Polar Lander heads to red planet

By DIANE AINSWORTH

After a stellar launch at 3:21 p.m. Eastern Standard Time on Sunday, Jan. 3, NASA’s Mars Polar Lander is now on its way to the south pole of Mars to search for water ice beneath the edge of layered terrain in this uncharted region of the planet.

The spacecraft was launched atop a Delta II-class launch vehicle identical to the expendable rocket used to loft Mars Climate Orbiter into space on Dec. 11, 1998. Hitchhiking aboard the diminutive spacecraft are two grapefruit-sized microprobes designed to crash into Mars’ surface and carry out up to seven days of soil and water experiments as far as 1 meter (3 feet) below the Martian surface. The probes will ride silently to Mars, mounted on the Polar Lander’s cruise ring, before they are turned on and deployed 10 minutes before the mothership touches down.

“The launch was incredible, just amazing, because the vehicle is just sitting there one minute and then it’s gone,” said Kari Lewis, chief mission engineer on the New Millennium Deep Space 2 microprobe mission. “There was a low cloud cover, though, so we didn’t see it for very long.”

Sixty-six seconds after liftoff on a cloudy, blustery day at Cape Canaveral Air Station, and the morning after a storm packing 38-mile-per-hour gusts of wind that had swept through Cocoa Beach, the Delta’s four solid-rocket strap-on boosters were jettisoned.

At 4:03 p.m. EST, Mars Polar Lander separated from the third stage. A set of solar panels located on the spacecraft’s outer cruise stage were deployed shortly thereafter and pointed at the Sun. The lander’s signal was acquired at 4:19 p.m. EST over Canberra, Australia, by a 34-meter-diameter (112-foot) Deep Space Network antenna.

The spacecraft is in excellent health, the flight team reports, and continues to show normal power and temperature levels and the proper attitude control for telecommunications with Earth using its medium-gain horn antenna.

Earlier in the week, the flight team was continuing to analyze data from Mars Polar Lander’s star camera, which had not yet been able to lock on to the proper set of stars to establish its reference in space. The situation became evident shortly after launch, as the lander was beginning to try to locate stars to establish its proper orientation in space. Proper operation of the star camera was initiated on Wednesday morning.

Mars Polar Lander’s interplanetary cruise will take it more than 180 degrees around the Sun in a Type 2 trajectory, allowing the spacecraft to target a landing zone close to Mars’ north polar dune fields four times a day, revealing new evidence that sand dunes and created a streak of dark sand out across the surface in recent months.

Some of the dunes appeared to be coated with thin, bright frost that was left over from the northern winter season that ended in mid-July. The frost was covered with dark streaks emanating from small dark spots that dotted the bases of many of the dunes. Dr. Michael Malin, principal investigator of the Mars Orbiter Camera, suggested that the dunes were probably altered by gusts of wind that had blown the dark sand out across the frost-covered dunes and created a streak of deposited sand over the frost.

To top off a summer of bonus science, new images and temperature readings of Phobos showed that the small moon had been pummeled by eons of meteoroid impacts, pounding surface materials into a fine powder that had started some landslides along the steep slopes of giant craters.

Temperature measurements—See MGS, page 6

MGS zooms in on Mars

By DIANE AINSWORTH

Mars Global Surveyor began the second phase of aerobraking this fall, after spending the spring and summer in an elliptical, 11.6-hour orbit to allow Mars to move into the proper position for the start of the mapping mission in March 1999.

Over five months, the spacecraft reaped the benefits of an orbit that took it much closer to the planet’s surface than will be possible once mapping starts. Surveyor collected an additional bounty of data at a closest approach of about 170 kilo-meters (106 miles) above the surface, allowing scientists to make highly detailed measurements of the Martian atmosphere and surface and magnetic measurements of near-surface fields without interference from currents generated by the interaction of the solar wind with the planet.

The results were spectacular. Close-up views of Elysium Basin revealed the first evidence of giant plates of solidified lava, rather than lakebed sediments, that appeared to have been broken up and transported across the Martian surface millions of years ago as they floated on top of molten lava. Scientists postulated that the area in the northern lowlands was once the site of giant ponds of lava flows hundreds of kilometers across.

MGS’s closest passage over the planet also took it right over the north polar dune fields four times a day, revealing new evidence that sand dunes in the region had hopped or rolled across the surface in recent months.

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New HR policies kick off 1999

By MARK WHALEN

With the new year comes a number of changes in JPL human resources policies.

Changes affecting extended work week, overtime and jury duty pay, sick leave and other issues have been in the works throughout 1998, said Human Resources Director Sue Henry. “With the implementation of our new Oracle-based business systems for 1999, now is a great time to implement the new personnel policies,” she said.

