

Saguaro Astronomy Club

Metro Phoenix, Arizona

SACNEWS



January 1992 — Issue #180

Twenty Years Ago: Soviet Mars Exploration

*The following was excerpted from "The Rocky Soviet Road to Mars," by Larry Klaes, published in the August, 1990 issue of **Spaceflight** magazine, a publication of the British Interplanetary Society (BIS). Larry provides additional notes at the end.*

The first year of the 1970s bore witness to the closest approach of the Red Planet in its solar orbit to Earth since 1956. Fifteen years earlier, neither the Soviets nor the U.S. had lofted even a single satellite into orbit around Earth; now the two nations were launching their most ambitious assaults yet on the fourth world from the Sun.

The U.S. made the first launch attempt with MARINER 8 on May 9. It was designed to orbit Mars with MARINER 9 and examine the entire surface of Mars for at least ninety days. Instead, the spacecraft ended up in the Atlantic Ocean when an autopilot fault in the CENTAUR stage of its ATLAS-CENTAUR rocket booster sent the craft wildly off course.

The Soviets had equally bad luck the next day. What might have been officially designated a MARS probe instead became COSMOS 419 when the vehicle failed to leave its parking orbit around Earth. The probe was subsequently destroyed upon re-entering the atmosphere on May 12. Success was finally achieved nine days later when the Soviet MARS 2 spacecraft escaped Earth's gravitational well. It was followed on May 28 by a twin named MARS 3. The U.S. rounded out the Mars launches two days after MARS 3 with MARINER 9, which also found its way on to the Red Planet.

MARS 2 and 3 were more advanced than any Soviet Mars spacecraft developed before. Weighing 4,650 kilograms (10,250 pounds) each, the MARS craft carried 450-kilogram (990-pound) landers to photograph and examine the Martian surface. The lander design was based on that of the LUNA 9 and 13 Moon landers of 1966: A sphere kept upright by four metal "petals" which opened around the lander's base after touchdown. The crafts' main buses contained rocket thrusters designed to brake the probes

Quick Calendar

SAC Meeting
7:30, Friday, January 17

Deep Sky Meeting
7:30, Thursday, January 23

Star Party
Buckeye Hills Recreation Area
Saturday, January 25

for insertion into orbit around Mars, where they would serve both as scientific stations and orbital relays for the landers' signals back to Earth. Even the project's design team was of a new generation, averaging less than thirty years in age. The team was supervised by veteran mission specialists.

Although launched from Earth last, MARINER 9 had taken a shorter flight path and arrived at Mars on November 13. It became the first spacecraft to orbit another planet. MARS 2 came on the scene November 27, followed by MARS 3 two days into the following month.

As the space vessels assembled in orbit in preparation for wrestling many of the secrets from this small world, Mars was to try to hide itself from human scrutiny once last time. During the months that the Soviet and American probes were traveling towards the Red Planet, astronomers on Earth noted that a major dust storm was brewing up on Mars. By the time the spacecraft had arrived in Martian orbit, the dust storm had engulfed the entire planet, obscuring almost every surface feature from the view of the probes' electronic eyes. MARINER 9 waited out the dust storm to begin its primary tasks. MARS 2 and 3 had no such luxury. Due to design limitations, the Soviet probes had to release their landers before injecting themselves into Mars orbit; they could not wait for the raging dust storm to end.

After being ejected from the orbiter buses, the landers were to enter the thin Martian atmosphere at supersonic speeds. The craft would be protected from heat friction with the air by a surrounding aeroshield. Once past this critical phase of the descent, a parachute would be released to slow the craft even further, followed by the

ejection of the shield. Just before touchdown, the MARS landers would fire retrorockets to cushion the landing impact to a survivable velocity. On the surface, the landers' metal "petals" would then open outward to provide balance, and the craft would immediately start to relay a panoramic view of their surroundings to their orbiting buses for transmission to Earth. The landers would then carry out various measurements of the immediate environment until their batteries were exhausted.

One mission study which was not conducted by the landers was the search for life on Mars. Dr. Lev Mukhin, chief of the Laboratory of Exobiology of the Soviet Institute of Space Research, deemed such experiments as 'too complex'.

Whether because of the dust storm or mechanical problems, MARS 2's surface mission was cut drastically short. The lander was ejected on November 27 and descended through Mars' turbulent atmosphere as planned; however, when the moment of touchdown arrived, only silence was received on Earth. The MARS 2 lander apparently crashed in the southern hemisphere of Mars in the western end of Hellas Planitia, a dust-filled basin with few impact craters. Though no data was returned from the lander, it did become the first human-made vehicle known to reach the surface of Mars. The lander also deposited a pennant displaying the Soviet Coat of Arms, which the probe carried in commemoration of the event. The MARS 2 bus subsequently went into an orbit ranging in altitude from 1,380 to 25,000 kilometers (860 to 15,500 miles), circling the planet once every eighteen hours.

