delayed the launch of Endeavour which was originally scheduled for June 3. The launch window for June 20 opens at 9:37 a.m. EDT and extends for 1 hour and 11 minutes. The limited launch window time is based on EURECA retrieval requirements. The mission duration is planned for seven days. However, it may be extended by one day immediately after launch if projections calculated at that time for electrical power consumption permit an extra day in space. The extra day will give two members of Endeavour's crew the opportunity to perform an extravehicular activity (EVA) or spacewalk. This will be the fourth flight of Endeavour and the 56th flight of the Space Transportation System. [**NASA/KSC Release No. 61-93**, June 7, 1993.]

June 8: **ENDEAVOUR: COUNTDOWN FOR STS 57**

The countdown for STS 57, Endeavour's fourth launch, will begin at 2:00 a.m. on June 17; launch is set for 9:37 a.m. EDT on June 20. Workers at Launch Complex 39B have completed preliminary HPOTP checks and torque checks on main engine #2. Today, workers are securing the new turbopump on main engine #2; conducting reaction control system helium tank pressurization; and pressurization checks and trickle purges of the reaction control system and the orbital maneuvering system. STS 57 work scheduled: engine leak checks June 9 and engine 2 heatshield installation and a helium signature test. [Halvorson, FLORIDA TODAY, p. 1A, June 8, 1993; KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, June 8, 1993.]

[] **STS 51: ORFEUS/ACTS-T0S**

Workers in Orbiter Processing Facility Bay 3 have installed Discovery's hot water tank and conducted nose landing gear checks. Today, OPF workers are making Orbiter mid-body, forward and aft closeouts; removing the Ku-band deploy assembly; conducting holddown post closeouts in the VAB on the mobile launcher platform; performing aerosurface checks and operations and implementing landing gear functional tests. Scheduled STS 51 work: OMS pod structural leak checks; closing payload bay doors for the rollover to the Vehicle Assembly Building.

[KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, June 8, 1993.]

[] **STS 58: ENGINE REMOVAL PREPARATIONS**

In OPF Bay 2 preparations continue for Columbia's STS 58 mission targeted for mid-September. Workers have completed: preparations for engine removal; auxiliary power unit catch bottle drain; orbital maneuvering system hypergolic deservice operations; removal and replacement of the thruster from the left orbital maneuvering system pod. Workers today began operations to remove the fifth cryogenic tank set; remove the main engines from Columbia; configure the payload bay to receive the SLS-2; drag chute installation; remove the Ku-band deploy assembly; preparations to install the extended duration orbiter (EDO) pallet. Waste containment system checks and tests are scheduled. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, June 8, 1993.]

June 9: **STS 57: PRELIMINARY LEAK CHECKS DONE**

The countdown for STS 57 will begin at 2:30 a.m. on June 17. Preliminary high pressure oxidizer turbopump leak checks of Endeavour's main engine number 2 have been completed at Launch Complex 39B; workers have also finished the reaction control system helium tank pressurization. Today, workers are completing the securing operations of the new turbopump installed on main engine #2; leak checks of main engine number 2 and engine 2 heatshield installation have also been finished. STS 57 work scheduled: helium signature test; flight readiness test; launch countdown preparations; final helium servicing of the SHOOT payload. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, June 9, 1993.]

[] **STS 51: PRE-LAUNCH PREPARATIONS**

The Space Shuttle Discovery remains in Orbiter Processing Facility Bay 3 where the vehicle is being readied for its STS 51 mission July 17. The mission will require a crew of six and last 9 days/22 hours. Technicians have completed main landing gear functional tests; aerosurface and flight control final cycling and checks; and removed the Ku-band deploy assembly. Today workers are installing Columbia's Ku-band deploy assembly inside Discovery. They are also conducting Orbiter mid-body, forward and aft closeouts and completing holddown post closeouts in the VAB's mobile launcher platform. STS 51 activities scheduled: testing of the newly installed Ku-band assembly and antenna; closing the payload doors for the rollover to the VAB and preparing for main engine installation. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, June 9, 1993.]

[] **STS 58: COLUMBIA PROCESSING UPDATE**

Columbia continues to undergo preparations inn OPF Bay 2 for its upcoming STS 58 mission. The vehicle's Ku-Band deploy assembly has been removed and preparations made for engine removal. Today workers will prepare to install the extended duration orbiter pallet and conduct waste containment system checks and tests. The EDO pallet installation is scheduled. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, June 9, 1993.]

[] **LOOSE SCREW DOOMED ATLAS LAUNCH**

"You don't ever want to lose a bird, but to have it come from something like this is just unfortunate," said Hughes Communications Director **Don O'Neal** about the recent Atlas launch failure. That failure has been attributed to a loose screw in the first stage Rocketdyne engine which led to a series of events which resulted in loss of thrust and failure of the mission. General Dynamics spokeswoman **Julie Andrews** said, "This was basically a workmanship problem; it was a quality control problem." [Halvorson, FLORIDA TODAY, pp. 1A-2A, June 9, 1993; Date, THE ORLANDO SENTINEL, June 9, 1993.]

June 10: **STS 57: MAIN ENGINE LEAK CHECKS**

Main engine #2 leak checks have been completed at Launch Complex 39B where Endeavour awaits the start of its STS 57 mission; liftoff is set for June 20 at 9:37 a.m. EDT. Workers at the pad also completed securing operations of the new replacement high pressure oxidizer turbopump (HPOTP) to main engine #2. Installation of engine #2's heatshield begins today. Other STS 57 work scheduled: launch countdown preparations; helium signature test (June 11); flight readiness test (June 12); beginning aft compartment closeouts; external tank purges; ordnance installation and final helium service of the SHOOT payload. STS 57 is planned to last 7 days and 23 hours, cryogenics permitting. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, June 10, 1993.]

[] **STS 51: HOLDDOWN POST CLOSEOUTS**

In the VAB, workers on the STS 51 mission processing team have completed holddown post closeouts in the mobile launcher platform. In OPF Bay 3, technicians have installed the Ku-Band deploy assembly shipped to KSC from California and conducted aerosurface and flight control final cycling and checks. The Ku-Band deploy assembly will be tested today and workers will implement Orbiter mid-body, forward and aft closeouts and make preparations for main engine installation. STS 51 work scheduled: closing payload bay doors for rollover and proceed with main engine installation on June 12. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, June 10, 1993.]

[] **STS 58: COLUMBIA PROCESSING STATUS**

The Space Shuttle Columbia continues to undergo processing for its mid-September STS 58 mission. In OPF Bay 2, technicians have removed Columbia's fifth cryogenic tank set, all three main engines and the vehicle's Ku-Band deploy assembly. Today preparations continue to install the extended duration Orbiter (EDO) pallet in Columbia and workers will conduct waste containment system checks and tests. The Orbiter's drag chute and the EDO are scheduled for installation. Columbia's 14-day mission will carry seven crew members to an orbital altitude of 176 miles. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, June 10, 1993.]

[] **OPTION B HAS BROAD SUPPORT**

Broad support has surfaced for "Option B," the second of three new Space Station proposals that NASA will present to President **Clinton** this week. Senator **Barbara Mikulski** (D-MD) said, " My recommendation to the vice president (Al Gore) would be to go with (the Freedom-derived) option. I think we get more science with minimum disruption (to the Station program). The key players on this issue and the ones who've been at this the longest seem to favor it." The plan would cost $19.3 billion to construct and put astronauts to work on it. The plan is also the favorite of NASA's partners - Canada, Japan and the European Space Agency - in part because the option uses European-developed equipment. Maryland, which Mikulski represents in the United States Senate, is home to the Goddard Space Flight Center (Greenbelt, MD), near Washington, D.C. [Banke, FLORIDA TODAY, pp. 1A-2A, June 7, 1993; Eisler, FLORIDA TODAY, pp. 1A-2A, June 8, 1993; Holton, THE ORLANDO SENTINEL, June 8, 1993; Eisler, FLORIDA TODAY, p. 1A, June 9, 1993; Holton, THE ORLANDO SENTINEL, June 10, 1993; Banke, FLORIDA TODAY, June 10, 1993; Eisler, FLORIDA TODAY, p. 1A, June 11, 1993.]

June 11: **STS 57: HEATSHIELD INSTALLED**

At Launch Complex 39B, technicians have completed both the installation of the main engine number 2 heatshield and preparations for today's helium signature test. Other activities occurring today: launch countdown preparations and the start of aft compartment closeouts. Scheduled STS 57 work: flight readiness test (June 12); external tank purges (June 14); ordnance installation (June 15); countdown beginning at 2:30 a.m. (June 17); crew arrival at KSC at 3:30 p.m. (June 17). [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, June 11, 1993; Banke, FLORIDA TODAY, p. 5A, June 12, 1993.]

[] **STS 51: KU-BAND INSTALLATION**

In OPF Bay 3, Discovery has had its Ku-band deploy assembly installed and technicians completed aerosurface and flight control final cycling and checks. Today, Discovery's pre-STS 51 processing includes: a test of the Ku-band deploy assembly; Orbiter mid-body, forward and aft closeouts and preparations for main engine installation. STS 51 work scheduled: final payload bay cleaning; main engine installation (June 12 and June 14) and closing of the payload bay doors for rollover to the Vehicle Assembly Building. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, June 11, 1993.]

[] **STS 58: MAIN ENGINES REMOVED**

All three of Columbia's main engines have been removed as part of the processing efforts for its next flight: STS 58, targeted for mid-September. Cabin heat checks and removal of the fifth cryogenic tank set have also been accomplished. Today preparations are underway to install the extended duration Orbiter (EDO) pallet; make waste containment system checks and tests; install the drag chute. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, June 11, 1993.]

[] **WHITE HOUSE PANEL EYES STATION PLANS**

All three plans submitted by NASA to the Clinton Administration are feasible and would cost less than the $34 billion currently projected. None, however, were within spending limits set by the president. The panel said two of the three were "most deserving of further consideration." The third option, Plan B, was rejected as being too similar to the old design. President **Clinton** has not yet chosen a plan he would support. ["Space Station: Truth, Whole Truth, Nothing But Truth," THE ORLANDO SENTINEL, June 6, 1993; "Panel Likes Options A & C for Station," FLORIDA TODAY, p. 1A, June 12, 1993.]

June 12: **PRE-LAUNCH PACE PICKS UP**

"We're right on schedule for our launch on Father's Day. Everything is going fine, and we are not working on any problems," said KSC spokesman **Bruce Buckingham**. Barring the unforeseen, launch is set for June 20 at 9:37 a.m.; the launch window extends until 10:48 a.m. EST. [Halvorson, FLORIDA TODAY, p. 1A, June 13, 1993.]

[] **GRINDLE WINS SERVICE MEDAL**

Douglas Grindle was recently awarded NASA's Public Service Medal by Kennedy Space Center Director **Robert L. Crippen**. Grindle is Vice President and Director of Human Resources for Lockheed Space Operations Co. which processes Shuttles for launch at KSC. He was recognized specifically for creating and executing an effective plan for reducing the number of Shuttle workers at KSC without adversely affecting processing schedules, safety or efficiency. ["Human Resources Director Wins Service Medal," FLORIDA TODAY, p. 9E, June 13, 1993.]

June 13: **DEKE SLAYTON: DEAD AT 69**

One of the original Mercury 7 astronauts, **Donald K. "Deke" Slayton** died today of brain cancer; he was 69. He is survived by his wife, Bobbie, and stepdaughter, Stacy. Slayton died at his home in League City, TX. Memorial services for Slayton have been set for 1 p.m. CDT Saturday, June 19, at the Johnson Space Center. The family requests that memorials be sent to The Mercury Seven Foundation at 6225 Vectorspace Boulevard, Titusville, FL, 32780; or to Give Kids the World at 210 S. Bass Road, Kissimmee, FL, 34746. "Deke will be remembered for the significant contributions he made to NASA," said KSC Director **Robert L. Crippen** whom Slayton hired as an astronaut in 1969. Crippen added, "He combined courage and daring with engineering competence, strong leadership skills and great regard for the safety of the people he worked with." NBC correspondent **Jay Barbree** said, "Nobody really knew what a giant he was. He was probably the single driving force behind the whole astronaut corps to make it what it is today." Slayton never flew on a Mercury mission; he was grounded because of an irregular heartbeat. He did make it into space, however, and in a big way. He was chosen to be a part of the American crew to take part in meeting the cosmonauts in 1975's Apollo Soyuz Test Project and a wait of 16 years was over. Former NASA Launch Pad Manager **Guenter Wendt** said of Slayton, "It was always said you better be on the good side of Deke or you were going to be sitting behind a desk instead of flying. He used to run the astronaut office with an iron hand." [Banke, FLORIDA TODAY, pp. 1A-2A, June 14, 1993; NASA/KSC News Release: 93-044; June 14, 1993.]

June 14: **STS 57: FRT COMPLETED**

The flight readiness test has been completed for Endeavour's STS 57 mission; the launch is set for 9:37 a.m. EST on June 20. Workers at Launch Complex 39B have also completed the helium signature test and the installation of the number 2 engine heatshield. Today, pad technicians are conducting launch countdown preparations; external tank purges and aft compartment closeouts. Tomorrow, ordnance installation is scheduled; final SHOOT [payload] servicing is set for June 16. The countdown is planned to begin at 2:30 a.m. June 17; that afternoon at

about 3:30 the six-member STS 57 crew will arrive at Kennedy Space Center. STS 57 is designed to last up to seven days and 23 hours if cryogenics supplies permit. [Banke, FLORIDA TODAY, p. 2A, June 14, 1993; KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, June 14, 1993.]

[] **STS 51: KU-BAND TESTED AND STOWED**

Discovery's main engines 1 and 3 have been installed and its Ku-band deploy assembly has been tested and stowed. The first leg of the vehicle's STS 51 mission comes June 19 when it is rolled over to the Vehicle Assembly Building for mating with its external tank and solid rocket boosters. Today, workers are implementing Orbiter mid-body, forward and aft closeouts; installing main engine number 2 and giving the payload bay a final cleaning. Before rollover, the Orbiter's payload bay doors will be closed. The target date for STS 51 is now set for July 17 and the mission will run for nine days and 22 hours. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, June 14, 1993.]

[] **STS 58: DRAG CHUTE INSTALLED**

In Orbiter Processing Facility Bay 2, workers have finished installing Columbia's drag chute. Today, preparations will be made to install the extended duration Orbiter (EDO) pallet; workers will also conduct waste containment system checks and tests and install the Ku-band deploy assembly. STS 58 work scheduled: installation of the EDO on June 17; orbital maneuvering system functional checks and helium system leak and functional checks. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, June 14, 1993.]

June 14: PETERSON NAMED ACTING NASA COMPTROLLER

NASA Administrator **Daniel S. Goldin** today announced the appointment of **Malcolm L. Peterson** as Acting Comptroller for the agency. Peterson's appointment follows the retirement last Friday of Acting Comptroller **Gary B. Allison**. Peterson, a NASA employee since 1972, recently led the control/cost estimating group within the agency's Space Station Redesign Team which last week submitted its final report to the President's Advisory Committee on the Redesign of the Space Station. Since 1989 Peterson was the Director of the Resources Analysis Division in the Office of the Chief Financial Officer at NASA Headquarters (Washington, D.C.). During that time he was assigned by then Administrator **Richard Truly** to the National Space Council for a year, where he conducted various studies including procurement reforms. Peterson began his career in federal service in 1969 and in 1972, began working in the Comptroller's office at NASA Headquarters. From 1972 through 1979, he was a program analyst in the Resources Analysis Division where he had the responsibility for several programs, including tracking and data acquisition, space applications, space

science and expendable launch vehicles. During that time he spent a year at the Goddard Space Flight Center, Greenbelt, MD), working in the Landsat/Nimbus project office.

In 1979 he was tasked with leading the Comptroller's independent analysis of the Space Shuttle program. After completion of the Shuttle's orbital flight test phase in 1982, he became the Branch Chief for Space Transportation Systems programs in the Resources Analysis Division. Peterson became Assistant Comptroller for Program Status Review and Cost Assessment in 1985. In that capacity, he was a member of the NASA Headquarters planning team formed in response to the Challenger accident. In 1986-1987 he led the independent cost estimate team for the Space Station. He is a member of the Senior Executive Service and is a recipient of the NASA Exceptional Service Medal. [NASA/KSC News Release: 93-112, June 14, 1993.]

June 16: **STS 57: COUNTDOWN STARTS TOMORROW**

Final ordnance installation has been completed for the STS 57 mission of Endeavour. Technicians at Launch Complex 39B also completed aft compartment and basic payload closeouts. Launch countdown preparations are underway today as well as an aft confidence test and the last SHOOT servicing before liftoff. STS 57 work scheduled for June 17: countdown beginning at 2:30 a.m. tomorrow; crew arrival at 3:30 p.m.; closing of payload bay doors for flight. On June 18, technicians will conduct Spacehab late stowage operations. Launch is set to occur at 9:37 a.m., June 20. Forecasters are predicting a 90% chance of favorable weather at launch time.[KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, June 16, 1993; L-3 DAY LAUNCH WEATHER FORECAST FOR STS 57, June 17, 1993.]

[] **DISCOVERY: PAYLOAD BAY DOORS CLOSED**

The Space Shuttle Discovery is being readied for rollover to the VAB for the final preparations leading to its STS 51 flight July 17. In OPF Bay 3, technicians working on Discovery have completed the final payload bay cleaning; closed the payload bay doors; finished hydraulic operations for aerosurface positioning; and removed the strongbacks after closing the payload bay doors. Today, workers are working on aft compartment closeouts; main engine securing and preparations to roll the vehicle over to the VAB. STS 51 work scheduled: Orbiter jackdown, weight and center of gravity checks; mating to Orbiter transport vehicle; rollover to the Vehicle Assembly Building at 12:01 a.m. June 19. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, June 16, 1993.]

[] **STS 58: DRAG CHUTE INSTALLATION**

Columbia is in OPF Bay 2 where it is being readied for the STS 58 mission. Technicians have completed installation of the vehicle's drag chute; repositioned aerosurfaces; installed the Ku-band deploy assembly. Today, workers will continue preparations to install the extended duration Orbiter (EDO) pallet; make waste containment system checks and tests; inspect ball strut tie-rod assembly joints and make orbital maneuvering system functional checks. STS 58 work scheduled: installation of the EDO and implementation of the helium system leak and functional checks. The upcoming mission is set for early or mid-September. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, June 16, 1993.]

[] **PMG MATED TO DELTA**

NASA's Plasma Motor Generator (PMG) experiment is being mated today to the second stage of an Air Force Delta II rocket at Launch Complex 17. PMG is scheduled for launch as a secondary payload no earlier than Saturday, June 26. The liftoff time is 9:04 a.m. The primary payload is an Air Force Navstar Global Positioning Satellite. There are four PMG elements being mated to the second stage: the Near End Package which is the control center for the experiment, the Far End Package, which is deployed attached to the tether and has its own self-contained experiment electronics and events sequencer, the Plasma Diagnostics Package which contains an ion spectrometer, and a Small Expendable Deployer System (SEDS) electronics box which provides the primary electrical system and telemetry interfaces with the Delta second stage. [NASA/KSC Release No. 64-93, June 16, 1993.]

[] **STS 57: COUNTDOWN BEGINS TOMORROW**

The countdown to launch Space Shuttle Endeavour on mission STS 57 is scheduled to begin at 2:30 a.m. EDT on June 17, at the T-43 hour mark. This will be the fourth launch of Endeavour and the 56th overall in the Space Shuttle program. The countdown includes 36 hours and 3 minutes of built-in hold time leading to the opening of the launch window at 9:38 a.m. (EDT) on June 20; the window extends until 10:49. A primary objective of this mission is the retrieval of the European Space Agency's free-flying platform, EURECA. This spacecraft was deployed from the Shuttle on mission STS 46, launch on July 31, 1992. EURECA is primarily a microgravity mission specifically designed for materials processing and life sciences payloads. Endeavour's crew will grapple the platform and return it to Earth. Endeavour will carry into orbit the commercial spacelab facility called SPACEHAB, a small pressurized module situated in the forward section of Endeavour's payload bay. It was designed by the privately financed corporation, SPACEHAB, Inc. Also in the payload bay are several other

experiments including the Super Fluid Helium on Orbit Transfer (SHOOT) Demonstration experiment and ten Get-Away Specials (GAS) experiments. Another of Endeavour's mission objectives is to allow two of the astronauts to perform a spacewalk for training and practice of deploy and retrieval techniques which will support Space Station assembly and the Hubble telescope servicing mission. [NASA/KSC Release No. 66-93, June 16, 1993.]

June 17: **CLINTON ANNOUNCES STATION SUPPORT**

Statement of the President

At a time when our long-term economic strength depends on our technological leadership and our ability to reduce the deficit, we must invest in technology but invest wisely, making the best possible use of every dollar. That's why I asked for a review of NASA's Space Station program. Concerns over rising costs and mismanagement raised serious questions about a program vital to our technological leadership. I instructed NASA to redesign the Space Station program in a way that would preserve its critical science and space research, and ensure international cooperation, but significantly reduce costs and improve management. NASA has met that challenge, offering a plan that will substantially reduce costs to taxpayers, improve management, preserve research, and allow the United States to continue to work with its international partners and keep its international commitments. That was the conclusion of an outstanding panel of independent experts who carefully reviewed NASA's proposals. And, that is my conclusion as well, after thoroughly considering their report and recommendations. It will take not just a redesign of the Space Station, but a redesign of NASA itself. I am calling for the U.S. to work with our international partners to develop a reduced cost, scaled-down version of the original Space Station Freedom. At the same time, I will also seek to enhance and expand the opportunities for international participation in the Space Station project, so that the Space Station can serve as a model of nations coming together in peaceful cooperation. Finally, I will be directing NASA to implement personnel reductions and major management changes to cut costs, reduce bureaucracy, and improve efficiency. The National Performance Review team, led by Vice President Gore, has been essential in working with NASA to develop these management proposals. We are going to redesign NASA at the same time that we redesign the Space Station.

To make maximum use of our investments and meet the scientific goals we have set, the specific design we will pursue will be a simplified version of Space Station Freedom recommended by the review panel. We will work with Congress, NASA and our international partners during the next ninety days to make the very best use of this design. The details of this proposal will be delivered to Congress within the next few days. I have asked Dr. John Gibbons, my Science and Technology Advisor, to transmit a letter to NASA with more detailed instructions

for implementing this decision. This redesigned program will capitalize on the investments we have already made. However, with its deep cuts in future development and operations costs, this redesigned program will save more than $4 billion over the next 5 years, compared with our assessments of what the real costs of funding the planned Space Station Freedom would have been. Over the two-decade life of the program, these savings will grow to more than $18 billion. There is no doubt that we are facing difficult budget decisions. However, we can not retreat from our obligation to invest in our future. Budget cuts alone will not restore our vitality. I believe strongly that NASA and the Space Station program represent important investments in that future, and that these investments will yield benefits in medical research, aerospace and other critical technology areas. As well, the Space Station is a model of peaceful international cooperation, offering a vision of the new world in which confrontation has been replaced with cooperation....["Statement of the President," The White House, June 17, 1993; "Clinton Hammers Home Merits of the Space Station Program," FLORIDA TODAY, pp. 1A-2A, June 16, 1993; Eisler, FLORIDA TODAY, p. 1A, June 17, 1993; Halvorson, FLORIDA TODAY, pp. 1A & 4A, June 18, 1993; Thompson, FLORIDA TODAY, pp. 1A-2A, June 18, 1993; Holton, THE ORLANDO SENTINEL, pp. A-1 & A-6, June 18, 1993; Stinson, FLORIDA TODAY, pp. 1A-2A, June 22, 1993.]

[] **ADMINISTRATOR GOLDIN ON STATION DECISION**

"America took another important step forward on the space frontier today with the decision by President **Clinton** to continue the Space Station project. We at NASA are gratified by the faith the President has placed in us to accomplish this challenging task, and inspired by his vision for our country's future in space. Only a few months ago the President charged NASA with a task many called impossible. But NASA met the challenge. People representing every part of the agency worked long hours and at great personal sacrifice and in so doing achieved the impossible. I want all Americans to be aware of the extraordinary effort put in by all of NASA's employees. I could not be prouder of any group of individuals than I am of the NASA team; our country is well served by these men and women. We remain committed to ensuring America's competitiveness in science and technology now and into the 21st century. And this project will help us meet that need. The Space Station will be a knowledge engine on the high frontier, returning dividends to Americans for years to come.

"But there are larger issues at stake, and we are pleased that the debate over this program is beginning to encompass the landscape we know as the future. In the wake of the Cold War, it is important for this nation to achieve a consensus on future goals for the space program. It is important for us to ask ourselves what kind of a space program we want, what kinds of goals we should pursue, and what kind of legacy we want to hand down to our children. With the President's

leadership and support, I believe we have the opportunity to help define a new era of international peace and cooperation thorough our scientific partnerships in space. The 20th century has been one long panorama of war and conflict. Now the world is changing, and with luck and with vision we may be able to replace a century of war with a new century of peace and understanding. Space cannot be left out of that equation, for space encompasses the essential challenges we will face in this new age. "Over the next few months, as we transition the existing Space Station program structure to support the redesign option selected by the President, we will pay close attention to NASA's most precious resource - its people, employees and contractors alike. We will do our utmost to minimize disruption during the process of restructuring the program. In a larger context, all of us at NASA must rededicate ourselves to continuing the internal improvements we have begun. Together, we have made great strides in the last year. We have begun to fundamentally change NASA for the better. But there is much more to do, and this is the time to do it. It is an honor that NASA has been asked to participate in Vice President Gore's National Performance Review. We must use this opportunity to set our course and make the space agency a model for effective government research and development. Only by committing ourselves to these goals can we live up to the faith and trust that President Clinton has placed in us. As responsible stewards for the nation's space program, we can do no less. I look forward to working with the entire NASA family on these exciting goals during the challenging times ahead." ["Statement by Daniel S. Goldin, NASA Administrator on the Space Station Redesign," June 17, 1993.]

[] **STS 57 CREW ARRIVES**

Astronaut **Janice Voss** demonstrated her delight to be part of Endeavour's STS 57 crew by jumping for joy. The six-member crew for the June 20 liftoff arrived this afternoon in their T-38 training jets at the Shuttle Landing Facility. Voss could not contain her enthusiasm, saying, "I'm so excited to be here. It's going to be a great flight. The best one that's ever been." The STS 57 crew includes, besides Voss: Commander **Ronald Grabe**, Pilot **Brian Duffy** and mission specialists **G. David Low, Jeff Wisoff** and **Nancy Sherlock**. [Banke, FLORIDA TODAY, p. 9A, June 18, 1993; "Sunday's Shuttle Launch Running On Schedule," THE ORLANDO SENTINEL, June 18, 1993.]

June 19: **STS 57: LAUNCH MINUS 1 DAY**

Work continues on schedule today for the launch of Endeavour tomorrow at the opening of the 71 minute window at 9:38 a.m. EDT. Yesterday crews entered the aft engine compartment to check on higher than expected concentrations of helium around the main propulsion system. Inspections revealed no problems and the aft doors were replaced early this morning. No other issues or concerns are being worked today. The rotating service structure was retracted late this morning with

first motion at 11:26 a.m. Workers are now in the process of making final stowage of flight crew equipment and mid-deck experiments. The weather forecast for tomorrow's launch is very favorable with only a 10 percent chance of launch criteria violation. This slight concern is primarily due to the possibility of rain in the vehicle's flight path. The STS 57 mission is planned to extend for 7 days/22 hours/46 minutes. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, June 19, 1993; Date, THE ORLANDO SENTINEL, pp. A-1 & A-5, June 19, 1993.]

June 20: **ENDEAVOUR SCRUBBED ON FIRST ATTEMPT**

Bad weather caused NASA launch managers to scrub Endeavour's STS 57 mission today at 10:44 a.m. A second attempt to launch the Shuttle will come tomorrow at 9:07 a.m.; the launch window will last till 10:18 a.m. Mission Commander **Ron Grabe** said, "We would have liked to have sent **Brian Duffy** over the hill in true style, but tomorrow's another day. Duffy's 40th birthday is today. [Banke, FLORIDA TODAY, pp. 1A-2A, June 21, 1993.]

June 21: **ENDEAVOUR LAUNCHES ON SECOND TRY**

The Space Shuttle Endeavour was launched today from KSC's Launch Complex 39B. No technical problems were worked throughout the duration of the terminal countdown phase. Liftoff was about 22 seconds late, however, due to a Range Safety hold as a stray aircraft intruded or was about to intrude into restricted airspace. Endeavour had been scheduled for launch yesterday, but the launch was scrubbed at T-5 minutes due to low clouds and rain near the Shuttle Landing Facility and concern for weather at all three available Transatlantic abort sites. Endeavour is scheduled to land back at KSC on Tuesday, June 29 at about 8:03 a.m. The crew for the STS 57 mission includes: Commander **Ronald Grabe**, Pilot **Brian Duffy** and Mission Specialists **G. David Low**, **Nancy Sherlock**, **Jeff Wisoff** and **Janice Voss**. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, June 21, 1993; Banke, FLORIDA TODAY, pp. 1A-2A, June 22, 1993; USA TODAY, June 22, 1993; Leary, THE NEW YORK TIMES, June 22, 1993; Harwood, THE WASHINGTON POST, June 22, 1993; Stewart, THE LOS ANGELES TIMES (Washington edition), June 22, 1993.]

[] **SHRIVER REPLACES SHAW ON MISSION MANAGEMENT**

Loren Shriver headed the Mission Management Team for Endeavour's STS 57 mission today. Shriver replaced **Brewster Shaw** when Shaw was transferred to Johnson Space Center (Houston, TX) to become Director of Shuttle Operations. Shriver had been Shaw's deputy at Kennedy Space Center. [Banke, FLORIDA TODAY, June 22, 1993.]

[] **DISCOVERY PROCESSING UPDATE**

Discovery remains in the Vehicle Assembly Building's High Bay 1 where it is undergoing final processing for its mid-July STS 51 mission. Discovery has been mated to the Orbiter transfer vehicle and has undergone Orbiter jackdown, and weight and center of gravity checks. Rollover to the VAB occurred June 18. Today, technicians will implement electrical mates to the external tank and conduct Shuttle interface tests. Rollout to Launch Complex 39B is scheduled to occur this weekend. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, June 21, 1993.]

[] **STUDENT LIFE SCIENCES PROGRAM AT KSC**

Forty college students today started an intensive 6-week Space Life Sciences Training Program (SLSTP) at NASA's Kennedy Space Center, FL. The summer residence training program is for college students interested in life sciences, bioengineering, ecology or related fields. The SLSTP is designed to attract college students towards a career in space life sciences research. Selected students work with NASA researchers in planning flight and ground support experiments. In addition to offering research experience, the curriculum includes lectures, tours and special projects to provide a complete overview of the field of space life sciences. The special project areas this year will involve plant space biology, global environment and monitoring of microbes in the Shuttle crew water system. The program will be held from June 21 through July 31, 1993. [NASA/KSC Release 93-117, June 21, 1993.]

June 22: **PAD DAMAGE MINIMAL**

KSC engineers are reporting no unusual damage to Launch Complex 39B as a result of yesterday's launch of Endeavour on its STS 57 mission. The solid rocket boosters have arrived at Port Canaveral and are making their way up the Banana River to Hangar AF. Disassembly and flight analysis will begin June 23. Preliminary inspections showed no peculiarities following the launch and separation from Endeavour and its external tank. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, June 22, 1993.]

[] **STS 51: MECHANICAL MATES COMPLETED**

In the Vehicle Assembly Building High Bay 1, technicians processing Discovery for its mid-July STS 51 mission have completed Orbiter mechanical mates to the external tank. Today they are working on electrical mates to the tank, Shuttle interface tests and heatshield installation and checks. STS 51 work activities scheduled: 17-inch disconnect functional checks; umbilical closeouts; rollout to Launch Complex 39B, set for this weekend and delivery of the mission payload

to the pad on June 24. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, June 22, 1993.]

[] **STS 58: EDO INSTALLED**

The EDO (extended duration Orbiter) pallet has been installed in the payload bay of Columbia as part of STS 58 processing activities. Technicians have also completed waste containment system checks and tests. Current processing activities include: electrical mates to the extended duration Orbiter pallet; ball strut tie-rod assembly joint inspections; orbital maneuvering system functional checks; auxiliary power unit leak and functional checks; helium system leak and functional checks and main propulsion system leak checks. Hydraulic flight control checks are scheduled. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, June 22, 1993.]

June 23: **STS 57: BOOSTERS RECOVERED AND EXAMINED**

At Hangar AF (Cape Canaveral Air Force Station), Endeavour's twin solid rocket boosters are set to undergo disassembly and flight analysis. Preliminary inspections show no peculiarities following the launch. The STS 57 crew includes: Commander **Ronald Grabe**, Pilot **Brian Duffy** and Mission Specialists **G. David Low**, **Nancy Sherlock**, **Jeff Wisoff** and **Janice Voss**. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, June 23, 1993.]

[] **STS 51: MECHANICAL MATES COMPLETED**

The Space Shuttle Discovery is now housed in the VAB's high bay 1 where Orbiter mechanical mates to the mission's external tank have been completed. T-O quick disconnect leak and functional checks are also finished. Today workers are making electrical mates from the Orbiter to the external tank; conducting Shuttle interface tests; installing heatshields and checking them; main engine leak checks; external tank interface leak checks; Launch Complex 39B validations. STS 51 work scheduled: removal of the mobile launcher platform from the launch pad; Orbiter/external tank 17-inch disconnect functional checks; rollout to Launch Complex 39B this weekend; delivery of the STS 51 payload to the pad on June 25; solid rocket booster hydraulic checks. The STS 51 mission is target to launch on July 17 at 9:22 a.m. EDT and to land at Kennedy Space Center on July 27. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, June 23, 1993.]

[] **STS 58: COLUMBIA PROCESSING UPDATE**

In Orbiter Processing Facility bay 2, workers have completed the electrical mates to the extended duration Orbiter (EDO) pallet in preparation for Columbia's next

mission, STS 58. Workers' tasks today include: extended duration Orbiter (EDO) pallet power reactant storage and distribution system checks; orbital maneuvering system functional checks; auxiliary power unit leak and functional checks; helium system leak and functional checks; main propulsion system leak checks; solid rocket booster stacking operations in Vehicle Assembly Building high bay 3. STS 58 work scheduled: hydraulic flight control checks and forward reaction control system functional checks. Columbia's STS 58 mission is scheduled to last for 14 days and commence with a launch in early to mid-September. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, June 23, 1993.]

[] **YES TO STATION: 216-215**

Kennedy Space Center and its workers breathed a sigh of relief on hearing that the U.S. House of Representatives had voted 216 to 215 to authorize NASA to spend $12.7 billion on Space Station Freedom in the next seven years. However, a second vote actually allowing NASA to spend that much money is set for next week in the House and opponents think they can marshall the votes to kill the Space Station. Representative **Charles Schumer** (D-NY) said, "The redesigned space station is still a waste of money...a program hopelessly in search of a mission." Space Station supporter Rep. **Newt Gingrich** (R-GA) said, "This is not about money. This is about whether Americans have enough faith in our children, in our future." At the space center, Director **Robert L. Crippen** said, "Congress has a difficult task in balancing the nation's priorities. I am very pleased the amendment to kill the Space Station was defeated, but I am disappointed it wasn't a larger margin because I believe the station is vital to the country and will give great dividends in the future to all of us." [Banke, FLORIDA TODAY, p. 3A, June 24, 1993; Holton, THE ORLANDO SENTINEL, pp. A-1 & A-4, June 24, 1993.]

June 24: **STS 51: HEATSHIELDS INSTALLED**

Discovery's main engine heatshields have been installed during the Orbiter's processing stay in the Vehicle Assembly Building. Work currently in progress: a Shuttle interface test, both mechanical and electrical); hydraulic testing of the solid rocket booster control systems; main engine/main propulsion system interface leak checks; external tank/Orbiter interface leak checks; payload rollout from the Vertical Processing Facility (VPF) at 8:30 p.m. tonight. STS 51 processing tasks scheduled: installation of payloads into the Pad B payload changeout room; retraction of the VAB access platforms tomorrow; positioning of the crawler transporter beneath the mobile launcher platform (MLP) tomorrow; Space Shuttle Discovery's rollout from the VAB to Launch Complex 39B tomorrow evening; Discovery hard-down on the launcher pedestals by 2:00 a.m. June 26; powerup of the Orbiter; crew hatch functional check; installation of payloads June 27; mate Orbiter mid-body umbilical unit June 27; KSC launch readiness review June 28;

STS 51 flight readiness review July 1. [STS 51 SPACE SHUTTLE STATUS REPORT, June 24, 1993.]

[] **ASTRONAUTS TO HEADQUARTERS ASSIGNMENTS**

NASA Administrator **Daniel S. Goldin** today announced the appointment of two astronauts to senior management positions at NASA Headquarters in Washington, D.C. Appointed are **William M. Shepherd** and **James D. Wetherbee** as Assistant Deputy Administrators - Technical. they will assist the Administrator and the Acting Deputy Administrator in providing technical oversight of NASA's programs. In addition to serving in this capacity, they have been designated as acting leaders of the transition activities for the Redesign Space Station program under the direction of **Bryan O'Connor**, the Director, Space Station Redesign. Shepherd, a 1971 Naval Academy graduate, received the degrees of ocean engineer and master of science in mechanical engineering from the Massachusetts Institute of Technology in 1978. He is a veteran of three Space Shuttle missions, STS 27 in December 1988, STS 41 in October 1990 and STS 52 in November 1992. Wetherbee is a graduate of the University of Notre Dame and a 1974 graduate of the U.S. Naval Test Pilot School. He served as the project officer and test pilot for the weapons delivery systems and avionics integration for the F/A-18 aircraft. He is a veteran of 2 Space Shuttle missions, serving as pilot on STS 32 in January 1990 and as commander of STS 52 in November 1992. [NASA/KSC Release: 93-120, June 24, 1993.]

June 25: **STS 51: PAYLOAD ARRIVES AT PAD TODAY**

While Discovery continues final preparations before rolling out to Launch Complex 39B, technicians are preparing to deliver the Shuttle's payload to the pad. The ACTS-TOES/ORFEUS-SPAS payload should arrive at 1:00p.m. today. A number of processing activities have been completed: installation of main engine heatshields; the Shuttle interface test (the electrical portion); hydraulic testing of the solid rocket booster control systems; main engine/main propulsion system interface leak checks; external tank/Orbiter interface leak checks. Activities underway today include: installing the ACTS-TOES/ORFEUS-SPAS into the payload changeout room at Launch Complex 39B; Shuttle interface test (the mechanical portion); removal of the VAB access platforms; position the crawler transporter beneath the mobile launcher platform (MLP) in VAB High Bay 2. STS 51 work scheduled: Discovery's rollout from the VAB to Pad B at 12:30 a.m. tomorrow; vehicle hard-down on the launcher pedestals by 7:00 a.m. tomorrow; moving of rotating service structure; powering up Discovery; crew hatch functional check; installation of payloads into Discovery; mate Orbiter mid-body umbilical unit (OMBUU); flight readiness test; ORFEUS-SPAS argon servicing; KSC launch readiness review; astronaut arrival for the terminal countdown demonstration test; ACTS-TOS interface verification test with

Discovery; ACTS functional test; ACTS battery charging; TCDT for two days; STS 51 flight readiness review; inertial measurement unit calibration and the ORFEUS-SPAS interface verification test. [STS 51 SPACE SHUTTLE STATUS REPORT, June 25, 1993; NASA/KSC Release No. 70-93, June 25, 1993.]

June 26: **DELTA TO LAUNCH TODAY**

If the weather permits, the Air Force is set to launch its Delta rocket from Cape Canaveral Air Force Station at 9:04 this morning. Forecasters predict a 70 percent chance of favorable weather for the liftoff. The Delta will deploy a Navstar Global Positioning Satellite, the 20th in a series. [Halvorson, FLORIDA TODAY, p. 2A, June 26, 1993; Date, THE ORLANDO SENTINEL, June 25, 1993.]

June 28: **SPACE STATION VOTE IN HOUSE**

The House of Representatives is set to vote today on an appropriation for the Space Station program. The authorization vote in the House passed 216-215 on June 23. The Executive Director of the National Space Society, **Lori Garver**, said that today's vote is not as crucial as that of last week, because the Senate could still vote in favor of the space station and, with President **Clinton**, could save the program in the conference committee which must negotiate to settle outstanding budget issues which differ in House and Senate versions of the budget bill. Another high technology bill facing considerable difficulty in the House is the super collider program. In 1993, $517 million had been provided for the project. The House has already voted 250-150 to kill the project during the authorization process. [Halvorson, FLORIDA TODAY, pp. 1A-2A, June 28, 1993.]

[] **ENDEAVOUR PACKS FOR RETURN HOME**

The crew of Endeavour is spending today packing experiments and flight gear and checking the Orbiter's flight control systems in preparation for tomorrow's planned landing at the Kennedy Space Center. Landing is scheduled to occur at 8:44 a.m. EDT, with a second opportunity available at 10:24 a.m. Weather for tomorrow's landing in Florida is considered to be marginal but potentially acceptable. Concerns center around the chance of rain within 30 miles of the Shuttle Landing Facility and greater than 2/10ths of cloud coverage below 10,000 feet. A determination on whether or not to land at KSC will be made early tomorrow morning. If managers choose to land at KSC on the first opportunity, the de-orbit burn would occur at 7:34 a.m. EDT. Should they choose the second opportunity, the burn would occur at 9:14 a.m. EDT. [SPACE SHUTTLE STATUS REPORT, June 28, 1993.]

[] **DISCOVERY AT LC 39B**

After its rollout to Launch Complex 39B, Discovery is harddown on the pad with its mechanical connections established between the Orbiter and the pad. The STS 51 payloads are being installed today. Work in progress: KSC launch readiness review; powering up the Orbiter; installation of foam around the main engines; a main engine readiness test and argon servicing or the ORFEUS-SPAS payloads inside the Orbiter. STS 51 work scheduled: ACTS-TOES interface verification test; astronaut arrival at 7:00 p.m. today for the terminal countdown demonstration test; start of TCDT at 8:00 a.m. June 30 and the conclusion at 11:00 a.m. July 1; flight readiness review and heliium signature leak check of engines. [SPACE SHUTTLE STATUS REPORT, June 28, 1993.]

[] **BOC EXTENDED THROUGH SEPTEMBER**

NASA announced today that the Kennedy Space Center (KSC) Base Operations Contract (BOC), currently held by EG&G Florida, Inc., has been extended for a three-month period. The contract extension includes a three-month period priced at $46,543,269, covering the period from July 1 through September 30, 1993, and three additional one-month options with a total potential value of $44, 256,267. The BOC provides a wide variety of services to KSC, primarily management, operations, maintenance and engineering for KSC facilities and utilities; technical and administrative support operations; and health, fire and security services. EG&G Florida has held the Base Operations Contract for the past ten years and is one of four companies involved in a recompetition. The new contract is expected to be awarded in late summer for an initial period of four years with three two-year priced options. The other competitors for the BOC are BAMSI, Inc. (Titusville, FL); Lockheed Space Operations Co. (Titusville, FL); and Westinghouse Electric. Corp., Government Business Unit (Pittsburgh, PA). [NASA/KSC Release No. 72-93, June 28, 1993.]

[] **STATION WINS HOUSE VOTE, NARROWLY**

By a vote of 220-196, the Space Station program has survived the appropriation process in the House of Representatives for another year. Merritt Island Rep. **Jim Bacchus** said, "This is a major victory and for all those who seek to look beyond political rhetoric to glimpse the shape of the future." The Station will face another difficult vote in the U. S. Senate in July. Arizona Senator **Dennis DeConcini** of the vote in the upper chamber, "It's going to be darned close." He suggested that efforts to reduce the federal deficit might also cost NASA some votes in the Senate. "I think what has changed this year is that there is this reality that we must cut expenditures. We need to cut the big-ticket items," DeConcini said. "I just don't see how we can afford the Space Station. I cannot vote for the Space Station and then turn around and cut other programs like Medicare." [Halvorson, FLORIDA TODAY, pp. 1A-2A, June 29, 1993.]

June 29: **WAKE SHIELD FACILITY ARRIVES**

The Wake Shield Facility (WSF), a primary payload for mission STS 60, has arrived at Cape Canaveral to begin final prelaunch assembly and checkout. The spacecraft will fly aboard the Space Shuttle Discovery targeted for launch the second week in November. The parabolic-shaped WSF is 12 feet in diameter and includes a communications and avionics system, solar cells and batteries, and a propulsion thruster. The experiment will take advantage of the near vacuum of space to attempt to grow innovative thin film materials for use in electronics. It will be deployed by the remote manipulator arm, and fly in formation with Discovery at a distance of up to 46 statute miles from the Orbiter for 56 hours. It will then be retrieved from space, again using the remote manipulating arm. WSF is undergoing initial processing in NASA's Hangar S on Cape Canaveral Air Force Station. In mid-September it will be moved to the Vertical Processing Facility in the KSC Industrial Area where tests will verify its compatibility with the Space Shuttle. The payload is scheduled to be transferred to the pad approximately one month later, about mid-October. WSF development is sponsored by the Space Vacuum Epitaxy Center (Houston, TX) which is a NASA Center for the Commercial Development of Space (CCDS). Experiments are also being sponsored by NASA, the Air Force and Army, and Case Western Reserve University in Cleveland, also part of NASA's CCDS program. [NASA/KSC Release No. 73-93, June 29, 1993.]

JULY

July 1: **ENDEAVOUR COMES HOME**

STS 57 Commander **Ronald Grabe** concluded Endeavour's mission by guiding the Orbiter to a landing at the Kennedy Space Center Shuttle Landing Facility at 8:52 a.m. EDT today. Endeavour will be towed from Runway 33 into Orbiter Processing Facility Bay 1 by mid-afternoon. The mission was extended two days due to weather concerns at KSC. [SPACE SHUTTLE STATUS REPORT, July 1, 1993; Banke and Halvorson, FLORIDA TODAY, p. 1A, July 2, 1993.]

[] **STS 51 SET FOR JULY 17**

At the conclusion of the STS 51 flight readiness review a mission launch date of July 17 was announced by NASA managers. Primary payload activity on the 9-day mission will include deployment of the Advanced Communications Technology Satellite (ACTS), and deployment and retrieval of the German-built ORFEUS-SPAS astrophysics free-flier. A 6-hour Extra Vehicular Activity (EVA), or space walk, will also be performed by two astronauts. Commanding the STS 51 crew is **Frank Culbertson** who will be making his second space flight. Pilot **William Readdy** has also flown once in space. Three Mission Specialists, each flying for the first time, round out the 5-man crew: **Jim Newman**, **Dan Bursch** and **Carl Walz**. The mission's terminal countdown demonstration test (TCDT) concluded at 11:30 a.m. today. In addition, workers at Launch Complex 39B finished Discovery's helium signature leak check of the Orbiter's main engines and C-band links and checkouts of the ACTS payload. Scheduled STS 51 work: checkout of inertial measurement units and preparations for loading onboard propellants. The five-member crew of Discovery returned to Johnson Space Center for further training today. [SPACE SHUTTLE STATUS REPORT, July 1, 1993; **Note to Editors: N93-38**, July 1, 1993; "Next Flight," FLORIDA TODAY, p. 1A, July 2, 1993.]

July 2: **ENDEAVOUR PARKED IN OPF BAY 1**

Endeavour is now inside OPF Bay 1 undergoing deservicing from the STS 57 flight which concluded yesterday with a landing at Kennedy Space Center. The ship's onboard fuels will be offloaded today and Saturday. The payload bay doors will be opened July 6, and the EURECA spacecraft is scheduled to be removed on July 9. Preliminary inspections of the Orbiter show the vehicle to be in excellent condition following the 10-day mission. Endeavour's next mission - STS 61 - will last 11 days and consist in part of a repair effort for the Hubble Space Telescope. [SPACE SHUTTLE STATUS REPORT, July 2, 1993.]

[] **STS 51 TCDT COMPLETED**

The Terminal Countdown Demonstration Test for Discovery's upcoming STS 51 mission has been completed at Kennedy Space Center. A flight readiness review was also conducted yesterday and the mission is now targeted officially for July 17. Other tasks now finished include: removal and replacement of Mass Memory Unit #1; calibration of the inertial measurement units and installation of the gaseous nitrogen flex line. STS 51 is planned for more than 9 days and will carry a crew of five persons. Workers at Launch Complex 39B are implementing the ORFEUS/SPAS interface verification test; securing and reconfiguring subsequent to the TCDT; and making preparations for loading hypergolic propellants on July 6. The removal and replacement of the TACAN #3 has also been scheduled. [SPACE SHUTTLE STATUS REPORT, July 2, 1993.]