Policy changes are as follows:

Extended Work Week (EWW): The maximum salary eligibility for EWW will be raised from $1,400 to $1,600 per week. Eligible exempt employees will receive their straight time hourly rate for hours worked in excess of 40, provided the EWW request meets policy guidelines.

“This policy change came about as a result of supervisor requests,” Henry said, noting that the $1,400 weekly limit had been in effect for many years. “We’ve also simplified the formula for paying EWW and increased the number of eligible employees.”

Computing overtime premiums for non-exempt employees: Non-exempt employees will be paid overtime for hours worked in excess of 40 hours in any work week. Employees will no longer be paid overtime for hours worked in excess of eight hours per day, unless the time worked exceeds 12 hours in a day. For hours in excess of 12, double time will be paid. “We’ve been looking forward to making this change since it became state law early last year,” Henry said. “It provides a lot more flexibility for non-exempt employees and their supervisors to get work done.”

 Jury duty pay: This policy has been changed to provide five paid days per year, replacing the current policy of 15 paid days in a three-year period that has been difficult to communicate and track. Employees who report for jury duty should clearly state the five-day limit to the judge when asked.

In May, Los Angeles County will implement a one-day or one-trial system in which jurors will be required to be excused from duty if not selected on their first day of service, Henry said.

Flexible workday: Current policy includes a choice of two standard work days, 8 a.m. to 4:45 p.m. or 7:30 a.m. to 4:15 p.m. Supervisors, at their discretion, may authorize an alternative work schedule, as long as it includes eight hours of work time (which includes two 15-minute paid

See Policies, page 6

Special Events Calendar

Ongoing

Alcoholics Anonymous—Meets at 11:30 a.m. Mondays, Tuesdays, Thursdays (women only) and Fridays. Call Occupational Health Services at ext. 4-3319.

Codependents Anonymous—Meets at noon Wednesdays. Call Occupational Health Services at ext. 4-3319.

Gay, Lesbian and Bisexual Support Group—Meets the first and third Fridays of the month at noon in Building 111-117. Call employee assistance counselor Cynthia Cooper at ext. 4-3680 or Randy Herrera at ext. 3-0664.

Parent Support Group—Meets the fourth Tuesday of the month at noon. Call Jayne Dutra at ext. 4-6400.

Senior Caregivers Support Group—Meets the second and fourth Wednesdays of the month at 6:30 p.m. at the Senior Care Network, 837 S. Fair Oaks Ave., Pasadena, conference room #1. Call (626) 397-3110.

Friday, January 8

Associated Retirees of JPL/Caltech Board—Meeting at 10 a.m. at the JPL, Woodbury complex, room 601-224, 500 W. Woodbury Rd., Altadena.

JPL Dance Club—Meeting at noon in Building 300-217.

Sunday, January 10

Chamber Music—The DeBussy Trio will perform harp, flute and viola at this free concert, to be held at 3:30 p.m. in Caltech’s Dubney Lounge. Call (626) 395-4652.

Thursday, January 14

Associated Retirees of JPL/Caltech—The group’s installation and awards luncheon will be held at Burger Continental in Pasadena. Cost: $14 per person. For information, call Lila Moore at (818) 790-5893.

Friday, January 15

JPL Dance Club—Meeting at noon in Building 300-217.

Saturday, January 16

Joe Williams—The legendary jazz and blues singer will perform at 8 p.m. in Caltech’s Beckman Auditorium. Tickets are $35, $31 and $27. Call (626) 395-4652.

Wednesday, January 20

JPL Drama Club—Meeting at noon in Building 301-127.

JPL Hiking Club—Meeting at noon in Building 238-543.

“The Monitor Is The Message: Writing Web Site Content That Works”—Sunjay Moorthy of Section 644 will discuss online documentation, helping users navigate your site and scan online information, and testing sites for usability. At noon in von Kármán Auditorium. Information from this talk will be available on the web in the “ICIS Noontime Talks” area of the “News & Events” section of the ICIS home page at http://icis.jpl.nasa.gov.

Friday, January 22

Award for Excellence Nominations—Due today from JPL personnel in business operations organizations (1X, 19X, 2X, and 6X) to the Reward & Recognition Administrator. For more information, visit the R&R home page at http://eis/sec614/reward/excel.htm or call ext. 4-3825.

Von Kármán Lecture Series—Origins Program Manager Dr. Firouz Naderi will speak at 7 p.m. in von Kármán Auditorium. Open to the public.

January 8, 1999

Universe

By MARK WHALEN

Changes affecting extended work week, overtime and jury duty pay, sick leave and other issues have been in the works throughout 1998, said Human Resources Director Sue Henry. “With the implementation of our new Oracle-based business systems for 1999, now is a great time to implement the new personnel policies,” she said.

