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AUGUST 1969

A CHRONOLOGY ON SCIENCE, TECHNOLOGY, AND POLICY

(HHR-23)

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AUGUST 1969

August 1: Lick Observatory scientists successfully recorded first hits on laser reflector left on moon by Apollo 11 astronauts. Hits, which came after 2,000-3,000 unsuccessful attempts by Lick and McDonald Observatories, were made by Lick's 120-in telescope--world's second largest. Scientists fired 500 pulses with pure red beam of ruby laser. Each pulse lasted 15-20 billionths of a second, reached moon in 1.3 secs, and bounced back in same time. Target--18-in-square panel of 100 three-faced prisms of fused silica--was hit about three-fourths of time. (GSFC Historian)

- . JPL engineers reported Mariner VII, enroute to Mars, had suffered sudden change in velocity--possibly because of gas leak from pressure can in infrared spectrometer--that could throw off its approach to Mars. Also, 20 of 92 telemetry channels, including one that aimed TV camera platform toward Mars, had not operated properly after controllers lost contact with spacecraft July 30. When engineers turned on TV cameras, however, they began taking pictures that appeared to be of Mars. (Auerbach, W Post, 8/2/69, A4)
- . Dr. Wilmot N. Hess, Director of Science and Applications at MSC, announced he would leave NASA in September to become Director of Research Laboratories for ESSA in Boulder, Colo. His successor had not yet been selected. Dr. Hess said he was taking new position because job was challenging one in growing organization with important mission. "We have passed a milestone in the manned space flight program by the recent lunar landing. We have put the Lunar Receiving Laboratory into operation and it is performing its mission well. We have placed instruments on the moon successfully and have the scientific program for the next several lunar missions well organized." Before going to MSC, Dr. Hess served as Chief of Laboratory for Theoretical Studies at GSFC, 1961-1967. (MSC Release 69-54)
- . Intelsat-III F-2 comsat (launched Dec. 18, 1968), which had stopped operating June 29 when mechanically despun antenna malfunctioned, was restored to service. Intelsat I (Early Bird), reactivated June 30, had worked with Intelsat-II F-3 to provide service during interruption. (ComSatCorp Release 69-49)
- . President Nixon arrived at Lahore, Pakistan, during round-the-world journey. Pakistan President Yahya Khan said at airport, "The City of Lahore is happy to receive you on its historic soil and to share your joy at the most recent and the most memorable triumph of human courage, determination, and scientific skill which was achieved by your astronauts when they were first to land on the moon." (PD, 8/4/69, 1060)

- August 1: LRL technicians Ronald J. Buffum and George E. Williams, accidentally exposed to lunar samples when glove used to examine samples cracked, were placed in quarantine with Apollo 11 astronauts, 2 doctors, and 12 technicians, cooks, and other employees. (W Post, 8/2/69, A4)
- . James L. Stamy, Deputy Manager of Michoud Assembly Facility since 1962, became Acting Manager, replacing Dr. George N. Constan, who retired July 31. (MSFC Release 69-169)
  - . U.S. Army Collateral Investigation Board appointed to investigate March 12 crash of AH-56A Cheyenne helicopter, in which civilian pilot David A. Beil lost his life, issued report. It found accident was caused by divergent, low-frequency, main-rotor oscillation and pilot had been killed by rotor blades. Manufacturer, Lockheed-California Co., had "failed to exercise due care and judgment in the planning and execution of flight 288 and in so doing failed to adhere to an acceptable level of sound industrial practice." (Text)
  - . M/G James T. Stewart, former Vice Director of USAF's Manned Orbiting Laboratory (MOL) program, had been named Deputy Chief of Staff for Systems, Gen. James Ferguson, AFSC Commander, announced. Gen. Stewart would replace M/G John L. Zoekler, who retired from USAF July 31. (AFSC Release 130.69)
  - . USN announced award of \$461-million contract to Lockheed Aircraft Corp. for development of S-3A carrier-based antisubmarine-warfare aircraft, formerly designated VSX. Contract, to be funded over five-years, was for 6 R&D aircraft with option to procure 193 production models, contingent upon successful development phase. (DOD Release 647-69)
  - . Christian Science Monitor reprinted London Economist editorial: "When Europe drew pride and status from its colonies, the Americans had none: the tables are turned now. While the United States rings July 21st red on its calendar, Europe faces the probability that when the planets are opened up we Europeans will have no part in doing it. The idea, at this late stage, of a European manned space programme is nonsense. The policy that would make more sense would be to approach the United States to see if the Administration will accept some foreign collaboration in the hugely expensive next years of its space programme. If the next American objective is Mars, a sensible Administration may welcome help and participation--especially if this excludes pressure to co-operate with the Russians.... There will be no opportunity in this generation that it would cost us more to miss." (CSM, 8/1/69)

August 2: Press conference on Mariner VI preliminary results was held at JPL. Scientists reported experiments had revealed that: recurring white blob seen in previous Mars pictures was 300-mi-wide crater with peak in center; linear features known as canals were actually large, irregular, low-contrast splotches without specific detail; temperature in equatorial area ranged from 75°F to -100°F; atmosphere was almost nonexistent; Mars had no sharply defined borders separating light and dark areas; and Martian surface was more heavily cratered than previously believed.

Dr. Charles A. Barth of Univ. of Colorado said any life on Mars would be very different from life on earth--perhaps form that used carbon dioxide. He said UV spectrometer had found atomic carbon and carbon monoxide, but no traces of nitrogen--essential to life on earth.

Dr. George C. Pimentel of Univ. of California at Berkeley said infrared spectrometer had detected presence of unknown compound related to methane--building block of life on earth. He also reported detection of super-thin layer of water ice hanging in atmosphere above Mars equator. (Auerbach, W Post, 8/3/69, A3; Lannan, W Star, 8/3/69, A5)

- . NASA's Mariner VII televised two good test pictures before start of its first series of 34 approach shots more than 1 million mi from Mars. (AP, W Star, 8/2/69, A3)
- . Initial results of tests at Lunar Receiving Laboratory in which mice were exposed to lunar samples showed no indication of life on moon, LRL preventative medicine specialist Dr. Norman D. Jones reported. All 24 sterilized mice that had lunar dust injected into their stomachs July 31 and 240 mice inoculated Aug. 1 were "alive and kicking.... They have shown no untoward reaction to the sample and seem to be in very good health." (AP, W Star, 8/3/69, A5)
- . Lick Observatory scientists said they had measured distance between earth and moon to be 226,970.9 mi, based on data from Aug. 1 test in which laser beam successfully hit reflector on moon. Figure was accurate to within 150 ft and eventually might be pinned down to inches. (AP, W Post, 8/4/69, A4)
- . Romanian President Nicolae Ceausescu met President and Mrs. Nixon on arrival at Otopeni Airport, Bucharest. President Nixon replied to welcome: "...this significant moment in the history of relations between our two countries coincides with a great moment in the history of the human race. Mankind has landed on the moon. We have established a foothold in outer space. But there are goals

August 2 (continued)

we have not reached here on earth. We are still building a just peace in the world. This is a work that requires the same cooperation and patience and perseverance from men of good will that it took to launch that vehicle to the moon." (PD, 8/4/69, 1065)

- . Washington Post editorial: "It is not often that the public has a chance to share in the day to day unraveling of scientific mysteries. The men and women who engage in basic research prefer to work quietly in laboratories and eventually announce their findings in the atmosphere of scholarly meetings or academic publications. But at Houston and Pasadena [MSC and JPL] these days, the public has become a silent observer of the plodding work that goes into basic research. Regardless of the drama that is involved, the study of the rocks brought back by Apollo 11 from the moon and of the pictures being transmitted back by Mariners 6 and 7 as they fly past Mars is simply basic research. Although results are trickling out each day, the dimensions of each discovery are hard to measure and an understanding of their cumulative impact is likely to be long in coming." (W Post, 8/2/69, A12)

August 3: At Andrews AFB, on return from world tour, President Nixon said:

"In Bucharest I noted that so many, particularly of the young people, held up a newspaper picture of the astronauts landing on the moon, and everywhere we went it was the same. Some way, when those two Americans stepped on the moon, the people of this world were brought closer together. ...I really feel in my heart that it is...the spirit of Apollo, that America can now help to bring to all relations with other nations. The spirit of Apollo...can bring the people of the world together in peace." (PD, 8/4/69, 1071-2)

- . New York Times published interview in which Grumman Aircraft Engineering Corp. President L. J. Evans expressed concern over possibility of failure in future space missions. "It has been one big gamble up to this point. This country must come up with rescue hardware. It would be shocking if someone got stuck in orbit someplace." He saw need for four space facilities: space station in earth or lunar orbit, shuttle for travel between earth and space laboratory, space "tug" to go between nonatmospheric orbits, and rescue vehicle. (Kampel, NYT, 8/3/69, F7)
- . New York Times editorial commented on Apollo 11 lunar landing and Mariner VI Mars mission: "Future generations may well regard the last two weeks of July 1969 as the most revolutionary and significant fortnight of the entire twentieth century. Not for 300

August 3 (continued)

years has any comparable quantum leap in man's knowledge of the cosmos taken place in so brief a time." (NYT, 8/3/69, 10)

- . There was no question that manned Mars mission could be "organized, equipped and flown, possibly by 1985 or 1986," William Hines said in Washington Sunday Star. "But the cost of such a flight would be tremendous." Apollo had cost \$25 billion over eight years. Project Mars "would cost four times as much over a period twice as long." Taxpayers and legislators "should listen to the professional pitchmen of space with a dubious ear, demanding facts instead of the sort of rhetoric Dr. George E. Mueller delivered on Apollo 11 splash-down day." (W Star, 8/3/69, C4)

August 3-4: Photos of Mars taken from 65,000-mi altitude by NASA's Mariner VII were received by JPL and shown live on TV. Although pictures were clear, canals were barely visible as dark splotchy areas, indicating they were not sharply defined features as previously believed. Viewers saw 100-mi-wide, 750-mi-long dark streak identified as Agathadaemon canal, Ceberus canal in light Plateau Elysium area, and Martian south pole with craters filled with substance resembling snow or ice. Pictures showed white grid pattern around Nix Olympica, identified by Mariner VI photos as 300-mi-wide crater. Absence in Mariner VII photos of bright streak on Tempe desert near Mars north pole that had been visible in Mariner VI photos suggested meteorological phenomenon similar to earth's seasonal changes. South polar cap, which was 2,500 mi across in Mariner VII photos, shrank to 250 mi across in Martian summer and increased to 3,500 mi across in winter. (Auerbach, W Post, 8/5/69, A1)

August 4: Scientists at Lunar Receiving Laboratory opened last box of Apollo 11 lunar samples containing charcoal-gray dust and assorted rocks ranging from gravel to size of orange. NASA geologist Dr. Jeffrey L. Warner described rocks as "different from anything we have on earth." Some of rocks had flat faces and appeared to have been broken off larger chunks of material. Rocks in first box of samples had been rounded. Some rocks contained unidentified crystals that sparkled; others had "an unusual smattering of what appeared to be metallics," possibly illemite (iron-titanium mineral oxide), important source of titanium. (UPI, W Post, 8/5/69, A6; AP, B Sun, 8/5/69, A1)

August 4: NAS-NRC Space Science Board published The Outer Solar System: A Program for Exploration. Report detailed program for unmanned exploration from 1974 to early 1980s; reaffirmed goals set by earlier study emphasizing experiments contributing to understanding of origin and evolution of solar system, of life, and of dynamic processes in terrestrial environment; and agreed exploration would concentrate on planets but time in flight would permit study of interplanetary medium. Missions recommended were 1974 Jupiter deep-entry probe and flyby, 1976 Jupiter orbit, 1977 earth-Jupiter-Saturn-Pluto probes, 1979 earth-Jupiter-Uranus-Neptune probes, and earth-Jupiter-Uranus entry probes in early 1980s. Vigorous national program could be developed for small fraction of total NASA program cost and increased portion of space budget should be devoted to planetary exploration. Report, originating from June 1968 study chaired by Dr. James A. Van Allen of Univ. of Iowa and Dr. Gordon J. F. MacDonald of Univ. of California at Santa Barbara, recommended NASA include long-term outer solar system exploration plan in 1971 Congressional budgetary presentation. (Text)

