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Chronology of KSC and KSC Related Events for 1978

National Aeronautics and
Space Administration

John F. Kennedy Space Center

NASA

KSC FORM 16-12 (REV. 8/76)

CHRONOLOGY OF

KSC AND KSC RELATED

EVENTS FOR

1978

Selected and edited by
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January 4: A total of 1,117,603 people took tours of America's Spaceport or Cape Canaveral Air Force Station during 1977.

The 1977 total was 1.7 percent below the total of 1,137,367 who purchased NASA Tours tickets in 1976, bringing the total of those touring the Kennedy Space Center since the tour program was initiated in 1966 to 11,490,332.

The December, 1977, tour volume of 100,983 was exceeded in only four previous years and was 6.5 percent above the 94,783 patrons registered in December, 1976. Patronage during the December 26-30 period was 50,524.

Tour patronage has exceeded a million every year since 1969 with the exception of 1974. In that year, a gasoline shortage reduced Florida tourism and dropped the 1974 NASA Tours total below the 900,000 mark. (NASA News, Release No. KSC 1-78, January 4, 1978.)

January 6: Intelsat IVA-F3 was successfully launched aboard Atlas-Centaur-46 (AC-46) from Launch Complex 36B at Cape Canaveral Air Force Station. The January 6 launch, which occurred at 7:15 p.m., placed the satellite into the desired transfer orbit, with an actual apogee and perigee of 35,926 km and 548.7 km. The planned apogee and perigee were 35,941 km and 548.6 km. This is the fifth in a series of improved INTELSAT commercial communications satellites. It has almost two-thirds greater communication capability than one of the Intelsat IV spacecraft.

The apogee kick motor was fired successfully by COMSAT on January 7, placing the satellite into near geosynchronous orbit. After initial positioning at 74 degrees East longitude, the satellite will be moved to 60 degrees as back-up to F-6, that is scheduled to be on-station at 63 degrees East longitude by mid-June. The satellite is functioning satisfactorily and is currently being used for dual-polarization experiments. (Prelaunch Mission Operations Report, No. E-491-633-78-05, January 5, 1978. Also, Post Launch Mission Operations Report, No. E-491-633-78-05, June 23, 1978.)

January 9: NASA's John F. Kennedy Space Center awarded a contract for $14,557,506 to Honeywell Information Systems, Inc., for the fabrication and installation of the Central Data Subsystem for the Vandenberg Air Force

Base Shuttle Launch Processing System. Work under this contract is expected to be completed by November 30, 1981. (Wilson R. Dietz, Directorate of Electronic Engineering, KSC. Also, Procurement Document Control, KSC Contracts, 3/1/79, Contract No. NAS10-9315, pg. 14.)

o NASA's John F. Kennedy Space Center has awarded a contract for delivery of a Central Data Subsystem for Space Shuttle launch processing to the Federal Systems Division of Honeywell Information Systems, 7900 Westpark Drive, McLean, Va.

The Central Data Subsystem is one of two major elements of the Space Shuttle Launch Processing System developed by KSC for automated checkout of main Shuttle components from their arrival at the Spaceport until launch. The Launch Processing System will also be involved in automated checkout of Space Shuttle ground systems.

The basic contract for the subsystem is for $3,544,832. With the exercise of various contract options in the amount of $11,160,595, total contract value can reach $14,705,427. In addition to delivery of the subsystem, the contract provides for associated computer programs, documentation, installation and maintenance.

KSC is procuring the Central Data Subsystem for the Air Force. Installation will be at Vandenberg Air Force Base in California where a second Space Shuttle launch and processing facility will be developed.

The Central Data Subsystem consists of two large-scale computers that share a common memory. The memory stores test procedures, a master program library, pre- and post-test data analyses, and other types of data. Shuttle checkout, countdown and launch will be conducted with the support of information stored in the computers.

The other major element of the Launch Processing System is the Checkout, Control and Monitor Subsystem that performs the command monitor functions involved in test, checkout and launch operations.

The contract will involve work at Honeywell's Deer Valley Park installation in Phoenix, Ariz., and Vandenberg AFB under technical supervision of KSC and Air Force engineers. (NASA News, Release No. KSC 3-78, January 11, 1978. Also, NASA Contract, Contract No. NASA10-09315, January 9, 1978.)

o Two KSC inventions were recently granted patents by the U.S. Patent and Trademark Office. Charles H. Bell, DL-DED-33, was issued a patent on a "Fiber Optic Multiplex Optical Transmission System" and Adam M. Kissiah, Jr., of IN-TEL-21, for a patent on an "Implantable Electronic Hearing Aid."

KSC's Patent Counsel indicated that the unusual thing about these two inventions was that both were determined to be patentable by the U.S. Patent and Trademark Office on its first examination of the patent applications, resulting in the patents being granted within approximately one year. The average patent application is examined three different times which takes up to three years before the patent is granted. The early issuance of a patent usually is indicative of the invention having a high degree of novelty or uniqueness. (SPACEPORT NEWS, Vol. 17, No. 1, January 9, 1978.)

January 17: For the next three months the Spacelab Office of KSC will be involved in a grueling exercise dubbed the Spacelab Critical Design Review. The results of the CDR will be presented at a final board meeting on March 11, where decisions will be made on what design changes must be made before Spacelab can fly.

The European Space Agency's prime contractor, ERNO, assembled the Spacelab data, consisting of 34 volumes and approximately 3000 drawings, packaged 5 sets, which weighed a total of 500 pounds, for shipment to the U.S. on January 16. The data was printed in Bremen, Germany. It was then trucked from Bremen to Amsterdam, flown to Chicago where MSFC, KSC, JSC, and HQs arranged to route their part of the data to their respective Centers. The data arrived on January 17 at KSC on schedule.

The trouble-free handling of the voluminous material all the way from Bremen, Germany, to the Mission Briefing Room in the O&C Building was the result of very thorough coordination by the KSC Transportation Branch. They recommended the airline routing to MSFC, handled the clearance through the U.S. Customs at Port Canaveral, and delivered the data as planned. (SPACEPORT NEWS, Vol. 17, No. 3, February 3, 1978.)

January 24: NASA's John F. Kennedy Space Center has awarded a contract for $3,227,300 to the Holloway Corporation, Titusville, Fla.

The fixed price contract is for the construction of a Solid Rocket Booster Recovery and Disassembly Facility at Hangar AF at Cape Canaveral Air Force Station in connection with the Space Shuttle program.

Under the contract, existing facilities at Hangar AF will be modified to accommodate the processing of the Space Shuttle's solid rocket motors after their recovery from the Atlantic Ocean into which they are jettisoned shortly after launch. The empty solid rocket motor casings will be refurbished and refilled with propellant for use in subsequent shuttle missions.

Work under the contract, one set aside for small business firms, is to be completed within 335 calendar days. (NASA News, Release No. KSC 9-78, January 25, 1978. Also, NASA Contract, Contract No. NAS10-09300.)

January 25: NASA Administrator Dr. Robert A. Frosch appeared before a House appropriations subcommittee to defend the Carter Administration's decision to cut the planned fleet of five Space Shuttle Orbiters to four.

In the FY '79 NASA budget, this decision was reflected by the deletion of $9 million for long lead items for the fifth vehicle.

Rep. Edward P. Boland (D-Mass.), chairman of the HUD-Independent Agencies Subcommittee, opened the hearings by reminding NASA that one year ago it had vigorously maintained that five Orbiters were necessary to carry out the 560-flight mission model projected for the 1980-1991 time period; that four Orbiters would end up being substantially more costly than five, and that five Orbiters were necessary to phase out expendable launch vehicles.

Frosch conceded that NASA was "taking some risk" in committing to only four Orbiters--both in terms of the additional money it would cost later to build a fifth Orbiter and in terms of not being able to meet requirements on both the East and West coasts if an unexpected additional number of flights are scheduled or if one of the Orbiters has an accident.

He described the Administration decision as "a reasonable gamble that we will not need" the fifth Orbiter at all.

He said the agency would save $300 to $400 million by not buying the fifth Orbiter, and that the additional cost of procuring the Orbiter in 1981-1992, if it is decided to do so then, would be "a couple of hundred million."

Frosch said the position taken by the Office of Management & Budget is that the most probable number of missions to be carried out in the 1980-1991 time period could be accommodated by four Orbiters.

The NASA chief asserted that the agency simply does not know how many missions will be conducted in that period, suggesting it will be "somewhere between 300 and 500."

At 300, he said there is no difference between four and five Orbiters, between 300 and 400, the difference is very small, and only near 560 is there a major difference. (Defense/Space Business Daily, Vol. 96, No. 18, Friday, January 27, 1978, pg. 140.)

o Dr. Robert A. Frosch, NASA Administrator, presented to the House appropriations subcommittee the agency's plans to transfer $100 million for Space Shuttle production in FY '78 to design, development, test and evaluation.

He noted that the transfer assumes the availability of the $56.7 million in FY '78 funding that was deferred by Congress to assure that shuttle development progresses satisfactorily prior to initiation of production.

Frosch said the transfer of funds to RDT&E is necessary because of: 1) technical problems requiring redesign and additional testing, including the main engine and Orbiter hydraulic system, 2) new requirements such as the addition of a back-up flight control system and updated structural and thermal load increases resulting from wind tunnel tests, and 3) cost growth on the Orbiter thermal protection system.

NASA has already cut $100 million from production by slipping the third and fourth Orbiters by six months.

In other areas:

Frosch said he did not know what NASA's employment would be in FY '80 but said he has been asked by the President to make recommendations on whether NASA should stay the same size, grow, or become smaller in the future. The study will include an evaluation of the need to maintain existing centers, as well as the possible need for more centers.

Boland reported that the runout costs of the Solar Polar Mission are $300 million, for the Earth Radiation Budget Satellite, $85 million, and for the Teleoperator Retrieval System, $40 million.

Frosch said that NASA probably cannot meet its internal schedule of launching the first Space Shuttle in March 1979, but can meet the June 1979 official schedule. (Defense/Space Business Daily, Vol. 96, No. 18, Friday, January 27, 1978, pg. 141.)

o KSC will hold the First Annual Symposium for Brevard Students in Engineering and the Sciences on January 25 in the Training Auditorium.

Entitled "New Directions for Women in Science," the symposium is designed to promote and encourage students, with emphasis on women, who are interested in engineering and scientific careers. The program will inform them of some of the aspects of those careers, from entrance preparation to successful professionalism.

All ten Brevard County public high schools are participating and ten students from each school plus counselors and teachers will be at the Center for the day's events.

Deputy Director Gerald Griffin will open the day-long seminar with welcoming remarks.

KSC engineers Judy Anderson, JoAnn Morgan and Janette Gervin, and chemist Helein Bennett, will serve as career models by telling about their work and experiences. John Conway will talk on the "Male Reaction to Female Engineers," and Mary Anne Tyson of the Training Branch will explain NASA's Co-op and pre-Co-op programs. (SPACEPORT NEWS, Vol. 17, No. 2, January 20, 1978.)

January 26: The International Ultraviolet Explorer (IUE-A) was launched from Kennedy Space Center (KSC) at 12:36 P.M., EST, January 26, 1978. The launch countdown was interrupted some 4 hours before the planned 10:56 A.M. launch by a decision to better secure an access door on the Delta heat shield. This effort delayed the launch to 12:36 P.M. Otherwise, the launch and succeeding launch vehicle and spacecraft functions proceeded normally.

Tracking data, including Range and Range Rate data from the IUE transponders, obtained from the various NASA tracking stations established the transfer orbit elements as follows:

	Actual	Planned
Apogee	46,081 km	46,431 km
Perigee	173.5 km	167 km
Inclination	28.7 deg	28.7 deg

The spacecraft started reorientation of 180 degrees at 4:20 P.M. on January 26, after establishment and verification of the transfer orbit elements and spacecraft status, in preparation for the Apogee Boost Motor (ABM) burn. The reorientation was completed at 10:45 P.M., January 26.

The ABM burn to establish the mission orbit occurred at second apogee on January 27 at 9:53 A.M., EST. The motor burn was nominal and established an excellent mission orbit with the following elements:

	Actual	Planned
Apogee	45,886 km	46,431 km
Perigee	25,667 km	25,245 km
Inclination	28.7 deg	28.7 deg

The achieved orbit also met the desired ascending mode station point longitude of 44 degrees W with minimum drift. The drift rate is .1 degree per day east and can be stopped with minimal hydrazine usage. Due to combination of Delta launch vehicle and ABM performance and orbit computations, hydrazine usage is considerably less than planned.

IUE was designed to examine the spectral region which lies in the ultraviolet (UV) between 1150 Angstroms and 3200 Angstroms, a region inaccessible from the ground. This region includes the fundamental emissions of many of the common elements in the universe (hydrogen, helium, carbon, nitrogen, oxygen).

With nearly 200 astronomers from 17 countries -- including the Soviet Union -- already selected to conduct observations with IUE, the spacecraft will become one of the most widely used satellites in NASA history. Studies will range from planets in our own solar system to some of the most distant objects in the universe, including quasar, pulsars and black holes in space.

The IUE is an octagonal structure with the telescope protruding from the top and a fixed solar array on two opposite sides.

The telescope is a 45 cm (17.5 in.) diameter f/15 Cassegrain design, the function of which is to collect optical radiation from astronomical sources and present it to the spectrographs. The telescope will provide point-source images of about 1 arc-sec on-axis at its focal plane. The useful field of view of the telescope, 16 minutes of arc in diameter, is used to identify the desired target star for fine pointing.

- o Clear aperture — 45 cm (17.5 in.) diameter
- o Length — 130 cm (46 in.)
- o Effective focal length — 675 cm (263 in.)
- o Effective focal ratio — f/15

(Mission Operations Report No. S-868-78-01, Subject: International Ultraviolet Explorer (IVE-1), Post Launch Report No. 1, February 2, 1978. Also NASA News, Release No. 78-8, mailed January 20, 1978.)

January 31: The year 1978 marks the 20th anniversary of the launch of Explorer I, the first U.S. satellite. It began at 10:48 P.M., January 31, 1958, when a 70-foot tall modified Jupiter C rocket called Juno I lifted off from Complex 26 on Cape Canaveral and streaked skyward. Minutes later, an 18-pound, spinning, cylindrical satellite named Explorer I was in orbit around the earth. America had entered the space age.

The tiny artificial moon, launched as part of the U.S. contribution to the International Geophysical Year (IGY), went right to work and relayed the discovery of the Van Allen radiation belt, perhaps the most significant finding during the IGY. It also confirmed man's ability to control temperature within an artificial satellite and determined that micrometeorites posed no serious hazards to orbiting vehicles.

Although its signals ceased several months after launch due to battery depletion, it remained in orbit until March 31, 1970. The Explorer I was launched by the Army Ballistic Missile Agency's Missile Firing Laboratory under the direction of Dr. Kurt H. Debus, now retired. However, over 84 current NASA KSC employees were members of the MFL at the time of the historic event. (SPACEPORT NEWS, Vol. 17, No. 2, January 20, 1978.)

o At the FY '78 budget briefing, NASA officials made the following points:

Studies are continuing on a rendezvous mission to a comet which returns to the solar system more often than Halley's Comet. The agency felt it was not ready for a Halley's rendezvous mission in 1982. Consideration was given to a simple fly-by of Halley's but it was found to be too difficult and expensive.

There have been no problems considered "major" on the Space Shuttle Main Engine (SSME), with the exception of the subsynchronous whirl, which has been solved. Other problems are considered "normal" for a program of this character.

The reduction from five to four Space Shuttle Orbiters does not change NASA's plans to phase out its expendable launch vehicles.

The FY '79 NASA budget contains $2 million for the search for extraterrestrial intelligence.

Consideration is being given to new applications programs next year, including a follow-on to Seasat-A.

NASA is watching the development of the European Ariane booster but does not think it can effectively compete with the Space Shuttle.

The state of California is continuing discussions with NASA and industry about a dedicated communications satellite.

The 1982 Jupiter Orbiter Probe mission has been renamed "Project Galileo" in honor of the 16th century Italian astronomer who was the first to observe Jupiter by telescope. Galileo is scheduled to be the first planetary spacecraft launched by the Space Shuttle. (Defense/Space Business Daily, Vol. 96, No. 17, Thursday, January 26, 1978, pg. 134.)

o The Earth resources observation satellite, Landsat 1, was retired on Jan. 16, after an accumulation of technical problems put it out of commission. The NASA/General Electric spacecraft operated for five and one-half years although it was designed for only one year of operational life. A second Landsat was launched in 1975 and is still performing. A third is to be launched in March, with a fourth under construction.

Landsat 1 took more than 300,000 pictures, including the ones which Defense/Space Daily used for the first public disclosures of the Soviet launching complexes at Baikonur Cosmodrome, near Tyuratam and Leninsk, and Plesetsk, the principally military launch complex below the White Sea. (Defense/Space Business Daily, Vol. 96, No. 17, Thursday, January 26, 1978, pg. 135.)

The John F. Kennedy Space Center completed the installation of Firing Room Number Two Checkout, Control and Monitor Subsystem of the Shuttle Launch Processing System.

February 1: Testifying at the opening hearings on the FY '79 NASA budget by the House Subcommittee on Space Science and Applications, NASA Associate Administrator Yardley said it would cost $365 million plus inflation to build the fifth Orbiter if go-ahead was given now; $600 million plus inflation if a decision were delayed to FY '81.

The decision about the fifth Orbiter, he said, rests on the need to carry out the 560 missions projected over the 1980-1991 time period in the Shuttle Mission Model.

He described the 560 figure as an "optimistic upper limit. Some of us think we will get it. Others think we may reach 560 but not necessarily. If you are fully convinced that you need 560, you should buy it now," he told the subcommittee.

Asked by Rep. Larry Winn (R-Kans.) about his personal view, Yardley said his personal opinion is that "when the dust settles, we will have five Orbiters."

Yardley also reported to the subcommittee that the Defense Department, like NASA, wanted five Orbiters -- a decision overruled by OMB and the President.

NASA Space Shuttle director Mike Malkin said that NASA is studying various options for procuring Orbiter 105 at a later time.

The NASA officials also discussed the following Space Shuttle Systems:

-- Solid Rocket Motor. Yardley said that consideration has been given for some time to having an alternate source for the SRM but that it is too early to make a decision. He said the proper time for a recommendation might be when the Shuttle flight schedule reaches a point where the demand for the SRM's exceed's Thiokol's production capability. He said that Thiokol might or might not win the recompetition, which may not include fabrication of new cases.

-- External Tank. Malkin confirmed that NASA may have to make a change in some ET subcontractors because of cost and schedule factors.

-- Main Engine. Malkin reported that several outside groups, including the National Academy of Engineering, are working on the turbine blade

problem in the SSME and expressed confidence that the blade program will be solved and the SSME certified before the March 1979 deadline. He said a new hydrogen turbopump with a new blade damper is to be installed at the end of this week, and that an advanced damper, more precision machined, will be available in March. He said the present damper may be too heavy and not properly designed. Cost of present problems on the SSME was estimated at $10-$20 million. SSME testing is six months behind the schedule set in 1973. (Defense/Space Business Daily, Vol. 96, No. 23, Friday, February 3, 1978, pg. 183.)

o NASA's STS operations director Chet Lee, in testimony before the House Subcommittee on Space Science and Application, reported that Space Shuttle launch agreements have been signed with ten commercial, foreign and government users.

He said that the agency has also received advance payments for more than 160 self-contained payloads. A breakdown of 157 self-contained payloads signed for showed 9 industrial, 24-1/2 educational and 33-1/2 individual.

He also reported that NASA-Goddard, which has been assigned to assist self-contained payload users, has developed a package which could be used by self-contained payload customers.

In other areas, the NASA officials reported that:

A decision will be made in July about how to reimburse the European Space Agency for the second Spacelab, with "a strong possibility" existing that payment will be made in shuttle launch services in a barter arrangement. Contract is to be signed next fall.

A study by Booz-Allen concerning the operation of Space Shuttle facilities at Kennedy Space Center has concluded that less civil service and more contract personnel should be involved.

A study by the National Academy of Public Administration concerning the possible contracting out of Space Shuttle operations has concluded that the first ten years of the operations should be conducted by NASA.

Culbertson is to complete his report on NASA's projected role in the 1980's, including its size, shape and character, and submit it to the President in early spring. The report is now two-thirds complete.

The Office of Space Transportation's budget for Design, Test and Mission Operations (DTMO) will be reduced in FY '80.

The Soviets can be considered ahead of the U.S. in Space Station operations at this time, but with the Orbital Power Module and Skylab, the U.S. would be ahead.

The Structural Test Article (STA) Orbiter has been designed Orbiter 099. (Defense/Space Business Daily, Vol. 96, No. 23, Friday, February 3, 1978, pg. 183.)

February 2: The space agency said there is a 50-50 chance astronauts will be able to save the Skylab space station from uncontrolled disintegration in Earth's atmosphere late in 1979.

Contrary to some reports, there is no concern that the 84-ton, 118-foot assembly will return this year.

"The situation with Skylab is that it could come down in late '79 or 1980 or thereafter," said Robert Aller, an engineer specializing in plans for the Shuttle-Skylab mission.

Skylab, abandoned in 1974 after separately supporting three three-man crews in space for a total of 24 weeks, is now circling the globe every hour and a half, in an orbit 250 miles high.

Scientists expect increased solar radiation activity in the coming year or two to accelerate Skylab's descent by increasing the density of particles in the tenuous fringes of the upper atmosphere. This would increase the drag on Skylab and it would dip closer and closer until it is no longer going fast enough to remain in orbit.

If Skylab re-enters the atmosphere, much of it would break up but engineers expect some pieces to survive and hit Earth somewhere.

NASA has been planning for more than a year to try to reach Skylab and push it into a higher orbit. The plan now is to send two astronauts up on the Space Shuttle's third test flight in October 1979.

The astronauts would guide a radio-controlled rocket unit to a docking with Skylab. The rocket then would be fired to push Skylab into a higher orbit, where it will stay for years. If Skylab is too low to do that, the ship would be maneuvered so that it would re-enter the atmosphere over a remote ocean area.

"We have a 50-50 chance of getting up in time to do the docking," said William O'Donnell, senior NASA public affairs officer.

He said the best available estimate is that Skylab would be about 150 miles high in October 1979 when the rescue attempt is planned. If Skylab's orbit were not changed, he said the "best guess" is that the craft would re-enter the atmosphere in November or December of next year. (Sentinel Star Newspaper, Orlando, Florida, Friday, February 3, 1978, pg. 5-A.)

February 9: The Fleet Satellite Communications System A (FLTSATCOM-A) spacecraft was successfully launched into a synchronous transfer orbit by the Atlas-Centaur AC-44 at 1617:01.1 hours EDT from the ETR Launch Complex 36 on February 9, 1978:

The transfer orbit parameters were:

	Actual	Nominal
Inclination (degrees)	26.4581	26.4583
Eccentricity	0.732187	0.732262
Apogee Height (KM)	35,956.5	35,968.5
Perigee Height (KM)	167.20	167.20

The spacecraft apogee kick motor was successfully fired at fifth apogee on February 11, 1978, injecting the FLTSATCOM spacecraft into the desired synchronous orbit. All spacecraft systems were turned on and are operating nominally.

The FLTSATCOM spacecraft consists of two major hexagonal elements, a payload module and a spacecraft module. A majority of the electronic equipment is mounted on 12 panels that enclose the payload and spacecraft modules.