[] **STS 58 PREPARATIONS CONTINUE**

Columbia, the eldest of the nation's fleet of four Space Shuttles, continues to undergo preparations in OPF Bay 2 for its mid-September STS 58 mission. That flight is planned to last two weeks and its main activity will be the utilization of Spacelab Life Sciences 2. Checkouts and closeouts of work on the Extended Duration Orbiter (EDO) pallet are finished and moisture checks of the EDO pallet lines have been completed as well. Workers in OPF Bay 2 are waterproofing the vehicle's orbital maneuvering system pods and are working on the remote manipulator system and its connecting mechanism. STS 58 activities on the schedule: continuation of the items listed above on July 6. No work is planned for the long July 4 weekend. Early next week, workers will attend to potable water servicing. [SPACE SHUTTLE STATUS REPORT, July 2, 1993.]

July 4: **JULY 4 QUIET AT KSC**

With most of the center's 18,000 employees absent because of the Independence Day holiday, Kennedy Space Center was a quiet place. When the center is again at full staff, launch preparations for Discovery's STS 51 mission will pick up their pace. The first task will be to load the Shuttle's onboard propellant tanks to power the steering thrusters and maneuvering rocket engines. Discovery's launch date is July 17 between 9:22 a.m. and 10:24 p.m. [Banke, FLORIDA TODAY, p. 4A, July 4, 1993; "KSC Quiet for Long Holiday Weekend," FLORIDA TODAY, p. 2A, July 5, 1993.]

July 6: **STS 51: IVT COMPLETED**

Columbia's ORFEUS/SPAS interface verification test for STS 51 has been completed at Launch Complex 39B. The Orbiter's payload bay doors have been closed the gaseous nitrogen flex line has been installed. Launch Complex 39B has

been cleared of non-essential personnel to permit loading of hypergolic propellants. STS 51 work scheduled: hypergolic propellant loading through July 8 and aft closeouts are set for the end of the week. [SPACE SHUTTLE STATUS REPORT, July 6, 1993.]

[] **STS 58: LAUNCH IN MID-SEPTEMBER**

In OPF Bay 2 workers have concluded moisture checks of Columbia's Extended Duration Orbiter (EDO) pallet lines. Current processing activities for STS 58 include: waterproofing of the orbital maneuvering system pods; closeouts of the extended duration orbiter pallet and feedlines and configuring of the crew compartment and potable water servicing. The activities listed above are scheduled to continue throughout the week. [SPACE SHUTTLE STATUS REPORT, July 6, 1993.]

[] **STS 61 PROCESSING BEGINS FOR ENDEAVOUR**

Endeavour, recently returned to KSC from the STS 57 mission, is currently undergoing preliminary processing activities for the Orbiter's STS 61 mission. Inside OPF Bay 1, the vehicle is being deserviced from its STS 57 flight. The Orbiter's onboard fuels were offloaded late last weekend. The payload bay doors were opened today and the EURECA spacecraft and SPACEHAB module are scheduled to be removed from the payload bay July 9. Inspections which followed the vehicle's recent landing show it to be in excellent condition after ten days in space. The STS 61 mission, with a crew of 7, is primarily designed to begin the repair of the Hubble Space Telescope and will launch in December and last for 11 days. [SPACE SHUTTLE STATUS REPORT, July 6, 1993.]

July 8: **STS 51: HYPERGOLICS LOADED**

"Everything is fine. It's just about as good as it gets," said KSC spokesman **Mitch Varnes** today about the processing operations for Discovery's STS 51 mission. He added, "There's nothing standing in the way of a launch on the 17th." Workers preparing Discovery for its STS 51 mission next week have completed hypergolic loading operations at Launch Complex 39B. Today processing operations include: aft engine compartment closeouts; opening payload bay doors; TACAN #3 test and checkout and launch countdown preparations. STS 51 scheduled activities: loading astronauts' spacesuits aboard Discovery; implementing a mass memory unit load; hypergolic fuel/oxidizer pressurization; ordnance operations; external tank purging and beginning of the countdown at 9:30 a.m. July 14. STS 51 will deploy the ACTS-TOS/ORFEUS-SPAS payloads. Landing is scheduled for Kennedy Space Center on July 27. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, July 8, 1993; Halvorson, FLORIDA TODAY, p. 9A, July 8, 1993; Halvorson, FLORIDA TODAY, p. 9A, July 9, 1993.]

[] **STS 58 PROCESSING ACTIVITIES**

Columbia is undergoing processing activities for its mid-September STS 58 mission. The Orbiter is currently in OPF bay 2 where workers are conducting: main propulsion line foaming operations; rudder speed brake checks; orbital maneuvering system checks; potable water servicing; payload bay closeouts and solid rocket booster stacking operations in Vehicle Assembly Building high bay 3. Scheduled work includes: air frame structural inspections and aerosurface positioning and hydraulic operations. Columbia's mission is scheduled to last 14 days and is crewed by 7 astronauts. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, July 8, 1993.]

July 9: **STS 51: PAYLOAD BAY DOORS OPENED**

"We're in our final week before launch, and we continue to be in good shape," said KSC spokesman **Bruce Buckingham**. While Discovery awaits its July 17 launch of the STS 51 mission, workers at Launch Complex 39B have been busily finishing last minute tasks. Spacesuits have been loaded aboard the Orbiter; the payload bay doors have been opened and hypergolic loading operations have been completed. In progress: aft engine compartment closeouts; TACAN #3 re-test and checkout; functional checks on the spacesuits; a mass memory unit load; and other launch countdown preparations. Scheduled STS 51 work: hypergolic fuel/oxidizer pressurization; ordnance operations; external tank purging; start of countdown at 9:30 a.m. July 14. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, July 9, 1993; Banke, FLORIDA TODAY, p. 4A, July 9, 1993.]

[] **STS 58 PROCESSING WORK**

Columbia remains in Orbiter Processing Facility bay 2 where the vehicle is undergoing processing for the upcoming STS 58 mission, now scheduled for early/mid-September of this year. In progress today: main propulsion line foaming; reinforced carbon/carbon leading edge panel repairs; rudder speed brake checks; orbital maneuvering system checks; potable water servicing; payload bay closeouts; solid rocket booster stacking operations in Vehicle Assembly high bay 3. The STS 58 mission may last longer than the 8 days/22 hours it has been scheduled for; the mission may run an extra day if orbiter cryogenics allow it. The mission will have a crew of 5. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, July 9, 1993.]

July 12: **STS 51: WEATHER FAVORABLE**

Forecasters indicate that there is a 10% chance that showers might interfere with launching Discovery's STS 51 mission on July 17. Kennedy Space Center

spokesman **Bruce Buckingham** said, "We're not working any problems, and the Orbiter is ready to go." He added, "There seems to be an excellent chance of getting off on Saturday [July 17]." At Launch Complex 39B, a number of prelaunch tasks have been completed: hypergolic fuel/oxidizer pressurization; ordnance operations; TACAN # 3 re-test and checkout; functional checks of astronauts' spacesuits; mass memory unit load. Today workers are conducting aft engine compartment closeouts; purging the external tank and other launch countdown preparations. STS 51 work scheduled: removal of platforms and installation of aft doors for flight; countdown beginning at 9:30 a.m. July 14; closing payload bay doors for flight; crew arrival now set for 2:30 p.m. on July 14. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, July 12, 1993; Banke, FLORIDA TODAY, p. 2A, July 13, 1993.]

[] **STS 58: STRUCTURAL X-RAYS COMPLETED**

Structural X-rays of Columbia have been completed in OPF Bay 2 as part of pre-rollout processing for STS 58. Potable water servicing and rudder speed brake corrosion checks have also been completed. Today workers are making corrosion repairs on the leading edge of the Orbiter's wings; conducting payload bay closeouts and completing solid rocket booster stacking operations in Vehicle Assembly Building high bay 3. STS 58 work scheduled: air frame structural inspections; aerosurface positioning and hydraulic operations; installation of the spacelab; main engine installation. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, July 12, 1993.]

[] **STS 61: AMMONIA BOILER CHECKS**

Endeavour, having completed its STS 57 mission, continues to undergo processing in OPF Bay 1 for the STS 61 mission scheduled now for early December. In the high bay workers have completed post flight hypergolic propellant deservicing operations; ammonia boiler checks and removal of the SPACEHAB and EURECA payloads. Work in progress includes: waste containment system servicing; cycling payload bay door bulkhead latches; auxiliary power unit lube oil deservicing; Ku-band checks; TACAN system tests; main engine inspections. Workers are scheduled to remove the Orbiter's heat shields and its main engines. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, July 12, 1993.]

July 13: **BEACH CLOSING FOR STS 51**

Playalinda Beach will be closed to the public beginning today at dusk due to this weekend's planned launch of the Space Shuttle Discovery. Given a successful launch on Saturday, the beach will reopen to the public at 6 a.m. July 18. Launch of Discovery is set for 9:22 a.m. EDT on July 17. The countdown leading to the

57th Space Shuttle flight is set to begin at 9:30 a.m. July 14. Safety and security concerns require that Playalinda Beach be closed to the public throughout the majority of a Space Shuttle launch countdown. [NASA/KSC Release No. 80-93, July 13, 1993.]

[] **STS 51: EXTERNAL TANK PURGED**

At Launch Complex 39B, pad workers have purged Discovery's external tank and have completed aft engine compartment closeouts. Today, workers are conducting an aft confidence test; completing payload bay closeouts and continuing with launch countdown preparations. STS 51 work scheduled: countdown begins at 9:30 a.m., tomorrow; the crew of five is scheduled to arrive at KSC by 2:30 p.m. tomorrow; the payload bay doors will also be closed tomorrow for flight on Saturday, July 17. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, July 13, 1993.]

[] **STS 58: PROCESSING CONTINUES**

Work continues today in processing Columbia for its STS 58 mission currently targeted for mid-September. Technicians are conducting Orbiter/external tank umbilical door functional checks; making corrosion repairs on the leading edge of wings and rudder speed brake; closing out the payload bay; and conducting solid rocket booster stacking operations in the Vehicle Assembly Building high bay 3. The STS 58 mission with a crew of seven will deploy the Spacelab Life Sciences-2 during its two week flight. The mid-September launch is expected to occur at approximately 11:30 a.m. EDT at the start of a 2 hour 30 minute window. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, July 13, 1993.]

[] **STS 61: PAYLOADS REMOVED FROM ENDEAVOUR**

Endeavour has had both the SPACEHAB and EURECA payloads removed from its cargo bay to ready it further for STS 61 processing. Technicians have completed waste containment system servicing; cycled payload bay door bulkhead latches; conducted post-flight hypergolic propellant deservicing operations; and made ammonia boiler checks. Today, the processing team is working on: payload bay deconfiguration; tunnel adapter removal; removal of heat shields; auxiliary power unit lube oil deservicing; Ku-band checks; TACAN system checks; and main engine inspections. The three main engines are scheduled for removal. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, July 13, 1993.]

July 14: **STS 51: COUNTDOWN SCENARIO**

The countdown for launch of the Space Shuttle Discovery on its STS 51 mission began at 9:30 EDT this morning at the T-43 hour mark. This marks the beginning to the 17th launch of Discovery and 57th overall in the Space Shuttle program. There are 28 hours and 52 minutes of built-in hold time leading to the opening of the launch window at 9:2 a.m. EDT on July 17; the launch window extends to 10:24 a.m. A primary objective of the STS 51 mission is the deployment of the Advanced Communications Technology Satellite (ACTS) and the Transfer Orbit Stage (TOS). ACTS/TOS is the latest in NASA's series of advanced communication satellites and a test-bed for technology which will be used in future operational satellites. Also, the Orbiting Retrievable Far and Extreme Ultraviolet Spectrometer-Shuttle Pallet Satellite (ORFEUS-SPAS) payload will be deployed and retrieved during this mission. Also on board is the IMAX camera, the Commercial Protein Crystal Growth (CPCG) experiment, and Chromosomes and Plant Cell Division in Space (CHROMEX) experiment.

Additionally, astronauts **Jim Newman** and **Carl Walz** are scheduled to perform a six-hour spacewalk on day five of the mission as a continuation of a series of test spacewalks to increase experience and refine training methods. They will work with several tools that may be used during the servicing of the Hubble Space Telescope mission later this year. At the beginning of the countdown, the KSC launch team in Firing Room 3 of the Launch Control Center will verify systems indicating the Shuttle is powered up and that the data processing and backup flight control systems are operating. Verifications will occur throughout the count to ensure reviews of the flight software stored in the Orbiter's twin memory banks is being conducted, computer controlled display systems are being activated, and the backup flight system general purpose computer is being loaded. Over the past weekend, final ordnance operations and hypergolic fuel/oxidizer loading operations were conducted at Launch Complex 39B. The Orbiter's aft engine compartment was closed for flight yesterday morning. After the count begins at 9:30 a.m., operations will begin to ready the Orbiter for onboard cryogenic loading. Orbiter navigation aids will be activated and the inertial measurement units will be turned on. Also today, ground crews will begin making the final storage of mid-deck and flight deck supplies and payloads. They will also perform microbial samplings of the flight crew's drinking water and check water levels in the crew waste management system. The crew is expected to arrive at Kennedy Space Center at approximately 2:30 p.m. today. The countdown's first hold lasts for 8 hours tomorrow morning. When the countdown resumes at 9:30 a.m., the launch pad will be cleared of all personnel for cryogenic fuel loading of the power reactant and storage distribution system tanks located under the payload bay lining. These tanks hold the super-cold liquid hydrogen and liquid oxygen reactants used by the fuel cells to provide electricity to the Orbiter and drinking water for the crew. The cryogenic loading lasts about five hours. When that operation concludes,

another hold begins on Thursday lasting from 5:30 to 9:30 p.m. The pad reopens for normal work once the cryogenics are aboard. The Orbiter mid-body umbilical unit used to load the super-cold reactants in the Orbiter's fuel cell tanks will be demated and retracted into the launch structure.

When the countdown resumes, technicians will complete final vehicle and facility closeouts and begin activating the Orbiter's communications systems and configuring Discovery's cockpit for flight. The Orbiter's flight control system and navigation aids will be turned on and the stowable crew seats will be installed in the flight and mid-decks. At 5:30 a.m. Friday the countdown will enter a 13-hour built-in hold at the T-11 hour mark. During the hold, time critical equipment will be installed in the Orbiter cockpit and the inertial measurement units will be activated and warmed up. The Rotating Service Structure will be rolled back from the vehicle and placed in launch position at about 11 a.m. Friday morning. At T-9 hours, about 9:02 p.m. July 16, the onboard fuel cells will be activated. At T-8 hours, the launch team will begin evacuating the blast danger area and clear the pad for loading the external tank with the super-cold cryogenic fuels. At T-7 hours, 30 minutes, conditioned air flowing through the Orbiter's payload bay and other areas of the vehicle will be switched to gaseous nitrogen in preparation for fueling the external tank. The inertial measurement units will transition from the warm up stage to the operate/attitude determination mode at T-6 hours, 45 minutes. Chilldown of the lines carrying the cryogenic propellants to the external tank begins when the clock resumes the count at 1:02 a.m. Filling and topping off the external tank is targeted for completion at T-3 hours or 4:02 a.m. July 17. During the two-hour hold at T-3 hours, an ice inspection team will survey the external tank's outer insulation and other Shuttle components. The closeout crew will also be dispatched to the pad to begin configuring the crew module and white room for the flight crew's arrival. Liquid oxygen and liquid hydrogen will be in a "stable replenish mode" during this time to replace any propellant that "boils" off. The crew will be wakened at about 4:12 a.m. After breakfast, the crew will be briefed about weather conditions both at Kennedy Space Center and around the world via satellite from Mission Control (Houston, TX). The crew will "suit-up" in their partial-pressure suits, leave the Operations and Checkout Building during the T-3 hour hold (about 5:52 a.m.). They are set to arrive at the LC 39B white room at about 6:22 a.m. where the white room personnel will aid the crew in getting into the crew cabin. Immediately prior to the T-1 hour mark, the test team and the flight crew get another weather update, including observations from astronaut **Robert "Hoot" Gibson** who will have been flying above KSC in a Shuttle Training Aircraft. The last two built-in holds will be 10 minutes in length and occur at the T-20 minute mark (8:42 a.m.) and at the T-9 minute mark (9:03 a.m.). During the latter hold, the flight crew and ground team receive the NASA launch director's and the mission management team's final "go" for launch. Milestones after the T-9 minute mark include the start of the ground launch sequencer; retraction of the Orbiter's auxiliary power units at T-5 minutes;

pressurization of the liquid oxygen tank inside the external tank at T-2 minutes, 55 seconds; pressurization of the liquid hydrogen tank at T-1 minute, 57 seconds; and the electronic "go" to the Discovery's onboard computers to start their own terminal countdown sequence at T-31 seconds. The Orbiter's three main engines will start at T-6.6 seconds. [NASA/KSC RELEASE NO. 82-93, July 13, 1993; Halvorson, FLORIDA TODAY, p. 2A, July 14, 1993.]

[] **STS 51: SHOWERS A SMALL CONCERN**

The countdown for Discovery's launch began at the T-43 hour mark today at 9:30 a.m. Forecasters indicate a 10 percent probability of weather prohibiting launch with a slight chance of showers being the primary concern. The five member crew for this mission arrived at KSC about 2:30 p.m. today. Crew members are: Commander **Frank Culbertson**, Pilot **William Readdy**, and Mission Specialists **Daniel Bursch**, **James Newman** and **Carl Walz**. Work completed at Launch Complex 39B: aft engine compartment closeouts; hypergolic pressurization closeout operations; launch countdown preparations; aft confidence test and external tank purging. Workers today are working a number of tasks: verification of the Shuttle's power on systems, data processing and flight control systems; final stowage of mid-deck and flight deck supplies and payloads; preparations for power reactant and storage distribution system operations; Orbiter closeouts; moving solid rocket booster flame deflectors to launch position; payload bay closeouts; retraction of the payload ground handling mechanism. STS 51 tasks scheduled: closing of the payload bay doors this afternoon; cryogenic reactants loading for power reactant and storage distribution system; retraction of the rotating service structure; external tank loading operations. The launch window for STS 51 runs from 9:22 a.m. until 10:24 a.m. EDT on July 17. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT; Mission: STS 51 ACTS-TOS/ORFEUS-SPAS, Launch Minus 3 days, July 14, 1993; Halvorson, FLORIDA TODAY, p. 1A, July 15, 1993.]

[] **CAPE CANAVERAL RESTRICTED AREAS, AIRSPACE**

A delay in the launch of the Space Shuttle (Endeavour) was once again narrowly avoided in June when a Federal Aviation Administration (FAA) patrol aircraft intercepted a local pilot who crossed into KSC restricted airspace. The intruding aircraft was escorted out of the area and legal action against the pilot was taken. Shuttle launch delays are expensive and sometimes jeopardize mission objectives. One of the ways NASA can help assure an on-time liftoff is to keep operational airspace clear of aircraft that have no direct involvement in launch activities. Launch of Discovery on its STS 51 mission is scheduled for July 17 at 9:22 a.m. As is customary, the airspace around the Kennedy Space Center and Cape Canaveral Air Force Station will be closed to general aviation beginning three hours before the scheduled liftoff time. Activating the restricted airspace within

the launch area is primarily intended to protect private aircraft from potential harm during launch activity. however, this also protects the Space Shuttle and the astronauts aboard.

During the final portion of the countdown, official aircraft supporting the launch will be in the air. The surrounding airspace will be congested. For pilots desiring to view the launch from their airplanes it is suggested that they remain outside an area bounded by the west shoreline of the Indian River, above the intersection of U.S. 1 and State Road 3 on north Merritt Island, and south of Port Canaveral and the Bee Line Expressway (SR 528). Notices to Airmen (NOTAMS) regarding restricted airspace are available from the St. Petersburg Flight Service Station. Real time advisories are also available from Patrick Approach Control. As is customary, FAA aircraft will be enforcing restricted airspace on launch day if they observe or are advised by Patrick Approach Control of violations. It is notable that some aircraft insurance companies are canceling policies of intruders convicted of an airspace violation involving the Space Shuttle. [NASA/KSC RELEASE NO. 84-93, July 14, 1993.]

July 15: **STS 51: LAUNCH MINUS 2 DAYS**

The countdown for Discovery's STS 51 launch continues without problem at KSC's Launch Complex 39B. No technical or hardware issues are being worked. The primary operation at the pad today features the loading of the onboard cryogenic tanks with the liquid oxygen and liquid hydrogen reactants. These reactants provide the Orbiter's electricity while in space and a by-product of drinking water. The pad was closed to all non-essential personnel at about 9:30 this morning for the loading operation. Cryogenic flow is expected to begin at about 11:30 a.m. and continue for about 5 hours. Following this operation the Orbiter mid-body umbilical unit will be demated. Communications activation and final vehicle and facility closeouts will begin. Also preparations will be made to retract the rotating service structure to launch position at about 11:00 a.m. tomorrow. Forecasters continue to indicate a 10 percent probability of weather prohibiting launch with a slight chance of showers being the primary concern. The winds at the pad are expected to be from the southwest at 4 to 6 knots; temperature 84 degrees F.; visibility 7 miles; and clouds scattered at 3,000 and 25,000 feet. A 24-hour and 48-hour delay will see about the same conditions with a forecast 20 percent chance of violation. The five-member astronaut crew for this mission arrived at KSC's Shuttle Landing Facility at about 3:30 p.m. yesterday. Today they will be involved with checking out their mission plans and fit checks of their equipment. They are scheduled for some free time this afternoon and will be ready for sleep at about 6:30 p.m. They will be awakened tomorrow at about 2:30 a.m. to prepare for the trip to the launch pad. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, July 15, 1993.]

[] **WINCHELL NEW CHIEF COUNSEL**

Michael G. Winchell was designated as Kennedy Space Center's new Chief Counsel on July 11, replacing **Ed Parry** who retired earlier in the year. As Chief Counsel, Winchell is responsible for providing legal advice and assistance to KSC Director **Robert L. Crippen** and to all elements of the Center. In the last 16 years, Winchell has had an illustrious career. Prior to his new KSC position, Winchell served as counsel, Marine Corps Logistics Bases, Albany, GA, where he was responsible for providing the full range of legal services to the logistics operations of the Marine Corps. In addition, he served as the senior environmental and contract lawyer for the Marine Corp outside of the Office of the Counsel to the Commandant, United States Marine Corps.

His federal career began in 1977 with the General Services Administration, where he attained the position of Assistant Regional Counsel. He subsequently served as an administrative law judge with the Equal Employment Opportunity Commission and as counsel, Southeastern Bases, U.S. Marine Corps before his position in Albany. He recently received the United States Marine Corps Commendation for Meritorious Civilian Service Award for his significant role in developing the Marine Corps Logistics Bases Strategic Plan, in leading the environmental compliance process and his dedication to quality and service. A native of Oklahoma, Winchell received a bachelor's degree in business administration in 1974 from Central State University (Edmond, OK), and his Juris Doctor degree from the University of Oklahoma (Norman, OK) in 1976. [NASA/KSC RELEASE No. 86-93, July 15, 1993; "KSC Director's New Legal Adviser Appointed," FLORIDA TODAY, p. 9E, July 25, 1993.]

[] **DISCOVERY READY FOR LAUNCH**

The Space Shuttle Discovery is prepared and ready to launch on its 17th voyage into space. Launch remains scheduled for the opening of a 62-minute window at 9:22 a.m. EDT from Kennedy Space Center's Launch Complex 39B. Preparations for Discovery's flight began just hours after the Orbiter returned from its most recent mission, STS 56, launched April 8, 1993. Discovery landed at KSC's Shuttle Landing Facility (SLF) on April 17 and was towed a few hours later to Orbiter Processing Facility (OPF) bay 3. In the OPF, the vehicle underwent standard turn-around operations and was prepared for transfer to the Vehicle Assembly Building (VAB) on June 18. Once in the VAB, Discovery was mated to the external tank (ET) and twin solid rocket boosters (SRB). Following standard Shuttle interface testing in the VAB, the entire Shuttle vehicle was rolled out to Launch Complex 39B on June 26. The day before rollout, the primary payload, the Advanced Communications Technology Satellite/Transfer Orbit Stage (ACTS/TOS), was delivered to the pad's payload changeout room. The next day Discovery's payload bay doors were opened and the ACTS/TOS payload was

transferred to the Orbiter's payload bay. Launch Complex 39B was turned around in just 4 and 1/2 days from the time Endeavour was launched on June 21 and Discovery was rolled out to the pad on June 26.

On June 30 the final phase of the terminal countdown demonstration test (TCDT) was conducted. The test involved the KSC launch team as well as the five crew members of mission STS 51. During the TCDT, STS 51 Commander **Frank Culbertson** made an Orbiter-to-Orbiter communications check with STS 57 Commander **Ron Grabe**, who had just landed the Shuttle Endeavour at KSC's SLF. At the pad, Discovery underwent typical pre-launch preparations and the countdown to launch the fifth Space Shuttle mission of the year began on time at the T-43 hour mark at 9:30 a.m., July 14. Mission STS 51 is scheduled to last nine days. An additional day on orbit may be permitted if enough onboard cryogenic reactants are available. Landing is scheduled to take place at KSC. The crew members for mission STS 51 are: Commander Frank Culbertson, Pilot **William Readdy**, and Mission Specialists **Daniel Bursch**, **James Newman** and **Carl Walz**. [NASA/KSC RELEASE NO. 85-93, July 15, 1993.]

[] **NASA/GERMAN SPACE AGENCY AGREEMENT**

NASA and the German Space Agency (DARA) signed an agreement tonight to cooperate on four space missions using the retrievable German Shuttle Pallet Satellite (ASTRO-SPAS). **Daniel S. Goldin**, NASA Administrator, and Professor **Wolfgang Wild**, DARA Director General, signed the memorandum of understanding in Washington, D.C. The ASTRO-SPAS program involves combined U.S. and German science payloads to be flown on a newly developed German-designed science satellite. The first phase of the ASTRO-SPAS program consists of two missions, one involving far and extreme ultraviolet astronomy and a second, to take infrared and far infrared radiation measurements in the Earth's atmosphere. The first planned ASTRO-SPAS mission is the Orbiting and Retrievable Far and Extreme Ultraviolet Spectrograph (ORFEUS-SPAS-1). In this mission, the German ORFEUS instrument will be flown with one German and two U.S. spectrographs. ORFEUS-SPAS-1 is currently scheduled for a Space Shuttle launch on July 17, 1993. The objective of ORFEUS-SPAS-1 is to launch a deployable/retrievable astronomical platform and obtain ultraviolet spectra for both astrophysically interesting sources and the intervening interstellar medium. The second planned ASTRO-SPAS mission is the first flight of the Cryogenic Infrared Spectrometers and Telescopes for the Atmosphere (CRISTA-SPAS-1). It is co-manifested with NASA's Atmospheric Laboratory for Applications and Science (ATLAS-3) for a planned Space Shuttle launch in September 1994. The objective of CRISTA-SPAS-1 is to explore the variability of the atmosphere and to provide measurements to complement the ATLAS-3 science objectives. The CRISTA instruments and the Middle Atmosphere High Resolution Spectrograph will provide trace gas measurements at locations in time and space not available

elsewhere, including an enhanced set of correlative measurements in support of the Upper Atmosphere Research Satellite and other Earth-orbiting atmosphere experiments. In the second phase of the ASTRO-SPAS program, NASA and DARA plan to re-fly ORFEUS-SPAS in 1995 and CRISTA-SPAS in 1996 on the Space Shuttle. [NASA/KSC RELEASE: 93-129, July 16, 1993; Banke, FLORIDA TODAY, pp. 1A-2A, July 16, 1993.]

July 16: **STS 51: LAUNCH MINUS 1 DAY**

The countdown for Discovery's STS 51 launch continues without problems at KSC's Pad 39B. No technical or hardware issues are being worked. Yesterday operations to load the onboard cryogenic tanks with the liquid oxygen and liquid hydrogen reactants was completed on schedule and the Orbiter mid-body umbilical unit, through which the reactants flow, was demated and retracted away from the vehicle. Communications activation and final vehicle and facility closeouts are continuing today. Also, time critical equipment and the last two mid-body payloads, CHROMEX and CPCG, are being installed in the Orbiter. Earlier, the rotating service structure was rolled to launch position with first motion occurring at 10:16 a.m. today. At about 1:00 a.m. tomorrow (July 17), operations will begin to load the external tank with more than 500,000 gallons of liquid hydrogen and liquid oxygen. Operations toward that milestone are proceeding without problem. Forecasters continue to indicate only 10 percent probability of weather prohibiting launch with a slight chance of showers being the primary concern. The winds at the pad are expected to be from the west-southwest at 4 to 6 knots; temperature 84 degrees F; visibility 7 miles; and clouds scattered at 3,000 and 25,000 feet. A 24-hour or 48-hour delay will see about the same conditions with a forecast 10 percent chance of violation each day. Today, the five-member astronaut crew for this mission have been given a briefing on tomorrow's weather outlook and completed their review of launch day activities and mission plans. STS 51 Commander **Frank Culbertson** and Pilot **William Readdy** will fly in the T-38 training aircraft this afternoon. The entire crew will be ready for sleep at about 6:30 p.m.; they will be awakened tomorrow at 4:12 a.m. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, July 16, 1993.]

July 17: **STS 51 SCRUBBED AT T-20 MARK**

Launch of the Space Shuttle Discovery on its STS 51 mission was scrubbed today at the T-20 minute mark due to a problem with a switch in the pyrotechnic initiator controller (PIC) which governs the pyrotechnic circuits on the Shuttle. "We are disappointed, of course, that this problem caused the launch to be scrubbed," said Mission Commander **Frank Culbertson**. "But safety is always of paramount concern in the Shuttle program," he added. The problem was narrowed down to a prematurely charged capacitor in the firing circuit of two of the eight solid rocket booster hold down posts and the T-O liquid hydrogen vent arm,

located on the side of the external tank. Work to repair the circuit, located on the mobile launcher platform, will begin tomorrow evening after the external tank has been emptied of its cryogenic fuels and the ordnance devices on the Shuttle have been safed. A specific launch date is yet to be determined but early assessments indicate the vehicle will probably not be ready for launch before next Thursday or Friday. Launch Director **Robert B. Sieck** said, "I think the worst we're talking about is the 26th." At 12:45 p.m.,the five members of the astronaut crew departed for their homes in Houston, TX, where they will await word as to when Discovery will again be ready for launch. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, July 17, 1993; "STS-51 Shuttle Status Update," July 17, 1993; Halvorson, FLORIDA TODAY, p. 1A, July 18, 1993.]

[] **STS 51 UPDATE**

After further analysis and troubleshooting, engineers have determined that all eight of the solid rocket booster hold down bolts and the T-0 liquid hydrogen vent arm, located on the side of the external tank, were prematurely charged with current, instead of just two of the bolts. This charge is normally initiated at the T-18 second mark in the countdown. At T-0, when the two solid rocket boosters are ignited, two additional commands are sent by the Orbiter's computers that send the signal to ignite the NASA standard detonators inside the frangible nut at the top of each bolt, freeing the vehicle from its launch platform. Schedules have been made to drain the Orbiter's fuel cell storage tanks of their liquid oxygen and liquid hydrogen reactants and to disconnect or safe pyrotechnic initiator controllers in various areas of the vehicle and payload. The payload doors will be opened to allow battery charging for the Advanced Communications Technology Satellite and for servicing the ORFEUS payload with argon. Officials estimate this work will be completed by July 19, allowing troubleshooting of the pyrotechnic racks inside the mobile launcher platform. ["STS-51 Shuttle Status Update," July 17, 1993; Halvorson, FLORIDA TODAY, p. 2A, July 19, 1993.]

[] **KSC WORKERS RECEIVE SILVER SNOOPYS**

NASA astronauts were on hand at Kennedy Space Center recently to present their Silver Snoopy Award to five KSC workers. Astronaut **Terence Wilcutt** presented Snoopys to **Roy Whitson**, **Mack McKinney**, **Raul Caimi** and **Rudolph Werlink**. The award was also presented to **Retha Olsen** by astronaut **Don McMonagle**. ["Silver Snoopys Follow Five KSC Workers Home," FLORIDA TODAY, p. 9E, July 18, 1993.]

[] **THIOKOL NAMES NASH VP**

Dale Nash (Titusville, FL) has been named Vice President of Space Services by Thiokol Corp., the manufacturer of the Space Shuttle's solid rocket boosters.

Nash, in his new position, will be responsible for oversight of solid rocket booster and external tank launch processing. ["Thiokol Names Nash to Space Services Post," FLORIDA TODAY, p. 9E, July 18, 1993.]

July 19: **ATLAS LAUNCH TONIGHT**

"This is going to be the most closely followed rocket launch of the year," said **John Pike**, Director of Space Policy for the Federation of American Scientists (Washington, D.C.). Pike referred to tonight's launch by General Dynamics of its Atlas rocket between 6:04 p.m. and 7:26 p.m. Pike added, "If this one ends up in the water, they might as well turn off the lights and go home." The launch is part of General Dynamics' effort to capture 30 percent of the commercial launch business which is currently dominated by the European Space Agency's Ariane rocket. [Halvorson, FLORIDA TODAY, pp. 1A-2A, July 19, 1993.]

[] **NEW DISCOVERY LAUNCH DATE TO BE SET**

NASA officials are busily trying to decide when to make a second attempt to launch Discovery on its STS 51 mission. Launch Director **Robert B. Sieck** said, "We should have a better handle on things (today)." Mission managers do not yet know why a bolt firing device was charged prematurely. Engineers were worried that Discovery's computer might have tried to shut down its main engines just after ignition, resulting in a dangerous launch pad abort. [Halvorson, FLORIDA TODAY, p. 2A, July 19, 1993.]

[] **STS 51: LAUNCH DATE UNDETERMINED**

Work to repair a faulty pyrotechnic initiator controller (PIC), located on the mobile launcher platform, is now underway, but a specific launch date for STS 51 remains to be determined. Technicians at Launch Complex 39B have opened Discovery's payload bay doors and offloaded onboard cryogenic tanks. They have completed safing the ordnance and removed mid-deck payloads for servicing. Today workers are troubleshooting the ground pyrotechnic initiator controller which led to the scrubbing of Discovery's launch on July 17. Pad workers are also servicing the ORFEUS payload and conducting a trickle charge of the ACTS batteries. STS 51 work scheduled includes: ordnance installation and reconnect operations; loading of onboard cryogenic reactants; aft engine compartment closeouts and aft confidence test; final payload bay closeouts and closing of payload bay doors for flight. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, July 19, 1993.]

July 19: **ATLAS 2 LAUNCH SUCCESSFUL**

The Air Force successfully launched a General Dynamics-built Atlas 2 rocket at 6:04 this evening. The launch was an important one for the credibility of General Dynamics' commercial space program. "You've got to build your reliability one launch at a time," said **Michael Wayne**, President of General Dynamics' Space Systems Division. The Atlas payload was a $160 million DSCS-III communications satellite which will allow President **Clinton** to contact military forces anywhere in the world. [Banke, FLORIDA TODAY, p. 1A, July 20, 1993.]

[] **DISCOVERY MAY LAUNCH JULY 23**

NASA officials said today that Discovery may launch on its STS 51 as early as July 23 or delay the next attempt until July 26. The decision on when to launch Discovery depends upon fixing the problem which halted the launch July 17 and on resolving a scheduling conflict with the Air Force which has plans to test a Titan rocket at Cape Canaveral Air Force Station's Eastern Test Range. The Air Force can support only one major launch activity at a time. [Banke, FLORIDA TODAY, p. 2A, July 20, 1993.]

July 20: **STS 51: LAUNCH DATE TBA**

An announcement is expected later today from NASA managers giving a firm launch date for Discovery on mission STS 51. At this time, launch will not occur before Friday, July 23. The problem circuit card in the pyrotechnic initiator controller which caused the launch scrub on July 17 has been replaced on the mobile launcher platform. Efforts to duplicate the problem on the suspect card were successful at KSC's malfunction laboratory. A thermally unstable circuit was the culprit. The five members of the astronaut crew departed for their homes in Houston (TX) on the 17th. Their schedule to return to KSC will be determined by the setting of a new launch date. The crew for the mission includes: Commander **Frank Culbertson**, Pilot **William Readdy**, and Mission Specialists **Jim Newman**, **Dan Bursch** and **Carl Walz**. Completed tasks include: argon servicing of the ORFEUS payload and opening of the payload bay doors. In progress today: extended launch scrub turnaround operations; purge of power reactant storage and distribution system; ordnance installation and reconnect operations; the pad will be cleared at 4:00 p.m. today; trickle charge of the ACTS batteries. STS 51 work scheduled: loading onboard cryogenic reactants; aft engine compartment closeouts and aft confidence test; final payload bay closeouts and closing of the payload bay doors for flight. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, July 20, 1993.]

[] **LAUNCH SET FOR JULY 24**

NASA managers this afternoon set July 24 as the new launch date for STS 51. The launch window opens at 9:27 a.m. and extends for 54 minutes. The decision

to go with July 24th as the new launch date follows the completion of work to inspect and retest the pyrotechnic initiator controller (PIC) unit on the launch pad. A problem with the unit caused the KSC Launch Director, **Robert B. Sieck**, to call a scrub during a launch attempt on July 17. "The entire July 24 date is the best date all around for the launch of Discovery on the STS 51 mission," said Shuttle Program Director **Tom Utsman**. "It gives enough time for KSC technicians to complete work on the PIC unit, the payload community time to service the STS 51 experiments and the entire launch team enough time to put the Shuttle system back into launch configuration. The July 24 date is also one that the Air Force Range Safety community can support." Air Force Range Safety support is contingent, however, on whether a planned mock countdown for the Air Force's Titan mission goes well. "They [NASA] have been offered an opportunity to go Saturday [July 24]; if the Titan test is delayed or runs long, we will have to take another look at the schedule," said Air Force spokeswoman **Terri Bracher**. Discovery's STS 51 mission will utilize its five man crew to deploy the Advanced Communications Technology Satellite (ACTS) which will give industry, academic and government organizations an opportunity to investigate new ways of communicating. The crew will also deploy and retrieve the Orbiting and Retrievable Far and Extreme Ultraviolet Spectrometer (ORFEUS-SPAS) which will gather information on the life-cycle of stars by observing some of the coldest (several degrees above absolute zero) and the hottest (more than one million degrees) matter found in our galaxy. [LAUNCH ADVISORY: JULY 24 NEW DATE FOR STS 51 LAUNCH, July 20, 1993; Halvorson, FLORIDA TODAY, p. 1A, July 21, 1993.]

July 21: **STS 51: LAUNCH MINUS 3 DAYS**

Mission managers yesterday announced July 24 as the new launch date for Space Shuttle Mission STS 51. The decision to go with July 24 follows completion of work to inspect and retest the problem circuit card in the pyrotechnic initiator controller (PIC) which caused the launch scrub July 17. It is also a date the Air Force range safety community can support. The countdown for the launch will begin counting at T-11 hours at 7:07 p.m. July 23. Weather for a launch attempt on July 17 is favorable with only a 10 percent chance of violating launch criteria. The primary concern is a slight chance for rain showers. The five members of the astronaut crew are scheduled to return to KSC today at about 4:00 p.m. Pre-launch tasks completed at LC 39B: purge of power reactant storage and distribution system; ordnance installation and reconnect operations; troubleshooting and replacement of the PIC and a PIC resistance test. Work in progress includes: extended launch scrub turnaround operations; aft engine compartment closeouts; trickle charge on ACTS batteries; final payload bay closeouts. STS 51 work scheduled: aft confidence test; closing payload bay doors for flight tonight and loading of onboard cryogenic reactants. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, July 21, 1993.]

[] **SPACE STATION STAFF CUTS LOOM**

NASA Administrator **Daniel S. Goldin** has announced in an open letter to 24,000 space agency employees the broad outlines of a plan to reduce NASA's Space Station personnel from 3,000 to 1,000. Goldin wrote, "These announcements will be followed by interviews to identify those talented NASA employees who will make up the new space station team." The announcement also included a plan for a "single space station contractor, a single NASA center to host the project and a single NASA manager" to supervise all portions of the program. The personnel changes will begin to occur within the month and those not retaining jobs with the program will have to look for other jobs in the agency, take early retirement or look for work in the private economy. [Halvorson, FLORIDA TODAY, p. 1A, July 22, 1993.]

[] **STS 51: CREW RETURNS FOR NEXT TRY**

The five man crew of Discovery returned to Kennedy Space Center today ready for a second try at launching the Shuttle. "It looks like we're in really good shape for Saturday [July 24]," said **Frank Culbertson** who is the Mission Commander. "We have a lot of confidence that we're going to have a successful countdown and that the weather is going to be good." [Halvorson, FLORIDA TODAY, p. 5A, July 22, 1993.]

July 22: **STS 51: COUNTDOWN SMOOTH**

The countdown for Discovery's launch continues without problem at Kennedy Space Center's Launch Complex 39B. No technical or hardware issues are being worked. Yesterday, the aft engine compartment and the payload bay were closed for flight. The primary operation at the pad today features the loading of the onboard cryogenic tanks with the liquid oxygen and liquid hydrogen reactants. These reactants provide the Orbiter's electricity while in space and a by-product of drinking water. The pad was closed to all non-essential personnel at about 8 a.m. today for this operation. Cryogenic flow began at about 9:30 a.m. and will continue for about five hours. Following this operation the Orbiter mid-body umbilical unit will be demated. Communications activation and final vehicle and facility closeouts will begin. Also preparations will be made to retract the rotating service structure to launch position at about 11 a.m. tomorrow. For launch on July 24, the countdown clock will begin counting at T-11 hours at 7:07 p.m. Friday, July 23.

Forecasters indicate a 10 percent probability of weather prohibiting launch with a slight chance of showers and low ceilings being the primary concerns. The winds at the pad are expected to be from the southeast at 6 to 8 knots; temperature 83 degrees F.; visibility 7 miles; and clouds scattered at 3,000 and 25,000 feet.

A 48-hour delay will see about the same conditions with a forecast 20 percent chance of violation. (No 24-hour forecast is available since the 24-hour scrub turnaround is not an option for Saturday's attempt.) The five-member astronaut crew arrived at the space center's Shuttle Landing Facility at about 3:30 p.m. yesterday. Today they will be involved with checking out their mission plans and fit checks of their equipment. They are scheduled for some free time this afternoon and will be ready for sleep at about 6:30 p.m. They will be awakened tomorrow at about 2:30 a.m. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, July 22, 1993.]

[] **LC 46 MAY BE MODIFIED**

If the Air Force approves the plan, Launch Complex 46 at Cape Canaveral Air Force Station may be modified in conjunction with the Spaceport Florida Authority. The first users of the facility would be a Lockheed commercial launch vehicle and Orbital Sciences' Taurus rocket. The Navy would also be involved in this project. Another plan discussed by the Authority called for the construction of a Titan warehouse at CCAFS by Martin Marietta which also builds the Titan. [Williams, FLORIDA TODAY, p. 1B, July 23, 1993.]

July 23: STS 51: COUNTDOWN STARTS AT T-11 HOURS

"The vehicle is in good shape; we're ready to go try again," commented **Jim Harrington**, Director of Shuttle Operations at Kennedy Space Center. Work toward Discovery's launch on July 24, continues without problem today at Launch Complex 39B. Yesterday, operations to load the cryogenic tanks with liquid oxygen and liquid hydrogen were completed and the Orbiter mid-body umbilical unit was demated and retracted into the service structure. Today, preparations continue to retract the rotating service structure to launch position at about 10 a.m. Also today, time critical equipment and the last two mid-deck payloads, CHROMEX and CPCG, are being installed into the Orbiter. The countdown will begin at the T-11 hours at 7:07 p.m. today. At about 12:30 a.m. tomorrow, the external tank will be ready for fueling with more than 500,000 gallons of liquid oxygen and liquid hydrogen.

Forecasters continue to indicate a 10 percent probability of weather prohibiting launch with a slight chance of showers and low ceilings being the primary concerns. The winds at the pad are expected to be from the southwest at 6 to 8 knots; temperature 83 degrees F.; visibility 7 miles; and clouds scattered at 2,500 and 25,000 feet. A 48-hour delay will see about the same conditions with a forecast 20 percent chance of violation. (No 24-hour forecast is available since the 24-hour scrub turnaround is not an option for tomorrow's attempt.) Today, the five-member astronaut crew are involved with checking out their mission plans and taking part in Orbiter and payload systems briefings. They are scheduled for

some free time this afternoon and will be ready for sleep at about 6:30 p.m. They will be awakened tomorrow at about 4:17 a.m. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, July 13, 1993; LAUNCH WEATHER FORECAST FOR STS 51 L-1 DAY, Cape Canaveral Forecast Facility, Department of the Air Force, July 23, 1993; Halvorson, FLORIDA TODAY, p. 1A, July 23, 1993.]

July 24: **PERRY REPORT ON PROCESSING**

Richard U. Perry, Director, Space Flight Safety and Mission Assurance Division, NASA Headquarters, recently undertook the chairmanship of a team to study Shuttle processing at the request of Kennedy Space Center Director **Robert L. Crippen**. His team has now completed its report which reaffirms that safety is the number one priority in Shuttle processing at the space center. Perry and **Robert B. Sieck**, Shuttle Launch Director at KSC, will brief the press on the Perry report and answer questions July 26. Teams such as Perry's are periodically implemented throughout NASA to ensure that the various fields of work of the agency are being done in the safest, most efficient and cost effective manner. In the Perry Report, the Review Team indicates "the Space Shuttle Processing is the best that it has ever been and is continually being evaluated for improvement." It also makes recommendations of areas where new or renewed emphasis should be placed to insure that this trend continues. [NASA/KSC RELEASE NO. 89-93, July 24, 1993.]

[] **STS 51: COUNTDOWN HALTED, 19 SECONDS**

Launch of Space Shuttle mission STS 51 was delayed today just 19 seconds before today's planned lift-off of 9:27 a.m. EDT. The countdown was halted when the Ground Launch Sequencer detected an unacceptably low measurement in the fuel system of a hydraulic power unit located inside the Shuttle's righthand solid rocket booster. Several factors could have resulted in the low fuel reading, but booster engineers believe the problem is isolated within the suspect hydraulic power unit. Consequently, a decision was made to remove and replace the hydraulic power unit and to retest the new system before proceeding with the next launch attempt. The team will spend the next couple of days offloading cryogenic and hypergolic fuels from the Shuttle and will not gain access to the booster until Tuesday. A realistic work schedule will not be available before mid-day July 26, but managers indicate that another launch attempt will not be made until at least another week to ten days from today. The five-member STS 51 flight crew has returned to the Johnson Space Center and will return to KSC a few days before the next launch attempt. Launch Director **Robert B. Sieck** said that no new launch attempt would come before August 2. The second delay in launching STS 51 will put pressure on the timetable for the upcoming mission to repair the Hubble Space

Telescope. [SPACE SHUTTLE MISSION STS 51 STATUS REPORT, July 24, 1993; Banke, FLORIDA TODAY, p. 4A, July 25, 1993; Halvorson, FLORIDA TODAY, pp. 1A & 4A, July 25, 1993; Halvorson, FLORIDA TODAY, p. 1A, July 26, 1993.]

[] **U.S./RUSSIA SIGN AGREEMENT**

The United States and the Russian Federation have signed an agreement to explore the possibility of further joint space exploration efforts. The agreement calls for a study to "define and determine the feasibility of a cooperative human space flight program." ["Russian, U.S. Sign Space Pact," p. 10E, July 25, 1993.]

July 26: **STATUS OF DISCOVERY: STS 51**

The launch of Discovery on its STS 51 mission was halted July 24 at the T-19 second mark due to a problem with the hydraulic power unit (HPU) on the right hand solid rocket booster. The HPU controls the rock and tilt actuators on the booster's nozzle. Specifically, the problem was narrowed down to the auxiliary power unit (APU) which is the power supply of the HPU. This resulted in a lower than allowable turbine speed. As a result, only the APU will be replaced. The faulty unit will be returned to the vendor for complete failure analysis and a new unit will be installed later this week. No additional work is scheduled for the left hand booster. Early assessments indicate another launch attempt will occur no earlier than August 2; to support this effort, a complete countdown will be required and the clock recycled to the T-43 hour mark. Technicians at LC 39B have drained the external tank of its cryogenic fuels; moved the rotating service structure back around Discovery; offloaded the onboard cryogenic fuels; demated the mid-body umbilical unit; opened the payload bay doors and opened the aft engine compartment doors. Today, workers are continuing the extended scrub turnaround activity; raising booster service platforms; conducting ordnance disconnect operations; installing payload access platforms and installing aft engine compartment entry level platforms. Scheduled STS 51 activities include: deservicing the HPU hypergolic fuels, removing and replacing the right hand SRB APU; hot firing the HPU and reconnecting ordnance devices. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, July 26, 1993; Halvorson, FLORIDA TODAY, p. 2A, July 27, 1993.]

