

Space News Roundup

Vol. 27 No. 7

March 25, 1988

National Aeronautics and Space Administration

STS-26 team primed for 36-hour sim

The crew of the next Space Shuttle flight and the JSC Mission Operations team are scheduled to launch the 36-hour STS-26 Long Duration Simulation on Tuesday - an exercise that may eventually be seen by millions of Americans.

On top of the usual internal scrutiny, this sim will be under the watchful eyes of some 40 to 50 CBS news producers, correspondents, engineers and technicians preparing a "48 Hours" television program on NASA.



The Shuttle Mission Simulator is set to run at 9 a.m. March 29 from the launch-minus 9 (L-9) minute reset point, and end after no more than 36 hours of mission elapsed time (MET).

"We're looking forward to this sim as the next to the last long sim prior to our flight," said STS-26 Commander Rick Hauck. "We'll be looking very closely at the lift-off and post-insertion timelines and are anxious once more to exercise all the interfaces between the Orbiter and the MOCR (Mission Control Center), Sunnyvale and White Sands as we get ready for the flight."

The exercise will include the support of a simulated Mission Management Team, the STS Operations Support Complex at Onizuka Air Force Base and White Sands (Continued on page 2)



SLIDING HOME—STS-26 Mission Specialist Dave Hilmers slides out of the Orbiter mock-up in Bldg. 9A during a March 11 Crew Station Review. The crew donned new partial pressure suits to evaluate crew equipment and procedures related to emergency egress methods and proposed crew escape options.

Manifest update swaps missions, uses new Orbiter

NASA's new mixed fleet manifest for Space Shuttle missions and expendable launch vehicles (ELVs) swaps two missions, adds a mission to retrieve the endangered Long Duration Experiment Facility (LDEF) and retains an Aug. 4 return to flight.

Interchanging the STS-29 and STS-28 missions eases the Orbiter processing flow and enables NASA to maintain the required launch windows for two interplanetary missions in 1989—Magellan, a mission to

assignments will be made during the formal integration process about 19 months before launch.

In addition to supporting Department of Defense mission requirements and the Commercial Space Initiative recently announced in conjunction with the new National Space Policy, the mixed fleet manifest continues to reflect the high priority assigned to civil space science and applications payloads, both on the Shuttle and ELVs.

Chart on Page 3

map the planet Venus in April, and Galileo, a cooperative project with Germany to survey Jupiter and its moons, in October.

Another important addition is a mission to retrieve the Long Duration Exposure Facility (LDEF) in July 1989. Launched by the Space Shuttle in April 1984, LDEF originally was scheduled for retrieval in March 1985 and is expected to reenter the Earth's atmosphere by the mid-1990s if not retrieved. The LDEF retrieval mission will replace Astro-1 as the payload for STS-32.

The manifest, announced March 15, is for planning purposes only. It stretches through fiscal year 1993, includes 51 Shuttle missions—from STS-26 to STS-77—and 35 ELV launches, and utilizes OV-105, the replacement Orbiter now under construction. Firm Shuttle payload

Astro-1, a Spacelab mission designed to study the universe in the ultraviolet spectrum is being reconfigured to enhance the study of Supernova 1987A, an event that has drawn the attention of astrophysicists from around the world. The Broad-Band X-Ray Telescope has been added to complement the Astro-1 mission now slated to fly on STS-35 in November 1989. The Hubble Space Telescope maintains its flight assignment date of June 1989.

Two Spacelab payloads have been assigned flights on Columbia in 1990—a Spacelab Life Sciences mission in March and the first of the Atmospheric Laboratory for Applications and Science mission series, ATLAS-1, scheduled for September. The Gamma Ray Observatory, moved forward in the projected schedule, is now slated (Continued on page 2)

Three Space Shuttle crews get nod for 1989 flights

By Jeff Carr

Crews have been chosen for three Space Shuttle missions scheduled to fly in 1989, ending the crew selection activities planned before return to flight.

Shuttle mission STS-29, scheduled for launch January 19, 1989, will be commanded by Navy Capt. Michael L. Coats. Piloting *Discovery* will be Air Force Col. John E. Blaha. Marine Col. James F. Buchli and Robert C. Springer, and James P. Bagian, M.D., have been assigned as mission specialists.