The payload module, which is fastened to the six corners of the spacecraft module, contains the UHF and X-band communications equipment and antennas. The UHF transmit antenna is made of ribs and mesh that opens like an umbrella, and the receive antenna is a separate, deployable helix. The spacecraft provides 23 UHF and one SHF communications channels inlcuding: Fleet broadcast, channel 1; Fleet relay, channels 2 through 10; Air Force narrowband, channels 11 through 22; and DoD wideband, channel 23. (Mission Operation Report No. M-491-202-78-01, Subject: FLTSATCOM-A Post Launch Report, April 14, 1978. Also, Mission Operation Report No. M-491-202-78-01, Prelaunch Report, Subject: FLTSATCOM-A Launch, February 3, 1978.)

February 17: The $110.5 million requested by NASA in FY '79 for Space Transportation System Operations Capability Development (Defense/Space Daily, Jan. 24) is allocated as follows:

Spacelab: $39 million. The Spacelab integration contractor, McDonnell Douglas Technical Services Co., will continue to develop and fabricate the majority of NASA hardware in support of the ESA-developed Spacelab. NASA plans to contract in the next two months for a Spacelab simulator to be used for training crew members at Johnson Space Center.

STS Upper Stages: $16.5 million. Funding covers NASA activities for the Inertial Upper Stage (IUS) being developed by Boeing for the Defense Department and the Spinning Solid Stages (SSUS) being developed at no cost to NASA by McDonnell Douglas as a commercial venture. IUS funding in FY '79 includes the design and development of a NASA twin-stage and twin-stage plus spinner (three stage) hardware configurations and software items; modifications to the basic airborne support equipment, and development of NASA IUS launch site ground operations capability. SSUS funding includes planning for ground processing and flight operations, and procurement of hardware and services for SSUS-A system verification.

Multimission & Payload Support Equipment: $10 million. The MMPSE consists of ground and flight interface hardware between payloads and the STS which will be developed into a standard, reusable inventory for all payloads.

Mission Control Center Upgrading: $13 million. Funds support work to configure the Mission Control Center at Johnson Space Center with the capability to support two Space Shuttle Orbiters simultaneously, a ground simulation network, and a MCC/launch site interface. Design requirements for an automated flight planning system capable of handling a minimum of 20 flights per year are being developed. This capability will be augmented as the flight rate increases.

Payload & Operations Support: $32 million. This funding includes $20.5 million for the Skylab reboost or deorbit mission, based on use of the Teleoperator Retrieval System. A decision on disposition of Skylab is scheduled for early 1979. Other funds cover work to integrate payloads on early Shuttle flights and to provide facilities for command and control of Shuttle/Spacelab attached payloads. (Defense/Space Business Daily, Vol. 96, No. 33, Friday, February 17,. 1978, pg. 263.)

February 28: In the first congressional action on the FY '79 NASA budget request, the House Subcommittee on Space Science & Applications yesterday restored the additional $4 million needed by NASA to continue work toward construction of a fifth Space Shuttle Orbiter.

The agency had requested $9 million in FY '79 for work on the fifth Orbiter but the funding was denied by the OMB in its controversial decision to cut back to four Orbiters.

Subcommittee chairman Rep. Don Fuqua (D-Fla.) pointed out yesterday that the agency would have to put out a "penalty" $5 million in FY '79 if the fifth Orbiter were eliminated and said by providing an additional $4 million the nation would benefit by retaining the option for a fifth Orbiter, which he said is probably going to be needed. Fuqua was supported by Rep. Larry Winn (R-Kans.), the ranking minority member of the subcommittee.

If the decision is made next year to continue development of the fifth Orbiter, funding of $103 million will be required in FY '80. If the fifth vehicle is not approved, a penalty of $50 million will have to be paid anyway, the subcommittee said.

It put the total cost of dropping the fifth Orbiter at $220 million; the total cost of building it, at $365 million. A two-year delay in go-ahead, would boost the cost of the fifth Orbiter by $235 million.

The decision to fund the fifth Orbiter, which is advocated by NASA's associate administrator for space transportation systems, John Yardley is also supported by the Senate subcommittee handling the NASA authorization. In addition, the House appropriations subcommittee responsible for NASA funding has indicated its support for the fifth vehicle. This leaves the Senate appropriations subcommittee, which is chaired by Sen. William Proxmire (D-Wis.). (Defense/Space Business Daily, Vol. 97, No. 1, Wednesday, March 1, 1978, pg. 4.)

During February: The John F. Kennedy Space Center completed the installation of Firing Room Number One Checkout, Control, and Monitor Subsystem of the Shuttle Launch Processing System.

- The John F. Kennedy Space Center awarded an add-on to Contract NAS10-8845 to the Martin Marietta Corporation consisting of the Checkout, Control, and Monitor Subsystem (CCMS), for the Vandenberg Air Force Base Shuttle Launch Processing System. (Wilson R. Dietz, KSC Directorate of Electronic Engineering.)

March 5: Landsat-3 (formerly Landsat-C), the third of this series, was successfully launched from the Western Test Range (WTR) at 12:54 P.M., EST, on March 5, 1978.

The countdown at WTR proceeded without problem, and the Delta launch vehicle performed in an excellent manner as indicated by the predicted and actual orbital parameters listed below:

	Nominal	Actual
Apogee Altitude (km)	911.853	26.4583
Perigee Altitude (km)	903.927	897.3
Period (minutes)	103.302	103.108
Inclination (degrees)	99.149	99.134
Eccentricity	0.000544	.0011

On March 7, 1978, previously planned orbit adjustment maneuvers were performed to further trim the orbit and to place Landsat-3 into an orbit where it will lag Landsat-2 by nine days.

The separation of the spacecraft from the vehicle was nominal, occurring 73 minutes after liftoff, while in view of the Winkfield, England, tracking station. Solar array deployment and Earth acquisition by the attitude control system were accomplished with no problems.

Landsat-C is a 900 kg spacecraft utilizing the same spacecraft systems that its predecessors used. Spacecraft attitude control is provided by a 3-axis Earth-oriented stabilization system; an orbit adjust system is utilized to maintain a repetitive ground track. Landsat-C is equipped with a 5-Band Multispectral Scanner, instead of the 4-Band unit used on previous Landsat missions. The 5th band measures emitted terrestrial infrared radiation in the 10.4-12.5 um band. The original 4 bands measure reflected visible and near infrared radiation in the .5-1.1 um range. Landsat-C has an improved 2 camera Return Beam Vidicon Camera system that provides higher resolution (40 meter) panchromatic images than the RBV's flown earlier. A Data Collection System for relaying information from remote collection platforms via the Landsat-C to ground acquisition stations is continued, as on previous missions. Two piggy-back payloads are included in this launch, one is a plasma interaction experiment, the other is an OSCAR amateur radio relay satellite.

The Wide Band Video Tape Recorders (WBVTR) have been operated in the playback mode using Multispectral Scanner (MSS) and Return Beam Vidicon

(RBV) data recorded during prelaunch tests. The quality of these playbacks was excellent.

All spacecraft and payload systems which have been activated are performing well and no anomalies have been reported. Operational data from the spacecraft (except for the thermal infrared band) should be available by the week of March 13, 1978. (Mission Operation Report No. E-641-78-03, Subject: Landsat-3 Post Launch Report No. 1, March 8, 1978. Also, Mission Operation Report No. E-641-78-03, Prelaunch Summary, January 25, 1978.)

March 6: NASA technicians made contact with the ailing Skylab space station Monday, but the results, they said, were inconclusive.

The contact was made from a tracking station in Bermuda in an effort to determine if the giant space station can again be inhabited and to see if its re-entry into the Earth's atmosphere can be controlled.

The space agency estimates Skylab will re-enter the Earth's atmosphere sometime between the summer of 1979 and the early part of 1980 unless something is done to slow its gradual descent out of orbit.

NASA officials have expressed concern that although the majority of the 85-ton, 118-foot space station will burn up upon re-entering Earth's atmosphere some of its pieces might hit the ground.

Following Monday's attempt to contact Skylab, NASA spokesman John Taylor said the space agency's scientists, engineers and technicians found one power converter is apparently not functioning and the motion of the spacecraft is causing intermittent power losses when contact is made with the Skylab's on-board computers.

However, Taylor added that the spacecraft has two other power converters that were not tested Monday. He also said the scientists did establish that the on-board computers apparently did receive and decode some of the ground station commands.

The space agency hopes to put the Skylab into a slow tumble which would decrease the drag of the Earth's atmosphere on the spacecraft and allow two Space Shuttle astronauts to visit the station in October 1979.

The astronauts, who would be flying on the third test flight of the Shuttle, would place a rocket motor on board Skylab which would either send

the space station into a very high orbit or let it come back to the Earth at a pre-determined location, preferably in an ocean area.

During Monday's tests sporadic contact was made with Skylab as it passed 220 miles above Bermuda.

Scientists and engineers received information from the space station for two minutes or less and then received nothing for the next several minutes.

Skylab was the home for three groups of astronauts during 1973-74. After the last astronauts left the space station in early 1974 Skylab was turned off and no contact had been made with the spacecraft until Monday. (Dick Baumbach, Today Newspaper, Cocoa, Florida, Tuesday, March 7, 1978.)

March 15: Answering expected criticism of the two-site Space Shuttle program from GAO and some members of Congress, the Pentagon's Dr. William J. Perry has told Congress that the second Shuttle site at Vandenberg AFB is absolutely necessary to carry out the DOD's launches into high inclination orbits (Sun-synchronous, polar and near-polar).

Testifying before a joint hearing of the House Appropriations Subcommittees on Defense, Military Construction and HUD-IA, the DOD's undersecretary for R&E pointed out that the spacecraft which DOD will launch on the Shuttle from Vandenberg "include our heaviest spacecraft which support missions of highest national priority." [About 45 DOD missions from Vandenberg are projected for 1980-92.]

The high inclination orbits required by these spacecraft, he said, "cannot be achieved from Kennedy Space Center without unacceptable overflight of populated land areas during launch, potential international problems, and unacceptable performance loss." Therefore, DOD has concluded that "KSC polar launches are not acceptable and that we must have Shuttle launch and landing facilities at Vandenberg."

He expanded on the problems with KSC as follows:

On a northerly launch from KSC to polar orbit the Shuttle would fly over the eastern U.S. and Canada. This would "routinely entail possible casualty expectations (risk to life and property) greater than now considered prudent." While the Shuttle will be an extremely reliable vehicle, "we are certainly not at the point now where we can ignore casualty expectations and commit ourselves to routine overflight of densely populated areas during Shuttle launch."

Northerly, high inclination Shuttle launches from KSC which pass over Soviet territory will be "disconcerting and perhaps objectionable to the Soviets" even if they get prior notification. "No matter how sophisticated the Soviet radars, the similarity of such northerly Shuttle launches to potential U.S. ICBM launches can lead to adverse Soviet reaction, if done routinely. Under worst case conditions, such as Shuttle breakup during ascent, a severe Soviet response cannot be discounted. . ."

Northerly launches from KSC result in "severe degradation" of Shuttle payload delivery capability. Maneuvering of the Shuttle to fly off the east coast of Florida to avoid populated areas and sonic boom problems would reduce the Shuttle's payload on a 98-degree, 150-nautical-mile mission to 22,000-24,000 pounds, which is less than that of current boosters (24,300 pounds) -- "and is totally unacceptable for the mid-1980 period." (Defense/Space Business Daily, Vol. 97, No. 11, Wednesday, March 15, 1978, pg. 84.)

March 17: The U.S. Navy's three-pound Vanguard I satellite, the second U.S. satellite to be orbited and currently the oldest satellite in orbit, marked the twentieth anniversary of its launch March 17. Two previous Vanguards had failed on Dec. 6, 1957, and on Feb. 5, 1958. The first U.S. satellite, Explorer 1, was successfully launched by the Army on Jan. 31, 1958. The Vanguard Association suggested that the historic satellite may be recovered in the future by the Space Shuttle and put on display. (Defense/Space Business Daily, Vol. 97, No. 17, Thursday, March 23, 1978, pg. 131.)

March 28: NASA's John F. Kennedy Space Center has awarded a $489,800 one-year contract extension for mail and distribution support services to Atlantic Technical Services, 290 Iris Road, Casselberry, Fla.

The new contract, a set-aside for small business firms, extends from April 1, 1978 through March 31, 1979.

Atlantic Technical Services has been KSC's contractor for mail and distribution support services since April, 1971. (NASA News, Release No. KSC-31-78, March 28, 1978).

o NASA's John F. Kennedy Space Center has awarded a $249,477.84 one-year contract extension for library and information support services to New World Services, Inc., 731 Kirkman Road, Orlando, Fla.

The contract, which is set-aside for a small business firm, was extended to cover the period from April 1, 1978 through March 31, 1979.

A contractor for KSC library services since 1971, the company originally had a three-year contract under Section 8(a) of the Small Business Act which gives minority-owned small business firms an opportunity at contracts they might not ordinarily receive.

The company successfully competed for the library services in 1974, becomin the first firm at KSC to progress from the 8(2) status to regular contract status. (NASA News, Release No. KSC-33-78, March 28, 1978.)

o NASA's John F. Kennedy Space Center has awarded a contract to the University of Florida to study the development of a water management system using satellite data and other NASA-developed technology.

The fixed-price contract is for $99,013 and covers a one-year period which began March 3. Participating in the project with the University of Florida's Institute of Food and Agricultural Sciences are Florida's five water management districts and personnel from KSC's applications office.

The study could result in a Florida Water Resources Management Information System, a computerized bank of information that managers can draw from to aid their decisions on meeting growing water demands. The system containing data compiled from earth resources satellites like NASA's Landsat, and the National Oceanic and Atmospheric Administration's GOES satellite, would take out much of the guesswork still involved in the water management process.

Florida's need for a comprehensive water management system was substantiated by results of studies conducted by the University of Florida and the South Florida Water Management District.

The University study showed a lack of water as the foremost problem facing agriculture in Florida, while the South Florida District reported that water demand in that area would equal the existing supply by about 1980.

These studies, coupled with a 1972 mandate by the Florida Legislature calling for the formation of a water use and supply development plan, prompted the Florida Water Management District to seek the University's resources and the Spaceport's technology to help them solve their complex problems.

The Kennedy Space Center is NASA's prime launch and recovery site for the Space Shuttle, scheduled for its first manned orbital flight from here in 1979. (NASA News, Release No. 32-78, March 28, 1978.)

March 31: Intelsat IVA F-6, the last of the Intelsat IVA series, was successfully placed into the desired transfer orbit by an Atlas Centaur vehicle, thus meeting all NASA objectives. The satellite was launched from Cape Kennedy at 6:36 P.M. on Friday, March 31, 1978.

Orbital Parameters	Planned	Actual
Apogee* (km)	35,941	35,912
Perigee* (km)	548.7	548.8
Inclination (deg)	21.83	21.84
Eccentricity	0.71868	0.71851

*Measured from Earth's surface

The apogee kick motor was fired by COMSAT on April 1 placing the satellite into a near-geosynchronous orbit. The satellite will continue to drift slowly toward its final location over the Indian Ocean and should be on-station at 63 degrees East longitude by mid-June.

All preliminary functional checks of the satellite are satisfactory. The F-6 will serve as the primary satellite for the Indian Ocean area.

The Intelsat IVA spacecraft has an overall height of 6.99 meters and a diameter of 2.38 meters. The height of the solar panel is 2.82 meters. Lift-off weight is approximately 1515 kg (3340 pounds), and in-orbit weight after apogee motor firing is 825.5kg (1820 pounds).

Although it has the same basic structural design as its predecessor, the Intelsat IVA spacecraft incorporates new antenna technology to yield about 6250 two-way voice circuits plus two television channels in the system configuration in which it will be used. This is two-thirds greater than the communications capacity of the Intelsat IV series satellite. The increased capaciy is made possible by a new antenna design which provides coverage of land masses on both sides of the Atlantic basin, using shaped beams. The eastern and western beams are sufficiently isolated to allow the frequency spectrum to be used twice -- once in the east and once in the west direction -- thus doubling the use of the frequency spectrum and increasing the communications capacity of the satellite. (Mission Operation Report No. #-491-633-78-06, Subject: Intelsat IVA F-6 Post Launch Report, June 23, 1978. Also, Mission Operations Report No. E-491-633-78-06, Prelaunch Summary, March 20, 1978.)

April 7: NASA's John F. Kennedy Space Center has awarded a contract for production of recovery systems for expended Space Shuttle solid rocket booster (SRB) casings to the International Hydrodynamics Co., Ltd., 145 Riverside Drive, Vancouver, British Columbia.

The $1,022,315.12 contract, awarded through the Canadian Commercial Corp., Ottawa, Ontario, provides for fabrication, testing and delivery of the recovery systems, called solid rocket booster nozzle plugs, and includes associated equipment and hardware. International Hydrodynamics is a small business firm.

The Space Shuttle's two SRBs, burning with the Orbiter's three main engines, will produce the thrust to place the Orbiter in earth orbit. Following burnout, about two minutes after launch, the expended SRBs will be jettisoned and parachute into the Atlantic Ocean about 146 nautical miles down range from the Kennedy Space Center launch site.

Two retrieval ships, each carrying a nozzle plug, will be stationed in the Atlantic Ocean near the landing area.

Each of the ships will recover a SRB casing, and the parachute and the frustum-drogue chute combination used in returning SRBs to the Earth's surface.

A nozzle plug is essentially a long motorized cylindrical metal cork. Operated remotely through an umbilical cord connecting the nozzle plug with pneumatic and control equipment on the ship, the plug swims into the tail section of a 129-foot long casing, secures itself in position and pumps air into the cavity.

This raises the casing partially out of the water, causing it to tip from vertical to the horizontal position necessary for towing it back to land.

Sizeable savings will be achieved through recovery of the SRB casings. With a scheduled lifetime of 19 reuses of a casing, the saving to be obtained through reuse of the casing, including the cost of retrieval and refurbishment, will be $47 million.

Parachutes will be reeled onto a large spool on the ship and the frustum will be lifted onto the deck by a ship's crane. (NASA News, Release No. KSC 37-78, April 10, 1978. Also, NASA Contract, Contract No. NAS10-9358, February 7, 1978.)

o The Japanese Direct Broadcast Satellite - Experimental (Japan/BSE) was launched into a synchronous transfer from the Eastern Test Range at 5:01 P.M., EST, on April 7, 1978, by a Delta 2914, Vehicle Mission Number 140.

Performance of the Delta launch vehicle was nominal and placed the spacecraft and its apogee boost motor (ABM) into the desired transfer orbit. The orbital elements achieved compared with the nominal expected, are as follows:

	Expected	Measured
Apogee (km)	35,975	35,923
Perigee (km)	166.6	166.1
Inclination (degrees)	27.2	27.2

The satellite performed satisfactorily during the transfer orbit, and the ABM was fired successfully at 7:34 P.M., EST, on April 8, 1978. The satellite is being maneuvered over the South Pacific to a position approximately 110 degrees East longitude above the equator and south of Japan. At this time, all subsystem functional checks are complete and satellite status is satisfactory.

The spacecraft configuration maximizes the mission benefits of a 3-axis controlled spacecraft by proving a fixed (non-gimballed or rotating) antenna platform, large North/South-viewing equipment panels for passive heat rejection, and an oriented solar array for efficient generation of power. The spacecraft in orbital configuration along with key spacecraft characteristics is shown in Figure 3. The packaging flexibility of the 3-axis design is utilized to obtain a favorable moment of inertia about the spin axis, assuring stable spin control with passive nutation damping during the transfer orbit and apogee kick motor firing.

The BSE spacecraft weighs 665 kg (1490 lb), including Apogee Boost Motor (ABM) at launch, is 1.3 m (4.4 ft) wide, 1.2 m (4.0 ft) long, and 3.9 m (12.6 ft) high. The spacecraft final weight in geosynchronous orbit after firing of the ABM will be 327 kg (745 lb). The solar panels, extended in orbit, measure 8.9 m (29.5 ft) in length and 1.5 m (5 ft) in width when fully deployed. (Mission Operation Report No. M-492-212-78-01, Subject: Japan - BSE/Delta Post Launch Report, June 28, 1978. Also, Mission Operation Report No. M-492-212-78-01, Prelaunch Report, Subject: Japan Broadcast Satellite Experimental (BSE) - Delta Launch.)

April 13: NASA has issued a new in-house Five-Year Plan (FY '79-83) which sees the agency's budget rising from $4.35 billion in FY '79 to $4.65 billion in FY '80 and to $4.9 to $5.0 billion annually in the FY '81-83 period. All figures are in FY '79 budget dollars.

In the agency's previous Five-Year Plan, issued about a year ago, budgets of $4.7 billion annually (FY '78 dollars) were projected for the FY '80-82 period. Using a 7-8 percent inflation index to update last year's dollars, the NASA budget under last year's plan would have topped the $5 billion mark beginning in FY '80.

NASA chief scientist John E. Naugle explained the Five-Year Plan as follows: "It represents our perception as to what programs we can undertake, within the resources likely to be available to us, that will be most valuable to the nation".

He said the program included in the newly revised plan was developed on the basis of "optimistic realism." He described the program as one "the nation can afford and (that) is realistic both in rate of scientific progress and in what would constitute a reasonable, slightly aggressive program of space research and development."

The plan assumes that the level of NASA's manpower and administrative services will remain approximately constant throughout the five-year period. It does not reflect any possible changes that may result from the institutional study conducted by NASA for President Carter covering what the agency should be doing and what resources it should have five years from now. The Five-Year Plan was the starting point for that study. (Defense/Space Business Daily, Vol. 97, No. 32, Thursday, April 13, 1978, pg. 254.)

April 14: The Senate Subcommittee on Science, Technology & Space approved a $13 million increase in the FY '79 authorization requested by NASA, including $4 million to continue work towards construction of a fifth Space Shuttle orbiter.

The additional $4 million for the fifth orbiter -- a vehicle specifically not sought by the Carter Administration -- has also been approved by the House Committee on Science & Technology, which voted an overall increase in the NASA budget of $28.2 million.

The bill approved Friday by the Senate subcommittee totals $4,384,600,000, including $3,318,109,000 for R&D, where all the increases were made.

In marking up the NASA bill, subcommittee chairman Sen. Adlai E. Stevenson (D-Ill.) emphasized his intention to stay with the $3.8 billion guideline for Space Research and Technology just recommended by the Senate Budget Committee. The guideline, which coincides with the Administration's $3.804 billion estimate, includes a plus or minus leeway of $50 million, which meets the subcommittee's desire for a $3.85 billion figure. Certain space R&T is done outside of NASA.

As in past years, most of the actions taken by the House and Senate units do not coincide, leaving most of the matters to a conference committee compromise.

The actions taken by the Senate subcommittee -- which was comprised only of Stevenson and Sen. Harrison Schmitt (R-N.M.) -- were as follows:

Space Shuttle: +$4 million for fifth orbiter.

Space Flight Operations: +$3 million. The additional funding is to go for Advanced Programs, including $2 million for development of the 25 KW Power Module.

Expendable Launch Vehicle: approved NASA request. The House committee cut the NASA request by $5 million.

Physics & Astronomy: approved NASA request. The House also made no change in the NASA request. Cut by OMB from P&A: the Gamma Ray Observatory.

Lunar & Plantetary: approved NASA request.

Life Sciences: +$2 million. The money will fund experiments for Spacelab to study the long-term effects of space flight on man.

Space Applications: approved NASA request.

Technology Utilization: approved NASA request. The House added $5.5 million.

Aeronautics R&T: approved NASA request. The House added a total of $28.2 million -- $26.7 million for composites research, $1.5 million for agricultural aircraft, and $12 million for SST technology, with the latter offset by a $12 million reduction in the subsonic engine component improvement and energy efficient transport programs.