[] **SPACELAB LIFE SCIENCES: STS 58**

Columbia remains in the Orbital Processing Facility bay 2 where main engines 1 and 2 have been installed on the Orbiter. The Spacelab tunnel has been installed and the external tank and solid rocket boosters have been mechanically mated. Today workers are installing main engine heat shields; conducting external tank and SRB electrical mating in the Vehicle Assembly Building and installing main

engine 3. Spacelab tunnel integration verification tests and end-to-end tests remain to be completed. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, July 26, 1993.]

[] **HUBBLE SPACE TELESCOPE REPAIR MISSION**

STS 61, also known as the Hubble Space Telescope Repair Mission, continues to be scheduled for early December 1993; the second delay in launching Discovery on its STS 51 mission will make it difficult to meet the December target date for Endeavour's mission. The main engines have been removed from the fleet's youngest member and the vehicle's Ku-band antenna has been demated. Preparations are underway in OPF Bay 1 for the installation of the 5th cryogenic tank set. The installation has been scheduled as have orbital maneuvering system functional tests. The STS 61 mission is expected to last 11 days and utilize a crew of 7 astronauts. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, July 26, 1993.]

[] **NASA: "WORKERS HIDE MISTAKES"**

Workers are hiding mistakes for fear that their jobs would be jeopardized if the errors were revealed, according to a recent NASA study. The study was conducted under the leadership of **Richard Perry** and was designed to review quality control problems at Kennedy Space Center. NASA Administrator **Daniel S. Goldin** ordered the study April 20. "There is a fear," the report said, "that noted mistakes will lead to loss of employment. Therefore, there is a tendency to not report problems, close calls and incidents because of the fear of reprisal. The report, however, found no evidence that reporting problems led to punishment and/or job loss. The fear was attributed to recent layoffs and news reports of Space Shuttle mishaps. [Halvorson, FLORIDA TODAY, pp. 1A-2A, July 27, 1993.]

July 27: **STS 58: PAYLOAD STATUS**

The primary payload for mission STS 58, the Spacelab Life Sciences 2 (SLS-2) laboratory module, passed a processing milestone today with the completion of the Interface Verification Test (IVT) verifying electrical and mechanical connections between the Spacelab module and the Spacelab tunnel. The tunnel, which provides astronaut access between the Orbiter mid-deck and the module itself, contains lights and air-handling equipment for the Spacelab. It was installed into Columbia's payload bay July 24-25. Also currently underway is an end-to-end test to verify communications capability between the laboratory in Columbia's payload bay and the Johnson Space Center in Houston. Columbia and SLS-2 are in Bay 2 of the Orbiter Processing Facility at KSC. The laboratory module was installed into Columbia on July 15 and these connections were also verified with an IVT

on July 20-22. Next, limited-lifetime experiment lockers were installed within the SLS-2 laboratory on July 22-23. The most time-critical of the experiments will be installed at the pad during launch countdown. After the experiment lockers wee installed in the OPF, the Spacelab tunnel installation followed last weekend on July 24-25. Columbia is targeted to move to the Vehicle Assembly Building on August 15 and roll out to Launch Pad 39-B about a week later. Once at the pad, ground support equipment used in experiment activation will be installed inside the Spacelab module. The actual SLS-2 activation occurs at the beginning of the STS 58 launch countdown. The SLS-2 mission, like its predecessor, SLS-1, is dedicated to life sciences research related to the future health, safety and productivity of humans in space. SLS-2 will re-fly many of the SLS-1 investigations to enable scientists to draw more definitive and statistically significant conclusions. Fourteen coordinated and complementary experiments will focus on the physiological mechanisms involved in the adaptation to microgravity and readaptation to normal Earth gravity. The STS 58/SLS-2 mission is targeted for launch the second week of September. [PAYLOAD STATUS REPORT STS 58/SLS-2, July 27, 1993; KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, July 27, 1993.]

[] **STS 61: HUBBLE REPAIR MISSION**

The Space Shuttle Endeavour is located in OPF Bay 1 where the Orbiter is undergoing preparations for its December STS 61 mission. Humidity separator functional checks, main propulsion system inspections, main engine removal and demating of the vehicle's Ku-band antenna have been completed. Today workers are preparing for the 5th cryogenic tank set installation and are conducting orbital maneuvering system functional checks. The installation of the 5th cryogenic tank set has been scheduled. STS 61 is planned to last for 11 days and will have a crew of 7 astronauts. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, July 27, 1993.]

July 28: **STS 51 LAUNCH DATE: AUGUST 4**

"We're going to give everybody Saturday off, and a good number of people will have Sunday off, too," said KSC spokesman **Bruce Buckingham**. "They have been working straight through for the past two weekends, and some have been at it longer than that." NASA announced today that the launch of Discovery on its STS 51 mission is now scheduled for August 4, 1993. The launch window opens at 9:06 a.m. EDT and extends to 10:14 a.m. The countdown is scheduled to pick-up at 9:30 a.m. on Sunday, August 1, at the T-43 hour mark. Pad technicians have deserviced the solid rocket booster auxiliary power unit hypergolic fuels and have raised booster service platforms. Today, workers removed and replaced the right hand solid rocket booster auxiliary power unit (APU); worked to closeout the aft engine compartment; charged the Advanced Communications Technology

Satellite (ACTS) battery and continued countdown preparations. STS 51 pre-launch activities scheduled: reservicing the APU hypergolic fuels; hot firing the SRB hydraulic power unit; reconnecting the ordnance devices; purging the power reactant storage and distribution system and powering down Discovery on July 31. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, July 28, 1993; Halvorson, FLORIDA TODAY, p. 1A, July 28, 1993; "Shuttle Liftoff Set for Aug. 4," THE ORLANDO SENTINEL, July 28, 1993; Halvorson, FLORIDA TODAY, p. 2A, July 29, 1993.]

[] **STS 58: SPACELAB TESTS**

Workers in the Orbiter Processing Facility's bay 2 have completed Spacelab end-to-end tests and Spacelab/tunnel integration verification tests in preparation for rolling Columbia over to the Vehicle Assembly Building. Main engine installation and leak checks are finished as is the installation of the Spacelab tunnel and the mechanical mating of the external tank and solid rocket boosters. Today, workers are securing the main engines, installing the main engine heatshields and carrier panels and conducting electrical mates of the external tank and solid rocket boosters in the VAB. A crew equipment interface test and Orbiter aft closeouts are scheduled. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, July 28, 1993.]

[] **STS 61: DECEMBER LAUNCH**

In OPF Bay 1, technicians continue to prepare Endeavour for its December STS 61 mission. Humidity separator functional checks and main propulsion system inspections have been completed. Today workers are preparing for the installation of the 5th cryogenic tank set; conducting orbital maneuvering system functional checks and ammonia system leak and functional checks and payload integration tests. The installation of the 5th cryogenic tank set is scheduled. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, July 28, 1993.]

July 29: **RIGHT HAND SRB APU REPLACED**

In the third runup to launch of the STS 51 mission Discovery's right hand solid rocket booster's auxiliary power unit has been replaced. In addition, pad workers have completed purges of the power reactant storage and distribution system. Today, pad workers have serviced the newly replaced APU with hypergolic fuels; there will be a hot firing of the SRB hypergolic power unit tonight. Countdown preparations continue and the Advanced Communications Technology Satellite has had its battery charged. STS 51 work scheduled includes: reconnecting the ordnance devices; closing out the aft compartment; powering down the vehicle (OV 103) on July 31. The Orbiter's payload bay doors will be closed for flight and the countdown will begin at 9:30 a.m.

August 1. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, July 29, 1993.]

[] **STS 58: HEATSHIELD INSTALLED**

In the OPF, main engine heatshield installation has been completed as have Columbia's electrical system redundancy tests. STS 58 work today includes: Orbiter aft closeouts; main engine securing, electrical interface and leak checks; main engine carrier panel installation and external tank and solid rocket booster electrical mates are underway in the Vehicle Assembly Building. A crew equipment interface test will be conducted July 31. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, July 29, 1993.]

[] **STS 61: MAIN AND NOSE LANDING GEAR LOWERED**

Endeavour is being processed for its December mission: STS 61. Workers in OPF bay 1 have lowered the Orbiter's main and nose landing gear. Today processing work continues: to prepare the vehicle for installation of the 5th cryogenic tank set; orbital maneuvering system and ammonia system leak and functional checks are underway as well as payload integration tests. STS 61 activities scheduled: installation of the 5th cryogenic tank set and main propulsion system leak and functional checks. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, July 29, 1993.]

[] **STS 51: METEOR SHOWER MAY DELAY FLIGHT**

"The concern is that there might be meteors in the vicinity of the Shuttle in orbit," said **Bruce Buckingham** a NASA spokesman at Kennedy Space Center. "The concern is with the possibility of strikes on the vehicle. We're still planning on flying on Wednesday [August 4], but we're going to continue to gather data, talking to all the experts." The annual Perseid meteor shower will peak, astronomers say, on the night of August 11 when the Discovery is still in orbit above the earth. Top NASA flight managers met today to discuss the meteor shower issue and gave consideration to putting off the upcoming November or December missions. [Halvorson, FLORIDA TODAY, p. 1A, July 30, 1993; Banke, FLORIDA TODAY, p. 1A, July 31, 1993.]

July 30: PERSEID SHOWER DELAYS LAUNCH

The Perseid meteor shower's activity has caused NASA managers to decide to delay Discovery's STS 51 launch until August 12, according to NASA spokesman **James Hartsfield**. Shuttle Director **Thomas E. Utsman** said, "Our review of the data indicates that the STS 51 mission could be flown safely during the Perseid event. However, we also recognized that this year's Perseid activity is a unique

event that may not be completely predictable. Therefore, the team felt the best overall course of action would be to wait until after the comet event to launch Discovery." Mission managers conceded that the chance of Discovery being hit by a meteor were 1 in 1,000, but it might have happened with the Shuttle crossing the path of the meteor shower about 10 p.m. August 11. Only the Hubble Space Telescope has had its operations affected by the shower. The telescope's solar arrays and main mirror will be turned away from the path of the meteors. [Banke, FLORIDA TODAY, p. 1A, July 31, 1993; LAUNCH ADVISORY: STS 51 LAUNCH DATE MOVED TO AUGUST 12, July 30, 1993.]

July 31: **JOURNALISM SEMINARS SET**

The first in a series of **Alan B. Shepard** Seminars for aerospace journalists will be held in Brevard County September 14. The lectures are "designed to improve public understanding of space issues." The project is underwritten by a $100,000 grant to the Mercury Seven Foundation from the Freedom Forum, a foundation dedicated to freedom of speech. ["Shepard Seminars Set for Sept.," FLORIDA TODAY, p. 10E, Aug. 1, 1993.]

[] **IMPACT OF DISCOVERY'S DELAYS**

"We're still analyzing what impact [the launch delay of STS 51] will have and we haven't made any decisions yet," according to NASA spokesman **Ed Campion**. Officials did say that Columbia's STS 58 mission will not be affected by the delay, but that the November and December missions may well be affected by the delays in launching Discovery on its STS 51 mission. Referring to the Perseid meteor shower early this month, KSC spokesman **Bruce Buckingham** said, "It certainly lets you know you're in the era of spaceflight and there are more things to be concerned with than what you can put your hands on here on Earth." [Banke, FLORIDA TODAY, p. 4A, July 31, 1993.]

AUGUST

August 2: **STS 51: ORDNANCE OPERATIONS COMPLETED**

At Launch Complex 39B, technicians have completed ordnance operations for STS 51. SRB auxiliary power unit hot firing inspections are finished as are aft engine compartment closeouts. Workers at the pad are occupied with servicing the newly replaced right hand solid rocket booster auxiliary power unit with hypergolic fuels. The results were positive from the SRB APU hot firing. Today pad workers charged the battery of the Advanced Communications Technology Satellite and installed the solid rocket booster (SRB) thermal curtain. Launch countdown preparations began and the countdown has been rescheduled to begin at 9:30 a.m. August 9. On Friday, July 30, NASA mission managers decided to postpone the launch of Discovery on Mission STS 51 until August 12; the delay is due to concerns regarding the Perseid meteor shower which is expected to peak on the evening of August 11. [Harwood, THE WASHINGTON POST, p. A4, July 31, 1993; Broad, THE NEW YORK TIMES, July 31, 1993; KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, August 2, 1993.]

[] **STS 58: LANDING GEAR CHECKS MADE**

Technicians in Orbiter Processing Facility bay 2 have completed the crew equipment interface test for Columbia's STS 58 mission; the Orbiter/tunnel `C' hatch has been installed and inspected; freon coolant loop adjustments have been made and checks have been completed and the landing gear functional checks are finished. Today Orbiter aft and mid-body closeouts are in process as are Spacelab closeouts and final payload bay cleaning. STS 58 work scheduled: crew module with Spacelab leakage tests; closing of the payload bay doors and a frequency response test. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, August 2, 1993.]

[] **STS 61: HUBBLE MISSION**

Ammonia system leak and functional checks and landing gear wheel and tire assembly installation have been completed on Endeavour. The fifth cryogenic tank set is being installed in Endeavour for its STS 61 mission; checks are being made of the vehicle's orbital maneuvering system functions and workers are conducting payload integration operations. Main propulsion system leak and functional checks are scheduled. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, August 2, 1993.]

August 3: **ACTS BATTERY DISCHARGED**

Workers at Launch Complex 39B have completed the Advanced Communications Technology Satellite (ACTS) batter discharge and aft engine compartment closeouts as part of their preparations for launching Discovery on STS 51 on August 12. Today, workers will be making accelerometer polarity adjustments to ACTS; they'll install the solid rocket booster (SRB) thermal curtain and complete SRB aft skirt firming. They will also continue work to closeout the crew compartment of the Shuttle. STS 51 work scheduled: transfer orbit stage (TOS) state-of-health checks; ORFEUS argon servicing; ACTS battery charging; launch countdown preparations; and starting the countdown on August 9 at the T-43 mark. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Aug. 3, 1993.]

[] **STS 58: CEIT COMPLETED**

Columbia's crew equipment interface test (CEIT) has been completed in OPF Bay 2; the eldest of the Space Shuttle fleet is being readied for a mid-September STS 58 mission. Orbiter/tunnel `C' hatch installation and inspections have been completed as have freon coolant loop adjustments and checks. Workers have finished landing gear functional checks as well. Today processing technicians are conducting Orbiter aft and mid-body closeouts; Spacelab external closeouts; crew module/Spacelab leakage tests and final payload bay cleaning. The payload bay doors are scheduled for closing and the frequency response test is also on the upcoming work agenda. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Aug. 3, 1993.]

[] **STS 61: AIMING FOR EARLY DECEMBER**

Despite the delays in launching Discovery on its STS 51 mission in the past thirty days, Endeavour continues to be on track for its December STS 61 mission. Workers have completed landing gear wheel and tire assembly installation. Currently workers are preparing for 5th cryogenic tank set installation; orbital maneuvering system functional checks; payload integration operations and radiator functional checks. Workers are also scheduled to undertake main propulsion system leak and functional checks. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Aug. 3, 1993.]

[] **KSC QUIETER DUE TO DELAYS**

"It's not like we've got a ghost town out here," according to KSC spokesman **Bruce Buckingham**. "It's just not as hectic as it's been over the last several weeks." Discovery was to have begun its STS 51 mission tomorrow morning; the liftoff was delayed due to the current activity of an annual phenomenon called the

Perseid Meteor Shower. For now, the launch is planned to occur between 9:10 a.m. and 10:07 a.m. on August 12; launch countdown is to begin at T-43 hours at 9:30 a.m. August 9. Meanwhile, engineers are checking the rocket motor in the Shuttle's cargo bay; the motor was built by Orbital Sciences Corp. and is called the Transfer Orbit Stage (TOS). [Banke, FLORIDA TODAY, p. 4A, Aug. 4, 1993.]

August 4: **STS 51: AFT SKIRT FOAMING**

At Launch Complex 39B, technicians have completed the Aft skirt foaming operations as a prelude to Discovery's August 12 launch. Aft engine compartment confidence checks and ACTS accelerometer polarity adjustments have been made. Today, workers are installing the SRB thermal curtain; conducting crew compartment closeouts; check the state-of-health checks on the Transfer Orbit Stage (TOS) in the vehicle's payload bay and readying for launch countdown. STS 51 work scheduled: ORFEUS argon servicing; battery charging for the Advanced Communications Technology Satellite (ACTS) and preparing for the countdown to begin on August 9. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Aug. 4, 1993.]

[] **STS 58: EDWARDS AFB LANDING**

Columbia's STS 58 mission is scheduled to land at Edwards Air Force Base, CA, after its 14 days in orbit. The Edwards landing is necessitated by the great weight of the Spacelab cargo. The crew equipment interface test has been completed as have the freon coolant loop adjustments and checks. Currently, workers are conducting aft, forward and mid-body closeouts; Spacelab external closeouts; crew module with Spacelab leakage tests; final payload bay cleaning. STS 58 work scheduled: closing the payload bay doors; frequency response testing; Ku-band antenna stowage. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Aug. 4, 1993.]

[] **STS 61: HUBBLE SERVICING MISSION**

Barring further setbacks in the Shuttle schedule, Endeavour will launch on its STS 61 mission in early December to attempt a repair of the Hubble Space Telescope. Processing technicians in OPF bay 1 have completed radiator functional checks and landing gear wheel and tire assembly installation. Work in progress: 5th cryogenic tank set installation; orbital maneuvering system functional checks; main propulsion system leak and functional checks; payload integration operations. Orbiter hydraulic system checkouts are scheduled. The STS 61 mission is scheduled to last for 11 days and will involve a crew of 7 at an orbital altitude (356 miles) nearly twice as high as most Shuttle missions. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Aug. 4, 1993.]

[] **STS 51: BEACH CLOSING**

Playalinda Beach will be closed to the public beginning August 8 at dusk due to next week's planned launch of the Space Shuttle Discovery on its STS 51 mission. Given a successful launch August 12, the beach will reopen to the public at 6 a.m. the next day. Launch of Discovery is set 2for 9:10 a.m. EDT on the 9th. The countdown leading to the 57th Space Shuttle flight is set to begin at 9:30 a.m. August 9; safety and security concerns require that Playalinda Beach be closed to the public throughout the majority of a Space Shuttle launch countdown. Other Canaveral National Seashore beaches, such as Apollo Beach, will not be affected by the referenced closing and will remain open during Discovery's launch. These beaches may be reached through the seashore's north beach entrance, located south of New Smyrna Beach. [NASA/KSC Release No. 94-93, Aug. 4, 1993.]

[] **NEW SAFETY RULES TO BE IMPLEMENTED**

When a botched test knocked out some systems aboard Endeavour during its June mission (STS 57), NASA began a review process which will lead to new safety rules being implemented. NASA created a Safety Advisory Board to study the incident which involved the sending of a wrong command to Endeavour. The signal resulted in a motor and fan short circuiting. The six astronauts aboard the vehicle were not endangered. "In the future, when we're staring something in the face that we haven't seen before, we want to make sure the process we have in place to deal with that is a zero-error type of thing," said NASA Flight Director **Lee Briscoe**. NASA's Congressional watchdog is the Aerospace Safety Advisory Panel; member **Seymour Himmel** said, "One of the inherent dangers in special procedures is that it's new. It's important to do everything you can to make checks and double checks. If they have found there wasn't sufficient review, then I think [the new Safety Advisory Board's] recommendations makes sense." [Banke, FLORIDA TODAY, p. 1A, Aug. 5, 1993.]

[] **FLORIDA PANTHERS SIGHTED IN REFUGE**

The fish and Wildlife Service Office at the Merritt Island National Wildlife Refuge gets weekly, sometimes daily, telephone calls from Kennedy Space Center workers who believe they have spotted an endangered Florida Panther on the land which serves both the Refuge and the space center. No evidence of Panther has yet been discovered on the 14,000-acre wildlife refuge - no tracks or tree scratches or other signs have been seen. KSC electrical engineer **Tim Mallow** doesn't claim to have seen a Florida Panther here at the space center either, but believes the reports of sightings. As founder and president of the Coryi Foundation - the cat's scientific name is Felis concolor coryi - Mallow devotes much of his spare time to saving and studying the panther. "When you consider that panthers have a range of 200 square miles and the fact that we know there are panthers within 50

miles of KSC, there's no reason why there wouldn't occasionally be a panther or two on the space center," Mallow said. "I think the sightings speak for themselves, but word alone is not enough."

The effort conclusively to determine whether Florida Panthers actually do roam the Kennedy Space Center recently led Mallow and a friend to erect a remote camera on the south side of the space center. Triggered by a combination of heat and motion, the 35 millimeter camera is set to photograph any mammal which crosses in front of the lens. "We're pretty excited to be given the chance to setup a camera on KSC," Mallow remarked. "Panthers have such a tremendous range, and there are more than 140,000 acres of land on the space center, but we feel we've selected a potentially good site," he continued. "It's a big challenge, but we're willing to stick it out and keep looking for panthers as long as the Fish and Wildlife Service will let us." FWS Biologist **Harvey Hill** said, "Tim enjoys a good reputation for working with panthers, and that's the main reason we approved his request. We're within the traditional traveling range of panthers, but have never been able to find any conclusive evidence of their presence on the refuge. Frankl I would be surprised if Tim finds one, but nothing would tickle me any more than getting a picture of a panther on our refuge." [NASA/KSC Release No. 93-93, Aug. 4, 1993.]

August 5: **STS 51: AFT SKIRT FOAMING**

Workers at Launch Complex 39B have completed foaming of the SRB aft skirt trailing edges and installing the solid rocket booster thermal curtain in preparation for the August 12 launch of Discovery. They are on schedule in their pre-launch processing efforts. Work in progress: crew compartment closeouts; argon servicing of ORFEUS spacecraft; launch countdown preparations. STS 51 work scheduled: Advanced Communications Technology Satellite (ACTS) batter charging tomorrow; start of countdown August 9 at 9:30 a.m.; the five astronauts of the STS 51 mission will arrive at the Shuttle Landing Facility about 3 p.m. EDT, August 9. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Aug. 5, 1993; Banke, FLORIDA TODAY, p. 7A, Aug. 6, 1993.]

[] **STS 58: AFT COMPARTMENT CLOSED OUT**

The Space Shuttle Columbia, which remains in OPF Bay 2, continues to be readied for rollover to the VAB as a first step on its STS 58 mission scheduled currently for mid-September. Technicians have completed the aft compartment closeouts; freon coolant loop adjustments and checks and the Ku-band antenna has been stowed for flight. Current STS 58 activities: Orbiter forward and mid-body closeouts; Spacelab external closeouts; crew module with Spacelab leakage tests and final payload bay cleaning. Scheduled activities include: closing payload bay

doors; frequency response test; rollover from the Orbiter Processing Facility to the Vehicle Assembly Building early in the evening on August 9. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Aug. 5, 1993.]

[] **STS 61: CRYO TANK SET INSTALLED**

Endeavour's STS 61 mission is dedicated to servicing the Hubble Space Telescope; it is targeted to launch in early December and will last 11 days. Radar frequency and power checks have been completed during the processing activities now underway in OPF Bay 1. In addition, technicians have removed and installed drag chute hardware and installed the 5th cyrogenic tank set. Currently, technicians are making orbital maneuvering system functional checks; main propulsion system leak and functional checks; and conducting payload integration operations. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Aug. 5, 1993.]

August 6: **STS 51: CLOSEOUTS FOR FLIGHT**

In anticipation of launching on August 12, Discovery's pre-launch preparations included closeouts of the solid rocket boosters, the aft main engine compartment and of the external tank. Work in progress: start of launch countdown at 9:30 a.m. August 9; repressurization of OMS pods with gaseous nitrogen; return of astronauts to Kennedy Space Center from JSC (Houston, TX); payload closeouts; closure of payload doors August 9 and loading of cryogenic propellants August 10. STS 51 work scheduled: ACTS battery recharging; preparations to repressurize OMS pods with gaseous nitrogen; countdown preparations in Firing Room 1. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Aug. 6, 1993; Banke, FLORIDA TODAY, p. 2A, Aug. 7, 1993; Date, THE ORLANDO SENTINEL, p. A-4, Aug. 7, 1993.]

[] **STS 58: COLUMBIA ROLLOVER PREPARATIONS**

Preparations for the STS 58 launch continue on schedule. The Spacelab SLS-2 module has been closed out for flight and the payload bay doors were closed last night. The aft compartment and mid-body closeouts are complete. The positive pressure check of the aft nd the orbiter structural leak check have been successfully performed. Weight and center of gravity determination will begin August 9. Rollover is targeted for 12:01 a.m. August 12. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Aug. 6, 1993.]

August 8: **MET-CON, INC. CONTRACT**

McDonnell Douglas Aerospace at Kennedy Space Center has awarded Met-Con, Inc. (Cocoa, FL) a contract to install and activate systems and ground support equipment for the new space station processing facility at KSC. The contract is worth $8.2 million and runs through December 31, 1995; it has two options that might be exercised during 1994 and 1995, according to McDonnell Douglas spokeswoman **Deborah Duschl**. Some work also will be done on facilities at Cape Canaveral Air Force Station. ["KSC Contracts With Cocoa Firm," FLORIDA TODAY, p. 10E, Aug. 8, 1993.]

August 9: **STS 51: LAUNCH MINUS 3 DAYS**

An upper level trough is expected to develop in the Eastern U.S. in conjunction with a ridge of high pressure over northern Florida. The resulting increase in moisture together with the high pressure southeasterly wind pattern will bring a chance for morning offshore shower or thundershower activity with a chance of local thunderstorms by the end of the week. At the opening of the launch window at 9:10 a.m. August 12, the forecast conditions are low scattered to broken clouds, visibility of 7 miles or greater, wind at the pad expected to be from the southeast at 5 to 7 knots. Temperature at launch time is predicted to be 83 degrees, dewpoint at 70 degrees and humidity at 69%. There is a chance of showers moving into the launch area from offshore. There is a 20% chance of launch weather criteria violation and a 0% chance of a tanking criteria violation. [Banke, FLORIDA TODAY, p. 1A, Aug. 8, 1993; LAUNCH WEATHER FORECAST FOR STS 51: L-3 Days, Aug. 9, 1993.]

[] **STS 51: COUNTDOWN BEGINS**

The countdown for launch of the Space Shuttle Discovery on mission STS 51 began as scheduled today at 9:30 a.m. EDT, at the T-43 hour mark. This marks the beginning of the third launch attempt of the Orbiter Discovery since the launch was scrubbed on July 17 and 24 due to technical problems. Additionally, launch was postponed from August 4 until August 12 due to concerns regarding the Perseid meteor shower which is expected to peak on the evening of August 11. The countdown includes 28 hours and 40 minutes of built-in hold time leading to the opening of the launch window at 9:10 a.m. (EDT) on August 12. The 57 minute window extends until 10:07 a.m. The five-member crew of STS 51 is expected to arrive in their T-38 training jets at the Shuttle Landing Facility at approximately 3:00 p.m. The crew includes Commander **Frank Culbertson**, Pilot **William Readdy** and Mission Specialists **Jim Newman**, **Dan Bursch** and **Carl Walz**. A primary objective of this mission is the deployment of the Advanced Communications Technology Satellite (ACTS) and the Transfer Orbit Stage (TOS). ACTS/TOS is the latest in NASA's series of advanced communications

satellites and a test-bed for technology which will be used in future operational satellites. Also, the Orbiting Retrievable Far and Extreme Ultraviolet Spectrometer-Shuttle Pallet Satellite (ORFEUS-SPAS) payload will be deployed and retrieved during this mission. Also on board is the IMAX camera, the Commercial Protein Crystal Growth (CPCG) experiment, and Chromosome and Plant Cell Division in Space (CHROMEX) experiment. In addition, astronauts Jim Newman and Carl Walz are scheduled to perform a six hour spacewalk on the fifth day of the mission as a continuation of a series of test spacewalks to increase experience and refine training methods. They will work with several tools that may be used during the servicing of the Hubble Space Telescope mission later this year.

Today in Firing Room 1 of the Launch Control Center, the KSC launch team is verifying systems to assure that the Shuttle is powered up and that the data processing and backup flight control systems are operating trouble free. Verifications will occur throughout the count to ensure reviews of the flight software stored in the Orbiter's twin memory banks is being conducted, computer controlled display systems are being activated, and the backup flight system general purpose computer is being loaded. Operations are also underway to prepare the Orbiter for on-board cryogenic loading. Later, Orbiter navigation aids will be turned on and tested and the inertial measurement units will be activated. Also today, ground crews are making the final storage of mid-deck and flight deck supplies and payloads. They will also perform microbial samplings of the flight crew's drinking water and check water levels in the crew waste management system. The STS 51 crew is scheduled to arrive at KSC at about 3 p.m. today. At T-27 hours, the countdown will enter its first built-in hold. This is an eight hour hold lasting from 1:30 to 9:30 a.m. Tuesday, August 10. When the countdown resumes, the launch pad will be cleared of all personnel in preparation for cryogenic fuel loading of the power reactant and storage distribution system tanks located under the payload bay lining. These tanks hold the super-cold liquid hydrogen and liquid oxygen reactants used by the fuel cells to provide electricity to the Orbiter and drinking water for the crew. Cryogenic flow is scheduled to start at about 11:30 a.m. August 10 and continue for about five hours. As servicing of the cryogenic tanks concludes, the clock will enter another built-in hold at the T-19 hour mark. This hold will last for four hours from 5:30 to 9:30 p.m. August 10.

Following cryogenic loading operations, the pad will be reopened for normal work and the Orbiter mid-body umbilical unit used to load the super-cold reactants in the Orbiter's fuel cell tanks will be demated and retracted into the launch structure. When the countdown resumes, technicians will complete final vehicle and facility closeouts and begin activating the Orbiter's communications systems and configuring Discovery's cockpit for flight. The Orbiter's flight control system and navigation aids will be activated. The stowable crew seats will be installed in the

flight and mid-decks. The countdown will enter a built-in at the T-11 hour mark at 5:30 a.m. Wednesday. This 13 hour, 20 minute hold will last until 5:30 a.m. Wednesday (August 11). This 13 hour, 20 minute hold will last until 6:50 p.m. During this hold, time critical equipment will be installed in the Orbiter's cockpit and the inertial measurement units will be activated and warmed up. At about 11 a.m. Wednesday, the Rotating Service Structure is scheduled to be moved away from the vehicle and placed in launch position. At T-9 hours, about 8:50 p.m. Wednesday, the onboard fuel cells will be activated. At T-8 hours, the launch team will begin evacuating the blast danger area and clear the pad for loading the external tank with the super-cold cryogenic fuels. At T-7 hours, 30 minutes, conditioned air that is flowing through the Orbiter's payload bay and other areas on the Orbiter will be switched to gaseous nitrogen in preparation for fueling the external tank. The inertial measurement units will transition from the warm up stage to the operate/attitude determination mode at T-6 hours, 45 minutes.

The countdown will enter another planned built-in hold at the T-6 hour mark at 11:50 p.m. During this one-hour hold, final preparations for loading the external tank will be completed and a pre-tanking weather briefing will be conducted. Chilldown of the lines that carry the cryogenic propellants to the external tank begins when the clock starts counting again at 12:50 a.m. August 12. Filling and topping off the external tank should be complete at the beginning of the next planned hold at T-3 hours, or 3:50 a.m. During the two-hour hold at T-3 hours, an ice inspection team will conduct a survey of the external tank's outer insulation and other Shuttle components. Also the closeout crew will be dispatched to the pad and begin configuring the crew module and white room for the flight crew's arrival. Liquid oxygen and liquid hydrogen will be in a stable replenish mode during this time to replace any propellant that "boils" off. During the hold at T-3 hours, the five-member STS 51 crew will be awakened at about 4 a.m. Following breakfast, the crew will receive a briefing on weather conditions both at KSC and around the world via satellite from Mission Control, Houston. The flight crew will suit-up in their partial pressure suits, then leave the Operations and Checkout Building during the T-3 hour hold, or at about 5:40 a.m. They will arrive at the pad's white room at about 6:10 a.m. where they will be assisted by white room personnel in getting into the crew cabin. Just prior to the T-1 hour mark, the test team and the flight crew will get another weather update, including observations from astronaut Robert "Hoot" Gibson flying in a Shuttle Training Aircraft in the KSC area.

The last two built-in holds will be 10 minutes in duration and will occur at the T-20 minute mark, or at 8:30 a.m., and at the T-9 minutes mark at 8:51 a.m. During the final hold, the flight crew and ground team receive the NASA launch director's and mission management team's final "go" for launch. Milestones after the T-9 minute mark include start of the ground launch sequencer; retraction of the Orbiter access arm at T-7 minutes, 30 seconds; start of the Orbiter's auxiliary power units

at T-5 minutes; pressurization of the liquid oxygen tank inside the external tank at T-2 minutes, 55 seconds; pressurization of the liquid hydrogen tank at T-1 minute, 57 seconds; and the electronic "go" to Discovery's onboard computers to start their own terminal countdown sequence at T-31 seconds. The Orbiter's three main engines will start at T-6.6 seconds. [NASA/KSC News Release No. 98-93, Aug. 9, 1993; KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Aug. 9, 1993; Banke, FLORIDA TODAY, p. 1A, Aug. 9, 1993; Banke, FLORIDA TODAY, p. 1A, Aug. 10, 1993; "Countdown No. 3 Begins for Space Shuttle Mission," THE WASHINGTON POST, Aug. 10, 1993.]

August 10: **STS 51: LAUNCH MINUS 2 DAYS**

The countdown for Discovery's STS 51 launch continues without problem today. The pad will be closed for most of today for the loading of the onboard cryogenic tanks with the liquid hydrogen and liquid oxygen reactants. These reactants provide electricity to the Orbiter is in space and drinking water for the crew. The pad was closed to all personnel at about 9:30 a.m. Cryogenic flow is expected to begin about 11:30 a.m. and last for about 5 hours. Following this operation the Orbiter mid-body umbilical unit will be demated, Orbiter communications activation will start and final vehicle and facility closeouts will begin. Tomorrow, preparations will be made to retract the rotating service structure to launch position at about 11 a.m. Tanking is scheduled to begin at about 12:30 a.m. August 12. The payload bay doors were closed yesterday at 5:30 p.m. following the completion of all payload bay operations. Two mid-deck experiments will be installed into the Orbiter tomorrow. The Commercial Protein Crystal Growth (CPCG) experiment will be installed at 9 a.m. and the Chromosome and Plant Cell Division in Space (CHROMEX) experiment will be installed beginning at about 6 p.m.

Forecasters indicate a 30 percent probability of weather prohibiting launch with the primary concerns being possible offshore thunderstorms and a low cloud ceiling. The winds at the pad are expected to be from the southeast at 8 to 12 knots; temperature 83 degrees F.; visibility 7 miles; and clouds scattered to broken at 2,500 and 25,000 feet. The 24-hour and 48-hour delay forecast reveal similar conditions with 30 percent and 20 percent chance of violation respectively. The five-member astronaut crew for this mission arrived at KSC's Shuttle Landing Facility yesterday at about 2:30 p.m. Today they will be involved with checking out their mission plans and fit checks of their equipment. They are scheduled for some free time this afternoon and will be ready for sleep at about 6:30 p.m. They will be awakened tomorrow at about 2:30 a.m. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT: MISSION STS 51 -- ACTS-TOS/ORFEUS-SPAS LAUNCH MINUS 2 DAYS, Aug. 10, 1993.]

[] **STS 51: AN EXTRA DAY LIKELY**

The Space Shuttle Discovery may get an extra day in space because of a classified military operation, according to Lt. Dave Honchul, a spokesman for the Air Force's 45th Space Wing. "Thee is an activity that was previously scheduled on the range that will preclude a Shuttle landing prior to the 22nd. It's classified; I can't talk about it," he said. [Halvorson, FLORIDA TODAY, p. 1A, Aug. 11, 1993.]

[] **FIRE CAUSED BY LIGHTNING**

Lightning started a fire and closed State Road 3 this afternoon; the acrid smoke from the fire welled up east of SR 3 about 2:15 and burned late into the night. More than 500 acres of trees and undergrowth were consumed by the fire on both sides of the road. According to KSC spokesman **Mitch Varnes**, the fire was under control by about six p.m. Some KSC workers who departed the center after four o'clock were unable to proceed south on SR 3; it was closed due to the smoke. "The land hadn't been cleared for several years as far as controlled burns go, so it was ripe for a fire," Varnes said. ["Lightning Sparks Fire at KSC, West of I-95," FLORIDA TODAY, p. 1B, Aug. 11, 1993.]

August 11: **STS 51: LAUNCH MINUS 1 DAY**

The countdown for Discovery's launch continues today. Managers and engineers decided late last night to replace a faulty liquid oxygen temperature sensor on main engine #1 following erratic temperature readings. Workers entered the aft engine compartment earlier this morning to remove and replace the sensor. It is expected the aft compartment will again be closed for flight by mid to late afternoon. Following aft compartment closeouts, an aft confidence test will be run and preparations made to retract the rotating service structure to launch position at about 7 p.m. today. At about 10 p.m. the pad will be cleared as preparations are made to load the external tank with liquid hydrogen and liquid oxygen propellants. Loading is scheduled to begin at about 12:30 a.m. August 12.

Two mid-deck experiments will be installed into the Orbiter today. The Commercial Protein Crystal Growth (CPCG) experiment will be installed by 11 a.m. and the Chromosome and Plant Cell Division in Space (CHROMEX) experiment will be installed by about 8 p.m. Forecasters continue to indicate a 30 percent probability of weather prohibiting launch with the primary concerns being possible offshore thunderstorms and a low cloud ceiling. The winds at the pad are expected to be from the southeast at 6 to 10 knots; temperature 83-85 degrees F.; relative humidity 70-75 percent; visibility 7 miles; and clouds scattered to broken at 2,500, 12,000 and 25,000 feet. The 24-hour and 48-hour delay forecast reveal similar conditions with 20 percent and 10 percent chance of violation respectively.

The five astronauts for this mission are reviewing their flight data files today. They will also take part in Orbiter and payload briefings and fly in their T-38 training aircraft prior to preparing for sleep at about 6:30 p.m. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT; MISSION: STS 51--ACTS-TOS/ORFEUS-SPAS LAUNCH MINUS 1 DAY, Aug. 11, 1993; LAUNCH WEATHER FORECAST FOR STS 51, Aug. 11, 1993.]

[] **HST HARDWARE ARRIVES AT KSC**

Preparations for the first servicing mission of the Hubble Space Telescope (HST) began today at KSC with the arrival of the Space Support Equipment (SSE). Some of this flight hardware will house the delicate Hubble replacement components inside Endeavour's payload bay during the mission. The SSE was shipped from Baltimore on August 6, after a checkout at NASA's Goddard Space Flight Center (Greenbelt, MD). Traveling aboard the Space Shuttle external tank barge, the hardware is enclosed in shipping containers previously used by the Gamma Ray Observatory (GRO) and the Long Duration Exposure Facility (LDEF). After being offloaded from the barge, the equipment will be taken to the Payload Hazardous Servicing Facility (PHSF) located in KSC's Industrial Area for launch preparations. One of the significant processing milestones will take place in mid-September when the Hubble replacement components, including the Wide Field/Planetary Camera II and Hubble corrective optics, are mated with their carriers. Astronauts will install these components on the 43-foot-long, 14-foot diameter HST during the mission. The SSE consists of three parts: the Orbital Replacement Unit Carrier which is a dedicated Spacelab maintenance and repair pallet; the Solar Array Carrier which will hold the replacement solar panels; and the Flight Support Structure which will hold and orient the telescope while it is being repaired by the astronauts in Endeavour's payload bay. This device was used previously aboard the Space Shuttle Challenger in 1984 during the Solar Maximum Satellite repair mission. Replacement components for the Hubble Space Telescope are scheduled to arrive at KSC later this month. Mission STS 61 is a planned 11-day flight featuring five spacewalks with seven crew members dedicated to the servicing of the Hubble Space Telescope. Launch is currently targeted for early December. [NASA/KSC Release No. 97-93, Aug. 11, 1993.]

August 12: THIRD DISCOVERY SCRUB

The main engines of the Space Shuttle Discovery cut off three seconds before launch due to a problem with a sensor that monitors fuel flow through main engine number 2. The time of the cutoff was 09:12:32 EDT. There are two sensors which are part of the flow meter that monitor the flow of hydrogen through the main engine. Each sensor has a Channel A and Channel B for a total of four readings. These sensors are monitoring the fuel flow from main engine ignition through main engine cutoff. The sensors are redundant so that all four

channels must report an acceptable fuel flow rate prior to liftoff. Data indicates that Channel A on the number two sensor failed. There was no electrical output at all from this sensors while the others were found to have operated normally. A completely redundant set of measurements is required to commit to flight.

At this time it is not known when Discovery will be launched, but there will be a delay of at least three weeks. The STS 51 astronauts returned to Houston this afternoon. The rotating service structure providing the primary access and weather protection for Discovery will be rotated into position around the vehicle tomorrow after boiloff of residual propellant in the external tank is complete. After the cryogenic reactants have been offloaded from the power reactant storage and distribution system (PRSD) tanks, the pad will be re-opened for normal about mid-day Friday (August 13). The delays in launching Discovery already have meant that one of the two showcase Shuttle flights planned for the fall will be bumped into 1994. The joint venture with Russian astronaut Sergei Krikalev was to have been flown in mid-November; the Hubble Space Telescope repair mission had been scheduled for December. [STS 51 Discovery Status, 4:30 p.m., Aug. 12, 1993; Halvorson, FLORIDA TODAY, pp. 1A-2A, Aug. 13, 1993; Halvorson, FLORIDA TODAY, p. 1A, Aug. 12, 1993; Halvorson, FLORIDA TODAY, pp. 1A-2A, Aug. 12, 1993; Banke, FLORIDA TODAY, p. 13A, Aug. 13, 1993; Date, THE ORLANDO SENTINEL, pp. A-1 & A-6, Aug. 13, 1993; Date, THE ORLANDO SENTINEL, Aug. 13, 1993; Halvorson, FLORIDA TODAY, p. 13A, Aug. 13A, Aug. 13, 1993; "4th Delay," USA TODAY, p. 3A, Aug. 13, 1993; Broad, THE NEW YORK TIMES, Aug. 13, 1993; Merzer; THE SUN, Aug. 13, 1993; Harwood, THE WASHINGTON POST, p. A8, Aug. 13, 1993; "Shuttle's Engine Cut 3 Seconds to Launch," THE WASHINGTON TIMES, p. A3, Aug. 13, 1993; "Onboard computers aborted....," THE WALL STREET JOURNAL, Aug. 13, 1993; Halvorson, FLORIDA TODAY, p. 1A, Aug. 14, 1993.]

[] **4TH SHUTDOWN IN 9 YEARS**

When Discovery's launch controllers shut down the vehicle's main engines today, it marked the fourth such incident in 9 years and more than fifty Space Shuttle flights. On June 26, 1984, Discovery's launch attempt halted four seconds before liftoff due to a faulty fuel valve inside a main engine. The Shuttle had to be rolled back from the launch pad for repairs and a delay of 64 days. On July 29, 1985, Challenger's liftoff came within three seconds of occurring when the attempt was aborted; the culprit was a faulty coolant valve in one of the main engines. The delay was 17 days. On March 22, 1993, at T-3 seconds, Columbia's launch was aborted; a liquid oxygen valve leaked inside a main engine. NASA managers decided to replace all three main engines at the pad; the delay was 33 days. [Banke, FLORIDA TODAY, p. 13A, Aug. 13, 1993.]

[] **STS 51: ENGINE REMOVAL PREPARATIONS**

At Launch Complex 39B, workers are preparing to remove all three Space Shuttle Main Engines (SSME) and replace them with engines which had been scheduled for use on Endeavour's Hubble Space Telescope repair mission planned for December. Currently workers are disconnecting ordnance devices which separate the Space Shuttle from its SRBs and external tank. On the 17th the SSME heatshields will be removed and the engine removal process starts on the 18th. NASA officials are talking about launching Discovery now in the first or second week of September. [Halvorson, FLORIDA TODAY, p. 1A, Aug. 14, 1993; Halvorson, FLORIDA TODAY, p. 2A, Aug. 15, 1993.]

August 16: **STS 51: POST-SCRUB TURNAROUND**

At Launch Complex 39B a number of post-scrub tasks have been completed: installation of engine service platforms under the vehicle; extension of the rotating service structure around the Orbiter; Orbiter mid-body umbilical mate and leak checks; off load onboard cryogenic reactants; open aft engine compartment and install work platforms; ACTS batter discharge; open payload bay doors; removal and replacement of faulty fuel flow sensor; repositioned main engines and aerosurfaces; disconnect ordnance. Today workers are engaged in post-scrub turnaround and securing operations; defoaming main engines and removing main engine heatshields. STS 51 work scheduled: removal and replacement of all three main engines at the pad; service of ORFEUS/SPAS with liquid argon; ACTS/TOS health checks. Unofficially, NASA's target date for the next Discovery launch attempt is September 10. Determination of an official launch date will be impacted by a crowded Eastern Test Range launch schedule. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Aug. 16, 1993.]

[] **STS 58: SPACELAB LIFE SCIENCES**

In the Vehicle Assembly Building's high bay 3, technicians have hardmated Columbia to its external tank; mechanical mates have also been completed as have been umbilical structural mates and liquid oxygen and liquid hydrogen mates. Today workers are continuing with Orbiter crew module operations. On the processing schedule: Orbiter/external tank electrical mates and a Shuttle interface test. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Aug. 16, 1993.]

[] **HUBBLE SPACE TELESCOPE SERVICING MISSION**

In OPF Bay 1, Endeavour is being readied for its upcoming Hubble Space Telescope servicing mission. Orbital maneuvering system functional checks and Ku-band antenna checks have now been completed; the payload doors have been closed. Workers today are installing Endeavour's 5th cryogenic tank set; performing main propulsion system leak and functional checks; payload integration

operations; reopening the payload bay doors and conducting ammonia boiler checks. Master events controller checks are scheduled. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Aug. 16, 1993.]

[] **COLUMBIA'S ROLLBACK POSSIBLE**

The need to service experiment containers in Columbia's payload bay may force NASA manager's to order the Shuttle rolled back to the VAB from LC 39A. KSC spokesman **Glenn Snyder** said, "The problem is those containers were not designed to be opened when the Orbiter and Spacelab are in a vertical position on the ground." The rollback would also allow workers to replace several batteries in other experiments. [Banke, FLORIDA TODAY, p. 4A, Aug. 16, 1993; Banke, FLORIDA TODAY, Aug. 17, 1993.]

August 17: **JSC TO HOST SPACE STATION**
BOEING TO BE PRIME CONTRACTOR

NASA Administrator **Daniel S. Goldin** today announced that the Johnson Space Center (Houston, TX) has been selected as the host center for the new Space Station Program. Boeing Defense and Space Group has been selected as the prime contractor. The selections are part of the President's initiative to save more than $4 billion over the next 5 years and more than $18 billion over the life of the Space Station Program. "These decisions, announced today, mark a significant step forward in carrying out the President's decision to move ahead with a redesigned Space Station," Goldin said. Goldin pointed out that later this week, Space Station managers will provide an interim report to the Office of Science and Technology Policy and the international partners on the design for the Space Station. "The transition process is on track, decisions are being made, and the groundwork for building the new Space Station team is being laid," he said. "I'm extremely pleased with the progress we are making."

The Johnson Space Center (JSC) was selected because of two critical factors. First, JSC has the necessary experience, personnel and facilities to respond flexibly to the Space Station Program needs. And secondly, JSC has a strong operations capability in terms of both the civil service workforce and its extensive facilities. JSC's close proximity to the operations capability is conducive for the evolution of the Space Station Development Program to an Operations Program, thereby driving to lower life cycle costs and promoting stability and efficiency. The new Space Station Program Office will be responsible for managing the design, development and the physical and analytical integration of the Space Station as the program evolves into operations. The new Space Station organizational structure will have about 1,000 civil servants. The program office, consisting of about 300 civil servants, will be located at JSC. The other 700 positions will be spread among all involved NASA centers, including JSC. The JSC Center

Director and management will have no Space Station Program-line management responsibility. The program office will report to NASA Headquarters.