- . NASA's Pegasus III meteoroid detection satellite, launched July 30, 1965, reentered earth atmosphere at 2:04 am CDT over Indian Ocean at 3.4° N. latitude and 56.7° E. longitude. Pegasus III was last in series of three Pegasus satellites with 96-ft-long detector panels launched to determine frequency of meteoroids in near-earth environment. All three had been turned off in 1968 after operating for more than double design lifetime. Few hours before reentry, controllers commanded Pegasus III beacon to begin operating again and beacon functioned satisfactorily until satellite was destroyed by reentry heat. (MSFC Release 69-170; GSFC SSR, 8/15/69)
- . ERC announced it had developed and successfully flight-tested "Flying Baton," simple, low-cost device to provide eye-level artificial horizon for pilots. Developed by Center's William J. O'Keefe, device could contribute to more "head-up" flying, be used for precision attitude flying, and allow pilot more time to look outside aircraft. (ERC Release 69-19)
- . DOT and HUD announced \$166,734 project for studies to recommend short- and long-term relief from aircraft noise at John F. Kennedy International Airport, New York; O'Hare International Airport, Chicago; Bradley International Airport, Hartford, Conn.; and Cape Kennedy Regional Airport, Fla. Area reflected cross-section of airport situations. Studies were to define noise problems, to identify



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August 4 (continued)

activities affecting problems, to identify approaches to land use compatible with airport locations, and to analyze feasibility of compatible land development in high-noise areas. (DOT Release 18369)

- . Apollo 8 commemorative medallions containing metal carried on mission were being distributed to NASA employees "as a token of appreciation for each individual's efforts in making the United States Lunar program possible," NASA Hq. Weekly Bulletin said. (NASA Hq WB, 8/4/69, 1)

August 4-5: NASA's Mariner VII transmitted first closeup photos of Mars south pole as it flew within 2,100 mi of planet. Dr. Robert P. Sharp, geologist at Cal Tech, said 31 photos might look like "baby pictures of Earth. This is what the Earth might have looked like some four billion years ago before it developed an atmosphere and oceans to weather its surface and nurture life." Photos taken on pass Aug. 4 were transmitted to JPL Aug. 5.

Polar cap, which had appeared gleaming white in more distant photos, looked dull gray in closeups. Pictures showed south polar cap with snow-like substance--possibly frozen carbon dioxide--piled up in vast dunes; pocked with deep, steeply walled craters; and much darker than desert to north. Floor of bright circular Hellas desert area, believed to be shallow crater or collapsed area, was strangely free of meteorite impact craters.

Mariner VII (launched March 27) with Mariner VI (launched Feb. 24) had provided most detailed information to date on Mars, including 198 photos covering 20% of planet and detailed scientific data from onboard experiments. Data indicated: thin Martian atmosphere had no detectable nitrogen; south polar cap, which appeared white and smoothly circular in telescope pictures, was ragged with dark splotch in center; surface temperatures ranged from 75°F to -100°F; some of narrower thin dark lines called canals might be segments of rubble-rims of craters up to 300 mi across; and Martian surface, though heavily pocked, was not as rugged as lunar surface. (AP, B Sun, 8/6/69, A1; AP, W Star, 8/6/69, A7; Auerbach, W Post, 8/6/69, A3)

August 5: Dr. Thomas O. Paine, NASA Administrator, and other top NASA officials testified on future space programs before Senate Committee on Aeronautical and Space Sciences.

August 5 (continued)

Introducing programs, Dr. Paine said: "The decade of the 1970's and 1980's should have a program as bold in concept and as productive as we have had in the decade of the 1960's. ...we need to have clear objectives to focus our work and a commitment, subject...to annual review, as to what these achievements will be. Our general goal area should be the continued exploration of the solar system while deriving the maximum scientific and practical benefits here on earth from the space program. There is no question that, at some future time, we will have the capability for manned planetary exploration and we need to face now some of the decisions that will not bear fruition for more than a decade. Although I do not believe that we will see manned exploration of the planets in the 1970's in the United States...I do think this could come in the 1980's. It is by no means clear that for the Soviet Union the decision may not be made to mount a crash program and bring this in before the end of the decade of the 1970's."

Dr. Wernher von Braun, MSC Director, described possible manned Mars expedition in which two spacecraft would leave earth Nov. 12, 1981; arrive in Mars orbit Aug. 9, 1982; remain in Mars orbit for 80 days, performing surface landing operations during which 6 of total 12 crew members would visit Martian surface; leave Mars in October 1982, making swingby of Venus in 123 days; and return to earth orbit Aug. 14, 1983. Two NERVA engines for each spacecraft would power departure from earth orbit and return to orbit for later reuse. Third nuclear stage would remain with spacecraft to power entry into Mars orbit and return to earth. Nuclear stages would be placed in orbit by separate launches. "Truly reusable vehicle" would be needed to fly from earth to refuel stages.

Each spacecraft would weigh 1.6 million lbs at departure from earth orbit and would be 270 ft long, "smaller than what we are flying already to the moon." Each should be able to carry all 12 astronauts in case one ship should be put out of commission. On arrival at Mars, unmanned landers would probe Mars and return soil to orbiting craft. Only after analysis would crew descend in larger lander with small biological laboratory. During planetary orbit, two ships could be joined. If artificial gravity proved desirable, joined spacecraft could be spun slowly to create gravity by centrifugal force.

NASA was using "concept of reusability" in planning, to improve and reduce cost of operating in space, Dr. George E. Mueller, NASA Associate Administrator for Manned Space Flight, told Committee, Reusability could be achieved "through the reuse of launch and space vehicles and...through the reuse of a mission module such as a space

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station" put into orbit and used over 10-yr or even 20-yr period. Space shuttles would be designed to run 100 or more flights. Modules and vehicles would be designed for multiple applications in earth, lunar, and synchronous orbits. Space tug would permit travel from space station to other spacecraft and back again--"general purpose...equipment." In earth orbital operations, "it permits us to fly off from the space station over to...an OAO, orbiting astronomical observatory, either to repair or check the OAO, or to bring it back to a space station where it can then be loaded on the space shuttle for return to earth and then brought back into orbit after repairs."

Dr. John E. Naugle, NASA Associate Administrator for Space Science and Applications, reviewed information from Mariner VI and VII flights past Mars. He concluded that with "excellent data we are getting this year" two Mariner 1971 spacecraft would be able successfully to "map the planet and watch for surface changes." And NASA confidence in ability of 1973 Viking orbiter-lander project to do scientific research also had increased. (Transcript)

- . Four LRL technicians--Miss Heather A. Owens, Chauncey C. Park, Roy G. Coons, and Riley Wilson--were placed in isolated area under quarantine after being exposed to lunar material when line carrying contaminated material from vacuum chambers to disposal area burst, spraying lunar material into examining room. Mishap, second in which LRL technicians were exposed to lunar material [see Aug. 1], brought total number of persons under quarantine to 23. (AP, W Post, 8/6/69, A3; MSC Hist Off)
- . NASA announced resignation of Astronaut F. Curtis Michel, effective Aug. 18. Dr. Michel, who had been on one-year leave of absence from NASA to do scientific research at Rice Univ. in Houston, said that--although he was reluctant to leave NASA and prospect of flight in space--he wanted to devote full time to research at Rice. Resignation reduced number of NASA astronauts to 48. (MSC Release 69-55)
- . NASA notified Instituto Geofisico del Peru that \$2-million NASA tracking station near Lima, Peru, would be closed because of shifting program requirements and economic reasons. Station, to be phased out by November, had participated in more than 75 satellite missions since 1957. (NASA Release 69-117)
- . Dept. of Interior announced grant of \$100,225 for research into health, safety, and water pollution in coal mining operations. Island Creek Coal Co. would determine if miners equipped with self-contained breathing apparatus similar to astronauts' could work efficiently in mines filled with nitrogen or other inert gas. (DOI Release 17784-69)

August 6: U.S.S.R. launched Cosmos CCXCI from Baikonur into orbit with 527-km (327.5-mi) apogee, 143-km (88.9-mi) perigee, 91.2-min period, and 62.2° inclination. Satellite reentered Sept. 8. (GSFC SSR, 8/15/69; 9/15/69; SED, 8/7/69, 109)

- . NASA's HL-10 lifting-body vehicle, piloted by NASA test pilot John A. Manke, reached 78,000-ft altitude and mach 1.55 after air launch from B-52 aircraft at 45,000-ft altitude west of Rosamond, Calif. Objective of flight, 23rd in series, was to obtain data on performance, stability, and control--especially roll control. (NASA Proj Off)
- . NASA named flight crews for Apollo 13 and 14 lunar landing missions. Prime crewmen for Apollo 13 were Astronauts James A. Lovell, Jr. (commander), Thomas K. Mattingly II (CM pilot), and Fred W. Haise, Jr. (LM pilot). Backup crew was composed of Astronauts John W. Young, John L. Swigert, Jr., and Charles M. Duke, Jr. Apollo 14 prime crewmen were Astronauts Alan B. Shepard, Jr. (commander), Stuart A. Roosa (CM pilot), and Edgar D. Mitchell (LM pilot). Backup crew was Astronauts Eugene A. Cernan, Ronald E. Evans, and Joe E. Engle. Both missions would include lunar exploration and deployment of Apollo lunar surface experiment packages (ALSEP). Total lunar surface stay time would include two EVA periods of three hours each and would not exceed 35 hrs. Flights would be first for Astronauts Mattingly, Haise, Roosa, and Mitchell. (NASA Release 69-115)
- . Apollo 11 Astronauts Neil A. Armstrong and Edwin E. Aldrin, Jr., quarantined in LRL, discussed lunar surface activities with about 40 scientists and geologists over closed-circuit TV. Astronauts said lunar surface was rich with interesting rocks. They described small, walnut-size fragments which appeared translucent or transparent, with reflecting surfaces like quartz crystals; spatters of glass on rocks, especially on rocks on bottom of craters; and rocks shaped like automobile distributor caps, which appeared to be weathered or eroded and sculptured at top in cylindrical shape. Astronauts said they regretted not being able to retrieve more lunar rocks and suggested that future Apollo astronauts be equipped with extra pocket or shoulder bag so they could collect interesting rocks as they saw them. (W Post, 8/7/69, A4; AP, B Sun, 8/7/69, A8)
- . Dissatisfaction with substandard performance in other parts of society was "something worthwhile that the Space Program is contributing to the United States," NASA Administrator, Dr. Thomas O. Paine, said in speech before National Press Club in Washington, D.C. "I hope we

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have spurred our society and our people to...demand higher performance, to set bolder goals, and then to have the gumption to stand up before the whole world and demonstrate whether or not the goals are achieved." Space program had also taught "need for broadly enlisting not only American capability, but the best people from around the world willing to throw their competence and a portion of their careers into challenging endeavors." It had "unleashed in the 1960's the talents and energies of a technological generation." U.S. must continue "to put together bold programs that will release the creative energies of our people in productive channels."

Dr. Paine thought history would record as "the great contribution of our generation" astronauts' blazing of "trail for all future generations of men who want to...conquer new worlds.... Through man's brains, energy and resources life can--and life will--extend itself through the solar system.... The 1980's are very clearly the decade in which both we and the Soviet Union, with reasonable-sized space programs in the 1970's, will develop a technological capability for landing on Mars."

In response to questions, Dr. Paine said: "It seems clear to me that there are increasing opportunities for all nations to work together in space exploration and application. Certainly we and the Russians can and should cooperate more closely in space science so our two programs can produce greater results than the simple sum of their outputs." (Transcript)

Future space program was described by Dr. George E. Mueller, NASA Associate Administrator for Manned Space Flight, before National Space Club in Washington, D.C. Reusable nuclear vehicle to serve as space shuttle between space station in earth orbit and space station in lunar orbit would be "final link that would permit us to reduce the cost of operation to something like \$200 for moving a pound of material from the earth's surface to the lunar surface and return as compared to something like \$100 thousand a pound using today's techniques. Similar reductions in the cost of transportation to the earth orbital station will permit us for the first time to consider processing materials in space, to use space for the kind of laboratory work that we now associate with ground-based laboratories." By end of 1970s "we would find so many uses for operations in synchronous orbit both for observing the universe and for observing the earth that we would have established a space station in synchronous orbit which would be regularly supplied by a nuclear shuttle system and which would provide us with direct television broadcasting and direct radio broadcasting to the homes of all people in the world, as well as providing us with great stellar observatories and a viewing platform

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for air traffic control, navigation and for a permanent weather watch.