Space R&T: +$3 million. The additional funds would go for materials development, R&D on large structures, advanced propulsion, communications, etc. The House added $3 million for Solar Power Satellite studies, including large space structures.

Energy Technology: +$1 million. The funds are for non-Solar Power Satellite work, e.g., testing advanced energy systems at NASA facilities.

Schmitt had sought a $3 million increase. The House added $3 million for Solar Power Satellite R&D.

T&DA: approved NASA request. The House voted a $5 million general cut offset by an addition of $4 million for a data processing facility at GSFC to handle data from Spacelab. The Senate subcommittee indicated support for the data processing facility in FY '80.

Construction: approved NASA request. The House cut $5 million.

R&PM: approved NASA request. The House did the same.

The Subcommittee's bill is scheduled to go to full committee on April 25. (Defense/Space Business Daily, Vol. 97, No. 34, Monday, April 1, 1978, pg. 271.)

April 30-May 6: During the week of April 30 - May 6, the John F. Kennedy Space Center joined other NASA centers and government agencies for Small Business Week, honoring the country's more than 13 million small businesses.

Supporting small businesses is something KSC takes seriously all year. During fiscal year 1977, KSC issued nearly $40 million in contracts to small business firms. Jack Dryer, industry advisor and small business specialist from KSC's Procurement Office, reports that $14 million of that went to small Florida-based firms, with many of the contracts granted to local businesses.

At the midway point in fiscal 1978, KSC has awarded $17 million to small business firms.

Small businesses account for 13 million of the 14 million businesses in the United States today, including some three million farms. Employment for over half the labor force and more than 48 percent of the gross business product is provided by small business firms.

Small businesses at KSC currently operate the technical and research library, provide janitorial services, furnish printing and reproduction services, handle the mail and distribution duties, and run the Center's calibration laboratory, component refurbishment facilities and key punch service. All construction contracts under $1 million are restricted to small business firms.

Several years ago KSC initiated a new provision in construction contracts, totaling more than $500,000, requiring the prime contractor to sub-contract at least 20 percent of his total subcontracted work to minority-owned firms. Since that time similar provisions have been adopted by other government agencies across the country. (SPACEPORT NEWS, Vol. 17, No. 9, April 28, 1978, pg. 3. Also, NASA News Release No. KSC 44-78, April 25, 1978.)

May 1: NASA's John F. Kennedy Space Center has awarded a $67,555 contract to Citrus Mechanical, Inc., of Inverness, Fla. The contract calls for modifications to the Headquarters Building cafeteria's hot water heating systems by adding a solar heat collection system. (A similar system was previously added to the Visitor Information Center's hot water system.) (Memo from AD-PRO/Procurement Office to PA/Public Affairs Office, Subject: Contract Award Information, Contract No. NAS10-9371, May 1, 1978.)

May 11: For the past several years KSC has encouraged use of annual leave during the end-of-year holiday periods. This policy resulted in significant cost savings and has been operationally effective. During the holiday period of December 24, 1977, through January 2, 1978, KSC's energy savings amounted to 1,618,750 KWH of electricity worth approximately $48,000.

Because of the arrival of Shuttle hardware later this year, the holiday leave policy must be changed for many of you who will be involved in Shuttle related operational activities. Those of you who will not be involved in Shuttle activities during the holiday time frame should plan holiday leave as in past years so that we can close buildings as much as possible. Others should schedule their leave to avoid loss at the end of the year and be available for work as needed.

Your supervisors will advise you regarding which category you are in so that you can finalize leave plans as soon as possible. With your support, our efforts to conserve energy while maintaining effectiveness will be successful. (Letter to Distribution from Lee R. Scherer, Director, KSC, May 11, 1978.)

o The European Space Agency's Orbital Test Satellite (OTS-B) was launched into a synchronous transfer orbit from the Eastern Test Range at 6:59 p.m., EDT, on May 11, 1978, by a Delta 3914, Vehicle Mission Number 141.

Performance of the Delta Launch vehicle was nominal and placed the spacecraft and its apogee boost motor (ABM) into the desired transfer orbit. The orbital elements achieved compared with the nominal expected, are as follows:

	Expected	Measureed
Apogee (km)	36,096	35,946

Perigee (km)	185.0	183.6
Inclination (degrees)	27.4	27.4

The satellite performed satisfactorily during the transfer orbit and the ABM was fired successfully at 8:00 a.m., EDT, on May 13, 1978. The satellite is being maneuvered over the South Atlantic to a position at 10 degrees East longitude above the equator. At this time, all subsystem functional checks are complete and satellite status is satisfactory. This was the first flight of the Delta 3914 (Caster IV) configuration since the failure of the OTS-A mission last September.

The Orbital Test Satellite is the forerunner of a European operational communications satellite network of the 1980s called the European Communications Satellite (ECS) system which will operate in the 11-14 GHz region.

This new type of communications spacecraft is one of two experimental models built by ESA to test the concept's performance in orbit. The concept is to use these frequencies to provide satellite links in the 1980s for the routing of portions of the intra-European telephone, telegraph and telex traffic as well as television relay for Western Europe handled by organizations in the European Broadcasting Union (EBU).

The spacecraft was built under the supervision of the European Space Agency by industries in 10 European countries: Belgium, Denmark, France, Germany, Italy, Netherlands, Sweden, Switzerland, the United Kingdom and Spain with Hawker-Siddeley Dynamics of Stevenage, England as prime contractor.

Principal co-contractors are: AEG-Telefunken (Germany), Aeritalia (Italy), ERNO (Germany), MATEA (France), and SAAB (Sweden).

The OTS satellite is also expected to be valuable for such difficult communications tasks as establishing communication links with areas of difficult access such as offshore oil rigs in the North Sea, and throughout the Europen continental shelf. Other potential applications are educational television, teleconferencing and radio broadcasting.

The ultimate ECS operational system calls for satellite transmission of from a third to half of European telephone traffic during the 1980s involving 5,000 to 20,000 phone circuits with at least one large Earth station handling telephone traffic and television transmissions in each country requiring satellite services, and eventally including North Africa and the Middle East. (Mission Operation Report no. M-492-210-78-02, Subj: ESA-OTS-B/Delta Post Launch Report, d. June 28, 1978. Also Mission Operations Report No. M-492-210-78-02, Prelaunch Report, Subj: ESA Orbital Test Satellite (OTS-B) - Delta Launch, d. April 27, 1978.)

- NASA's KSC negotiated a $1,133,420 supplemental agreement to a contract, McDonnell Douglas Technical Services Co., Inc. The agreement brings the total amount of the contract to $13,773,452. Under this supplemental, McDonnell Douglas to continue the definitization of program schedule changes and transfer of certain ground support equipment from the Marshall Space Flight Center to Kennedy Space Center under a Change Order to the KSC Spacelab Integration Supplement. Work under this cost plus award fee contract is to be completed by March 31, 1981.

May 12: NASA's Kennedy Space Center has awarded a fixed price contract to Fluid Scientific, Inc. of Orlando, Florida. The $173,406 contract calls for the contractor to provide two fuel and one oxidizer vapor type Hypergol Subber for the Secondary Landing Site and the Shuttle Payload Vertical Processing Facility. Work under the contract is to be completed by December 1, 1978. (Memo to PA/Public Affairs Office from AD-PRO/Procurement Officer, Subject:Contract Award Information, Contract NAS10-9400, d. May 18, 1978.)

May 15: NASA's Kennedy Space Center negotiated a supplemental agreement with Rockwell International Corporation, Downey, California. The 1,364,262 supplemental brings the total value of the Rockwell contract to 100,776,658, and causes work to be performed between May 15 and September 30, 1978. The cost plus fixed fee modification call for the fabrication, installation and acceptance listing of various access bridges and platforms to provide additional access to the Space Shuttle Orbiter within the Orbiting Processing Facility. Also included in the modification is the design, fabrication, installation and acceptance testing of the Horizontal Zero Gravity Simulator to be used in the OPF for operation of the Orbiter Payload doors.

May 17: NASA Administrator Robert A. Frosch told the Congress yesterday that the national space program, through its international cooperative efforts, has contributed over $2 billion to the United States balance of payments from 1965 to 1977.

Frosch told the House Space Science and Applications Subcommittee that this contribution is realized because NASA's collaborators, even in cooperative programs, often spend 10-15 percent of their funds for U.S. components and services, because NASA conducts a large number of reimbursable launchings, and because independent foreign space programs "look to U.S. industry for support."

Citing examples, he said Japan has purchased launch vehicle components, launches, and satellites worth about $350 million; European Space Agency reimbursable launches have totaled $120 million; Intelsat launches and satellite purchases (minus the U.S. contribution) have totaled $360 million; purchases of goods and services in the remote sensing field have totaled $50 million; and a cooperative dollar inflow is estimated at $130 million. (Defense/Space Business Daily, Vol. 98, No. 15, Friday, May 19, 1978, pg. 107.)

May 18: NASA's John F. Kennedy Space Center awarded a $1,311,510 contract to the Belko Steel Corporation, 2548 Hansrob Road, Orlando, Florida, for construction of a canister to carry payloads from checkout facilities for installation in the Space Shuttle Orbiter.

Construction of the canister is to be completed within 335 days of award of contract.

The container will be moved from site to site on a heavy-duty multi-axle transporter. For payloads designed for horizontal installation in the Orbiter in an Orbiter Processing Facility high bay, the canister will be carried on the transporter horizontally. In its horizontal position it is 64-1/2 feet long, 22 feet wide and 23 high at the center of its curved top.

For payloads scheduled for vertical installation in the Orbiter cargo bay through a Payload Changeout Room at a KSC launch pad, the canister will be carried vertically on the transporter.

The canister will provide all-weather protection for payloads during moves and will be instrumented to monitor payload conditions during transportation. (NASA News, Release No. KSC 50-78, May 17, 1978. Also, Memo from AP-PRO/Procurement Office, Subject: Request for Priority News Release, May 15, 1978, NASA Contract No. NAS10-9397.)

May 20: NASA's John F. Kennedy Space Center has awarded a $23,626,661 contract extension for engineering support services to Planning Research Corporation, McLean, Va.

The 12-month cost-plus-fixed-fee contract extension provides for Planning Research Corporation to continue design engineering services for Space Shuttle equipment and other engineering activities for which KSC's Design Engineering Directorate is responsible, from May 20, 1978 through May 19, 1979.

Services provided by the contractor include the design of new and modified ground support equipment and minor facilities design support for all Center programs. Included among the company's employees are engineers, draftsmen, technical writers and computer programmers.

Support is provided at the Spaceport and Cape Canaveral AFS in Florida, and at Vandenberg AFB and NASA's Dryden Flight Research Center in California.

The extension brings the total amount of the contract since the original award in May, 1974, to $97,306,220. (NASA News, Release No. KSC 53-78, June 2, 1978. Also, Memo from AP-PRO/Procurement Office to PA/Public Affairs Office, Subject: Contract Award Information, Contract No. NAS10-8525.)

May 20: The 582 Kg Pioneer Venus Orbiter was launched May 20, 1978. The spacecraft with its complement of 12 scientific instruments was launched by an Atlas SLV-3D/Centaur D-1A (AC-50) from Complex 36B of Cape Canaveral Air Force Station, Florida.

The Pioneer Venus Orbiter will be the first of two missions in the Pioneer Venus Program that will conduct a comprehensive scientific investigation of Venus' atmosphere. The Pioneer Venus Program is composed of an orbiter with aeronomy, fields and particles and remote sensing instrumentation, and a Multiprobe spacecraft carrying four atmospheric entry probles.

The concept for using two different types of flight missions in a series for planetary investigation orginated at Goddard Space Flight Center (GSFC) where, under the designation Planetary Explorer, the feasibility study was conducted. The scientific rationale and the desired priority for the Venus mission was endorsed by the scientific community. The program was transfered to NASA Ames Research Center (ARC) January 1972, where the Phase B, System Definition Phase was conducted competitively with two major aerospace firms. The program was renamed Pioneer Venus. The original concept was to launch these missions with the Delta 2914 launch vehicle. However, after a specific low cost study was conducted to determine if a significant cost savings could result by increasing the weight and volume capability, it was concluded that the Atlas/Centaur launch vehicle should be used to support Pioneer Venus. Use of existing designs throughout the spacecraft system, commonality between subsystems within the spacecraft system and between missions, and increased design margins indicated sufficient overall program savings to justify the assignment of the larger vehicle to the mission series.

The Pioneer Venus Orbiter Mission will accomplish the delivery of an instrumented Orbiter spacecraft to Venus, and the injection of the spacecraft into an elliptical orbit around Venus with an orbital lifetime

of at least 243 Earth days duration for observations and measurements of the planet, its atmosphere, ionosphere, and solar wind interaction region.

The Type II transfer trajectory from Earth to Venus was selected for the 1978 mission. Following the required midcourse maneuvers, the Orbiter spacecraft was to pass close to the planet where, at closest approach, an on-board retro-motor can apply the proper change in velocity to place the spacecraft into a highly elliptical planetary orbit.

An attitude reorientation maneuver will point the retro-motor thruse axis so the retro motor will be applied in the proper direction at Venus Orbit Insertion (VOI). The initial periapsis altitude will be selected on the basis of the trajectory accuracy requirements, and periapsis will be lowered during later orbits to satisfy science requirements.

Injection into orbit about Venus will be performed at the periapsis of the fly-by trajectory at an altitude safely above the surface. After injection, precise measurement of orbital parameters will be made and trim maneuvers at apoapsis and periapsis will be used to reduce and maintain periapsis at the desired altitude. Data will be transmitted to Earth at a rate predicated upon scientific measurement requirements, overall system design, and communications distance. Provisions for data storage on-board will provide for concentrated sampling during the orbital period, and allow measurements through periods of Earth occultation. Solar gravity disturbances and atmospheric drage will cause the periapsis altitude to rise or fall throughout the mission. Periodic orbital change maneuvers will be required to maintain periapsis altitude within the desired range. (Mission Operation Report No. S-825-78-01, Prelaunch Summary, Subject: Pioneer Venus Program, d. May 11, 1978.)

May 24: Sen. Adlei E. Stevenson (D-Ill.) and Rep. Don Fuqua (D-Fla.), chairman of the Senate and House Space Subcommittees, respectively, met with President Carter for two hours on Wednesday to urge the setting of new directions for the space program, emphasizing new applications for the benefit of mankind.

Stevenson commented that "some basic decisions have to be made" on the direction of the space program in the Space Shuttle era. "With declining development funds and the spacing out of launchings, the money [not used for development and launches] would be used to bring space to Earth," Stevenson said. He noted that the Soviets and others would move ahead in space unless the U.S. acted.

Asked about the President's reaction to the meeting, Fuqua said "it was more of an exchange of views. . .to express our concerns. The space program is going through a transition. We must decide how we can utilize the

Space Shuttle." He also noted that the U.S. must take a stand at the forthcoming U.N. Conference on Development & Technology. (Defense/Space Business Daily, Vol. 98, No. 19, Thursday, May 29, 1978, pg. 131-2.)

- The launch of the NASA Seasat A has been delayed to no earlier than June 24 in order to provide time to make some design modifications to the General Dynamics Atlas F launch vehicle. During the two recent launches of the Air Force/Rockwell International Navstar Global Positioning System (GPS) satellites by the Atlas F, higher than normal temperature rises were recorded in the aft boattail of the rocket.

  As a precautionary measure, project officials have decided to delay the Seasat launch until changes can be made in the harness bundles, thicker insulation installed, hydraulic lines replaced with heat resistant lines, and protective shields have been installed in the boattail of the Atlas.

  The Seasat A, managed by the Jet Propulsion Laboratory, will be launched into a polar orbit for surveying 95 percent of the world's oceans every 36 hours using microwave sensors. It is designed to help locate sea ice and ice leads and provide information about sea-state and related weather phenomena. The instruments will have the capability of making resolutions as small as 25 meters (about 80 feet). (Defense/Space Business Daily, Vol. 98, No. 19, Thursday, May 29, 1978, pg. 132.)

May 24: NASA's Kennedy Space Center announced the award of a $3,215,824.00 contract to McGregor & Werner, Inc. of Washington, D.C. The contract, a set-aside for small business firms, calls for the contractor to provide printing, reproduction and documentation support services to KSC. The one year contract with two successive years optional is effection July 1, 1978. (Memo to PA/Public Affair Office from AP/Procurement Officer, Subject: Request for Priority News Release, d. May 24, 1978.)

June 1: NASA's John F. Kennedy Space Center has awarded a $1,774,404 contract extension to Management Services, Inc. The Huntsville, Alabama, firm operates the Spaceport's component refurbishment and chemical analysis laboratories.

The one-year extension covers the period from June 1, 1978 through May 31, 1979. The cost-plus-award-fee contract is set-aside for small businesses.

The $1,774,404 extension brings the total value of the original contract to $4,536,339. The basic contract, awarded in 1976, called for a total of three years with annual renewals of performance and was negotiated competitively. (NASA News, Release No. KSC 58-78, June 13, 1978.)

o NASA's John F. Kennedy Space Center has awarded a $11,107,658 contract extension for communications and instrumentation support services to the Computer Sciences Corporation's Applied Technology Division, Falls Church, Va.

The cost-plus-award-fee extension provides for Computer Services Corporation and its subcontractor, the RCA Service Company, Cherry Hill, N.J., to continue support in the ares of communications, measurements, telemetrics, scientific and administrative computer services, data storage and retrieval, program planning, and reliability and quality assurance programs.

The extension is for a one-year period beginning June 1, 1978.

Data acquisition and data processing for KSC's manned and unmanned launches and administrative programs, instrumentation of Launch Control Center firing rooms and the operation of timing systems are among the support services provided under the contract. (NASA News, Release No. KSC 55-78, June 6, 1978. Also, Contract No. Contract NAS 10-9130.)

June 5: The Facility presently identified as the Spacecraft Assembly and Encapsultation Facility No. 1 (SAEF-1) M7-1469 is now to be officially identified as the Vertical Processing Facility. (Memo to Distribution from DF-FSE-2/Chief, Master Planning and Real Property Branch, Subject: Facility Name Change: Vertical Processing Faility, d. June 5, 1978.)

o NASA's John F. Kennedy Space Center negotiated a $6,356,344 supplemental agreement to its contract with Modular Computer Systems, Inc. of Ft. Lauderdale, Florida. The new agreement brings the toal value of the contract to $17,600,233. The supplement is for additional minicomputer and peripheral system configurations with associated software, add-on equipment, spare parts, training and documentation as part of the Vandenburg Air Force Base Launch Processing System. Work under the contract is to be completed by June 30, 1979. (Memo to PA/Public Affairs Office from AP-PRO/ Procurement Office, Subject: Contract Award Information, Contract NAS 10-8849, S/A #21, June 9, 1978.)

June 6: NASA engineers are scheduled to start work today on an attempt to put the ailing Skylab space station into a refined orbit that would keep it from falling back to Earth.

Working from Johnson Space Center in Houston, and aided by personnel at Patrick Air Force Base, the crews are preparing for a Saturday attempt to send the station into a new orbit that would minimize the drag of the Earth's atmosphere.

Right now the huge ghost space station is in a 200-mile high orbit and is slowly tumbling back toward Earth.

NASA officials are concerned that unless something is done to slow down the descent of the out-of-control space station it could come back into the Earth's atmosphere sometime between the beginning of next year and early 1980.

That worries space agency officials because it is possible parts of the orbiting space station will survive re-entry and could fall onto populated areas.

Today's operations call for turning on gyroheaters aboard the 96-foot long, 85-ton spacecraft. The heaters are being used to warm up lubricants so that the gyros stabilizing mechanisms can spin freely.

On Thursday the gyros will actually be spun up to make sure Skylab is stabilized.

The space station will be commanded on Friday to make its solar panels face the sun and hold its attitude.

At 5:55 a.m., Saturday, Skylab will be commanded to maneuver into an orbit which calls for it to fly into the solar wind thus slowing down its descent. (Dick Baumbach, "In Space," Today Newspaper, Cocoa, Florida, Tuesday, June 6, 1978.)

o The first maneuver to slow the ailing Skylab's descent back to earth was successfully completed Tuesday in an effort to prevent the space station from possibly showering populated areas with debris.

NASA officials said the operation conducted at 2:59 a.m., while Skylab was orbiting over Madrid, Spain, called for turning on the space station's gyroheaters.

The gyroheaters are used to heat the lubricants that permit the space station's gyros to function.

On Thursday, NASA engineers at Johnson Space Center, Houston, Texas, will order the gyros to turn on and cause the spacecraft to stabilize. Skylab is currently in a tumbling orbit.

The Skylab project calls for the space station, which was used by three Apollo astronaut crews in 1973-74, to be placed in a more stable and slower-descending orbit by Saturday.

NASA would then have additional time to send Space Shuttle astronauts to the Skylab in late 1979.

The astronatus would place a small rocket system on the space station which would either boost the spacecraft into a much higher orbit or send the space station back into the earth's atmosphere where parts could land in an ocean.

NASA officials are concerned that Skylab, the largest spacecraft orbiting over the Earth, will fall back into the atmosphere sometime between early 1979 and early 1980 unless steps are taken to slow down its rate of descent. (Dick Baumbach, Today Newspaper, Cocoa, Florida, Wednesday, June 7, 1978.)

June 9: Scientists working to keep the Skylab space station from crashing back to Earth got the 85-ton vehicle stabilized Friday after a tense 90 minutes when it rolled out of control.

Ground controllers at Johnson Space Center said late Friday afternoon they were moving ahead with preparations for a final maneuver today intended to delay the vehicle's drop from orbit, which could lead to its breakup with debris possibly striking a populated area.

Computer calculations indicate that when Skylab dives back into the atmosphere it could spew debris over a track 3,000 miles long and 100 miles wide. As many as 400 pieces, some weighing 300 pounds, could survive the searing heat of re-entry, and strike Earth at speeds of 200 mph.

Early Friday, the Houston control center sent a critical command which tilted the unmanned space station so that its solar panels continually point at the sun. That allows the panels to generate more electricity for the vehicle's controls and instruments.

But later, while controllers were sending up routine commands, the station, the world's largest manmade satellite, began rolling out of control. Officials said an unexplained signal from the on-board computer had changed the position of the control gyroscopes.

That caused small steering rockets to fire and sent the spacecraft tumbling. The delay in regaining control was caused by Skylab passing out of range of ground-based radio.

A series of commands from the ground corrected the gyroscopes' positions and stopped the rockets. (TODAY Newspaper, Cocoa, Florida, Saturday, June 10, 1078.)

June 10: NASA successfully maneuvered the orbiting Skylab space station into a low drag attitude that is expected to add moths to its lifetime in space.

The activities, completed June 10, involve putting a new computer program into the onboard computer, using the attitude control system to maneuver Skylab into the desired position and operating the control moment gyros to keep the spacecraft in that mode. These procedures were completed in mid--June.

These measures are designed to extablish control of the spacecraft and thereby extend its orbital lifetime by perhaps as much as 6 to 12 months. If the gyros continue to operate to hold Skylab in its new attitude, reentry into the Earth's atmosphere could be delayed until sometime between late 1979 and mid-1980. (NASA Activities, Vol. 9, No. 7, Office of Public Affairs, NASA, Washington, D.C., July 1978, p.7)

June 14: NASA's Kennedy Space Center awarded a contract for $740,000 to Haskins and Sells of Washington, D.C. The 30 month contract calls for the contractor to design and implement a data based financial system to meet KSC operating and programs management needs. Work under the contract will be performed at KSC and will begin on this date. (Memo to PA/Public Affairs Office, from AP/PRO Procurement Officer, Subject: Contract Award Information, Contract NAS 10-9421.)