Boeing's role as the provider of the essential Space Station elements necessary to sustain human life - the pressurized laboratory and habitation modules as well as the environmental control and life support system - were the key factors in its selection as prime contractor. Non-selected Space Station prime contractors - Grumman Aerospace Corp., McDonnell Douglas Corp. and Rocketdyne Division, Rockwell International - have agreed to become novated subcontractors to Boeing, whose expertise in complex integration tasks, due to its current role in the integration and the outfitting of the modules as well as the analytical and physical integration of the experiments, made it the logical choice since, as prime, it will be responsible for delivering the full-up Space Station vehicle and for coordinating and integrating the U.S. elements with those provided by the international partners. As the single prime contractor, Boeing will be responsible for the design, development, physical and analytical integration, test, delivery and launch of the Space Station vehicle.
Additionally, Boeing will be responsible for 1 year of sustaining engineering following launch of each launch package, including the appropriate spares. Boeing will also be responsible for management and integration of the Space Station vehicle and will manage the subcontracts. [NASA/KSC NEWS RELEASE: 93-148, Aug. 17, 1993; "Houston Space Center, Boeing Will Oversee Freedom Program," FLORIDA TODAY, p. 1A, Aug. 18, 1993; Banke, FLORIDA TODAY, p. 1A, Aug. 18, 1993; "Houston, Seattle Get NASA Job," THE ORLANDO SENTINEL, pp. A1 & A4, Aug. 18, 1993; Peltz and Miller, LOS ANGELES TIMES/WASHINGTON EDITION, Aug. 18, 1993; Nomani and Cole, THE WALL STREET JOURNAL, p. A12, Aug. 18, 1993; Hoversten, USA TODAY, p. 3A, Aug. 18, 1993; Glater and Mintz, THE WASHINGTON POST, Aug. 18, 1993.]

[] **STS 51: PROCESSING UPDATE**

Technicians at Launch Complex 39B have finished defoaming Discovery's main engines and removed the heatshields. There has been a successful duplication of the engine sensor failure that led to the August 12 engine shutdown three seconds prior to launch. Today workers are continuing post scrub turnaround and securing operations; preparing to remove main engine #1 and servicing the ORFEUS/SPAS with liquid argon. Scheduled STS 51 work includes removing and replacing all three main engines at the launch pad and conducting ACTS/TOS health checks. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Aug. 17, 1993; Halvorson, FLORIDA TODAY, p. 4A, Aug. 18, 1993.]

August 18: **STS 51: BAD SENSOR CAUSED SCRUB**

The faulty fuel flow sensor from main engine number 2 that caused the recent scrub of Discovery's launch last week was tested at the manufacturer yesterday. Referring to the failed sensor, Launch Director **Robert B. Sieck** said, "That was the exact cause of the failure. Why and how it happened we don't know." Tests conducted under cryogenic conditions were successful in duplicating the sensor failure. The tests showed that the sensor failed at 57 degrees Fahrenheit, according to KSC spokesman **Bruce Buckingham**. Discovery's main engines have been defoamed; the main engine heatshields have been removed and ORFEUS/SPAS has been serviced with liquid argon. Today, pad workers are conducting post scrub turnaround and securing operations and removing and replacing main engine number 1. Technicians at Launch Complex 39B are scheduled to remove and replace main engines number 2 and 3 at the pad. Launch and landing times remain to be determined. NASA officials have determined that the mission which would carry Russian cosmonaut **Sergei Krikalev** into space has been pushed into 1994. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Aug. 18, 1993; Halvorson, FLORIDA TODAY, p. 1A, Aug. 19, 1993.]

[] **STS 58: VAB OPERATIONS ON HOLD**

Operations in the Vehicle Assembly Building are on hold pending a decision to demate the Orbiter from its external tank. Demating and moving the Orbiter to the horizontal position may be required due to certain Spacelab payload changeout considerations. Columbia has been hardmated to its external tank; mechanical mates of the Orbiter to its external tank have also been accomplished. Today, workers are occupied with Orbiter crew module operations. STS 58 work scheduled includes Orbiter/external tank electrical mates and a Shuttle interface test. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Aug. 18, 1993.]

[] **STS 61: HUBBLE RESCUE MISSION PROCESSING**

Endeavour remains in Orbiter Processing Facility bay 1 where it continues to be processed for its Hubble Space Telescope repair mission. The launch date of that mission has been made indefinite due to delays in launching STS 51. In OPF bay 1, technicians have completed master events controller/pyrotechnic initiator controller checks; re-opened the payload bay doors; made ammonia boiler checks and orbital maneuvering system functional checks. Work in progress: installation of 5th cryogenic tank set; main propulsion system leak and functional checks; payload integration operations; water spray boiler functional tests; freon coolant loop functional test. Work scheduled: installation of the forward reaction control system on the Orbiter. Work was completed overnight to remove from the mobile

launcher platform in the VAB the left and right hand aft booster segments dedicated for the STS 60 mission. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Aug. 18, 1993.]

August 19: **STS 51: FLOODLIGHT REPLACED**

Discovery's mid-deck floodlight has been removed and replaced as part of the turnaround operations now underway at Launch Complex 39B. Today workers at the pad are removing and replacing main engine number 1 and conducting orbital maneuvering system regulator flow operations; they are scheduled to remove and replace main engines 2 and 3 at the pad. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Aug. 19, 1993.]

[] **STS 58: ELECTRICAL MATES TO CONTINUE**

Operations will resume today to continue electrical mates between Columbia and its STS 58 external tank. A decision was reached yesterday not to destack the Orbiter on the basis that any Spacelab payload changeout considerations can be accomplished at the pad and on orbit if required. Mechanical mates of Columbia to its external tank have been completed. Today, workers are conducting the electrical mates and Orbiter crew module cleaning operations, as well. The mission's Shuttle interface test (SIT) has been scheduled. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Aug. 19, 1993.]

[] **STS 61: HST SERVICING MISSION**

Endeavour's payload bay doors have been re-opened; ammonia boiler checks have been made; a freon coolant loop functional test has been completed as have orbital maneuvering system functional checks. Work in progress: fifth cryogenic tank set installation; main propulsion system leak and functional checks; payload integration operations; installation of auxiliary power unit number three; water spray boiler functional test. STS 61 work scheduled: installation of the forward reaction control system on Endeavour; thruster repair operations; servicing the freon coolant loop. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Aug. 19, 1993.]

[] **HUBBLE HARDWARE ARRIVING AT KSC**

Flight hardware which will fly aboard the Space Shuttle Endeavour for use on the Hubble Space Telescope (HST) first servicing mission has begun arriving at the Kennedy Space Center. The Wide Field/Planetary Camera II (WFPC II) arrived today at Hangar AE, a NASA Spacecraft Checkout Facility on Cape Canaveral Air Force Station. During the next two weeks 17 trucks will be transferring the flight

hardware for HST servicing and associated support hardware from Goddard Space Flight Center (Greenbelt, MD) to the Kennedy Space Center. The instruments have been in a clean room at Goddard for the last several months undergoing integration and testing. In addition to WFPC II, other primary components arriving over the next two weeks include the Corrective Optics Space Telescope Axial Replacement (COSTAR), two solar panels, the Goddard High Resolution Spectrograph redundancy kit, rate gyro sensor and electronic control units and two magnetometers. The Space Support Equipment (SSE) arrived at KSC by barge August 11 and is now in the Payload Hazardous Servicing Facility being prepared for launch. The units of the SSE include the Orbital Replacement Unit Carrier which is a Spacelab maintenance and repair pallet dedicated to HST activities; the Solar Array Carrier which will hold the replacement solar panels, and the Flight Support Structure which will hold and orient the 43-foot-long, 14-foot diameter HST during its repair by the astronauts. Some of the SSE will house the delicate Hubble corrective optics inside Endeavour's payload bay during the mission. STS 61 is a planned 11-day flight with seven crew members featuring five spacewalks and is entirely dedicated to the servicing of the Hubble Space Telescope. [NASA/KSC News Release No. 103-93, Aug. 19, 1993.]

August 20: **EXTERNAL TANK INSPECTED**

Workers at Launch Complex 39B have completed the post-abort inspections of Discovery's STS 51 external tank; they have also removed and replaced main engine #1 and removed main engine #3. Today, technicians will be making mechanical connections of main engine #1, installing main engine #3 and preparing to remove main engine #2. STS 51 work scheduled: mechanical connections of main engine #3; removal of main engine #2 August 21 and replacement August 22. Orbital maneuvering system/reaction control system checks are planned for August 23. [Halvorson, FLORIDA TODAY, p. 2A, Aug. 23, 1993; KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Aug. 20, 1993.]

[] **STS 58/61 PROCESSING STATUS**

In the Vehicle Assembly Building high bay 3, technicians have completed Orbiter and external tank closeouts and are continuing Orbiter/ET mating operations for Columbia's STS 58 mission. The Shuttle interface test is scheduled to begin August 23. Meanwhile, in OPF bay 1, workers processing Endeavour for the STS 61 mission have completed orbital maneuvering system functional checks and leak and functional checks of the hydrogen side of the main propulsion system. Work in progress today: fifth cryogenic tank set installation; checkouts of the water spray boilers and payload integration operations. STS 61 work scheduled: master events controller checks and installation of the auxiliary power unit #3.

[KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Aug. 20, 1993.]

August 22: **HUBBLE REPAIR HARDWARE AT KSC**

The first batch of equipment for the Hubble Space Telescope repair mission - scheduled for early December - has arrived at Kennedy Space Center. The equipment includes:

(a) A special carrier that will serve as a repair pallet.
(b) Another carrier that will hold new solar panels to be installed on the telescope
(c) A support structure that will hold and orient the telescope while repairs are made.

The equipment was shipped to KSC after checkout at Goddard Space Flight Center (Greenbelt, MD). It was transported by barge in shipping containers used earlier by the Gamma Ray Observatory and the Long Duration Exposure Facility. On arrival the equipment was taken to the Payload Hazardous Servicing Facility for launch preparations. Telescope replacement components have yet to arrive at the space center; they are expected to arrive later this month. ["Hubble Repair Hardware Arrives," FLORIDA TODAY, p. 10E, Aug. 22, 1993.]

August 23: **STS 51: ALL ENGINES REPLACED**

At Launch Complex 39B, all of Discovery's main engines have been replaced in preparation for launch in early September. System checks of the Orbiter's rudder speed brake have been made and the multiplexer/demultiplexer unit that failed during a checkout last Friday has been removed. Work in progress: securing of main engine #2; checks of the orbital maneuvering system/reaction control system; installation of a replacement multiplexer/demultiplexer unit and preparations for engine leak checks. STS 51 work scheduled: leak checks of the main engines should begin tonight; a flight readiness test of the main engines is set for August 26 and 27. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Aug. 23, 1993.]

[] **STS 58/STS 61 UPDATES**

Orbiter/external tank umbilical closeouts have been completed in preparation for Columbia's STS 58 mission. Today workers are continuing Orbiter/external tank mating operations and are continuing to conduct the Shuttle interface test to its completion today. Workers processing Endeavour for its STS 61 mission have completed checkouts of the water spray boilers and have conducted leak and functional checks of the hydrogen side of the main propulsion system. Currently,

workers are installing the 5th cryogenic tank set and implementing payload integration operations. STS 61 work scheduled includes: master events controller checks and the electrical connection of auxiliary power unit #3. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Aug. 23, 1993.]

[] **STS 51: LAUNCH ADVISORY**

NASA managers today set September 10, 1993, as the new launch date for Shuttle Mission STS 51. The launch window on September 10 opens at 7:38 a.m. EDT. The launch date decision follows the completion of work to remove and replace the three main engines on Discovery. The engine changeout effort was the most efficient way to recover from the launch shutdown which took place on August 12. "The September 10 date is based on successful testing and leak checks of the main engines scheduled for later this week and the assumption of no significant problems arising in the remaining processing flow," said Shuttle Director **Thomas Utsman**. "The entire Shuttle team is doing a super job getting Discovery back into launch configuration." [Halvorson, FLORIDA TODAY, p. 4A, Aug. 21, 1993; LAUNCH ADVISORY: SEPT 10 NEW DATE FOR STS 51 LAUNCH, Aug. 23, 1993; Halvorson, FLORIDA TODAY, p. 4A, Aug. 24, 1993.]

[] **MARS OBSERVER MISSION STATUS**

Engineers are continuing to attempt to reestablish communication with the Mars Observer Spacecraft, after losing contact with the craft at 6 p.m. PDT on August 21, three days before the spacecraft's capture in orbit around Mars. The spacecraft's on-board sequence to begin preparing for orbit insertion was uplinked on Friday, August 20. Controllers have no reason to believe that the spacecraft is not carrying out those instructions even though communication has been interrupted. The spacecraft is set to enter Martian orbit at approximately 1:30 p.m. August 24. [Halvorson, FLORIDA TODAY, pp. 1A-2A, Aug. 23, 1993; MARS OBSERVER STATUS, Jet Propulsion Laboratory Public Information Office, 8 p.m. PDT, Aug. 22, 1993; "NASA Loses Link to Mars Observer," THE ORLANDO SENTINEL, pp. A1 & A4, Aug. 23, 1993; Halvorson, FLORIDA TODAY, p. 1A-2A, Aug. 24, 1993; Date, THE ORLANDO SENTINEL, pp. A-1 & A-4, Aug. 24, 1993; Halvorson, FLORIDA TODAY, p. 1A, Aug. 25, 1993; Date, THE ORLANDO SENTINEL, pp. A-1 & A-7, Aug. 25, 1993.]

[] **NOAA-13 SATELLITE: LOSS OF CONTACT**

Satellite controllers lost contact with the NOAA-13 satellite on Saturday, August 21, and preliminary indications are that the spacecraft's power system is not working, officials at NASA and the National Oceanic and Atmospheric Administration said today. Contact has also been lost with the Mars Observer Spacecraft [see above]. All battery charging aboard the satellite ceased at

approximately 3:45 p.m. EDT August 21, said **Charles E. Thienel**, Meteorological Satellites Project Manager at NASA's Goddard Space Flight Center (Greenbelt, MD). Contact with the spacecraft during subsequent ground passes showed steadily decreasing battery voltages and currents, he said. [**NASA/KSC RELEASE: 93-151**; Aug. 23, 1993; "Mars Observer Status Briefing Set for 1 p.m. EDT Today," EDITORS NOTE: N93-48, Aug. 24, 1993; Date, THE ORLANDO SENTINEL, Aug. 24, 1993.]

[] **SPACEPORT WORKERS CONTRACT DISPUTE**

Workers at Spaceport USA have filed a protest over their latest contract with the National Labor Relations Board; the workers claim that they had been unfairly represented by their union's business manager. There was no comment today from TW Recreational Services, Inc., the company which runs the Spaceport USA attraction for NASA. [Liden, FLORIDA TODAY, p. 20C, Aug. 24, 1993.]

August 24: **STS 51: MISSION UPDATE**

NASA managers yesterday selected September 10, 1993, as the new launch date for mission STS 51. The launch window lasts from 7:38 a.m. til 9:42 a.m. EDT. The countdown for mission STS 51 will pickup the morning of September 7 (time to be determined) at the T-43 hour mark. The main engines and multiplexer/demultiplexer (MDM) have been removed and replaced. The power reactant storage and distribution system has been purged. Currently, technicians are installing main engine dome heatshields and conducting main engine securing operations. STS 51 work scheduled: retest of the replacement multiplexer/demultiplexer and a flight readiness test of the three main engines and the aerosurfaces. Current planning calls for a night landing at Kennedy Space Center at 5:42 a.m. September 20. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Aug. 24, 1993; Halvorson, FLORIDA TODAY, p.1, Aug. 25, 1993.]

[] **STS 58: ELECTRICAL MATES COMPLETED**

In preparation for Columbia's STS 58 mission, electrical mates of the Orbiter and its external tank have been completed. Work in progress: Orbiter crew module cleaning operations; Shuttle interface test; Orbiter/external tank umbilical closeouts; leak checks of the main propulsion system; solid rocket booster hydraulic testing. STS 58 work scheduled: rollout to Launch Complex 39B to occur about 4 to 5 days after the launch of Discovery. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Aug. 24, 1993.]

[] **STS 61: PAYLOAD INTEGRATION OPERATIONS**

In OPF Bay 1, workers have installed Endeavour's auxiliary power unit number 3 and completed payload integration operations. Work in progress: installation of the 5th cryogenic tank set; auxiliary power unit number three leak and functional checks; thruster feedline repair operations; water spray boiler checkout and service; deservicing freon coolant loop number 1; main propulsion system leak and functional checks and the installation of the drag chute. STS 61 work scheduled: installation of the forward reaction control system on Endeavour; star tracker door functional test; Orbiter/external tank umbilical door functional test. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Aug. 24, 1993.]

August 25: **STS 51: MDMS REMOVED AND REPLACED**

Discovery continues to await launch on its STS 51 mission; liftoff is now set for September 10, 1993. Workers at LC 39B have installed main engine dome heatshields and removed and replaced multiplexer/demultiplexers (MDM). Work in progress: main engine securing operations; main engine and main propulsion system leak checks; retesting of MDMs and hydraulic circulation and sampling. STS 51 work scheduled: flight readiness test of the main engines and their aerosurfaces; replacement of solid rocket booster batteries; spacesuit functional checkout. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Aug. 25, 1993.]

[] **STS 58: ELECTRICAL MATES COMPLETE**

Orbiter/external tank electrical mates for Columbia's STS 58 mission have been completed. Work currently underway for STS 58 in the VAB high bay 3: solid rocket booster hydraulic operations; Orbiter crew module cleaning operations; Shuttle interface test; Orbiter/external tank umbilical closeouts; leak checks of the main propulsion system. STS 58 work scheduled: rollout to Launch Complex 39B to occur four to five days after the launch of STS 51 and a flight control frequency test. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Aug. 25, 1993.]

[] **APU 3 INSTALLED**

Endeavour is being processed in OPF bay 1 for its STS 61 mission, also known as the Hubble Space Telescope repair mission. In the OPF, payload integration operations have been completed as has the installation of the auxiliary power unit number 3. Today, workers are involved in the following activities: 5th cryogenic tank set installation; installation of the drag chute; thruster feedline repair operations; auxiliary power unit number three leak and functional checks;

deservice of freon coolant loop number 1; water pray boiler checkout and service; main propulsion system leak and functional checks. STS 61 scheduled work: Orbiter/external tank umbilical door functional test and the star tracker door functional test. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Aug. 25, 1993.]

[] **ADVISORY: MARS OBSERVER**

JPL's von Karman Auditorium was the sight of today's Mars Observer News Conference. Mars Observer Project Manager **Glenn Cunningham** will discuss the outcome of the spacecraft's onboard "command lost timer,' which would have clocked out at approximately 2:15 p.m. today and instructed the spacecraft to wait for commands from Earth. Cunningham acknowledged lack of receipt of the communications signal and explained plans for continuing to uplink command sequences to prompt the spacecraft to respond. Cunningham said, "The current situation certainly erodes our prospects considerably. Every day without communications clearly lessens our probability of success." [EDITORS' ADVISORY, Aug. 25, 1993; Halvorson, FLORIDA TODAY, pp. 1A-2A, Aug. 26, 1993.]

[] **STS 51: ENGINE TEST LOOMS**

Tomorrow the three new main engines of Discovery will be tested; the two-day test cycle will commence today and continue until tomorrow. The goal is to ensure that the engines can be steered properly while in flight. Launch of STS 51 remains slated for September 10. [Halvorson, FLORIDA TODAY, p. 2A, Aug. 26, 1993.]

August 26: **STS 51: TEMPERATURE SENSORS INSTALLED**

At Launch Complex 39B, technicians have installed liquid oxygen dome temperature sensors; they have also completed main engine securing operations and main engine and propulsion system leak checks. Work in progress: flight readiness test of main engines and aerosurfaces; hydraulic circulation and sampling; spacesuit installation into Orbiter; preparations for helium signature test. STS 51 work scheduled: replace external tank and solid rocket booster batteries; retest multiplexer/demultiplexer (MDM); spacesuit functional checkout; helium signature test and ordnance connections. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Aug. 26, 1993; Halvorson, FLORIDA TODAY, Aug. 26, 1993; Halvorson, FLORIDA TODAY, Aug. 27, 1993; Date, THE ORLANDO SENTINEL, Aug. 14, 1993.]

[] **STS 58: SPACELAB LIFE SCIENCES-2**

Columbia continues to remain in the Vehicle Assembly Building's High Bay 3; rollout to LC 39B will occur four to five days after Discovery's STS 51 mission commences. Workers in the VAB have completed their leak checks of Columbia's main propulsion system. Currently, workers' tasks include: Orbiter crew module cleaning operations; Shuttle interface test; solid rocket booster hydraulic operations and Orbiter/external tank umbilical closeouts. A flight control frequency response test has been scheduled. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Aug. 26, 1993.]

[] **STS 61: HST MISSION**

Endeavour is being processed for its next mission - STS 61 - in OPF bay 1. Workers have completed the installation of the drag chute and deservicing freon coolant loop number 1. Payload integration operations are finished as is the installation of auxiliary power unit number 3. Work in progress: installation of the 5th cryogenic tank set; thruster feedline installation and mechanical fitting operations; auxiliary power unit number 3 leak and functional checks; freon coolant loop pump package inspections; water spray boiler checkout and service; main propulsion system leak and functional checks; move forward reaction control system to OPF. STS 61 work scheduled: Orbiter/external tank umbilical door functional test; star tracker door functional test; installation of forward reaction control system on Orbiter. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Aug. 26, 1993.]

[] **NOAA-13 INVESTIGATION**

A 12-member panel of experts from NASA and NOAA has been named to investigate the failure of the NOAA-13 meteorological satellite, officials at NASA's Goddard Space Flight Center (GSFC), said today. Dr. **Shelby Tilford**, Acting Associate Administrator for the Office of Mission to Planet Earth, NASA Headquarters, and Dr. **Kathryn Sullivan**, Chief Scientist, NOAA, requested Dr. **John M. Klineberg**, Goddard Center Director, to name the investigation board. The board will investigate and to the extent possible, determine the cause of the spacecraft failure and recommend corrective actions which will minimize or preclude the possibility of similar future failures. Klineberg named **Jeremiah Madden**, Associate Director of Flight Projects at Goddard, as board chairman. [NASA/KSC RELEASE NO. 93-154, Aug. 26, 1993.]

[] **MARS OBSERVER INVESTIGATION BOARD**

NASA Administrator **Daniel S. Goldin** today named Dr. **Timothy Coffey**, Director of Research at the Naval Research Laboratory (Washington, D.C.), to head the

review board to investigate the loss of contact with the Mars Observer Spacecraft. Membership of the board will be announced in the very near future. The board will investigate and determine, to the extent possible, the cause of the loss of communications and recommend corrective action to prevent a recurrence in future missions. Communication with the Mars Observer was lost at 6 p.m. PDT on Saturday, August 21, three days before the craft's capture in orbit around Mars. The spacecraft was set to enter orbit around Mars at approximately 1:30 p.m. PDT on Tuesday, August 24. [NASA/KSC RELEASE NO. 93-153, Aug. 26, 1993; Date, THE ORLANDO SENTINEL, pp. A-1 & A-7, Aug. 26, 1993; "NASA Orders Probe of Spacecraft Loss," THE ORLANDO SENTINEL, Aug. 27, 1993; Meyer, FLORIDA TODAY, Aug. 28, 1993; "NASA Chief Appoints Group to Look Into Another Mars Shot," THE ORLANDO SENTINEL, Sept. 1, 1993.]

August 27: **COSTELLO & SONS CONTRACT**

Costello & Sons Co. (Merritt Island, FL) has been awarded a $362,000 contract to renovate the Occupational Health Facility (OHF) in the Industrial Area at Kennedy Space Center. This contract covers work on the east wing of the OHF. The work will involve the removal of asbestos insulation from the ceiling and replacement of the tile, installation of additional plumbing and modification and expansion of some existing rooms. Other work includes revisions to heating and air conditioning ductwork, lighting and the replacement of fire detectors. The work will be performed in three phases to allow the OHF to be fully operational at all times. Costello & Sons will also provide a temporary trailer for office space to accommodate four doctors throughout the contract period. The OHF is one of two medical facilities operated at KSC by Base Operations Contractor EG&G Florida, Inc. [NASA/KSC RELEASE NO. 101-93, Aug. 27, 1993.]

[] **STS 51: FRT COMPLETED**

Technicians at Launch Complex 39B have stowed spacesuits in Discovery's airlock as part of pre-launch preparations for the STS 51 mission. A flight readiness test of the three main engines has also been completed. Work in progress: spacesuit functional checkout; preparations for helium signature test of main engines and main propulsion system; cycling aerosurfaces; retesting multiplexer/demultiplexer (MDM). STS 51 work scheduled: replacement of the external tank and solid rocket booster batteries; helium signature test; ordnance connections; topping off Discovery's auxiliary power units and pressurization of the boosters' hydraulic power units. The launch window for STS 51 on September 10 will be from 7:38 a.m. until 9:42 a.m.; the mission is planned to last for just under 10 days. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Aug. 27, 1993; Halvorson, FLORIDA TODAY, p. 4A, Aug. 27, 1993; Halvorson, FLORIDA TODAY, Aug. 28, 1993.]

[] **STS 61: ENDEAVOUR PROCESSING UPDATE**

Endeavour is in the OPF bay 1 where it is being processed for its mission to repair the Hubble Space Telescope. Work currently underway includes: functional testing of the external tank doors; preparations to install the forward reaction control system; 5th cryogenic tank set installation; thruster feedline installation and mechanical fitting operations; auxiliary power unit number three leak and functional checks; freon coolant loop pump package inspections. STS 61 work scheduled: star tracker door functional test; installation of the forward reaction control system on Endeavour. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Aug. 27, 1993.]

[] **MARS OBSERVER STATUS**

The Mars Observer flight team has not been able to reestablish communication with the spacecraft despite repeated efforts to prompt the spacecraft to respond. A command sequence to "reboot" the spacecraft's central computer was sent at 4:30 a.m. PDT on August 27. Commands are sent to the spacecraft assuming it is in orbit around Mars, and to another area of the sky assuming the spacecraft flew by Mars and is now in a heliocentric orbit around the sun. The same commands were reradiated at 1:07 a.m. to the coordinates of the heliocentric orbit. If the command to "cold boot" the spacecraft's central computer system was successful, the spacecraft would enter a safing mode. This mode is more serious than the contingency mode that Mars Observer was switching to during its cruise to Mars. Safe mode is entered in response to a spacecraft hardware anomaly. Flight controllers will wait 65 hours to hear back from the spacecraft. With that option exercised, the team will have utilized all presently understood recovery approaches. They would then begin a "listen only" vigil in the event that the spacecraft's on-board fault protection would be able to restore communication with the ground. [**MARS OBSERVER MISSION STATUS**, Aug. 27, 1993.]

[] **KSC/FLORIDA SIGN AGREEMENT**

Kennedy Space Center Director **Robert L. Crippen** and Governor **Lawton Chiles** recently signed an agreement which will speed the transfer of technology developed in the space program to private industry. Transferring information and technology to the private sector is one of NASA's chartered responsibilities and has greatly benefited the general public and the national economy over the years. Crippen points out the significance of this agreement is that - for the first time - NASA and a state government have set aside money to help develop commercial products using NASA technology. Each party has designated one million dollars spread over the next two years to implement projects under this pact. Under the dual-use partnership, KSC will identify specific NASA technology that has

potential commercial uses. A goal is to share the development costs with an industrial partner in order to achieve the greatest return. The State of Florida, through the Titusville based Technological Research and Development Authority, will identify products and industries that are most likely to benefit from technology and to provide resources and support for promoting the transfer. "This agreement serves as a pipeline that will carry advanced technology developed for our nation's space program into the market place - in the form of innovative, practical products," said Gov. Chiles. "This agreement is believed to be directly on track with our administration's new direction for technology development," said Crippen. "It is in our nation's best interests to return our technological investment to our citizens, and I applaud the State of Florida for assisting industry in sharing this return on our investment." Presentations are planned for the annual Space Congress symposium held in Cocoa Beach. A joint annual report will be made to summarize activities resulting from the intergovernmental cooperative agreement. [NASA/KSC RELEASE NO. 105-93, Aug. 27, 1993; "NASA/Florida Pen Agreement," FLORIDA TODAY, p. 10E, Sept. 12, 1993.]

August 29: **ORBITER PAINTING IN LC 39 AREA**

A 22-foot image o a Space Shuttle has been painted on the side of a water tower next to the Vehicle Assembly Building by employees of EG&G Florida Inc. "The painting is the result of an employee suggestion to increase morale in the Launch Complex 39 area," said **Larry Sloan** of NASA's Roads, Grounds, and Heavy Equipment Branch. ["Orbiter Painted to Lift Morale," FLORIDA TODAY, p. 10E, Aug. 29, 1993.]

August 30: **PREPARATIONS CONTINUE FOR STS 51**

Workers at Kennedy Space Center's Launch Complex 39 will conduct a check of Discovery's thruster system that steers the Shuttle in orbit, according to KSC spokesman **Bruce Buckingham**. The Orbiter's three main engines have already been replaced at the pad. NASA had planned to move Discovery off the launch pad if Hurricane Emily threatened to make landfall in the Brevard County area; those plans were aborted when Emily moved away from the county and headed north. [Reitz, FLORIDA TODAY, p. 2A, Aug. 30, 1993.]

[] **CAPE ROCKET LAUNCHES THIS WEEK**

The Air Force will launch a Delta 2 rocket today between 8:38 a.m. to 9:04 a.m.; the rocket will launch a Navstar Global Positioning System satellite. On September 3, a General Dynamics Commercial Atlas rocket will launch carrying a Hughes Communications Inc. communications satellite. The launch window for the General Dynamics launch is between 6:59 a.m. and 8:19 a.m. [Halvorson, FLORIDA TODAY, p. 2A, Aug. 30, 1993.]

[] **STS 51: SPACESUITS INSTALLED**

Discovery continues to undergo preparations for its September 10 STS 51 mission. Completed tasks include: flight readiness test of main engines and aerosurfaces; hydraulic circulation and sampling; retest multiplexer/demultiplexer (MDM); spacesuit installation into Orbiter and functional checkout; replacement of external tank and solid rocket booster batteries; helium signature test. Work in progress: X-ray main engine hydraulic quick disconnects; open payload bay doors; crew module hatch functional checks; orbital maneuvering system helium tank pressurization. STS 51 work scheduled: ordnance connections; launch countdown preparations; aft engine compartment closeouts. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Aug. 30, 1993; Reitz, FLORIDA TODAY, Aug. 30, 1993.]

[] **STS 58: SHUTTLE INTERFACE TEST**

Columbia's Shuttle interface test has been completed. Workers in the Vehicle Assembly Building's high bay 3 have also completed Orbiter/external tank umbilical operations and solid rocket booster hydraulic operations. Today, workers are conducting Orbiter crew module cleaning operations. A flight control frequency response test will be conducted tomorrow, August 31. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Aug. 30, 1993.]

[] **STS 61: FRCS INSTALLED**

In OPF bay 1, Endeavour's forward reaction control system has been installed. Other tasks completed in the course of the Orbiter's STS 61 processing include: auxiliary power unit number three leak and functional checks; freon coolant loop pump package inspection; water spray boiler checkout and service; main propulsion system leak and functional checks; move forward reaction control system to OPF; installation of the fifth cryogenic tank set. Work in progress: fifth cryogenic tank set leak checks; thruster feedline mechanical fitting checks; ammonia boiler checks; freon coolant loop operations; Orbiter vent door functional checks; forward reaction control system electrical connections and interface verifications. STS 61 work scheduled: Orbiter/external tank umbilical door functional test; star tracker door functional test. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Aug. 30, 1993.]

[] **DELTA 2 LAUNCH SUCCESSFUL**

The Air Force successfully launched its Delta 2 this morning at 8:38 a.m.; the launch was the 44th consecutive launch success for the McDonnell Douglas Space Systems Co. (Huntington Beach, CA). The Delta carried the 25th Global Positioning System satellite into orbit. According to Air Force spokeswoman **Terri**

Bracher, the GPS system can pinpoint the location of military ships, planes and ground troops to within 50 feet anywhere in the world and was used widely during the War in the Persian Gulf. [Thompson, FLORIDA TODAY, p. 1A, Aug. 31, 1993.]

[] **ENDEAVOUR MUST FLY BY DEC. 10**

"We will not slide the launch [of Endeavour] into the Christmas and New Year's time frame," said NASA mission director **Randy Brinkley**. NASA officials said today that unless Endeavour flies its Hubble Space Telescope repair mission by December 10, the mission would be delayed until 1994. "And based on the last six months," Brinkley said, "I'm sure you recognize there is a distinct possibility that we may in fact have to delay the launch...." [Halvorson, FLORIDA TODAY, pp. 1A-2A, Aug. 31, 1993.]

[] **ACTS CHECKED BEFORE LAUNCH**

"We don't expect there to be any problem. This [the checking] is something routinely done to see if there is any commonality" with the Advanced Communications Technology Satellite and the lost Mars Observer spacecraft, according to KSC spokesman **George Diller**. A possible cause of the Mars Observer failure is the presence of a bad transistor like those found on the NOAA-13 satellite which was lost the same day as the Mars Observer. [Tamman, FLORIDA TODAY, p. 2A, Aug. 31, 1993; Banke, FLORIDA TODAY, Sept. 1, 1993.]

August 31: **MARS OBSERVER STATUS**

The Mars Observer flight team is meeting today to discuss the possible ramifications of attempting another command sequence to switch the "redundant crystal oscillator" -- the "quartz crystal" of the spacecraft's internal clock, from the backup to the primary unit. No commanding will occur today. The earliest time that the team would begin another command sequence would be late afternoon on Wednesday, September 1. A decision to try to "cold boot" the spacecraft's backup computer system was also deferred yesterday. Analysis by flight team groups indicated greater potential risk to other spacecraft subsystem elements in doing so than was deemed necessary. [MARS OBSERVER MISSION STATUS, Aug. 31, 1993.]

SEPTEMBER

September 1: **TOS HEALTH CHECK**

At Launch Complex 39B, workers have completed a state-of-health check on the Transfer Orbit Stage (TOS) in the payload bay of Discovery. Pad technicians preparing the Orbiter for next week's STS 51 launch also completed a checkout of the solid rocket booster hydraulic system. Work in progress on STS 51: ordnance connections; application of foam insulation to Orbiter engine interface lines; installation of aft skirt thermal curtains; installation of main engine heat shield carrier panels and countdown preparations in Firing Room 1. STS 51 work scheduled: external tank purges; start of aft closeouts; Advanced Communications Technology Satellite (ACTS) functional test; ORFEUS argon servicing. [STS 51 SPACE SHUTTLE STATUS REPORT, Sept. 1, 1993; Banke, FLORIDA TODAY, Sept. 2, 1993.]

[] **MARS OBSERVER MISSION STATUS**

The Mars Observer flight team is meeting again today to discuss various commands that might be viable options in the next few days. No commanding will occur today. The command sequence to switch the "redundant crystal oscillator" - the "quartz crystal" of the spacecraft's lateral clock - from the backup to the primary unit was under consideration today. A sequence to attempt to "cold boot" the spacecraft's backup computer system was also under consideration. [MARS OBSERVER MISSION STATUS, Sept. 1, 1993.]

[] **GOLDIN ANNOUNCED NEW MARS OBJECTIVE**

NASA Administrator Daniel S. Goldin today announced the establishment of a study team at NASA's Jet Propulsion Laboratory (Pasadena, CA), to explore possibilities for a return mission to Mars to recover some of the scientific objectives of the Mars Observer mission, if communications with that spacecraft cannot be reestablished. The study team, led by Dr. Charles Elachi (Assistant Laboratory Director at JPL) will look at a variety of low-cost spacecraft, instrument and launch options, with the objective of returning to Mars in 1994 or 1996. The team will review spacecraft and instrument options from industry and government, including Mars Observer spares and possibly international contributions. The team is expected to present potential mission options to NASA within the next two months. [NASA/KSC RELEASE: 93-157, Sept. 1, 1993; "NASA May Send New Mars Probe," FLORIDA TODAY, p. 2A, Sept. 3, 1993.]

[] **COLUMBIA/ENDEAVOUR STATUS**

In the Vehicle Assembly Building, a frequency response test of the Orbiter's flight controls was rescheduled from yesterday to today. The test was postponed after a leak developed in a hydraulic fluid supply line on ground support equipment. In OPF bay 1, technicians are installing auxiliary power unit No. 2 in Endeavour's aft compartment and flood lights inside the payload bay. [STS 51 SPACE SHUTTLE STATUS REPORT, Sept. 1, 1993.]

September 2: **STS 51: ORDNANCE CONNECTIONS**

Ordnance connections have been made at Launch Complex 39B where preparations continue for Discovery's launch on the STS 51 mission. Solid rocket booster aft skirt thermal curtains have been installed as have been the main engine heat shields and carrier panels. Work in progress: main engine compartment closeouts; avionics bay closeouts; application of foam insulation to #3 engine interface lines; external tank purge; countdown preparations in Firing Room 1 for 8:00 a.m. September 7 start. [STS 51 SPACE SHUTTLE STATUS REPORT, Sept. 2, 1993.]

[] **STS 58/61 STATUS REPORT**

In the Vehicle Assembly Building, the frequency response test of the Orbiter's flight controls continues. Columbia's STS 58 mission is now targeted for early October. Endeavour continues to undergo processing activities in OPF bay 1. In the bay, verification testing of the forward reaction control system continues, the air data probe is being aligned in preparation for a deployment test, and leak checks to the PRSD cryogenic reactant system are in work. Installation of the Global Positioning Satellite (GPS) receiver is complete. At Pad 39A, tanker trucks have been delivering liquid oxygen to refill the storage tanks for Endeavour's December launch. [STS 51 SPACE SHUTTLE STATUS REPORT, Sept. 2, 1993.]

[] **U.S./RUSSIAN SPACE PACT**

Vice President **Al Gore**, decreeing a virtual end to the space race of thirty years ago, today announced a major space agreement with Russia. The two nations agreed to collaborate to build an international space station that would cut costs and speed up construction of the station. Gore said the pact will produce a space station that "will be significantly better than any of the options that we could orbit on our own. There is a natural fit between important components of the Russian program and the American program that allow our cooperative work to produce a superior station at lower costs." The astronaut/cosmonaut exchange program will also be expanded. Russian Prime Minister **Victor Chernomyrdin** said, "It is

time to leave behind the vestiges of the Cold War and reach for a new partnership between the United States and Russia." [Halvorson, FLORIDA TODAY, pp. 1A-2A, Sept. 3, 1993; Halvorson, FLORIDA TODAY, p. 1A, Sept. 3, 1993; Banke, FLORIDA TODAY, pp. 1A-2A, Sept. 4, 1993; "U.S., Russia Agree to Cooperate In Energy Development, Space," THE ORLANDO SENTINEL, p. A-6, Sept. 3, 1993.]

September 3: **GENERAL DYNAMICS ATLAS LAUNCH**

Today, General Dynamics will launch its Atlas rocket carrying another Navy communications satellite; earlier in the year a launch of the same sort and identical payload failed. The Navy's project director, Capt. **John Long** said, "We're very satisfied with the work General Dynamics has done in preparing this launch vehicle following our failure." [Banke, FLORIDA TODAY, p. 2A, Sept. 3, 1993; Banke, FLORIDA TODAY, p. 1B, Sept. 4, 1993; Date, THE ORLANDO SENTINEL, p. A-7, Sept. 3, 1993; Date, THE ORLANDO SENTINEL, Sept. 4, 1993.]

[] **TECHNOLOGY/EDUCATION INITIATIVES**

Today NASA Administrator **Daniel S. Goldin**, U. S. Senator **Robert C. Byrd** and U. S. Representative **Alan B. Mollohan** participated in a ceremonial ground-breaking for two NASA projects with national potential at the Wheeling Jesuit College (Wheeling, West Virginia). The two programs are the Classroom of the Future and the National Technology Transfer Center (NTTC). The Classroom of the Future is a leading-edge, educational technology initiative to improve the quality of science, mathematics and technology education. It is a "laboratory" to develop stimulating, interactive multimedia curriculum materials and model pre-service and in-service teacher education programs.

The National Technology Transfer Center (NTTC) operates a national gateway service that assists U.S. firms in rapidly locating federal laboratory technology and provides the associated technology transfer assistance. The NTTC gateway service, which began in October 1992, currently handles between 200 to 300 technological inquiries from industry every month. Other key NTTC activities include technology transfer training and education services, outreach to industry to promote federal technology transfer and initiatives to stimulate private/public technology partnerships with federal labs and to further develop the national network. [NASA/KSC RELEASE: 93-158, Sept. 3, 1993.]

[] **MARS OBSERVER BOARD NAMED**

Dr. **Timothy Coffey**, Chairman of the Mars Observer Investigation Board, today recommended the remaining board members for approval by NASA Administrator

Daniel S. Goldin. In accepting the recommendations, Goldin said, "I have full confidence that the board will do its utmost in providing a thorough and systematic review to determine the cause for the loss of communications with Mars Observer." Dr. Coffey, who is Director of Research at the Naval Research Laboratory (NRL, Washington, D.C.) said, "The members were selected based on their significant experience in the development, acquisition and operation of space systems."

The board will investigate and determine, to the extent possible, the cause of the loss of communications and recommend corrective actions to prevent a recurrence in future missions. The board plans to present its findings to the NASA Administrator in late November. A final report will be released and made public after final acceptance by the NASA Administrator. The board includes: **Thomas C. Betterton**, Rear Admiral, United States Navy; **Peter G. Wilhelm**, Director of Naval Center for Space Technology, NRL; Dr. **Michael D. Griffin**, Chief Engineer, NASA; Dr. **Joseph Janni**, Chief Scientist, Air Force Philips Laboratory; Dr. **Kathryn D. Sullivan**, Chief Scientist, National Oceanic and Atmospheric Administration. Communication with the Mars Observer was lost at 6 p.m. PDT on Saturday, August 21; the spacecraft was set to enter Mars orbit at approximately 1:30 p.m. PDT on Tuesday, August 24. [NASA/KSC RELEASE: 93-159, Sept. 3, 1993.]

[] **STS 51: PRE-LAUNCH STATUS**

At Launch Complex 39B, technicians have completed ordnance connections on Discovery for its September 12 STS 51 mission. In addition, external tank purges and main engine foaming operations have been completed. Work in progress: Orbiter aft engine compartment closeouts; launch countdown preparations; ACTS functional test and battery charging; ORFEUS gaseous argon servicing. STS 51 work scheduled: start of countdown at 8 a.m.; aft confidence test; ACTS health checks; close payload bay doors for flight. [Banke, KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Sept. 3, 1993; Banke, FLORIDA TODAY, p. 1A, Sept. 4, 1993.]

[] **STS 58/61 UPDATES**

Columbia's STS 58 mission to deploy Spacelab Life Sciences-2 is scheduled for sometime in early October and last for two weeks. The flight control frequency response test has been completed and hydraulic circulation and sampling operations are underway. Work to X-ray the auxiliary power units is scheduled. Meanwhile, processing operations for Endeavour's STS 61 mission have continued as well. The mission is targeted for early December and is designed to service and repair the Hubble Space Telescope. Completed tasks include: flood light installation; thruster feedline mechanical fitting checks; Orbiter/external tank

umbilical door functional test; star tracker door functional test; ammonia boiler checks; Orbiter vent door functional checks; forward reaction control system electrical connections, interface verifications and trickle purge initiation and window number 5 installation. Work in progress for STS 61: cryogenic tank set pressurization and leak checks; freon coolant loop deservice operations; auxiliary power unit installation and tests. Crew module leak tests are scheduled. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Sept. 3, 1993.]

[] **KOHRS RETIRING**

Richard H. Kohrs, Director, Space Station Freedom, is retiring from NASA today after 30 years of service to the space agency in Houston and in Washington, D.C. "Mr. Kohrs has made many significant contributions to NASA and to the Apollo, Space Shuttle and Space Station programs over the last 3 decades," said **Arnold Aldrich**, NASA's Associate Administrator for Space Systems Development. "His outstanding program management abilities are unique in the agency. His talents will be sorely missed. For Space Station Freedom, Dick built a strong and effective program organization which stood the test despite continuing cycles of reassessment and restructure. With each review, the Space Station became a stronger and more effectively focused program. He has been an immensely respected leader for Space Station Freedom within NASA, our international partners, the program contractors, on Capitol Hill and in the Executive Branch." [NASA/KSC RELEASE: 93-160, Sept. 3, 1993; "Freedom Designer Kohrs Resigns," FLORIDA TODAY, p. 2A, Sept. 4, 1993; "Space Station Chief Retires As Project Faces Overhaul," THE ORLANDO SENTINEL, Sept. 4, 1993.]

[] **DISCOVERY GETS NEW SOFTWARE**

NASA has installed new launch software in Discovery in order to circumvent another last minute main-engine shutdown. It would allow Discovery to liftoff even if the same engine problem which occurred last month occurred again. The software change was just one of many updates. The new software was tested before it was installed just before Discovery's fourth launch attempt. [Date, THE ORLANDO SENTINEL, p. A-1 & A-8, Sept. 4, 1993.]

September 7: **STS 51 LAUNCH RESCHEDULED**

Late Friday evening (September 3) mission managers rescheduled the launch of STS 51 for Sunday (September 12) to allow engineers and managers additional time to complete a review concerning the ACTS payload. Specifically, the ACTS Independent Review Team is reexamining the spacecraft's design, production and testing heritage while verifying the readiness of the spacecraft for launch. STS

51 tasks which have now been completed include: Orbiter aft engine compartment closeouts; ACTS functional test and health checks and ORFEUS gaseous argon servicing. Work in progress: launch countdown preparations; aft confidence tests; payload vertical closeouts; ACTS battery charging. STS 51 work scheduled: start of the countdown at 8 a.m. September 9 at T-43 hours; closing of the payload doors for flight. [Banke, FLORIDA TODAY, p. 4A, Sept. 1, 1993; Banke, FLORIDA TODAY, p. 6A, Sept. 2, 1993; Banke, FLORIDA TODAY, p. 1A, Sept. 5, 1993; KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Sept. 7, 1993; Minis, FLORIDA TODAY, p. 4A, Sept. 8, 1993; "Shuttle Work Will Resume After Holiday," FLORIDA TODAY, Sept. 6, 1993; Date, THE ORLANDO SENTINEL, Sept. 9, 1993.]

[] **STS 58: APU'S X-RAYED**

The Space Shuttle Orbiter Columbia is in the Vehicle Assembly Building's high bay 3 for processing prior to its rollout for the STS 58 mission. The Orbiter's auxiliary power units have been X-rayed. Today technicians are conducting hydraulic leak checks and circulation and sampling operations. Rollout will follow Discovery's STS 51 launch on Sunday, September 12. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Sept. 7, 1993.]

[] **STS 61 PROCESSING UPDATE**

In OPF bay 1, technicians have completed freon coolant loop deservice operations in preparation for Endeavour's STS 61 mission in December. Work in progress: cryogenic tank set pressurization and leak checks; auxiliary power unit installation and tests; orbiter aft closeout operations; stacking of solid rocket boosters in the Vehicle Assembly Building's high bay 1. Crew module leak tests are scheduled. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Sept. 7, 1993.]

[] **ONEIDA CONSTRUCTION CONTRACT AWARD**

Oneida Construction Co. (Mims, FL) has been awarded a $180,548 contract to construct a contract bid information center at the Gate 2 Pass and Identification Building at Kennedy Space Center. Officially, the facility will be known as KSC's Central Industry Assistance Office and will be regularly staffed with NASA procurement employees. The center will be housed in a 1,950-square-foot addition to the present structure on State Route 3 at KSC's southern boundary. The small business firm will have until January 15, 1994, to complete construction and installation of equipment to upgrade the structure's existing heating, ventilation and air conditioning system.

Members of the public will be able to review all NASA contract bid openings at the new center without having to enter KSC. Previously, potential bidders had to obtain a temporary badge to gain access to the Headquarters Building in order to review contract solicitations. Federal regulations prohibit unbadged or unescorted access to KSC. Representatives of the prime Kennedy Space Center contractor companies will also be use the center to provide information on bidding for their subcontracts. NASA procurement officials hope the center will help the general public receive information in a more timely fashion to meet bid submission deadlines. [KSC Release No. 107-93, Sept. 7, 1993; "Bid Info Center Springs to Life," FLORIDA TODAY, p. 10E, Sept. 12, 1993.]

September 9: STS 51 COUNTDOWN STARTS ON SCHEDULE

The countdown for launch of the Space Shuttle Discovery on its STS 51 mission began as scheduled today at 8 a.m. EDT, at the T-43 hour mark. This marks the beginning of the fourth launch attempt of the Orbiter Discovery since launch was scrubbed on July 17 and 24 due to technical problems and again, most recently, on August 12. Additionally, launch was postponed from August 4 until August 12 due to concerns regarding the Perseid meteor shower and from September 10 to 12 due to concerns with the Advanced Technology Satellite (ACTS) payload. The countdown includes 28 hours and 45 minutes of built-in hold time leading to the opening of the launch window at 7:45 a.m. (EDT) September 12. The 1 hour, 55 minute window extends until 9:40 a.m.