"...this approach to using space is one that is readily extended, once the shuttle capability has been developed, to a corresponding approach for planetary exploration and...the same nuclear shuttle system together with the space station modules need only to be supplemented by a Mars landing module to permit us to carry out the first manned planetary expedition to Mars." (Text)

August 7: Scientists at JPL presented conflicting opinions on preliminary data from Mariner VI and Mariner VII flybys of Mars. Dr. George C. Pimentel and Dr. Kenneth C. Herr of Univ. of California at Berkley said data from infrared spectrometer indicated presence of gaseous ammonia and methane in Martian atmosphere. "We are confident that we have detected solid carbon dioxide that is not on the surface; that is, it is suspended as a cloud above the polar cap. Our data are consistent with and suggest that the polar cap is composed of water ice and probably not solid carbon dioxide near the polar cap edge." If life did exist on Mars, they said, it could be in region near edge of polar icecap where "polar ice provides a reservoir of water" and solid carbon dioxide cloud "provides protection from ultraviolet radiation."

Dr. Gerry Neugebauer of Cal Tech said temperature of Mars was "strong circumstantial evidence that the polar caps are in fact predominantly made of carbon dioxide." Infrared radiometer experiment, which measured temperatures on Martian surface, indicated that temperature of south polar cap was close to  $-253^{\circ}\text{F}$ --temperature at which carbon dioxide would solidify in thin Martian atmosphere.

UV spectrometer experiment had found large amount of UV radiation reflected from south polar icecap, indicating that UV light from sun was penetrating thin Martian atmosphere and reaching surface. Dr. Charles Hord of Univ. of Colorado said strong UV radiation reaching surface "would destroy many of the important molecular bonds of organic compounds." If life did exist on Mars, he said, it "must be pretty strong stuff," or it must have some means of protection against UV rays.

Dr. Robert B. Leighton of Cal Tech said one of most striking results of Mariner photos was indication of dynamic process occurring on Martian surface. Unlike rest of Martian surface, which was heavily cratered and closely resembled moon, Hellas area appeared to be smooth and free of craters. "Hellas is the first non-lunar-like feature" discovered by Mariner VII, he said. Apparently there was "activity in that region which is obliterating craters as fast as they are being formed." (Bishop, WSJ, 8/8/69; Sullivan, NYT, 8/8/69, 1; Lannan, W Star, 8/8/69, A4)

August 7: Lunar Receiving Laboratory scientists presented first comprehensive report on preliminary study of lunar samples collected by Apollo 11 astronauts. Experiments indicated there was no life in sample and traces of organic material reported earlier were probably from astronauts' spacesuits and containers, rubber gloves, and tools used to handle material. (Traces of hydrocarbons in two samples of lunar dust had been reported Aug. 6) Autopsies performed on 48 mice injected with lunar dust and then killed had shown no signs of germs or illness. Detailed analyses of samples would begin in late September when material would be released from quarantine and distributed to 146 principal investigators in 9 countries. (AP, W Star, 8/8/69, A4; Sullivan, NYT, 8/7/69, 1)

- . Sen. Ralph W. Yarborough (D-Tex.) offered amendment to H.R. 11271, FY 1970 NASA authorization bill, [see June 24] to increase funds for NASA R&D and program management from amount reported by Senate Committee on Aeronautical and Space Sciences to amount passed by House. Increases would total \$256.50 million in R&D and \$6.35 million in research and program management. He said: "My amendment authorizes the bare minimum that we, as a nation, should commit to space. Its adoption is vital to the proper balance in our national priorities; it is vital to the future of our exciting and promising space program; and it is vital, in my opinion, to the interests and well-being of our country." (CR, 8/7/69, S9383)
- . Washington Post published results of July 26-28 Gallup survey, which found public lukewarm about Government funding of manned Mars landing. While majority of young adults favored idea, majority of those 30 or over opposed it. Generally, 39% of those polled favored attempt to land man on Mars, 53% opposed, and 8% had no opinion. Blacks opposed by 3-to-1 ratio. (W Post, 8/7/69, F4)
- . At White House dinner for West German Chancellor Kurt G. Kiesinger, Dr. Wernher von Braun, MSC Director, told press putting man on Mars by 1982 posed less risk than putting man on moon because most technical problems had been solved. In time space travel would become commonplace, with spacecraft carrying passengers. On Martian surface man could move from home to car or office in completely controlled environment. (Shelton, W Post, 8/8/69, D2)
- . MSFC announced award of two contracts. Eight-month, \$400,000 contract had been given to General Dynamics Corp. to study experiment modules for proposed manned space station. Study, which would complement space station investigations being conducted by McDonnell Douglas Corp. and

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North American Rockwell Corp., would examine variety of experiments suitable for manned space station, analyze scientific and engineering community's need for experiment modules, and develop concepts for least number of modules needed to meet these requirements.

Martin Marietta Corp. had been awarded \$1,170,000 contract to fabricate, test, and deliver 15 Saturn V workshop rate gyro processors and 1 module test set and to retrofit 22 Apollo Telescope Mount rate-gyro processors for Apollo Applications program. Work, expected to take 18 mos, would be done in Orlando, Fla. (MSFC Release 69-172; 69-173)

- With encouragement from President Nixon and Vice President Spiro T. Agnew, NASA had "begun drumming up pressure for the huge sums required to send men to Mars in the early 1980's," New York Times editorial said. "But the latest Mariner information makes the probability of life on Mars much less than it seemed even a week ago, thus removing much of the original motivation for such a project. The shift of emphasis now proposed to unmanned satellites would be far cheaper; scientifically it would also be far more productive. (NYT, 8/7/69, 32)

August 8-14: Zond VII automatic space station was launched by U.S.S.R. from Baikonur with "powerful carrier rocket" and placed on free-return lunar trajectory from parking orbit. Tass said mission objectives were to study moon and near-lunar space further, photograph lunar surface, and test improved onboard systems and design of "rocket-space complex." All equipment was functioning normally.

On Aug. 11 Tass announced that spacecraft had circled moon on flight plan similar to that of Zond V (launched Sept. 15, 1968) and Zond VI (launched Nov. 10, 1968), had photographed lunar surface, and was returning to earth. Zond VII reentered atmosphere by skipping across outer layers of atmosphere to reduce its entry speed and then descended and softlanded in predetermined area near Kustanay in northern Kazakhstan Aug. 14. (SBD, 8/11/69, 120-1; 8/18/69, 152; NYT, 8/9/69, 26; 8/12/69, 6; 8/15/69, 14; GSFC, SSR, 8/15/69)

August 8: NASA announced selection of Heliodyne Corp. and Wolf Research and Development Corp. for final negotiations leading to one-year, \$1-million, cost-plus-award-fee contract with two one-year options to operate National Space Science Data Center at GSFC. (NASA Release 69-118)



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August 8: In Washington Daily News, Sen. Everett T. Dirksen (R-Ill.) said:

"Unknowing voices clamor to us to give up the search into the unknown. They ask us to spend the money on things here on earth. They ask for something that already has been done. Where do you think the money is spent that sent Apollo 11 to the moon? It wasn't spent on the moon. There are no creatures there to benefit from the billions spent to finally land Neil Armstrong and Buzz Aldrin in the Sea of Tranquility. The money was spent here on earth, where it enriched the laborers, the craftsmen, the technicians, the engineers, the scientists--and their neighborhoods. It enriched the millions and millions of people who always benefit from industry...." (W News, 8/8/69, 23)

- Washington Post editorial: "There was a certain logic in playing down the purely scientific aspects of the Apollo program in the past since the effort was to land men on the moon before the Russians did. But that day is past. The scientists of space, as contrasted with its engineers and technicians, have been forced into the back seat of the manned space program. It is time now to make them the navigators. The choice of missions--for future flights to the moon and for future operations that will lead some day to a trip to Mars and eventually other planets--should be largely in their hands. They, far better than the men who created the hardware and the knowledge necessary to make space travel possible, know the areas most appropriate for exploration in terms of gaining knowledge." (W Post, 8/8/69)

August 9-15: NASA's OSO VI (OSO-G) Orbiting Solar Observatory was successfully launched from ETR at 3:52 am EDT by two-stage Delta N booster to study sun and its influence on earth's atmosphere. Orbital parameters: apogee, 348.0 mi (560 km); perigee, 307.6 mi (495 km); period, 95.2 min; and inclination, 32.96°. Primary mission objective was to obtain high-resolution spectral data from pointed experiments in 10-20 keV range and 1 Å-1,300 Å range during one solar rotation and make raster scans of solar disc in selected wavelengths. Spacecraft would obtain useful data from nonpointed experiments and from pointed experiments for more than one solar rotation for extended observations of single lines and solar flares.

OSO VI was spin stabilized, weighed 640 lbs, carried seven experiments, was designed with six-month lifetime, and had two main sections--wheel (lower), which carried nondirectional scanning experiments and basic support equipment, and sail (upper), which carried pointed experiments. It was similar to previous OSOs but had unique capability which enabled two sun-pointing telescopes to study in detail UV and x-ray spectra at any point on solar disc and would provide greater knowledge

August 9-15 (continued)

of solar atmosphere (chromosphere) as well as outermost layer (corona) visible only through special instruments or during total solar eclipse. Experiments, designed to continue and extend work of preceding OSO spacecraft, were provided by Harvard College Observatory, Naval Research Laboratory, Rutgers Univ., Los Alamos Scientific Laboratories, Univ. of New Mexico, Univ. of Bologna, and University College (London).

Both tape recorders were operating at liftoff and were still operating satisfactorily. Spacecraft stabilized and acquired sun as scheduled shortly after entering orbit. By Aug. 15 all experiments had been turned on and were operating satisfactorily. Two minor anomalies--higher than planned use of current by motor that provided fine elevation pointing and lower than expected spacecraft operating temperature--were not expected to affect spacecraft operation adversely.

OSO VI was seventh in series of eight OSO spacecraft designed to provide direct observation of sun during most of 11-yr solar cycle. OSO I (launched March 7, 1962) and OSO II (launched Feb. 3, 1965) had surpassed their six-month design lifetimes and together provided more than 8,600 hrs of scientific information. OSO-C (launched Aug. 25, 1965) had failed to reach orbit when booster malfunctioned. OSO III (launched March 8, 1967) and OSO IV (launched Oct. 18, 1967) continued operating satisfactorily, each providing  $7\frac{1}{2}$  hrs of real-time data daily. OSO V (launched Jan. 22, 1969) had both tape recorders and seven of eight experiments operating satisfactorily after six months in orbit. OSO program was managed by GSFC under OSSA direction. (NASA Proj Off; NASA Releases 69-112, 69-123)

August 9: "Scientists who have long felt that their role was secondary to that of engineers in the Apollo project" were complaining openly and trying to force greater emphasis on science in planning future lunar landing missions, John Noble Wilford reported in New York Times. "Their argument is that, with the success of Apollo 11, the project's goal should be to learn as much as possible about the moon and not merely to repeat the demonstration that moon landings are possible."

Dr. Elbert A. King, curator of Lunar Receiving Laboratory, had said in interview that NASA Administration did not have "enough sympathy with, or understanding of, scientific objectives." Casting science in "piggyback role" for first manned lunar landing was understandable, he said. "No one really criticizes that, because...getting men to the moon and back had to be a massive engineering effort. But now that we have accomplished that goal, the justification for future lunar exploration is largely science. There has to be a shift of emphasis." Scientists were pressing for more active role in mission

August 9 (continued)

planning, return of larger amounts of lunar samples, selection of scientists for flight crews, and more time between missions in which to evaluate data for application to future experiments. (NYT, 8/10/69, 44)

Soviet scientist Dr. Valery A. Krasheninnikov and academician Dr. Aleksandr P. Lisitzin had returned to San Diego from 55 days with U.S. Deep Sea Drilling Project aboard drilling ship Glomar Challenger convinced their findings were "more important to man than the samples from the moon," Associated Press reported.