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See Policies, page 6
**Galileo provides many discoveries in ’98**

By JANE PLATT

1998 was a tough year for those trying to keep up with all the discoveries from the Galileo Europa Mission, which has wrapped up the first half of its two-year extended mission. Following on the heels of the primary mission, Galileo Europa has sent numerous batches of pictures and data back to Earth, helping scientists unlock the mysteries of Jupiter and its moons.

A series of additional Europa flybys in 1998 has provided information bolstering the premise of a liquid ocean beneath the icy moon’s surface. The science community, the media and the public were enthralled this past March when pictures were unveiled from Galileo’s closest Europa flyby in December 1997. The images, taken from only 200 kilometers (124 miles) above Europa, revealed rough, broadly scalloped icy cliffs on Europa as high as Mt. Rushmore, and a large, icy fracture large enough to be spanned by the Brooklyn Bridge. Also shown were impact crater Pwyll and the Conamara Chaos region, where icy plates on the surface have broken apart and moved around.

It appears Europa may not be the only Jovian moon with a possible ocean. Data from Galileo’s magnetometer instrument revealed evidence supporting the premise of a liquid ocean under Callisto’s surface. This data indicated that electric currents flowing in a shell near Callisto’s surface are causing changes observed in Jupiter’s magnetic field during Galileo’s flybys. A salty liquid layer has been suggested as a likely candidate for creating the electrically conducting shell.

Scientists are re-thinking their ideas about Callisto’s interior structure, based on new data from Galileo. While previous data indicated that Callisto’s interior was totally undifferentiated, new information suggested Callisto has an interior that does not vary dramatically, but is not completely uniform. Io, Ganymede and Europa, on the other hand, have differentiated structures with separated layers. The Galileo data suggest that Callisto may have been less affected by gravitational squeezing and subsequent heating than Io, Ganymede and Europa.

New Galileo pictures showed closeup views of a fault on Europa as long as California’s portion of the infamous San Andreas. Called Astypalaea Linea, it is a strike-slip fault, meaning it has two crustal blocks that move horizontally past one another, somewhat like two opposing lanes of traffic. The Galileo images show that about 50 kilometers (30 miles) of movement has taken place along the fault. While the Galileo pictures captured a 290-kilometer-long (180-mile) portion of the fault, scientists calculate its full length returned to normal levels.

In 1999, work will begin on the TOPEX/ Poseidon follow-on mission, Jason-1. Satellite assembly, test and integration will begin in February at satellite contractor Alcatel Space Industries in Cannes, France. Jason-1 will be launched from Vandenberg in late 2000.

September 1999 will see the launch of Space Shuttle Atlantis with the Shuttle Radar Topography Mission (SRTM) onboard. SRTM uses the Spaceborne Imaging Radar C (SIR-C) antenna that flew twice in 1994 and adds a second antenna at the end of a 60-meter (200-foot) mast extending from the shuttle. The two antennas allow SRTM to conduct radar interferometry, a technique that compares two radar images taken at slightly different locations to obtain elevation or surface-change information. The SRTM antennas will leave JPL in early February for the Cape, where they will be installed in the shuttle payload bay.

The first radar test flights of the Geographic Synthetic Aperture Radar (GeoSAR) are expected to begin early this year with final delivery of the system by the end of 1999. GeoSAR is a new airborne interferometric mapping radar being designed and built by JPL for future commercial operation by Caligis Inc. under sponsorship of the Defense Advanced Research Projects Agency (DARPA) and the California Department of Conservation. The system will
TAP success noted at JPL and beyond

By JOHN G. WATSON

1998 marked the first calendar year that the Technology and Applications Programs (TAP) Directorate was under the helm of director, Mike Sanders, who assumed the post after more than 25 years with JPL and NASA Headquarters in various capacities. While engineering a customer-orientated reorganization of the directorate, in 1998 he oversaw milestones in a wide range of diverse technology development units.

Following development and ground testing through 1997, the NASA Solar Electric Propulsion Technology Application Readiness (NSTAR) project delivered the xenon ion engine used on Deep Space 1. NSTAR is a JPL/NASA Lewis venture. The ion propulsion equipment used on Deep Space 1 was provided by Hughes Electron Dynamics Division, Moog Inc., Spectrum Astro and Physical Science.

The first mission of the New Millennium Program, designed to flight-validate new technologies so that they can be confidently used on future science missions, Deep Space 1 marks the first-ever use of an ion propulsion system for primary propulsion in deep space. From Nov. 24 to Dec. 8, the engine thrusted continuously for 335 hours, far beyond the 200-hour minimum required to declare mission success.