The primary mission objective will be to deploy a third Tracking and Data Relay Satellite (TDRS-D). Based on the new Shuttle flight manifest, STS-29 is scheduled to fly after STS-27 and before STS-28.

A five-member crew also has been chosen for Shuttle mission STS-30, slated for launch April 27, 1989. Commanding the four-day mission aboard *Atlantis* will be Navy Capt. David M. Walker. The pilot will be Air Force Col. Ronald J. Grabe. Norman E. Thagard, M.D., Mary L. Cleave, Ph.D., and Air Force Maj.

Mark C. Lee, have been chosen as mission specialists.

The STS-30 mission objective will be to deploy the planetary probe Magellan. Magellan is scheduled to arrive at Venus in mid-1990, and will map the entire surface of Venus for the first time, using specialized radar instruments.

STS-31 will feature deployment of the Hubble Space Telescope and is targeted for launch June 1, 1989. Air Force Col. Loren J. Shriver will command the mission. Piloting *Discovery* will be Marine Col. Charles

F. Bolden. Steven A. Hawley, Ph.D., Navy Capt. Bruce McCandless II, and Kathryn D. Sullivan, Ph.D., will fly as mission specialists.

Coats flew as pilot on mission STS 41-D in August 1984.

Blaha will make his first space flight since being selected as an astronaut in 1980.

Buchli will be making his third Shuttle flight. His first was as a mission specialist aboard *Discovery* for the first Department of Defense mission, STS 51-C, in January 1985. He also was mission specialist on

STS 61-A (Spacelab D-1) in October 1985.

Springer also selected by NASA in 1980, will make his first space flight.

Bagian will make his first space flight since his selection in 1981. He was born February 22, 1952, in Philadelphia.

Walker flew as pilot aboard *Discovery* on mission STS 51-A in November 1984.

Grabe will make his second space flight also. He flew as pilot on STS (Continued on page 2)

Scientists hear about future's bottom line

Key technological developments in NASA's science program can mark an appropriate pathway for manned exploration of our solar system, but legislative decisions made this year will determine whether we follow that path, according to NASA officials speaking at a special session of the 19th Lunar and Planetary Conference at JSC.

The Bldg. 2 auditorium special session on robotic and human exploration initiatives highlighted the week-long conference hosted by JSC and the Lunar and Planetary Institute. About 690 scientists gathered here March 14 through 18 to discuss topics ranging from cosmic dust to planetary atmospheres.

"The decisions that the Congress is being asked to make this year are decisions of historical proportions," said Dr. Lennard Fisk, NASA's associate administrator for Space Science and Applications. "They will be looked back upon by future generations of Americans as decisions which preserved our position of leadership in space or allowed that mantle of leadership to pass from us."

"Let us hope there are still visionaries out there who will not get mired down in the nation's short-term budget problems, and who will recognize that this nation's future lies in space and will ensure that the future is protected," Fisk said.

"We have been living off the (Continued on page 2)



Dr. Bevan French of the NASA Headquarters Solar System Exploration Division presents a plaque commemorating the American discovery of the Martian moon Phobos' to Dr. Lev Mukhin of the Soviet Space Research Institute. The Soviet government has agreed to place the plaque on either the spacecraft or the lander expected to reach Phobos in the spring of 1989. The aluminum plaque is a transfer of U.S. Naval Observatory astronomer Asaph Hall's telescope log of his August 17, 1887 discovery, with both Russian and English inscriptions.

Small business researchers to sign contracts

By Beverly Green

JSC's Small Business Innovation Research (SBIR) Office will manage contracts to be awarded next month to 12 companies that will build prototypes of potential hardware for upcoming space projects.

"Specifically, we were looking for companies that presented ideas that NASA hadn't already invented or for innovative approaches that could solve an existing problem," said Milton Goodhart, JSC SBIR officer.