Concentrated drilling between Honolulu and Guam had produced rocks and sedimentary cores showing microorganisms in perfect state of preservation. They might provide history of earth's creation. Project was cooperative venture of Scripps Institution of Oceanography, Woods Hole Oceanographic Institution, Lamont Geological Observatory of Columbia Univ., Univ. of Miami Institute of Marine Science, and Univ. of Washington. (NYT, 8/10/69, 45)

August 10: Apollo 11 Astronauts Neil A. Armstrong, Edwin E. Aldrin, Jr., and Michael Collins and 20 other persons quarantined in Lunar Receiving Laboratory were released shortly after 10:00 pm EDT--four hours earlier than planned. Dr. Charles A. Berry, Director of Medical Research and Operations, MSC, said astronauts, who had been confined since July 24, showed no signs of any possible infection from exposure to moon. He cautioned that astronauts might become ill after release--not from lunar contamination, but from earth organisms to which they were highly susceptible after long period of isolation. Report on health of persons under quarantine would be presented by NASA Aug. 11 to Inter-Agency Committee on Back Contamination, which had approved early release. (Sehlstedt, B Sun, 8/11/69, A1; AP, W Post, 8/10/69, A7)

- . NASA had assured Post Office Dept. that master die for 10-cent moon landing commemorative stamp [see July 9] had gone all the way to lunar surface as planned. It had returned to earth in CM and been rushed to Washington, D.C., July 31 after decontamination at MSC. However, moon letter envelope with die proof of moon landing stamp had not been postmarked on lunar surface. Because of tight schedule for lunar EVA, letter had been left with Astronaut Michael Collins in CM Columbia while Astronauts Neil A. Armstrong and Edwin E. Aldrin, Jr., worked on moon. "Moon Landing" postmark had been applied during return voyage. Letter had been decontaminated at MSC and returned to Postmaster General Winton M. Blount Aug. 5. (Fairies, W Star, 8/10/69, H11)

August 10: William Hines in Washington Sunday Star said time was "ripe" for NASA reorganization, "not merely the firing, promoting and transferring of officials, but the functional restructuring of the agency as well." There was some suspicion that no place existed for Dr. Thomas O. Paine, NASA Administrator, who was "not only a Johnson-administration holdover, but a card-carrying Democrat as well." Some observers believed Apollo 8 Astronaut Frank Borman, "the President's current darling and space confidant," might be next NASA Administrator. "The idea of putting astronauts in charge of the space program may seem incongruous, but it is clearly not beyond the realm of possibility in the image-conscious Nixon regime."

Paine's fate would determine that of Associate Administrator for Manned Space Flight, Dr. George E. Mueller. With lunar landing, Apollo had changed from developmental to operational effort. Christopher C. Kraft, Director of Flight Operations at MSC, would likely transfer to Washington as Apollo Program Manager--possibly "controlling all space missions for NASA." Hines saw possibility of Apollo Program Deputy Director, George H. Hage's moving into position being vacated by L/G Samuel C. Phillips, Apollo Program Director, who was rejoining USAF. "George M. Low, Apollo chief at Houston, may replace the Houston Center director, Robert R. Gilruth, if Gilruth can be prevailed upon to retire." There was talk about moving MSC Director Dr. Wernher von Braun to Washington "to do what he does best: charm money out of Congress." Dr. Kurt H. Debus, KSC Director, "may retire to make way for Rocco Petrone...." (W Star, 8/10/69, G4)

- . Space program spinoffs of medical benefit to mankind were described by Howard A. Rusk, M.D., in New York Times. NASA's Scientific Information Div. provided stockpile of knowledge indexed in computer tapes and distributed on microfiche. Collection of 250,000 documents increased by approximately 75,000 items annually. NASA Technical Utilization Div. selected inventions, ideas, and new techniques for use in nonaerospace activities, including medicine, and distributed them through eight regional centers. Under interagency agreement, NASA and HEW Social and Rehabilitation Services Administration reported results of aerospace research to solve problems of 4 million physically or mentally disabled Americans of working age. Research had developed technique for sharpening x-rays, micrometeorite sensor to record Parkinsonian tremors, and technique for applying electrodes with spray of conductive material. (NYT, 8/10/69, 55)

August 10: History of Jet Propulsion Laboratory from 1936, "when the 'crazy scientists' under...Dr. Theodore von Kármán lit off one of their rockets in the dry gulch called the Arroyo Seco," to current time, when "JPL's sights are set a little higher--and farther out," was traced by John Lannan in Washington Sunday Star. JPL controlled NASA Deep Space Network with jurisdiction over space efforts 10,000 mi from earth and beyond, though its Goldstone facility also had participated with GSFC in support of Apollo 11. Its space flight operation facility was "actual directorate" for handling cosmic penetration flights. It was currently gearing for Martian Orbiter series in 1971 and for 1973 Viking Landers. Future held possibilities of developing and directing missions leading to Grand Tour of planets. JPL was owned by Federal Government and staffed and operated by Cal Tech. (W Star, 8/10/69, G3)

- . George Gallup released results of first poll of President Nixon's popularity since Apollo 11 success. Poll showed 65% of U.S. public approved his performance in office. Poll July 11-14, before Apollo 11 mission, had shown 58% approval. (W Post, 8/11/69, A2)
- . Apollo 11 had opened vast market for medals, tokens, and pins to collectors who specialized in commemorative pieces, New York Times said. Medals issued by several countries after Apollo 8 were "few compared to the meteoric shower of commemoratives for the moon landing." Medal by Ralph J. Menconi portrayed Apollo 11 astronauts on face side; reverse showed Astronauts Neil A. Armstrong and Edwin E. Aldrin, Jr., with LM on lunar surface and earth in background. Medal designed in U.K. by Paul Vincze depicted astronaut on lunar surface and names of Apollo 11 astronauts, with reverse showing figure of Hermes holding winged staff of flight and olive branch and Saturn V in background. (Haney, NYT, 8/10/69)
- . New York Times advertisement announced availability of Apollo 11: On the Moon, magazine-size special edition with story of Apollo 11 mission and color photographs, presented by Times and Look. (NYT, 8/10/69, 66)

August 11: Rep. George P. Miller (D-Calif.), Chairman of House Committee on Science and Astronautics, told House: "...I do not at this time wish to commit ourselves to a specific time period for setting sail for Mars. I believe that there are many tasks that can be accomplished that will ultimately provide that capability, but will be less costly and will be necessary in meeting short term objectives." He urged priority attention to intermediate steps and balanced program "that fully exploits the great

August 11 (continued)

potential of unmanned spacecraft, while at the same time maintaining a vigorous manned flight program."

He advocated continuation of lunar exploration to obtain "experience of operating a base for science and exploration on another heavenly body"; manned earth-orbital operations leading to long-term space station supported by low-cost shuttle rocket; greater emphasis on applications satellites that "have the greatest potential for economic return in the near term"; larger funding for unmanned planetary exploration, "an area in which the U.S. may soon be overshadowed by the Soviet Union"; continued NERVA development because "improved propulsion is a key to space leadership"; and "special emphasis on ERS satellites, "which promise to yield so much...to agriculture and industry." (Text; CR, 8/11/69, H7251-4)

- . Sen. J. William Fullbright (D-Ark.) told Senate: "It would be a major step forward if we could now negotiate a new space treaty which would go beyond the disavowal of national claims of sovereignty in the existing treaty and explicitly recognize the United Nations as the 'owner' or sovereign of extraterrestrial bodies and also define the functions and responsibilities of a United Nations space authority, particularly the ways in which it would regulate and coordinate national space exploration programs. The overall objective of such a treaty would be to regulate but not eliminate the competition in space. One benefit of such an arrangement is that it would allow the space powers to reduce their expenditures and so reallocate funds to more pressing domestic and international requirements." (CR, 8/11/69, S9633)
- . On first day out of quarantine, Apollo 11 crew visited MSC offices, then enjoyed official day off. NASA spokesman said astronauts had requested their activities be kept secret. (UPI, W Post, 8/12/69, A3)
- . Approximately nine hours of satellite time had been booked for TV coverage abroad of Apollo 11 astronaut events during coming week, ComSatCorp said. They included more than two hours live coverage of Aug. 12 MSC news conference, to be relayed via Intelsat-III F-2 to Western and Eastern Europe and, in part, to Tokyo and Sydney via Pacific Intelsat-III F-4. Nearly two hours coverage of New York ticker tape parade and visit to U.N. would be transmitted to Europe Aug. 13. Ceremonial dinner in Los Angeles, later in day, would be taped for transmission to Europe Aug. 14. (ComSatCorp Release 69-50)

August 11: New York Times editorial: "On that eventful day when the first men walk on the surface of Mars, they will find much 'magnificent desolation' akin to that seen by Neil Armstrong and Edwin Aldrin when they strolled on the moon last month. That virtual certainty emerges from the brilliantly successful exploration of the red planet just completed by Mariners 6 and 7. Their expedition lacked the human drama of Apollo 11, but the scientific information they returned may well qualify the two Mariners as the most scientifically productive enterprise men have yet carried out in space." (NYT, 8/11/69)

- . Subcommittee on NASA Oversight submitted to House Committee on Science and Astronautics report Engineering Management of Design and Construction of Facilities of the National Aeronautics and Space Administration. Report concluded closer economic scrutiny of design and construction management at NASA executive level could "yield dividends in more efficient management and lower costs at the field centers." Organization of Office of Facilities was "progressive step." Cost accounting of administrative expenditures needed to be improved and engineering management costs should be clearly identified for all projects at all centers. Relative cost effectiveness...should be one of the basic criteria in a choice among management systems." Army Corps of Engineers and on-site space contractors were "particularly well adapted to managing large construction," for post-Apollo program if new missions required new facilities but, in small or diminishing facilities construction program, there was advantage in concentrating management at centers in in-house civil service staffs. Better project identification was needed. Design and construction management record was creditable, but could be improved, "especially in design supervision." (Text)

August 12-18: NASA's 951-1b ATS V (ATS-E) Applications Technology Satellite was launched from ETR at 7:01 am EDT by Atlas (SLV-3C) -Centaur booster on mission to conduct carefully instrumented gravity-gradient-orientation experiment for basic design information on stabilization and control of long-lived spacecraft in synchronous orbit and to obtain useful data from onboard experiments during first 30 days in orbit. Spacecraft successfully entered elliptical transfer orbit with 26,737.2-mi (43,020.2-km) apogee, 5,297.0-mi (8,522.9-km) perigee, 686.5-min period, and 17.9° inclination.

Because of anomaly which required excessive fuel to maintain stable spin condition, apogee-kick motor was fired on first apogee, instead of second, and spacecraft had to be biased so it would drift from position over India to intended station over area west of Ecuador. Maneuver successfully placed ATS V into near-synchronous orbit with 22,927-mi

August 12-18 (continued)

(36,889.5-km) apogee, 22,221-mi (35,753.6-km) perigee, 1,464.0-min period, 2.7° inclination, and 6.9° per day westward drift. Active nutation control was overpowered by unidentified force that caused spacecraft to go into flat spin, preventing ejection of motor case without possibility of damage to spacecraft. Controllers were investigating alternatives--stopping spacecraft spin, restoring spacecraft to normal spin mode, or minimizing ejection hazard--which could be executed Aug. 25 when spacecraft became visible to Rosman, N.C., ground station. Spacecraft was not in danger thermally or electronically and was expected to become stable and operational after successful ejection of kick motor.

ATS V was fifth in series of seven ATS satellites designed to investigate and flight-test technological developments common to number of satellite applications and useful to satellites operating in stationary orbits, conduct carefully instrumented gravity-gradient experiments for basic design information, and flight-test experiments peculiar to orbits of various missions. ATS I (launched Dec. 6, 1966) had exceeded test objectives and was still operating satisfactorily. ATS II (launched April 5, 1967), though judged a failure because of eccentric orbit, had transmitted some useful data before being turned off Oct. 23, 1967. ATS III (launched Nov. 5, 1967) had operated successfully and transmitted color photos of earth. ATS IV (launched Aug. 10, 1968) had remained in parking orbit when Centaur failed to complete second burn and had re-entered Oct. 17, 1968. ATS program was managed by GSFC under OSSA direction. (NASA Proj Off)

August 12: Apollo 11 Astronauts Neil A. Armstrong, Edwin E. Aldrin, Jr., and Michael Collins held first postflight press conference at MSC, narrating 45-min film of mission and answering questions. On meaning of lunar landing, Collins said it was "technical triumph for this country to have said what it was going to do a number of years ago, and then by golly do it. Just like we said we were going to do. Not just...purely technical, but also a triumph of the nation's overall determination, will, economy, attention to detail, and a thousand and one other factors that went into it."

To Aldrin mission meant "that many other problems perhaps can be solved in the same way by taking a commitment to solve them in long time fashion. I think that we were timely in accepting this mission of going to the moon. It might be timely at this point to think in many other areas of other missions that could be accomplished."

Armstrong said moon landing heralded "beginning of a new age." He said moon was "stark and strangely different place, but it looked



August 12 (continued)

friendly...and proved to be friendly." Astronauts had much less trouble than expected on lunar surface. Primary difficulty was that "there was just far too little time to do the variety of things that we would have liked to have done.... We had the problem of the 5 year old boy in a candy store. There are just too many interesting things to do."