June 16: GOES-3, the third operational spacecraft of a series of Geostationary Operational Environmental Satellites, was launched into orbit from the Eastern Test Range at 6:49 a.m., EDT, on June 16, 1978, by a Delta 2914 vehicle number 142.

Performance of the Delta launhc vehicle was nominal and placed the spaecraft and its apogee boost motor (ABM) into the desired transfer orbit. The initial orbital elements measureed compared with the nominal expected were as follows:

	Expected	Measureed
Apogee (km)	36,670	36,702
Perigee (km)	185	185
Inclination (degrees)	23.8	23.8
Period (minutes)	648	648.65

The spacecraft performed very well throughout the launch and during the transfer orbit.

Following the successful placement of GOES-3 in transfer orbit, the spacecraft apogee boost motor was fired at 11:22 p.m., EDT on the same date. This firing took place at second apogee, when the spacecraft was at 71 degrees W longitude, and resulted in the following orbit:

Eccentricity:	.0142
Inclination:	1.7 Degree
Ht. of Perigee:	35,469.1 km
Ht. of Apogee:	36,679.2 km
Drift:	3.7 Degree/Day West

The drift rate was higher than desired, and an orbit adjust maneuver on June 20, 1978, reduced it to 2 degrees/day West. GOES-3 was expected to arrive on station at 135 degrees W longitude on July 16, 1978.

The mission objectives for GOES-C are to extend the knowledge and understanding of the atmosphre and its domestic and international envirionmental network that can receive, process, and distribute routine observations and early weather warnings as they occur; to improve National Oceanographic and Atmospheric Administration's (NOAA) ability to forecast and warn of solar distrubances in realtime; to increase the kind, quantity, and quality of environmental-parameter measurements.

GOES-C is the fifth spacecraft in a new class of weather observers, designed to operate from a very high altitude. Two of the previous spacecraft was called Synchronous Meteorological Satellites and after checkout and a period of operation by Goddard, were turned over to NOAA. With GOES-1, launched on October 16, 1975, and follow-on spacecraft, NOAA has assumed operational responsibility once the satellite is launched and checked out by NASA. GOES-C will be redesignated GOES-3 once the satellite is turned over to NOAA.

The GOES-C spacecraft, manufactured by Ford Aerospace and Communications Corporation, Western Development Laboratories, has a life expectancy of 5 years. It is a cylindrical shaped satellite 75 in. (190 cm) in diameter with 15,000 solar cells mounted around the periphery. The primary structural member is a thrust tube located in the center of the cylinder. The radiometer/telescope instrument extending the length of the spacecraft, is located in and supported by the thrust tube. The scanning mirror looks out through an opening in the cylindrical solar array of the spacecraft with a clear field of view of the earth. The radiation cooler is mounted on the end of the spacecraft with an unobstructed view of space. Solar panels form the outer walls of the spacecraft. An equipment shelf contains most of the spacecraft electronics. (Mission Operation Reports No. E-612-78-01, Subject: GOES-3 Post Launch Reports #1 and #2. Dates June 16 and June 26, 1978 respectively. Also, Launch Mission Summary and Sequence of Events, GOES-C, Delta 142, John F. Kennedy Space Center, NASA, June 1, 1978, p. 3.)

June 19: As of June 19, NASA had received advance payments for 233 Small Self-Contained Payloads that will be carried on a space-available basis on Space Shuttle flights.

The payloads, which will receive no services, such as power, from the Shuttle, and which must weigh less than 200 pounds and occupy less than 5 cubic feet of space, will be charged from $3,000 to $10,000 (1975 dollars) for the ride into space and return.

The number of advance payments received since the first week of February is 70.

The current payloads include 141 industrial, up 44; 46-1/2 education, up 18, and 45-1/2 individual, up 8. (Defense/Space Business Daily, Vol. 98, No. 36, Tuesday, June 10, 1978, pg. 252.)

o The House Monday passed a $68.2 billion FY '79 HUD-IA appropriations bill containing $4,333.9 million for NASA, a reduction of $37.7 million from the amount requested by the agency.

The legislation was passed exactly as recommended by the HUD-IA Appropriations Subcommittee.

A bid on the floor to make a 2 percent across-the-board reduction in the overall bill was rejected. There were no attempts made on the floor to change the NASA appropriation.

Meanwhile, Senate action on the NASA appropriations has been held up by the HUD-IA Appropriations Subcommittee, which says it will wait for passage of the authorizations for the agencies under its jurisdiction.

For NASA, the House has authorized a $43.7 million increase in the FY '79 budget; the Senate, a $17 million increase. As of yesterday, no date had been set for a conference, although conferees have been named and a meeting is being sought.

Changes in the NASA budget made in the House appropriations bill are as follows:

1) +$4 million for long-lead hardware to support an "optional" fifth Space Shuttle Orbiter. These funds do not represent a commitment to ultimately support funding for a fifth Orbiter, only to preserve an option. The committee also noted that Orbiter 101 could be modified to serve as a fifth vehicle.

2) +$4 million for Stereosat.

3) +$7 million for advanced programs, including $2 million for development of the 25 KW Power Module.

4) +$3 million for work on a solar satellite power system.

5) +$7 million for aeronautical research, which may be applied to composite technology, variable cycle engine work and agricultural aircraft.

6) -$1.4 million from the Search For Extraterrestrial Life (SETI).

7) -$10 million for Development, Test & Mission Operations (DTMO).

8) -$5 million for Expendable Launch Vehicles.

9) -$1 million for Tracking & Data Acquisition (T&DA).

10) -$20.5 million for development of the Teleoperator Retrieval System (TRS) that NASA wants for the Skylab rescue mission. This action was taken before the apparently successful Skylab reorientation. The committee said it would reconsider this funding "if it can be demonstrated that changes in Skylab decay estimates and shuttle launch capability provide a reasonable opportunity for a successful reboost/deorbit mission".

11) A contingency reserve of $30 million was established for the Space Shuttle program by taking $15 million from the Space Telescope, $10 million from the Jupiter Orbiter Probe and $5 million from the Solar Orbiter Probe.

12) -$12.8 million from construction of Pad B at KSC, delaying the project a year.

13) -$5 million from rehabilitation and modification of facilities.

14) -$7 million from Research & Program Management. (Defense/Space Business Daily, Vol. 98, No. 37, Wednesday, June 21, 1978, pg. 257-8.)

June 23: John F. Kennedy Space Center awarded a $3,119,000 contract to the W&J Construction Corp., Cocoa, Florida. The fixed price contract calls for the contractor to provide all labor, equipment, materials and supplies necessary for the modification of the Spacecraft Assembly and Encapsulation Facility. Work consists of airlock modifications, modifications to both the high and low bays, deluge sprinkle system, storm drains, air conditioning and plumbing work and miscellaneous site, structural and mechanical work. (Memo to PA/Public Affairs Office from AP-PRO/Procurement Officer, Subject: Request for Priority News Release Contract NAS 10-9438 d. June 23, 1978.)

June 29: NASA's Kennedy Space Center awarded a $145,500 contract to the James E. Rose Mechanical Contractor, Inc. of Orlando, Florida. The 180 day, fixed price contract calls for replacement and for modification to air conditioning systems in the Communications Distribution and Switching Center and the Base Support Building at KSC and Hangar S, the E and L Building, the Delta Spin Test Building and the NASA Records Storage Building, on Cape Canaveral. Effective date of the contract is June 29, 1978. (Memo to PA/Public Affairs Office, from AP-PRO Procurement Officer, Subject: Contract Award Information, Contract NAS 10-9427. d. June 29, 1978.)

- The Comstar-C spacecraft was successfully launched into a synchronous transfer orbit by the Atlas Centaur AC-41 at 2224 hours EST from the ETR Complex 36A on June 29, 1978.

The transfer orbital parameters were:

	Expected	Measureed
Apogee (km)	35,919	35,940
Perigee (km)	548.66	548.8
Inclination (degrees)	21.833	21.834

The spacecraft apogee motor was fired successfully at 1737 EST on July 1, 1978, injecting the Comstar spacecraft into the desired synchronous orbit.

COMSTAR D-3, the third spacecraft in this series, is being launched to become an in-orbit backup to COMSTAR D-1, now operting at 128° west longitude, and COMSTAR D-2, operating at 119° west longitude. The new geosynchronous orbit satellite will be located at 131.8° west longitude.

The three satellites are positioned so that no more than one at a time will be operating in the shadow of the earth, or temporarily removed from service due to a transit across the face of the sun. A fourth COMSTAR has been built, and is available for launch should a need arise in the future.

Although they are capable of relaying other forms of data, COMSTARs are primarily used for long-distance telephone service. The increasing need for long-distance lines within the United States prompted the development of high-capacity domestic commercial communications satellites, rather than major increases in land-line communications. COMSAT General, a wholly-owned subsidiary of COMSAT Corporation, owns the COMSTAR satellites, and leases their entire in-orbit capacity to American Telephone & Telegrph (AT&T). AT&T in turn has an agreement with GTE Satellite Corporation (GSAT), a subsidiary of General Telephone and Electronics, to share the satellites in providing communications between each company's network of terrestrial stations. AT&T has ground stations in New York, Chicago, San Francisco, and Atlanta. GSAT has stations serving Tampa, Los Angeles, and the island of Hawaii. The COMSTARs are also capable of serving Alaska and Puerto Rico, through ground stations in those locations owned by other communications carriers.

AT&T uses the COMSTAR system primarily for Wide Area Telephone Service (WATS) and U.S. Government private line communications. They are controlled by two Telemetry, Tracking & Command stations operated by COMSAT General, one in Southbury, Connecticut, and one in Santa Paula, California. Both stations are connected with COMSAT General's System Control Center in

Washington, D.C. Each station has two COMSTAR antennas, a 12.8 meter (42 foot) diameter tracking antenna, and a 10.4 meter (34 foot) non-tracking antenna. A third antenna very similar to the larger one provides similar services for MARISAT, a maritime satellite communications system also owned and operated by COMSAT General. The two tracking antennas can provide backup support to each other when necessary.

The COMSTAR program is a means of providing more long-distance telephone lines in the USA without the usual accompanying increase in telephone poles and miless of wire overhead, or the alternative method of microwave towers strung across the countryside. Domestic long-distance telephone service by satellite is now as much a part of American communications as the established satellite systems for television transmisstion, data transfers, and telegraphic services. (Mission Operation Report No. M-491-201-78-03, Subject: Comstar-C Post Launch Report, d. January 16,1979. Also, Launch Mission Summary, Comstar D-3, Atlas/Centaur-41, John F. Kennedy Space Center, NASA, d. June 29, 1978. p.1.)

July 1: NASA's John F. Kennedy Space Center has awarded Boeing Services International, Inc., Seattle, Washington, a one-year, $24,071,643 extension of its ground systems operations contract.

The contract covers the period July 1, 1978, to June 30, 1979. The renewal brings the cumulative value of the parent contract to $67,143,012.

Services to be performed under the contract cover Ground Systems Operations, including facility and utility maintenance. These functions include propellants; cranes, doors and platforms; elevators; service shops; nondestructive evaluation; life support; industrial operations and facility and utility operations and maintenance. (NASA News, Release No. KSC 63-78, July 9, 1978.)

July 1: John F. Kennedy Space Center, awarded a one yar contract with two 1-year options totaling 19,032,030 to Boeing Services International, Inc., Cocoa Beach, Florida. Additionally, two more years of unpriced options are available making it possible for the contract to cover a five year period. The cost plus award for the contract calls for BSI to provide supply and transportation services including material management, storage and distribution, transportation management and planning, and control activities associated with these services for KSC. (Memo to PA/Public Affairs Office from AP-PRO/Procurement Officer, Subject: Request for Draft News Release (Contract NAS 10-9420). d. June 13, 1978.)

July 1: NASA's John F. Kennedy Space Center awarded a $1,710,601 one-year extension of its occupational medicine and environmental services contract to the Aerospace Services Division, Pan American World Airways, Inc., Cocoa Beach, Florida.

The extension covers the period July 1, 1978 to June 30, 1979. The renewal brings the total value of the basic contract to $3,320,850. This is the second of four one-year optional extensions under the cost-plus-fixed-fee contract.

Under the contract, Pan American will provide occupational medicine and environmental health services for civil service, military and contractor personnel, supporting both NASA's Kennedy Space Center and Cape Canaveral Air Force Station. Services are performed by physicians, medical

technicians, nurses and environmental specialists. (NASA News, Release No. KSC 65-78, July 14, 1978.)

July 7: NASA's John F. Kennedy Space Center awarded a $306,400 contract to Industrial Steel, Inc., Mims, Florida. The small business fixed price contract calls for Industrial Steel to complete these tasks: Task A - to fabricate a Strongback Fixture to be used to transport cargo between te Operations and Checkout Stands and Canister and between the Orbiter/Canister; Task B, to fabricate the Orbiter Aft Access Platform--a mobile stand that provides access to fluid line connections at the aft end of the Orbiter for hypergolic deservicing operations; Task C, to fabricate an External Tank - Checkout Cell Portable Access Platform--a sturdy, portable, all aluminum structure which will provide access to the uppermost plumbing electrical compartment of the External Tank while it is located in the Vehicle Assembly Building. (Memo to PA/Public Affairs Office from AP-PRO/ Procurement Officer, Subject: Contract Award Information, Contract NAS 10-9437. d. July 6, 1978.)

July 10: NASA's John F. Kennedy Space Center has awarded Expedient Services, Inc., Titusville, Fla., a one-year $1,081,743 contract extension for roads and grounds services at the Spaceport.

The extension covers the period from July 1, 1978 to June 30, 1979, and includes options to extend through June 30, 1980. The cost-plus-fixed-fee contract is one set aside for disadvantaged firms and was awarded by the Small Business Administration of Atlanta, Ga., on behalf of the Kennedy Space Center.

Under the contract, the Titusville firm will provide roads and grounds services, including roadway grass mowing and care, landscape maintenance, pest control, and trash pickup and disposal.

Expedient Services currently holds a custodial services contract with the Spaceport. (NASA News, Release No. KSC 68-78, July 14, 1978.)

o Thirty-five new astronaut candidates reported to the Johnson Space Center on July 10, to begin a two-year training and evaluation period.

Activities scheduled in July and August included aircraft life support ejection seat training for the T-38 aircraft, aircraft physiological training, T-38 systems and operations, and a trip to Homestead Air Force Base in

Florida for the standard Air Force water survival course given by USAF instructors. In subsequent weeks, the candidates will attend lectures on the history of space flight, technical assignment methods and procedures within the astronaut office, lessons on manned spacecraft engineering, Space Shuttle program, aerodynamics, flight operations and the many disciplines associated with preparation for and operation of vehicles in space. (NASA Activities, August 1978, pg. 4.)

July 13: For the third consecutive year, the Kennedy Space Center is hosting about 80 of the nation's leading atmospheric physicists and lightning researchers for a summer of combined study of the electrical properties of thunderstorms.

Known as the Thunderstorm Research International Program (TRIP) the study utilizes the Spaceport's unique meteorological facilities--built up during the Apollo and Skylab programs for assessing thunderstorm hazards during launch operations--and the high incidence of lightning-charged storms that occur in this area over the summer months.

Seventeen scientific investigators, representing many of the country's top educational institutions and research organizations--including ten universities, two research laboratories, the National Oceanic and Atmospheric Administration (NOAA) and three other NASA Centers in addition to KSC--are participating in the study.

The university researchers are funded by the Office of Naval Research and the National Science Foundation. KSC provides its meteorological instrumentation facilities of the local National Weather Service office and normally available support services such as power, communications and film processing. Personnel from KSC's Technical Support (TS) Directorate assist the investigators in selecting and setting up their experiment sites. Angelo Taiani, of the TS Operations Support Management Office, is Project Coordinator of TRIP '78.

The TRIP study was first conducted at KSC in 1976, born out of the concept that much more knowledge about the phenomena that cause electrical charges in clouds can be brought out by having many investigators study the same storms in the same area. (NASA News, Release No. KSC 66-78, July 13, 1978.)

July 14: The European Space Agency's Geostationary Scientific Satellite (GEOS-2) was launched into a synchronous transfer orbit from the Eastern Test Range at 6:43 a.m. EDT, on July 14, 1978, by a Delta 2914, Vehicle Mission Number 143.

Performance of the Delta launch vehicle was nominal and placed the spacecraft and its apoge boost motor (ABM) into the desired transfer orbit. The orbital elements achieved compared with the nominal expected, are as follows:

	Expected	Measureed
Apogee (km)	36,069	36,030
Perigee (km)	231	231
Inclination (degrees)	25.7	25.76

The satellite performed satisfactorily during the transfer orbit and the ABM was fired successfully at 12:30 a.m., EDT, on July 16, 1978. The satellite is being maneuvered over the South Atlantic to a position at +6 degrees Greenwich Meridian above the equator. At this time, all subsystem functional checks are complete and satellite status is satisfactory. This missio replaced the GEOS-1 mission which was placed in an incorrect orbit by Delta in April 1977.

The mission of the GEOS-B satellite will make integrated scientific studies of the magnetosphere, particularly the investigation of waves and fields and the distribution of particles, over a wide range of energies (from thermal to medium energy) in a geostationary orbit. This orbit, with a radius of 6.6 times that of the Earth, places the satellite in a region of the magnetosphere where many of the dynamic processes responsible for magnetic and ionospheric disturbances are believed to develop more specifically.

Time and space ambiguities will be minimized as the spatial variations experienced by the satellite will be small. It will also be possible to investigate short-lived transient phenomena and to determine diurnal variations.

The satellite will scan the region between the plasmapause and the inner edge of the plasma sheet. These two boundaries are not fixed in space and may cross the geostationary orbit from time to time. Phenomena associated with such boundary crossings will be studied.

GEOS will be positioned on those magnetic field lines that are connected to both auroral zones. It will, therefore, be a particular interest to correlate the GEOS data with data acquired at linked auroral stations by means of ground-based, ballon-borne, or rocket-borne instruments.

Because of the scientific importance of GEOS, it will play a major role in the International Magnetospheric Study (IMS) Program. Discussions between GEOS experimenters and scientists planning complementary observations from the ground have taken place on a regular basis in a Committee for Coordination of Observations associated with GEOS (CCOG). A GEOS-B longitudinal shift plan has been drawn up, taking due accont of the scientists' requirements, in order to provide the optimum basis for

correlation studies. Longitudinal shifts will be carried out between 0 degrees W and 35 degrees E. The GEOS-B planned lifetime in orbit is two years. (Mission Operation Report No. M-492-302-78-02, Subject: ESA-GEOS-2/ Delta Post Launch Report, d. October 3, 1978. Alos, Mission Operation Report No. M-492-302-78-02, Subject: Prelaunch Summary European Space Agency Geostationary Satellite (ESA/GEOS-B)/Delta Launch, d. June 22, 1978.)

July 19: A serious main-engine fire's impact on the overall Space Shuttle program is unknown, a top Rocketdyne Co. official said Friday.

The fire broke out Wednesday during a test of the engine at NASA's National Space Technology Laboratory in Bay St. Louis, Miss. The fire occurred at 41 seconds into a routine engine test.

Rocketdyne is the main contractor developing the Shuttle's engines.

There was considerable damage to the engine and some damage to the test stand. The fire has been traced to an oxygen pump on the engine but its cause could not be determined.

NASA investigators are expected to issue a preliminary report on their findings by next week. It will take another 60 days before any final conclusions can be made.

Test engines last year caught fire twice. Those mishaps set back the Shuttle program.

Main engine development has proved to be the most troublesome part of the Shuttle project.

The first Shuttle launch, which will take place at Kennedy Space Center, was originally scheduled for March 1979. But engine problems caused that launch date to be pushed back until later in the year. Officially NASA leaders are calling for a June launch date but privately indicate the lift-off will be in late summer or early fall. ("In Space", TODAY Newspaper, Cocoa, Florida, Saturday, July 22, 1978.)

o Skylab moved a major step closer to a more stable orbit Wednesday.

The huge spacecraft's solar panels are again receiving maximum power from the sun.

That's a major step needed to again place the 85-ton space station into an attitude which will slow down its descent out of orbit.

Flight controllers from the space center here and engineers at the Marshall Space Flight Center, Huntsville, Ala., have been working for the past 10 days to return Skylab to a more stable condition.

NASA officials said by having the solar panels aboard the 188-foot-long spacecraft zeroed in on the sun additional battery power can be supplied to Skylab.

Commands were sent to the spacecraft Wednesday as it passed over tracking stations at Goldstone, Calif., Bermuda, and Madrid, Spain, ordering it to lock onto the sun's rays.

The satellite was put into a stable attitude a little more than a month ago.

But, on July 9, various electrical components aboard the spacecraft began to fail and Skylab went out of its controlled flight path.

It will take at least two more days of monitoring and sending various commands to Skylab before it again can be placed in a controlled attitude.

Once in its correct position, NASA officials hope Skylab will stay in orbit for an additional six months. ("In Space", TODAY Newspaper, Cocoa, Florida, Thursday, July 20, 1978.)

o NASA's John F. Kennedy Space Center negotiated a $383,183 supplement to NASA contract NAS 10-8986 with Florida Technological University. The supplement calls for a continuation of the University's study "Baseline Studies for Environmentally Monitoring for Effects of Space Transportation Systems at Kennedy Space Center". The fixed price contract will continue through August 15, 1979. (Memo to PA/Public Affairs Office from AP/Procurement Officer, Subject: Contract Award Information, Contract NAS 10-8986, S/A No. 6.)

July 20: In a statement dated July 20, 1978, President Jimmy Carter said: "Nine years ago, the world paused to watch two brave men tread the surface of the Moon. It was a moment without precedent in human experience, a moment when terrestrial life reached out to touch another world. It is a source of pride for us that those men were Americans. Today, the lunar surface is criss-crossed in a half-dozen places with the footprints of American astronauts and implanted with a variety of American scientific instruments.

"The Space Shuttle, our next major manned space project, will begin regular, routine, economical operation in the early 1980's. Through it, we will use the vantage point of space to learn more about the Earth's surface features and processes and to improve our ability to manage our resources and cope with natural phenomena. We will continue to develop technology to realize the full potential of space communications and other practical applications of space technology.

"In the deeper reaches of space, we will continue to seek to expand our knowledge of the solar system and the universe of which we are a part.

"As time and technology take us ever more deeply into the space age, it will continue to be our policy to conduct operations in space as required for our national well-being and to support the right of all nations to do likewise. In so doing, we remain committed to the underlying principle of the exploration and use of space for peaceful purposes and for the benefit of all mankind." (NASA Activities, September 1978, pg. 3.)

July 21: NASA officials said Thursday they've indefinitely postponed a maneuver designed to keep Skylab in orbit after the ailing space station unexpectedly rolled to its right.

The uncontrolled movement late Wednesday night caused the 118-foot-long Skylab to lose precious nitrogen fuel which is used to maneuver the spacecraft.

NASA officials are concerned the 85-ton Skylab will fall back into the Earth's atmosphere by the spring of 1979 unless steps are taken to slow down its descent out of orbit.

Pieces of the spacecraft, some weighing as much as 2-1/2 tons, could survive the searing heat of re-entry into the atmosphere and fall to the Earth's surface.

Flight controllers and engineers had originally hoped to put Skylab into a position Thursday where its rate of descent could be slowed down.

That plan went out the window when Skylab, for unexplained reasons, rolled to its right Wednesday.