The NSTAR team also used the Deep Space 1 flight spare ion thruster to demonstrate 50 percent extended lifetime to support Deep Space 4/Champollion and future Discovery missions.

In the past year, improvements continued with such technologies as the Quantum Well Infrared Photodetector, one of the world’s most highly sensitive infrared cameras at long wavelengths, and the Active Pixel Sensor, which enables video cameras to be reduced to the size of a chip coupled with optics while using only 1/100 the power of standard CCD cameras.

JPL was awarded nine projects in 1998 in the inaugural year of NASA’s Incubator Instrument Program, five of which were heavily dependent on TAP-sponsored technologies. These included “Global Positioning System on a chip” technology. Millimeter Integrated Circuit low-noise amplifiers and a submillimeter sensor to measure ice.

TAP-developed technologies contributing to far infrared missions include submillimeter heterodyne sensors (mixers, receivers and associated electronic components for detection needs in the microwave and submillimeter wave spectral regions) and cryogen free amplifiers (designed to absorb light for broadband astronomy in spaceborne astrophysics missions). They will enable such missions as the First Infrared and Submillimeter Space Telescope (FIRST), the Microwave Instrument for the Rosetta Orbiter (MIRO) and FIRST/Planck, which will determine how structure in the universe emerged from the Big Bang.

TAP is also developing Lithograhie Galvanoformung Abformung (LIGA) grids for NASA’s High Energy Solar Spectroscopic Imager (NESSI) mission. The grids will help reduce the size of this spaceborne telescope. LIGA is a microfabrication technique created in Germany in the 1980s, with specific applications developed in collaboration with several national lab, university and industrial partners.

New collaborations and strategic alliances with industry continued through JPL’s Commercial Technology and Regional Development Program, as more than 200 new JPL-developed technologies were reported, about one-third of which were converted to patent applications, higher than in any previous year. 1998 milestones included a licensing agreement with Ford Motor Company for neural network chip technology for diagnostics under the hood of a vehicle. See TAP, page 6

Cassini performance excellent heading into ‘99

By MARY BETH MURRILL

The Cassini/Huygens mission to Saturn and Titan celebrated a year of problem-free flight as the spacecraft travels through the inner solar system. “The overall performance of the Cassini spacecraft and the operations team has been excellent,” said Cassini Program Manager Bob Mitchell. Mitchell was named to his post in mid-1998 when former program manager Richard Spohalski retired.

One highlight of the spacecraft’s flight over the year was trajectory correction maneuver number 2, which was performed using Cassini’s reaction control system on Feb. 25, 1998. The performance was excellent, and as a result, two other scheduled trajectory correction maneuvers were cancelled as they became unnecessary.

The first of two Venus flybys occurred flawlessly on April 26, 1998 at 284 kilometers (175 miles) altitude. The radio plasma wave spectrometer was operated in an attempt to detect lightning in Venus’ atmosphere, but none was detected. The program conducted a review of requirements in preparation for the second Venus flyby and an Earth swingby in June and August this year.

A large propulsive maneuver (called the Deep Space Maneuver) was performed on Dec. 3, 1998, in order to establish the necessary gravity-assist conditions at the upcoming Venus encounter. A total of 771 kilograms (1,700 pounds) of propellant was used to change the spacecraft’s speed by 450 meters per second (1,000 mph). All systems performed properly.

Engineering checkouts of the Huygens probe were conducted twice last year, and periodic instruments’ performance and engineering maintenance activities on Cassini have shown the spacecraft to be running smoothly. The first in-flight use of Cassini’s high-gain antenna began Dec. 28, 1998 for the start of a 25-day instrument checkout activity.

Spohalski received the American Astronomical Society W. Randall Lovelace II Award in recognition of “his outstanding contributions to space science technology.” In October, NASA Honor Awards were given to Cassini and Huygens team members and contractors in recognition of their contributions to the program’s successful development and launch.

Stardust ready for Feb. launch

By MARY BETH MURRILL

The Stardust Project is now buttressing up its spacecraft for a Feb. 6 launch on a Delta II rocket from Cape Canaveral, Fla. “Stardusters,” as the project personnel call themselves, spent the last year assembling and testing spacecraft components and materials at JPL, at Lockheed Martin Astronautics in Denver, where the spacecraft was built, and at Kennedy Space Center in Florida. The project maintained its schedule and budget throughout the year.

Stardust’s target is Comet Wild-2 (pronounced “VILT-2”) — a “fresh” comet which just 24 years ago was deflected by Jupiter’s gravity from its previous home in an orbit lying much farther out in the solar system. Having spent most of the solar system’s history in the coldest, most distant reaches of the solar system, Wild-2 represents a well-preserved, pristine comet. Huygens team members and contractors in recognition of their contributions to the program’s successful development and launch.