Initially, MARS 3 had better luck than its counterpart. Arriving in orbit on December 2, the lander was released from the main bus towards Mars and plunged through the wind-swept dust and sand at supersonic speeds. Three minutes later, the lander successfully touched down in a heavily cratered plain near the northern rim of an ancient crater named Ptolemaeus, located in the southern hemisphere. Ninety seconds after the historic touchdown, the craft's timer mechanism ordered a panoramic imaging scan of the lander's surroundings; but just twenty seconds into the scan, the signals suddenly ceased. A partial picture was returned to Earth, but it 'did not reveal any noticeable difference in the contrast of details', according to a Soviet report. For almost a full week after the incident, Soviet controllers tried to regain the lander's signal, but the effort would eventually prove futile.

At first the signal loss of the MARS 3 lander was blamed on the global dust storm as the cause for the probe's demise. The vehicle may have been saturated with fine sand, or knocked over by strong winds. Soviet space scientists M. Y. Marov and G. I. Petrov later announced that the MARS 3 orbiter may have been at fault, failing to continue transmitting its lander's information to Earth at the critical time, due to an error in the main bus telemetry system.

With the MARS lander missions now permanently

defunct, Soviet controllers concentrated on the scientific studies made by the orbiters. Photographing the planet's surface proved frustrating, as the dust storm continued to blot out most Martian features through early 1972. After several weeks the imaging part of the mission was given secondary status, while MARS 2 and 3 concentrated on taking measurements of the Martian atmosphere and surface.

The orbiters discovered atomic hydrogen and oxygen in the upper atmosphere. The average temperature on the surface ranged from thirteen degrees Celsius (55.4 degrees Fahrenheit) at noon to -110 degrees Celsius (-230 degrees Fahrenheit) at night. Portions of the planet's night side were found to be twenty to twenty-five degrees warmer than some of their immediate surroundings. Atmospheric pressure on the ground was recorded at 5.5 to 6 millibars (by comparison, air pressure on Earth averages 1,013 millibars at sea level), and water vapor was scarce.

The orbiters were subsequently turned off in August of 1972. Despite the problems encountered with the landers, MARS 2 and 3 did become the first Soviet spacecraft to orbit the Red Planet for study and deposit landers on its surface while still in communication with Earth.

Notes —

It has since been learned that COSMOS 419 was designed as a Mars orbiter to reach Mars ahead of the United States MARINER craft and thus give the Soviet Union credit for being the first nation to orbit another planet. It was originally thought that COSMOS 419 was a combined orbiter/lander mission like MARS 2 and 3.

It was revealed in the July/August 1990 issue of **The Planetary Report** (A publication of The Planetary Society) that the MARS 2 and 3 landers carried miniature tethered rovers, which would have conducted analysis of the Martian soil up to fifteen meters (fifty feet) from the craft.

Directions to SAC Events

SAC General Meetings 7:30 PM at Grand Canyon University, Fleming Building, Room 105 — 1 mile west of Interstate 17 on Camelback Rd., north on 33rd Ave., second building on the right.

SAC Star Parties at Buckeye Hills Recreation Area — Interstate 10 west to Exit 112 (30 miles west of Interstate 17), then south for 10.5 miles, right at entrance to recreation area, one-half mile, on the right. No water and only pit toilets. Please arrive before sunset; allow one hour from central Phoenix.

SAC Deep Sky Subgroup Meeting at John & Tom McGrath's, 11239 N. 75th St., Scottsdale, 998-4661 — Scottsdale Rd. north, Cholla St. east to 75th St., southeast corner.

Bits and Pieces

Coming Events

Several Public Star parties are being planned for the Spring. Currently it looks like South Mountain in February, Reach 11 in March, and Thunderbird Park in April.

Minutes of the November Meeting

President Paul Lind called the meeting to order at 7:30pm. The first item on the agenda was the Christmas Party. It will be held at Paul Lind's house on Dec 14. It will be as usual a pot luck. New guests were then introduced. A motion to move the next Buckeye Star Party to Dec 7 was passed by voice acclamation. Tom Polakis then gave a short talk on the upcoming annular solar eclipse in San Diego on Jan 4. Tom also announced that *Telescope Making* and *Deep Sky* magazines were going out of business. Lastly Tom demonstrated the Voyager astronomy software available for the Macintosh.

Elections for the 1992 officers was next on the agenda. The slate of Paul Lind for President, Steve Coe for Vice President; Rich Walker for properties director, and Bob Dahl for Treasurer was accepted by unanimous voice acclamation. In the only contested position Susan Morse was elected as Secretary.

At the break the annual swap meet was held. For the Show-N-Tell Steve Coe showed his slides of various constellations.

There was no main speaker. —*Phil Dahl, SAC Secretary*

1992 SAC Meetings

January 17
February 14
March 20
April 17
May 15

1992 SAC Star Parties

January 25
February 22
March 28
April 25
May 23

Deep Sky Meeting

The Deep Sky meeting will take place on Thursday, January 23 at 7:30pm.

February Newsletter Deadline

Be sure to mail items to be included in the newsletter by Jan 22. Items sent later will not be included, but will be included in the next newsletter.