No new date to attempt the maneuver has been set.

The rolling movement itself was viewed as basically harmless, but what followed caused the spacecraft to lose 20 percent of its remaining nitrogen fuel.

After the roll occurred, Skylab's on-board computers ordered the spacecraft to roll back to its previous position so its solar panels could again lock onto the sun's rays. The panels provide solar power for the spacecraft's batteries.

The computer performed the move correctly, but in the process wasted a large amount of fuel, space agency officials said.

Since NASA technicians started the save-the-Skylab mission four months ago they have lost more than 50 percent of the space station's nitrogen fuel.

At least 36 percent of the space station's fuel must be available to permit proposed docking maneuvers with the Space Shuttle.

NASA officials are hoping Skylab can be kept in orbit another year and a half so a Shuttle astronaut crew can reach it and attach a small rocket motor to the spacecraft.

The rocket would either be used to send Skylab into a higher orbit or cause the spacecraft to re-enter the atmosphere over uninhabited ocean area. (TODAY Newspaper, Cocoa, Florida, Friday, July 21, 1978.)

July 28: NASA's John F. Kennedy Space Center has awarded a fixed price contract for $240,000 to Carr Smith & Associates, Inc., Coral Gables, Fla.

The contract is for architect/engineer services in the design of a mobile airlock which will be used to handle Department of Defense payloads to be carried into orbit aboard the Space Shuttle.

The mobile airlock is a structural and mechanical device with platforms, doors, a monorail and hoist and environmental control system. The airlock is 71 feet long, 21 feet wide and 26 feet deep and will be used to transport Department of Defense payloads from their receiving point in the KSC area to the Complex 39 launch pads.

Once at the pad, the airlock and its payloads will be hoisted into the Rotating Service Structure and the payloads transferred into the 60-foot long, 15-foot diameter cargo bay of the Space Shuttle Orbiter. (NASA News, Release No. KSC 79-78, August 9, 1978.)

August 1: The Senate Appropriations Committee has approved the $4.358 billion FY '79 appropriation for NASA that was recommended by its HUD-IA Subcommittee.

The bill is $14 million below the Administration request and $24 million above the amount already approved by the House.

The two major differences in the House and Senate appropriations are the Teleoperator Retrieval System, where the committee voted to restore the $20.5 million deleted by the House, and the $30 million Space Shuttle "contingency" fund established by the House with money from the Space Telescope, Jupiter Orbiter Probe and Solar Polar Missions, a shift not approved by the committee.

Other differences of note are the committee's action to delete the $4 million added to the NASA bill by the House for the Stereosat satellite and the $3 million added by the House for Solar Power Satellite R&D.

The Senate committee, following the recommendation of Senator Proxmire's subcommittee, took only three actions that did not involve rejection or lessening of House deletions:

It deleted the entire $5.7 million requested by NASA for lunar sample analysis, on the grounds that this work, if it is necessary at all, should be the responsibility of the National Science Foundation.

It cut $1.2 million from the Spacelab request in anticipation of a barter agreement under which NASA will provide Space Shuttle launch services to the European Space Agency in exchange for Spacelab components/modules.

It deleted the entire $2 million request for NASA's Search for Extraterrestrial Intelligence (SETI) program [the House voted to leave $.6 million], which Proxmire has called a waste of money.

Both the Senate committee and House-passed NASA appropriations bills include $4 million for long lead work to retain the option for the fifth Space Shuttle Orbiter--a vehicle that was not requested by the Administration in a move that represented its major space program decision. The House and Senate have already voted to authorize the extra $4 million. The congressional mandate for the fifth Orbiter can be expected to conflict with the Administration's FY '80 budget request for NASA, which like most federal programs, will reflect the Administration's new austerity emphasis.

Funding of about $50 million is the estimated requirement in FY '80 for a fifth Orbiter. (Defense/Space Business Daily, Vol. 99, No. 21, Wednesday, August 2, 1978, pg. 147.)

August 4: Guided bus tours of the nation's Spaceport attracted 181,063 visitors during July, an increase of 15.3 percent above the 156,999 for the same month in 1977.

The July tour patronage figure brings the cumulative total for the first seven months of 1978 to 864,518, an increase of 21.7 percent over the same period of 1977.

The tour increase for July maintains a trend established earlier in the year as the Kennedy Space Center continues its buildup for the first manned orbital test flight of the Space Shuttle, scheduled for 1979. (NASA News, Release No. KC 76-78, August 4, 1978.)

August 8: The Pioneer Venus Multiprobe was launched on August 8, 1978. The launch was by an Atlas SLV-3D/Center D-1AR (AC51) from Complex 36A of the Cape Canaveral Air Force Station.

The launch vehicle will place the Multiprobe on the desired Type I interplanetary trajectory after a 14 to 18 minute coast period in a 90 nautical mile high Earth orbit. During the launch phase, spacecraft engineering telemetry is transmitted from the forward omni antenna. Immediately prio to separation, the Centaur will orient the spacecraft in a normal-to-the-ecliptic attitude with the positive spin axis in the direction of the South ecliptic pole. The spacecraft separation switches will initiate a command sequence stored in the command processor memory that results in spacecraft spin-up-to approximately 15 rpm. Ground station acquisition from the DSS 44 will occur within hour after launch.

Within the first few days, the attitude control thrusters will be calibrated in preparation for the first trajectory correction maneuver (TCM) at L + 5 days. The maneuver will be performed in either a normal-to- the-ecliptic attitude or after a precession around the Sunline to an attitude that allows use of axial thrusters. The selection will depend upon which mode minimizes propellant usage. Subsequent maneuvers, if required, will be performed at L + 20 days and E - 30 days to correct execution errors resulting from the preceding maneuvers.

During transmit to Venus, telemetry is transmitted from the forward omni antenna. The command and control of the Multiprobe will normally be exercised by using the DSN 26-meter network. The Bus instruments checkout at L + 14 days will use the DSN 26-meter network. During maneuver periods and checkouts of the Bus instruments and probes aafter L + 60 days, the 64-meter network will be used.

At approximately E-28 days, the spacecraft spin axis will be precessed to an attitude in the ecliptic plane so that the medium gain horn antenna can be used for communications. The Bus instruments and Large Proble will be checked out at E-27 days. The release attitude, which requires a 44 degree precision, is selected so that the probe will enter the atmosphere at a near zero angle of attack.

Immeidately after Large Probe release, the spin axis orientation will be precessed to allow use of the Bus medium gain horn antenna for Earth communication. At E-23 days, the Multiprobe will be spun up to a TBD rpm and a pulsed radial jet V maneuver will be performed to achieve the desired Small Probe targeting. Bus spin rate at Small Probe separation determines the spread of the probe entry points. The desire is to maximize the spread; but it is also necessary to insure good communications to Earth.

The three Small Probes will be checked out at E-22 days. The three Small Probes will be released at E-20 days. The TBD rpm spin rate will impart lateral momentum sufficient to achieve the desired target points. Since the Sun will be only 17 degrees removed from the positive spin axis, the Bus can only remain in the Small Probe release attitude for a total of 4 hours due to spacecraft power and thermal control considerations.

Immediately after Small Probe release, the spin axis will be precessed to an attitude which allows use of the medium gain horn antenna for Earth communication and provides a Sun angle of 40 degrees for spacecraft power considerations. At E-18 days, a V maneuver will move the trajectory aim point to that desired for Bus entry and slow the arrival by 90 minutes. The Bus will be oriented to the final entry attitude. At E-2 days, the Bus will be despun to 9.45 rpm. The Bus scientific instruments will then be checked out, and on December 9, 1978, the Bus will arrive at Venus and provide the desired sampling before it either skips out or is destroyed during atmospheric entry. The probes will also arrive at Venus on December 9, 1978, descend through the atmosphere and transmit data from E-17 minutes to surface impact.

Just before separation a coast timer is set in each probe. The probes are silent until after this timer starts a descent sequence which is hard-wired and cannot be changed by ground command.

Key times of the descent sequence (relative to entry at 200 km) for the Large Probe are:

- 150 min	turn on receivers and battery heaters
- 22 min	turn off heaters and turn on transmitters (RF only)
- 17 min	turn on science for calibration; turn on subcarrier
- 5 min	start blackout mode; some science into memory; some off.
+ 30 sec	science on
+ 36 sec	fire pilot chute - 67 km
+1067 sec	jettison main chute - 67 km
+ 55 sec	impact

The sequence for the Small Probes is similar except there are no parachute events and sensor booms are deployed at +46 sec. (Mission Operation Report No. S-825-78-02, Perlaunch, Subject: Pioneer Venus Program, Multi Probe Launch. d. August 2, 1978.)

August 10: NASA's John F. Kennedy Space Center has awarded a $985,805 contract to Marmon Transmotive, Knoxville, Tennessee, to supply equipment that will be used to handle and transport empty Solid Rocket Booster (SRB) casings at the SRB Disassembly Facility.

The fixed price contract covers the period between August 10, 1978 and March 1, 1979.

Under the contract, Marmon Transmotive will furnish equipment that will be used to lift the empty 149-foot SRB casings from the water at the SRB Disassembly Facility, and transport them through the wash facility.

Two Solid Rocket Boosters burn in parallel with the orbiter's three main engines at liftoff. Two minutes later, when the solid propellant has been used up, they are jettisoned. They are recovered by ships and returned to the SRB Disassembly Facility--located in Hangar AF at Cape Canaveral Air Force Station on the eastern shore of the Banana River--for refurbishment and eventual reuse.

Upon arrival at the SRB Disassembly Facility, the empty 180,500-pound casings are hoisted out of the water onto a dolly for safing and preliminary washing. The dollies carry the casings into the facility for disassembly into their major elements, and a thorough cleaning. Finally, they are shipped back to the contractor for final refurbishment and loading with propellants. (NASA News, Release No. KSC 81-78, August 24, 1978.)

August 11: NASA's John F. Kennedy Space Center has awarded a $17,195,000 contract for modifications to Complex 39's Pad B--site of future Space Shuttle launches--to Frank Briscoe Company, Inc., East Orange, New Jersey.

Pad B, the launch site for Apollo 10 and manned Skylab missions 2, 3 and 4, was last used in 1975 as the launch site for the Apollo Soyuz Test Project, which marked the first international rendezvous and docking in space.

Completion of Pad B modifications is scheduled for 420 days after award of the contract. The first Space Shuttle launch from Pad B is planned for about 1983.

Meanwhile, construction work on Pad A is nearing completion and the former Apollo/Saturn V launch site will be ready to support the first Space Shuttle flight next year, and all early Space Shuttle missions thereafter.

Other services provided for under the fixed price contract include:

--Modification and erection of a Fixed Service Structure. The upper portions of the umbilical tower from a Mobile Launcher have been removed and will be permanently installed at Pad B to serve as a fixed Shuttle service and access tower.

--Installation of a bridge to allow the Rotating Service Structure--which provides the capability of servicing the Orbiter and access to the Orbiter's cargo bay for loading and unloading payloads at the pad--to be moved back and forth across the 58-foot wide flame trench.

--Installation of a complete sound suppression system, to include a 290-foot tall, 300,000 gallon capacity water tank. The system will protect the Orbiter, astronauts and delicate payloads from acoustical damage during launch.

--Various modifications to existing facilities. (NASA News, Release No. KSC 80-78, no date.)

August 12: The countdown for the ISEE-C launch was completed without incident and the spacecraft was launched by a Delta 2914 rocket from the Eastern Test Range at 11:12 a.m., EDT, on August 12, 1978. At 11 days into the mission, the spacecraft is approximately 900,000 km out from the Earth in a transfer trajectory to the halo orbit about the Sun-Earth libration point.

All scientific instruments have been activated and are operational, all spacecraft appendages have been deployed with the exception of the $\pm$ Z axes

antennas which have been partially deployed, and all spacecraft housekeeping parameters are within their expected limits.

On August 13, 1978, the first course correction maneuver was successfully executed. The 2nd and 3rd maneuvers are presently scheduled for September 6 and October 20, 1978, respectively, and insertion into the halo orbit should occur on November 20, 1978. Sixteen days after insertion into its halo orbit, the + X axes antennas will be fully deployed and the spacecraft will then be in its final mission configuration.

The International Sun-Earth Explorers (ISEE) Project is an international cooperative project between the National Aeronautics and Space Administration (NASA) and the European Space Agency (ESA) focusing on solar-terrestrial relationships as a joint contribution to the International Magnetospheric Study (IMS). The IMS is an international scientific program recommended for the 1976-79 time period by the Joint Special Study Group for IMS established by the Committee for Space Research (COSPAR) and the Interunion Commission on Solar Terrestrial Physics (IUCSTP) of the International Council of Scientific Unions.

The project consists of two missions utilizing three spacecraft with NASA providing the ISEE-A and C and ESA providing the ISEE-B spacecraft.

The ISEE-A and -B spacecraft were launch on October 22, 1977, on the same Delta vehicle into the same highly elliptical earth orbit and are presently opeational. This pair of satellites in tandem flight are to be complemented by the launch of ISEE-C on August 12, 1978. The ISEE-C will be placed into a heliocentric orbit near the Sun-Earth libration point. The ISEE-C scientific payload has been provided by 12 principal investigators both U.S. and European and consists of 16 cdetector systems and their associated electronics.

The ISEE-A, B, and C missions invovle a total of 117 investigators representing 35 universities, government, and private organizations.

The ISEE-C spacecraft will orbit a point in space where a gravitational equilibrium exists between the Sun, Earth, and Moon. This point, called a libration point, is located between the Earth and the Sun about 1.5 million km (one million miles) from the Earth. At this location, the ISEE-C will be able to measure the characteristics of the solar-wind and other solar-induced phenomena (e.g., solar flares) about an hour before they disturb the space environment near the Earth.

Specifically, the ISEE-C mission was designed to obtain detailed measurements of the solar wind and its fluctuations. Individually, ISEE-A, B, and C are capable of contributing to our scientific knowledge. However, the greatest scientific return will be attained when data from all three

spacecraft are acquired simultaneously. In concept, the ISEE-C, in its heliocentric orbit will measure the Sun's input function unperturbed by the Earth's influence while ISEE-A and B are measuring the effect of this input on the physical structure surrounding the Earth. When the ISEE-C enters its halo orbit in November 1978, it will become the world's first libration point satellite. (Mission Operation Report No. S-862-78-03, Subject: ISEE-C Mission, Post Launch Report #1, d. August 24, 1978. Also, Mission Operation Report No. S-862-78-03, Prelaunch Summary, ISEE-C. d. July 31, 1978.)

August 15: NASA's John F. Kennedy Space Center has awarded a $2,021,000 contract to Algernon Blair Industrial Contractors, Inc., Norcross, Ga., for modifications to Mobile Launcher Platform #2, which will serve as a launch platform for Space Shuttle flights from Complex 39.

The platform was used previously to support the manned Apollo lunar landing missions.

Modification work under the fixed price contract includes:

--mechanical modifications consisting of installation and changes to the liquid oxygen and liquid hydrogen systems and the helium and gaseous nitrogen hydraulic systems. These systems service the Space Shuttle Orbiter when it is erected atop the Mobile Launcher Platform.

--electrical modifications to instrumentation and communication cabling, fire alarm systems and cabling for the uninterrupted power system.

--various modifications to supply a blast deck to protect the platform's upper deck during liftoff of the Space Shuttle orbiter. (NASA News, Release No. KSC 92-78, August 23, 1978.)

August 18: NASA's John F. Kennedy Space Center has awarded a contract for $185,465 to Frank A. Kennedy, Inc., Cape Canaveral, Fla.

The fixed price contract is for modifications to the Operations and Checkout Building where large payloads will be assembled and tested prior to insertion in the Space Shuttle orbiter's payload bay.

Services provided for under the contract include converting an existing two-bay test stand structure--formerly used to assemble and checkout Apollo spacecraft hardware--and an underlying basement area, to a storage facility for ground support equipment.

Work under the contract is to be completed in 120 days. The contract is one set aside for award to a small business firm. (NASA News, Release No. KSC 99-78, September 27, 1978.)

August 31: The official designations for Space Shuttle Orbital Flight Tests and Operational Flights are Space Shuttle 1 (SS-1), Space Shuttle 2 (SS-2), etc.

You are not required to purge existing documentation to make this change; however, all ne or revised documentation will use the new designations. The official numbering system will be used exclusively outside the Agency, especially for public affairs purpose.

If additional information is required, contact Jack Ackerman, SP-MPC, 867-2126.

R. H. Gray, KSC's Manager, Space Transportation System announced that the official designation for Space Shuttle Flight Tests and Operational Flight tests were Space Shuttle 1 (SS-1), Space Shuttle 2 (SS-2), etc. The official numbering system will be used exclusively outside the Agency (NASA) especially for Public Affairs purposes. (Memo to Distribution, from SP/ Manager, STS Projects Office, Subject: Official Flight Titles for the Space Shuttle. d. August 31, 1978.)

September 1: For the eighth consecutive month, guided bus tour patronage at the Kennedy Space Center increased above the number of visitors for the same month a year ago.

In keeping with a trend established earlier this year, figures for August show the nation's Spaceport attracted 156,164 visitors, a 10.8 percent increase above the 141,005 recorded for the same month in 1977.

Bus tour patrons also nudged over the one million mark for 1978 in August. Last year, the one millionth NASA tours ticket was not logged until November, and not since 1973, during the manned Skylab program, has this milestone been reached so early in the year.

The cumulative total for bus tour patronage during the first eight months of 1978 is 1,020,682, an increase of 19.9 percent over the same period of 1977. (NASA News, Release No. KSC 92-78, September 14, 1978.)

o NASA's John F. Kennedy Space Center has awarded a contract for $2,330,850 to Unified Services Inc., Washington, D.C.

The cost plus fixed fee contract is for custodial services, inluding janitorial, trash and garbage disposal, and clean room services.

The contract extends from September 1, 1978, to August 31, 1981. In addition to the first year award of $2,330,850, the contract includes a second year priced option of $2,437,524 and a third year unpriced option.

Overall value of the contract over the three-year period is estimated at $7,750,000.

The contract is one set aside for disadvantaged firms under the Small Business Administration's 8(a) program. (NASA News, Release No. KSC 93-78, August 23, 1978.)

September 19: The engine designed to power America's manned Space Shuttle reached a milestone when a test model exceeded 5,000 seconds in total firing time, NASA reported.

The tests are being conducted at NASA's engine test facility at Bay St. Louis, Miss.

The test was significant because it matched the firing time that a production engine must meet before it can be certified for manned space flight. The latest test, plus several other recent successful firings, indicate engineers are solving many of the problems that have plagued the powerplant, one of the most efficient and powerful ever designed. It is to be capable of boosting the reusable Shuttle into orbit 100 or more times in its lifetime.

The engine problems are the main reason the first launch of the Shuttle from Kennedy Space Center has been delayed from March 1979 until at least next September.

The main trouble has been with four high-speed turbine-driven centrifugal pumps that deliver propellants under high pressure to the combustion chamber. Failures earlier this year included cracks, fractures, leaks and a lack of rigidity. ("Today in Space", TODAY Newspaper, Cocoa, Florida, Wednesday, September 20, 1978.)

o House/Senate conferees on the FY '79 NASA appropriation have directed NASA not to reprogram any FY '79 funds from Space Shuttle production to Shuttle development unless a supplemental request to restore such funds is transmitted to Congress. At the same time the conferees said that Congress will give prompt consideration to any supplemental request to restore funds transferred to Shuttle development from Shuttle production. [NASA is expected to detail the additional development funds it will need for the Shuttle in testimony to Congress next week.]

In another action the conferees, while approving the $20.5 million requested for the Teleoperator Retrieval System, told NASA not to spend more than $10 million of this money for continued development of the TRS without congressional committee approval, with the remaining $10.5 million to be available only for Shuttle funding requirements if the committee does not okay it for the TRS.

The $4.35 billion NASA appropriation voted by the conferees includes $3,292.2 million for R&D, $147.5 million for construction and $910.5

million for R&PM. (Defense/Space Business Daily, Vol. 100, No. 10, Tuesday, September 19, 1978, pg. 64.)

September 25: The Space Shuttle Main Engine (SSME), the pacing item in Space Shuttle development since the inception of the program, has almost caught up with the other elements of the program.

NASA Associate Administrator John Yardley said that Rocketdyne and NASA have made "remarkable progress" on the SSME in the last six weeks as a result of intensive effort over the last six months.

From August 12 to Sep. 20, for example, 7400 seconds of test time was accumulated, with 6608 seconds at rated power level (RPL). Over 5000 seconds was accumulated on one flight configuration engine. NASA has now completed six full-duration runs of 520 seconds at RPL, five of which were conducted consecutively during the past month on one engine.

The SSME has now been tested 343 times, accumulating 25,186 seconds of test time, including 8099 seconds at RPL.

Yardley said that if NASA tests the SSME at maximum test capability it can achieve the certification goal of 80,000 seconds between June and September 1979, possibly even earlier. However, some further technical difficulties are expected.

He put it this way: "As a result of our successful testing, the engine has been shown to be satisfactory and the comprehensive test program is continuing. While engine development still remains a top concern, it is believed that the engine development tests will support the first manned orbital flight in 1979 [Sept. 28 to Dec. 31] while still allowing some time to solve unanticipated problems."

Included in the SSME test time is 300 seconds at 102 percent RPL, though not on the certified engine.

Yardley said that when 100 and 102% RPL is achieved for the required duration then NASA will build up to the 109% level that was planned. After that, it will build up to a 55-time reusability, which he said may take three years. After that, he said, NASA may build up to 115 percent RPL. (Defense/Space Business Daily, Vol. 100, No. 17, Thursday, September 28, 1978, pg. 115.)

- The camera that the Itek Corporation's Optical Systems Division is building for the Space Shuttle program will have a resolution from an altitude of 120 miles of 50 feet. The company says a single-family house can be distinguished on the surface of the Earth with this resolution.

  Itek says the photography from this camera, which it calls the Large Format Camera, will find immediate application in the search for oil and mineral resources. Also, geographers and cartographers will use the camera photos to draw accurate maps of many parts of the Earth that have never been charted.

  The heart of the camera is a lens that combines "for the first time" very high resolution and wide field of view required for precise stereo photography. (Defense/Space Business Daily, Vol. 100, No. 15, Tuesday, September 26, 1978, pg. 101.)

- After seven years of development, the Space Shuttle, less than a year away from its planned launch date, has run into developmental problems that will delay its first launch by 6 to 9 months and push its costs to $445 million (FY '71 dollars) over original estimates.

  NASA Associate Administrator John Yardley told the House Space Subcommittee that unforeseen additional work on the Shuttle has required that about $80 million in work planned for FY '78 be shifted into FY '79. In order to cover this, along with the additional requirements for FY '79 resulting from the development problems, NASA will require an additional $100 million to $200 million in FY '79 he said.

  If this money is not provided, he said, the additional cost to the Government in the long-run will be $1 billion to $1.5 billion. He said this includes $600 million to $800 million in direct Shuttle overruns plus $400 to $600 million in other costs such as continuation of expendable launch vehicles and the payloads designed for them.

  The NASA associate administrator for space transportation systems said that NASA is currently looking at ways to provide the additional FY '79 funding through supplemental requests, reprogramming from within the total NASA budget, and reprogramming from Shuttle production funding.

  The latter could result in added long-run costs of the order cited.

  At one point, Yardley told the subcommittee that NASA may do some internal shuffling of its budget in order to help keep the Shuttle on schedule.