One highlight of the past year was the successful drop test of the Stardust sample return capsule at the U.S. Army’s Douglas Proving Grounds at the Utah Test and Training Range near Salt Lake City. The capsule swung gently beneath its parachute after being dropped from a balloon floating at about 3,960 meters (13,000 feet) altitude. Project engineers said the soft landing demonstrated that the return capsule can successfully deliver comet and interstellar dust samples at the mission’s end in 2006.

An educators conference was hosted by the project as a key element of its outreach emphasis. “Our participation in the JPL community open house, involvement with the release of the Paramount picture ‘Deep Impact’ and interaction through the project’s education partners at Omniplex, the Jason Foundation, and the Challenger Centers got millions of students involved with Stardust,” said Project Manager Dr. Kenneth Atkins.

More than 1.5 million names were collected and etched onto the Stardust capsule.
Origins to look beyond solar system

WIRE launch set for Feb. 26

By JANE PLATT

A galaxy of developments this past year pertained to the Origins Program and related astrophysics missions. Public interest is heightened by the discovery of additional extra-solar planets, including a Hubble Space Telescope image of what appeared to be a planet ejected into deep space by its parent stars. The image of the object, called TMR-1C, may turn out to be the first direct look at a possible planet outside our solar system.

Excitement was generated also by the discovery of the clearest evidence yet of a budding solar system around a nearby star. An image taken with the new Keck II telescope in Hawaii, equipped with the sensitive, JPL-developed infrared MIRLIN camera, revealed probable planet formation site around the star HR 4796.

Wide-Field Infrared Explorer (WIRE), a spaceborne telescope designed to explore the evolution of starburst galaxies and search for protogalaxies, is scheduled for launch Feb. 26 from Vandenberg Air Force Base. Fabrication, assembly and test of the instrument were completed in 1998 and the instrument was shipped to Goddard Space Flight Center for spacecraft-integration instrument. It will be shipped from Goddard to Vandenberg in mid-January.

WIRE is NASA’s fifth Small Explorer mission. The Small Explorer Program, managed for NASA by Goddard, provides frequent flight opportunities for highly focused, relatively inexpensive science missions.

The Space Infrared Telescope Facility (SIRTF) entered its formal development phase last spring. The highly advanced orbiting space observatory formally passed its critical design review in September and NASA’s independent annual review in October.

The SIRTF Science Center was formally established in April, with Caltech Professor B. Thomas Soifer named as director. The center will be responsible for all the observatory’s science operations, including interaction with the science user community.

A decision was made to use a prototype 85-centimeter (33-inch) diameter beryllium mirror as the flight primary mirror. Procurement and fabrication are under way for five types of detectors for the three science instruments.

Development activities in 1999 include the fabrication of the spacecraft bus and focal plane assembly for each of the science instruments; telescope and cryostat fabrication and assembly will also be done. SIRTF, scheduled for launch in December 2001, will give astronomers unprecedented views of phenomena in the universe that are invisible to other types of telescopes.

In 1998, JPL selected Lockheed Martin Missiles and Space of Sunnyvale and TRW Inc., Space and Electronics Group of Redondo Beach for negotiations as industry team members for the Space Interferometry Mission (SIM).

The total value of these two contracts, including mission formulation and implementation phases, is estimated to be above $200 million. The initial contracts will cover the formulation phase, with an option for the implementation phase. During the formulation phase, initial mission design and planning for full-scale implementation will be completed.

In 1999, SIM will focus its efforts on a set of technology experiments and analyses to enable an instrument architecture decision later in the year. In parallel, the SIM team will develop the initial draft of its project implementa-tion plan. SIM will launch in 2005 on a journey to measure precisely the location of stars and to search for planets orbiting nearby stars.

Terrestrial Planet Finder project members in 1998 studied a number of mission configurations, developed a technology roadmap, and developed plans to support the upcoming National Academy of Science decade review process. This year, a detailed technology plan will be developed for a starlight demonstration, and ongoing industrial studies will be completed.

The Keck Interferometer project completed its Critical Design Review last August and selected EOST of Tucson, Ariz., as contractor for the outrigger telescopes. The Keck project also received a permit from the Hawaii Department of Land Management for the test siderostats, which will be installed in 1999 after site construction is completed. During the coming year, the Keck project will also apply for a permit for the outrigger telescopes, and the two-way beam combiner will begin lab integration and testing at JPL.