A primary objective of this mission is the deployment of the ACTS and its Transfer Orbit Stage (TOS). ACTS/TOS is the latest in NASA's series of advanced communications satellites and a test-bed for technology which will be used in future operational satellites. Also, the Orbiting Retrievable Far and Extreme Ultraviolet Spectrometer-Shuttle Pallet Satellite (ORFEUS-SPAS) payload will be deployed and retrieved during this mission. Also on board is the Commercial Protein Crystal Growth (CPCG) experiment, the Chromosome and Plant Cell Division in Space (CHROMEX) experiment, and the IMAX camera. In addition, astronauts **Jim Newman** and **Carl Walz** are scheduled to perform a six-hour spacewalk on the fifth day of the mission as a continuation of a series of test spacewalks to increase experience and refine training methods. They will work with several tools that may be used during the servicing of the Hubble Space Telescope mission later this year. Today in Firing Room 1 of the Launch Control Center, the KSC launch team is verifying systems to assure that the Shuttle is powered up and that the data processing and backup flight control systems are operating trouble free. [**KSC Release No. 112-93**, Sept. 9, 1993.]

[] **STS 51: COUNTDOWN STARTS**

The countdown for Discovery's launch began today at 8 a.m. at the T-43 hour mark. Forecasters indicate a 30 percent probability of weather prohibiting launch with the primary concerns being a chance of showers and possible cloud ceilings below 8,000 feet. The five member crew for this mission are scheduled to arrive at KSC at about 1 p.m. today. Crew members are Commander **Frank Culbertson**, Pilot **William Readdy**, and Mission Specialists **Jim Newman**, **Dan Bursch** and **Carl Walz**. STS 51 work completed include: Advanced Communications Technology Satellite (ACTS) battery charging; crew equipment closeouts; launch preparations.

Mission processing work today: verification of Shuttle power on systems, data processing and flight control systems; stowage of mid-deck and flight deck supplies and payloads; preparations for power reactant and storage distribution system operations; Orbiter and payload bay closeouts; retraction of payload ground handling mechanism; closing of payload bay doors; crew arrival; repressurization of orbital maneuvering system with gaseous nitrogen. STS 51 work scheduled: loading cryogenic reactants into the onboard power reactant storage and distribution system tanks; retraction of the rotating service structure; external tank loading operations. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Sept. 9, 1993.]

[] **STS 51 CREW ARRIVAL**

The five member crew of Discovery's STS 51 mission arrived today at Kennedy Space Center's Shuttle Landing Facility; the time was 1:36 p.m. The crew met reporters at the SLF in what is a Shuttle tradition. As reported in FLORIDA TODAY, "It's one for the money," Discovery Commander **Frank Culbertson** sang out...." "Two for the show," said Pilot **Bill Readdy**. "Three to get ready," piped in Mission Specialist **Jim Newman**. "And four is to GO!" astronaut **Daniel Bursch** shouted, stabbing a fist in the air. NASA Test Director **Bill Dowdell** commented in a more sober tone, "We've said all along that we will launch when we're ready." [Halvorson, FLORIDA TODAY, p. 1A, Sept. 10, 1993.]

September 10: **LAUNCH MINUS 2 DAYS**

The countdown for Discovery's STS 51 launch continues today without problem. The pad will be closed for most of today for the loading of the onboard cryogenic tanks with the liquid hydrogen and liquid oxygen reactants. These reactants provide electricity to the Orbiter while in space and drinking water for the crew. The pad was closed to all personnel at about 8 a.m. Cryogenic flow began about 10 a.m. and will last for about 5 hours. Following this operation the Orbiter mid-body umbilical unit will be demated, Orbiter communications activation will start and final vehicle and facility closeouts will begin. Tomorrow, preparations will

be made to retract the rotating service structure to launch position at about 11 a.m. Tanking is scheduled to begin at about 11:25 p.m. Saturday (September 11). The payload bay doors were closed yesterday at 3:30 p.m. following the completion of all payload bay operations.

Two mid-deck experiments will be installed into the Orbiter tomorrow. The Commercial Protein Crystal Growth (CPCG) experiment will be installed at 7:45 a.m. and the Chromosome and Plant Cell Division in Space (CHROMEX) experiment will be installed beginning at about 4:30 p.m. Forecasters indicate a 20 percent probability of weather prohibiting launch with the primary concerns being possible showers and a low cloud ceiling. The winds at the pad are expected to be from the northeast at 5 to 7 knots; temperature 74-80 degrees F.; visibility 7 miles; and clouds scattered at 2,500 and 25,000 feet. The 24-hour and 48-hour delay forecasts reveal an increasing threat of showers and isolated storms at KSC during the launch window and list a 40 percent chance of violation each day. The five-member astronaut crew for this mission arrived at KSC's Shuttle Landing Facility yesterday at about 1:30 p. m. Today they will be involved with checking out their mission plans and fit checks of their equipment. They are scheduled for some free time this afternoon and will be ready for sleep at about 5 p.m. They will be awakened tomorrow at about 2:30 a.m. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Sept. 10, 1993; Date, THE ORLANDO SENTINEL, Sept. 11, 1993.]

[] **BOC EXTENDED THROUGH OCTOBER**

NASA announced today that the Kennedy Space Center Base Operations Contract (BOC) currently held by EG&G Florida, Inc., has been extended for one additional month. Exercising one of three, one-month, options to the existing contract, this action covers the period from October 1 to October 31, 1993, and is valued at $14,168,019. One of three major contracts at KSC, the BOC provides a wide variety of services to the center including management, operations, maintenance and engineering for KSC facilities and utilities, technical and administrative operations, health, fire and security services. EG&G Florida has held the Base Operations Contract for the past 10 years and is one of four companies involved in a re-competition. [KSC Release No. 113-93, Sept. 10, 1993.]

[] **CORDOVA NAMED NASA CHIEF SCIENTIST**

NASA Administrator **Daniel S. Goldin** announced today that Dr. France Anne Cordova, head of the Astronomy and Astrophysics Department at Pennsylvania State University, will assume the responsibilities of NASA Chief Scientist effective mid-October. She will be on extended detail from the University to NASA. In this position, Cordova will be the Administrator's senior scientific advisor. Also, she will be the principal interface between the Administrator and

the national and international science community to ensure that NASA programs are universally regarded as scientifically and technologically well founded and are appropriate for their intended applications. One of her critical duties will be to coordinate an integrated strategic plan for all the scientific disciplines across NASA. "NASA and the whole scientific community are indeed fortunate that Dr. Cordova has agreed to assume this most important position. She brings to the agency a wealth of professional experience and service," Goldin said. [NASA/KSC RELEASE: 93-162, Sept. 10, 1993.]

September 11: **LAUNCH MINUS 1 DAY**

The countdown for Discovery's STS 51 launch continues without problem today. Yesterday work to load cryogenic fuels into the Orbiter storage tanks was completed on time and the pad was reopened for the regularly scheduled operations. Following fueling operations the Orbiter mid-body umbilical unit was demated from the vehicle. Orbiter communications activation and final vehicle and facility closeouts are continuing today. This morning, preparations are being made to retract the rotating service structure to launch position. First motion remains set for about 11 a.m. At about 11:25 p.m. tonight, operations will begin to load the external tank with more than 500,000 gallons of liquid hydrogen and liquid oxygen. Operations toward that milestone are proceeding without problem.

Two mid-deck experiments are on the schedule for installation into the Orbiter today. The Commercial Protein Crystal Growth (CPCG) experiment was installed at 7:45 a.m. and the Chromosome and Plant Cell Division in Space (CHROMEX) experiment will be installed beginning at about 4:30 p.m. Forecasters indicate a 30 percent probability of weather prohibiting launch tomorrow with the primary concerns being possible showers and thunderstorms and a low cloud ceiling. The winds at the pad are expected to be from the northeast at 5 to 7 knots; temperature 74-80 degrees F; visibility 7 miles; and clouds scattered at 2,500 and 10,000 feet and broken at 25,000 feet. The 24-hour and 48-hour delay forecast reveal an increasing threat of showers and isolated storms at KSC during the launch window and list a 30 percent chance of violation each day.

Today, the five-member astronaut crew for this mission have been given a briefing on tomorrow's weather outlook and completed their review of launch day activities and mission plans. All STS 51 crew members flew in the T-38 training aircraft this morning. The crew will be granted several hours of free time this afternoon and be ready for sleep at about 5 p.m. They will be awakened tomorrow at 2:50 a.m. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Sept. 11, 1993; Halvorson, FLORIDA TODAY, pp. 1A-2A, Sept. 11, 1993; Halvorson, FLORIDA TODAY, pp. 1A & 6A, Sept. 12, 1993.]

September 12: **STS 51 LAUNCH SUCCESS**

Everything worked perfectly this morning for Discovery; launch was right on time at 7:45 a.m. EDT. Seven minutes after launch, however, a temperature sensor on one of Discovery's main engines failed; a backup sensor came to the rescue. **Loren Shriver**, former astronaut and Chairman of NASA's Mission Management Team, said, "We're going to have to get more data on the sensor and some analysis as to what caused it to go shoot off the scale." Launch Director **Robert B. Sieck** spoke of the tense moments before launch, "As we went into the terminal count, I think you could have heard a pin drop in the Launch Control Center." Shriver added, "When you come through three countdowns like we did and have two of them end very close in, there's a lot of work, a certain amount of letdown when you have to come back and try it again. I think everybody was just kind of extra alert and kind of sitting on the edge of the chair." [Halvorson, FLORIDA TODAY, pp. 1A-2A, Sept. 13, 1993.]

[] **FOSTER WINS SILVER SNOOPY**

USBI's **Judith Foster** was recently awarded a Silver Snoopy by astronaut **Charles Precourt** for making significant contributions to the manned space program. Foster has been employed as a senior quality assurance technician for 14 years by USBI. She was specifically recognized for identifying a problem with a fuse on some ordnance by going beyond the normal inspection requirements. ["Foster Wins Silver Snoopy," FLORIDA TODAY, p. 9E, Sept. 12, 1993.]

[] **COLUMBIA'S PROBLEMS MAY CAUSE DELAY**

Technical problems inside the Space Shuttle Columbia may cause its STS 58 mission launch to be delayed a week. Two of the Orbiter's auxiliary power units are suspect and must be replaced so that NASA will have to push beyond the target date of October 7 and assign a new, later, liftoff date. "We're still laying the schedule out," according to Kennedy Space Center Launch Director **Robert B. Sieck**. "It will probably be somewhere around the 10th to the 15th, somewhere within the second week of October." [Banke, FLORIDA TODAY, p. 4A, Sept. 13, 1993.]

September 13: **LITTLE PAD DAMAGE**

KSC managers are reporting very minimal damage to Launch Complex 39B following yesterday's successful launch of Discovery at 7:45 a.m. EDT. The twin solid rocket boosters are due into the port early this afternoon. STS 51 is expected to conclude with a Kennedy Space Center landing on September 22 at

C-3.

4:04 a.m. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Sept. 13, 1993.]

[] **STS 58: SPACELAB LIFE SCIENCES-2**

In the VAB, work has been completed on Columbia's external tank cavity purge. Today, technicians will be conducting cavity purge checks and making external tank/solid rocket booster pre-rollout preparations. Rollout of Columbia to Launch Complex 39B is set for September 16 at 4:00 a.m. The mission's terminal countdown demonstration test is set for early next week followed by the launch readiness review. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Sept. 13, 1993; "Columbia Heads for Launch Pad," FLORIDA TODAY, p. 10E, Sept. 12, 1993.]

[] **STS 61: PRE-LAUNCH TESTING CONTINUES**

In OPF bay 1, technicians continue to ready Endeavour for rollover to the Vehicle Assembly Building. Completed tasks include: replacement of payload bay flood lights; ammonia boiler installation and pallet checks; crew module hatch and functional tests. Work in progress: cryogenic tank set pressurization and leak checks; freon coolant loop pump package installation and operational checks; Orbiter aft closeout operations; stacking of solid rocket boosters in Vehicle Assembly Building high bay 1. STS 61 work scheduled: installation of window number 5 and auxiliary power unit number 1. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Sept. 13, 1993.]

September 14: **STS 51 UPDATE**

Discovery's twin solid rocket boosters arrived at Hanger AF at Cape Canaveral Air Force Station yesterday in the early afternoon. Disassembly and flight assessments are in work today. The mobile launcher platform will be removed from Launch Complex 39B tomorrow morning. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Sept. 14, 1993.]

[] **STS 58: ROLLOUT SCHEDULED**

Columbia will be rolled out to Launch Complex 39B on September 16 at 4 a.m. Technicians in the Vehicle Assembly Building have completed an Orbiter/external tank cavity purge. Today, they are conducting LC 39B pad validations; pre-rollout inspections; retracting service platforms and preparing to remove auxiliary power units 1 and 3. Both the terminal countdown demonstration test (TCDT) and the launch readiness review (LRR) will be implemented early next week. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Sept. 14, 1993.]

[] **STS 61: FLOODLIGHT REPLACED**

Preparations for Endeavour's STS 61 mission continued in OPF bay 1. Technicians have replaced the mid-port floodlight in the Orbiter's payload bay. In addition, ammonia boiler installation and pallet checks and crew module hatch and functional tests have been completed. Work in progress today: cryogenic tank set pressurization and leak checks; main propulsion leak and functional tests; freon coolant loop pump operational checks; installation of auxiliary power unit number 1; ammonia boiler servicing operations; installation of window number 5; Orbiter aft closeout operations; stacking of the solid rocket boosters in the Vehicle Assembly Building's high bay 1. Payload bay door functional checks and orbital maneuvering system electrical circuit verifications are scheduled. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Sept. 14, 1993.]

September 15: **STS 58: PRE-ROLLOUT INSPECTIONS**

Pre-rollout inspections for Columbia have been completed; rollout to Launch Complex 39B is scheduled to occur tomorrow at 4:00 a.m. Preparations to remove auxiliary power units 1 and 3 have been completed as part of the pre-launch processing for Columbia's STS 58 mission. The mission is expected to commence in mid-October. Today workers are completing Pad 39B validations and are implementing rollout preparations and the retraction of service platforms. STS 58 work scheduled includes rollout tomorrow and TCDT and LRR tests early next week. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Sept. 15, 1993.]

[] **STS 61: EARLY DECEMBER LAUNCH**

Endeavour's freon coolant pump package has been installed during the Orbiter's stay in OPF bay 1. Work in progress: cryogenic tank set pressurization and leak checks; main propulsion leak and functional checks; install auxiliary power unit number 1; freon coolant loop operational checks; install auxiliary power unit number 1; ammonia boiler servicing operations; install window number 5; Orbiter aft closeout operations; stacking of solid rocket boosters in Vehicle Assembly Building high bay 1. STS 61 work scheduled: payload bay door functional checks; Orbital maneuvering system electrical circuit verifications. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Sept. 15, 1993.]

September 16: **STS 58: ROLLOUT DELAYED**

Rollout of Columbia to Launch Complex 39B for its upcoming STS 58 mission has been delayed until midnight tonight due to inclement weather forecasts throughout the day. Rollout preparations had been completed and the service platforms had been retracted. Pre-rollout inspections had been conducted. LC

39B pad validations were implemented today. STS 58 tasks scheduled: the rollout and the terminal countdown demonstration test is set for early next week. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Sept. 16, 1993.]

[] **STS 61: COOLANT LOOP SERVICED**

Technicians in the Orbiter Processing Facility have completed Endeavour's coolant loop servicing and operational checks. Work in progress today: install inertial measurement unit; cryogenic tank set pressurization and leak checks; main propulsion leak and functional checks; install auxiliary power unit number 1; remove auxiliary power unit number 2; ammonia boiler servicing operations; install window number 5; Orbiter aft closeout operations; stacking of solid rocket boosters in the Vehicle Assembly Building high bay 1. STS 61 work scheduled: payload bay door functional checks and orbital maneuvering system electrical circuit verifications. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Sept. 16, 1993.]

September 17: **STS 58: COLUMBIA ROLLS TO PAD**

Rollout to Launch Complex 39B began with first motion out of the Vehicle Assembly Building at 10:57 p.m. last night. A minor motor generator problem on the crawler transporter caused a brief delay in the stacked Shuttle's arrival at the pad. KSC spokesman **Bruce Buckingham** said, "When we got up to the ramp, we realized we couldn't make it up to the pad with only eight of the 16 motors. So we had to back it back down." At the foot of the ramp, four additional motors were started and the climb up to the pad was achieved. Ordinarily, the 4.2 mile journey takes about six hours; today's was 11 hours. Pad validations are underway at present. STS 58 work scheduled: terminal countdown demonstration test (TCDT) is set for 11 a.m. Sept. 21; the STS 58 crew will arrive to participate in the TCDT on Saturday; operations to remove and replace auxiliary power units numbers 1 and 3. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Sept. 17, 1993; Halvorson, FLORIDA TODAY, Sept. 18, 1993.]

[] **SPACE STATION FIGHT RESUMES**

Opponents of the Space Station Program - Senator Dale Bumpers (D-Ark.) and Sen. James Sasser (D-TN) - will introduce an amendment seeking to kill the program. Their amendment would be added to an $87.9 billion appropriations bill for a group of independent federal agencies which includes the Veterans Administration and Department of Housing and Urban Development among others. NASA's budget request of $14.6 billion, includes $2.1 billion for the Space Station Program. ["Space Station Faces Big Fight," FLORIDA TODAY, p. 8A, Sept. 18, 1993; Eisler, FLORIDA TODAY, pp. 1A-2A, Sept. 22, 1993.]

[] **STS 61: APU #2 REMOVED**

Endeavour continues to undergo processing for its upcoming STS 61 mission in early December. Completed tasks include: cyrogenic tank set pressurization and leak checks; installation of inertial measurement unit; removal of auxiliary power unit number 2. Work in progress: main propulsion leak and functional checks; installation of auxiliary power unit number 1; ammonia boiler servicing operations; installation of window number 5; Orbiter aft closeout operations; stacking of solid rocket boosters in Vehicle Assembly Building high bay 1. STS 61 work scheduled: payload bay door functional checks; orbital maneuvering system electrical circuit verifications; installation of auxiliary power unit number 2. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, September 17, 1993.]

September 20: **STS 58: CREW ARRIVES FOR TCDT**

At Launch Complex 39B, pad validations for the STS 58 launch of Columbia were completed after the Orbiter was hard down on the pad. The STS 58 crew arrived to participate in the terminal countdown demonstration test (TCDT). Work in progress today: terminal countdown demonstration test which began at 8:30 a.m., T-O set for 11 a.m. September 21; operations to remove and replace auxiliary power units numbers 1 and 3; main engine valve cycle checks; preparations for helium signature test. STS 58 work scheduled: helium signature test and inertial measurement unit tests. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Sept. 20, 1993.]

[] **STS 61: WINDOW NUMBER 5 INSTALLED**

Technicians in Orbiter Processing Facility bay 1 have installed Endeavour's window number 5 and have installed and checked out the payload bay flood lights. Work in progress includes: installation of the chin panel; servicing the freon coolant loop; payload bay closeouts; main propulsion leak and functional checks; installation of auxiliary power units 1 and 2; ammonia boiler servicing operations; Orbiter aft closeout operations; stacking of solid rocket boosters in the Vehicle Assembly Building high bay 1. STS 61 work scheduled: payload bay door functional checks; orbital maneuvering system electrical circuit verifications. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Sept. 20, 1993.]

[] **STS 51: DISCOVERY'S LANDING**

Nine days after launch from Complex 39's Pad B, Space Shuttle Discovery is scheduled to land at the Kennedy Space Center, and possibly achieve the first KSC night landing. The first landing opportunity is on orbit 143 at 5:28 a.m. EDT tomorrow. A second opportunity is available at KSC one orbit later on orbit 144 and occurs six minutes before sunrise at 7:03 a.m. In each case the retro maneuver, or deorbit burn, is scheduled to occur 57 minutes before the planned touchdown. A landing opportunity is available at KSC on Wednesday (September 22) at 3:56 a.m. and also at Edwards Air Force Base, CA, at 3:47 a.m. EDT. [NASA/KSC RELEASE NO. 117-93, Sept. 20, 1993.]

September 21: **DISCOVERY'S LANDING POSTPONED**

Two landing opportunities at Kennedy Space Center were waved off today due to the potential for rain within 30 miles of the Shuttle Landing Facility. There are two KSC landing opportunities tomorrow: 3:56 a.m. EDT on orbit 158 (deorbit burn at 2:57 a.m.) and 5:31 a.m. on orbit 159 (deorbit burn at 4:33 a.m.). Also, there are three landing opportunities tomorrow at Edwards Air Force Base, CA. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Sept. 21, 1993.]

[] **STS 58: APUS REPLACED**

At Launch Complex 39B, technicians have removed and replaced auxiliary power units 1 and 3 on Columbia. Main engine valve cycle checks have also been completed. Work in progress at the pad: the terminal countdown demonstration test for STS 58; leak checks of replacement auxiliary power units 1 and 3; inertial measurement unit calibration tests; preparations for helium signature test. STS 58 work scheduled: helium signature test and pre-launch propellant loads. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Sept. 21, 1993.]

[] **STS 61: FLOOD LIGHTS INSTALLED**

Endeavour is nearing the end of its current stay in OPF bay 1 and a number of tasks have been completed: main propulsion leak and functional checks; installation of auxiliary power unit 1, window number 5 and the payload bay flood lights which have also been checked. Work in progress today: installation of the chin panel; servicing of the freon coolant loop; payload bay closeouts; orbital maneuvering system electrical circuit verifications; installation of auxiliary power unit 2; ammonia boiler servicing operations; Orbiter aft closeout operations; stacking of solid rocket boosters in Vehicle Assembly Building high bay 1.

Payload bay door functional checks are scheduled. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Sept. 21, 1993.]

September 22: **NIGHT LANDING "BEAUTIFUL"**

"It was beautiful. I just had the most incredible vista you could imagine," said Shuttle Pilot **William Readdy**. "As we were making our descent, we could see the hangars at Cape Canaveral Air Force Station and we could see down Cocoa Beach and everything." Commander **Frank Culbertson,** described the landing as being "just like training." Discovery and her five-member crew safely touched down at KSC's Shuttle Landing Facility (SLF) at 3:56 a.m. EDT today in what was the first nighttime Shuttle landing at Kennedy Space Center. "It's nice to have the first one under your belt," said KSC Shuttle Launch Director **Robert B. Sieck**. The Orbiter traveled over 4.1 million miles prior to the nominal touchdown on SLF runway 15. Preliminary measurements show the Orbiter touched down about 2,150 feet from the runway 15 threshold. Rollout distance was about 8,350 feet. The vehicle was towed from the SLF beginning at about 7:30 a.m. and was spotted in OPF bay 3 at about 8:40 a.m. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Sept. 22, 1993;Halvorson, FLORIDA TODAY, p. 8A, Sept. 23, 1993; Date, THE ORLANDO SENTINEL, pp. A-1 & A-4, Sept. 23, 1993.]

[] **STS 58: TCDT COMPLETED**

At Launch Complex 39B, Columbia is being readied for its STS 58 launch targeted presently for October 14. The mission's terminal countdown demonstration test (TCDT)has been completed as have inertial measurement unit (IMU) calibration tests. Work in progress today includes: leak checks of replacement auxiliary power units 1 and 3; forward reaction control system pressurization; preparations for the helium signature test which is scheduled; solid rocket booster thermal curtain installation and crew compartment cleaning. Pre-launch propellant loads have been scheduled. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Sept. 22, 1993.]

[] **STS 61: APU INSTALLATION**

Endeavour is undergoing its pre-rollover processing for the STS 61 mission in the Orbiter Processing Facility bay 1. Completed processing tasks include: installation of auxiliary power unit 2; orbital maneuvering system electrical circuit verifications; service of the freon coolant loop; main propulsion leak and functional checks. Work in progress: installation of the chin panel; payload bay closeouts; ammonia boiler servicing operations; Orbiter aft closeout operations; power reactant storage and distribution system tests; stacking of solid rocket boosters in the Vehicle Assembly Building high bay 1. STS 61 work scheduled:

payload bay door functional checks and auxiliary power unit system tests. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Sept. 22, 1993.]

[] **SPACE STATION LIVES: FLORIDA TODAY**

"The Senate gave NASA and the Space Station Program a vote of confidence today, propelling America forward on a quest to remain on the cutting edge in science and technology," said Senator Phil Gramm (R-Texas.) The U.S. Senate voted 59-40 against an amendment which would have eliminated money for the project from the NASA budget. [Eisler, FLORIDA TODAY, pp. 1A-2A, Sept. 22, 1993; "Senate Blocks Latest Move to Kill Space Station Funding," THE ORLANDO SENTINEL, p. A-7, Sept. 22, 1993.]

September 23: **STS 58: LEAK CHECKS COMPLETED**

Columbia's auxiliary power units have been checked for leaks while the Orbiter awaits its STS 58 launch at Launch Complex 39B. The solid rocket booster thermal curtain has also been installed. Work in progress: helium signature test; preparations for hydrazine servicing of auxiliary power units (APU) 1 and 3; crew compartment cleaning. STS 58 work scheduled: APU servicing overnight tonight; APU hot fire September 28. [SPACE SHUTTLE STATUS REPORT, Sept. 23, 1993.]

[] **DISCOVERY IN OPF**

In OPF Bay 3, Discovery has been jacked and leveled and access platforms are being moved into place around the vehicle. Access into the aft compartment is expected to occur later today. Facility power and purge umbilical lines are being established. The fuel cells have been powered down. Powering up the Orbiter with ground facility power is targeted for approximately 8 p.m. tonight. Inspections of the thermal protection system show five tiles have impacts greater than one inch. [SPACE SHUTTLE STATUS REPORT, Sept. 23, 1993.]

[] **ENDEAVOUR: RMS TESTING**

In Orbiter Processing bay 1, testing of the remote manipulator system is in work today, a functional test of the waste containment system is underway, potable water servicing is in work, and testing of Endeavour's cryogenic reactant system is being performed. Installation of window number 5 is complete. [SPACE SHUTTLE STATUS REPORT, Sept. 23, 1993.]

[] **GAS PIPELINE TO KSC**

NASA's Kennedy Space Center today entered into an agreement with City Gas Company Rockledge, FL)to design and construct a pipeline system and to provide natural gas for use at America's spaceport. The agreement specifies that City Gas Co. will pay the entire cost of the pipeline, and that no government funds will be used for this portion of the agreement. The 10-year agreement is effective today and runs through September 23, 2003. The multi-faceted agreement represents a major milestone in KSC's ongoing efforts to reduce energy costs and the center's reliability on petroleum-based fuels. "Natural gas is routinely used around the country and has proven to be both an environmentally and economically sound substitute for many of our current energy sources," said KSC Director **Robert L. Crippen**. "This is a significant step toward making KSC a more energy efficient work place. I'm confident that this transition to natural gas will save millions of tax dollars in the coming years and decades."

Under the terms of the agreement, City Gas Co. will build an estimated 25-mile pipeline linking much of KSC with a main pipeline spur located near Utilities Commission facility, situated south of the NASA Causeway on U.S. Route 1. The pipeline will run along the public rights-of-way of the NASA Causeway and other KSC thoroughfares. Hydraulic dredging will enable the pipeline to cross underneath the Indian River, resulting in no permanent impact to boat traffic. All aspects of the dredging operation will be coordinated with appropriate federal and state officials to assure minimal impact to the Indian River's ecosystem. Construction of the pipeline will begin this fall and should be complete by mid-to-late 1994. Once operational, the pipeline will enable natural gas to be sent to a large portion of the space center where it will be used to fuel objects ranging from government vehicles to water heaters to entire facilities.

Natural gas will eventually be used for many purposes, but one of the initial roles will be in the area of transportation. Officials are planning to convert 126 of the center's buses, sedans, vans and light trucks from gasoline to natural gas-burning vehicles by the end of 1994. The dozens of tour buses based at Spaceport USA will be converted to natural gas beginning in 1996, and many of the center's forklifts and delivery trucks will be running on natural gas in the years following. By the end of the decade, it is estimated that natural gas will be the fuel of choice for more than 75 percent of the space center's land-roving vehicles.

Among other benefits, KSC's switch to natural gas will result in a dramatic increase in combustion emissions around the center. By converting large hot water boilers, vehicles and miscellaneous other equipment to natural gas, the amount of sulfur dioxide and similar emissions will be reduced by about 99 percent by the year 2000. The natural gas pipeline will also nearly eliminate the center's annual need for approximately 500 truckloads of petroleum fuel. A

groundbreaking ceremony to commemorate the start of the pipeline is planned to occur within the next couple of months, and construction will begin immediately thereafter. [NASA/KSC RELEASE NO. 120-93, Sept. 23, 1993.]

September 24: **STS 58: HELIUM SIGNATURE TEST**

At Launch Complex 39B, the helium signature test for Columbia's STS 58 mission has been completed. Leak checks of replacement apus 1 and 3 have been conducted. The forward reaction control system pressurization has been finished and the solid rocket booster thermal curtain has been installed. Work in progress today: fuel line connections on auxiliary power units 1 and 3; crew compartment cleaning; reaction control system regulator flow checks. STS 58 work scheduled: pre-launch propellant loads; retraction and extension of the pad's rotating service structure; hot firing of auxiliary power units; main engine flight readiness tests and aerosurface cycling; Orbiter midbody umbilical connections and leak checks; SLS-2 late stowage operations (MVAC); launch readiness review and flight readiness review. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Sept. 24, 1993.]

[] **STS 61: CHIN PANEL INSTALLED**

Endeavour remains in OPF Bay 1 for the final pre-rollover processing leading to the Orbiter's STS 61 mission. The vehicle's waste containment system has already been checked. Currently, technicians are: making remote manipulator system checks; payload bay closeouts; ammonia boiler servicing operations; preparations for auxiliary power unit connections; Orbiter aft closeout operations; power reactant storage and distribution system tests and are stacking the mission's solid rocket boosters in the Vehicle Assembly Building high bay 1. STS 61 tasks scheduled: payload bay door functional checks; auxiliary power unit hazardous connections; landing gear functional tests; payload electrical circuits end-to-end test; installation of main engines; inertial measurement unit functional tests and calibrations. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Sept. 24, 1993.]

[] **STS 60: OPF PROCESSING UPDATE**

Discovery, having returned from space last week, is now in OPF bay 3 being processed there for the Orbiter's next mission, STS 60. Completed tasks include: offloading of onboard cryogenic fuels; establishing ground power to the vehicle; main engine bearing drying operations; Orbiter jack and leveling. Work in progress today: gaining access to the aft engine compartment; installation of platforms for Orbiter access; post-flight deconfiguration and checkouts; thermal protection system inspections and repairs. STS 60 work scheduled: opening the payload bay doors; auxiliary power unit inspections; payload removal

(ORFEUS/SPAS & TOS airborne support equipment). [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Sept. 28, 1993.]

[] **HST STATUS REPORT**

Flight hardware integration activities for the upcoming revisit to the Hubble Space Telescope have been underway in the Payload Hazardous Servicing Facility (PHSF) at KSC and are nearing completion. The replacement solar arrays, the latest flight element, arrived at KSC on September 10. During the second week of September the three primary replacement flight elements, which include these twin solar arrays as well as the Corrective Optics Space Telescope Axial Replacement (COSTAR) and the Wide Field Planetary Camera II (WFPC II), were installed in protective enclosures on their respective payload carriers.

Closeout activities in preparation for moving the flight hardware to the Vertical Processing Facility (VPF) began late last week and are concluding today. The payload canister has arrived at the PHSF atop its transporter in preparation for moving the three flight elements to the VPF. The current schedule calls for the flight support structure, which holds the telescope during on-orbit operations, to be installed into the payload canister on Tuesday. This will be followed by the solar array carrier and the orbital replacement unit carrier holding WFPC II and COSTAR on Wednesday. On Thursday the payload canister is to be rotated from the horizontal to vertical position and on Friday will arrive at the VPF to be installed in the east test cell. The three payload elements will undergo routine testing in the VPF during October to verify compatibility and readiness to be integrated with the Space Shuttle Endeavour. In addition, end-to-end testing to verify all communications systems and communications links is planned. The flight hardware is scheduled to go to the pad on October 28. [PAYLOAD STATUS REPORT: STS 61 HUBBLE SPACE TELESCOPE FIRST SERVICING MISSION, Sept. 27, 1993;Date, THE ORLANDO SENTINEL, Sept. 27, 1993.]

September 25: **AWARD WINNERS**

Dan Patterson, Vice President of Lockheed Space Operations Co. and Launch Site Director, has been awarded the Public Service Medal from Kennedy Space Center Director **Robert L. Crippen**. Patterson was cited for "exceptional contributions made to NASA's mission accomplishment." Patterson is a 25-year veteran of the aerospace industry and is a resident of Merritt Island, FL. United Technologies USBI has named **Dan Larsen** its employee of the month for September. Three NASA workers received Silver Snoopys from astronauts recently. Astronaut **William Gregory** presented the coveted Snoopys to **Robert Garthwaite**, **Alvaro Diaz** and **Paul Schwindt**. ["Lockheed VP Receives NASA's Highest Award," FLORIDA TODAY, Sept. 26, 1993.]

September 27: **STS 58: RCS FLOW CHECKS**

Columbia is sitting atop the pad at Launch Complex 39B and, while there, continues to undergo final processing for its STS 58 mission. The highlight of that mission will be the utilization of Spacelab Life Sciences-2. At LC 39B, technicians have completed reaction control system (RCS) regulator flow checks; the mission's helium signature test; solid rocket booster thermal curtain installation and the forward reaction control system pressurization. Work in progress today includes: fuel line connections on auxiliary power units 1 and 3; crew compartment cleaning; loading of pre-launch propellants; launch readiness review. STS 58 work scheduled this week: hot firing of the auxiliary power units; main engine flight readiness tests and aerosurface cycling; Orbiter midbody umbilical connections and leak checks; SLS-2 late stowage operations (MVAK); and the flight readiness review. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Sept. 27, 1993.]

[] **STS 61: PRSD CHECKOUTS**

Power reactant and storage distribution (PRSD) checkouts of Endeavour have been completed in OPF bay 1 in preparation for its STS 61 mission to repair the Hubble Space Telescope. The Orbiter's chin panel has been installed and the waste containment system has been checked. Work in progress today: remote manipulator arm checks; payload bay closeouts; ammonia boiler servicing operations; preparations for auxiliary power unit connections; Orbiter aft closeout operations; stacking of solid rocket boosters in the Vehicle Assembly Building's high bay 1. STS 61 work scheduled this week: payload bay door functional checks; auxiliary power unit hazardous connections; landing gear functional tests; payload electrical circuits end-to-end test; install main engines and inertial measurement unit functional tests and calibrations. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Sept. 27, 1993.]

[] **STS 60: FUELS OFFLOADED**

In OPF bay 3, technicians working on Discovery have offloaded that vehicle's onboard cryogenic fuels as part of readying it for its next mission: STS 60. Ground power to Discovery has been established; main engine bearing drying operations have been completed as has the Orbiter jack and leveling operation. Work in progress: preparations for removing payloads; post-flight deconfiguration and checkouts; thermal protection system inspections and repairs. Work scheduled includes: auxiliary power unit inspections and payload removal (ORFEUS/SPAS & TOS airborne support equipment). [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Sept. 27, 1993.]

September 28: **STS 58: EDWARDS AFB LANDING**

The target launch date for Columbia's STS 58 mission is October 14 with a landing scheduled two weeks later at Edwards Air Force Base, CA. because experiments aboard the Spacelab Life Sciences payload must be processed immediately on landing and the processing facilities are located there. Reaction control system regulator flow checks have been completed; leak checks of high-point bleed valves are also finished. The launch readiness review (LRR) for the mission has been completed after meetings this week at Kennedy Space Center. Work in progress this week: preparations for a hotfire of the auxiliary power units 1 and 2; crew compartment cleaning and loading of pre-launch propellants. STS 58 work scheduled: hot firing of the APUs; main engine flight readiness tests and aerosurface cycling; Orbiter midbody umbilical connections and leak checks and the flight readiness review October 1. Launch of Columbia and its seven-member crew is planned for 10:53 a.m.; the launch window extends for another two hours and thirty minutes. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Sept. 28, 1993; Date, THE ORLANDO SENTINEL, Sept. 22, 1993; Banke and Halvorson, FLORIDA TODAY, p.9A, Sept. 29, 1993.]

[] **STS 61: HUBBLE SPACE TELESCOPE MISSION**

Processing work continues on Endeavour during its pre-rollover stint in the Orbiter Processing Facility's bay 1. Completed tasks include: Ku-band checkout with TDRSS; polishing the Orbiter's windows and power reactant and storage distribution (PRSD) checkouts. Today, technicians will be removing, then replacing the Orbiter's flight recorder and conducting auxiliary power unit (APU) checkouts. STS 61 work scheduled: payload bay door functional checks; landing gear functional tests; installation of main engines and inertial measurement unit functional tests and calibrations. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Sept. 28, 1993.]

[] **STS 60: SPACEHAB-2**

Technicians working on Discovery in OPF bay 3 have completed the validation of Orbiter power systems; payload bay doors have been opened and secured; the Ku-band antenna has been deployed and the payloads have been safed. Today, processing workers will prepare to remove the STS 51 payloads; conduct post flight deconfiguration and checkouts and thermal protection system inspections and repairs. STS 60 work scheduled includes: auxiliary power unit (APU) checkouts; payload removal beginning late tomorrow. Technicians will be removing the ORFEUS/SPAS and TOS airborne support equipment. STS 61 will carry a crew of six on its mid-January launch; the mission itself will be eight days and five hours in duration, barring an extension due to poor weather at the Kennedy Space

Center Shuttle Landing Facility. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Sept. 28, 1993.]

September 29: **STS 58: AIMING AT OCT. 14**

At Launch Complex 39B, technicians have completed loading hypergolic fuels for Columbia's STS 58 mission. Today, pad workers will retract the rotating service structure for APU hotfiring which is set to begin at 2 p.m.; they will extend the rotating service structure after the hot firing and continue preparations for the flight readiness test of the Orbiter's main engines. STS 58 work scheduled: main engine flight readiness tests and aerosurfaces cycling planned for tomorrow; Orbiter midbody umbilical connections and leak checks; SLS-2 late stowage operations (MVAC); flight readiness review set for October 1. [Halvorson, FLORIDA TODAY, p. 1A, Sept. 30, 1993; KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Sept. 29, 1993.]

[] **STS 61: PRSD CHECKOUTS COMPLETED**

The Space Shuttle Endeavour remains in OPF bay 1 where it is being readied for its rollover to the Vehicle Assembly Building. Technicians have completed power reactant and storage distribution (PRSD)system and auxiliary power unit checkouts and have loaded mass memory units 1 and 2. Currently the flight recorder is being replaced and preparations are being made for installing the Orbiter's main engines. STS 61 work scheduled: installation of main engines beginning October 1; flushing of the Orbiter's gaseous nitrogen lines and functional checks of the main landing gear. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Sept. 29, 1993.]

[] **STS 60: WAKE SHIELD FACILITY AND SPACEHAB-2**

Discovery is being processed in Orbiter Processing Facility bay 3. Technicians in the OPF have validated the Orbiter power systems; deconfigured the Orbiter's aft flight deck and deployed the Ku-band antenna. Today, workers will remove the ORFEUS/SPAS payload in the afternoon and make thermal protection system inspections and repairs. STS 60 work scheduled includes: auxiliary power unit inspections and deconfiguring of the payload bay. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Sept. 29, 1993.]

September 30: **APU HOT FIRING COMPLETED**

Preparations for the liftoff of STS 58 aboard Columbia continue at Launch Complex 39B. The Orbiter's auxiliary power units have been hot-fired; technicians have also completed pre-launch propellant loads and the rotating service structure has been retracted and extended. Today, workers are conducting

main engine flight readiness tests and aerosurface cycling along with Orbiter midbody umbilical connections and leak checks. STS 58 work scheduled: SLS-2 late stowage operations (MVAC); flight readiness review October 1; pre-launch preparations; Orbiter aft engine compartment closeouts. [Banke and Halvorson, FLORIDA TODAY, p. 9A, Sept. 29, 1993; KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Sept. 30, 1993.]

[] **STS 61: IMU TESTS/CALIBRATIONS**

In OPF bay 1, Endeavour has undergone payload bay door functional checks and inertial measurement unit functional tests and calibrations as part of its STS 61 processing before being rolled over to the VAB. Work in progress today: ammonia boiler servicing operations; power reactant storage and distribution system tests; preparations for installing main engines; potable water servicing; freon coolant loop flush and service checks; final auxiliary power unit controller tests; stacking of solid rocket boosters in the Vehicle Assembly Building high bay 1. STS 61 work scheduled: main engine installation; main engine electrical verifications and main propulsion system integrated testing; landing gear functional tests; payload electrical circuits end-to-end test; crew equipment interface tests and checks. The STS 61 crew of seven will arrive this weekend for checks. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Sept. 30, 1993.]

[] **STS 60: PAYLOAD REMOVAL**

A number of post-STS 51 tasks have been completed in OPF bay 3 where Discovery is being processed. The payload bay doors have been opened and the ORFEUS/SPAS & TOS airborne support equipment have been removed. Technicians now have access to the aft engine compartment and have installed platforms for Orbiter access. They have also conducted post-flight deconfiguration and checkouts. Work in progress today: positioning the body flap; main engine removal preparations; preparations to remove the forward reaction control system (FRCS); payload bay post-flight and post-payload deployment assessments; assessment of minor damage to the remote manipulator system (RMS); deconfiguring the payload bay. STS 60 work scheduled: removal of the forward reaction control system; offloading of hypergolic fuels; auxiliary power unit inspections. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Sept. 30, 1993.]

[] **STS 60: OPF PROCESSING UPDATE**

Discovery, having returned from space last week, is now in OPF bay 3 being processed there for the Orbiter's next mission, STS 60. Completed tasks include: offloading of onboard cryogenic fuels; establishing ground power to the vehicle;

main engine bearing drying operations; Orbiter jack and leveling. Work in progress today: gaining access to the aft engine compartment; installation of platforms for Orbiter access; post-flight deconfiguration and checkouts; thermal protection system inspections and repairs. STS 60 work scheduled: opening the payload bay doors; auxiliary power unit inspections; payload removal (ORFEUS/SPAS & TOS airborne support equipment). [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Sept. 28, 1993.]

[] **HST STATUS REPORT**

Flight hardware integration activities for the upcoming revisit to the Hubble Space Telescope have been underway in the Payload Hazardous Servicing Facility (PHSF) at KSC and are nearing completion. The replacement solar arrays, the latest flight element, arrived at KSC on September 10. During the second week of September the three primary replacement flight elements, which include these twin solar arrays as well as the Corrective Optics Space Telescope Axial Replacement (COSTAR) and the Wide Field Planetary Camera II (WFPC II), were installed in protective enclosures on their respective payload carriers.

Closeout activities in preparation for moving the flight hardware to the Vertical Processing Facility (VPF) began late last week and are concluding today. The payload canister has arrived at the PHSF atop its transporter in preparation for moving the three flight elements to the VPF. The current schedule calls for the flight support structure, which holds the telescope during on-orbit operations, to be installed into the payload canister on Tuesday. This will be followed by the solar array carrier and the orbital replacement unit carrier holding WFPC II and COSTAR on Wednesday. On Thursday the payload canister is to be rotated from the horizontal to vertical position and on Friday will arrive at the VPF to be installed in the east test cell. The three payload elements will undergo routine testing in the VPF during October to verify compatibility and readiness to be integrated with the Space Shuttle Endeavour. In addition, end-to-end testing to verify all communications systems and communications links is planned. The flight hardware is scheduled to go to the pad on October 28. [PAYLOAD STATUS REPORT: STS 61 HUBBLE SPACE TELESCOPE FIRST SERVICING MISSION, Sept. 27, 1993;Date, THE ORLANDO SENTINEL, Sept. 27, 1993.]

September 25: **AWARD WINNERS**

Dan Patterson, Vice President of Lockheed Space Operations Co. and Launch Site Director, has been awarded the Public Service Medal from Kennedy Space Center Director **Robert L. Crippen**. Patterson was cited for "exceptional contributions made to NASA's mission accomplishment." Patterson is a 25-year veteran of the

aerospace industry and is a resident of Merritt Island, FL. United Technologies USBI has named **Dan Larsen** its employee of the month for September. Three NASA workers received Silver Snoopys from astronauts recently. Astronaut **William Gregory** presented the coveted Snoopys to **Robert Garthwaite**, **Alvaro Diaz** and **Paul Schwindt**. The three were recognized for outstanding contributions to the space program. ["Lockheed VP Receives NASA's Highest Award," FLORIDA TODAY, Sept. 26, 1993.]

September 27: **STS 58: RCS FLOW CHECKS**

Columbia is sitting atop the pad at Launch Complex 39B and, while there, continues to undergo final processing for its STS 58 mission. The highlight of that mission will be the utilization of Spacelab Life Sciences-2. At LC 39B, technicians have completed reaction control system (RCS) regulator flow checks; the mission's helium signature test; solid rocket booster thermal curtain installation and the forward reaction control system pressurization. Work in progress today includes: fuel line connections on auxiliary power units 1 and 3; crew compartment cleaning; loading of pre-launch propellants; launch readiness review. STS 58 work scheduled this week: hot firing of the auxiliary power units; main engine flight readiness tests and aerosurface cycling; Orbiter midbody umbilical connections and leak checks; SLS-2 late stowage operations (MVAK); and the flight readiness review. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Sept. 27, 1993.]

[] **STS 61: PRSD CHECKOUTS**

Power reactant and storage distribution (PRSD) checkouts of Endeavour have been completed in OPF bay 1 in preparation for its STS 61 mission to repair the Hubble Space Telescope. The Orbiter's chin panel has been installed and the waste containment system has been checked. Work in progress today: remote manipulator arm checks; payload bay closeouts; ammonia boiler servicing operations; preparations for auxiliary power unit connections; Orbiter aft closeout operations; stacking of solid rocket boosters in the Vehicle Assembly Building's high bay 1. STS 61 work scheduled this week: payload bay door functional checks; auxiliary power unit hazardous connections; landing gear functional tests; payload electrical circuits end-to-end test; install main engines and inertial measurement unit functional tests and calibrations. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Sept. 27, 1993.]

[] **STS 60: FUELS OFFLOADED**

In OPF bay 3, technicians working on Discovery have offloaded that vehicle's onboard cryogenic fuels as part of readying it for its next mission: STS 60. Ground power to Discovery has been established; main engine bearing drying

operations have been completed as has the Orbiter jack and leveling operation. Work in progress: preparations for removing payloads; post-flight deconfiguration and checkouts; thermal protection system inspections and repairs. Work scheduled includes: auxiliary power unit inspections and payload removal (ORFEUS/SPAS & TOS airborne support equipment). [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Sept. 27, 1993.]

September 28: **STS 58: EDWARDS AFB LANDING**

The target launch date for Columbia's STS 58 mission is October 14 with a landing scheduled two weeks later at Edwards Air Force Base, CA. because experiments aboard the Spacelab Life Sciences payload must be processed immediately on landing and the processing facilities are located there. Reaction control system regulator flow checks have been completed; leak checks of high-point bleed valves are also finished. The launch readiness review (LRR) for the mission has been completed after meetings this week at Kennedy Space Center. Work in progress this week: preparations for a hotfire of the auxiliary power units 1 and 2; crew compartment cleaning and loading of pre-launch propellants. STS 58 work scheduled: hot firing of the APUs; main engine flight readiness tests and aerosurface cycling; Orbiter midbody umbilical connections and leak checks and the flight readiness review October 1. Launch of Columbia and its seven-member crew is planned for 10:53 a.m.; the launch window extends for another two hours and thirty minutes. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Sept. 28, 1993; Date, THE ORLANDO SENTINEL, Sept. 22, 1993; Banke and Halvorson, FLORIDA TODAY, p.9A, Sept. 29, 1993.]

[] **STS 61: HUBBLE SPACE TELESCOPE MISSION**

Processing work continues on Endeavour during its pre-rollover stint in the Orbiter Processing Facility's bay 1. Completed tasks include: Ku-band checkout with TDRSS; polishing the Orbiter's windows and power reactant and storage distribution (PRSD) checkouts. Today, technicians will be removing, then replacing the Orbiter's flight recorder and conducting auxiliary power unit (APU) checkouts. STS 61 work scheduled: payload bay door functional checks; landing gear functional tests; installation of main engines and inertial measurement unit functional tests and calibrations. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Sept. 28, 1993.]