Armstrong said that during landing they "were concerned about running low on fuel on range extension we did to avoid the boulder field and craters. We used a significant percentage of our fuel margins and we were quite close to our legal limit." On possibility of abort during period they were receiving alarm signals, Aldrin said procedure in preparation simulations had been always to "keep going as long as we could.... The computer was continuing to issue guidance...and it was continuing to fly the vehicle down in the same way that it was programmed to do. The only thing that was missing...is that we did not have some of the displays...and we had to make several entries...to clear up that area." Armstrong added, "We would have continued the landing so long as the trajectory seemed safe. And landing is possible under these conditions although with considerably less confidence than you have when you have the information from the ground and the computer in its normal manner available to you." (Transcript)

- . Leningrad astronomer Nikolay Kozyrev called for lunar laboratories over, under, and on moon's surface. Soviet and American space exploration had made scientists "more confident that this is not a dead accumulation of rocks but a space body with a very interesting history whose life also continues today." Lunar research goals were establishment of astronomical instruments on stable platforms in lunar orbit, permanent scientific laboratory on moon, spacecraft launching centers on moon for planetary exploration, and laboratory stations under lunar surface or in natural caves, "to give reliable protection from dangerous radiation and meteorite hits." (UPI, NYT, 8/13/69, 11)
- . MSFC announced award of \$15,455,800 contract modification to Boeing Co. for continued Saturn V systems engineering and integration. Contract covered work from June 1967 through June 1970 and continued effort through 10 Saturn V boosters. (MSFC Release 69-177)
- . New Jersey State Div. of Clean Air and Water requested order from Superior Court, Newark, asking seven airlines to stop polluting air with jet engine exhaust at Newark Airport. Suit called for modification of existing jet engines with air-pollution-control devices or for switching to new smokeless engines and asked imposition of \$2,500 fine. In Washington, Air Transport Assn. spokesman said that "it

August 12 (continued)

would be hard to make a case for massive retrofit with the absence of a major health hazard." He said studies had shown that jet engine pollution was only one percent of total problem and was case of "visibility" and "esthetics" rather than health danger. United Airlines spokesman said November 1968 engine modifications to three of airline's Boeing 727s had sharply decreased pollution. (Sullivan, NYT, 8/13/69, 1)

- . Philadelphia Evening Bulletin editorial: "The public ceremonies honoring the astronauts underscores identity in a larger and much more responsible sense--a feeling of community, rooted in a family and expanding to embrace the nation, perhaps ultimately the world. There are other words for it--awareness of a common purpose, a sense of decency both public and private, a common standard of behavior and a common sense of service and loyalty to country. This is what made Apollo succeed, and this is what the nation is recognizing as the celebration begins today." (P Bull, 8/12/69)

August 13: NERVA experimental engine (XE) was successfully run through two bootstrap startups in open-loop control and three autostart experiments in Jackass Flats, Nev. Objective was to obtain additional data about engine in startup phase. Engine and test facility operated normally and all test objectives were achieved. (NASA Proj Off; SBD, 9/2/69, 4)

- . Apollo 11 Astronauts Neil A. Armstrong, Edwin E. Aldrin, Jr., Michael Collins, their families, and NASA Administrator, Dr. Thomas O. Paine, flew in presidential jet from Houston to New York, Chicago, and Los Angeles during day of cross-country celebrations.

Three-hour New York visit included greeting at City Hall by Major John V. Lindsay, motorcade to U.N. for greeting by U.N. Secretary General U Thant, and ticker-tape procession to John F. Kennedy International Airport for departure to Chicago. Party was more than half hour ahead of schedule. New York Public Events Commissioner John S. Palmer estimated crowds at 4 million; other observers said there were fewer and blamed off-schedule appearance and TV coverage.

In Chicago, welcoming crowd was estimated at 3.5 million. Major Richard J. Daley greeted party at Civic Center and presented medals symbolic of honorary citizenship to astronauts and Dr. Paine. Illinois Gov. Richard B. Ogilvie said, "To these first citizens of the new epoch, the people of Chicago and Illinois offer their profound admiration and respect." Astronauts spoke to 15,000 young people in Grant Park before returning by helicopter to O'Hare International Airport for flight to Los Angeles.

August 13 (continued)

Mayor Samuel W. Yorty met party at Los Angeles International Airport. After brief ceremony, party sped to Century Plaza Hotel for reception preceding state dinner. (Lelyveld, NYT, 8/14/69, 1; Oberdorfer, W Post, 8/14/69, A1; NASA PAO)

- . Climaxing day of cross-country celebrations, President and Mrs. Nixon hosted formal state dinner at Century Plaza Hotel in Los Angeles to honor Apollo 11 astronauts, their wives, and "historic achievement of the first manned landing on the moon." Guests included other astronauts and wives; widows of Astronauts Virgil I. Grissom and Edward H. White II; Mrs. Esther Goddard, widow of rocket pioneer Dr. Robert H. Goddard; NASA and other space program officials; U.S. and international aviation pioneers; Cabinet members; Chief Justice and Mrs. Warren E. Burger; governors of 44 states; members of Joint Chiefs of Staff; Diplomatic Corps members representing 83 nations; Mrs. Dwight D. Eisenhower, widow of former President; former Vice President and Mrs. Hubert H. Humphrey; and Congressional leaders.

President asked NASA Administrator, Dr. Thomas O. Paine, to read citation of posthumous awards: "The National Aeronautics and Space Administration awards posthumously to Virgil I. Grissom, Edward H. White, and Roger B. Chaffee the NASA Distinguished Service Medals for professional skill, courage, and dedication to duty in Project Apollo. They gave their lives in their country's historic undertaking to realize the goal of landing men on the moon and returning them safely to earth."

President also asked Dr. Paine to read citation of NASA Group Achievement Award to Apollo 11 Mission Operations Team "for exceptional service in planning and exemplary execution of mission operational responsibilities for...first manned lunar landing mission." Award was presented to Apollo Flight Control Engineer Stephen G. Bales, who had made decision to proceed with lunar landing when computers failed just before Eagle's landing on Sea of Tranquility, on behalf of 400,000 persons who had contributed to Apollo program success. Vice President Spiro T. Agnew, as NASC chairman, presented Medal of Freedom, nation's highest civilian honor, to Apollo 11 astronauts for participation in "a unique and profoundly important adventure. The accumulated scientific knowledge and technological ability of mankind made man's first step on the moon practicable; the courage and skill of men like these made it possible. Their contributions to this undertaking will be remembered so long as men wonder and dream and search for truth on this planet and among the stars."

August 13 (continued)

Replying to honors, Astronaut Edwin E. Aldrin, Jr., said: "What Apollo has begun we hope will spread out in many directions, not just in space, but underneath the seas and in the cities, to tell us unforgettably that we can do what we will and must and want to do."

During evening orderly crowd of peace and antipoverty protestors gathered outside hotel. (PD, 8/18/69, 1141-2, 1148-51; Roberts, NYT, 8/15/69, 14; B Sun, 8/14/69, A1)

- . MSFC announced award of three 10-mo contracts totaling \$1,370,000 to McDonnell Douglas Corp., North American Rockwell Corp., and Lockheed Aircraft Corp. to study design concepts and development requirements for nuclear rocket stage that could replace Saturn V 3rd stage (S-IVB) for advanced missions beginning in late 1970s and serve as workhorse for earth orbital and planetary applications.
 

McDonnell Douglas received \$570,828 to develop and evaluate two alternative stage concepts--one with modified Saturn V hardware, other with new stage design and advanced design techniques. NAR received \$511,734 to study modified Saturn V hardware concept only and Lockheed received \$287,000 to study advanced design concept only. (MSFC Release 69-180)
- . New York Times editorial on Aug. 12 Apollo 11 news conference in Houston: "What came through most clearly in yesterday's enthralling first-hand report by the Apollo astronauts was the infinitesimal margin by which Eagle escaped either catastrophe or a decision to abort the moon landing. Either of the two major problems that emerged in those nerve-wracking moments before touchdown--the overburdened computer and the near-exhaustion of their fuel supply before Neil Armstrong and Edwin Aldrin found a suitable landing spot--might have forced a very different ending to the historic mission. That all turned out perfectly is a tribute to the astronauts' skill, courage and poise as well as to the ability of the back-up personnel at Mission Control in Houston." (NYT, 8/13/69, 40)
- . Apollo 11 commander Neil A. Armstrong stood to inherit 100,000-franc fortune of Mme. Anna E. Guzman, widow of French industrialist, which had been held in trust by Academy of Science of Institute of France since her 1891 death, according to article Rep. James G. Fulton (R-Pa.) inserted in Congressional Record. Legacy--once worth \$20,000 but currently decreased in value to \$290 exclusive of interest--was to be awarded to first scientist to make personal contact with heavenly body other than Mars. (CR, 8/13/69, E7023)

August 13: In Senate, Sen. William Proxmire (D-Wis.) called for at least temporary halt in USAF plans to purchase Lockheed C-5A cargo aircraft while U.S. Comptroller General studied aircraft's costs and value to be gained from further purchases. (CR, 8/13/69, S9972-8)

- . Rep. J. Herbert Burke (R-Fla.) introduced joint resolution calling for redesignation of Cape Kennedy as Cape Canaveral. (CR, 8/13/69, H7387)

August 14: U.S.S.R. launched Cosmos CCXCII from Plesetsk into orbit with 765-km (475.4-mi) apogee, 745-km (462.9-mi) perigee, 99.9-min period, and 74.0° inclination. (GSFC SSR, 8/15/69; SBD, 8/20/69, 169; UN Public Registry)

- . NASA announced that 8 of 14 aerospace research pilots trained for USAF's Manned Orbiting Laboratory program terminated June 10, would join NASA. One, L/C Albert H. Crews (USAF), would be assigned to Flight Crew Operations Directorate at MSC. Seven would be astronauts, bringing total number of active NASA astronauts to 54: Maj. Karol H. Bobko (USAF), L/Cdr. Robert L. Crippen (USN), Maj. Charles G. Fullerton (USAF), Maj. Henry W. Hartsfield, Jr. (USAF), Maj. Robert F. Overmyer (USMC), Maj. Donald H. Peterson (USAF), and L/Cdr. Richard H. Truly (USN). Effective date for new assignments had not been set. Maj. Bobko, Maj. Hartsfield, and Maj. Peterson would complete studies for graduate degrees before assuming astronaut duty. (NASA Release 69-120)
- . NASA announced appointment of eight-man failure review committee to determine why Intelsat-III F-5 comsat did not achieve planned orbit after launch from KSC July 25. (NASA Release 69-119)
- . Discovery of x-ray "star" between constellations Centaurus and Lupus from data relayed during July by two Vela nuclear detection satellites launched May 23 had been announced by Los Alamos Scientific Laboratory astronomers, New York Times reported. Dr. J. P. Conner, Dr. W. D. Evans, and R. D. Helian said object had twice the intensity of most brilliant x-ray sources previously known--in constellation Scorpius--and had not yet been identified in wavelengths observable by human eye. No obvious source of x-ray emissions had been identified, such as stars, stellar explosions, or pulsars. (Sullivan, NYT, 8/14/69, 7)

August 14: Cross-country ceremonies for Apollo 11 astronauts constituted "probably the single greatest peacetime celebration in the nation's history," New York Times editorial said. "It was more than a tribute to three courageous and able men; it was also an act of homage to the hundreds of thousands of workers, engineers, technicians and scientists whose hard work over almost a decade made the moon landing possible. At the most fundamental level, perhaps, the outpouring of national rejoicing stemmed from the renewed sense of purpose the Apollo's incredible feat had brought to a nation long torn and depressed by military travail abroad and racial and generational antagonisms at home. The essence of that sentiment was well stated by Mr. Armstrong when he declared at the United Nations that 'we citizens of earth who can solve the problem of leaving earth can also solve the problems of staying on earth.'" (NYT, 8/14/69)

- Research submarine Ben Franklin surfaced 300 mi south of Nova Scotia, ending 1,200-mi, month-long Gulf Stream Drift by Swiss oceanographer Jacques Piccard and team which included MSC researcher Chester B. May [see July 14]. During journey team had noted Gulf Stream contained fewer fish, stronger current, and more turbulence than expected. (UPI, W Star, 8/14/69, A1; Blakeslee, NYT, 8/8/69, 38)