As for a supplemental, he said that this has been reviewed by the White House Office of Management and Budget (OMB) and they will consider it together with the FY '80 NASA budget request. He said NASA would meet with OMB on Oct. 2 and that a decision is expected by the end of November. A supplemental, if approved, would probably be submitted in January or February. Yardley did not indicate whether he thought the supplemental would be granted.

The agency's internal "target" date for the first orbital flight of the Shuttle--which had been March 1979, with an official objective of June 1979--is now Sept. 28, 1979. If everything is successful between now and then, that target could be met.

However, more realistically, he said that the initial flight should be expected in December 1979.

Under the new schedule, delivery of the first production Shuttle, Orbiter 102, is being slipped from October 1978 to February 1979; Orbiter 099 to February 1981, and Orbiters 103 and 104 to December 1982 and December 1983, respectively, slips of 3 months.

Including the initial flight, NASA plans to conduct a total of six Orbital Flight Tests with the first operational flight (SS-7) made in February 1981.

Yardley also reported that further improvements to the Shuttle system are necessary to bring the Shuttle up to its full operational design specifications.

In order to deliver the planned maximum 65,000 pounds of payload and to achieve full mission duration, performance improvements in the main engine and weight reductions in the external tank and orbiter will be required.

"In addition, further performance enhancements, i.e., strap-on [solid] rockets, appears to be required to launch 32,000 pounds into a 98 degree inclination orbit from Vandenberg AFB," he said. The current launch shortfall is 6000 pounds.

NASA plans to study alternative augmentation methods in FY '79 and to begin work in FY '80 to attain the necessary operational capability in mid-1984, he said. (Defense/Space Business Daily, Vol. 100, No. 15, Tuesday, September 26, 1978, pg. 101.)

September 25-29: Through workshops, exhibits, entertainment and conversation, employees on the Kennedy Space Center became better informed about the contributions of their ancestors and other ethnic groups during "Proclaim Your Heritage Week."

The special week was inaugurated here last year to stress the importance of each individual in the progress of our country and world. It combines the various observations such as Black history Week, Spanish Heritage Week and Native American Week, and expands them to include all employees.

Workshops and entertainment activities were generally well-attended, and exhibits throughout the Center attracted much attention. Of special interest was a unique brochure put out by the Equal Opportunity Advisory Committee, listing the stories of some of the ancestors of KSC employees who played a part in some significant events in the history of the world. (Spaceport News, Vol. 17, No. 21, John F. Kennedy Space Center, NASA, October 13, 1978. p. 6.)

September 27: Sen. Adlai E. Stevenson (D-Ill.), chairman of the Senate Space Subcommittee, has introduced legislation that would establish a national space policy and program direction to enable the U.S. to "maintain leadership in space science and technology. . ."

Among the ten-year program goals in the area of space applications set forth in the "Space Policy Act of 1978" are:

Construction of first-generation Space Structures for communications, remote sensing, electric power experimentation, human habitation, etc.

Design, and--if proved safe and cost-effective--construction in space of prototype systems for generation of electric power.

Design and development of advanced communications systems in space, including systems for electronic mail and data transmission, emergency and personal security systems, educational and instruction television, medical and health care and other public services.

Design and testing in space of technologies to determine the scientific and economic feasibility of space-based manufacturing.

Establishment and operation of a system of remote sensing of the Earth's resources and environment.

Stevenson is introducing the legislation now in order to familiarize the Congress with it and will resubmit it early next year. He intends to hold hearings on the legislation prior to his hearings on the FY '80 NASA auth-

orization. (Defense/Space Business Daily, Vol. 100, No. 16, Wednesday, September 27, 1978, pg. 111.)

During September: The John F. Kennedy Space Center completed the installation of the Checkout, Control, and Monitor Subsystem equipment that will be used as part of the Shuttle Cargo Integration Test Equipment.

o The first portion of the Central Data Subsystem of the Vandenberg Air Force Base Shuttle Launch Processing System was delivered in September 1978. (Wilson R. Dietz, KSC Directorate of Electronics Engineering.)

October 1: President Carter told the NASA audience at Kennedy Space Center that the United States will not give up its leadership in space but that the pace of the program will be pitted against the rest of the nation's needs.

Carter stressed that the national space program in the coming generation will "reflect the range of our requirements and interests as a vigorous, responsible and free society."

The President, at the space center to present six Congressional Space Medals of Honor on NASA's 20th anniversary said, however, the nation's space activities "will be measured against all the needs of our country. We will be encouraging other countries to participate both in the work and in its benefits. But we will not give up the leadership of the United States in space."

Speaking in the Vehicle Assembly Building, the President made it clear that he is more concerned at the moment with the expense of any major new space initiative, rather than its possible benefits. He said it was "too early" to give the go-ahead to "expensive" projects such as "space factories" and solar power stations.

Carter extolled the capabilities of the Space Shuttle, noting that it will be able to orbit 32 tons into orbit mission after mission and "give us a regular, frequent and economical access to space." He said many benefits would be reaped from the future space program.

He presented the Congressional Space Medal of Honor to Neil Armstrong, Frank Borman, Charles Conrad Jr., Sen. John H. Glenn Jr., Alan B. Shepard, and to Betty Grissom, the widow of Virgil L. Grissom, who was killed in the Apollo 1 fire in 1967.

Carter recognized the Apollo lunar landings as a "stupendous achievement." (Defense/Space Business Daily, Vol. 100, No. 20, Tuesday, October 3, 1978.)

o **October 1:** President Jimmy Carter recently honored six astronauts by awarding them the Congressional Space Medal of Honor, the first such medal ever awarded by the United States. Recipients are: Neil A. Armstrong; Frank Borman, Charles Conrad, Jr., John H. Glenn, Jr., Virgil I. Grissom (posthumous); and Alan B. Shepard, Jr.

The medals were presented by the President during a visit to Kennedy Space Center, Fla., on Oct. 1, the date that marks the 20th anniversary of the founding of NASA.

The award, authorized by the Congress in 1969, is conferred on an "astronaut who in the performance of his duties has distinguished himself by exceptionally meritorious efforts and contributions to the welfare of the Nation and of mankind."

The awards cited:

Neil A. Armstrong, for actions to overcome problems and land his spacecraft safely on the Gemini 8 mission in March 1966 and for "steady cool professionalism, repeatedly overcoming hazards" on the Apollo 11 mission in July 1969, when he become the first person to walk on the Monn.

Frank Borman, who commanded the Gemini 7 mission in December 1965 and the Apollo 8 mission in December 1968, both of which "significantly hastened and facilitated achievement of the manned lunar landing objective." On Apollo 8, he commanded the first manned spacecraft ever to escape the Earth's gravity.

Charles Conrad, Jr., who from August 1965 to June 1973, participated in four space flights of increasing duration, complexity, and achievement. His contribution culminated the first manned Skylab mission in May and June 1973, when he commanded the crew that performed "lengthy, dangerous, and strenuous activities that were necessary to repair damage inflicted on the orbital workshop during launch and thereby save the two-billion-dollar program."

John H. Glenn, Jr., the first American to orbit the Earth in the third manned mission of project Mercury in February 1962, when his professional handling of extreme difficulties with the spacecraft "demonstrated the value of the human pilot in space. ...He returned to a nation and a world which seized on him as a major hero. This difficult role he handled with the same polite dignity that he brought to all his assignments."

Virgil I. Grissom (posthumous), the second American in space, who, from 1961 to January 1967, participated in Mercury and Gemini space flights and lost his life during preparation for the first Apollo flight. Experienced gained from the first manned Gemini flight in March 1965, which he commanded, led to "procedures necessary for the support of subsequent long-duration and rendezvous missions."

He died in a flash fire in January 1967 that swept through the Apollo spacecraft on the launch pad.

Alan B. Shepard, Jr., who was the first American in space aboard the Mercury spacecraft in May 1961, which "demonstrated that this country laked neither the courage nor the technology to compete in the new arena of space." He was also cited for showing "the highest qualities of leaderhip" as commander of Apollo 14, the third lunar landing mission in February 1971. (NASA Activities, Vol. 9, No. 11, NASA Headquarters, November 1978, p. 5-6).

o Kennedy Space Center, Fla.--Drive-through tours of NASA's John F. Kennedy Space Center and adjacent Cape Canaveral Air Force Station were suspended for sunday, October 1.

The Spaceport's Visitors Center was open to the public Sunday but the tours operated from there were restricted to the historical sites on Cape Canaveral Air Force Station and the lunar diorama housed in the Flight Crew Training Building in the KSC Industrial Area.

The alteration in normal tour operations was due to the visit of President Jimmy Carter in connection with NASA's 20th anniversary on Sunary and the need to regulate traffic in the Launch Complex 39 area during the presidential tour.

During his brief stay at KSC, President Carter toured the Space Shuttle launch facilities at Launch Complex 39 nad presented the Congressional Space Medal of Honor to six astronauts in a ceremony hold in the Vehicle Assembly Building.

Those who received the medal were: Neil A. Armstrong; Frank Borman; Charles Conrad, Jr., John H. Glenn, Jr., Virgil I. Grissom (posthumous), and Alan B. Shepard, Jr. (NASA News, Release No. KSC 102-78, September 26, 1978.)

October 5: NASA's John F. Kennedy Space Center has awarded a contract of $429,876 to K & S Electric, Inc., Titusville, Fla.

The fixed-price contract provides for the labor, material, and equipment necessary to install and check out a phase of the Utilities Control System in the KSC Industrial Area. The Utilities Control System will remotely control and monitor the heating, ventilation, and air conditioning systems

and monitor the fire alarm system. This new instrumentation will be easier to monitor than the previous system with decentralized controls and should aid in reducing power consumption.

Work under the contract - one set aside for small businesses - is to be completed within 300 calendar days. (NASA News, Release No. KSC 193-78, November 24, 1978.)

October 6: NASA's John F. Kennedy Space Center has awarded a contract for $660,000 to Harris Corporation, Government Systems Group, of Melbourne, Fla.

The contract is for equipment that will be used to integrate Shuttle cargo before it is actually installed in the Orbiter.

Harris Corporation will manufacture a payload data interleaver (mixer) and a pulse code modulation master unit for use with test equipment in the Operations and Checkout Building and the Vertical Processing Facility on the space center. The mixer device combines data from up to five data sources and funnels it into one point which then transmits the data through a master unit.

Work on this fixed price contract began October 6, and is to be completed by November 6, 1979. (NASA News, Release No. KSC 112-78, October 18, 1978.)

o 1979 Combined Federal Campaign. Over 92 percent of the Center's employees participated in the drive, donating $118,270, the largest amount of pledges and contributions ever recorded.

The total collected or pledged through October 6 smashed last year's record total of $110,000 and represented 118 percent of KSC's $100,000 goal. The average individual contribution increased 25 percent over last year while 78 percent of those participating did so through payroll deduction.

"The community reached out and asked KSC and the other federal employees in Brevard County to support their many needs, and these employees responded by making this annual drive an overwhelming success," explanined Huseonica. "This fantastic support is an indication that every individual at KSC recognized the reaching out of the community--and responded. Now we can share in the pride of knowing we have supplied a helping hand to those people in need throughout Brevard."

Huseonica, who next year will move up to Vice Chairman of the Brevard County CFC drive, acknowledged the job done by the unit coordinators and key solicitors, whose friendly and cooperative manner helped KSC exceed its goal. He also praised KSC's Vice Chairman, Bill Holden, for his support throughout the campaign. Holden will serve as CFC Chairman for KSC next year. The fine support from Tom Floyd who did the KSC CFC accounting job and Hugh Harris, who handled publicity, also helped make this campaign a successful event.

The Brevard County CFC drive, headed up this year by Hamp Wilson, Chief of KSC's Administrative Operations Branch for Procurement, Supply and Transportation, ran through October 6. The CFC drive at KSC was extended an additional week past its original September 29 deadline to allow people who might have been involved with President Carter's visit or were on leave or travel to participate in the regular campaign. (Spaceport News, Vol. 17, No. 21, John F. Kennedy Space Center, NASA, October 13, 1978. p.2.)

October 10: Brevard County's 9,000 federal employees have contributed generously in this year's Combined Federal Campaign, exceeding the $175,000 goal by more than 14 percent. Total contributions went over $200,000.

The contributions breakdown includes $119,000 from civil service employees of NASA and tenant agencies at the Kennedy Space Center and $73,000 by the Air Force and its tenants at the Air Force Eastern Test Range and Cape Canaveral Air Force Station.

The remainder--approximately $8,400--was contributed by civil service employees of the other 17 federal agencies operating in Brevard County.

Employee response in the campaign which extended from September 18 to October 6 was swift and generous. Personnel at the armed forces recruiting stations in Melbourne met their goal during the first day of the campaign.

The General Services Administration office providing transportation and other services at the Kennedy Space Center met its goal of 100 percent participation and raised 132 percent of its goal.

The $200,000 raised this year marks a substantial increase over the $193,000 contributed by federal employees during last year's Combined Federal Campaign.

CFC proceeds are allocated 77.77 percent to the United Way, 15.8 percent to the National Health Agencies and 6.5 percent to the International Service Agencies. (NASA News, Release No. KSC 110-78, October 10, 1978.)

October 11: President Carter announced a go-slow civil space policy which he said will set the directions of U.S. efforts in space over the next decade.

The President said he would support the space program with an "adequate" Federal budget, but it appears that this will mean a reduction from the current budget level. He said that money now being spent for development of the Space Shuttle may or may not be used for new space applications and exploration when Shuttle development is completed, and advocated a space science and exploration program which would be fiscally constrained "when conditions warrant."

The policy not only fails to commit the United States to any important new space projects at this time, it specifically rules out for now any major Apollo-like "high-challenge space engineering initiative" and a number of other proposed new projects such as a Satellite Solar Power Station, Space Manufacturing Facility, and an operational Landsat.

Instead, it calls for studies of some new systems which may or may not be initiated in FY '81 and for increased funding of the U.S. space program by the private sector and foreign countries in cooperative arrangements. The new programs to be considered are:

*Incremental improvements to the Space Transportation System" as they become necessary." An interagency task force will study the need for a Power Module and other systems for extending the Space Shuttle's stay-time in orbit and for a reusable Space Tug and Orbital Transfer Vehicle, and submit its findings prior to the FY '81 budget.

NASA will chair an interagency task force which will examine options for integrating current and future remote sensing systems into "an integrated national system," and report prior to the FY '81 budget.

DOD, NASA and NOAA will review meteorological satellite programs to determine the degree to which these programs might be consolidated in the 1980's and the extent to which separate defense satellite should be maintained.

DOD, NASA and NOAA will examine the possibility of integrated systems for ocean observation from space.

DOC's National Telecommunications & Information Administration will assist in market aggregation, technology transfer "and possible development" of domestic and international public satellite services, such as education and health services and basic communications services for remote areas. (Defense/Space Daily, Vol. 100, No. 27, Friday, October 13, 1978, pg. 183.)

o Through Oct. 11, NASA has conducted 350 test firings of the Rockwell Space Shuttle Main Engine (SSME) with a total duration of 26,530 seconds, including 8969 at rated power level (RPL). Certification goal is 80,000 seconds.

Between Sept. 10 and Oct. 12, thirteen test firings were conducted on two engines for a total of 3794 seconds, including 3096 seconds at RPL.

Three of the tests were prematurely shut down--two for instrumentation problems and one, the first test on Engine 0006, when propellant priming of the engine oxidizer system occurred out of sequence and caused damage to a fuel turbo pump turbine and the main injector of the engine.

Full duration testing of the complete main propulsion system, a cluster of three engines, is scheduled for early 1979 when the first manned orbital flight configuration engines become available. (Defense/Space Business Daily, Vol. 100, No. 37, Friday, October 27, 1978, pg. 259.)

October 13: TIROS-N, the third generation operational prototype spacecraft for the National Operatonal Environmental Satellite System (NOESS), was launched from the Western Test Range on October 13, 1978, at 7:23 a.m., EDT, by an Atlas-F type launch vehicle. The Atlas booster and the spacecraft's Apogee Boost System performed exceptionally well resulting in an orbit with elements as follows:

Orbital Element	Expected	Achieved
Apogee (km)	859.88	861.69
Perigee (km)	859.15	845.64
Inclination (degrees)	98.86	98.91
Period (minutes)	102.13	102.01
Local Equator Crossing Time (ascending)	1500	1500
Orbital Drift (minutes/year)	10	10

The National Operational Environmental Satellite System (NOESS) is a joint effort by NASA and the Department of Commerce to provide systematic, global, weather observations. Governed by a NASA-Commerce agreement, dated July 2, 1973, the National Oceanic and Atmospheric Administration (NOAA) is responsible for establishing the requirements for and operting the system, and NASA is responsible for developing the spacecraft and associated ground stations, for launching the spacecraft, and for ensuring the successful operation of the spacecraft.

The Low Earth Orbit Satellite Program included a first series of spacecraft (ESSA-1 through 9), now all launched, which consisted of four Advanced

Vidicon Camera System (AVCS) versions for remote globel cloud-cover imaging and five Automatic Picture Transmission (APT) versions for local-area coverage.

A second series of improved spacecraft combining the remote and local viewing functions into a single spacecraft, having in addition, a nighttime viewing capability and a limited atmospheric temperature sounding capability was initiated by the successful launch and operation of TIROS-M in early 1970. There were five additional spacecraft in this series designated NOAA-1 through NOAA-5 which met the operational needs until the present time.

TIROS-N is the operational prototype for the third generation of low Earth orbiting weather satellites designed and developed by NASA to satisfy the increasing needs of the operational system. This new generation will have a new complement of instruments which emphasize the acquisition of quantitative data of the global atmosphere for use in numerical models to extend and improve our long range (3 to 14 days) forecasting ability. The TIROS-N system was designed to also meet the data requirements of the First GARP Global Experiment (FGGE) which will commence on December 1, 1978.

A number of anomalies were observed in the early orbits, the most significant being loss of attitude control on orbit three. Spacecraft control was reestablished on orbit 12 by modifying the on-board computer program to place the spacecraft into an attitude acquisition mode using the cold gas momentum unloading capability for rate nulling. The spacecraft's attitude control system has maintained the spacecraft in proper configuration since that time.

All of the spacecraft's subsystems have been turned on and evaluated in the last 3 weeks. Although several anomalies have been observed, none are serious enough to prevent TIROS-N from meeting all mission requirements. All instruments have been turned on, and except for an inoperative channel on the British-supplied Stratospheric Sounding Unit (SSU), they are providing high quality data. Loss of the SSU channel is not serious since similar data is being obtained from the High Resolution Infrared Sounder (HIRS) and the Microwave Sounding Unit (MSU). All spacecraft anomalies continue to be investigated by the contractor as well as by a specially formed review committe at the Goddard Space Flight Center. The results of these reviews will be applicable to NOAA-A and subsequent satellites in the series.

Based on the spacecrafts' performance, NOAA has accepted TIROS-N for operational use on November 6, 1978. TIROS-N will be available to support the Global Weather Experiment, formerly called the First GARP Global Experiment (FGGE) during the first intensive observing period scheduled to commence on December 1, 1978.

The mission objectives of TIROS-N have been achieved. It was launched into the specified Sun-synchronous orbit, has completed its in-orbit evaluation and checkout successfully, and has been turned over to NOAA for operational use. Therefore, the TIROS-N mission is certified to be successful. (Mission Operation Report No. E-614-78-01, Subject: TIROS-N Post Launch Report, Mission Assessment, d. November 14, 1978. Also Mission Operation Report No. E-614-78-01, Prelaunch Summary TIROS-N Launch, d. August 21, 1978.)

October 16: NASA reported that all systems on the two Venus-bound Pioneer spacecraft are operating nominally and that all testing in preparation for the Venus encounter is going as planned.

Pioneer-Venus 1, the Orbiter spacecraft, which was launched May 20, is 22 million miles from Earth and traveling at a speed of 4700 mph. It has covered some 203 million of its 310 million mile flight path and will arrive at Venus on December 4.

Pioneer-Venus 2, the Multiprobe spacecraft, which was launched August 8, is 9 million miles from Earth traveling at a speed of 6600 mph. It has covered 88 million miles on its 200 million flight path and will arrive at Venus on December 9. The large, 700-pound Sounder probe will separate from the bus on November 15, with the smaller North, Day and Night probes separated four days later. (Defense/Space Business Daily, Vol. 100, No. 28, Monday October 16, 1978. p. 194).

October 17: A short-circuit involving a series of solar cells on the European Space Agency's GEOS-2 magnetospheric monitoring satellite has partially disrupted signal transmissions from three of the satellite's seven experiments. ESA said it does not consider the problem particularly alarming because the proportion of data lost is small and there is a possibility of reconstituting a part of it by mathematicl processing on the ground. GEOS-2 was launched July 14 from Cape Canaveral and is operating in geosynchronous orbit. It is participating, along with the three International Sun-Earth Explorer (ISEE) satellites, in the International Magnetosphere Study, which is designed to learn more about the near-Earth environment. The experiments affected by the signal problem are measuring magnetopheric fields and waves and low-energy particles. (Defense/Space Business Daily, Vol 100, No. 29., Tuesday October 17, 1978. p. 198).

October 23: NASA's John F. Kennedy Space Center awarded a contract of $83,900 to Ivey's Steel Erectors, Inc., of 480 Bellaire Avenue, Merritt Island, Florida. The seventy-five day contract calls for the contractor to

provide labor, equipment and material necessary to modify the rear swing platform structural and drive systems, OPF High Bay 1. The work consists of removing existing structural steel, dismantling track and drive systems, installing new steel, modifying trucks, installing new drive systems and associated electrical work. (Memo to PA/Public Affairs, from AP-PRO Procurement Office, Subject: Contract Award Information, Contract No. NAS10-9513, October 24, 1978.)

October 24:

Nimbus-G, the last of the Nimbus series was launched by Delta 2910 launch vehicle. The launch which occurred at 0414.0072 was made from launch complex SLC-2 at the Space and Missile Test Center, Vandenberg Air Force Base, California. The flight path datat was as follows:

	Planned	Accomplished
Apogee	955.7	954.6 km
Perigee	955.5	953.6 km
Inclination	99.2 deg	99.28 deg
Eccentricity	0.00001	0.000071
Period	104.1	104.4 minutes

Nimbus-G is the last satellite in the series dedicated to flight testing of advanced instruments for pollution, oceanographic and meteorological applications, and for development and refinement of associated science algorithms and data processing technicques. The Nimbus series, since the first launch in August 1964, has provided continuous Earth Observation capability and contributed significantly to the development and demonstration of observation techniques now being incorporated in operational observation satellites such as GOES and TIROS. The Nimbus-G Program includes:

-- A three-axis attitude stabilized, Earth-viewing spacecraft bus
-- An eight sensor payload complement
-- Funded science team participation, domestic and international, involving extensive science algorithm development and validation, and post-flight applications
-- Processing, formating, distribution, and archiving of standardized, Experiment Team-defined data products

The Nimbus-G spacecraft weight at launch will be 987 kg. The payload complement consists of one facility instrument, the Temperature Humidity Infrared Radiometer (THIR), and seven science instruments:

- o Stratospheric and Mesospheric Sounder (SAMS) - developed by the United Kingdom
- o Scanning Multichannel Microwave Radiometer (SMMR)
- o Coastal Zone Color Scanner (CZCS)
- o Solar and Backscattered Ultraviolet and Total Ozone Mapping System (SBUV/TOMS)
- o Earth Radiation Budget (ERB)
- o Limb Infrared Monitor of the Stratosphere (LIMS)
- o Stratospheric Aerosol Measurement II (SAM II)
- o Temperature Humidity Infrared Radiometer (THIR)

During the first year of operations, science algorithms and data processing technicques will be fine-tumed and validated, and data archival will commence. Data applications investigations will also begin during this period.