[] **STS 60: SPACEHAB-2**

Technicians working on Discovery in OPF bay 3 have completed the validation of Orbiter power systems; payload bay doors have been opened and secured; the Ku-band antenna has been deployed and the payloads have been safed. Today, processing workers will prepare to remove the STS 51 payloads; conduct post

flight deconfiguration and checkouts and thermal protection system inspections and repairs. STS 60 work scheduled includes: auxiliary power unit (APU) checkouts; payload removal beginning late tomorrow. Technicians will be removing the ORFEUS/SPAS and TOS airborne support equipment. STS 61 will carry a crew of six on its mid-January launch; the mission itself will be eight days and five hours in duration, barring an extension due to poor weather at the Kennedy Space Center Shuttle Landing Facility. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Sept. 28, 1993.]

September 29: **STS 58: AIMING AT OCT. 14**

At Launch Complex 39B, technicians have completed loading hypergolic fuels for Columbia's STS 58 mission. Today, pad workers will retract the rotating service structure for APU hotfiring which is set to begin at 2 p.m.; they will extend the rotating service structure after the hot firing and continue preparations for the flight readiness test of the Orbiter's main engines. STS 58 work scheduled: main engine flight readiness tests and aerosurfaces cycling planned for tomorrow; Orbiter midbody umbilical connections and leak checks; SLS-2 late stowage operations (MVAC); flight readiness review set for October 1. [Halvorson, FLORIDA TODAY, p. 1A, Sept. 30, 1993; KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Sept. 29, 1993.]

[] **STS 61: PRSD CHECKOUTS COMPLETED**

The Space Shuttle Endeavour remains in OPF bay 1 where it is being readied for its rollover to the Vehicle Assembly Building. Technicians have completed power reactant and storage distribution (PRSD)system and auxiliary power unit checkouts and have loaded mass memory units 1 and 2. Currently the flight recorder is being replaced and preparations are being made for installing the Orbiter's main engines. STS 61 work scheduled: installation of main engines beginning October 1; flushing of the Orbiter's gaseous nitrogen lines and functional checks of the main landing gear. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Sept. 29, 1993.]

[] **STS 60: WAKE SHIELD FACILITY AND SPACEHAB-2**

Discovery is being processed in Orbiter Processing Facility bay 3. Technicians in the OPF have validated the Orbiter power systems; deconfigured the Orbiter's aft flight deck and deployed the Ku-band antenna. Today, workers will remove the ORFEUS/SPAS payload in the afternoon and make thermal protection system inspections and repairs. STS 60 work scheduled includes: auxiliary power unit inspections and deconfiguring of the payload bay. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Sept. 29, 1993.]

September 30: **APU HOT FIRING COMPLETED**

Preparations for the liftoff of STS 58 aboard Columbia continue at Launch Complex 39B. The Orbiter's auxiliary power units have been hot-fired; technicians have also completed pre-launch propellant loads and the rotating service structure has been retracted and extended. Today, workers are conducting main engine flight readiness tests and aerosurface cycling along with Orbiter midbody umbilical connections and leak checks. STS 58 work scheduled: SLS-2 late stowage operations (MVAC); flight readiness review October 1; pre-launch preparations; Orbiter aft engine compartment closeouts. [Banke and Halvorson, FLORIDA TODAY, p. 9A, Sept. 29, 1993; KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Sept. 30, 1993.]

[] **STS 61: IMU TESTS/CALIBRATIONS**

In OPF bay 1, Endeavour has undergone payload bay door functional checks and inertial measurement unit functional tests and calibrations as part of its STS 61 processing before being rolled over to the VAB. Work in progress today: ammonia boiler servicing operations; power reactant storage and distribution system tests; preparations for installing main engines; potable water servicing; freon coolant loop flush and service checks; final auxiliary power unit controller tests; stacking of solid rocket boosters in the Vehicle Assembly Building high bay 1. STS 61 work scheduled: main engine installation; main engine electrical verifications and main propulsion system integrated testing; landing gear functional tests; payload electrical circuits end-to-end test; crew equipment interface tests and checks. The STS 61 crew of seven will arrive this weekend for checks. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Sept. 30, 1993.]

[] **STS 60: PAYLOAD REMOVAL**

A number of post-STS 51 tasks have been completed in OPF bay 3 where Discovery is being processed. The payload bay doors have been opened and the ORFEUS/SPAS & TOS airborne support equipment have been removed. Technicians now have access to the aft engine compartment and have installed platforms for Orbiter access. They have also conducted post-flight deconfiguration and checkouts. Work in progress today: positioning the body flap; main engine removal preparations; preparations to remove the forward reaction control system (FRCS); payload bay post-flight and post-payload deployment assessments; assessment of minor damage to the remote manipulator system (RMS); deconfiguring the payload bay. STS 60 work scheduled: removal of the forward reaction control system; offloading of hypergolic fuels; auxiliary power unit inspections. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Sept. 30, 1993.]

OCTOBER

October 1: **EG&G WINS BOC, AGAIN**

NASA has selected EG&G Florida, Inc. (Cocoa, FL) for final negotiations for the Base Operations Contract at the Kennedy Space Center. EG&G Florida's proposed cost is approximately $1.7 billion, exclusive of fees. The cost-plus-award/incentive fee contract will be for a total potential contract period, including options, of 10 years. As the base operations contractor, EG&G Florida will provide a broad base of support services for the KSC mission, encompassing management, operation, maintenance and engineering for KSC's utilities and facilities; health, fire and security services; and certain technical and administrative operations.

These support services are for NASA and other NASA contractors and tenants at KSC, Cape Canaveral Air Force Station and a limited number of other locations. NASA's original selection for this contract award - to Lockheed Space Operations Co. - was made in November 1993, but was protested to the General Services Administration Board of Contract Appeals. As a result of settling this protest, NASA agreed to revise the solicitation and to recompete. EG&G Florida, Inc., the incumbent contractor, has continued to provide base operations support during the recompetition process. [NASA/KSC NEWS RELEASE C93-W, Oct. 1, 1993; Liden and Halvorson, FLORIDA TODAY, pp. 1A-2A, Oct. 2, 1993.]

[] **STS 58: FLIGHT READINESS TESTS**

Columbia's number 2 and 3 main engines have undergone flight readiness tests at Launch Complex 39B. The Orbiter's aerosurfaces have been cycled and technicians have completed Orbiter midbody umbilical connections and leak checks. Work in progress today: SLS-2 late stowage operations (MVAC); flight readiness review (FRR); flight readiness test (FRT) of engine 1 and replacement of main engine number 1 oxidizer preburner oxidizer valve actuator that failed during FRT; Orbiter aft engine compartment closeouts. STS 58 work scheduled for next week: main engine hydraulic closeouts; pre-launch preparations; continue with Orbiter aft engine compartment closeouts; continue with SLS-2 late stowage operations (MVAC). [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Oct. 1, 1993.]

[] **STS 61: NEW TESTS FOR HST CAMERA**

Based on an independent optics panel's assessment for NASA, mission managers have decided to return the Wide Field/Planetary Camera (WFPC) II to the Payload Hazardous Servicing Facility (PHSF) at KSC for possible additional testing prior to the STS 61 Hubble servicing mission. WFPC had already been installed into

the payload canister and was in the process of being transported to the Vertical Processing Facility when the decision was reached yesterday to return to the PHSF. Potential risks associated with performing the tests are currently being evaluated. A decision on what tests will be performed is expected in the next few days. No impact to the camera's readiness for launch is expected.

Ammonia boiler servicing operations have been completed on Endeavour which remains in OPF bay 1. Preparations for installing the main engines have been made; tests of the modular auxiliary data systems (MADS) recorder have also been conducted. Work in progress today: main engine installation; final auxiliary power unit controller tests; power reactant storage and distribution system tests; potable water servicing; freon coolant loop flush and service checks; stacking of solid rocket boosters in the Vehicle Assembly Building's high bay 1. STS 61 work scheduled for next week includes: main engine electrical verifications and main propulsion system integrated testing; landing gear functional tests; payload electrical circuits end-to-end tests; crew equipment interface tests and checks and the arrival of the STS 61 crew on October 3. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Oct. 1, 1993.]

[] STS 60: HYDRAULIC OPERATIONS COMPLETED

Discovery continues to undergo processing activities aimed at readying the Orbiter for its STS 60 mission targeted now for mid-January of 1994. Hydraulic operations are finished as well as the positioning of the vehicle's body flap. Inspections showed minor damage to the remote manipulator system (RMS). The Shuttle's forward reaction control system has been removed. Work currently underway includes: body flap checks; main engine inspections and removal preparations; payload bay post-flight and post-payload deploy assessments; deconfiguring of the payload bay. STS 60 work scheduled for next week [October 4-8]: offloading hypergolic fuels (SCAPE Operations); auxiliary power unit inspections; waste management post-flight servicing and removal and replacement of fuel cells 2 and 3. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Oct. 1, 1993.]

[] STS 58: LIFTOFF OCTOBER 14

Shuttle managers today targeted October 14, 1993, for launch of the Space Shuttle Columbia and the second Spacelab Life Sciences (SLS-2) mission. The vehicle and its payloads were declared ready for launch following today's Flight Readiness Review at NASA's Kennedy Space Center. The 2 1/2 hour launch window on the 14th opens at 10:53 a.m. EDT. The 14-day mission will be commanded by **John Blaha** and piloted by **Rick Searfoss**. Rounding out the 7-member crew will be Mission Specialists **Rhea Seddon, Bill McArthur, David Wolf** and **Chignon Lucid**, and Payload Specialist **Martin Fettman**. STS 58 represents the 58th Space Shuttle

flight and the 15th for Columbia. [Halvorson, FLORIDA TODAY, P. 5A, Oct. 1, 1993; Halvorson, FLORIDA TODAY, p. 1A, Oct. 2, 1993; LAUNCH ADVISORY: DATE SET FOR STS 58 MISSION, Oct. 1, 1993.]

October 3: **SSME PART RETESTED**

When a main engine part failed its test last week it was replaced; the new test for the replacement part takes place this morning. The original part was a valve in the liquid oxygen plumbing of main engine number 1. When the new part is tested, workers will move on to more routine pre-launch activities: the installation of ordnance and pressurization of Columbia's propellant storage tanks. Workers will also stock provisions for the Orbiter's two week mission. Landing will occur at Edwards Air Force Base,CA, to give the commander more margin for error after having been in space for two weeks. [Banke, FLORIDA TODAY, p. 18A, Oct. 3, 1993.]

October 4: **STS 58: FRR COMPLETED**

Columbia's flight readiness review was completed October 1; the vehicle's water spray boilers have been serviced and, over the weekend, technicians successfully carried out the flight readiness test of the Orbiter's engines. Currently, technicians and mating and leak-checking the Orbital midbody umbilical unit; conducting the Orbiter aft confidence test and starting aft closeouts; stowing Spacelab hardware and minor payload equipment. Launch countdown preparations begin today. Aft compartment closeouts are scheduled to continue this week as are other launch preparations. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Oct. 4, 1993.]

[] **STS 61: MAIN ENGINES INSTALLED**

Over the past weekend, Endeavour's three main engines were installed and the Orbiter's freon system was flushed as part of pre-rollover preparations. Work in progress today: potable water servicing; securing of main engines; closeouts of the Orbiter's forward compartment and purging of the gaseous nitrogen lines. STS 61 work scheduled for the week: leak checks of the main engines and checkouts of the Orbiter's closed circuit television. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Oct. 4, 1993.]

[] **STS 60: MID-JANUARY LAUNCH TARGETED**

Discovery's next mission is targeted for mid-January 1994; its primary payloads will be the Wake Shield Facility and Spacehab 2. Current completed tasks include: removal of the STS 51 Orfeus/Spas payloads and a dump of the Orbiter's flight recorder data. Work in progress today: inspections of the Orbiter's 17-inch

disconnect; thermal protection system inspections and repairs; removal of fuel cells 2 and 3 and removal of the engine heatshields. Scheduled STS 60 tasks: deconfiguring of the payload bay; removal of the main engines and removal of the Orbiter's forward reaction control system (FRCS). The STS 60 mission will carry a crew of six astronauts and last for 8 days and 5 hours with a planned landing at Kennedy Space Center. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Oct. 4, 1993.]

[] **ONE DEAD IN SR 3 ACCIDENT**

One person was killed and two others were injured in a three-car accident at Kennedy Space Center this morning. **Dick Young**, a spokesman for KSC, said that the driver of a 1987 Subaru sedan died in the crash. The name of the deceased was not released, pending notification of the family. The accident occurred after the victim, who was driving south in the northbound lane of Courtenay Parkway (also known as State Road 3), struck two oncoming vehicles. The injured drivers in the other autos were identified as **George Folmar** and **Gail Walker**, both of Merritt Island. They were treated for minor injuries and were released. ["Car Crash Claims One at KSC," FLORIDA TODAY, p. 2B, Oct. 5, 1993.]

[] **HERNANDEZ ENGINEERING WINS AWARD**

NASA Administrator **Daniel S. Goldin** announced today the recipients of the Minority Contractor and Subcontractor of the Year Awards in recognition of minority businesses that have made outstanding contributions to NASA. Hernandez Engineering, Inc. (Houston, TX) was named Minority Contractor of the Year; AJT and Associates, Inc. (Cape Canaveral, FL) was named Minority Subcontractor of the Year. "As we continue to strive to meet our goals in minority subcontracting, all of NASA takes pride in seeing the excellence provided by Hernandez Engineering and AJT and Associates."

Hernandez Engineering, Inc., nominated by the Kennedy Space Center, was cited for providing outstanding and critical technical support in safety engineering, industrial engineering, and software support to the KSC Directorate of Safety, Reliability and Quality Assurance as part of the Space Shuttle Program. Hernandez was cited for creative problem solving techniques, strong management leadership and efficient resource utilization and cost control. Hernandez was nominated as a finalist for this award last year by the Johnson Space Center (Houston, TX). Their president, Miguel A. Hernandez, Jr., is currently serving on NASA's minority resources advisory committee.

AJT and Associates was nominated by USBI Facilities Group of the United Technologies Corp., a prime contractor at KSC, managed by the Marshall Space

Flight Center (Huntsville, AL). AJT's president, Alfredo J. Teran, is the founder and president of the Minority Business Enterprise Alliance of Florida. AJT provided high quality architect/engineering services that assisted USBI in meeting and exceeding the prime contract statement of work. The award citation notes that AJT is an outstanding firm that has consistently provided excellent support to KSC for many years. [NASA/KSC Release: 93-177, Oct. 4, 1993; "KSC Contractors AJT, Hernandez Engineering Earn Business Awards,FLORIDA TODAY, Oct. 10, 1993.]

October 5: **STS 58: MAIN ENGINE TESTS**

The Space Shuttle Columbia is at Launch Complex 39B awaiting its October 14 launch on the STS 58 mission. The Orbiter's main engines have undergone a flight readiness test and hot gas leak checks. The first phase of SLS-2 late stowage operations has been completed. Orbiter mid-body umbilical connections and leak checks are now completed as well. Work in progress: main engine hydraulic closeouts; Orbiter aft engine compartment closeouts and the installation of extravehicular mobility units (spacesuits). STS 58 tasks scheduled: ordnance installation; external tank purges; pressurizing the hypergolic fuel system; repressurization of auxiliary power unit fuel/oxidizer systems and the second phase of SLS-2 late stowage operations (MVAK). [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Oct. 5, 1993.]

[] **STS 61: CEIT HELD**

The STS 61 crew has been on hand at Kennedy Space Center to take part in crew equipment interface tests (CEIT) and checks. The Endeavour main engines have been installed and final auxiliary power unit controller tests have been conducted. Freon coolant loop flush and service checks have also been completed. Current tasks include: main engine securing operations and integrated testing; power reactant storage and distribution system (PRSD) tests; potable water servicing; Orbiter mid-body closeouts; stacking of solid rocket boosters in the Vehicle Assembly Building high bay 1. STS 61 tasks scheduled include: main engine electrical verifications and main propulsion system integrated testing; landing gear functional tests; payload electrical circuits end-to-end test. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Oct. 5, 1993.]

[] **STS 60: BODY FLAP CHECKS**

Workers in the Orbiter Processing Facility bay 3 have removed Discovery's landing gear and tire assemblies, made body flap checks and offloaded hypergolic fuels. These activities are part of the turnaround processing activities that the Orbiter has undergone since the completion of its STS 51 mission. Work in progress: main engine inspections and removal preparations; heatshield removal;

payload bay post-flight and post-payload deploy assessments; deconfiguring the payload bay and preparations to remove and replace fuel cells 2 and 3. STS 61 work scheduled: removal of the main engines; auxiliary power unit inspections; waste management post-flight servicing; removal and replacement of fuel cells 2 and 3. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Oct. 5, 1993.]

[] **KSC OFFICIALS SPEND DAY IN WHEELCHAIRS**

Led by Center Director **Robert L. Crippen**, five top managers at Kennedy Space Center spent the day in wheelchairs today as part of KSC's observance of National Disability Employment Awareness Month. Crippen volunteered to participate in the event which was arranged by KSC's Disability Awareness and Action Working Group, co-chaired by **Hugh Harris**, Director of Public Affairs for the Space Center, and **Leon Wichman** of the NASA Procurement Office. Harris also volunteered to spend the day in a wheelchair. Crippen then invited top local officials of four major contractors at KSC to join them in becoming more aware of and sensitive to the everyday challenges in the work place facing people who are disabled.

The contractor participants today were **Jim Dubay**, President and General Manager of EG&G Florida, Inc.; **George Faenza** Vice President and General Manager of McDonnell Douglas Aerospace KSC Division; and **Lee Solid**, Vice President and General Manager of Rockwell International Corp., Space Systems Division. **Gerry Oppliger**, President of Lockheed Space Operations Co., was out of town today, but is planning on participating at a later date. "The center is committed to making it possible for every employee to work up to their full potential," Crippen said. "We have about 186 civil service employees and scores of contractor employees with disabilities who are making a major contribution to the space program." [NASA/KSC Release No. 123-93, Oct. 6, 1993.]

October 6: **PLAYALINDA BEACH CLOSING**

Playalinda Beach will be closed to the public beginning Sunday at sunset due to next week's planned launch of the Space Shuttle Columbia on STS 58. Assuming a successful launch October 14, the beach will be open again to the public at 6 a.m. October 15. Other Canaveral National Seashore beaches, such as Apollo Beach, will not be affected by the closing of Playalinda and will remain open during the launch of Columbia next Thursday. [**NASA/KSC Release No. 125-93**, Oct. 6, 1993.]

[] **STS 58: EVA SUITS INSTALLED**

"We're in good shape. We're right on schedule and we aren't working any problems," said KSC spokesman **Bruce Buckingham** in the course of briefing journalists about the pre-launch process for STS 58. Technicians at Launch Complex 39B have installed extravehicular mobility units (spacesuits) in Columbia and have completed main engine hydraulic closeouts. Work in progress today: final ordnance installation; pressurizing hypergolic fuel system; repressurizing auxiliary power unit fuel/oxidizer systems; pre-launch preparations. STS 58 activities scheduled: Orbiter aft engine compartment closeouts; external tank purges; second phase of SLS-2 late stowage operations (MVAC); mid-deck payload stowage; the countdown is scheduled to begin at 12 a.m. October 11; the STS 58 crew arrival is expected to be at 1:30 p.m. on October 11. [Halvorson, FLORIDA TODAY, p. 6A, Oct. 7, 1993; KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Oct. 6, 1993; Halvorson, FLORIDA TODAY, Oct. 7, 1993.]

[] **STS 61: KU-BAND ANTENNA STOWED FOR FLIGHT**

Technicians working in the OPF's high bay 1 have stowed Endeavour's Ku-band antenna aboard the Orbiter; they have completed main engine securing operations and, in the VAB, other workers have stacked the solid rocket boosters in high bay 1 preparatory for mating with the Orbiter after rollover. Work in progress in behalf of the Hubble Space Telescope servicing mission: main engine integrated testing and heatshield installation; final stowage of flight tools; retest of auxiliary power units; power reactant storage and distribution system (PRSD) tests; potable water re-servicing; Orbiter mid-body closeouts; mating of external tank to solid rocket boosters in the VAB's high bay 1. STS 61 work scheduled: main engine electrical verifications and main propulsion system integrated testing; landing gear functional tests; payload electrical circuits end-to-end test; and open the payload bay doors. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Oct. 6, 1993.]

[] **STS 60: MAIN ENGINES INSPECTED**

In Orbiter Processing Facility bay 3, technicians have completed an inspection of Discovery's main engines and have made preparations to remove and replace fuel cells 2 and 3. In addition, orbital maneuvering system helium vent operations have been completed. Current processing activities include: main engine removal preparations; engine heatshield removal; removal and replacement of fuel cells 2 and 3; deconfiguration of the payload bay. Work scheduled: remove the main engines; inspect the auxiliary power units; service the waste management system and remove the right side main landing gear wheel and tire assembly. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Oct. 6, 1993.]

October 7: **SLS-2 STOWAGE TODAY**

The final activities to prepare the Spacelab Life Sciences-2 laboratory for flight start shortly before the countdown clock begins counting October 11 at 12 a.m. EDT. A 75-member NASA/contractor team from Kennedy Space Center, Ames Research Center and McDonnell Douglas is responsible for the laboratory's last hours on the ground. Work begins with the 12-hour activation of the Gas Analyzing Mass Spectrometer (GAMS) which analyzes crew respiration, at 12 a.m. Monday (October 11). Extra food bars for the rodents will be stowed at about 3 a.m. Monday.

On Tuesday (12th) at 12:30 p.m. the SLS-2 laboratory will be powered up. Refrigerators that will hold samples and specimens collected during the 14-day mission, will be turned on and temperatures checked. Also on Tuesday, the team will activate and check the life support systems of the Research Animal Holding Facility (RAHF), which will hold the rodents during the mission. The rodent's initial supply of food has already been attached to the food trays and the water supply topped off.

At 2 a.m. Wednesday (13th) the chemicals and materials for processing blood and tissue samples will be transported from the Hangar L Life Sciences Facility on Cape Canaveral Air Force Station to the launch pad for storage inside the laboratory refrigerators. At 4 a.m. Wednesday, four dozen rodents will be loaded into the module for flight. Should a 24-hour scrub turnaround become necessary, no SLS-2 activity is required. After two launch attempts, however, launch would not be rescheduled for 72-hours to allow replacement of the rodents and time-critical experiment processing materials. [NASA/KSC Release No: 128-93, Oct. 7, 1993.]

[] **HST SERVICING MISSION UPDATE**

Testing using the Cargo Integrated Test Equipment (CITE) at KSC begins October 8 in the Vertical Processing Facility. First is the Interface Verification Test (IVT). This is an electrical test to verify the readiness and compatibility of the HST systems to be integrated with the Space Shuttle Endeavour and to be commanded as necessary from the flight deck. Undergoing testing is the complete path and associated circuitry. Connected are the solar array carrier with the flight support structure, the orbit replaceable unit carrier with the flight support structure, and Endeavour's flight deck with the flight support structure. From the flight deck the astronauts can command power and various latches and heater circuits as well as monitor telemetry from HST while it is attached to the flight support structure.

To follow on October 9 (Saturday) will be the end-to-end test which will verify the ability of the Johnson Space Center in Houston to monitor and communications network. This consists of the MILA tracking station at KSC connected by satellite to the communications switching and distribution facilities at the Goddard Space Flight Center (Greenbelt, MD) where the signals are forwarded to Houston. This communications test is scheduled to last about eight hours. The HST flight hardware arrived at the Vertical Processing Facility on Wednesday and was installed in the east test cell. Yesterday the solar array drive electronics were installed. The Wide Field Planetary Camera (WFPC II) was delivered to Spacecraft Hangar AE early on Sunday (October 3), a highly clean spacecraft checkout facility used for the WFPC's final assembly and initial checkout upon arrival at the Cape.

NASA managers have decided to conduct a test to revalidate the focal point of WFPC II at Spacecraft Hangar AE next week. The test procedure and parameters are currently being developed. Performance of the test will not affect payload readiness to meet the STS-61 launch date. Neither the WFPC II nor the Corrective Optics Space Telescope Axial Replacement (COSTAR) are required for CITE testing. The WFPC II will be returned to the Payload Hazardous Servicing Facility (PHSF) upon completion of testing where it will rejoin the other flight elements before going to the launch pad at the end of October. [STS-61 PAYLOAD STATUS REPORT: HST FIRST SERVICING MISSION, Oct. 7, 1993; Banke, FLORIDA TODAY, p. 5A, Oct. 9, 1993.]

[] **STS 58: FINAL ORDNANCE INSTALLATION**

At Launch Complex 39B, technicians have finished installing Columbia's ordnance. They have also repressurized the auxiliary power unit fuel/ oxidizer systems and pressurized the hypergolic fuel system. Current processing activities include: Orbiter aft engine compartment closeouts; external tank purges; pre-launch preparations; potable water servicing and filter checks; loading the Orbiter's mass memory units and post-ordnance installation operations. STS 58 work scheduled: the second phase of SLS-2 late stowage operations (MVAC); mid-deck payload stowage; start of the countdown and crew arrival on October 11. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Oct. 7, 1993.]

[] **STS 61: ET MATING TO SRBS COMPLETED**

In the Vehicle Assembly Building's high bay 1 an STS 61 milestone was accomplished today: the mission's external tank was mated to its solid rocket boosters. In OPF bay 1, technicians made final stowage of flight tools aboard Endeavour. Work in progress includes; main engine integrated testing, heatshield installation and electrical verifications; power reactant storage and distribution

system (PRSD) tests; auxiliary power unit tests; potable water servicing and filter checks; Orbiter mid-body closeouts. STS 61 tasks scheduled: landing gear functional tests; payload electrical circuits end-to-end test; opening payload bay doors and frequency response test. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Oct. 7, 1993.]

[] **STS 60: 17-INCH DISCONNECT INSPECTED**

Discovery is undergoing processing for its mid-January 1994 STS 60 mission in Orbiter Processing Facility bay 3. Completed tasks include: inspections of the Orbiter's 17-inch disconnect; main engine removal preparations; engine heatshield removal; removal and replacement of fuel cells 2 and 3; removal of the left side main landing gear wheel and tire assembly. Work in progress currently: removal of the main engines; deconfiguration of Discovery's payload bay; leak checks of replacement fuel cells 2 and 3. STS 60 work scheduled: auxiliary power unit (APU) inspections; waste management post-flight servicing; removal of the rightside main landing gear wheel and tire assembly; Ku-band integrated tests; main propulsion system leak and functional tests. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Oct. 7, 1993.]

October 8: **STS 58: EXTERNAL TANK PURGES**

Technicians working at Launch Complex 39B have completed external tank purges, loaded the Orbiter's mass memory units and finished post-ordnance installation operations. Work in progress today at the pad include: Orbiter aft engine compartment closeouts; pre-launch preparations; potable water servicing and filter checks; mid-deck payload stowage. STS 58 work scheduled: the second phase of SLS-2 late stowage operations; countdown beginning at 12 a.m. October 11; crew arrival at 1:30 p.m. October 11; fueling of external tank set to begin at 2:33 a.m.; launch to begin at 10:53 a.m. October 14. [Halvorson, FLORIDA TODAY, p. 9A, Oct. 8, 1993; KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Oct. 8, 1993.]

[] **STS 61: APU TESTS**

Endeavour continues to undergo pre-rollover processing in OPF bay 1. Completed tasks include: power reactant storage and distribution system (PRSD) tests; auxiliary power unit (APU) tests; mechanical and electrical connections attaching external tank to the solid rocket boosters. Current tasks include: main engine integrated testing, heatshield installation and electrical verifications; potable water servicing and filter checks; landing gear functional tests; Orbiter mid-body closeouts; preparations for frequency response test; cycling the payload bay doors; payload integrated verification tests. STS 61 work scheduled next week: payload electrical circuits end-to-end test; frequency response test and flight

control final cycling; standard payload bay cleaning and closing of payload bay doors prior to rollover to the Vehicle Assembly Building (VAB); Orbiter aft engine compartment closeouts; forward compartment and forward reaction control system structural leak checks; potable water system leak and functional tests. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Oct. 8, 1993.]

[] **STS 60: FUEL CELL REPLACEMENTS**

Technicians processing Discovery for its next mission - STS 60 - have removed and replaced fuel cells 2 and 3. They have also removed the Orbiter's main engines and have transported them to the VAB. Currently, processing technicians are: continuing post-flight (STS 51) payload bay debris assessments; conducting leak checks of replacement fuel cells 2 and 3; configuring zero-G strongbacks for cycling payload bay doors and cycling the external tank doors. STS 60 work scheduled for next week: humidity separator tests; radiator mechanical functional checks; fuel oil voltage checks; auxiliary power unit inspections; waste management post-flight servicing; removal of the rightside main landing gear wheel and tire assembly; Ku-band integrated tests; main propulsion system leak and functional tests. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Oct. 8, 1993.]

October 11: **STS 58: ASTRONAUTS ARRIVE**

"We're really happy to be here and proud to be here on behalf of everybody in the country and NASA who have been working so hard on this mission," said STS 58 Commander **John Blaha** on his arrival today at Kennedy Space Center. "We're looking forward to a launch on Thursday [October 14]," he added. Air Force meteorologists predict an 80 percent chance of favorable weather. [Banke, FLORIDA TODAY, p. 4A, Oct. 12, 1993; "Astronauts Set for Longest Shuttle Mission," THE ORLANDO SENTINEL, Oct. 12, 1993; Halvorson, FLORIDA TODAY, p.1A, Oct. 10, 1993.]

October 13: **STS 51 HARDWARE INVESTIGATION**

NASA Associate Administrator for Space Flight **Jeremiah W. Pearson** today announced the formation of an investigation board to examine the causes of a simultaneous detonation of two Super*Zip explosive ords, one primary and the other a backup, that occurred during the deployment of the Advanced Communications Technology Satellite (ACTS) and the Transfer orbit Stage (TOS) booster from Discovery during STS 51 (September 12-20, 1993). The board will submit an initial report to Pearson by mid-November. A final report of the findings of the review will be submitted by early December.

The board will be headed by **Robert T. Wingate**, Systems Engineering and Operations, Langley Research Center (LaRC), Hampton, VA. Other members of the team include **Michael A. Grainfield**, Office of Safety and Mission Assurance, Headquarters (HQ); **Charles R. Gunn**, Office of Space Science, HQ; **Keith L. Hudkins**, Office of Space Flight, HQ; **Lawrence J. Bement**, Systems Engineering and Operations, LaRC; **Robert M. Stephens**, Office of the General Counsel, HQ; **Robert W. Moss**, Systems Engineering and Operations, LaRC; and **Tommy W. Holloway**, Office of Space Flight, HQ.

Significant data on the anomaly has been gathered. Earlier this month, NASA technicians, while performing post-flight inspections of Discovery following the STS 51 mission, found debris damage to the aft bulkhead, consisting of surface damage on thermal insulation, some penetration of the insulation and payload bay liner and one penetration of the bulkhead wall. The damage was discovered and categorized when Discovery's payload bay was opened and the area was closely inspected in the processing hangar. [NASA/KSC RELEASE: 93-184, Oct. 13, 1993.]

[] **STS 58: LAUNCH MINUS 1 DAY**

The countdown for Columbia's launch continues without problem today. Yesterday, work to load cryogenic fuels into the Orbiter storage tanks and the extra extended duration Orbiter tanks was completed on time and the pad was reopened for regularly scheduled operations. Following fueling operations the Orbiter mid-body umbilical unit was demated from the vehicle. Final late stowage of experiments into the Spacelab will continue throughout today. Also, Orbiter communications activation and final vehicle and facility closeouts are in work today.

This morning, preparations were made to retract the rotating service structure to launch position. First motion occurred at about 11 a.m. At about 2:33 a.m. tomorrow, operations will begin to load the external tank with more than 500,000 gallons of liquid hydrogen and liquid oxygen. Operations toward that milestone are proceeding without problem. Forecasters indicate a ten percent probability of weather prohibiting launch tomorrow. The winds at Launch Complex 39B are expected to be from the east at 10 to 14 knots; temperature 78 degrees F; visibility 7 miles; and clouds scattered at 3,000, 8,000, and 25,000 feet. The 24-hour delay forecast reveals an increasing threat of high upper level winds and additional cloud coverage at KSC during the launch window and lists a 30 percent chance of violation.

Today, the seven-member astronaut crew for this mission have been given a briefing on tomorrow's weather outlook and completed their review of launch day activities and mission plans. Commander **John Blaha**, Pilot **Richard Searfoss**, and

mission specialist **Bill McArthur** flew in the Shuttle Training Aircraft earlier today. The crew will be granted several hours of free time this afternoon and be ready for sleep at about 9:30 p.m. They will be awakened tomorrow at various times ranging from 5:33 to 5:58 a.m. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Oct. 13, 1993; Halvorson, FLORIDA TODAY, pp. 1A-2A, Oct. 13, 1993.]

October 14: **RANGE SAFETY PROBLEM SCRUBS LAUNCH**

The countdown for the launch of Columbia's STS 58 mission was halted today at the T-31 second mark at about 12:52 p.m. due to the failure of a range safety destruct command processor. The computer system was reinitiated and declared ready to proceed with another attempt tomorrow. The window for tomorrow's attempt is open from 10:53 a.m. until 1:21 p.m. EDT. Following the scrub, the external tank was drained of its cryogenic propellants. At 2:33 a.m. tomorrow, operations will begin to reload the external tank with more than 500,000 gallons of liquid hydrogen and liquid oxygen. Forecasters late Thursday indicate a 70 percent probability of weather prohibiting launch tomorrow. The primary concerns are for possible thunderstorms and unacceptable cloud coverage. The winds at Launch Complex 39B are expected to be from the southeast at 10 knots; temperature 80 degrees F; visibility 7 miles or greater; and clouds scattered to broken at 3,000, 8,000 and 25,000 feet. The 72-hour delay forecast lists a 20 percent chance of violation. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Oct. 14, 1993; Notice to Editors/News Directors: Launch of Columbia on Mission STS 58 Rescheduled, Oct. 14, 1993; Date, THE ORLANDO SENTINEL, p. A-4, Oct. 14, 1993.]

[] **ANIMAL RIGHTS PROTEST**

Nine animal rights activists protested NASA's planned decapitation of six rats on its upcoming STS 58 mission. "Why waste these rats' lives? They feel pain and torture like anyone else. It's a disrespect for life," according to **Chris Kohler**, Managing Director of the Animal Rights Foundation of Florida. NASA's position is that the beheadings were a necessary part of an experiment to gauge the effects of weightlessness on humans. [Date, THE ORLANDO SENTINEL, Oct. 11, 1993; Evans, FLORIDA TODAY, p. 6A, Oct. 15, 1993.]

October 15: **STS 58: SECOND SCRUB**

The launch of the Space Shuttle Columbia was scrubbed today at the T-9 minute mark at about 11:08 a.m. due to the failure of an S-Band transponder on the Orbiter. This system is one of two transponders that are used for communications between the Orbiter and ground controllers. Mission managers and engineers have determined that it will take six to eight hours to replace the failed system once

technicians are given access to the pad following de-tanking operations later today. Because of the turnaround cycle required for some of the Spacelab payloads, managers have set the new launch date for Monday, October 16. "We were at a point in the count where we couldn't recover in time," said Air Force Col. **Bill Sample**. The window for Monday's attempt is open from 10:53 a.m. until 1:17 p.m. EDT.

Launch controllers are currently working under a 72-hour scrub turnaround sequence. The countdown is expected to pick-up again at the T-11 hour mark at 9:33 p.m. Sunday night. The seven-member crew will remain at KSC during this turnaround sequence. No onboard Orbiter cryogenics or auxiliary power unit propellants need to be replenished for the launch attempt on Monday (October 18). Forecasters today have indicated a 20 percent probability of weather prohibiting launch on Monday. The only concerns are for possible isolated showers and a limited chance for crosswind violations at the Shuttle Landing Facility. The winds at Launch Complex 39B are expected to be from the east at 10 knots; temperature 80 degrees F; visibility 7 miles or greater; and clouds scattered at 3,000 feet. The 24-hour delay forecast lists a 30 percent chance of violation with similar conditions. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Oct. 15, 1993; Date, THE ORLANDO SENTINEL, Oct. 15, 1993.]

October 18: **COLUMBIA THUNDERS ALOFT**

"This is just spectacular to see something that's gone through so much planning and so much endeavor finally launch," said NASA Science Advisor **Victor Schneider**. He was on hand for the successful launch of Columbia on its STS 58 mission. The liftoff came just 10 seconds behind schedule; a U.S. Customs aircraft was in the restricted flight area. The STS 58 mission is dedicated to finding out as much as possible about the effects of weightlessness on humans. [Banke, FLORIDA TODAY, pp. 1A-2A, Oct. 19, 1993.]

[] **NASA: ADVANCE HUBBLE LAUNCH**

NASA managers are talking about advancing the launch date of the STS 61 Hubble Repair Mission of Endeavour from December 2 until November 30. There is a problem with that scheduling, however; an Air Force rocket carrying a military satellite is set to liftoff on November 28. NASA officials are trying to ensure that enough time in the schedule exists to get Endeavour back in the OPF at KSC before Christmas. **Loren Shriver**, NASA Manager of Shuttle Launch Integration said, "I think we are hoping that by say a week or so from now to have our final decision." The STS 61 mission will have an unprecedented number of spacewalks, from five to seven, depending on the need for time to make the Hubble repairs. [Halvorson, FLORIDA TODAY, Oct. 19, 1993.]

October 20: **STS 61: LEAK CHECKS COMPLETED**

Workers in OPF bay 1 have completed their aft leak checks of Endeavour prior to its being rolled over to the Vehicle Assembly Building (VAB). Technicians have also completed:. Orbiter compartment positive pressure tests and airlock pressure checks and leak tests. Work in progress today: landing gear final tire pressure top off; retract main and nose landing gears; Orbiter jackdown, weight and center of gravity checks; Orbiter mate to Orbiter transport system (OTS). STS 61 work scheduled: rollover to the VAB tomorrow; mating to the mission external tank; rollout to Launch Complex 39A on October 28. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Oct. 20, 1993; Date, THE ORLANDO SENTINEL, p. A-7, Oct. 19, 1993.]

[] **STS 60: DISCOVERY IN OPF BAY 3**

Discovery continues to undergo processing activities in OPF Bay 3. Fuel cell single cell voltage checks and preparations for APU leak and functional tests have been completed. Current STS 60 tasks underway: main propulsion system leak and functional tests; auxiliary power unit (APU) leak and functional tests; elevon flipper door checks; power reactant storage and distribution system (PRSD)tests; main landing gear wheel, tire assembly and brake replacement; waterproofing of the chin panel; waste management post-flight servicing; Ku-band integrated tests; S-Band communication system checks. STS 60 work scheduled: water spray boiler checkout and servicing and the resumption of stacking the right-hand solid rocket boosters in VAB high bay 3 following the rollover of Endeavour tomorrow. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Oct. 20, 1993.]

[] **SPACE STATION MANAGEMENT**

NASA Administrator **Daniel S. Goldin** today announced the Office of Space Flight will assume responsibility for management of the Space Station Program. **Jeremiah W. Pearson III**, Associate Administrator for Space Flight, will lead the integration of these major programs. "Our planned Space Shuttle flight activities are becoming increasingly more involved with our Space Station planning," Goldin said. "These programs, of necessity, must be more closely integrated. The Space Shuttle will be a key element of the redesigned Space Station program and in all presently planned human space flight activities with Russia." Details of the merger of these two programs at NASA Headquarters are under development and will be announced soon.

Goldin also named **William Shepherd** as the Space Station Program Manager at the Johnson Space Center (JSC), Houston. He is currently an Assistant Deputy Administrator (technical) at NASA Headquarters and has been leading the day-to-

day transition activities for the Space Station Program. Shepherd and the new Space Station Program Office at JSC will assume responsibility for the program and related transition activities effective immediately. Program Directors for the Space Shuttle and Space Station, reporting to Pearson, will be responsible for all activities of the respective programs at NASA Headquarters. Pending selection of the Space Station Program Director, **Bryan O'Connor** has been designated as acting. O'Connor is currently the Director of the Space Station Transition. **Thomas Utsman** is the Space Shuttle Program Director. The present Space Shuttle organizational structure will continue to be responsible for the Space Shuttle Program. [**NASA/KSC Release: 93-191**, Oct. 20, 1993.]

October 21: **ASRM LOSES IN CONFERENCE**

House members of a Congressional conference committee forced Senators to omit funding for the Advanced Solid Rocket Motor (ASRM) in NASA's budget this year. Left in the budget was $100 million needed to terminate the project. Senator **Howell Heflin** (D-AL) said, "As much as I hate to admit it, the ASRM is dead. There's no question in my mind that the safety of our astronauts and the safety of the Shuttle should dictate the decision that the ASRM be completed." Rep. **George Brown** (D-CA) said, "A very large number of members of Congress are looking for large targets to cut out of the budget so they can demonstrate their commitment to reducing the deficit. ASRM was one of those projects that are fairly large - it would eventually have been $2-$3 billion - and whose justification to them was marginal." ["Rocket Project's Fate May Bode Ill for Super Collider," FLORIDA TODAY, p. 6A, Oct. 10, 1993; Eisler, FLORIDA TODAY, p. 1A, Oct. 22, 1993; Camire and Eisler, FLORIDA TODAY, p. 2A, Oct. 23, 1993.]

October 22: **STS 61: ENDEAVOUR IN VAB**

The Space Shuttle Endeavour began its rollover to the Vehicle Assembly Building yesterday morning at 10:35 a.m. and, today, the Orbiter has been hoisted from the transfer aisle to the high bay. Today, technicians are busy with mating Endeavour with its external tank. STS 61 work scheduled: electrical and mechanical hookups between Orbiter, mobile launcher platform and other Shuttle elements; interface verification checks; Shuttle interface test and rollout to Launch Complex 39A on October 28, 1993. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Oct. 22, 1993.]

[] **STS 60: KU-BAND TESTS COMPLETED**

In the Orbiter Processing Facility's bay 3, Discovery's Ku-band antenna integrated tests have been completed and the S-band communication system checks are also finished. Work in progress today: main propulsion system leak and functional tests; power reactant storage and distribution system (PRSD) tests; waste

management post-flight servicing; auxiliary power unit (APU)leak and functional tests; elevon flipper door checks; main landing gear wheel, tire assembly and brake replacement; waterproofing of the chin panel. STS 60 work scheduled: removal and replacement of the thruster from the left hand orbital maneuvering system pod; Orbiter/external tank umbilical door cycle checks; water spray boiler checkout and servicing; preparations to install the tunnel adapter; resumption in stacking the right-hand solid rocket boosters in the VAB high bay 3 following the rollover of Endeavour. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Oct. 22, 1993.]

October 25: **STS 61: ROLLOUT SET FOR OCTOBER 28**

In the Vehicle Assembly Building, Endeavour has been lifted and mated to its external tank for the STS 61 mission. Orbiter/external tank mechanical and electrical mates have been completed as well as the demate from the Orbiter transport system (OTS). Currently, technicians are conducting the Shuttle interface verification test and Orbiter/external tank electrical closeouts. STS 61 work scheduled: moving the payload to the launch pad and installing it in the payload changeout room. Rollout to Launch Complex 39A is scheduled for October 28. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Oct. 25, 1993.]

October 27: **STS 61: SHUTTLE POWER DOWN**

In the Vehicle Assembly Building, technicians have completed a manual Shuttle vehicle power down. Endeavour will be powered up again at the launch pad. The Shuttle interface verification test has also been conducted. Work in progress today: preparations for the rollout to Launch Complex 39A; Orbiter/external tank electrical closeouts; transfer of the payload to the payload changeout room at LC 39A. STS 61 work scheduled: rollout to LC 39A at 4 a.m. October 28; launch pad validations with a hot firing of the auxiliary power units; place rotating service structure around the Orbiter October 29. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Oct. 27, 1993; Banke, FLORIDA TODAY, p.2A, Oct. 28, 1993.]

[] **STS 60: APU TESTS**

In Orbiter Processing Facility bay 3, workers have completed auxiliary power unit (APU) leak and functional tests; they have tested and replaced thrusters and have made Orbiter/external tank umbilical door cycle checks. Work in progress today: water spray boiler checkout and servicing; S-Band communication system checks; main propulsion system leak and functional tests; preparations to install the tunnel adapter; waste management post-flight servicing; stacking the right-hand solid rocket boosters in the VAB's high bay 3. STS 60 work scheduled: installation

of the tunnel adapter; preparations to re-install the forward reaction control system; integrated drag chute installation. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Oct. 27, 1993.]

October 28: **ENDEAVOUR ROLLS TO LC 39A**

"The move is one of the last major milestones before launch," said KSC spokesman **Bruce Buckingham** about Endeavour's rollout to Launch Complex 39A this morning. The six-hour journey began at 3:21 a.m. and inched along the 3 1/2-mile crawlerway at a stately 1 mile per hour pace. The Orbiter's STS 61 mission will carry a corrective lens for the Hubble Space Telescope into orbit. The crew includes: Commander **Richard Covey**, Pilot **Ken Bowersox**, Payload Commander **Story Musgrave** and Mission Specialists **Tom Akers, Jeffrey Hoffman, Claude Nicollier** and **Kathryn Thornton**. [Halvorson, FLORIDA TODAY, p. 2A, Oct. 29, 1993.]

October 29: **STS 61: APUS HOT FIRED**

Endeavour was hard down on the pad at Launch Complex 39A at about 10 a.m. yesterday. The vehicle has been secured to the pad and the crawler transporter has been removed. The ground power source to the vehicle was secured and the Orbiter was powered up. Technicians then conducted a successful hot firing of auxiliary power units 1, 2 and 3. Work in progress today: placing the rotating service structure around the vehicle; launch pad validations and pad/shuttle interface checks and opening of the payload bay doors. STS 61 work scheduled for next week: final payload bay cleaning prior to payload installation; installation of the IMAX camera and ICBC payloads into the Orbiter; installation of the primary payloads into the payload bay; payload interface verification checks and end-to-end tests; helium signature test; preparations for hypergolic reactant loading onto the vehicle; terminal countdown demonstration test with crew arrival November 3 and T-0 on November 5. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Oct. 29, 1993.]

[] **STS 60: TESTS AND LEAK CHECKS**

Discovery is in OPF bay 3 where it is being prepared for its STS 60 mission. S-band communication system checks have been completed. Technicians preparing the vehicle for rollover to the Vehicle Assembly Building have also completed Orbiter/external tank umbilical door cycle checks; test and leak check replaced thrusters and finished auxiliary power unit leak and functional tests. Work in progress today for the STS 60 mission: rudder speed brake and body flap checks; raising the nose landing gear; preparations to install the tunnel adapter; payload bay cleaning prior to installation of the tunnel adapter; water spray boiler checkout and servicing; integrated drag chute installation; stacking right-hand solid rocket

boosters in VAB high bay 3; preparations to replace a thruster. STS 60 work scheduled for next week: replacing the thruster on the OMS pod; main propulsion system leak and functional tests; installation of the tunnel adapter; preparations to install the forward reaction control system (FRCS); transfer FRCS to OPF for installation on Orbiter and interface verification checks; Orbiter/external tank umbilical door closeouts; radiator mechanical functional checks; preparations to install SPACEHAB; preparations to transfer the Wake Shield Facility to the vertical processing facility. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Oct. 29, 1993.]

November

November 1: **STS 58: COLUMBIA LANDS AT EDWARDS**

Columbia landed successfully and on time today at Edwards Air Force Base, California. This ends the longest Space Shuttle mission to date. The Orbiter and crew landed on orbit 225 on concrete runway 22. Approximate mission elapsed times are as follows:

Main gear touchdown:	14:00:12.32 (10:05.42 EST)
Nose gear touchdown:	14:00:12.44 (10:05.54 EST)
Wheel stop:	14:00:13.34 (10:06.44 EST)
Mission duration:	14 days/13 minutes

Current plans call for Columbia to begin its two-day ferry flight back to KSC on November 7, with an arrival at Kennedy Space Center on November 8. The STS 58 crew included: Commander **John Blaha**; Pilot **Richard Searfoss**; Mission Specialists **Rhea Seddon, Bill McArthur, David Wolf, Shannon Lucid**; Payload Specialist: **Martin Fettman**. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Nov. 1, 1993; KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Nov. 2, 1993; Date, THE ORLANDO SENTINEL, pp. A-1 & A-6, Nov. 2, 1993.]

[] **STS 61: PAYLOAD BAY DOORS OPEN**

Technicians at Launch Complex 39A have now opened Endeavour's payload bay doors and have installed the IMAX camera and the ICBC payloads. The rotating service structure has been placed around the Orbiter; launch pad validations and pad/Shuttle interface checks have been completed. Pre-launch tasks in process today: final payload bay/payload changeout room cleaning prior to payload installation; preparations for the helium signature test; preparations for hypergolic reactant loading onto Endeavour. STS 61 tasks scheduled: installation of payloads; payload interface verification checks and end-to-end tests; helium signature test; terminal countdown demonstration test. The STS 61 crew is expected to arrive tomorrow. The crew includes:Commander **Richard O. Covey**, Pilot **Kenneth Bowersox**, Mission Specialists. **Story Musgrave, Thomas D. Akers, Jeffrey A. Hoffman, Kathryn C. Thornton, Claude Nicollier**. Payload: Hubble Space Telescope optical correction, SM-1, ICBC. The target launch date for STS 61 is December 1. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Nov. 1, 1993; Banke, FLORIDA TODAY, Nov. 21, 1993.]