In 1998, the configuration of the FIRST/Planck project (Far Infrared/Submillimeter Telescope) was selected for technology demonstration by the European Space Agency’s Space Program Council, the scientific body that makes recommendations to the director. Composite Optics Inc. of San Diego was selected as telescope contractor.

ESA is scheduled to confirm the FIRST/Planck mission in February, as long as conflicts are resolved between instrument funding profiles and delivery schedules. Fabrication of the 2-meter telescope technology is also scheduled for 1999.

FIRST/Planck will determine how structure in the universe emerged from the Big Bang by studying the evolution of galaxies and stars, the origin and evolution of the elements, and star and planet formation.

Laser Interferometer Space Antenna (LISA) Mission Definition Team members met twice in 1998. This year, a New Millennium DS-5 opportunity for flight demonstration will be sought for LISA technology, with the goal of demonstrating inertial sensors. LISA will partner with European space agencies to the extent possible.

Eighteen scientists from all over the world collaborated in 1998 to define science goals for Advanced Radio Interferometry between Space and Earth (ARISE), which will use an innovative spacecraft with a 25-meter inflatable antenna. An innovative combined structural and thermal antenna model was developed using new Develop New Products software.

ARISE goals for 1999 include the issuance of draft guidelines of cooperation between National Science Foundation and NASA. Feasibility, trade and implementation studies will be performed for the antenna, ground segment.

See Origins, page 8

Outer Planets/Solar Probe: new name; launch dates set

By JANE PLATT

A project encompassing three diverse missions gained a new name and a set of launch dates in 1998. Europa Orbiter, Pluto-Kuiper Express and Solar Probe, which had been grouped as the Ice and Fire Preprojects, were converted to Outer Planets/Solar Probe Project. Europa Orbiter was assigned a planned launch date of November 2003, with a December 2004 launch planned for Pluto-Kuiper Express, and February 2007 for Solar Probe.

Dr. John McNamee was appointed Outer Planets/Solar Probe project manager, with Robert Staehle serving as deputy project manager. Prime science objectives were selected for all three missions, and X2000 began developing the hardware and software for the planned journeys to the Sun, Europa, Pluto and beyond.

The new year will bring additional progress for the missions, with the anticipated selection by NASA of the first science payload for Europa Orbiter. A propulsion module contract will be awarded, and an industry collaborator selected for all three missions.

Europa Orbiter has reaped the rewards of inter-

MUSES CN progresses

By MARY BETH MURRILL

NASC and Japan’s space science organization ISAS signed an interim agreement formally establishing the collaboration on the MUSES C sample return and rover mission to an asteroid. Last year, the announcement of opportunity for the MUSES CN science team was released and proposals were received.

In the area of nanorover and spacecraft engineering, the project tested the ISAS-developed heat shield materials at NASA’s Ames Research Center. The engineering models of the motors for the MUSES CN nanorover were delivered to JPL. The rover is about halfway finished with its detailed design, said Project Manager Ross Jones. In addition, he said, the electronic boards for the software development model rover were completed.

JPL and The Planetary Society signed a memorandum of understanding establishing the society as an outreach partner with MUSES CN.
MGS

Continued from page 1

taken from distances of 1,045 to 1,435 kilometers (648 to 890 miles), or far enough away to capture global views of the Martian moon in a single spectrum—showed that the surface must be composed largely of fine ground powder at least 1 meter (3 feet) thick, and that day- and night-side temperatures varied from extremes of -4 degrees Celsius (25 degrees Fahrenheit) during the day to lows of -112 Celsius (-170 degrees Fahrenheit) at night.

Dr. Philip Christensen of Arizona State University, principal investigator of the thermal emission spectrometer, explained that the temperature drops are the result of the absence of an atmosphere around the moon and a thick carpet of fine, powdery granules that have a low heat capacity and lose heat quickly once the Sun sets.

Extensive laser altimeter measurements were made of the north polar region, including scans that crossed very near to the geographic pole. These measurements allow scientists to make an accurate determination of the volume of the ice cap. In addition, data from the magnetic investigation revealed peculiar magnetic anomalies as the precession of the low point of the orbit, or the periapsis, moved across new latitudes.

Mars Global Surveyor will continue aerobraking operations until early February 1999. The spacecraft recorded its 1,000th orbit around Mars on Jan. 5 and will descend to a three-hour orbital period by Jan. 15. After reaching a two-hour orbit, the “walk-out” phase of aerobraking, which will begin to raise the spacecraft’s periapsis in preparation for the start of the mapping mission, will be initiated on Feb. 4, followed by termination of aerobraking on Feb. 9.