August 15: Results of qualitative study of Mariner VI photos were summarized in Science by Dr. Robert B. Leighton, Dr. Norman H. Horowitz, Dr. Bruce C. Murray, and Dr. Robert P. Sharp of Cal Tech; Alan G. Herriman and Dr. Andrew T. Young of JPL; Bradford A. Smith of New Mexico State Univ.; Merton E. Davies of RAND Corp.; and Conway B. Leovy of Univ. of Washington: "The principal results from preliminary study...are: the surface of Mars appears similar to that of the Moon, but there are significant differences; some features seen from Earth are characterized; the 'blue haze' hypothesis is disproved; and new phenomena associated with the polar cap are discovered." Mars resembled moon in abundance, form, arrangement, and size of craters, but there appeared to be break in size-distribution curve of craters in some parts of Mars not characteristic of moon--apparently because Mars had more effective weathering and transportation process than moon. Similarities between Martian and lunar surfaces included craters with slump blocks, terrace, and radial dry-debris avalanche chutes on steep inner surfaces; central peaks, polygonal outlines, blocky ejecta rims, and irregular ejecta; and irregularly sinuous ridges. Differences included more subdued relief of many Martian craters, flatter floors, fewer central peaks, more subdued debris blankets, absence of obvious secondary craters

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August 15 (continued)

and rays, and greater abundance of "ghost" craters. Photos showed no sinuous rilles and no distinctive earth-like phenomena such as mountain ranges, tectonic basins, stream-cut topographs, dune fields, playa flats, or other arid-region features. (Science, 8/15/69, 685-90)

- . Classical astronomical data on figures of moon and terrestrial planets were being supplemented by new information from Lunar Orbiter program. Comparable future planetary probes would provide fundamental data from simple experiments, Cornell Univ. radiophysicists Dr. Brian T. O'Leary, Dr. Malcolm J. Campbell, and Dr. Carl Sagan said in Science. Lunar Orbiter results had revealed lunar mascons' nonuniform surface distribution that could explain lunar dynamical asymmetries "and perhaps similar asymmetries for Mars and Mercury." (Science, 8/15/69, 651-7)
- . Astronaut Joseph P. Kerwin was uninjured when faulty landing gear on T-33 jet trainer forced belly landing at Ellington AFB, Tex. (AP, W Star, 8/16/69, A2)
- . Soviet newspaper said Tu-144, Soviet supersonic transport, had been flying beyond sound barrier "for extended periods of time" with no difficulty, Associated Press reported. (W Post, 8/16/69, A2)
- . C-5 Galaxy aircraft would demonstrate its cargo and troop delivery capability in joint USAF-USA-Lockheed-Georgia Co. Transport Air Drop and Jettison Test (TADJET) program to begin in early October, DOD announced. Approximately 150 flights from Pope AFB, N.C., would airdrop equipment and men. During transport phase, C-5 would be loaded and unloaded some 50 times and perform mating maneuvers with air-transportable dock that could handle cargo capacity of three C-5s. (DOD Release 683-69)

August 15-17: Second National Air Exposition at Dulles International Airport, Va., featured first public appearance of Lockheed C-5A, world's largest aircraft. Show was opened by Secretary of Transportation John A. Volpe, who announced plans for further expositions. (AP, NYT, 8/16/69, 46)

August 16: U.S.S.R. launched Cosmos CCXCIII from Plesetsk into orbit with 244-km (151.6-mi) apogee, 202-km (125.5-mi) perigee, 88.9-min period, and 51.7° inclination. Satellite reentered Aug. 28. (GSFC SSR, 8/31/69; UN Public Registry; SBD, 8/20/69, 166)

August 16: Estimated 250,000 persons watched Apollo 11 astronauts parade in Houston, Tex. Crowd threw confetti, ticker tape, and "moon certificates"--fake \$100 and \$1,000 paper money--until streets were two to three feet deep in litter. Later, 55,000 persons attended gala in Houston's Astrodome coliseum, which was filled to capacity. Total of 31 astronauts and families rode through cheering throngs. (UPI, W. Post, 8/17/69, A12)

Associated Press said Austin, Tex., Judge John R. Brown had granted request of atheist Madalyn Murray O'Hair for three-judge Federal court to hear her suit against NASA seeking to prevent astronauts on duty from practicing religion [see Aug. 6]. (AP, W Post, 8/16/69, A3)

Agnew E. Larsen, space research consultant with Frankford Arsenal, Philadelphia, Pa., died at age 73. He had received 1930 Robert J. Collier Trophy for perfecting autogiro, predecessor of helicopter. (NYT, 8/18/69, 31)

August 17: Apollo 11 astronauts discussed possible manned Mars landing by 1982 on CBS TV program "Face the Nation." Astronaut Neil A. Armstrong said, "I am quite certain that goals of the Mars variety are within our range, should we choose...that investment of our national resources." First exploratory flights could be combined with earth-orbiting spacecraft to develop long-term capability with same kind of spacecraft. It was "well within our capability" to be prepared for Mars launch in 1981.

Astronaut Edwin E. Aldrin, Jr., said he was "not so sure...this is the time that we can accurately set a date like 1981." Setting goal was worthwhile but as intermediate goals were reached "I believe we will be able to better define exactly what our longer term goals are in terms of ten years from now."

Astronaut Michael Collins said, "I don't think 1981 is too soon. I think it is well within our capability to do so." Very nature of long-duration trip "requires careful design and testing of the equipment, which could easily be done in Earth orbit with a number of ancillary benefits." He defended Bible reading in space and announced he would never fly in space again because he found it increasingly difficult "to keep up year after year" with rigorous training required. (SBD, 8/19/69, 159; W Post, 8/18/69, A2; NYT, 8/18/69, 33)



August 17: Controversy was building up over astronauts' future, Apollo program, and manned space flight generally, Harry Schwartz said in New York Times. Three major debates were over whether engineer-astronauts or scientist-astronauts should be sent on future Apollo missions; who should control mission schedules and astronaut activities, "NASA hierarchy" or ground-based scientists in NASA; and whether U.S. should emphasize unmanned probes or crash program to put men on Mars in early 1980s. "The fact that it is the scientists who have been resigning while astronauts with test pilot backgrounds have been receiving unprecedented public acclaim makes it evident where the balance of power lies for the moment within NASA. But the issue is far from settled, since NASA itself must and does use the prospect of scientific advances as a key argument in seeking appropriations for space activities. Hence the dissident scientists could have substantial leverage if they teamed up with Congressmen and others who oppose the space appropriations for other reasons. It would not be surprising...if NASA sought to ease the scientists' irritation by satisfying some of their demands." (NYT, 8/17/69, D2)

Japan successfully launched her largest rocket to date--four-stage, 75-ft-long, 4.5-ft-dia, 43.8-ton MU3D--Kyodo News Service reported. Rocket reached 100-mi (160.9-km) altitude in  $4\frac{1}{2}$  min, with last stage reaching 1.8 mps--about half speed thought needed to orbit satellite--and splashing down in Western Pacific after 7 min 35 secs of flight. (B Sun, 8/18/69, A4)

President Nixon's post-Apollo 11 tour of Asia and Romania July 25-Aug. 3, plus his remarks and reactions aboard U.S.S. Hornet at splashdown and during welcoming ceremony for astronauts, were recorded in New York Times Magazine article by Max Frankel and Robert B. Semple, Jr. Authors were among press accompanying President and Mrs. Nixon on tour. President and party had basked "in reflected moonglow." When President walked towards reviewing stand in Guam, spectator had remarked, "that's his moon walk." Apollo 11 had given President "new exuberance." (NYT Magazine, 8/17/69, 26-9, 76-80)

Rep. George P. Miller (D-Calif.), as Chairman of House Committee on Science and Astronautics, had forced NASA to pay \$5,522 for USAF jet to transport 32 committee members and wives to Aug. 13 Apollo 11 state dinner in Los Angeles, Rowland Evans and Robert Novak said in Washington Post. NASA also had to pay \$19,342 for chartered commercial jet for space officials and \$2,800 for Aug. 12 Houston luncheon, and White House was charging agency with most of estimated \$75,000 cost of state dinner. (W Post, 8/17/69, B7)

August 18: Swiss physicist Dr. Johannes Geiss, originator of Apollo 11 experiment to trap atomic particles from solar wind on lunar surface, would use "deliberate speed" in assaying results, New York Times reported. NASA courier had delivered square foot of aluminum foil exposed on moon for an hour to catch particles emitted by sun. Dr. Geiss and associates in Berne Univ.'s Physics Institute had devised plan for dual study of foil in Berne and at Federal Polytechnic at Zurich. Analyses, determining components by spectrometer, would require several weeks. NASA would not release remaining three square feet of foil to him until 1970. (NYT, 8/18/69, 34)

British Aircraft Corp. and Sud Aviation announced completion of second phase of Anglo-French Concorde supersonic transport flight development program. Two prototypes were being readied for transonic phase to push aircraft's speed beyond mach 1 in early September. Two prototypes had logged 104 flying hrs in 39 and 24 flights and had achieved speeds to mach 0.95 and altitudes to 40,000 ft. Concorde 002 was being prepared for supersonic flights to mach 2, or 1,400-mph cruising speed, in tests expected to begin at year's end. (BAC/Sud Aviation Release 10C/69)

August 19: McDonald Observatory successfully recorded its first hits on laser reflector left on moon by Apollo 11 astronauts at 9:30 pm CDT. Scientists said distance at that moment was 232,271.406 mi and moon was 131.2 ft farther from earth than previously believed. Lick Observatory had recorded first hits Aug. 1 and had estimated earth-moon distance to be 226,970.9 mi at that time. (AP, W Star, 8/21/69, A3)

U.S.S.R. launched Cosmos CCXCIV from Plesetsk into orbit with 343-km (213.1-mi) apogee, 205-km (127.4-mi) perigee, 89.7-min period, and 65.4° inclination. Satellite reentered Aug. 27. (GSFC SSR, 8/31/69; SBD, 8/20/69, 166; UN Public Registry)

NASA announced selection of Chester M. Lee as Apollo Mission Director, succeeding George H. Hage, who had been elected vice president for product development with Boeing Co. Lee, retired USN captain who had served in Polaris missile program and in Directorate of Research and Engineering in Office of Secretary of Defense, had been Assistant Apollo Mission Director since August 1966. (NASA Release 69-122)

August 20: Study of possible orbiting Space Technology Applications and Research Laboratory (STARLAB), sponsored by NASA and American Society for Engineering Education, was completed at MSFC. Eleven-week design project focused space-developed technology on earth resources use, crop-maturity prediction, soil analysis, vegetation vigor, sea farming, and other earth problems. Final presentation in project, which had participation of 21 faculty members from 18 colleges and universities, was report on orbiting space laboratory illustrating systems approach that could be valuable in solving major earth problems. (MSFC Release 69-179)

Washington Post published letter from former Secretary of State Dean Rusk. He recommended U.S. abandon idea of space race with U.S.S.R.; "throw wide open the doors on international cooperation"; proceed with development of near-earth space capabilities and activities contributing to understanding of earth; and "take advantage of NASA's extraordinary ability to mobilize scientific, technical, industrial and other talents" for other tasks, like air travel and air pollution problem-solving. "Manned flights to the planets might better be a decision for the next generation." (W Post, 8/20/69, A28)

August 21: NASA's X-24A lifting-body vehicle, piloted by Maj. Jerauld R. Gentry, successfully completed third flight after air-launch from B-52 aircraft over South Rogers Lake Bed, Calif. Objectives of flight were to obtain handling qualities, stability and control derivatives, flow visualization over aft portion of vehicle, and longitudinal trim curves and lift-to-drag ratio at 15° upper-flap setting. Procedural error caused X-24A to be launched 35 secs early and some planned data were not obtained. (NASA Proj Off)

- Intelsat I (Early Bird) had been put back into orbital retirement and full communications service via Intelsat-III F-2 had been restored, ComSatCorp announced. Intelsat I, reactivated June 30 after six-month retirement to compensate for failure of Intelsat-III F-2 until service was restored Aug. 1, would remain in orbit and would be capable of operational service if needed. Restored Intelsat-III F-2 was handling 620 full-time commercial circuits serving countries in Atlantic area and transatlantic TV programming when ordered. (INTELSAT Release 69-53)

August 21: Every scientist-astronaut except one--geologist Harrison Schmitt--had been removed from NASA's lunar landing training list, Victor Cohn reported in Washington Post. Report was later denied by NASA. Cohn said remaining scientists had been assigned to train for long-duration, earth-orbiting Apollo Applications missions beginning in 1972. Action was "certain to aggravate the already existing disagreements between scientists and space officials," Cohn said, and would probably prompt more resignations by scientists. (W Post, 8/21/69, A1; 8/22/69, A18)