[] **STS 60: DRAG CHUTE INSTALLED**

Discovery continues to undergo processing activities while in Orbiter Processing Facility bay 3 for its next mission: STS 60. Workers have completed the following tasks: rudder speed brake and body flap checks; raising the nose

landing gear; replacing an OMS pod thruster; integrated drag chute installation. Work in progress today: preparations to install the tunnel adapter; payload bay cleaning prior to installation of the adapter; water spray boiler checkout and servicing; stacking right-hand solid rocket boosters in the Vehicle Assembly Building's high bay 3. STS 60 work scheduled: main propulsion system leak and functional tests; installation of the tunnel adapter; preparations to install the forward reaction control system (FRCS); transfer the FRCS to OPF for installation on Discovery and interface verification checks; Orbiter/external tank umbilical door closeouts; preparations to install Spacehab; preparations to transfer Wake Shield Facility to the Vertical Processing Facility. [**KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT**, Nov. 1, 1993.]

NOVEMBER 2: **STS 58: LANDING UPDATE**

Preliminary post-flight inspections revealed a total of 68 dings to Columbia's Thermal Protection System tiles, with 23 of these dings being one inch or greater in size. A 40-inch section of thermal barrier was torn around the heat shield area of one of the main engines. The cause of this tear is still unknown and will be examined upon the Orbiter's return to Kennedy Space Center. Current plans call for Columbia to begin its two-day ferry flight from California back to KSC on November 7, with arrival at the space center on November 8. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, November 2, 1993.]

[] **STS 61: PAYLOAD CHANGEOUT ROOM CONTAMINATION**

Installation of the STS 61 payloads into the Orbiter Endeavour has been put on indefinite hold due to some contamination that was recently discovered inside the launch pad's payload changeout room. A very fine sandy substance appeared in the changeout room last weekend. It is believed to have been caused by a windy weather system that recently passed through Central Florida. The changeout room was subsequently cleaned but a smaller amount of the debris was detected late Sunday. No single area has been found to be the sole source of the contamination, but the debris may be associated with recent sandblasting operations at Launch Complex 39A. Shuttle management has formed four teams to investigate the matter and to address any schedule changes that may be necessary. The rotating service structure has been placed around Endeavour. Launch pad validations and pad/Shuttle interface checks are complete. The payload bay doors have been opened and the IMAX camera and ICBC payloads installed. Work in progress today: preparations for the terminal countdown demonstration test, the helium signature test and for hypergolic reactant loading onto the Orbiter. STS 61 work scheduled: helium signature test, the TCDT and crew arrival on November 4. **KENNEDY SPACE CENTER SPACE SHUTTLE**

STATUS REPORT, Nov. 2, 1993; Halvorson, FLORIDA TODAY, pp. 1A-2A, Nov. 3, 1993.]

[] **STS 60: OMS POD THRUSTER REPLACED**

In OPF bay 3, one of Discovery's OMS pod thrusters has been replaced. In addition, rudder speed brake and body flap checks have been finished. The nose landing gear has been raised and integrated drag chute installation is complete. Work in progress today: preparations to install the tunnel adapter; payload bay cleaning prior to installation of tunnel adapter; water spray boiler checkout and servicing; stacking right-hand solid rocket boosters in Vehicle Assembly Building high bay 3. STS 60 work scheduled: main propulsion system leak and functional tests; installation of the tunnel adapter; preparations to install the forward reaction control system (FRCS); transfer of the FRCS to the OPF for installation on Discovery and interface verification checks; Orbiter/external tank umbilical door closeouts; preparations to install SPACEHAB; Wake Field Facility to be moved to the Vertical Processing Facility tomorrow. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Nov. 2, 1993.]

[] **TITAN LAUNCH DELAYED**

The upcoming Titan 4 launch has been delayed indefinitely so that a potentially explosive booster segment can be replaced. Air Force launch managers will decide within two weeks whether the changeout work can be done at the pad, according to spokeswoman **Terri Bracher**. If the work cannot be done there, the Titan will be returned to the vertical assembly building. An August 2 launch failure at Vandenberg AFB (CA) made the Titan 4 now at its pad suspect to managers. The California failure has been traced to an improperly repaired booster segment; the explosion destroyed an $800 million group of ocean surveillance satellites. **John Pike**, Director of Space Policy for the Federation of American Scientists, said: "The Titan has turned out to be a surprisingly unreliable vehicle. They shouldn't be having these problems. There's just no excuse for it." [Halvorson, FLORIDA TODAY, Nov. 3, 1993.]

November 3: **STS 61: POSSIBLE PAD MOVE**

In light of the contamination at Launch Complex 39A's payload changeout room (PCR), the decision has been made to remove the HST payload from LC 39A's PCR and return it to the Payload Hazardous Servicing Facility (PHSF) for further cleanliness inspections. Current projections indicate the payload will remain at the PHSF for about 10 days. Tonight, the payload canister will be transported to the pad and, on November 5, the move to the PHSF will occur. For this, the rotating service structure will be retracted this afternoon and remain in the park position throughout the terminal countdown demonstration test (TCDT). Also, managers

are currently working to preserve options to launch STS 61 from either pad. A decision is expected by the end of the week. There has been no impact to the targeted launch date. Endeavour's payload bay doors have been closed and the helium signature test has been completed. Work in progress: payload changeout room cleaning and inspections; securing aft engine compartment and installation of aft doors; retracting the rotating service structure from around the vehicle; preparations to return the primary HST payload to the PHSF. STS 61 work scheduled: return the payload to the PHSF for cleanliness inspections; terminal countdown demonstration test, ending at 11 a.m. November 5; preparations for hypergolic reactant loading onto the Orbiter. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Nov. 3, 1993.]

[] **STS 60: PAYLOAD BAY CLEANING**

Discovery has had its payload bay cleaned while undergoing pre-rollover processing in the OPF bay 3. The FRCS has been transferred to the OPF and preparations have been made to install the tunnel adapter in the vehicle. Work in progress today: body flap actuator checks; Orbiter/external tank umbilical door closeouts; main propulsion system leak and functional tests; install the tunnel adapter; preparations to install the forward reaction control system (FRCS); water spray boiler checkout and servicing; payload interface checks; stacking right-hand solid rocket boosters in the Vehicle Assembly Building high bay 3. STS 60 work scheduled: installing FRCS and interface verification checks; checks on Orbiter door radiators; preparations to install SPACEHAB, preparations to transfer Wake Shield Facility to the Vertical Processing Facility. Current plans call for Columbia, just returned from its STS 58 mission, to begin its two-day ferry flight back to Kennedy Space Center on November 7. Arrival will be the following day, barring weather problems. All work is continuing as planned on the vehicle which is currently in the mate/demate device. Experiment destow is complete. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Nov. 3, 1993.]

[] **SHUTTLE TO MAKE 10 MIR TRIPS**

The new cooperative ventures in space with Russia means that there will be at least 10 Space Shuttle missions to the Russian Space Station Mir according to plans the Clinton White House will reveal today. Congressman **Jim Bacchus** said the agreement will impact the Kennedy Space Center in two important ways: "Shuttles launched from KSC will carry all U.S. hardware to NASA's proposed International Space Station, which Russia will join as a full partner; Shuttles will remain the primary vehicle for ferrying supplies to the station." Bacchus added, "That's big news for Brevard County. This gives us assurances of full use of the Space Shuttle over the next few years, and that's extraordinarily important." The increases in numbers of missions are an elaboration of the planned mission next

year with Russia's **Sergei Krikalev** and the first Shuttle mission to Mir in 1995. [Halvorson, FLORIDA TODAY, Nov. 4, 1993; Elder, FLORIDA TODAY, pp. 1A-2A, Nov. 5, 1993; "Pact Pushes U.S., Russia As Comrades In Space," THE ORLANDO SENTINEL, pp. A-1 & A-4, Nov. 5, 1993.]

November 4: **MUSICAL PADS?**

No decision has been made yet as to which pad mission STS 61 will be launched from. The concern is over sandblast grit found in Launch Complex 39A's payload changeout room (PCR). Because of the potential for contamination, the HST payloads will be removed from the PCR and returned to the Payload Hazardous Servicing Facility (PHSF) for further cleanliness inspections. Also, the PCR at LC 39A will be cleaned and the PCR's at both pads reinspected. The payload transport canister was delivered to Pad A last night and operations to install the payloads into the canister are in work today. Early tomorrow morning the canister will leave the pad and be transported to the PHSF. Managers are still working to preserve options to launch STS 61 from either pad. A decision is expected by the end of the week.

The rotating service structure has been retracted from around Endeavour. The aft engine compartment has been secured and the aft doors installed. Work in progress today includes: the terminal countdown demonstration test which ends at 11 a.m. November 5; payload changeout room cleaning and inspections; installation of the primary HST payloads into the transport canister; preparations to return payloads to the PHSF. STS 61 work scheduled: returning the payloads to the PHSF for cleanliness inspections and preparations for hypergolic reactant loading onto Endeavour. [**KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT**, Nov. 4, 1993.]

[] **TCDT TODAY FOR ENDEAVOUR**

While NASA managers are deciding whether to keep the Space Shuttle Endeavour at Launch Complex 39A or move it to 39B, the Orbiter itself and, in the latter stages its seven member crew, will undergo the mission's terminal countdown demonstration test. The test gets underway at 8:00 a.m. this morning and runs through tomorrow morning. Endeavour's prime payload for its STS 61 mission, the Hubble Space Telescope's replacement instruments, will be moved November 5 to a KSC satellite processing facility for examination and cleaning, if necessary. Installation in Endeavour's cargo bay is expected to occur November 16 to stay on schedule for the expected December 1 launch. Columbia, in California at Edwards Air Force Base, is being readied for its ferry flight back to Kennedy Space Center; it should arrive at KSC early Sunday, November 6. [Halvorson, FLORIDA TODAY, Nov. 4, 1993; Halvorson, FLORIDA TODAY, Nov. 5, 1993.]

[] **STS 60: WAKE SHIELD FACILITY TO VPF**

The Wake Shield Facility, scheduled to fly into space aboard Discovery, has been transferred to the Vertical Processing Facility. The forward reaction control system (FRCS) has been transferred to the Orbiter Processing Facility. The Orbiter's tunnel adapter has been installed and workers have made Orbiter/external tank umbilical door closeouts. STS 60 work in progress: body flap actuator checks; tunnel adapter/crew module leak checks; main propulsion system leak and functional tests; preparations to install the forward reaction control system (FRCS); water spray boiler checkout and servicing; payload interface checks; stacking right-hand solid rocket boosters in the Vehicle Assembly Building's high bay 3. STS 60 work scheduled: installation of the FRCS and interface verification checks; checks on Orbiter door radiators; preparations to transport SPACEHAB to OPF and install it in the Orbiter's payload bay. [**KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT**, Nov. 4, 1993.]

November 5: **STS 61: ENDEAVOUR TO SWITCH PADS**

Managers decided today to move the Space Shuttle Endeavour and the HST service mission from Launch Complex 39A to Launch Complex 39B. KSC spokesman **Bruce Buckingham** said today, "It's going to chew up all our contingency time except for a few days around the Thanksgiving holidays." Contamination found in pad A's payload changeout room (PCR) as a result of last weekend's high winds demonstrated additional measures were required to insure protection for the Hubble Space Telescope (HST) instruments. Managers are certain that the required recertification of the pad A PCR is achievable, however, the normal vehicle processing activities may conflict with the recertification schedule. Some standard post-launch work\k at pad B remains to be accomplished, including recertification of the PCR. Additionally, the pad B PCR will be modified to enhance the integrity of the facility. This work includes modifying and sealing the ceiling for added protection.

The Endeavour vehicle will remain at pad A and continue its routine processing activities, including hypergolic propellant loading, until pad B is ready to accept the vehicle. This decision allows the pad B PCR activities to proceed in parallel with the Shuttle processing on pad A, thus providing the best opportunity for meeting the target launch date. The earliest move to pad B is expected to occur approximately November 15 with no impact to target launch date of December 1. The HST payloads were transported there last night from pad A to the canister rotation facility. There, the canister will be placed in a horizontal position. Later today, with the payloads still inside, the transport canister will be moved to the Payload Hazardous Servicing Facility (PHSF) for further cleanliness inspections. The HST instruments will likely be moved to pad B about November 15. The STS 61 mission's terminal countdown demonstration test was completed today at

11 a.m. The primary HST payloads were installed into the transport canister and moved to the Payload Hazardous Servicing Facility. Work in progress today includes: extending the rotating service structure around the vehicle; payload changeout room cleaning and inspections; removal of the aft compartment doors; preparations for hypergolic reactant loading onto the vehicle. The hypergolic fuels will be loaded onto the Orbiter next week. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Nov. 5, 1993; Halvorson, FLORIDA TODAY, p. 1A, Nov. 6, 1993; "Endeavour's Launch Pad Switch Won't Delay Mission," THE ORLANDO SENTINEL, Nov. 6, 1993.]

[] **STS 60: TUNNEL ADAPTER INSTALLED**

Discovery's tunnel adapter has been installed and payload bay radiator functional checks have been completed in preparation for the vehicle's STS 60 mission. Current processing tasks include: body flap actuator checks; tunnel adapter/crew module leak checks; installation of the 'D' hatch; main propulsion system leak and functional tests; water spray boiler servicing and decay leak checks; stacking right-hand solid rocket boosters in the Vehicle Assembly Building high bay 3; installation of the Wake Shield Facility into the Vertical Processing Facility high bay. Work schedule for next week: installation of the forward reaction control system (FRCS) and interface verification checks; checks on the Orbiter door radiators; orbital maneuvering system flight control verifications; preparations to transport SPACEHAB to the Orbiter Processing Facility (OPF) and install it in Discovery's payload bay; Wake Shield Facility interface verification checks. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Nov. 5, 1993.]

[] **STS 58: COLUMBIA'S RETURN**

Current plans call for Columbia to begin its two-day ferry flight back to o KSC on November 7, with arrival at Kennedy Space Center on November 8, if weather en route permits. All work is continuing as planned on the vehicle which is currently in the mate/demate device. Ferry kit installation operations is in work. The vehicle will be mated to the Shuttle Carrier Aircraft (SCA) this weekend. Once at KSC, the Orbiter will be towed and placed inside OPF Bay 2 for processing of its next mission, STS 62. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Nov. 5, 1993.]

[] **KSC IMPACT ON FLORIDA ECONOMY**

Space related employment and contracts at NASA's Kennedy Space Center yielded a $1.519 billion boost to Florida's economy during the 1993 fiscal year which ended September 30. This represents an increase of about $32 million over the previous year. Of KSC's expenditures, $1.230 billion went to contractors

operating on-site at the space center. An additional $96.8 million went to off-site businesses in Brevard County. Other purchases and contracts awarded to Florida businesses outside Brevard County totaled about $62.4 million. Space center purchases and contracts to businesses outside Florida totaled about $63.5 million.

Civil service salaries and personnel benefits through the end of fiscal year 93 amounted to $157.3 million, an increase of about $4.7 million over last year. About $129.6 million was for regular salary, lump-sum payments, overtime and awards programs. The remaining $27.6 million went for additional personnel benefits. (The $27.6 million civil service benefits package and $63.5 million in out of state business awards increased KSC's total spending during the year to $1.610 billion.) Permanent federal employees at KSC totaled 2,631 during the same period. While 3,902 people were employed through construction and tenant jobs at KSC, the majority of the workers were employed by the on-site contractors and numbered almost 11,720. Overall, approximately 18,253 workers were employed at KSC through the close of the Fiscal Year on September 30. Major contractors at Kennedy Space Center include Lockheed Space Operations, Co., the Shuttle Processing Contractor; EG&G Florida, Inc., the Base Operations Contractor; McDonnell Douglas Aerospace KSC Division, the Payload Ground Operations Contractor; and Rockwell International Corp., the Shuttle Orbiter logistics support contractor. [NASA/KSC Release No. 142-93, Nov. 5, 1993.]

November 6: **KSC OPEN HOUSE**

Kennedy Space Center opened its doors wide to employees and their families today from 9:00 a.m. until 3:00 p.m. "This is really a great opportunity. This really gets the public up close to the space program. It gets you excited and makes you want to support the program," said **Jeff Sager**, whose family members were guests of KSC employee **Bob Springer**. Visitors were able to drive around Launch Complex 39A where Endeavour awaits its STS 61 mission launch and to see the Launch Control Center and Orbiter Processing Facility. The KSC Headquarters Building and Operations & Checkout Building were also open to the public. [Halvorson, FLORIDA TODAY, p.1B, Nov. 7, 1993.]

November 7: **INTERNATIONAL SPACE STATION**

The heads of the space agencies involved in the International Space Station, met in Montreal, Canada, today. The participants included NASA, the Canadian Space Agency (CSA), the European Space Agency (ESA), and the National Space Development Agency of Japan (NASDA), together with the head of the Russian Space Agency (RSA). Their joint statement follows:

Pursuant to the Joint Statement on potential Russian involvement in the Space Station issued by the United States, Canada, Japan and the Member States of the

European Space Agency on October 16, 1993, the heads of the space agencies involved in the International Space Station, the Canadian Space Agency (CSA), the European Space Agency (ESA), the National Space Development Agency of Japan (NASDA) and the United States National Aeronautics and Space Administration (NASA), together with the head of the Russian Space Agency (RSA), met in Montreal, Canada, on November 7, 1993. This was the first collective meeting of the Space Station partners with Russia, which is a significant step in the consideration of broadening the International Space Station partnership. The heads of agencies reviewed the outcome of the joint NASA/RSA studies conducted over the last several months and reflected in the Addendum to the Space Station Alpha Program Implementation Plan of November 1, 1993, and discussed the possible participation of Russia as a partner in the International Space Station.

Such a project would be the largest undertaking in history, bringing together the combined space efforts of Canada, Europe, Japan, Russia and the United States. The CSA, ESA and NASDA expressed their appreciation for the information provided in the Addendum, which outlines an enhanced program that could lead to a more robust and reliable International Space Station that would benefit all the partners. They also expressed their appreciation for the efforts undertaken by NASA and RSA in producing this Addendum and welcomed the additional information provided at this meeting. The heads of agencies noted that Phase 1 involving the Space Shuttle and the MIR station, with its attendant science, technology and operations activities, offers an early opportunity for learning and experience. This Phase is intended to greatly reduce the risks for all of the partners during the combined Phase 2/Phase 3 activities to construct, operate and utilize the International Space Station. The head of the RSA expressed to his counterparts Russia's firm desire to participate as a partner, contributing additional capabilities and resources, whilst acknowledging the attendant obligations and responsibilities it would undertake as a full partner. Recognizing the benefits to be gained, CSA, ESA, NASDA and NASA agreed on the need to complete an intense process at all levels that could lead to Russia becoming a full partner in the International Space Station. [**NASA/KSC NOTE TO EDITORS: N93-62,** Nov. 8, 1993; Stinson, FLORIDA TODAY, p.1A, Nov. 5, 1993; "Space Partnership Should Protect Jobs," FLORIDA TODAY, Nov. 14, 1993.]

[] **TBS PLANS SPACE MINISERIES**

A four-hour television miniseries on the history of the space program is being made by Turner Broadcasting Service, and producers are looking to Brevard County residents for help with the project. "For the series we are very interested in obtaining photographs and home movies from people who worked on the space program or who lived near NASA facilities," associate producer **Daniel Levitt** said. The video project will be based loosely on a book to be published next summer

by Brevard residents **Howard Benedict** and **Jay Barbree**. "Our project will tell the story from the astronauts' and insiders' perspective," said Levitt. "Anecdotal images from people who were there at the time will be invaluable in helping us tell the behind the scenes story of NASA's tremendous achievement." Levitt said the series will air in late 1994 as part of the activity commemorating the 25th anniversary of the Apollo 11 moon landing. TBS's companion network - Turner Network Television - is planning a documentary on Apollo 11 to be broadcast in July 1994. Merritt Island resident **Nancy Yasecko**, of Varied Productions, planned research in January 1994, in the Kennedy Space Center Library Archives as part of her work on the anniversary production. ["TBS Plans Miniseries on NASA," FLORIDA TODAY, p. 10E, Nov. 7, 1993.]

November 8: **COLUMBIA RETURNS TO KSC**

Bascom Murrah, Processing Manager for the Space Shuttle Columbia, said today: "You know, they say the older the violin, the sweeter the music. Well, [Columbia's] the queen of the fleet." Launch Director **Robert B. Sieck** said, "We're happy to get the bird back and looking forward to go fly it again next year." The oldest Shuttle, Columbia, returned to KSC where more than two weeks ago it was launched on a record 14-day stay in space. The Orbiter attached to its 747 Shuttle Carrier Aircraft landed on the Shuttle Landing Facility shortly before 11 a.m. EST. [Halvorson, FLORIDA TODAY, p. 1A, Nov. 8, 1993; Banke, FLORIDA TODAY, p. 1A, Nov. 9, 1993.]

November 9: **MORE ON SHUTTLE MOVE**

Managers decided last Friday (November 5) to move the Shuttle Endeavour and the HST service mission from LC 39A to LC39B. Contamination found in pad A's payload changeout room (PCR) as a result of last weekend's high winds demonstrated additional measures were required to insure protection for the HST instruments. Managers are certain that the required recertification of the pad A PCR is achievable, however, the normal vehicle processing activities may conflict with the recertification schedule. Some standard post-launch work at pad B remains to be accomplished, including recertification of the PCR. Additionally, the pad B PCR will be modified to enhance the integrity of the facility. This work includes modifying and sealing the ceiling for added protection. The Endeavour vehicle will remain at pad A and continue its routine processing activities, including hypergolic propellant loading, until pad B is ready to accept the vehicle. This decision allows the pad B PCR activities to proceed in parallel with the Shuttle processing on pad A, thus providing the best opportunity for meeting the target launch date. Endeavour may be moved to pad B as early as this Monday (November 15), with no impact expected to a target launch date of December 1. The terminal countdown demonstration test is scheduled for November 12. Foaming of the solid rocket boosters' aft skirt trailing edge has

been completed. Turbopumps on both Endeavour and Discovery will be inspected because of problems found with a test engine at Rocketdyne's Canoga Park factory. At the factory, a tiny crack was found in a titanium inlet that feeds liquid hydrogen into a main engine's high-pressure fuel turbopump.

Work in progress today in behalf of the STS 61 mission: pad B payload changeout room cleaning and inspections; cleaning of pad B in preparation of the arrival of Endeavour at the pad; preparations for hypergolic reactant loading onto the Orbiter; loading of hypergolic reactant fuels beginning late today. STS 61 work scheduled: inspections of engine fuel pumps; moving the Orbiter to pad B as early as November 15; replacement of protective cover on the Hubble Space Telescope payloads and transport of the payloads to Launch Complex 39B November 15. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Nov. 9, 1993; Halvorson, FLORIDA TODAY, pp. 1A-2A, Nov. 10, 1993.]

[] **STS 60 & 58: UPDATES**

Workers in OPF Bay 3 have installed the tunnel adapter in Discovery and made payload bay radiator mechanical functional checks. They have also conducted the interface verification test of the Wake Shield Facility. Current STS 60 tasks: body flap actuator checks; tunnel adapter/crew module leak checks; flight control aerosurface checkouts; main propulsion system leak and functional tests; preparations to install the forward reaction control system (FRCS) and stacking right-hand solid rocket boosters in the Vehicle Assembly Building's high bay 3. STS 61 work scheduled: installation of the FRCS and implementation of the interface verification checks; checks on the Orbiter door radiators; orbital maneuvering system flight control verifications; preparations to transport the SPACEHAB to the Orbiter Processing Facility and install it in Discovery's payload bay on November 15. Meanwhile, Columbia and its 747 Shuttle Carrier Aircraft landed at KSC's Shuttle Landing Facility at 10:56 a.m. The duo left Edwards Air Force Base, California, November 7 and remained overnight at Columbus Air Force Base, Mississippi, before moving on to Kennedy Space Center. Columbia was demated from its 747 carrier aircraft and has been moved to OPF bay 2 where it will be deserviced from STS 58 and readied for its next mission, STS 62. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Nov. 9, 1993.]

November 10: **STS 61: TURBOPUMP INSPECTIONS**

Precautionary inspections of Endeavour's three main engine high pressure fuel turbopumps will begin this week. Officials want to be certain that there are no imperfections in the pumps. Some minor discoloration and tiny cracks were recently observed inside a test pump at the Rocketdyne manufacturing plant in

California. Hypergolic oxidizer propellants have been loaded onto Endeavour. Current processing tasks include: pad B payload changeout room cleaning and inspections; preparations to inspect the turbopumps; loading of hypergolic propellants and the Kennedy Space Center Launch Readiness Review. STS 61 work scheduled: inspections of the engine fuel pumps; moving the Orbiter to pad B on November 15; replacement of a protective cover on the Hubble Space Telescope payloads and transportation of the payloads to LC 39B on the 15th. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Nov. 10, 1993; "Test Engine Crack Spurs Inspection of Endeavour," THE ORLANDO SENTINEL, Nov. 10, 1993.]

[] **STS 60 & COLUMBIA UPDATES**

The interface verification test of the Wake Shield Facility has been completed; the facility is the prime payload of Discovery on its next mission, STS 60. Technicians in OPF bay 3 have also conducted flight control aerosurface checkouts. Current tasks include: tests of the Orbiter/payload interfaces; tunnel adapter/crew module leak checks; main propulsion system leak and functional tests; preparations to install forward reaction control system (FRCS) and stacking right-hand solid rocket boosters in the Vehicle Assembly Building's high bay 3. STS 60 work scheduled: installation of the FRCS and interface verification checks; orbital maneuvering system flight control verifications; preparations to transport SPACEHAB to the OPF and install it in Discovery's payload bay on November 15. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Nov. 10, 1993.]

November 11: **ENDEAVOUR'S PUMPS TESTED TODAY**

"We finished all the pump inspections [of Endeavour] and they were all good," said Rocketdyne's **John Plowden**. "I was very confident that we wouldn't find anything, but we went ahead and looked anyway. It's a critical part, and safety is first." Discovery had two of its three turbopumps inspected as well and, like Endeavour, no defects were found. Tiny cracks found on other pumps at the Rocketdyne Canoga Park manufacturing site led to the inspections. Malone went on to say, "We have no reason to suspect we have a problem with the pumps at the pad. This is just a precautionary check to make sure there are no discrepancies." [Halvorson, FLORIDA TODAY, p. 3A, Nov. 11, 1993; Halvorson, FLORIDA TODAY, p. 1A, Nov. 12, 1993.]

November 12: **STS 61: TURBOPUMPS READY FOR FLIGHT**

Endeavour's turbopumps have been inspected and found to have no discrepancies; they are ready for the launch of STS 61. "We finished all the pump inspections (on Endeavour) and they were all good. I was very confident that we wouldn't

find anything, but we went ahead and looked anyway. It's a critical part, and safety is first," commented **John Plowden**, Rocketdyne's Site Director at Kennedy Space Center. Hypergolic propellants have been loaded onto the Orbiter. Work currently in progress: helium signature leak test of the main engine fuel systems; pad b payload changeout room cleaning and inspections; preparations to transfer Endeavour to Launch Complex 39B and preparations to replace auxiliary power unit controller 2. STS 61 work scheduled for next week: moving the vehicle; replacing protective covers on the HST payloads; payloads to be transported to LC 39B at midnight November 15; installation of the payloads on November 19 and a Flight Readiness Review on November 17. Launch is targeted for 4:57 a.m. EST on December 1 and landing is expected to occur at 3:33 a.m. on December 12 EST. The launch window is one hour, 11 minutes in duration. [**KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT**, Nov. 12, 1993; Halvorson, FLORIDA TODAY, Nov. 12, 1993.]

[] **STS 60: FRCS INSTALLED**

Discovery's forward reaction control system has been installed and the flight control aerosurface checkouts are now completed. Technicians in the OPF's bay 3 have also conducted the interface verification test of the Wake Shield Facility. Current processing activities include: tests of the Orbiter payload interfaces; preparations to install the SPACEHAB payload; transfer of the SPACEHAB to the OPF; servicing the Orbiter with ammonia and stacking right-hand solid rocket boosters in the Vehicle Assembly Building high bay 3. Work scheduled for next week: electrical verifications of the forward reaction control system; installation of SPACEHAB in the Orbiter's payload bay and installation of Discovery's three main engines. Post-flight processing of Columbia after its successful STS 58 mission continues. Current activities: removal of the tail cone; installation of strongbacks on the payload bay doors; opening the payload bay doors and post-flight inspections. Next week, technicians will remove the Spacelab Life Sciences payload from Columbia's cargo bay. [**KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT**, Nov. 12, 1993.]

[] **ENDEAVOUR PASSES HELIUM TEST**

Endeavour successfully underwent a vital test of its main propulsion system today when engineers passed gaseous helium through parts of the Orbiter's system to check on the possible existence of leaks. Kennedy Space Center spokeswoman **Lisa Malone** said, "We're making headway." A similar test had been conducted earlier in the month; since that time the engines had been inspected and launch managers ordered the retest to assure that no leaks had been introduced during the inspections. An APU controller will be replaced and will be retested. The launch target date remains December 1. [Halvorson, FLORIDA TODAY, p. 2A, Nov. 13, 1993; Halvorson, FLORIDA TODAY, Nov. 14, 1993.]

November 14: **SILVER SNOOPYS AWARDED**

Seven civil service employees were recently honored with the prestigious astronaut award, the Silver Snoopy: **Paul Kilpatrick** (Titusville, FL) a safety engineer with the Safety, Reliability and Quality Assurance Directorate; **Howard "Bird" Schinzielorz** (Palm Bay, FL), a fluids test engineer with the Shuttle Management and Operations Directorate; **Martha Williams** (Port St. John, FL) a materials engineer with the Engineering Development Directorate; **Frank Der** (Cocoa, FL) also with the Engineering Development Directorate; **Elizabeth Brown** (Orlando, FL) of the Procurement Office; **Christopher Sigg** (Titusville, FL) of the Center Support Operations Directorate, and **Nora Ross** (Titusville, FL), secretary and personal assistant to the Director of Shuttle Operations in the Shuttle Management and Operations Directorate. ["NASA, KSC Workers Earn Silver Snoopys," FLORIDA TODAY, p. 9E, Nov. 14, 1993.]

[] **COMPANIES WIN KSC AWARDS**

Eight contractors at Kennedy Space Center were recently recognized for outstanding performance in the past year:

COMPANY NAME	LOCATION	CATEGORY
Lockheed Space Operations Company	Titusville, FL	Large Business Contractor
Watson Paving, Inc.	Cocoa, FL	Small Business Contractor
Hernandez Engineering, Inc.	Houston, TX	Small Disadvantaged Business Contractor
Analex Space Systems, Inc.	Titusville, FL	Woman-Owned Small Business Contractor
V. A. Paving, Inc.	Cocoa, FL	Woman-Owned Small Business Contractor
Amertron, Inc.	Melbourne, FL	Small Business Contractor
United Services Associates, Inc.	Kennedy Space Center, FL	Small Disadvantaged Business Subcontractor
High Purity Systems, Inc.	Titusville, FL	Woman-Owned Small Business Subcontractor

["Area Companies Win KSC Awards," FLORIDA TODAY, p. 10E, Nov. 14, 1993.]

November 15: **PAD SWITCH ON FOR TODAY**

"It's not something we plan on doing normally, but in this particular case, it works to our advantage," said **Lisa Malone**, KSC spokeswoman. Malone was referring to today's move of Endeavour from Launch Complex 39A to Launch Complex 39B. The move is aimed to keep the space center on track for launching STS 61 on its target date of December 1, 1993. The move begins at noon today and is expected to take some five hours to complete. [Halvorson, FLORIDA TODAY, p. 4A, Nov. 14, 1993; Halvorson, FLORIDA TODAY, p. 1A, Nov. 15, 1993.]

[] **ENDEAVOUR STILL ON SCHEDULE**

"We're in good shape," said Kennedy Space Center spokesman **Bruce Buckingham**. "We're still on schedule." Buckingham was referring to NASA's target launch date of December 1 for Endeavour's STS 61 mission. The move to pad B was successful; the HST payload was cleaned over the past weekend and coverings of the payload which had been sprinkled by sand have now been replaced. The pad switch for Endeavour was the second such switch in the history of the Space Shuttle program at KSC. In 1990, Columbia was moved from pad A to B to make room at LC 39A for Atlantis. [Halvorson, FLORIDA TODAY, p. 2A, Nov. 16, 1993; "Endeavour Makes Move to Different Launch Pad," THE ORLANDO SENTINEL, Nov. 16, 1993.]

[] **ENDEAVOUR UPDATE**

Work is in progress today to move the Space Shuttle Endeavour and the Hubble Space Telescope service mission from pad 39A to pad 39B. Contamination found in pad A's payload changeout room (PCR) as a result of high winds in late October demonstrated additional measures were required to insure protection for the HST instruments. No impact to a target launch date of December 1 is anticipated. The firm launch date will be set at the Flight Readiness Review scheduled for this Wednesday (November 17). The HST payloads will be transported to pad B tonight. They will be installed into the PCR at pad B tomorrow.

Pre-roll preparations have been made; the rotating service structure was retracted today, beginning at about 9 a.m. The HST payloads have been transferred from the Payload Hazardous Servicing Facility to the canister rotation facility for rotation to a vertical position. Pad B cleaning and inspections have been completed along with the fuel side of te vehicle helium signature test. Hypergolic fuels have been loaded aboard the Orbiter. Auxiliary power unit number 2 controller has been removed and replaced. Three of Endeavour's multiplexer/demultiplexers have been replaced, as well. Test conductors have completed solid rocket booster hydraulic circulation and retained a sample for analysis.

The roll-around of Endeavour from pad A to pad B began at about noon today and was expected to be completed by six p.m. Launch pad B validations are also underway today. STS 61 work scheduled: oxidizer side helium signature test; transport payload canister to the pad tonight and lift the payload into the payload changeout room tomorrow morning. Endeavour's payload bay will also be opened tomorrow to receive the HST payload. The flight readiness review will be conducted November 17. [**KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT**, Nov. 15, 1993.]

[] **DISCOVERY: STS 60 UPDATE**

Discovery's next mission will be STS 60 and the vehicle is currently undergoing processing activities for that mission. The forward reaction control system (FRCS) has been installed in the Orbiter and interface verification checks have been made. In addition, Orbiter door radiator checks have been made and SPACEHAB has been transported to the Orbiter Processing Facility where Discovery is being processed. Current activities include: installation of SPACEHAB into the vehicle's payload bay; forward reaction control system interface verification checks continue; orbital maneuvering system flight control verifications; preparations to install the main engines; stacking the solid rocket booster in Vehicle Assembly Building high bay 3. STS 60 work scheduled: ammonia servicing; main engine installation; orbital maneuvering system flight redundancy checks. [**KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT**, Nov. 15, 1993.]

[] **STS 62: U.S. MICROGRAVITY PAYLOAD**

Columbia's tailcone has been removed; Space Shuttle's must have the tail cone covering the engine area during ferry flights from California. The Orbiter's waste containment system has been removed. Today, technicians will make Orbiter power system validations and install strongbacks and make preparations for opening the payload bay doors. STS 62 work scheduled: payload bay door functional tests; removal of the Spacelab Life Sciences-2 payload module from the Orbiter's cargo bay. [**KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT**, Nov. 15, 1993.]

November 16: **STS 61: HST PAYLOAD AT PAD**

Endeavour was hard down on Launch Complex 39B at 6:07 p.m. The Hubble Space Telescope payloads are now at the pad as well. Work in progress: launch pad B validations; installation of payloads into the pad's Payload Changeout Room (PCR). STS 61 work scheduled: extend the rotating service structure; open Orbiter payload bay doors and install payload; flight readiness review; inertial measurement unit calibrations; main engine flight readiness test. [**KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT**, Nov. 16, 1993.]

[] **STS 60: PROCESSING UPDATE**

The Spacehab module has been installed in Discovery's payload bay. Technicians in the OPF bay 3 have also conducted forward reaction control system (FRCS) interface verification tests and orbital maneuvering system flight control verification. STS 60 work scheduled: main engine installation; orbital maneuvering system flight redundancy checks; SPACEHAB interface verification tests; orbital maneuvering system redundant electrical circuit verifications.

[KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Nov. 16, 1993.]

[] **STS 62: APU #2 INSPECTIONS**

Columbia is in bay 2 of the Orbiter Processing Facility where strongbacks have been installed and the payload bay doors opened. Technicians have inspected auxiliary power unit #2 and conducted post-mission propellant deservicing. Current processing activities include: Orbiter power system validations; main propulsion system leak and functional checks; auxiliary power unit lube oil servicing and main engine inspections. STS 62 work scheduled: payload bay door functional tests; removal of the Spacelab Life Sciences-2 payload module; auxiliary power unit leak and functional test. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, November 16, 1993.]

November 17: **STS 61: OFFICIAL DATE SET TODAY**

"We know of no issues [NASA managers] are planning on discussing that would threaten Endeavour's target launch dated of December 1," said **Bruce Buckingham**, Kennedy Space Center spokesman. NASA managers are meeting at the space center to address several concerns that uniquely affected Endeavour's pre-flight preparations: the switch of launch pads; the readiness of LC 39B to support the launch and the cleanliness of the Hubble Space Telescope spare parts which make up the prime payload for the STS 61 mission. Buckingham remarked further yesterday, "We understand the [HST] payload is very sensitive to contamination and it needs to be granted all of its due respect." Launch is set to occur in a window which runs from 4:57 to 6:04 a.m. The STS 61 crew includes Commander **Richard Covey**, Pilot **Ken Bowersox** and Mission Specialists **Kathryn Thornton, Claude Nicollier** (ESA), **Jeffrey Hoffman, F. Story Musgrave** and **Tom Akers**. The launch time or date may yet be impacted by two unmanned rocket launches from Cape Canaveral Air Force Station; these are presently scheduled for the same week. [Banke, FLORIDA TODAY, p. 9A, Nov. 17, 1993; Banke, FLORIDA TODAY, p. 9A, Nov. 18, 1993; "Note to Editors: **NASA Sets Launch Date for STS 61 HST Servicing Mission**, Nov. 17, 1993.]

[] **STS 60: SPACEHAB INSTALLED**

The SPACEHAB module has been installed in Discovery's payload bay while the Orbiter undergoes pre-rollover processing in OPF bay 3. Forward reaction control system (FRCS) interface verification tests have been conducted along with orbital maneuvering system flight control verifications. Work currently in progress: ammonia servicing; preparations to install the main engines; potable water servicing; stacking solid rocket booster in Vehicle Assembly Building high bay 3. STS 60 work scheduled: main engine installation; orbital maneuvering system

flight redundancy checks and redundant electrical circuit verifications; SPACEHAB interface verification tests. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Nov. 17, 1993.]

[] **COLUMBIA: PROPELLANT DESERVICING**

Columbia is in OPF bay 2 where technicians have completed post-mission propellant deservicing. Strongback installation has been completed and the payload bay doors have been opened. Technicians have inspected auxiliary power unit number 2. Work in progress today: Orbiter power system validations; main propulsion system leak and functional checks; auxiliary power unit lube oil servicing and main engine inspections. STS 62 work scheduled: payload bay door functional tests; removal of Spacelab Life Sciences-2 payload module by the end of the week and auxiliary power unit leak and functional testing. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Nov. 17, 1993.]

November 18: **STS 61: PCR RECEIVES PAYLOADS**

Following yesterday's Flight Readiness Review (FRR) held at Kennedy Space Center, STS 61 mission managers selected December 1 as the firm launch date for Endeavour. The window on December 1 extends from 4:57 until 6:04 a.m. EST. The Hubble Space Telescope payload has now been installed into LC 39B's payload changeout room (PCR) in preparation for placement in the cargo bay of Endeavour. Other completed tasks include: the flight readiness review (FRR); extend rotating service structure; Orbiter midbody umbilical unit mate and leak checks; open Orbiter payload bay doors; inertial measurement unit calibrations; launch pad B validations. Work in progress today: main engine flight readiness test; main propulsion system aerosurface cycles; retest of the multiplexer/demultiplexers; final payload bay cleaning; solid rocket booster hydraulic closeouts; auxiliary power unit #2 controller tests; stowage and checkouts of spacesuits in the Orbiter's airlock. STS 61 tasks scheduled: remove payload covers prior to installation of payload into the Orbiter payload bay; aft Orbiter closeouts; Ordnance installation; Hubble Space Telescope (HST) payload interface verification and end-to-end tests. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Nov. 18, 1993.]

[] **STS 60: AMMONIA SERVICING COMPLETE**

In OPF bay 3, technicians have completed ammonia servicing on Discovery in preparation for its rollover to the Vehicle Assembly Building. Main engine installation is ready to be implemented and stacking of solid rocket boosters in the VAB is finished. Today, workers are installing the main engines in the Orbiter, servicing the potable water supply and conducting SPACEHAB interface verification tests. STS 60 work scheduled includes: orbital maneuvering system

flight redundancy checks and redundant electrical circuit verifications along with mating the external tank to solid rocket boosters in the VAB's high bay 3. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Nov. 18, 1993.]

[] **STS 62: SECOND U.S. MICROGRAVITY PAYLOAD**

Main propulsion system leak and functional checks on Columbia have been completed in OPF bay 2. Technicians have also completed: payload bay door functional checks, removal of the Spacelab Life Sciences - 2 payload module and post flight propellant deservicing. Currently, technicians are conducting Orbiter power system validations; auxiliary power unit leak and functional testing and main engine inspections. Scheduled STS 60 tasks: removal of the tunnel adapter; auxiliary power unit lube oil servicing; removal of the STS 58 main engines and transporting the Spacelab Life Sciences-2 payload module to the Operations and Checkout (O & C) Building. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Nov. 18, 1993.]

November 19: **STS 61: DELAY POSSIBLE**

A sensor problem may prevent Endeavour from launching on its STS 61 mission on December 1. Kennedy Space Center spokesman **Bruce Buckingham** said, "We feel there is a reasonable chance to find a solution that will allow us to fly safely." Pre-launch activities are continuing to allow for an on-time launch "if the technical problem with the sensor is resolved," Buckingham added. The sensor is one of four which measures hydraulic fluid pressure in an actuator within the right-hand wind of Endeavour. The actuator moves an elevon which enables steering during a Shuttle landing. NASA officials noted that even if all four sensors were to fail, there remained other ways for the astronauts to know whether the elevon is working properly. A repair to the sensor would require rolling Endeavour back to the VAB and that would delay the Hubble Space Telescope repair mission until January. Another problem was also being worked: excessive noise over the radios in two of Endeavour's spacesuits. [Banke, FLORIDA TODAY, p. 1A, Nov. 20, 1993; "Hubble-Repair Launch Seen Despite Glitches," THE ORLANDO SENTINEL, p. A-8, Nov. 20, 1993.]

[] **U.S. HOUSE: ANOTHER VOTE ON SPACE STATION**

The U.S. House of Representatives may face today another vote on the Space Station Program. A House panel will allow an amendment to kill the program to come to a vote. Local Congressman **Jim Bacchus** promised a "full-court press" in an effort to defeat the amendment. He said, "I'm distressed that the third time this year, opponents of the Space Station are seeking an opportunity to re-wage

a battle we have already won twice." [Wheeler, FLORIDA TODAY, p. 3A, Nov. 20, 1993.]

November 20: **SILVER SNOOPYS FOR SEVEN AT KSC**

NASA astronauts will present seven Silver Snoopy Awards to Kennedy Space Center and NASA employees: **William Olsen** (Satellite Beach, FL) , who is a senior safety engineer with Hernandez Engineering, Inc.; **Cindy Hall** (Titusville, FL), who is a quality assurance specialist with the Safety, Reliability and Quality Assurance Directorate; **Vincent Carrubba** (Satellite Beach, FL), a quality assurance specialist also with the Safety, Reliability and Quality Assurance Directorate; **Michelle Kamman Jones** (Cocoa, FL), a payload integration engineer for the STS 55 mission and **David Taylor** (Cocoa, FL), lead mechanical engineer on MVAK; **Damon Nelson** (Titusville, FL), a senior experiment project engineer who worked on Spacelab 2, and **David Brown** (Titusville, FL) a lead computer engineer, who was recognized for his lead role in software production. ["NASA, KSC Workers Get Silver Snoopys," FLORIDA TODAY, p. 9E, Nov. 21, 1993.]

November 22: **SPACE STATION SURVIVES, AGAIN**

"I'm thrilled with the victory we've won tonight. Many of my colleagues are beginning to understand there are important policy decisions at stake with our venture with the Russians," said Rep. **Jim Bacchus** (D-Melbourne., FL) after the U. S. House easily turned back an effort to kill the Space Station Program. Bacchus went on to note that there would be other challenges to the Space Station in the future. "I'm certain we will have to fight this fight next year, the year after, and until the Space Station is finally in orbit," he remarked. **Sue Munsey**, President of the Cocoa Beach (FL) Area Chamber of Commerce said after the vote, "It's going to be very, very important for the President to come out strongly and endorse the Space Station in the State of the Union address in January. If he does not, I'm afraid we'll be dealt the same hand we've been dealt this year." [Wheeler, FLORIDA TODAY, p. 1A, Nov. 21, 1993; Wheeler, FLORIDA TODAY, p. 1A-2A, Nov. 23, 1993; Banke, FLORIDA TODAY, pp. 1A-2A, Nov. 24, 1993.]

[] **SUSPECT ELEVON PASSES RETEST**

NASA managers must decide by tomorrow whether to waive a launch rule which requires each of four sensors to operating properly at liftoff. Kennedy Space Center spokesman **Bruce Buckingham** said that "for all intents and purposes, the flight controllers in Houston are playing devil's advocate - seeing if they can come up with any rationale for not flying as is." The suspect sensor was disconnected over the weekend and retested, successfully, according to Buckingham. "There's a comfortable feeling among management that they would still maintain their

required redundancy even without the fourth sensor." Only one of the four sensors is needed to gauge hydraulic pressure accurately; the three others act as back-ups. [Halvorson, FLORIDA TODAY, p. 4A, Nov. 23, 1993.]

November 23: **HOUSE VOTE SUSTAINS SPACE STATION**

The House of Representatives voted today 248 to 184 to kill an amendment which would have cut off all money for the Space Station Program. "A lot of people are really concerned about how the Space Station is going to go. It's been up in the air so much." That was the reaction of **Mike Kinslow**, a Space Station manager for McDonnell Douglas at Kennedy Space Center. The Director of Space Station Operations, **Dick Lyon**, said, "We are very thankful; we're all elated." Rep. **Jim Bacchus** (D-Merritt Island, FL) said, "The next challenge in the form of a vote will come in the authorization and appropriations process for the 1995 budget late next spring. In the meantime, we have to persuade a majority of the House that the redesign is worthwhile, the partnership with Russia is advisable and the whole program is affordable." [Banke, FLORIDA TODAY, pp. 1A-2A, Nov. 24, 1993.]

November 24: **ENDEAVOUR GO FOR LAUNCH**

By waiving a launch rule, NASA managers avoided the necessity of sending Endeavour back to the Vehicle Assembly Building for repairs; that would have delayed STS 61 until January. The problem was with one of four sensors which monitor the hydraulic pressure in a device which activates a Shuttle wing flap. "We are comfortable," said Kennedy Space Center spokesman **Bruce Buckingham**, "with the redundancy on board, despite the fact that we have one less sensor working." Flight rules had required that each of the four sensors be working to begin the countdown. Officials said that even if all four failed in flight, the astronauts would still be able to monitor the wing flap using other instruments. Former KSC Director **Forrest S. McCartney** pronounced himself unconcerned with the launch rule change: "They've [NASA managers] had a long time to analyze it. It's a whole lot different when you're in the countdown and the vehicle is fueled and nearly ready to go." [Banke, FLORIDA TODAY, Nov. 25, 1993; Banke - "Celestial Spyglass Offers Clues to Science Puzzles," FLORIDA TODAY, Nov. 28, 1993; Banke - "Space for Kids: Hubble Takes Snappy Pictures," FLORIDA TODAY, Nov. 28, 1993; Date - "Just 1 Little Slip and Project Was Ruined," THE ORLANDO SENTINEL, Nov. 28, 1993; Date - "Hubble - Huge Test for NASA," THE ORLANDO SENTINEL, Nov. 28, 1993; Date - "1992 Repair Mission Sent NASA A Message," THE ORLANDO SENTINEL, Nov. 28, 1993.]