Follow-on contracts in the amount of approximately \$500,000 will be awarded in April to each of the 12 companies whose innovations have proven to have merit during the research and evaluation of SBIR Program Phase I. The projects selected for Phase II (Continued on page 2)

People



Nisbet

Secretaries recognized

Angela Hess and Victoria Nisbet recently received Marilyn Bockting Secretarial Excellence Awards. Hess, secretary to the Space and Center Operations Procurement Office chief, has established an excellent filing system and handles administrative tasks. As the senior/lead clerical person for the division, Hess manages to keep work



Hess

flowing smoothly with minimal disruption. Nisbet, personnel clerk to a Personnel Management Specialists section, provides a full range of personnel management services to about one half of JSC. Nisbet has gained experience and knowledge of personnel functions that enable her to respond to a high percentage of inquiries that normally would be referred to the professional staff.

Bulletin Board

Digital signal processing seminar March 30

The IEEE Education Committee is sponsoring a free vendor seminar at 9 a.m. March 30 at the Lockheed Plaza 1 Bldg. The topic will be "Digital Signal Processing." To preregister, call Eddie Robinson, 333-7029.

Disney's World on Ice to be at Summit April 2

Tickets are now available at Bldg. 11 for Walt Disney's "World on Ice" starring Snow White and the Seven Dwarfs. The show will be at noon April 2 in the Summit. NASA price is \$6 and employees are limited to six tickets. For more information call x35350.

Lunar bases and space activities symposium April 5-7

A second symposium on Lunar Bases and Space Activities of the 21st Century, sponsored by NASA, AIAA, American Society of Civil Engineers, American Geophysical Union and the Lunar and Planetary Institute will be held April 5-7 at the Westin Galleria Hotel in Houston. Symposium General Chairman is JSC Director Aaron Cohen. Speakers will discuss general areas of science, technology and policy, and technical sessions will consider contributed papers. On-site registration will cost \$85. Copies of the symposium program are now available from the Syposia Office, Lunar and Planetary Institute. For more information, call 486-2150.

Clear Lake SIGAda meeting scheduled April 7

The next Clear Lake area SIGAda meeting will be at 5:30 p.m., April 7 at the Gilruth Center. Dennis Cornhill will talk about "Hard Real-Time Scheduling and Its Implications on Ada." Dinner, which begins at 6:30 p.m., costs \$7.50 for CLAS members and \$8.50 for others. Reservations deadline in April 1. For more information call Charlie Randall, 488-8806.

Astronautical Society holds Houston symposium

The Southwest section of the American Astronautical Society will host James E. Oberg and other aerospace guest speakers from 1 p.m. to 5:30 p.m. on April 7 in the Bldg. 2 auditorium. The topic will be "Space: Recharting the Past, Exploring the Future".

NASA night at Astroworld will be April 8

Tickets are now available for a JSC Employee Activities Association NASA night at Astroworld from 6 p.m. to midnight on April 8. Employees may purchase up to eight tickets for \$7 each at the Bldg. 11 exchange store from 10 a.m. to 2 p.m., Monday through Friday. After the first 5,000 tickets are sold the price will go up to \$8.95.

Parent-child relationships symposium is April 9

The Employee Assistance Program is co-sponsoring a symposium, "Mother/Daughter and Father/Son: A Day of Sharing and Learning," from 8:30 a.m. to 2:15 p.m. April 9 at the Gilruth Center. Topics include parent-child relationships, self-esteem, "your Bodymachine," and sexually transmitted diseases. Registration is \$10, and includes lunch; deadline is April 1. For more information, call the EAP at x36130.

ABWA scholarship program benefit on April 9

The Clear Lake area chapter of the American Business Women's Association (ABWA) will hold its annual flea market from 9 a.m. to 5 p.m. April 9 at the Galveston County Park (Walter Hall Park) in League City. Flea market items include apparel, shoes, toys, games, books, household items, plants and baked goods. For more information call Gail Anderson, x30294.

Automation and robotics workshop is April 14

The JSC Systems Development and Simulation Division and the Houston section of American Institute of Aeronautics and Astronauts are sponsoring a one-day workshop on automation and robotics on April 14 at Gilruth Center. Highlights of the workshop will include a luncheon presentation on "Perspectives of Robotics in Space" by Dr. Del Tesar of the University of Texas and a special afternoon panel on autonomous robotics operation issues. Luncheon cost is \$7; the workshop is free if registration is made before April 8. After April 8 the workshop cost is \$3.00. For reservations call Sharon Lactson, x31525. For more information call Andre Sylvester, x31537.