- . Washington Post published letter from Irene S. Rubin in Lampang, Thailand. Real impact of Apollo 11 success in Thailand had been "on the group of educated men who have some effect on government. Their primary reaction was not one of shared accomplishment but of shame in the gap thus dramatized between themselves and the developed countries." Though U.S. could not hide technological capacity, "I think we should be more aware of the context into which news of the Apollo mission is received. Far from bringing the world closer together with such performances, we may be arousing bitterness and obstinacy in the misallocation of development funds." (W Post, 8/21/69, A18)

August 22: U.S.S.R. launched Cosmos CCXCV into orbit with 473-km (293.9-mi) apogee, 270-km (167.8-mi) perigee, 91.9-min period, and 71.0° inclination. (GSFC SSR, 8/31/69; UN Public Registry)

- . NASA named Rocco A. Petrone, Director of Launch Operations at KSC since 1966, to succeed L/G Samuel C. Phillips (USAF) as Director of Apollo Program, effective Sept. 1. He would be succeeded by Deputy Director of Launch Operations Walter J. Kapryan. Petrone had been Saturn Project Officer and Apollo Program Manager. His awards included NASA Exceptional Service Award for direction of Apollo 7 checkout and launch and NASA Distinguished Service Medal, NASA's highest award, for direction of Apollo 8 checkout and launch. (NASA Release 69-124)
- . International Academy of Astronautics announced selection of Dr. Charles A. Berry, Director of Medical Research and Operations at MSC, to receive Daniel and Florence Guggenheim International Astronautics Award for 1969. Award and \$1,000 prize would be presented during 20th International Astronautical Congress in Argentina in October. (UPI, W Post, 8/23/69, B3)
- . NASA's alleged neglect of pure science research goals in favor of engineering pursuits and "glamor" had caused undercurrent of dissatisfaction among scientists, Science noted. When interviewed by Science Dr. F. Curtis Michel,

August 22 (continued)

Dr. Donald U. Wise, and Dr. Elbert A. King, who had resigned from NASA recently, declined to attribute their resignations directly to major dissatisfactions with NASA and denied that they had resigned to protest emphasis on engineering rather than scientific research. They did, however, express some dissatisfaction with role of basic science in space exploration and impatience with NASA's management of scientific projects and admitted they were lured from NASA by prospects of new positions that offered more time for scientific research. (Science, 8/22/69, 776-8)

AIAA announced election of Honorary Fellows: Secretary of the Air Force, Dr. Robert C. Seamans, Jr.; German rocket pioneer Hermann Oberth; and Northrop Corp. founder John K. Northrop. Dr. Seamans, former NASA Associate Administrator, was honored for "organizing the research, development and operational base which produced the Apollo program." Honors would be presented at Oct. 23 banquet in Anaheim, Calif. (AIAA Release)

In letter advocating postponement of decision on manned Mars landing [see Aug. 20] former Secretary of State Dean Rusk had "gone to the heart of what is bound to become a critical national decision," Richard Wilson said in Washington Evening Star. "Now that we know we can and will do this thing does it make any difference in the eons of time yet to come when we do it? Fifty years from now might we not have developed far cheaper and more efficient ways to do it? Mars will still be there.... The space men have shown us not only the moon, but what a beautiful planet we have in what may otherwise be a wholly desolate solar system--a beautiful planet that needs loving care to preserve it." (W Star, 8/22/69, A15)

In telephone interview, UCLA astronomer Dr. Samuel Herrick, Jr., said planetoid Geographos, due to pass earth at 5.6 million-mi distance Aug. 27, would be best site of all asteroids for eventual space station beyond moon and good spot for manned or unmanned spacecraft landing. Its farthest point from sun in given orbit was least distant from sun and from earth of all minor planets. But astronauts landing on it would have to "dig in and tie themselves down" since its estimated g was so slight "even a sneeze directed at the surface would propel a man off into space." (AP, B Sun, 8/23/69, A3)

In Science, MIT Lincoln Laboratory scientists A. E. E. Rogers and R. P. Ingalls reported mapping Venus surface reflectivity by radar interferometry at 3.8-cm wavelength for region from  $-80^{\circ}$  to  $0^{\circ}$

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August 22 (continued)

longitude and from  $-50^{\circ}$  to  $+40^{\circ}$  latitude. Map was free from twofold range-Doppler ambiguity, presented new features, and clearly delineated features previously observed. It showed large circular regions of significantly lower reflectivity than their surroundings, with size and appearance of lunar maria. (Science, 8/22/69, 797-9)

- . At National Amateur Astronomers convention in Denver, Colo., six-member panel including Northwestern Univ. astronomer Dr. J. Allen Hynek and Univ. of Arizona physicist Dr. James E. McDonald suggested UFO investigation be taken from USAF and placed with scientific body. Panelists said since UFOs apparently presented no danger to national defense, they were unimportant to USAF. Panel disagreed with 1968 Condon Report on UFOs [see Jan. 9]. Hynek said UFO research should continue. (AP, W Star, 8/24/69, A17)

August 23: USAF launched unidentified satellite from Vandenberg AFB by Titan III-B-Agena booster. Satellite entered orbit with 251.7-mi (405-km) apogee, 72.7-mi (117-km) perigee, 89.7-min period, and  $108.0^{\circ}$  inclination and reentered Sept. 7. (GSFC SSR, 8/31/69; 9/15/69; SBD, 8/26/69, 190)

- . Chemical analysis of moon rocks at Lunar Receiving Laboratory had disclosed their age might range from 2 billion to 4.5 billion yrs--far greater than most scientists expected--lunar scientists in touch with LRL colleagues said. It was "almost conclusive evidence that it has been billions of years since these rocks crystallized." Finding might settle difference between geologists who had viewed lunar surface as having had continuous history and those like Dr. Harold C. Urey who believed moon was ancient, undisturbed place made of material which would help unfold history of early planets. Later, MSC Director of Science and Applications, Dr. Wilmot N. Hess, said Dr. S. Oliver Schaeffer and Dr. John Funkhouser of State Univ. of New York; Dr. Joseph Zahringer of Max Planck Institute in Heidelberg, and Dr. Donald Bogard of MSC had measured solar particles trapped in lunar rocks to determine lunar material's age. (Cohn, W Post, 8/24/69, A1; UPI, W Star, 8/25/69, A4)
- . Ten space pioneers were named to first National Space Hall of Fame. Honorees, chosen by Houston City committee, would be feted at first annual awards dinner in Houston, Tex., Sept. 27. They included: Astronaut Alan B. Shepard, Jr., first American to journey in space; former Astronaut John H. Glenn, Jr., first American to orbit in

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August 23 (continued)

space; late Astronaut Edward H. White II, first man to walk in space; Dr. Wernher von Braun, MSFC Director; late Rep. Albert Thomas (D-Tex.), staunch supporter of space program; Dr. Kurt H. Debus, KSC Director; late Dr. Hugh L. Dryden, former NASA Deputy Administrator; Dr. Maxime A. Faget, Director of Engineering and Development at MSC; Dr. Robert R. Gilruth, MSC Director; and late Dr. Robert H. Goddard, father of rocketry. Hall was in Albert Thomas Center in Houston. (UPI, NYT, 8/25/69, 8)

August 24: This Week published interview with science fiction author Arthur C. Clarke. Most important recent outer space discovery was pulsars--"It's possible that they might be signals from some higher civilization." Scientific surprise in Apollo program was "its immaculate perfection. You don't expect that, no matter how carefully you prepare." Clarke was writing space exploration documentary which would show "whole span of human interest in space, back to the Babylonian astronomers and on up through the colonization of the solar system." It would include Stonehenge which was "as big a burden for the primitive economy that built it--in fact, probably a much bigger burden than the Apollo program is for us." (Bradford, This Week, 8/24/69, 7)

Transfer of USAF MOL officers to NASA astronaut corps [see Aug. 14] was criticized in Washington Sunday Star by William Hines: "With the initial moon landing now an accomplished fact, the pace of manned space operations has slowed down to three flights per year. This means that no more than nine men can fly annually, and with 54 astronauts now on board, this, in turn, means an average of six years between flights." Though pace might accelerate in time and future space stations would increase annual number of crew assignments, "the glamor and glory of being an astronaut--particularly a non-flying one--no longer compensates for the enforced idleness imposed by the modified flight schedule." (W Star, 8/24/69, D4)

August 25: Postmaster General Winton M. Blount announced that "First Man on the Moon" postage stamp would be issued Sept. 9 in Washington, D.C., in conjunction with National Postal Forum. Printed from master die carried to moon on Apollo 11 mission (July 16-24), 10-cent air mail stamp would be 50% larger than conventional commemorative stamps and would be dedicated in special ceremony attended by Apollo 11 Astronauts Neil A. Armstrong, Edwin E. Aldrin, Jr., and Michael Collins.

August 25 (continued)

Post Office had received 500,000 first-day cover requests within three weeks after stamp was announced July 9 and was still receiving 60,000-80,000 such requests daily--of which about one-fifth were from foreign countries. (PO Dept Release 130)

- . Robert E. Bernier, former ComSatCorp systems engineer for Intelsat III program, became NASA European Representative in Office of International Affairs. He replaced Clotaire Wood, who would return to Office of Advanced Research and Technology at NASA Hq. Bernier would begin his duties at American Embassy in Paris in early October, handling NASA's cooperative relations and programs with European regional and national space organizations. (NASA Release 69-125)
- . Scientist-astronaut Dr. William E. Thornton, who had been grounded in spring, received USAF clearance to continue jet pilot training. Thornton had had difficulty landing because of distortion of vision called aniseikonia, which reduced his depth perception. Vision had been corrected with special glasses. (UPI, W Star, 8/26/69, A3; W Post, 8/26/69, A9)
- . Washington Post published results of July 30-Aug. 4 Harris survey of 1,577 U.S. households to determine attitude toward spending \$4 billion annually for decade to explore moon and other planets. While 53% of those polled approved funding for lunar landing, narrow plurality of 47% was opposed to further \$4 billion annually; 44% favored. Persons under 30 favored extension of space program by 60% to 34% but those over 50 opposed it by 59% to 30%. Black citizens were opposed by 68% to 19%. (W Post, 8/25/69)
- . Dr. Harry H. Hess, Chairman of NAS-NRC Space Science Board, died of heart attack suffered while attending Board meeting at Woods Hole, Mass. Dr. Hess, Blair professor of geology at Princeton Univ., was one of scientists who had analyzed Apollo 11 lunar samples. In 1950 he had advanced theory that volcanic activity on ocean floor caused continental drift. He had been past president of Mineralogical Society of America and of Geological Society of America, chairman of site-selection committee for NSF's Project Mohole, and adviser to numerous Federal agencies, including NASA. (UPI, W Post, 8/27/69, A10; Science, 8/29/69, 882)



August 25-30: Eighth International Symposium on Space Technology--first major international space meeting since Apollo 11--was held in Tokyo. In opening speech, general chairman Tsuyoshi Hayashi expressed world's appreciation to U.S. for making "a great leap for mankind" but said many other nations had contributed to scientific knowledge that made lunar landing possible. He asked recognition of moon as international territory.

Among 400 scientists from 19 countries attending meeting were NASA Apollo Applications Program Director William C. Schneider; Dr. Cristoper C. Kraft, Jr., MSC Director of Flight Operations, and M. P. Frank from MSC; Herbert A. Wilson, Jr., Chief of Applied Materials Div., from LaRC; OGO Project Manager Wilfred E. Scull from GSFC; Dr. Thomas Vrebalovich from JPL; and Leon C. Hamiter, Jr., MSFC engineer. Hamiter presented paper on increased computer capacity and lighter weight flight hardware. Prof. Masahiko Kido of Japan's Ehime Univ. said legal status should be developed for moon before disputes arose over lunar real estate. Other participants urged steps to outlaw military use of moon.