November 27: **STS 61 CREW ARRIVAL TODAY**

The crew of Endeavour's STS 61 mission are expected to arrive at Kennedy Space Center today at approximately 11 a.m. The crew includes Commander **Richard Covey**, Pilot **Kenneth Bowersox**, and Mission Specialists **Story Musgrave, Claude Nicollier, Tom Akers, Kathryn Thornton** and **Jeffrey Hoffman**. The Space Center is shutting down many operations today due to the Thanksgiving holiday. The countdown for STS 61 begins November 28 at 9 a.m. Air Force meteorologists predict a 60% chance of favorable weather for liftoff. [Banke, FLORIDA TODAY, Nov. 27, 1993.]

November 28: **ATLAS FLIES; SHUTTLE READY**

An Air Force Atlas rocket launched successfully tonight at 6:40 p.m.; a computer error caused the liftoff to be delayed by 31 minutes. If the Atlas launch had required a lengthy delay, the commencement of Endeavour's STS 61 mission might have been postponed at least 24 hours. Shuttle Test Director **Mike Leinbach** said, "The Shuttle is in good shape. Endeavour is a good ship, and we hope to get her off on the first attempt and get on with this very exciting mission for America and the world." The Atlas mission was prepared n a record 41 days and provided confidence that recent failures of General Dynamics rockets were in the past. "The Atlas launch team has definitely made a statement," said Lt. Col. **Heinz Butner**, commander of the 3rd Space Launch Squadron, which oversees Atlas operations at Cape Canaveral Air Force Station. A new Atlas rocket is scheduled to liftoff no earlier than December 13; the new rocket features strap-on solid rocket boosters. Endeavour will have until December 6 to begin its mission. If the mission is not ongoing by December 9, it will have to be delayed until next year to take into account the Christmas and New Year's holidays. [Banke, FLORIDA TODAY, p. 1A, Nov. 29, 1993.]

[] **STS 61: COUNTDOWN STARTS TODAY**

At 9:00 a.m. this morning, the countdown to launch for STS 61 began. **Terry Oswalt**, an astronomer for Florida Tech (Melbourne, FL) said, "I've got a couple of former students and several colleagues whose jobs basically depend on the success of this mission." On his arrival at Kennedy Space Center two days ago, Commander **Richard Covey** said, "We look forward to putting on quite a show. " He added, "We've trained hard, and we feel confident that two weeks from (today) we're going to be back here getting ready to head back to Houston in the other direction after a very successful mission." [Banke, FLORIDA TODAY, Nov. 28, 1993.]

[] **LAUNCH OF ATLAS 2 CRITICAL TONIGHT**

Time needed to reconfigure for launch makes it critical that the Air Force successfully launch tonight's Atlas 2 rocket. An inability to launch would push Endeavour's launch to December 2 rather than December 1. "We do have a concern with the weather," said Air Force spokeswoman **Terri Bracher**. "We're looking at a 60 percent chance of violating launch weather constraints because of potential thick clouds in the area. The Atlas payload for this mission is a Defense Satellite Communications System Spacecraft, the fourth in a series of nine DSCS under an $858 million contract the Air Force has with General Dynamics, builder of the Atlas 2. [Banke, FLORIDA TODAY, Nov. 28, 1993.]

[] **ATLAS LAUNCHED SUCCESSFULLY**

An Atlas 2 rocket lifted a military communications satellite into orbit tonight at 6:40 p.m. and the launch cleared the way for the December 1 launch of STS 61. The rocket lifted off after a 31 minute delay because of a faulty valve reading. The Defense Satellite Communications System satellite is number 8 in a planned series of such spacecraft used to relay secret conversations among U.S. military personnel. ["Military Satellite Launched Into Orbit Aboard Rocket," THE ORLANDO SENTINEL, Nov. 29, 1993; Banke, FLORIDA TODAY, p. 1A, Nov. 29, 1993.]

November 30: **CHLORINE LEAK AT KSC**

A malfunctioning valve in one of two chlorine tanks allowed chlorine gas to escape from a KSC tank farm and led to the evacuation of about 100 persons from Kennedy Space Center and nearby neighborhoods on Merritt Island. The tank farm is located on the southern edge of the space center property. No one was injured and there was no impact on the impending launch of Endeavour on its STS 61 mission. Gas flowed from late Monday [November 29] or early Tuesday morning until it was discovered by a NASA worker who checked the tanks to assure that they had switched properly. He alerted authorities when he detected a hissing sound, said KSC spokesman **Mitch Varnes**. News of the leak spread through north Merritt Island neighborhoods which evacuated over the course of an hour. The incident did tie up some rush-hour traffic at the space center because officials closed State Road 3 from State Road 528 to the NASA Causeway for about 15 minutes. [Evans, FLORIDA TODAY, Dec. 1, 1993.]

December

December 1: **STS 61: WEATHER SCRUBBED MISSION**

The launch of Endeavour on mission STS 61 was scrubbed today at 5:58 a.m. due to unacceptable weather, specifically higher than allowable crosswinds and scattered showers within 20 miles of the Shuttle Landing Facility. Launch has been rescheduled for tomorrow. The launch window extends from 4:27 until 5:38 a.m. EST. Work to safe the vehicle at the pad is currently in progress. Draining of the liquid hydrogen and liquid oxygen reactants is expected to be completed by late morning. The countdown is expected to begin this afternoon at the T-11 hour mark at about 2:07 p.m. At about 7:30 p.m. today, operations will begin to load the external tank with more than 500,000 gallons of liquid hydrogen and liquid oxygen.

Weather forecasters indicate a forty (40) percent probability of weather prohibiting launch tomorrow. The primary concerns are for cloud ceilings below 8,000 feet and a slight chance of showers. The winds at pad 39B tomorrow are expected to be from the east northeast at 8 to 14 knots; temperature 70 degrees F; visibility 7 miles; and clouds scattered to broken at 4,500 feet. The 24-hour delay forecast reveals an improved situation and lists only a 20 percent chance of violation. The seven-member crew have returned to their quarters where they will eat lunch and prepare for sleep. They will be awakened later tonight at about 9 p.m. and prepare for the second launch attempt early tomorrow. Departure for the pad is set for about 12:42 a.m. tomorrow.

Mission Responsibility	Crew Member
Commander	**Richard Covey**
Pilot	**Kenneth Bowersox**
Mission Specialist (MS1)	**Kathryn Thornton (EVA3)**
Mission Specialist (MS2)	**Claude Nicollier**
Mission Specialist (MS3)	**Jeffrey A. Hoffman (EVA1)**
Mission Specialist (MS4)	**F. Story Musgrave (EVA2)**
Mission Specialist (MS5)	**Thomas Akers (EVA4)**

[KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Dec. 1, 1993; Halvorson, FLORIDA TODAY, pp. 1A-2A, Dec. 1, 1993.]

December 2: **STS 61: ENDEAVOUR OFF TO FLYING START**

Bad weather yesterday prevented the launch of the Space Shuttle Endeavour on its STS 61 mission. This morning, however, the mission commenced right on time at 4:27 a.m. EST. On reaching orbit, Commander **Richard Covey** said, "It's a beautiful sunrise." Astronaut **Ken Cockrell**, who observed the launch from Mission Control (JSC, Houston, TX) said, "It looked awfully good from here, too." Mission Manager **Loren Shriver**, himself a former astronaut, said, "This mission is higher profile than most. I have big confidence we will get this one done." Once in orbit, Endeavour will begin to chase the Hubble Space Telescope so as to be in position for the start of the repair effort on December 4. The Orbiter should be within 35 feet of the HST by 4:10 a.m. Saturday. Commander Covey referred to the fact that there is only enough fuel aboard Endeavour for one rendezvous attempt; he said before the launch, "We have to do it right the first time." Approximately 420 journalists were on hand for the launch, according to **Leslie Williams**, accreditation secretary for the KSC Media Services Branch. [Banke, FLORIDA TODAY, pp. 1A-2A, Dec. 3, 1993; Date, THE ORLANDO SENTINEL, pp. A-1 & A-18, Dec. 3, 1993.]

December 6: **SPACE STATION TO INCLUDE RUSSIA**

"A major hurdle has been overcome. The governments of the international partners are now all agreed to bring in Russia. There was a time when we weren't so sure," said a Clinton administration official who spoke off the record. The Space Station partners met today in Washington to give their assent. "The governmental representatives who were there, including the French, Germans, Canadians and Japanese, all made strong opening statements about positive factors Russia can bring. They also emphasized how it's consistent with the broader objectives of integrating Russia into the international community." The Vice President of the United States will travel to Moscow December 14-17 to settle details of Russia's participation in the Space Station Program. ["Space Station Partners Agree to Invite Russia," FLORIDA TODAY, p. 2A, Dec. 7, 1993; "U.S. Asks Russia to Join Space Station," THE ORLANDO SENTINEL, p. A-6, Dec. 7, 1993.]

December 7: **DELTA 2 READY FOR LAUNCH**

"We're not looking at any issues; launch activities are proceeding as planned,"said McDonnell Douglas spokeswoman **Anne McCauley** about tonight's launch of a commercial Delta 2 rocket. The liftoff will take into space a North Atlantic Treaty Organization (NATO) military communications satellite. According to Air Force weather watchers, there is a 60 percent chance of acceptable launch conditions. Another upcoming nighttime launch is that of an Air Force Atlas

rocket on December 14. [Banke, FLORIDA TODAY, p. 2A, Dec. 7, 1993; Date, THE ORLANDO SENTINEL, p. A-6, Dec. 7, 1993.]]

[] **STS 60: RMS STOWED**

Discovery remains in Orbiter Processing Bay 3 where it is undergoing processing for its STS 60 flight next month. Technicians have stowed the Orbiter's remote manipulator arm (RMS) and concluded mass memory unit loading. Other completed tasks include: nose gear functional test; landing gear functional test; aerosurface cycling; hydraulic system testing; payload bay door radiator closeouts; Ku-band antenna self-testing; SPACEHAB-2 leak checks. Work in progress includes: crew compartment structural leak check; aft main engine compartment closeouts; Orbiter mid-body closeouts; tile closeouts; SPACEHAB-2 closeouts; potable water sampling; stowage of Ku-band antenna for flight; final test of payload bay cameras. STS 60 work scheduled: payload bay cleaning; closure of payload bay doors; UHF air-to-ground antenna check; main propulsion system pneumatic system testing; Orbiter structural and aft compartment leak checks; VAB rollover targeted for December 15 with rollout to Launch Complex 39A targeted for December 20. Meanwhile, processing activities continue for Columbia's STS 62 mission. The planned removal and replacement of the #1 fuel cell is occurring today. Main propulsion system leak and functional checks are in process. S-band communications system testing is also underway. Planned removal of auxiliary power unit #2 is complete. Loading of mass memory unit #2 has also been completed. The left hand orbital maneuvering system pod is scheduled for removal tonight. [SPACE SHUTTLE STATUS REPORT, Dec. 7, 1993.]

[] **DELTA LAUNCHES NATO SATELLITE**

Tonight at 7:48 p.m., at Cape Canaveral Air Force Station the Air force launched a Delta 2 rocket which carried aloft a communications satellite for the North Atlantic Treaty Organization [NATO]. The satellite was the eighth such craft built for NATO by British Aerospace and Matra Marconi to provide secure communications; it will begin service in the fall of 1994 and last until 2001. An earlier satellite was launched in January 1991 and became operational in October 1993; the two spacecraft cost approximately $366 million, including special launch and control services. ["Delta Rocket Lofts A NATO Satellite," THE ORLANDO SENTINEL, Dec. 8, 1993; Banke, FLORIDA TODAY, p. 2A, Dec. 8, 1993.]

December 8: **STS 60: SPACEHAB WORK COMPLETED**

Technicians in Orbiter Processing Facility bay 3 have completed a number of tasks in the processing of Discovery for next month's STS 60 mission: SPACEHAB-2 closeouts and leak checks; potable water sampling; leak checks of forward reaction

control system; stowage of Ku-band antenna for flight; mass memory unit loading; nose gear functional test; landing gear functional test; aerosurface cycling; payload bay door radiator closeouts; and, Ku-band antenna self-testing. Work in progress: nosewheel tire and strut pressurization; payload bay cleaning; UHF air-to-ground antenna test; crew compartment structural leak check; aft main engine compartment closeouts; Orbiter mid-body closeouts; tile closeouts. STS 60 work scheduled: closure of payload bay doors; crew cabin leak checks; Orbiter structural and aft compartment leak checks; VAB rollover targeted for December 15 with rollout set for December 20. [SPACE SHUTTLE STATUS REPORT, Dec. 8, 1993.]

[] **STS 62: COLUMBIA PROCESSING UPDATE**

Columbia remains in Orbiter Processing Facility bay 2 where main propulsion system leak and functional checks are in work. Removal of the left hand orbital maneuvering system pod is underway. Reinstallation of drag chute pyrotechnic hardware is being performed. Servicing of the waste containment system is in process. Engineers are troubleshooting one of the flight data recorders. The TACAN self-test is complete. Fuel cell #1 has been removed as planned. [SPACE SHUTTLE STATUS REPORT, Dec. 8, 1993.]

December 9: **AFT COMPARTMENT CLOSEOUTS**

In OPF bay 3, technicians have completed Orbiter aft engine compartment closeouts; made SPACEHAB leak checks and cleaned the payload bay for the final time before rolling Discovery over to the Vehicle Assembly Building for mating with the STS 60 solid rocket boosters and external tank. Currently, processing tasks include: closing the payload bay doors; Orbiter mid-body closeouts; stowage of Ku-band antenna; recharging the Wake Shield Facility batteries and final landing gear checkouts. STS 60 work scheduled: payload bay door strongback removal; weight and center of gravity checks; installation of the Orbiter on the Orbiter transporter; installation of the Getaway Special (GAS) bridge into the transport canister; rolling Discovery to the Vehicle Assembly Building on December 14 and rolling the stacked Space Shuttle to Launch Complex 39A on December 20. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Dec. 9, 1993.]

[] **STS 62: COLUMBIA MISSION UPDATE**

Columbia's auxiliary power unit (APU) number 2 has been removed from the Orbiter; the left hand (OMS) pod has also been removed. Technicians completed TACAN activation and self test. Today, Shuttle workers will conduct checks of the forward reaction control system; drag chute pyrotechnic operations; main propulsion system leak and functional checks; solid rocket booster stacking operations in the VAB high bay 1. STS 62 work scheduled: removal and

replacement of the humidity separator and installation of the left hand orbital maneuvering system (OMS) pod. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Dec. 9, 1993.]

[] **SPACEPORT USA: CHANGES AFOOT**

A new IMAX theater has recently been dedicated at Kennedy Space Center's Spaceport USA; the new theater allows simultaneous showing of two IMAX films: "The Dream Is Alive" and "The Blue Planet." The films are just part of the growth of the fifth most popular tourist attraction in Florida. Next week another major attraction will be available for photography - a full-scale, high-fidelity reproduction of a Space Shuttle Orbiter. The replica is being assembled on the eastern end of the large visitors complex. The Orbiter itself is approximately the size of a medium range jetliner and its vertical stabilizer will be visible for quite a distance. At some point on the morning of December 15, the 50 millionth visitor to Spaceport USA will arrive at the attraction. The visitor will receive special red-carpet treatment and be presented with a number of valuable gifts. Currently, attendance is running at approximately 2.6 million visitors per year. [Young, NASA/KSC News Release No. 153-93, Dec. 9, 1993.]

December 13: **ENDEAVOUR LANDS AT KSC ON TIME**

The Space Shuttle Endeavour made a successful landing in the darkness at Kennedy Space Center this morning at 12:26. The STS 61 mission which made repairs to the Hubble Space Telescope lasted just under 11 days. Deorbit burn came on orbit 161 at about 11:15 p.m. Endeavour entered Florida airspace near the city of Crystal River and traveled east across the state. It passed over Orlando and Titusville prior to landing. When the Orbiter passed over Orlando it was about 5 minutes before landing and was traveling at an altitude of approximately 91,000 feet and traveling at a speed of about Mach 3. The landing this morning was the 18th at KSC. It was the seventh night landing and only the second such landing at the space center. The first such landing was on September 22 at the conclusion of the STS 51 mission. A chart of Kennedy Space Center landings follows:

STS 41B	Challenger	February 11, 1984
STS 41G	Challenger	October 13, 1984
STS 51A	Discovery	November 16, 1984
STS 51C	Discovery	January 27, 1985
STS 51D	Discovery	April 19, 1985
STS 38	Atlantis	November 20, 1990
STS 39	Discovery	May 6, 1991
STS 43	Atlantis	August 11, 1991
STS 45	Atlantis	April 2, 1992
STS 50	Columbia	July 9, 1992
STS 46	Atlantis	August 8, 1992
STS 47	Endeavour	September 18, 1992
STS 52	Columbia	November 1, 1992
STS 54	Endeavour	January 19, 1993
STS 56	Discovery	April 17, 1993
STS 57	Endeavour	July 1, 1993
STS 51	Discovery	September 22, 1993
STS 61	Endeavour	December 13, 1993

[**NASA/KSC Release No. 153-93**, Dec. 12, 1993; **KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT**, Dec.10, 1993; Date, THE ORLANDO SENTINEL, Dec. 14, 1993; Halvorson, FLORIDA TODAY, pp. 1A-2A, Dec. 14, 1993.]

[] **JUNKYARD YIELDS SHUTTLE TREASURE**

"It shouldn't have been out there. My finding it saved a delay in launch from what I was told," said NASA employee **Brooks Humphrys** about the Shuttle part he found in a Kennedy Space Center junkyard while looking for recyclable materials. What Humphrys found was a piece of the Space Shuttle Discovery's wing; it was valued at $304,000, according to space center officials today. The wing panel is one of 22 on the Orbiter wing's leading edge; collectively they help keep the vehicle from burning up during re-entry. Officials said that it had been

packed inside a heavy, sealed wooden crate and accidentally discarded by Lockheed Space Operations Co. workers. They had put the crate along with several others outside Discovery's hangar and all were hauled away as part of the cleanup for the recent Open House at Kennedy Space Center. The material was taken by EG&G Florida workers who took it to a landfil on the east end of Schwarz Road, according to KSC spokesman **Bruce Buckingham**. What caused Humphrys to be curious about the crate was its appearance compared to other crates in the landfill. He thought the crate looked too new and out of place. He opened the crate and saw an object wrapped in packing material. "I didn't know what it was, but it looked important so I began calling the names on the labels inside. Word eventually reached a Lockheed worker who came to retrieve the panel for the Orbiter Processing Facility. An investigation board was formed and a report written. The findings were presented to Shuttle Launch Director **Robert B. Sieck** and, as a result, LSO changed the way materials are handled in the processing area. Crates are now marked clearly whether they are to be recycled, or not. EG&G also responded by changing landfill procedures to require all lids to be removed from any containers before the waste is accepted. [Banke, FLORIDA TODAY, p. 1A, Dec. 14, 1993.]

[] **STS 60: KU-BAND ANTENNA STOWED**

Discovery continues with pre-rollover processing activities in OPF bay 3; technicians there have stowed the Ku-band antenna and closed the payload bay doors. Other completed tasks include: a retest of the startracker; Orbiter and mid-body closeouts; final landing gear closeouts and installation of the Getaway Special (GAS) bridge into the transport canister. Work in progress for the STS 60 mission next month: final Orbiter power down; payload bay door strongback removal; recharge of the Wake Shield Facility batteries. STS 60 work scheduled: weight and center of gravity checks; installation of Orbiter on transporter; rollover to the Vehicle Assembly Building December 14; lift and mate Orbiter to the external tank; rollout to the pad targeted for December 20. [**KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT**, Dec. 10, 1993.]

[] **STS 62: US MICROGRAVITY PAYLOAD-2**

Alongside Discovery in the Orbiter Processing Facility is the Space Shuttle Columbia which is being readied for its next mission, STS 62, in early March 1994. Columbia, in OPF bay 2, has undergone a checkout of its cabin pressure transducer and leak and functional checks of the main propulsion system's helium system. Work in progress today includes: installation of the left-hand orbital maneuvering system (OMS) pod; checks of the forward reaction control system; main propulsion system leak and functional checks; solid rocket booster stacking operations in the VAB's high bay. STS 62 work scheduled: drag chute pyrotechnic operations; removal and replacement of the humidity separator;

removal and replacement of the fuel cell number 1; OMS pod and functional checks. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Dec. 10, 1993.]

DECEMBER 14: STS 59: PAYLOAD STATUS REPORT

The Space Radar Laboratory (SRL-1) reaches a milestone this week in the Operations and Checkout (O & C) Building at the Kennedy Space Center with the performance of the Mission Sequence Test. This test involves executing portions of the mission timeline with SRL in flight configuration to verify proper performance. This test runs for approximately 50 hours and will be performed over a period which covers four days concluding December 16. SRL is a joint project between the German Space Agency and the Italian Space Agency whose associated contractors, Dornier and Alenia Spazio, will be participating in the test for the X-band instruments. For NASA, in addition to KSC engineers and technicians, there are representatives from the Jet Propulsion Laboratory and contractor Ball Aerospace for the C-band and L-band instruments.

The Langley Research Center will participate in the testing of an instrument called MAPS, which stands for the Measurement of Atmospheric Pollution from Satellites, and is attached to a Mission Peculiar Support Structure (MPESS). On January 4, SRL-1 is scheduled to be moved to the Cargo Integrated Test Equipment (CITE) stand in the O & C to begin one week of tests. This will verify the electrical interfaces and readiness to be integrated with the Space Shuttle Orbiter. Then, in mid-February, SRL-1 will be moved to OPF bay 1 to be placed in the payload bay of Endeavour. This will be followed by an Interface Verification Test (IVT) to verify the connections with the Orbiter and the flight deck. At the end of February an End-to-End test will be conducted to verify the compatibility to use the NASA Communications Network (NASCOM) to provide communications between SRL in the payload bay, the Tracking and Data Relay Satellite, the Goddard Space Flight Center (Greenbelt, MD), and Mission Control at the Johnson Space Center (Houston, TX).

Then the first week of March Endeavour will move to the Vehicle Assembly Building and out to the launch pad. No significant payload testing or servicing is required at the pad. The SRL 40-foot by 20-foot phased array antenna arrived at the SAEF-2 spacecraft checkout facility at KSC on July 27 where stand-alone tests were performed. Meanwhile in the O & C, the SRL-1 Spacelab pallet was undergoing mechanical and electronic build-up with associated testing. The antenna was moved from SAEF-2 to the O & C on November 8 for mating with the pallet on November 24 and was followed by a 5-day IVT which concluded December 6. The STS 59 first SRL mission will provide images and geophysical measurements of topography, vegetation, deforestation and soil erosion, ocean dynamics, wave fields and wind fields, volcanism and tectonic activity.

Approximately 30 million square miles of the Earth will be surveyed. The MAPS instrument will study carbon monoxide concentrations in the middle troposphere on a global scale. [Diller, **STS 59 PAYLOAD STATUS REPORT; SPACE RADAR LABORATORY**, Dec. 14, 1993.]

[] **STS 60: DISCOVERY ROLLOVER DELAYED**

Mission managers decided today not to roll Discovery to the Vehicle Assembly Building or to the pad prior to the Christmas holidays. Discovery will remain in OPF bay 3 for additional testing on all 44 reaction control system thrusters (R1R) following its most recent mission, STS 51, managers decided further inspections of the remaining thrusters was warranted. Thruster R1R has been replaced. The move to the VAB will not occur until after the first of next year. Weight and center of gravity checks have been completed; the payload bay doors have been closed and the star tracker has been retested. Technicians will set up for reaction control system thruster testing in the OPF today; the test will occur December 16. Rollover to the VAB will occur after the first of the year. [**KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT**, Dec. 14, 1993.]

[] **STS 62: MISSION UPDATE**

In Orbiter Processing Facility bay 2, technicians have installed the left-hand orbital maneuvering system (OMS) pod and have completed checks of the forward reaction control system. Work in progress: left-hand orbital maneuvering system pod functional checkout; removal and replacement of fuel cell number 1; drag chute pyrotechnic operations; checkout of freon coolant loop number 2; main propulsion system leak and functional checks and solid rocket booster stacking operations in the VAB's high bay 1. STS 62 work scheduled: integrated drag chute installation. [**KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT**, Dec. 14, 1993.]

[] **STS 59: SPACE RADAR LABORATORY**

Post landing debris inspections of Endeavour's thermal protection system indicated the Orbiter sustained a total of 120 hits, of which 13 had a dimension of one inch or greater. Both of these totals are less than average. Endeavour was towed to OPF bay 1 following its landing at Kennedy Space Center on runway 33 at 12:25 a.m. yesterday. Work in progress today: gain access to Orbiter crew compartment and engine compartment; begin operations to off-load onboard cryogenic reactants; payload bay door latch functional test; thermal protection system post-flight inspections; chin panel inspections and main engine inspections. Scheduled operations include: opening the payload bay doors; hydraulic power up operations and removal of the payload support equipment. [**KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT**, Dec. 14, 1993.]

[] **UNDERSEA CELSS CROP HARVESTED**

Biologists from NASA's Kennedy Space Center today harvested the first crop of plants ever to undergo a full-duration growth cycle in a protected and environmentally controlled underwater laboratory. The harvesting of 18 heads of Waldmann's Green lettuce took place inside an undersea research facility at Key Largo, FL, and is a continuation of NASA's research of plants and the ability successfully to grow them in a Controlled Biological Life Support System (CELSS). The CELSS project is being developed for a time when astronauts may have to grow their own food during long-duration missions to the moon, Mars or beyond. The program is funded by NASA Headquarters (Washington, D.C.), and managed by KSC's biomedical operations and research office.

Over the last few years, scientists have grown and harvested several crops of lettuce, potatoes, soybeans and wheat inside a CELSS chamber at KSC. However, today's harvest signifies the beginning of a challenging new era in CELSS research, one in which plants are grown in an isolated habitat similar to what may be encountered during future space voyages. The lettuce was planted on November 18, 1993, and spent its entire growth cycle inside a habitat owned by the Marine Resources Development Foundation (MRDF). The MRDF area in Key Largo is the world's only permanent underwater facility designed primarily for scientific research.

The plants were tended daily by MRDF researcher **Chris Olstad** and checked weekly by KSC bioengineer **Dennis Chamberland**. "I'm very pleased with the results of this first crop of lettuce," Chamberland said. "We pursued this venture as a prototype for a similar 90-day test in 1994....The entire KSC CELSS team put a lot of effort into making this first test such a success, and I believe we're on track for going ahead with the more extensive undersea project by late fall or early winter of next year." Besides today's CELSS harvest, there is only one other documented instance of environmentally controlled undersea plant growth. This first attempt at underwater farming occurred in 1965 when scientists planted barley inside the SEALAB II module. This experiment was short-lived, though, and failed just two weeks into the plants' 100-day life cycle. [**NASA/KSC Release No. 154-93**, Dec. 14, 1993.]

December 16: **AERONAUTICS AGREEMENT**

NASA and the Russian State Committee for the Defense Branches of Industry (GOSKOMOBORONPROM) signed a memorandum of understanding today in Moscow to cooperate in eight areas in fundamental aeronautical sciences. The agreement was signed by NASA Administrator **Daniel S. Goldin** and GOSKOMOBORONPROM Chairman Mr. Glukhikh. "With the signing today of the new Aeronautics agreement, NASA is entering a new partnership with our

Russian colleagues to advance aeronautical science," said Goldin. The agreement calls for cooperative activities in the following areas:

1) Transition and Turbulence - Fundamental investigations of initial disturbance fields and their receptivity into the boundary layer at low and high speeds.
2) Composite Structures and Materials - Fundamental investigations of advanced high-temperature composites, adhesives and sealants.
3) Chemically Reacting Flows - Fundamental investigations of chemical kinetic reaction mechanisms, turbulence closure for reacting flows and computational modeling.
4) Thermal Protection System Materials - Fundamental investigations of the catalytic efficiency and overall performance of heat shield materials.
5) Environmental Concerns in Aviation - Research on the effects of engine emissions on the atmosphere, in particular, the ozone layer, generation, propagation and prediction of acoustic waves, including sonic boom.
6) Hypersonic Technologies - Fundamental investigations of the controlling physical phenomena of hypersonic flight.
7) Experimental Test Facilities - Use of ground and flight test facilities and techniques for research on advanced aeronautical technologies.
8) Advanced Aerospace Materials - Investigation of the properties of new materials for use in aerospace programs.

NASA and GOSKOMOBORONPROM will establish a Joint Working Group On Aeronautical Sciences to manage the new cooperative activities. [**NASA/KSC Release : 93-221**, Dec. 16, 1993; "Gore Optimistic On U.S.-Russia Space Merger," FLORIDA TODAY, p. 4A, Dec. 15, 1993; Halvorson, FLORIDA TODAY, pp. 1A-2A, Dec. 17, 1993.]

[] **JOINT SHUTTLE/MIR MISSIONS**

NASA and the Russian Space Agency [RSA] have agreed to up to 10 Shuttle flights to Mir with a total of 24 months time onboard Mir for U.S. astronauts, a program of scientific and technological research, and the upgrade and extension of the Mir lifetime during the period 1995 - 1997. This is the first of a three-phase program in human spaceflight cooperation which may culminate in the construction of an international Space Station. NASA Administrator **Daniel S. Goldin** and RSA Director General **Yuri Koptev** signed this protocol today in Moscow, expanding the terms of the 1992 Human Space Flight Cooperation Agreement. "This is a very significant step in expanding our human spaceflight cooperation with our Russian friends," Goldin said. "These activities will provide valuable experience for the construction and operation of the international Space Station." The following is a summary of cooperative activities outlined in this protocol:

1) An additional Russian cosmonaut flight on Space Shuttle mission STS 63 scheduled for launch in 1995. Colonel **Vladimir G. Titov**, the back-up cosmonaut currently in training at NASA's Johnson Space Center for the January 1994 flight (STS 60), will be the primary cosmonaut for the STS 63 flight. **Sergei K. Krikalev**, the STS 60 primary cosmonaut, will act as the backup. During the STS 63 mission, the Space Shuttle will perform a rendezvous with the Mir-1 Space Station and will approach to a safe distance.

2) The Space Shuttle will rendezvous and dock with the Mir-1 in October-November 1995, and the Shuttle crew may include Russian cosmonauts. Mir-1 equipment, including power supply and life support system elements, also will be carried. The crew will return on the same Space Shuttle mission. The mission will include activities on Mir-1 and possible extravehicular activities to upgrade solar arrays.

3) NASA-designated astronauts will fly on the Mir-1 Space Station for an additional 21 months for a total of 2 years. This will include at least four astronaut flights.

4) The Space Shuttle will dock with Mir-1 up to ten times. The Shuttle flights will be used for crew exchange, technological experiments, logistics and sample return. Some of those flight programs will be developed by the Mission Science Joint Working Group. The activities carried out in this program will expand ongoing research in biotechnology, materials sciences, biomedical sciences, Earth observations and technology.

6) NASA and RSA will initiate in 1993 the joint development of a solar dynamic power system with a test flight on the Space Shuttle and Mir in 1966, the joint development of spacecraft environmental control and life support systems and studies on potential development of a common space suit starting with the compatibility of respective spacesuits.

7) A crew medical support program for the benefit of both sides' crew members, including the development of common standards, requirements, procedures, databases and countermeasures will be initiated. [**NASA/KSC Release: 93-222**, Dec. 16, 1993.]

December 15: **ATLAS 2AS LAUNCHES SUCCESSFULLY**

Liftoff of the new General Dynamics Atlas 2AS came tonight at 7:40 p.m., delayed about 18 minutes by a minor electrical problem. "I'm happy," said **Michael Wash**, President of General Dynamics' Commercial Launch Systems Division. "It's a big boost for us. It went right down the line and it was a perfect launch. " The rocket's payload was a $125 Telstar 401 satellite; it was delivered to orbit in about thirty minutes after launch. The rocket carried four boosters, two of which ignited initially, followed by the other two a minute after liftoff. Tonight's launch was the first ever for the new vehicle and for its payload, a new kind of satellite. "We believe Telstar 401 will open the door to a whole new era

of satellite communications," said **Ernest DeNigris**, AT&T's General Manager for the Telstar 401 Program. "It's loaded with new state-of-the-art features and capabilities that are sure to be a big hit with our customers," he added. AT&T officials said that they expected the satellite to be tested and ready for operation in early January 1994. [Banke, FLORIDA TODAY, Dec. 14, 1993; Date, THE ORLANDO SENTINEL, p. A-6, Dec. 14, 1993; Banke, FLORIDA TODAY, Dec. 15, 1993; Banke, FLORIDA TODAY, Dec. 16, 1993.]

December 18: **GREATHOUSE GIVEN SILVER SNOOPY**

Gene Greathouse, a Lockheed Space Operations Co. engineer, was recently presented the coveted Silver Snoopy Award by astronaut **Mark Lee**. Greathouse is a senior reliability engineer who is responsible for performing systems reliability analyses of Shuttle landing aids at three sites in the United States and six sites in Europe and Africa. ["Lockheed Engineer Gets Silver Snoopy Award," FLORIDA TODAY, p. 9E, Dec. 19, 1993.]

December 20: **PNEUMATIC SYSTEM DECAY CHECKS**

Technicians in OPF bay 3 have completed pneumatic system decay checks; established orbital maneuvering system (OMS) trickle purge; main landing gear tire pressure top-off for the Orbiter's next mission; cycled Orbiter's vent doors for next month's rollover to the VAB; and a successful check of the Orbiter's Reaction Control System thrusters. Work in progress: configuring facility and vehicle for the holiday break; thermal protection system inspections. Nothing significant is scheduled for next week for the processing team. The current schedule calls for Discovery to be transferred to the Vehicle Assembly Building on January 4 and then to Launch Complex 39A on January 10. The payload will be sent to the pad on January 6. The terminal countdown demonstration test is currently scheduled for January 13-14 and the flight readiness review is set for January 20. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Dec. 20, 1993.]

December 21: **STS 60: ROLLOVER SET FOR JAN. 4**

The current schedule calls for the Space Shuttle Discovery to be transferred to the Vehicle Assembly Building on January 4 and then to pad A on January 10. The payload will be sent to the pad on January 6. The terminal countdown demonstration test [TCDT] is presently set for January 13-14 and the flight readiness review [FRR] is targeted for January 20. Completed tasks include: forward compartment/crew cabin closeout; T-0 umbilical cables disconnected for rollover; main landing gear tire pressure topped-off for mission. Work in progress: jackdown to floor and installation onto Orbiter transfer vehicle for the rollover to the VAB; preparations for the holiday stand down. Minimal work is

planned this week for Orbiters Columbia and Endeavour; the Shuttle processing team is given a holiday break from December 23 through January 3, 1994. [KENNEDY SPACE CENTER SPACE SHUTTLE STATUS REPORT, Dec. 21, 1993; Banke, FLORIDA TODAY, Dec. 23, 1993; Banke, FLORIDA TODAY, Dec. 27, 1993.]]

[] **CALIFORNIA BOC AWARDED**

John F. Kennedy Space Center today awarded Space Mark, Inc. [Colorado Springs, CO] a $6,973,838 contract for overall base operations at its West Coast launch site at Vandenberg Air Force Base [CA]. The period of performance is three years, beginning February 1, 1994, and ending January 31, 1997. The contract gives NASA the option of extending performance until January 31, 2001, and has a potential overall value of over $17 million. Under the terms of the contract, Space Mark is responsible for the operation, management, and maintenance of facilities, systems, equipment, support services and specified technical/administrative operations at NASA facilities located at Vandenberg AFB. NASA uses Vandenberg as its prime launch site for polar-orbiting spacecraft, launched on ATLAS, DELTA and other expendable launch vehicles. The contract was competed nationally as a set-aside for small disadvantaged businesses. NASA solicited 182 sources for negotiation of the contract and received 11 offers in response. [NASA/KSC Release No. 158-93, Dec. 21, 1993.]

December 29: **1993: YEAR IN SPACE REVIEW**

All spaceflight hardware is secure in its processing facilities and the team at NASA's John F. Kennedy Space Center (KSC) is off for the holidays, concluding a busy and eventful year of operations at America's spaceport. Seven Space Shuttle missions were successfully launched from KSC in 1993, with five flights ending at the center's Shuttle Landing Facility (SLF). KSC's expendable vehicles group assisted and coordinated with the launching of space vehicles from both Florida and NASA's West Coast launch site in California. Other KSC divisions made significant contributions in engineering, the sciences and toward the continuous improvement of operations at the space center.

The year of Shuttle launches began and ended with NASA's newest spaceship, Endeavour. On January 13 at 8:59 a.m. EST, Endeavour lifted off from Launch Complex 39B carrying a five-member flight crew and the fifth Tracking and Data Relay Satellite (TDRS-6). The purpose of the mission was two-fold: to safely and successfully deploy TDRS-6 and to have a pair of spacewalking astronauts test techniques that may eventually be used during the in-space assembly of the International Space Station. TDRS-6 was deployed on the first day of the flight and is now an operating part of the TDRS network used to transmit communication between the Space Shuttle and ground controllers. Astronauts

Gregory Harbaugh and **Mario Runco** left the confines of Endeavour's crew compartment on the mission's fifth day and spent five hours performing a series of tasks to increase NASA's knowledge of working in space.

The Diffuse X-Ray Spectrometer (DXS) was mounted in Endeavour's payload bay during STS 54 and used to collect data on X-Ray radiation from a variety of sources in deep space. Several middeck experiments were also carried aboard Endeavour on STS 54, including one designed and sponsored by KSC's life sciences team. The Chromosome and Plant Cell Division in Space Experiment (CHROMEX) is an ongoing investigation into the effects of microgravity on the development and growth of plants. The STS 54 mission ended on January 19 at 8:37 a.m. EST with a landing at Kennedy Space Center on runway 33. The Shuttle completed 96 orbits, and the mission duration was five days, 23 hours and 38 minutes. The STS 54 crew was comprised of Commander **John Caspar**, Pilot **Donald McMonagle** and Mission Specialists **Mario Runco, Gregory Harbaugh** and **Susan Helms**. The second flight of 1993, STS 56 was hosted by the Orbiter Discovery. The first of the year's two nighttime launches took place at Launch Complex 39B on April 8 at 1:29 a.m. EDT. The mission included a five-member crew and the Atmospheric Laboratory for Applications and Science-2 (ATLAS-2) Spacelab payload. ATLAS-2 is an element of NASA's Mission to Planet Earth Program and includes the same seven instruments flown on the March 1992 flight of ATLAS-1. These primary instruments will also be flown on ATLAS-3, now scheduled for launch in the fall of 1994. The primary purpose of ATLAS-2 was to collect data on the relationship between the sun's energy output and Earth's middle atmosphere and how these factors effect the ozone layer. The knowledge gained from ATLAS-2 and others in the Mission to Planet Earth Program are providing scientists with a greater understanding of Earth's continuously changing state.

Another significant payload on STS 56 was the Shuttle Point Autonomous Research Tool for Astronomy-201 (SPARTAN-201), a free-flying science platform that allowed scientists to study the velocity and acceleration of the solar wind and to observe the sun's corona. SPARTAN-201 was deployed from Discovery on April 11 and recaptured and berthed in the Orbiter on April 13. Many other smaller payloads flew inside the Orbiter's middeck. One of the most interesting is the ongoing Shuttle Amateur Radio Experiment (SAREX) that allows amateur ham radio operators from around the world to communicate with Shuttle astronauts. During this flight, astronauts made the first space-to-space ham radio contact when they briefly communicated with cosmonauts aboard the Russian space station Mir. Discovery completed 148 orbits during the STS 56 mission and landed on KSC runway 33 at 7:37 a.m. EDT on April 17. The mission duration was nine days, six hours and eight minutes. The crew consisted of Commander **Kenneth Cameron**, Pilot **Stephen Oswald** and Mission Specialists **Kenneth**

Cockrell, Michael Foale and **Ellen Ochoa**. During the mission, Ochoa became the first woman of Hispanic heritage to fly in space.

The third mission of 1993 began just nine days after the landing of STS 56. Columbia and STS 55 lifted off from Launch Complex 39A at 10:50 a.m. EDT on April 26. The launch was originally attempted on March 22 but was halted after main engine ignition and only three seconds before lift-off when a check valve in one of the vehicle's three main engines was found to be leaking. The launch was safely aborted, and all three engines were removed and replaced prior to the late April launch. The incident marked the first launch pad main engine shutdown since the Shuttle's return to flight in 1988 and was the third such occurrence in the Program's history. The other two engine shutdowns occurred on mission 41D in 1984 and on mission 51-F in 1985.

The main payload of STS 55 was the Spacelab D-2 module, a joint venture between the United States and the Federal Republic of Germany. It marked a unique collaboration in that the flight was controlled from NASA's Johnson Space Center while the mission itself was managed from a control center in Germany. The payload was comprised of 88 experiments in a variety of disciplines that included the materials and life sciences, technology applications, Earth observations, astronomy and atmospheric physics. The landing was originally planned for KSC but was diverted to Edwards Air Force Base [CA] runway 22 due to bad weather in Florida. Landing occurred on orbit 160 at 10:30 a.m. EDT on May 6. The mission duration was nine days, 23 hours and 39 minutes. At the end of the mission, the Shuttle fleet had accumulated more than a year in space: 365 days, 23 hours and 48 minutes. The international flight crew of STS 55 was comprised of Commander **Steven Nagel**, Pilot **Terence (TOM) Henricks**, Mission Specialists **Jerry Ross**, **Charles Precourt** and **Bernard Harris**. The two German Payload Specialists were **Ulrich Walter** and **Hans Schlegel**.

Endeavour was again called upon for STS 57, the year's fourth Space Shuttle flight; liftoff came at 9:07 a.m. from Launch Complex 39B on June 21. STS 57 marked the first flight of the commercially-developed SPACEHAB laboratory. A pressurized module that more than doubles the working area inside the Shuttle, SPACEHAB-1 carried 22 experiments in the fields of materials and life sciences. A wastewater recycling experiment for Space Station was also included inside the module. The flight also marked the end of an era for the European Retrievable Carrier [EURECA] payload. A free-flying science platform that was deployed in space in the summer of 1992, EURECA was retrieved and stowed aboard Endeavour on STS 57. The payload and its experiments were returned to Earth for analysis and will be re-flown in the coming years.

On the fifth day of the STS 57 mission, astronauts **Jeff Wisoff** and **David Low** conducted a five-hour, 50-minute-long spacewalk that continued research into the

abilities of humans in space. Eleven Get Away Special (GAS) payloads were mounted inside Endeavour's payload bay on STS 57. These small payloads require little, if any, action by the astronauts and generally test the effects of microgravity on certain chemicals and substances. The Shuttle Amateur Radio Experiment (SAREX) was again flown on STS 57. Endeavour returned to KSC at 8:52 a.m. EDT on July 1 with a landing on runway 33. The mission duration was nine days, 23 hours and 44 minutes. The six-member crew consisted of Commander **Ronald Grabe**, Pilot **Brian Duffy** and Mission Specialists **David Low**, **Nancy Sherlock**, **Janice Voss** and **Jeff Wisoff**.

Discovery's second and final flight of 1993 was the year's fifth and most trying launch. After three previous attempts - including a main engine shutdown on August 12 - Discovery left Pad B at 7:45 a.m. EDT on September 12. The mission was an ambitious one that included the deployment of a communications satellite, the deployment and retrieval of an astronomical observatory and a spacewalk by two crew members. The Advanced Communications Technology Satellite (ACTS) - considered to be the next generation of communications satellites - was successfully deployed from Discovery on the mission's first day. On the second day of the mission, the astronauts deployed the mission's second primary payload, the Orbiting and Retrievable Far and Extreme Ultraviolet Spectrograph-Shuttle Pallet Satellite (ORFEUS-SPAS) spacecraft. The first in a series of ASTRO-SPAS astronomical missions, ORFEUS-SPAS was an astrophysics observatory sponsored by both Germany and the United States. The payload was controlled and managed by officials at the SPAS Payload Operations Control Center (SPOC) located at KSC. This activity marked the first time that an on-orbit Shuttle payload has ever been completely managed from Florida.

A series of test-centered spacewalks conducted on STS 54 and STS 57 continued on the STS 51 mission. Astronauts **James Newman** and **Carl Walsh** ventured through Discovery's airlock on September 16 to evaluate tools, tethers and foot restraint platforms for their use on December's mission to repair the Hubble Space Telescope. The two astronauts spent seven hours and five minutes floating in Discovery's open payload bay, carefully testing the equipment for its comfort, durability and ease of use. Middeck payloads flown on the STS 51 mission included the IMAX camera and the year's second flight of the KSC-managed Chromosome and Plant Cell Division in Space Experiment (CHROMEX-04) that tests the reactions of microgravity on the development and growth of plants. The first night landing at Kennedy Space Center occurred at 3:56 a.m. EDT on September 22 when Discovery touched down on runway 15. The ship landed at the completion of 158 orbits and nine days, 20 hours and 11 minutes since launch. The STS 51 crew consisted of Commander **Frank Culbertson**, Pilot **William Readdy** and Mission Specialists **James Newman**, **Daniel Bursch** and **Carl Walz**.

Columbia's STS 58 mission, sixth of the year, launched from LC 39B at 10:53 a.m. EDT on October 18. Outfitted with extra fuel and provisions due to the installation of an Extended Duration Orbiter (EDO) pallet, Columbia and her seven-member crew went on to spend more than two weeks in space - a record for the Shuttle Program. The mission's prime payload was the Spacelab Life Sciences-2 (SLS-2) module. The second Shuttle mission dedicated to the study of life sciences, SLS-2 included 14 principal experiments that were divided into four specific study areas: regulatory physiology, cardiovascular/cardiopulmonary, musculoskeletal and neuroscience. Eight of the experiments focused on the astronauts, while the other six were centered on the 48 rodents that flew aboard Columbia during the mission. SLS-2 was the second in a series of Shuttle flights designed to study the effects of microgravity on living organisms. The first SLS mission was conducted on STS 40 during the summer of 1991. Six of the four dozen rodents were decapitated and dissected during the mission, yielding the first animal tissue samples to be collected in space and returned to Earth free of the physiological changes caused by re-exposure to gravity.

Other secondary experiments flown aboard STS 58 included the Shuttle Amateur Radio Experiment (SAREX) and the Portable Inflight Landing Operations Trainer (PILOT), a laptop computer simulator that allowed Shuttle commanders and pilots to maintain proficiency during longer flights. Columbia and crew completed the longest Shuttle mission with a landing on runway 22 at Edwards Air Force Base (CA); the landing occurred on orbit 225 at 10:05 a.m. EDT on November 1. The mission duration was 14 days and 12 minutes. The seven member crew included Commander **John Blaha**, Pilot **Richard Searfoss**, Payload Commander **Rhea Seddon** and Mission Specialists **William McArthur**, **David Wolf**, **Shannon Lucid** and **Martin Fettman**.

The final and most difficult Shuttle mission of the year was Endeavour's STS 61 mission which launched at 4:27 a.m. EDT on December 2 from LC 39B. Seven astronauts spent nearly two years training together and preparing for this mission to repair the Hubble Space Telescope (HST). Deployed into space during the STS 31 mission in 1990, HST was designed and built for on-orbit maintenance. During the course of the STS 61 flight, four astronauts conducted a record-high total of five spacewalks to remove, replace or repair components of the telescope. The spacewalking astronauts were divided into two teams of two. Payload Commander **Story Musgrave** joined up with **Jeffrey Hoffman** to perform three separate extravehicular activities [EVAs] while **Kathryn Thornton** and **Tom Akers** teamed together for two other work sessions outside Endeavour. European Space astronaut **Claude Nicollier** operated the Shuttle's robotic arm and worked closely with both groups of astronauts during all of the spacewalks.

Major work done on HST included the removal and replacement of its solar arrays, Wide Field Planetary Camera II, two rate sensor units and Solar Array

Drive Electronics Unit. A Corrective Optics Space Telescope Axial Replacement was mounted inside the telescope to correct the manufacturing flaw in its main mirror. Every mission objective was completed during the EVAs. The next HST repair mission is slated for 1997. The IMAX camera was also flown on STS 61, acquiring footage of the repair work done on HST and scenes from that effort will be included in the next IMAX film "Destiny" which is set for release next summer. The STS 61 mission ended December 13 with a nighttime landing at KSC on runway 33. Endeavour's touchdown occurred at 12:25 a.m. EST at the conclusion of 163 orbits. STS 61 was the 59th flight since the Shuttle Program began with Columbia's first mission on April 12, 1981. The STS 61 landing was the 18th at KSC. The crew included Commander **Richard Covey**, Pilot **Kenneth Bowersox**, Mission Specialists Story **Musgrave**, **Jeffrey Hoffman**, **Kathryn Thornton**, **Tom Akers** and **Claude Nicollier**. [**NASA/KSC Release No. 160-93**, Dec. 29, 1993.]

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