Gilruth Center News

Call x30304 for more information

EAA badges — Dependents and spouses may apply for pictured I.D. badge on April 4 or April 12 between 6:30 and 8:30 p.m.

Defensive driving — Course is offered April 16 from 8 a.m. to 5 p.m. and costs \$20.

Weight safety — This is a required course for those employees wishing to use the Rec Center weight room. The class will be on April 6 or April 20. The cost is \$4.

Physical Fitness — The next 12-week course of the JSC Physical Fitness Program will be held April 4 to June 24 from 11 a.m. to noon or from 4 to 5 p.m. All NASA and contractor employees and dependents are eligible upon completion of an acceptable physical exam and a maximal treadmill stress test. For more information call x30301.

Almost Anything Goes — Six coed teams are needed Saturday, May 7. Teams consist of 3 men and 3 women. The entry fee is \$10. Entry deadline is April 29. Every team member will receive a T-shirt.

Three new flight directors appointed

By Brian Welch

Three new flight directors have been named within the Mission Operations Directorate at the Johnson Space Center.

The three, all of whom are former flight operations controllers, are Robert E. Castle, Jr., N. Wayne Hale, Jr., and Robert M. Kelso.

Mission Operations Director Eugene F. Kranz also announced that Michele A. Brekke, a flight director since 1985, has accepted a position as a payload integration manager in the National Space Transportation System Integration and Operations Office.

During Space Shuttle missions, flight directors lead the large cadre

of operators within the Mission Control Center who are responsible for monitoring spacecraft systems and operations. Flight directors have overall responsibility for the conduct of the mission and for real-time decision making as mission events unfold.

Castle, head of the Communications Section, Systems Division, has served as Instrumentation Communications Systems Officer, or INCO, for several Shuttle missions. He began his career at JSC in June 1976 as a summer intern and is the recipient of numerous group achievement and performance awards.

Hale, Head of the Propulsion

Systems Section, Systems Division, has also served as head of the Communications Section and as a senior propulsion systems flight controller on Shuttle missions. He began his career at JSC in June 1978 and has received numerous group achievement and performance awards.

Kelso, head of the Payload Support Planning Section, Operations Division, has served as a payloads flight controller on several Shuttle missions. He began his NASA career at JSC in May 1973 as a cooperative education student and summer aide. He is the recipient of numerous group achievement and performance awards.



JSC Photo by Sherri Dunnette

PICNIC PLANNING—Members of the JSC-Employee Activities Association picnic committee take a look at the flyer for this year's JSC picnic at a recent planning meeting. The "Back to the Future Picnic '88" is scheduled for May 7 at the Gilruth Recreation Center.

Manifest supports new space policy

(Continued from page 1)

for March 1990 and the Ulysses mission to study the Sun and its environment, remains in its projected October 1990 launch date.

The manifest supports the commercial space initiative announced with the National Space Policy, February 11, 1988, as follows:

★ The Industrial Space Facility (ISF) is manifested as a fully reimbursable payload under an existing

agreement.

★ The Spacehab is manifested as a fully reimbursable payload.

★ The Commercially Developed Space Facility (CDSF) will be manifested when the government's lease arrangements are complete.

The mixed fleet manifest continues to reflect NASA's plans to use ELVs for those payloads that do not need the capabilities of the Space Shuttle.

Three Space Shuttle crews get nod

(Continued from page 1)

51-J, a DOD mission. Grabe was born June 13, 1945, in New York, N.Y.

Thagard makes his third space flight after serving as mission specialist on STS-7 in June 1983 and on STS 51-B in April 1985.

Cleave flew previously as mission specialist on STS 61-B in November 1985.

Lee makes his first flight in space since his selection in 1984.

Shriver flew as pilot on DOD

mission STS 51-C in January 1985.

Bolden was pilot on STS 61-C in January 1986, and makes his second space flight.

Hawley makes his third flight after serving as mission specialist on STS 41-D in August 1984 and again on STS 61-C in January 1986.

McCandless flew as mission specialist on STS 41-B in February 1984.

Sullivan served as mission specialist on STS 41-G in October 1984, and makes her second space flight.