Dr. Werner J. Kleen, Director of European Space Research and Technology Center, said ESRO had been given permission to put comsat into orbit and would start work in autumn. Japan announced its space development corporation would begin operations Oct. 1 and launch MS-4 three-stage rocket in early 1970, followed by comsat launch. (Shabecoff, NYT, 8/26/69, 11; MSFC Release 69-181; NASA Off of Int Affairs)

August 26: Moon landing would change human lives, C. P. Snow said in Look. "I am afraid that in the long run, perhaps a generation, perhaps longer, it will have a bad effect. It will give us the feeling, and the perfectly justified feeling, that our world has finally closed in. This is forever the end of the mortal frontier." Space enthusiasts thought lunar landing would liberate human imagination but "I believe...that human imagination is going to be restricted--as to an extent it was when the last spots on the globe had been visited, the South Pole and the summit of Everest. Nowhere on earth for adventurous man to go. Very soon, there will be no place in the universe for adventurous man to go." (Look, 8/26/69, 68-72)

- . NASA announced award by LaRC of \$2.5-million contract to Ling Temco Vought Aerospace Corp. to design, develop, and flight-qualify larger 1st-stage solid rocket motor for Scout booster. New Algol III motor would have 44- or 45-in dia, 4 or 5 in wider than Algol IIB, and would enable Scout to place 400-lb payload, 100 lbs more than IIB capacity, into orbit with 300-mi altitude. (NASA Release 69-126)

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August 26: Bright red lights, believed by observers to be meteors, flashed across California, Nevada, and Arizona at 8:50 pm PDT. North American Air Defense Command (NORAD) later identified lights as parts of Soviet booster burning during reentry. Booster had launched Cosmos CCXCIV Aug. 19. (AP, W Star, 8/27/69, A5; later ed, A13)

August 27: NASA's 148-lb drum-shaped Pioneer E failed on 5:29 pm EDT launch from ETR by Thrust-Augmented Improved Delta (DSV-3L) booster. Satellite had been intended for solar orbit to collect scientific data on electromagnetic and plasma properties of interplanetary medium near earth's orbital path during six or more passages of solar activity centers.

Jettison of three strap-on solid-propellant rockets, 1st-stage Thor engine cutoff, and 2nd-stage ignition occurred as planned but vehicle began gyrating, veered off course, and was destroyed by Range Safety Officer at 8 min 2 secs GET. Pioneer E and TETR C test and training satellite, carried as secondary payload to test Apollo communications network, splashed into Atlantic about 300 mi southeast of Barbados. Preliminary analysis of data indicated loss of hydraulic pressure during 1st-stage burn permitted engine nozzle to develop uncontrolled gimbaling and vehicle gyrations. Investigation would be conducted to determine exact cause and action to prevent recurrence.

Pioneer E was last in series of five spacecraft designed to provide continuing measurements over the solar cycle at widely separated points in interplanetary space. Pioneer VI (launched Dec. 16, 1965), Pioneer VII (launched Aug. 17, 1966), Pioneer VIII (launched Dec. 16, 1967), and Pioneer IX (launched Nov. 8, 1968) had received 25,000 commands from ground and were still producing useful data from widely scattered positions in heliocentric orbits. Most recent Pioneer missions had provided new information on functions of magnetosphere, additional data on finding that diffuse solar plasma regions appeared to have attraction of their own, measurements of cosmic dust populations, data on changes in electrical and magnetic characteristics of solar corona, and targets for precision radar tracking which led to establishment of reliable value for earth-moon mass ratio and sun-earth mass ratio. Pioneer program was managed by ARC under OSSA direction. (NASA Proj Off; NASA Release 69-116; SBD, 8/29/69, 213)

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August 27: Moon was twin planet of earth, formed from same whirling gas cloud, in early view of two LRL scientists studying Apollo 11 samples. Dr. S. Ross Taylor of Astri National Univ., Canberra, Australia, said, "Moon's composition is unlike the earth's. But it is not outside our experience. It is like the material you would expect if the earth and moon were formed as a double planet." He thought moon was younger twin, while Dr. Oliver A. Schaeffer of State Univ. of New York thought it might be equally old."

Age of two lunar rocks had been estimated at 3.1 billion yrs, "give or take...200 million years," by measuring proportion of argon 40 to potassium in rocks, Dr. Schaeffer said. Lunar highlands might be 4.5 billion yrs old. Moon, he thought, never grew big enough to melt internally and produce geologic activity to change lunar surface and leave younger rocks. Dr. Taylor's studies had shown unusually high amounts of refractory material and absence or low concentration of volatile materials, implying volatile material had boiled away in melting process. He inferred rock chemistry was different from deep mantle of earth and from cosmic abundances--distribution of elements that would be expected in distant, more primitive planet captured by earth. (Cohn, W Post, 8/28/69, A1)

- . MSC Deputy Director George S. Trimble announced his resignation, effective Sept. 30, after 2½ yrs with NASA. He had been Director of Advanced Manned Missions Program in NASA Office of Manned Space Flight before appointment to MSC post Oct. 13, 1967. (MSC Release 69-70; W Post, 8/28/69, A8; NASA Ann, 10/13/67)
- . NASA announced selection of RCA Service Co. to receive two-year, cost-plus-award-fee contract with one-year option for logistic support to Space Tracking and Data Acquisition Network (STADAN), Manned Space Flight Network (MSFN), and NASA Communications Network (NASCOM). Contract was expected to exceed \$17 million. (NASA Release 69-127)
- . American Airlines began showing NASA color film of Apollo 11 and distributing free copies of CBS News recording "Man on the Moon" and free cut-out lunar modules for children on "Americana" flights between East Coast and California through Sept. 23. (NYT, 8/18/69, 23)

August 28: Leading lunar scientist Dr. Harold C. Urey told conference on nuclear energy at Argonne National Laboratory near Chicago he was "pleased" at discovery that age of lunar rocks might range between

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August 28 (continued)

3 billion and 4.5 billion yrs [see Aug. 23] and had "expected this for a long time.... But I'm not making any more bets on the moon's origin." He was "puzzled" by once-molten lunar sea material; it might have been formed by huge meteor or asteroid impacts rather than volcanism and moon might have originated out of cluster of such asteroidal debris. (Cohn, W Post, 8/29/69, A3)

Fiftieth anniversary of International Air Transport Assn. (IATA), founded in Amsterdam Aug. 28, 1919. International flying under IATA auspices in 1919 amounted to 3,500 passengers; in 1969 it was expected to total 300 million. Organization was still devoted to original principles: promotion of safe, regular, and economical air transport; collaboration among international carriers; processing of technical matters and common fares; and functioning as clearinghouse for settlement of member airline accounts. From original membership of six airlines, IATA now had 103 participating members. (Bamberger, NYT, 8/24/69, 86)

August 29: U.S.S.R. launched Cosmos CCXCVI from Baikonur into orbit with 299-km (185.8-mi) apogee, 227-km (141.1-mi) perigee, 89.6-min period, and 64.9° inclination. Satellite reentered Sept. 6. (GSFC SSR, 8/31/69, 9/15/69; SBD, 9/3/69, 9; UN Public Registry)

Some plants treated with lunar dust in early August were showing unexpected responses. Treated plants--including seedlings of several common food plants like wheat, tomatoes, cucumbers, and limes--were generally huskier and slightly greener than untreated plants. NASA statement said: "The seedlings challenged with lunar materials uniformly look better than the controls (untreated plants). Germination in the presence of lunar soil indicates that it is behaving like a source of nutrients." Plant cells in tissue culture showed "some evidence of subtle change as a result of lunar inoculation." Dr. J. A. Vozzo, plant pathologist at Lunar Receiving Laboratory, emphasized that changes were minor and could not yet be positively attributed to lunar dust. (Cohn, W Post, 8/30/69, A1)

NASA selected General Electric Co. to receive three-year, \$4-million, cost-plus-award-fee contract with two-year option to provide engineering and mission-related support to LaRC for Viking Project--series of planetary probes which would begin softlanding on Mars in 1973. (NASA Release 69-128)

August 29: New determination of abundance of water in Mars atmosphere was reported in Science by Illinois Institute of Technology astronomers Tobias Owen and Harold P. Mason. New spectrograms of planet had been obtained in region of water-vapor band at 8,200 Å during February and March 1969. Amount of precipitable water was found to be about 15 μ. Abundance reaffirmed that some water was present at current epoch but otherwise had little bearing on evolution of Martian atmosphere. Water vapor did not imply liquid water existed on Martian surface. (Science, 8/29/69, 893-5)

August 31: Washington Post Sunday supplement Potomac published profile of Dr. Richard T. Whitcomb, head of 8-Foot Tunnels Branch at LaRC. He had won 1954 Robert J. Collier Trophy for design of "coke bottle" aircraft fuselage configuration that enabled high-speed aircraft to pass through mach 1 with increased power. More recently he had devised supercritical wing, which would permit subsonic jet aircraft to approach mach 1. If adopted by commercial aircraft manufacturers, wing would cut nearly one hour from current five-hour transcontinental flights. (Potomac, 8/31/69, 1, 5-7)

- . DOD internal, classified, memoranda suggested Government would waste money buying additional Lockheed C-5A aircraft, Washington Post said. Central conclusion was that most efficient and least costly transportation network to support two major and one "brushfire" war "for which military wants to be prepared consists of the existing three squadrons (58) [of] C-5As plus smaller carriers like the C-141 and modern freighters." (Nossiter, W Post, 8/31/69, A1)

During August: Pace magazine published articles by Vice President Spiro T. Agnew, also NASC Chairman, and by NASA Administrator, Dr. Thomas O. Paine.

Dr. Paine said, "To improve conditions in our society we need to create more wealth through greater productivity based on new technology. We should be restless and dissatisfied with our slowness in overcoming social ills, and I hope that the space program will continue to spur us onward here. If we can go to the moon, why can't we build great and shining cities? Why can't we eliminate ignorance, crime and poverty? If our space program highlights such questions and helps form a national commitment to find new solutions, it will have served the nation well. Our space advances should embolden the nation to proceed forward with increased

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During August (continued)

confidence in these other areas. Our Apollo program has demonstrated anew what Americans can accomplish given a national commitment, capable leadership and adequate resources.

"Man's future in space is limitless. We have embarked on a new stage of evolution that will engage all future generations of men. We face the unknown in countless areas: What are the effects of sustained zero and artificial gravity? Of time-extending flight at nearly the velocity of light? Of societies genetically selected for extraterrestrial living?

"We must find the answers. We must move vigorously forward in space. The practical benefits alone justify this venture, but there are many other compelling human reasons. Progress in space should continue to spur us onward to find new solutions to our age-old problems here on Spaceship Earth. We must make the blue planet Earth a home base, worthy of men who will set forth one day on journeys to the stars."

Vice President Agnew said: "With the remarkably successful Apollo moon-landing program on the verge of culmination, we are now faced with a need to define just what we should proceed to do to make use most effectively of the results of our past and continuing space-exploration investment. Wealthy as our economy is, rich as our technology has become, we must plan carefully in order to meet a wide range of urgent national requirements.... It is our hope that, with a carefully reasoned set of goals adequately funded by the people through their Congress, the nation and the world will reap the maximum possible benefit from mankind's most ambitious undertaking. We must keep our horizons wide and our sights high. Despite its many internal domestic priorities, this nation should never turn inward, away from the opportunities and challenges of its most promising frontier. (Pace, 8/69, 2-4)

Four hundredth anniversary of Mercator's map, published in Rhenish city of Duisberg in 1569 by Gerhard Kremer (known by his Latin name Gerardus Mercator). Map translated earth's sphere into plane on chart on which straight line drawn by navigator cut across all meridians at same angle. Mercator projection was still standard for worldwide sea navigation and for aeronautical charts. (NYT, 8/17/69, 82)

'Technologically and managerially, Apollo was difficult," Englebert Kirchmer said in Space/Aeronautics editorial. "Politically and socially, it was simple. Just the reverse is true about the great

During August (continued)

problems of our society. What is making these so hard to solve is not technology but serious disagreement about goals and priorities, about what is good for whom, who is to get what and who should pay for it. The space program does not hold the answer to these questions. Trying to find them in Apollo will only distort and therefore belittle an incomparable achievement. Apollo took us to the moon, to that shining disk in the sky that looks so unbelievably distant. Isn't that enough?" (S/A, 8/69, 27)

- . AFSC Newsreview editorial commented on Apollo 11: "If, like the early Vikings or Columbus at the shores of the New World, Amundsen at Antarctica, Hillary at the peak of Mt. Everest--our astronauts stood alone with their thoughts on unknown soil, they were not alone. With them was the invisible presence of the most extensive, highly trained, professionally competent, and thoroughly dedicated task force we have known. We in the Air Force Systems Command salute the astronauts on their accomplishment. We are proud that we have been able to contribute to their magnificent achievement." (AFSC Newsreview, 8/69, 2)

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