The flight operations team will deploy Surveyor’s high-gain antenna on March 30, 1999, approximately three weeks after the start of mapping on March 8. The antenna deployment is being delayed to ensure that a minimum set of science data is acquired and the minimum mission success criteria are met in case there is any problem resulting from the antenna deployment. There has been some concern about the performance of a damper device in the antenna’s deployment mechanism. A problem with a similar damper on Global Surveyor’s solar panel caused damage to the panel’s supporting structure just after the spacecraft was launched.

Surveyor’s science mapping mission, which will last one full Martian year or the equivalent of two Earth years, will be complemented by additional imaging and atmospheric measurements in 2000, when Mars Climate Orbiter begins its scientific mission to study the Martian weather, atmosphere and climatic history.

Policies

Continued from page 2

rest periods for non-exempt employees), and an unpaid 45-minute lunch break.

“Why not empower employees to get their work done the best way possible?” Henry asked. “As long as people work eight hours a day and take their required breaks, we think employees and supervisors can be trusted to do a good job with flexible schedules.”

If questions or disagreements on schedules arise, Henry suggested that new schedules be put in writing “to avoid misunderstandings.”

Sick leave/illness in the immediate family: Employees may continue to use up to 10 sick days per year to attend to illnesses in the family. If the employee has accrued sick leave and is attending to the serious health condition of an immediate family member, up to an additional 10 days per year may be approved. Written certification from a health care provider, in accordance with the Family and Medical Leave Act, is required.

“Fortunately, there is not a large number of employees who will need to take advantage of this change,” Henry said. “But it is very nice for those who need it.”

Advancing sick leave: A section manager may request a one-time sick leave advance of five days provided the employee has a serious or long-term illness or disability and he or she has completed a minimum of 60 days of continuous employment.

Once the advance is authorized by the Benefits Office, the policy requires that the subsequent monthly sick leave accruals be used to “pay off” the negative balance.

“There are not many in this situation who are going to use it,” Henry noted. “We think it’s a nice gesture to help those in need when they come back to work.”

Leaves of absence: Laboratory policy requires supervisors to submit leave of absence paperwork to the Benefits Office on the 10th day of an employee’s absence and use the first day the employee did not report to work as the effective date of the leave.

When an employee is placed on a FMLA (Family and Medical Leave Act) leave for his or her own serious health condition, supervisors are required to debit all sick leave accrual first and then debit vacation accrual.

Payroll will debit the employee’s sick leave balance each pay period by the amount of State Disability Insurance (SDI) income (converted to hours) paid directly to the employee by the state of California. This process will begin the eighth calendar day of a non-work related illness. Payroll will supplement SDI income with vacation accrual only after all sick leave accrual has been used.

Employees who want to continue medical coverage while on FMLA or disability leave for their own serious health condition pay only the employee portion of the medical premium for a period of up to six months.

“This change is really a coordination of benefits,” Henry said, “and will allow employees to maximize their sick leave as well as take advantage of disability payments.”

Changing to a non-benefit-based status: The revised policy requires the payoff of all vacation accrual and personal holiday at the time the status change is effective.

Employees are encouraged to discuss questions on the new policies with their supervisor or call the Employee Relations Office at ext. 4-7506.

Earth

Continued from page 3

map above and below vegetation canopies.

The long-awaited launch of NASA’s Earth Observing System satellite AM-1, now named Terra, is slated for late 1999 with two JPL-related instruments onboard. The Multi-Angle Imaging Spectro Radiometer (MISR) was built by JPL and the Advanced Spaceborne Radiometer (ASTER) is provided by Japan’s Ministry of International Trade and Industry, with scientific support provided by JPL. Terra will launch from Vandenberg.

The Active Cavity Radiometer Irradiance Monitor (ACRIM) satellite (ACRIMSat), which will study the Sun and its impact on the Earth’s climate, is scheduled for launch in October 1999.
Millennium
Continued from page 3

ing beyond expectations throughout.
Deep Space 1’s other new tech-
nologies, many of which have already
been validated, include autonomous
optical navigation, several microelec-
tronics experiments, and software to
plan and execute many onboard activ-
ities with only general direction from
the ground. Two science instru-
ments—one combining a camera,
ultraviolet imaging spectrometer and
infrared imaging spectrometer, the
second combining several instru-
ments that study space plasma—will
be further tested during a planned
flyby of asteroid 1992 KD this July.
By Dec. 1, Deep Space 1 had accom-
plished enough testing to satisfy the
technology validation aspects of the
minimum mission success criteria and
is now well on its way toward meet-
ing maximum criteria as well.

Following its Jan. 3 launch, Deep
Space 2’s two small probes will reach
Mars this December and will crash into
the Martian soil to test new technolo-
gies and conduct science experiments. Each probe, approximately the size of a
large grapefruit inside a basketball-sized
aeroshell, contains a suite of minia-
ture electrical and mechanical sys-
tems that must withstand extreme
environments, including crashing
into the planet’s surface at speeds
of up to 500 mph and surviving
extremely low temperatures. Upon
impact, they will begin collecting
data to verify the survival of the
penetrator system, which contains
10 new technologies.