Small businesses researchers to innovate

(Continued from page 1)

awards are diversified, with annual activities totaling approximately \$7.5 million dollars.

Since the program's inception in 1983 close to 40 small businesses have received Phase II SBIR award contracts managed at JSC. "We've been screening a series of innovations of small companies for best potential contractors for Space Station or other JSC advanced programs. Many of the small businesses will be competitive in commercial industry as well," said Goodhart.

Research was recently completed for the first four companies that received follow-on contracts in 1985. Bend Research, a company that developed a reverse osmosis spacecraft water purification system, and Thermacore, a company that developed flexible heat pipes, are now prime contenders for roles in Space Station subcontracts.

Twenty-three other Phase II activities are ongoing at JSC. Companies recently selected for Phase II follow-on awards are scheduled to begin their two-year studies in April.

The selected companies include Eltron Research Inc. based in Aurora, Ill., which will investigate a process to extract oxygen from lunar soils for life support on a lunar base or as propellant oxidizer for rockets, said David McKay, technical monitor.

Wilton Industries Inc., Danbury, Ct., is developing hardware that may allow up to 24 crew members to use a wireless optical communication system. Expanding capabilities of wireless telemetry may provide for a full-scale high speed digital hardware development program in physiological data monitoring -or robotics, said Joe Prather, technical monitor.

Netrologic of San Diego, Calif., is integrating the capabilities of artificial intelligence and neural networks into mission planning, a process that will extract features from data through automatic pattern recognition, said James Villareal, technical monitor.

Speech Systems Inc., based in Tarzana, Calif., will be developing a program designed to reduce the amount of time it takes a computer to respond to the inquiries of natural speech. Presently, it takes about 15 seconds for one to receive an answer, said Villareal.

E-Tek Dynamics, Inc., of Melbourne, Fla., will develop a tunable laser diode and incorporate this package into an optical phase locked loop that will control a more precise wavelength output of the light source, said Kent Dekome, technical monitor.

Umpqua Research Co., based in Myrtle Creek, Ore., will design, fabricate and test a filtering system to remove soap, detergent and debris from the waste water of the Space Station laundry and shower. The filtering system is designed to help extend the life of the equipment, said Raphael Garcia, technical monitor.

Creare, Inc., Hanover, N.H., will build and test a prototype high performance condenser for operation in a gravity-free environment that may serve as a condenser or heat exchanger for Space Station. The JSC technical monitor is Russ Long.

Foster-Miller Inc., of Waltham, Mass., will develop a continuous fiber manufacturing process for aluminum graphite Space Station truss joints and end fittings out of continuous fibers, said Tom Dunn, technical monitor.

Transition Research of Bethel, Conn., will develop a proximity operation using log polar coordinate transformation. This method will allow lighter hardware for image computations in space and reduce the time necessary to identify correct attitude and range of an object or scene in space.

Photo-Catalytics Inc., based in Boulder, Colo., will develop a process utilizing ultraviolet light to purify and disinfect reclaimed spacecraft water.

Sensor Frame Inc., based in Pittsburgh, will refine the hardware capabilities of an optic-based computer input device that should allow operators to manipulate objects or soft control panels using a computer screen and multiple simultaneous finger gestures, said JSC technical monitor Linda Orr, manager of Graphic Analysis Facility.

Infrared Fiber Systems, Inc., of Silver Springs, Md., will develop the technology base for infrared fiber optic temperature measurement and spectroscopic systems that may be utilized in radiative thermometry in confined or harsh environments such as aircraft or spacecraft propulsion systems, high velocity wind tunnels or spacecraft and aircraft fire detection systems, said Steve Koonitz, technical monitor.

Team ready for sim

(Continued from page 1)

Ground Terminal. Real-time Shuttle Mission Simulator (SMS), Weightless Environment Training Facility (WETF) and Manipulator Development Facility (MDF) support will be available if required.

Larry Bourgeois will be lead Flight Director. Other flight directors will be Gary Coen, ascent and entry; Milt Heflin, orbit 1; Chuck Shaw, orbit 2 and payload deployment; and Bourgeois, planning.

Lead Sim Sup will be Stokes McMillan. SMS Training Team leader will be Rick Bush.