SAC Officers

President	Paul Lind	863-3077
Vice President	Steve Coe	878-1873
Secretary	Susan Morse	
Treasurer	Bob Dahl	582-5526
Properties	Rich Walker	997-0711
SACNEWS Editor	Paul Dickson	841-7044

Comet Comments

by Don Machholz

Two more comets have been discovered and one recovered recently. Three faint comets remain visible to us. Beginning with this issue I'll supply only the Epoch 2000 coordinates for comets. Most visual observers have little use for the Epoch 1950 coordinates.

Periodic	Comet	Hartley	2	(1991t)
Date	RA-2000-Dec	Elong	Sky	Mag
12-25	10h59.9m	-08°04'	103°	M 10.7
12-30	10h59.6m	-08°33'	108°	M 10.8
01-04	10h58.3m	-08°54'	113°	M 10.9
01-09	10h55.9m	-09°07'	118°	M 11.0
01-14	10h52.5m	-09°11'	124°	M 11.1
01-19	10h48.2m	-09°06'	129°	M 11.2
01-24	10h43.1m	-08°52'	135°	M 11.3
01-29	10h37.3m	-08°29'	141°	M 11.4
02-03	10h31.0m	-07°58'	147°	M 11.6
02-08	10h24.4m	-07°19'	153°	M 11.7

Periodic	Comet	Faye	(1991n)
Date	RA-2000-Dec	Elong	Sky Mag
12-25	02h32.8m	+01°56'	123° E 11.0
12-30	02h40.2m	+02°30'	120° E 11.1
01-04	02h48.0m	+03°08'	117° E 11.3
01-09	02h56.3m	+03°50'	114° E 11.5
01-14	03h04.8m	+04°35'	111° E 11.6
01-19	03h13.7m	+05°22'	109° E 11.8
01-24	03h22.8m	+06°09'	106° E 12.0

Comet	Shoemaker-Levy	(1991d)
Date	RA-2000-Dec	Elong Sky Mag
12-25	16h21.4m	+39°02' 67° M 11.0
12-30	16h40.0m	+39°20' 68° M 11.0
01-04	16h58.5m	+39°34' 69° M 11.0
01-09	17h08.9m	+40°16' 69° M 11.0
01-14	17h27.0m	+40°30' 69° M 11.0
01-19	17h44.7m	+40°42' 69° M 11.0
01-24	18h01.8m	+40°51' 69° M 11.1
01-29	18h18.3m	+40°58' 68° M 11.1
02-03	18h34.2m	+41°04' 67° M 11.0
02-08	18h49.3m	+41°09' 67° M 11.0

Periodic Comet Shoemaker-Levy 6 (1991b₁): Carolyn and Eugene Shoemaker and David Levy used the 18" Schmidt camera at Mt. Palomar to pick up this comet on Nov. 7. Early reports had it as bright as magnitude eleven, but it rapidly faded. The orbital period is 7.5 years.

Periodic Comet Tsuchinshan 1 (1991c₁): T. Seki of Japan recovered this comet on Nov. 8 at magnitude 17. It is now fading.

Comet Shoemaker-Levy (1991d₁): The Shoemakers and David Levy discovered this comet on Nov. 13 at magnitude 16. It is presently getting dimmer.

Don Machholz (916) 346-8963

Announcement

from the
Orange County Astronomers

Electronics Oriented Astronomy 4 Seminar

The Electronics Oriented Astronomy 4 Seminar will be held on February 22, 1992 at Hashinger Hall of Chapman University in Orange County California, from 9am until almost 10pm. Typical topics include CCD and other imaging system design, construction and use, photoelectric photometry, stepper control, electronic setting circles, etc. For those not attending, a poster paper area will be available for computer, printed, or videotaped papers. Deadline for contributors is January 20, 1992, so the Proceedings book may be prepared for distribution at the event. Cost of the seminar is \$25 for admission, free refreshments at 2 breaks, and the Proceedings book. The book by mail alone is \$15 ppd (please place orders by Feb. 1.)

Papers chair is John Sanford, 2195 Raleigh Ave., Costa Mesa, CA. 92627 Phone 714-722-7900, fax 714-646-7578. Registrar is Charlie Oostdyk, P.O. Box 1762, Costa Mesa, CA. 92628. Program Chairman is Wayne Johnson, 2630 Raven Cir., Corona, CA. 91720 714-734-8475.

Such-A-Deal

SUCH-A-DEAL is a place to advertise equipment, supplies, and services related to amateur astronomy. This is a free service for SAC members and friends. SAC is not responsible for the quality of advertised items or services.

Software—new copy of DR DOS 6.0 operating system, DOS shell, task switching, disk caching, defragmenting, disk compression, etc. \$25 Pete Burggraaf, 995-4273 (days), 995-1964 (evenings).

Telrad base—\$8.00 Pete Burggraaf, 995-4273 (days), 995-1964 (evenings).

Wanted—Coulter Odyssey 8, Pete Burggraaf, 995-4273 (days), 995-1964 (evenings).