Included in the Nimbus-G launch is a piggy-back experiment called CAMEO (Chemically Active Material Ejected in Orbit). This Goddard Space Flight Center experiment weighs approximately 89 kg and consists basically of one lithium and four barium gas canisters. These gases will be released at orbital altitudes in order to facilitate the study of the boundary structure between the polar cap and the auroral belt, and to evaluate orbital velocity effects on neutral and ion clouds. The CAMEO will remain attached to the second stage of the Delta vehicle. (Mission Operation Report No. E-604-78-08, Subject: Nimbus-G Post Launch Report #1 d. October 25, 1978. Also, Mission Operation Report No. E-604-78-08, Prelaunch, Subject: Nimbus-G d. August 21, 1978.)

October 25: NASA's John F. Kennedy Space Center awarded a $609,384 contract to Industrial Steel, Inc., Mims, Florida, a small business firm. The fixed price contract calls for the contractor to furnish all labor materials and equipment necessary for certain modification to Launch Complex 39-A for Space Shuttle. Work consists of adding hand rails, installing safety devices on ladders, additional trolley beams and trolleys, fabrication and installation of additional access platforms, structural modifications to the Rotating Service Structure, relocation of comprised air on gaseous nitrogen stations, fabrication and installation of new safety cages. Work under the contract is to be completed in 120 days. (Memo to PA/Public Affairs Office from AP-PRO/Procurement Officer, Subject: Contract Award Information, Contract NAS 10-9509. d. October 25, 1978.)

October 28: Over 6,000 employees and their families turned out to take part in Kennedy Space Center's Open House on October 28.

Families viewed work areas and major points of interest such as the VAB, Orbiter Processing Facility, Shuttle Landing Facility and Pad A, along with the KSC Industrial Area and facilities on Cape Canaveral Air Force Station.

Many contractor and Civil Service employees volunteered their time to give briefings and answer questions at the different stops along the tour route. (Spaceport News, Vol. 17, No. 23, November 10, 1978.)

During October: The fourth increment or phase of the Central Data Subsystem, of the Kennedy Space Center Launch Processing System was delivered and installed in October 1978. (Wilson R. Dietz, KSC Directorate of Electronics Engineering.)

o Jack H. Williams has been named Director, Ground Systems, Technical Support Directorate.

Formerly Associate Director for Management, Support Operations, Williams was promoted to his current position following a reorganization of the TS Directorate. The reorganization is expected to provide for more effective and efficient response to the developing requirements of Shuttle operations here.

In his new position, Williams will direct the operation and maintenance of the Center's support systems, equipment and facilities, and the general maintenance of its facilities and utilities.

Williams joined NASA's Launch Operations Center in February 1961, following two years active duty in the U.S. Marine Corps. He worked first in the Instrumentation Planning Branch, and transferred to the Plans, Programs and Requirements Office which later became the Apollo Program Office.

In 1966, he was named head of the NASA Test Support Office, which was responsible for coordinating Eastern Test Range support for NASA launches from Cape Canaveral Air Force Station and KSC. He was named Associate Director for Management, Support Operations, in 1975. (Spaceport News, Vol. 17, No. 21, John F. Kennedy Space Center, NASA, October 13, 1978. p. 3.1

November 1: Performance and service awards were bestowed upon 120 Kennedy Space Center employees at an awards ceremony Nov. 1.

The awards included the presentation of one of NASA's highest awards, the Exceptional Service Medal, to four individuals; a Presidential Letter of Commendation; Equal Opportunity Awards; the Woman of the Year Award; KSC Certificates of Commendation and Group Achievement Awards.

Making the presentations were NASA Administrator Dr. Robert Frosch and KSC Director Lee R. Scherer.

The Exceptional Service Medals were presented by Dr. Frosch to William Baulig, Satellite Beach; C. M. Giesler, Mims; Thomas E. Utsman, Cocoa Beach; and Wiley Williams, Titusville.

The Presidential Letter of Commendation, given in recognition of effecting significant cost savings to the government, was awarded to William F. Petty of Cocoa.

The Director's Award, KSC's highest, was presented to George L. English of Titusville.

The KSC Federal Woman of the Year Award was presented to the individual woman at KSC who during the past year has best demonstrated a high level of competence on her job, aided other women to develop their potential and significantly enhanced other women's status on the job or in the community.

Receiving this award was Clorine D. Coates of Melbourne, a construction contract administrator with KSC's Procurement Office.

Equal Opportunity Awards went to George Gogel, Indian Harbour Beach, and Annie E. Taylor, Rockledge.

The KSC Certificate of Commendation, the Center's second highest award, is granted for exceptional individual accomplishment and outstanding direction or management of a program or effort that affects the entire Center.

Receiving Certificates of Commendation were Mary H. King, Cape Canaveral; James D. DeVault, Robert M. Ferguson and Maggie L. Wright, Cocoa; Darwin V. Brown, Donald E. Burris, and Sara M. Sheppard, Cocoa Beach; Henry C. Creighton, Richard M. Davis, David E. Dunsmoor, Gary Gutkowski, Robert H. Haber, Robert M. Howard, Robert C. Kimble, Donald L. Nichols, Melvin G. Olsen, Nels E. Roseland and Richard N. Young, Merritt Island.

Paul Thomas Breakfield III, Willis Crumpler, James J. Hart, Donald L. Lovall, Bruce E. Miller and A. R. Raffaelli, Rockledge; Paul E. Ferris, Charles D. Gay and Dallas K. Gillespie, Satellite Beach; Dale E. Armstrong, Howard E. Baxter, David C. Moja and Frank Ruggieri, Titusville.

A Group Achievement Award was presented to the Electronic Section of KSC's Information Systems Directorate for outstanding achievement in the hardware design, fabrication, test and installation of the real-time interface of the Launch Processing System.

Sharing in this award was Thomas W. Brauer, Chuluota; George D. Mathews and Edwin W. Manry Jr., Cocoa Beach; Dennis R. Fougnie, Melbourne; Edward J. Oscar and Richard E. Whitehead, Merritt Island; Keith M. Wooded, Rockledge, and David L. Hornyak, Titusville.

The Public Service Group Achievement Award is NASA's way of recognizing outstanding team efforts by private industry. This award was presented to the Frank Briscoe Company of East Orange, N.J.

Also honored were 70 people who were presented with 30, 35, and 40-year service awards. This group has amassed a cumulative total of 2,240 years of federal service. (Spaceport News, Vol. 17, No. 73, November 10, 1978.)

o R. H. Gray, Manager Space Transportation System announced the official designation of the Shuttle Orbital Flight Tests and Operational Flights are to be STS-1, STS-2, etc., instead of SS-1, SS-2, etc., as designated in August these designations will be used by NASA when communicating outside the Agency, especially in public affairs matters.

Effective immediately, the offical designations for Space Shuttle Orbital Flight Tests and Operational Flights are STS-1, STS-2, etc. continuing sequentially through the Operations era instead of SS-1, SS-2, etc.

As stated in my referenced memo, you are not required to purge existing documentation to make this change; however, all new or revised documentation will use the new designations. Of particular importance is the use of this new designation when communicating outside of NASA, especially in

public affairs matters. (Memorandum to Distribution, from SP/Manager, STS Project Office, Subject: Official Flight Titles for Space Shuttle for OFT and Operational Flight, d. November 1, 1978.)

November 2: NASA's John F. Kennedy Space Center awarded a 1,764,700. contract to the W&J Construction Corporation, Cocoa, Florida. The fixed price, small business firm contract calls for the W&J Corporation to furnish all labor, materials, and equipment to fabricate and install new elevating platforms, fixed platforms, retractable access platforms, compressed air systems, structural modifications, new electrical work and vertical payload handling devices for the east and west cell of the Spaceport Assembly and Encapsulation Facility (SAEF-1). Work under the contract must be completed in 300 days. (Memo to PA/Public Affairs Officer from AP-PRO/ Procurement Office, Subject: Request for Priority News Release [NAS 10-9115]. November 2, 1978.)

o NASA's John F. Kennedy Space Center has awarded a contract for $257,050 to Ivey's Steel Erectors, Inc., Merritt Island, Fla., for the modification of a Mobile Launcher Platform.

The contract is for the strengthening of the blast deck area to protect it from the exhaust plumes of the Space Shuttle's twin solid rocket boosters during liftoff.

Each of the Shuttle's solid rocket boosters produces 2.9 million pounds of thrust. The twin solid motors are ignited at the zero point in the countdown and burn for approximately two minutes in parallel with the Orbiter's three main engines during the early launch phase.

Two of KSC's three Saturn V/1B Mobile Launchers are being modified to serve as Mobile Launcher Platforms for the Space Shuttle program.

Completion of the work under the contract - one set aside for small business firms - is scheduled for 120 calendar days. (NASA News Release No. KSC 191-78, November 17, 1978.)

o NASA's John F. Kennedy Space Center has awarded a $1,764,700 contract to W & J Construction Corporation, Cocoa, Fla, for modifications to the Vertical Processing Facility.

Space Shuttle payloads to be installed vertically at the launch pad will be checked out at the Vertical Processing Facility. These types of payloads consist primarily of automated spacecraft involving upper stages and operations too hazardous to be performed in the Orbiter Processing Facility.

The contract is for supplying all labor, materials, and equipment necessary to furnish and install new elevating, fixed and retractable access platforms, compressed air systems, structural modifications, new electrical work, and Vertical Payload Devices for two cells in the Vertical Processing Facility.

Work under the fixed price contract is to be completed within 300 days after notice to proceed. The award is to a small business firm. (NASA News, Release No. 183-78, November 3, 1978. Also, NASA Contract No. NAS10-9515.)

November 3: NASA flight controllers were successful Friday night in turning around the ailing Skylab space station.

The flight controllers, working out of the Johnson Space Center, Houston, Texas, at 7:52 p.m. commanded Skylab to reverse its position in orbit to help a gyro which was freezing.

The flight controllers, in reversing Skylab's position, permitted more solar energy to be absorbed by the space station's solar panels, keeping it stabilized in orbit.

Skylab is expected to come back into the Earth's atmosphere some time late next year or in early 1980.

During the past eight months there have been numerous problems with Skylab and keeping it stabilized in orbit. NASA officials now believe Friday night's successful maneuver, which was verified at 9:28 p.m., will allow the space station to remain in orbit and not fall out of space until early 1980. (TODAY Newspaper, Cocoa, Florida, Saturday, November 4, 1978.)

o NASA successfully carried out the reorientation maneuver of the Skylab this weekend, which was designed to warm up a control gyro that had been out of the Sun's rays. The maneuver began at 6:52 p.m. CST Friday and was completed by 8:29 p.m. Skylab is orbiting at an altitude of about 234 miles. The orbit is decaying at the rate of about a mile a month, with the station projected to reenter in June 1980. A mission to either reboost the station

or to send it on a controlled reentry is planned for February 1980. (Defense/Space Business Daily, Vol. 101, No. 5, Tuesday, November 7, 1978, pg. 31.)

November 6: NASA's John F. Kennedy Space Center has awarded a contract of $35,970 to Jones Machine and Welding Shop, Merritt Island, Fla.

The contractor is to manufacture, deliver, and fit check a Flight Readiness Firing Radiation Heat Shield that will be used to protect the solid rocket boosters and external tank from heat radiation during a test firing of the Space Shuttle main engines at Launch Complex 39. The shield will protect the coating on the solid rocket boosters and external tank from deterioration and remove the necessity for their refurbishment before the first flight test of the Shuttle.

Work began November 6, 1978, and will continue through March 1, 1979. The contract is one set aside for award to a small business firm. (NASA News, Release No. KSC 194-78, d. November 24, 1978.)

November 7: The European Space Agency's Spacelab Program Board has turned down NASA's proposal to barter Space Shuttle launch services for the second Spacelab, which NASA is committed to acquire. The action is seen as final.

NASA had hoped to exchange the launch services for the Spacelab in order to keep down the cost of its budget. Cost of the second Spacelab is estimated at roughly $100 million. Under the agreement with NASA, ESA developed and is building the first Spacelab with some $600 million of its own funds.

While ESA itself was favorable to the barter plan, the European governments opposed it because they did not want to commit themselves in advance to the Shuttle flights involved, although West Germany, which is paying the bulk of the Spacelab development costs, has already signed up for two dedicated Spacelab flights.

In order to mitigate this problem, NASA recently informally proposed that instead of four dedicated Shuttle flights, the Spacelab be exchanged for partial flights, i.e., where the ESA payload would account for only part of the payload and thus be charged only part of the cost. (Defense/Space Daily, Vol. 101, Wednesday, November 6, 1978, pg. 39.)

November 13: On November 13, 1978, at 12:24 a.m., EST, the High Energy Astronomy Observatory (HEAO-2) was successfully launched by an Atlas-Centaur vehicle into a planned orbit from the Cape Canaveral Air Force Station, PAD LC36B.

The computer orbital parameters achieved by HEAO-2, based on data from various tracking stations, are:

Item	Nominal	Actual
Apogee	547.3 km	547.5 km
Perigee	529.2 km	527.3 km
Period	95.4 min	95.38 min
Inclination	23.52 deg	23.49 deg
Eccentricity	0.000660	0.000659

The HEAO-B is the second in a series of three Atlas-Centaur launched satellites. The HEAO satellites are designed to survey the entire sky for X-ray sources and background of about one-millionth of the intensity of the brightest sources, to make measurements of the gamma-ray flux and determine source locations and line spectra, and to examine the composition and synthesis of cosmic-ray nuclei.

The HEAO-B mission will provide detailed studies of individual X-ray sources discovered by previous instruments as well as by HEAO-B. Precise information on location, intensity, variability, and spectral content will be obtained. Unlike HEAO-1, whose primary mode was scanning, HEAO-B will carry out its scientific objectives exclusively in a pointing mode and will cover the energy range of 0.2 to 4 keV; and an auxiliary instrument will monitor X-ray sources up to 20 keV.

The mission is designed and currently approved for 1 year duration with an additional 6 months for data analysis. Orbital altitude and attitude control system parameters are being selected to permit later approval of extended operation and data analysis depending on availability of funds and quality of science data. (Mission Operation Report No. S-832-78-02, Subject: High Energy Astronomy Observatory (HEAO-2) Post Launch Report No. 1, November 14, 1978. Also, Mission Operation Report No. S832-78-02, Prelaunch, Subject: High Energy Astronomy Observatory - B (HEAO-B), d. October 30, 1978.

November 15: NASA officially declared the $95 million Seasat-A mission ended. The proof-of-concept ocean-monitoring satellite was launched June 26 on a one-to-three year mission, but contact was lost with the satellite on its 1502nd orbit on Oct. 9 when an unexplained short circuit drained all power from the satellite's batteries.

Seasat's major instrument, a synthetic aperture radar (which provided images of sea ice, waves, coastal conditions and land forms), completed some 300 data-gathering passes, collecting about 60 hours of data. The spacecraft's scatterometer (sea surface wind speeds) and scanning multi-frequency microwave radiometer (sea surface temperature and wind speed) collected data for 99 days. Seasat's altimeter and visual and infrared radiometer returned data for 70 and 55 days, respectively.

The three major objectives of the mission were to: 1) demonstrate techniques to monitor the Earth's oceanographic phenomena and features from space on a global scale, 2) provide oceanographic data in a timely fashion to maritime scientists and ocean users; and 3) to determine the key features of a full-time, operational ocean monitoring system, i.e., a follow-on multi-satellite network. (Defense/Business Daily, Vol. 101, No. 12, Friday, November 17, 1978, pg. 80.)

November 18-20: The North Atlantic Treaty Organization's NATO III-C satellite was launched into a synchronous trnafer orbit fom the Eastern Test Range at 7:46 p.m., EST, on November 18, 1978, by a Delta 2914, Vehicle Mission Number 146 from Launch Complex 17. Pad B.

Performance of the Delta launch vehicle was nominal and placed the spacecraft and its apogee boost motor (ABM) into the desired transfer orbit. The orbital elements achieved compared with the nominal expected, are as follows:

	Expected	Measured
Apogee (km)	35,975	35,891
Perigee (km)	185.2	184.5
Inclination (degrees)	27.2	27.2

The satellite performed satisfactorily during the transfer orbit and the ABM was fired successfully at 8:00 p.m., EST, on November 20, 1978. The satellite was maneuvered over the South Atlantic to a position at 50 degrees West longitude above the equator and satellite status is satisfactory. This was the third and final NATO III-C satellite placed in orbit by NASA for the USAF/SAMSO acting as agents for NATO.

NATO-IIIC was designed to replace the NATO-II satellites in the NATO Integrated Communications System (NICS). Funded entirely by NATO, the three spacecraft were built by Ford Aerospace & Communications Corporation Western Development Laboratories at Palo Alto, California. The United States Air Force Space and Missile Systems

Organization (SAMSO) serves as the satellite contracting agency on behalf of the NATO Integrated Communications System Management Agency (NICSMA). Launch functions are controlled by the Expendable Vehicles Directorate at the Kennedy Space Center, Florida.

After NATO-IIIC was injected into the transfer orbit, the U.S. Air Force Satellite Control Facility (SCF) network will exercise control on NATO's behalf. To convert the orbit from elliptical to circular, and change the 27.2-degree angle of inclination so that the flight path will be directly above the equator, SCF operators, on about the fifth apogee, will correctly orient the spacecraft and fire an on-board solid propellant kick-motor. This final burn transfers the satellite into a circular drift orbit, almost at geosynchronous altitude. (Mission Operation Report, No. M-492-201-78-03 Subject: NATO, III-C/Delta Post Launch Report, d. February 5, 1979. Also, KSC GP-51 Launch Mission Summary and Sequence of Events, NATO III-C, Delta-146, John F. Kennedy Space Center, NASA, d. October 23, 1978. p. 3.)

December 4: Pioneer I slipped to an oval orbit around Venus on Monday to begin a 25-day probe of the cloud-shrouded planet that scientist hope will yeild clues to the origins of Earth's climat and environment.

The flagship of the unmanned space fleet that will conduct the study swept behind the planet at 7:56 a.m. PST, right on schedule, said officials at the National Aeronautics and Space Administration's Ames Research Center here. The craft, shaped like a coffee can, emerged 20 minutes later from the back side of the planet.

Controllers received signals that the craft's speed had been reduced from 32,000 mph to 29,650 mph -- slow enough to bring it under the influence of Venusian gravity and start an oval-shaped orbit on a 24-hour cycle. (Orlando Sentinal Star, Tuesday, December 5, 1978. p. 11-A.)

o The Pioneer Venus 1 spacecraft, which was successfully placed in orbit around Venus Monday, was continuing to operate well yesterday although a programming error prevented the start of radar mapping of the planet, which was to begin Tuesday. The error: a computer programmer punched a C instead of a 6.

The Venus 1 Orbiter was initially placed into a 236/40,080-mile, 23 hour, 11-minute orbit of Venue. On-boad rocket firings were scheduled to reduce the perigee to 150 miles and to correct the period to exactly 24 hours. The perigee will later be cut to 90 miles.

All of the Orbiter's 12 instruments have been turned on and checked out.

The first of the daily ultraviolet pictures of the thick clouds that blanket Venus were expected yesterday.

Meanwhile, NASA reported that the gamma ray burst detector on the spacecraft had successfully detected six gamma ray bursts on its way to Venus. The agency is hopeful that by triangulating the Orbiter's data with that of DOD's Vela satellites and the solar-orbiting ISSE-3 and Helios 2, it will for the first time be able to pinpoint the sources of the huge gamma ray bursts emanating from deep space. (Defense/Space Business Daily, Vol. 101, No. 25, Thursday, December 7, 1978. p. 178.)

December 6: The cloud photopolarimeter on-board the Venus 1 Orbiter spacecraft returned its first ultraviolet picture of the plaet Venus Wednesday -- a low contrast picture showing a one-quarter crescent of Venus illuminated by the Sun.

The picture, taken at a distance of 30,000 to 40,000 miles, did not show any of the dark markings that have been seen previously in the Venusian cloud cover. Scientists suggested that the marking must thus lie below the upper layers of the atmosphere. A more detailed look at the full disc of the planet is expected in pictures to be taken in January and February.

Meanwhile, NASA said that controllers, for the second day in a row, had issued the wrong computer command to the spacecraft, which pointed a radar antenna awary from the planet, preventing the start of the planned 243 days of radar mapping of the planet's surface. (Defense/Space Business Daily, Vol. 101, No. 26, Friday, December 8, 1978. p. 182.)

December 7: In a move designed to save up to $6 million, NASA has decided to prepare Spacelab scientific equipment at Kennedy Space Center rather than in Huntsvill, Ala.

The equipment will be used in experiments conducted aboard Spacelab, a European Space Agency craft which will be housed in the Shuttle's Orbiter cargo bay during numerous Shuttle flights.

The equipment will be mounted on large frameworks called "racks" and "pallets".

Pallets are very large frameworks, measuring 10 feet by 14 feet, which hold equipment in the cargo bay, which actually will be exposed to space, Harris said.

Racks are smaller metal frameworks which hold various electronic devices, such as cameras and monitors, inside the Spacelab module.

The equipment originally was to be installed on the racks and pallets in Huntsville at the Marshall Space Center. But NASA cost analyses have found that the agency will save $4 million to $6 million during the first six years of Spacelab if installation is done at KSC, he said. (Cynthia Green, Today Newspaper, Thursday, December 7, 1978.)

December 8: John F. Kennedy Space Center negotiated a supplemental agreement of 301,794 to contract NAS10-8995 with TRW Systems Group, Redondo Beach, California. The supplemental agreement calls for the continuation of support to the Expendable Vehicle Directorate for launch operation and reliability and quality assurance engineering services. (Memo to PA/Public Affairs from AP-PEO/Procurement Officer, Subject: Contract Award Information, Contract NAS-10-8995, Amd. #15, d. December 18, 1978.)

December 9: The bus spacecraft and the four descent probes of the Pioneer Venus 2 spacecraft, the second half of the $225 million U.S. exploration mission to Venus, scored a major scientific advance Saturday as they carried out their mission to perfection -- reporting data that has brought into question the theories of how the planets were created.

The Hughes-built bus, carrying 112 pounds of scientific instruments, entered the Venusian atmosphere on Saturday afternoon, sending back data on the upper atmosphere of Venus before burning up a few minutes after entry as planned.

The four probe spacecraft, built by General Electric, all descended to the surface of the planet in about an hour as scheduled, sending back data all the way down. All seven instruments aboard the 700-pound large probe and the three instruments on each of the smaller, 200-pound probes all worked all the way down to the surface, sending back signals for 67 minutes.

The information returned by the probe spacecraft which has disrupted existing theories on the formation of the solar system -- in particular, on the creation of the inner planets -- was a concentration of argon-36 gas in the Venusian atmosphere that is 100 times greater than on Mars/

Because argon-36 cannot be created after a planet's formation, the finding means either that Venus was formed from different substances than Earth or Mars or that the formation process itself was different, i.e., that Venus either had more argon-36 in its primordial atmosphere than did the Earth or Mars, or that it somehow retained that original atmosphere, unlike the Earth and Mars.

Other findings of Pioneer Venus 2:

Polar Areas Warner Than Equator. The Venusian cloud tops, about 40-50 miles altitude, were found to be more than 40 degrees F warner at the north and south poles than at the equator. The polar cloud-top temperatures were -40 degrees; at the equator, -80 degrees F. Surface temperature on Venus has been found to be about 900 degrees F around the planet. The upper level of the "air" at the poles is about 2 kilometers below the upper level

of the air at the equator, which scientists said could mean that there is "rising and cooling air at the equator and warming, descending air at the poles."