Apollo investment requires renewal

(Continued from page 1)

interest of the Apollo era of technology investment and it is now time to replenish our technology reservoir," agreed John Aaron, assistant administrator for the Office of Exploration.

This pathway should be balanced, using robotic missions to lead the way for human exploration of the solar system and establishment of a lunar base, Aaron said.

The Mars Observer Mission now scheduled for 1992 launch will be an important precursor to further exploration of the "crown jewel of planetary exploration," Aaron said. Likewise, the proposed Mars Rover Sample Return will pave the way through technology and science return and have profound implications to eventual human exploration.

"The thrust of our human Mars exploration work will be on the rationale for such undertaking to concentrate on the science objectives, leveraging our resources and the exploitation of potential spin-offs," said Aaron. "It is an ambitious goal and one we're anxious to tackle. However we overlook infrastructure investments that must take place."

MIXED

M A N I F E S T

FLEET

Space Shuttle

Flight	Date/ Orbiter	Inclination/ Altitude	Crew/ Duration	Primary Payload	Carrier
26	8/4/88	28.5°	5	TDRS-C	IUS
	<i>Discovery</i>	160	4		
27	10/27/88	—	5	DOD	
	<i>Atlantis</i>	—	—		
29	1/19/89	28.5°	5	TDRS-D	IUS
	<i>Discovery</i>	160	4		
28	3/2/89	—	5	DOD	
	<i>Columbia</i>	—	—		
30	4/27/89	28.9°	5	Magellan	IUS
	<i>Atlantis</i>	160	4		
31	6/1/89	28.5°	5	HST	Unique
	<i>Discovery</i>	320	5		
32	7/13/89	28.5°	5	LDEF RETR	Unique
	<i>Columbia</i>	220	5	SYNCOM IV-5	Unique
33	8/24/89	—	—	DOD	
	<i>Atlantis</i>	—	—		
34	10/8/89	34.3°	5	Galileo	IUS-2 STA
	<i>Discovery</i>	160	4		
35	11/16/89	28.5°	7	ASTRO-1	IG+2 PAL
	<i>Columbia</i>	190	9	BBXRT	Unique
36	12/14/89	—	—	DOD	
	<i>Atlantis</i>	—	—		
37	2/1/90	55.0°	7	CIRRIS (DOD)	Pallet
	<i>Discovery</i>	140	7	IBSS (DOD)	SPAS
38	3/5/90	TBD	7	SLS-1	LM
	<i>Columbia</i>	160	TBD		
39	3/29/90	28.5°	5	GRO	Unique
	<i>Atlantis</i>	TBD	4		
40	5/10/90	—	—	DOD	
	<i>Discovery</i>	—	—		
41	6/7/90	33.4°	7	STARLAB	LM+1 PAL
	<i>Columbia</i>	175	7	(DOD)	
42	7/19/90	28.5°	5	TDRS-E	IUS
	<i>Atlantis</i>	160	4		
43	9/10/90	57.0°	7	ATLAS-1	IG+2 PAL
	<i>Columbia</i>	135	9		
44	10/5/90	28.5°	5	Ulysses	IUS/PAM
	<i>Discovery</i>	160	4		
45	11/8/90	—	—	DOD	
	<i>Atlantis</i>	—	—		
46	1/17/91	28.5°	7	TSS-1	MPRESS+PAL
	<i>Discovery</i>	160	7	EURECA-1L	EURECA-A
47	2/7/91	28.5°	7	GPS-1	PAM-D2
	<i>Columbia</i>	160	9	IML-1	LM
48	3/14/91	—	—	DOD	
	<i>Atlantis</i>	—	—		
49	4/18/91	28.5°	5	WAMDII	Unique
	<i>Discovery</i>	160	7	SKYNET-4A	PAM-D2
50	5/9/91	44.0°	7	GPS-2	PAM-D2
	<i>Columbia</i>	160	7	S/L-J	LM
51	6/10/91	28.5°	5	Spacehab-1	Unique
	<i>Atlantis</i>	160	7	EURECA-1R	EURECA-A
52	8/8/91	57.0°	7	LAGEOS-2	IRIS
	<i>Columbia</i>	160	9	SRL-1	Pallet
53	9/12/91	28.5°	7	ASTRO-2	IG+2 PAL
	<i>Atlantis</i>	190	7	INMARSAT-1	PAM-D2
54	10/31/91	57.0°	5	UARS	Unique
	<i>Discovery</i>	290	5		
55	12/19/91	44.0°	7	S/L-D2	LM + USS
	<i>Columbia</i>	160	9		