Within the first six hours, they
will also attempt to detect the pres-
ence of water ice. If successful,
this mission will pave the way for future
science projects involving scores of
microinstruments sent to all regions
of a solar system planet or moon.
The probes’ three parts—a fore-
body that pierces up to nine-tenths
of a meter (three feet) into the
ground, an aftbody that remains
above the ground (tethered to the
forebody for telecommunications)
and the aeroshell in which they are
traveling to Mars—were delivered to
the Kennedy Space Center this
fall and attached to the Mars Polar
Lander cruise ring, on which they
are piggybacking to the red planet.
Launch was the crowning touch to
the mission. After the previous project manager,
Erickson, who assumed the post
leadership of Project Manager Jim
Bob Mitchell, became Cassini pro-
ject manager after the previous project manager,
Erickson, who assumed the post
leadership of Project Manager Jim

TAP
Continued from page 6

Two experiments were selected
when the program issued a solicita-
tion for inflatable space experi-
ments to fly with an inflatable sun-
shield, including an inflatable solar
array test in 2000 for potential use
on Deep Space 4/Champollion.

As part of its current proof-of-
concept phase, the Viewing Imager
Gimbaled Instrumentation Lab &
Analog Neural Three-dimensional
processing Experiment (Vigilante)
tested infrastructure was complet-
ed in 1998. Vigilante is a machine
vision instrument that combines
several sensors to recognize specif-
c targets in real time without the
aid of the human eye. The key is a
new, JPL-developed, sugar
cube-sized processor built on
neural networking principles.

Stardust
Continued from page 4

silicon chips mounted and flown
on Stardust.

A milestone was reached as the
mission’s environmental assessment
process was successfully completed.
The cometary and interstellar
dust analyzer instrument, provided
by Germany, was delivered on time,
and the flight system completed fab-
rication and test in Denver and was
shipped on time to Kennedy Space
Center. All stages of Boeing’s Delta
II launch vehicle arrived and began
integration at KSC, said Atkins, and
pre-launch operations have pro-
ceeded smoothly.
For Sale

BICYCLE, hand-made recumbent, P-38 Lightning, very lightweight, very fast. Fully downhill, 5100 ft.; $500/obo. 626/796-9807.

CD PLAYER, Denon DCD 1300, single play, remote control, perfect working order, $200. 626/281-2179, Mike.

COFFEE TABLE, oak, vg cond., 25” x 50”; $50. 626/395-6142, Terry.

DIET TAPES, Jenny Craig, set of 14, $5.00. 714/399-3890.

EXERCISE BIKE, Tunturi Engenerm, $60; ROWING MACHINE, Precor, $50; BLOOD, Weber 22 1/2 ”kettle; $25; BIKE, Motobecane. 10-sp.; $35; TV ST AND, Sony blk. 25” w/storage underneath, $25; SKIS, new, size 18”, $220/obo. 213/313-0136.

WATER/ICE DISPENSER, clean, gd cond., $140. 626/796-5684.

ORGAN, Y amaha 415 electronic console w/13 pedals, 3 keyb’ds, 200 var . football stars/rookies, $20. 626/914-6083.

PRECOR, $50; BBQ, W eber 22 1/2” kettle, $25; BIKE, Motobecane sound card, speakers w/subwoofer, 3-yr . gold warr ., must sell, make offer. 626/501-1011.

COMPUTER CASE, tower, 5 drive bay, $20; MX mid-tower case, $35; Anadex dot matrix printer , 9501. 249-8524.

'90 CHEVY Lumina APV 7-pass. minivan, loaded, only 54,700 mi., very fast, very comfortable, cost $2,300, sell $1,200. 626/836-8561.

BICYCLE, hand-made recumbent, P-38 Lightning, very lightweight, very fast. Fully downhill, 5100 ft.; $500/obo. 626/796-9807.

MAMMOTH condo, 2 bd. + loft, 3 ba., slps. 8, spa, full kitch., 12/15-4/14 rate: $1 10/nite/2, $10/nite/add'l person. 949/348-8047.

MAMMOTH condot in Chamonix at lifts 7, 8, 16, 17; walk to Warming Hut, $2, 25 ft. surf, 1 bd. w/loft, full comp., phone, color TV, VCR, microwave, dishwasher, pool, hot tub; $1205/week. 714/870-1872.

MAMMOTH, 2 bd., 2 la., $395/week. 714/870-1872.

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