Night Temperatures Higher Than Day. Cloud-top temperatures were found to be slightly higher on the night side of Venus than on the day side. It was suggested that this could mean that the cloud-tops drop lower at night.

Lack Of Water. Scientists said the lack of water on Venus indicates that the planet never had any water or that is was lost "by something dramatically different from anything observed on other planets."

Dust On Surface. The Venus 2 probe that impacted on Venus raised a cloud of dust when it hit. The dust cloud lasted for four minutes, indicating that winds on the surface of Venus are almost nil. The temperature inside the probe reached 260 degrees F.

Clouds End At 30 Miles. Data indicated that the clouds of Venus go down to an altitude of 30 miles from the surface. (Defense/Space Business Daily, Vol. 101, No. 28, Tuesday, December 12, 1978. p. 198.)

December 12: Explorer 51, the first of three ne Atmospheric Explorer spacecraft orbited by NASA, is expected to enter the Earth's atmosphre and burn up sometime this month after operating for five years in low Earth orbit.

The 1450-pound, RCA-built spacecraft was launched Dec. 16, 1973, ito a 100-by-2400 mile elliptical orbit. Since that time, it has been directed to dip in and out of the upper atmosphere, using its hydraine-fueled Orbit Adjust Propulsion Subsystem . The system was used to lower the satellite's perigee to 80 miles -- the lowest orbit ever regularly attained by a NASA spacecraft -- and then refired every few weeks to raise the orbit, preventing it from being pulled into the atmosphere and destroyed. Depletion of the hydrazine fuel now makes that inevitable.

The spacecraft, carrying 14 scientific experiments weighing 210 pounds, is designed to make a full investigation of the photochemical processes and energy transfer mechanisms occurring in the thermosphere, where most of the ultraviolet and x-ray energy from the Sun is absorbed and which control the structure and behavior of the Earth's upper atmosphere -- which in turn affects the Earth's weather.

Histroians note: Reentered December 12, 1978.

(Defense/Space Business Daily, Vol. 101, No. 24, Wednesday, December 6, 1978, p. 168. Also, Satellite Situation Report, Volume 18, No. 6, Goddard Space Flight Center, NASA, December 31, 1978. p. 96.)

o In a compromise action, the 27-man board of governors of Intelsat has decided to use both the reusable U.S. Space Shuttle and the expendable European Ariane vehicle to launch the fifth, sixth and seventh Intelsat V satcoms in the 1981-82 period.

Two Space Shuttles and one Ariane will be ordered by the 102-nation Intelsat at a price of $82 million. Intelsat said the cost of the Ariane will be about $26 million, leaving the cost of the Shuttles at $28 million each.

The decision to use the Ariane is a major breakthrough in Europe's bid to compete with the U.S. for launch services -- marking the first time that a non-U.S. launch vehicle will be used to launch an Intelsat satellite. Earlier, it was planned that the Space Shuttle would be used for the fifth, sixth and seventh Intelsat V launches.

The decision by the European Space Agency, at the insistence of France, to fund the largely French Ariane was a signal that Europe would compete with the U.S. in space. The price of the Ariane has been set below its cost to ESA, as has the price for Shuttle launches. ESA said in May that the fixed price on Ariane for internal European use (full payload) would be $31 million. The U.S. believes that the European "subsidy" for Ariane is much larger than the U.S. Government support for the Shuttle.

Intelsat said that its launch vehicle decision was made difficult by the fact that neither the Shuttle nor Ariane has flown. The Shuttle will not make its first test flight before next September at the earliest; the Ariane's maiden launch is scheduled for July, although some testing problems have been encountered.

However, the decision to go to Ariane at all is controversial in light of the fact that:

1) NASA has agreed to provide an Atlas-Centaur backup to the Shuttle in case the first Shuttle is not available; if the Ariane is not available, there is no way for Europe to provide a backup.

2) If the Space Shuttle should fail to place the Intelsat satellite in orbit, it would, except in a catastrophic case, be able to return the satellite to Earth for re-launch, and NASA has said that it would provide another Shuttle launch at no cost; if the Ariane should fail, the satellite would be lost and it is not known whether ESA would absorb the cost of a second launch vehicle.

If the Ariane is not available, Intelsat noted that it had not yet assigned launch vehicles for the three Intelsat V launches. Presumably, if the Ariane was not ready, the Space Shuttle, if it was ready, or the Atlas-Centaur could be used instead.

The availability and success of the two launchers for the first three launches will, of course, be a factor in decisions about launchers for follow-on Intelsat satellites. Intelsat has options to launch more than seven Intelsat V's currently planned and is also looking at a new Intelsat VI series.

The launch of the fifth Intelsat V is tentatively planned for April/May 1981. (Defense/Space Business Daily, Vol. 101, No. 29, Wednesday, December 13, 1978, pg. 205.)

December 15-18: A delegation of space scientists from the People's Republic of China joined a contingent of Canadians and America's astronaut candidates in viewing the successful nighttime launch of ANIK-B, Canada's fourth domestic communications satellite.

The Chinese delegation has been touring U.S. space centers and aerospace industry facilities since Nov. 28, discussing with American officials their interest in puchasing a U.S. built communications satellite that would be launched here by NASA.

The 15-member group, headed by Dr. Jen Hsin-min, directory of the China Space Technology Research Institute, arrived late Thursday after a full day visit at the Johnson Space Center in Houston.

They spent Friday touring launch activities and were accompanied by a diplomat from the Chinese Mission in Washington and a Chinese news agency correspondent.

NASA hosts showed their foreign guests the mobile launch platform on which America's new space shuttle will be assembled, the pad where it will take off and the control firing room from where it will be guided.

Most of the Chinese officials wore western-style suits although a few members of the delegation sported dark blue Mao-style garb.

They made no statement to American newsmen but a NASA official said the Chinese have been impressed with the U.S. facilities.

Chinese leaders have announced their intent to modernize their nation's technology in an effort to catch up with other major world powers by the end of the century.

The Chinese have launched seven satellites of their own but have not developed the ability to place communications spacecraft into more distant, desirable orbits, western experts believe. (Orlando Sentinel Star "Chinese Guests at Cape Launch," by Jim Ball, Saturday, December 16, 1978.)

The Telesat/Canada's Telesat-D (ANIK-B) satellite was launched into a synchronous transfer orbit from LC-17-A at the Eastern Test Range at 7:21 p.m., EST, on December 15, 1978, by a Delta 3914, Vehicle Mission Number 147.

Performance of the Delta launch vehicle was nominal and placed the spacecraft and its apogee boost motor (ABM) into the desired transfer orbit. The orbital elements achieved compared with the nominal expected, are as follows:

	Expected	Measured
Apogee (km)	35,959	35,896
Perigee (km)	185.1	184.7
Inclination (degrees)	27.2	27.2

The satellite performed satisfactorily during the transfer orbit and the ABM was fired successfully at 8:00 p.m., EST, on December 18, 1978. The satellite as maneuvered over the South Atlantic to a position 109 degrees West longitude above the equator and satellite status is satisfactory.

Telesat-D (ANIK-B), a dual band satellite designed for internal use within Canada, is able to carry commercial traffic in the 6/4 GHz frequency bands, and in addition, operate in the 14/12 GHz bands.

Telesat Canada, a corporation formed by Act of Parliament and owned by Canadian telecommunications common carriers and the federal government, will assume control of the spacecraft in the transfer orbit. Operating from the Satellite Control Center in Ottawa, Ontario, Telesat will fire an on-board solid propellant motor on the seventh apogee. This will circularize the orbit at synchronous altitude, 22,300 miles (35,900 kilometers)

above the equator. Its final station will be at 109 degrees West Longitude, over the Pacific Ocean. Tracking data and command access will be provided by an arrangement with Intelsat tracking stations at Carnarvon, Australia, and Fucino, Italy, in addition to the Telesat main Telemetry Tracking and Command station at Allan Park, Ontario.

ANIK-B has 12 transponder channels in the 6/4 GHz bands for use in the commerical communications system and 4 transponder channels for use in the 14/12 GHz bands. Each transponder in the 6/4 GHz band can transmit a color TV channel or 960 one-way voice circuits. The higher frequency channels (14/12 GHz) will be leased to the Canadian Department of Communications for pilot projects as a follow-on to the successful joint Canadian-American experimental venture with the Communications Technology Satellite. (Mission Operation Report No. M-492-201-78-04, Subject: Telesat D/Delta Post Launch Report, d. February 5, 1979. Also, KSC GP 15-3, Launch Mission Summary and Sequence of Events, Telesat-D, Delta-147, John F. Kennedy Space Center, NASA, November 30, 1978. p. 3.)

December 21: According to NASA Associate Administrator John Yardley NASA has examined the full range of possible ways to prevent the Skylab Space Station from reentering the Earth's atmosphere over populated areas -- including use of the Anti-Satellite (A-Sat) system that has been developed and tested in space by the Soviet Union and designed to destroy U.S. military reconnaissance/surveillance and communications satellites in a global war. The U.S. A-Sat is in a developmental stage. Yardley said, however, that the agency concluded that the use of the Soviet A-Sat [presuming that the Soviets would agree to its use, which is extremely doubtful] to destroy Skylab would result in more, not less debris reentering the atmosphere.

As matters presently stand, NASA estimates that 40,000-50,000 pounds of debris -- in 400 to 500 pieces, weighing as little as one pound and as much as several hundred pounds -- might survive reentry.

The debris would fall in a 3000-4000-mile-long, 100-mile-wide path at 50 degrees latitude, encompassing the United States, almost all of South America, most of Europe and Africa, and all of Australia and New Zealand.

Yardley reported that NASA now plans to continue to stabilize the Skylab's position in orbit until January. After that, a decision will be made on whether to continue tha effort or to let the Skylab follow its own path, in which case it could reenter as early as next May, although the best estimate for reentry is between July and September.

NASA is also developing contingency plans to provide medical assistance and other aid if necessary as a result of the Skylab falling to Earth. The

agency will pay for any damage or injury caused by falling debris, although the possibility of that occurring is considered very remote.

NASA's general council, Neil Hosenball, noted that the 1972 Outer Space Treaty "provides for absolute liability (with) no proof or negligence" in cases involving loss due to falling space objects. The treaty sets up a claims commission to arbitrate the amount of damage. In addition, Americans have claims rights under U.S. law. (Defense/Space Business Daily, Vol. 101, No. 35, Thursday, December 21, 1978, pg. 244.)

December 22, 1978: NASA's John F. Kennedy Space Center has officially notified Santa Claus' North Pole headquarters that its 15,000-foot-long Shuttle Landing Facility is available for emergency landings if needed.

"We've sent a Telex to the North Pole," said Center Director Lee R. Scherer, "advising Santa that our Shuttle Landing Facility is open to him if he encounters an emergency during his journey through Central Florida Christmas Eve or Christmas morning."

It's conceivable that Merry Ol' St. Nick's reindeer might heat up or throw a shoe, or even that his sleigh might blow a runner as he makes his annual rounds.

"We've handled the C-5A, the world's largest aircraft, and President Carter's 707," said Scherer. "Our shuttle runway can accommodate any plane now flying and we're sure Santa would find all the room he needs in event of an emergency."

The landing strip is equipped with an automatic landing system which may be compatible with that aboard Santa's sleek new NOEL VIII (Mark 2) sleigh.

Landing facility night lights will not be illuminated over the holidays but Santa's long experience at night flying has qualified him to enter the landing pattern under visual flight rules. (NASA News, Release No. KSC 203-78, December 22, 1978.)

The go-ahead for implementing the Vandenberg AFB Launch Processing System (LPS) was given and KSC responded by expanding their Checkout, Control, and Monitor System (CCMS) contracts to include both hardware and software for VLPS. Primary contracts are with IBM, MMC, and MODCOMP. By October, support software was installed on the VAFB Central Data System (CDS) to permit early checkout procedure development. In December, the initial set of CCMS hardware was delivered and installation begun. (CCMS installation and checkout will continue into 1980.)

The LPS hardware and support software related to the Solid Rocket Boosters (SRBs) were returned to KSC from MSFC. This was the first set of operational LPS. Due to the early need date, it was produced in-house at KSC from the existing design.

Development was completed on a full parallel processing system test to be used in the Firing Rooms. The test will exercise all consoles and front end processors (FEPs) and be used to verify, in part, that the LPS CCMS is ready for use.

CCMS hardware deliveries and installation for KSC Flow I LPS were completed. Hardware/software integration was completed for all sets. (KSC operational LPS sets include FR-I, FR-II, OPF, VAB, HMF, PAD A, MLP-1, SRB, CCS, and Serial 0.)

Several sensor specifications were developed to provide commonality of sensors used in KSC GSE. Standardization of sensors promotes efficiency and decreases cost by reducing spares inventory and providing a uniform series of specifications for procurement.

The first prototype Hardware Interface Module (HIM) card containing a microprocessor was developed. The card will interface with the Hazardous Gas Detection System (HGDS) and perform data acquisition functions. It gathers asynchronous data and provides control capability which allows HGDS to perform its automated functions independent of LPS. The card design uses the IEEE 488 bus structure to interface with the HGDS. This interface structure allows the card to "talk" to any device which uses the IEEE bus.

Record and Playback System (RPS) operational software was released which brought the facility to an operational status. (The RPS is used to analyze LPS data in both unprocessed and processed formats independent of firing room operations.)

- Dynamic Integrated Test (DIT) software to support Shuttle Avionics Integration Laboratory (SAIL) at JSC and KSC operations was basically completed in 1978. DIT runs under control of the Shared Peripheral Area (SPA) computers and communicates through the launch data bus FEP to orbiter resident software to simulate various flight phases (pre-launch, ascent, in-orbit, etc.). DIT software is an important link in "matching" and verification of the orbiter/LPS interface.

- The majority of the Cargo Integration Test Equipment (CITE) "basic" software was completed in 1978. The CITE "basic" phase allows single cargos to be verified as ready for mate with the orbiter. CITE will be expanded in 1979/80 to allow multiple payload checkout simultaneously from the Vertical Processing Facility (VPF) and the Horizontal Processing Facility (HPF). Approximately 90% of the CITE software has been developed and released. CITE will become operational in mid-1979 and play a key role in payload checkout.

- Fiber optic data transmission developed to the point of being a cost effective alternative to many other broadband approaches. Transmission of data rates up to 130 megabits per second over 16 kilometers was demonstrated. Key performance parameters of the underground KSC fiber optic cable were continually monitored and no significant degradation was found. (Engineering trade studies led to recommending the installation of an operational fiber optic link to support Spacelab data requirements.)

  In conjunction with the Naval Research Laboratory and Energetics Sciences Incorporated, KSC developed hypergolic (fuel and oxidizer) sensors for use as leak detectors for equipment integrity checks and as toxic threshold limit value (TLV) monitors for hydrazine (N_2H_4) and nitrogen dioxide (NO_2). The equipment was delivered to KSC in December. Efforts will continue to develop TLV sensors for monomethylhydrazine (MMH) and anticipated lower limits by OSHA.

- Two Microwave Scanning Beam Landing System-Ground Stations (MSBLS-GS) have been installed and tested at KSC. The MSBLS-GS provides guidance for the orbiter during final approach and through rollout on the runway. The guidance is provided by pulse coded microwave signals that contain azimuth, elevation and distance data that is decoded by receivers on board the orbiter. The microwave signals cover a 30° by 30° volume of coverage relative to the transmitter antennas which allows the orbiter to approach the runway at various angles. The orbiter can begin MSBLS guided landings from 20 nautical miles from the runway, and can approach from north or south for landing on either runway direction. The MSBLS-GS has successfully completed a series of ground and flight test activities leading to commissioning completion early in 1979.

- A Precision Laser Tracker (PLTS) has been installed at KSC's Shuttle Landing Facility to provide high accuracy calibration of the MSBLS-GS. The

PLTS has supported MSBLS testing here as well as several airborne radar altimeter calibrations. The PLT is an optical "laser radar" type system that provides highly precise reference positioning for a given "target." The system is used as a reference in determining the accuracy of the MSBLS-GS.

- A single station, all electronic theodolite has been in use in conjunction with the MSBLS Ground Stations installation activities at KSC. The theodolite provides accurate siting of targets in azimuth and elevation angles (±4 seconds) as well as in range (±5mm/km) by use of a built-in helium-neon laser and high precision optics. The theodolite is used as an integral part of the alignment procedures of the system, by comparing its positioning data with that data received from the MSBLS Ground Stations. This initial activity, called boresighting, checks various static points in the MSBLS-GS volume of coverage, to confirm uniform accuracy in the initial set-up of the systems. The theodolite, acting as a "static radar," is sited to a receiver antenna that is decoding MSBLS-GS data at some given point in space; the theodolite also checks this point and sends positioning data to a computer/calculator for comparison. The theodolite has also been used for various measurements and position checks in the VAB High-Bay areas in preparation for expected Shuttle operations later in 1979. (Information prepared by Wilson R. Dietz, Directorate of Electronic Engineering.)

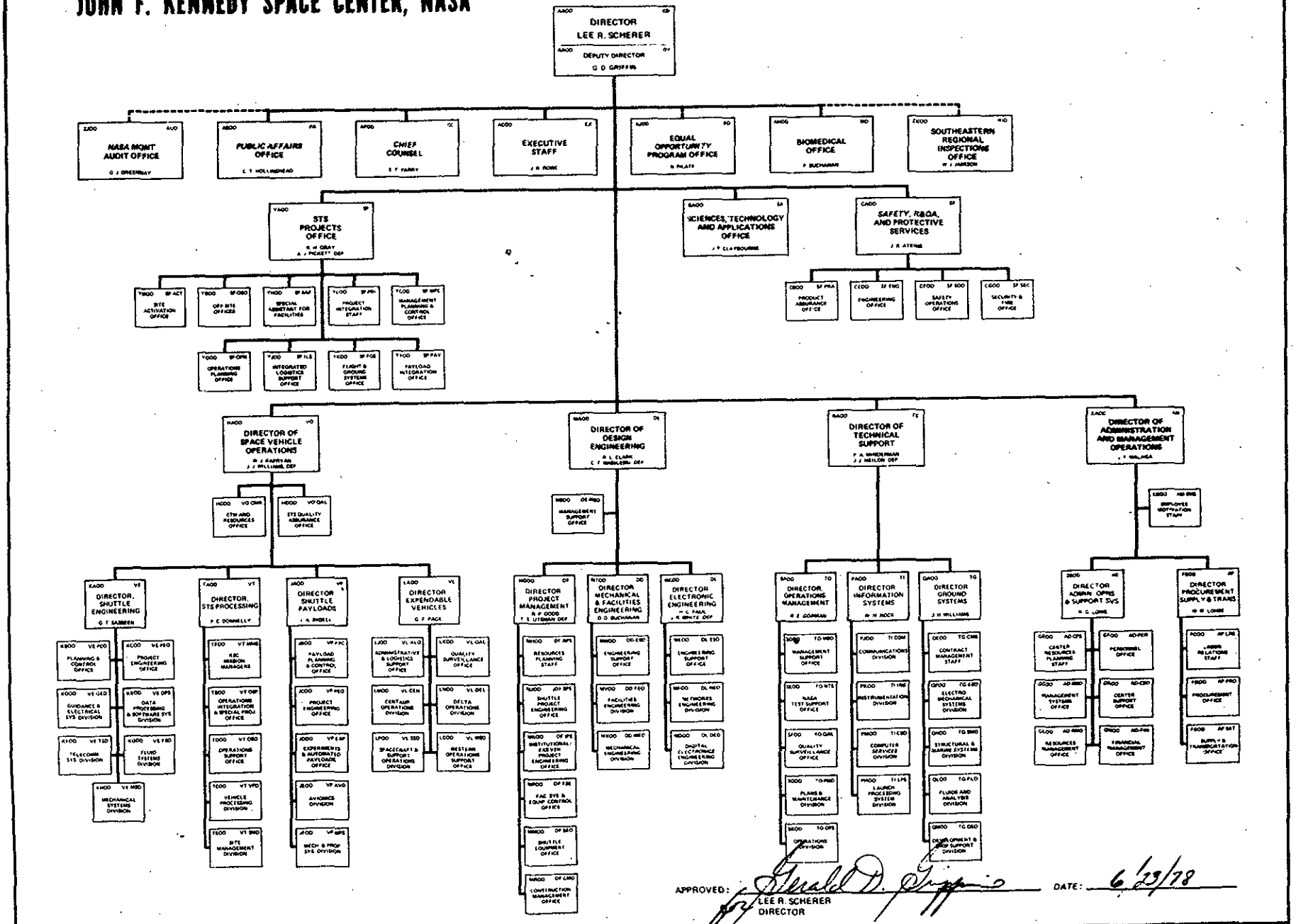
APPENDIX A

KSC ORGANIZATION CHART

6 JUNE 1978

A-1
KSC ORGANIZATION CHART
23 JUNE 1978

JOHN F. KENNEDY SPACE CENTER, NASA



APPROVED: Gerald D. Griffin — DATE: 6/23/78

LEE R. SCHERER
DIRECTOR

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APPENDIX B

MAJOR NASA LAUNCHES

JANUARY THROUGH DECEMBER

1978

APPENDIX B

MAJOR NASA LAUNCHES - JANUARY 1 - DECEMBER 31, 1978.

DESIGNATION	DATE	LAUNCH VEHICLE	SPACECRAFT	LAUNCH PAD	ETR TEST NO.	RESULTS
INTELSAT IV-A	1-6-78	ATLAS-CENTAUR-46	F-3	36B	3525	S
IUE	1-26-78	DELTA-144	IUE	17A	3990	S
FLTSATCOM 1	2-9-78	ATLAS-CENTAUR-44	FLTSATCOM-A	36A	2321	S
LANDSAT 3	3-5-78	DELTA-139	LANDSAT-C	SLC-2W		S
INTELSAT IV-A	3-31-78	ATLAS-CENTAUR-48	F-6	36B	2469	S
BSE-(JAPAN)	4-7-78	DELTA-140	BSE	17B	4360	S
OTS 2	5-11-78	DELTA-141	OTS-B	17B	4440	S
PIONEER VENUS 1	5-20-78	ATLAS-CENTAUR-50	PIONEER VENUS ORBITER	36A	2440	S
GOES 3	6-16-78	DELTA-142	GOES C	17B	4550	S
COMSTAR D-3	6-29-78	ATLAS-CENTAUR-41	COMSTAR D-3	36B	3888	S
GEOS 2	7-14-78	DELTA-143	GEOS B	17A	5544	S
ISEE 3	8-12-78	DELTA-144	ISEE-C	17B	6366	S
PIONEER VENUS 2	8-18-78	ATLAS-CENTAUR-51	PIONEER VENUS MULTI-PROBE	36A	7450	S
NIMBUS 7	10-24-78	DELTA-145	NIMBUS-G	SLR-2W		S
HEAO 2	11-13-78	ATLAS-CENTAUR-52	HEAO-B	36B	4444	S

APPENDIX B

MAJOR NASA LAUNCHES - JANUARY 1 - DECEMBER 31, 1978 (CONTINUED)

DESIGNATION	DATE	LAUNCH VEHICLE	SPACECRAFT	LAUNCH PAD	ETR TEST NO.	RESULTS
NATO III C	11-18-78	DELTA-146	NATO III-C	17B	6446	S
TELSAT 4	12-15-78	DELTA-147	TELSAT-D	17A	5929	S