Expendables

Date	Launch Vehicle	Orbit	Launch Site	Payload
3/88	Scout S-206C	LEO	SMR	San Marco-DL
4/88	Scout S-211C	LEO	WSMC	SOOS-III
5/88*	Atlas 63E	SS	WSMC	NOAA-H
6/88	Scout S-213C	LEO	WSMC	NOVA-II
8/88	Delta 183	LEO	ESMC	DOD-3
8/88	Scout S-214C	LEO	WSMC	SOOS-IV
2/89	Delta 184	SS	WSMC	COBE
5/89	Atlas 50E	SS	WSMC	NOAA-D
9/89*	Atlas Centaur 68	GSO	ESMC	FLTSACOM-F8
11/89	Scout S-215C**	LEO	WFF	CRRES-1
2/90	Delta	LEO	ESMC	ROSAT
2/90	Scout S-218C	LEO	WSMC	TRANSIT-27
3/90	Atlas Centaur	GSO	ESMC	GOES-I
6/90	Atlas Centaur**	GTO	ESMC	CRRES
8/90	Scout S-210C	LEO	WSMC	TRANSIT-28
9/90	Atlas 34E	SS	WSMC	NOAA-I
12/90	Atlas Centaur	GSO	ESMC	GOES-J
3/91	Scout S-217C**	LEO	WFF	CRRES-2
5/91*	Titan IV** /IUS	EO	ESMC	Planetary Alt.
6/91	TBD**	LEO	TBD	NASA-1**
8/91*	Titan III** IUS	GSO	ESMC	TDRS Callup***
8/91	Delta	LEO	ESMC	EUVE
9/91	TBD**	LEO	TBD	NASA-2**
12/91	Atlas 45E	SS	WSMC	NOAA-J

* Not before this date.

** For NASA planning purposes.

Glossary

ASTRO	Ultraviolet Astronomy Telescope	LEO	Low Earth Orbit
ATLAS	Atmospheric Laboratory for Applications and Science	MAGELLAN	Venus radar mapping
BBXRT	Broad Band X-ray Telescope	NOAA	National Oceanic and Atmospheric Administration
CIRRIS	Cryogenic Infrared Radiance Instrument for Shuttle	NOVA	Advanced Navy Navigation Satellite
CRRES	Combined Radiation Release Experimental Satellite	PAM	Payload Assist Module
DOD	Department of Defense	ROSAT	Roentgen Satellite
EO	Escape Orbit	SAN MARCO	NASA/Italian Earth physics satellite
ESMC	Eastern Space and Mission Center	SKYNET	United Kingdom military communication satellite
EURECA	European Retrievable Carrier	S/L-J	Spacelab J
FLTSATCOM	Fleet Communication Satellite	SLS	Space Life Sciences
GALILEO	Jupiter Probe	SRL	Space Radar Laboratory
GOES	Geostationary Operational Environmental Satellite	SS	Sun Synchronous Orbit
GPS	Global Positioning System	STARLAB	DOD Spacelab
GRO	Gamma Ray Observatory	SYNCOM	Hughes Geosynchronous Communication Satellite
GSO	Geosynchronous Orbit	TDRS	Tracking Data Relay Satellite
GTO	Geosynchronous Transfer Orbit	TRANSIT	Navy Navigation Satellite
HST	Hubble Space Telescope	TSS	Tethered Satellite System
IBSS	Infrared Background Signature Survey	UARS	Upper Atmosphere Research Satellite
IML	International Microgravity Laboratory	ULYSSES	Formerly International Solar Polar Mission
INMARST	International Maritime Satellite	WAMDII	Wide Angle Michelson Doppler Imaging Interferometer
ITV	Instrumented Test Vehicle	WFF	Wallops Flight Facility
IUS	Inertial Upper Stage	WSMC	Western Space and Missile Center
LAGEOS	Laser Geodynamics Satellite		
LDEF	Long Duration Exposure Facility		

