Apollo 18

Robert O'Connell and Anthony Cook

We noted in 'Revisiting The 1963 Aristarchus Events'[1] that NASA had considered the Aristarchus Plateau as the landing site for the *Apollo 18* mission in part based on reports of transient lunar phenomena (TLP) seen in the area. In this web-based supplement, we present the relevant 1969 Senate testimony from the Congressional Record. This supplement available for download at www.the1963aristarchusevents.com

On July 29, 1969 NASA issued a tentative planning schedule for the Apollo 12 - 20 manned lunar missions which included a February 1972 Apollo 18 landing near Schröter's Valley on the Moon's Aristarchus Plateau.[2] Site selection was based on the region's diverse geology and because of TLP reportedly observed in the area by many observers, e.g., by Sir William Herschel (1783 & 1787), Greenacre (1963) and others. (See Figures 1 and 2). Alternative landing sites were also under consideration including the craters Gassendi and Copernicus. Unfortunately the *Apollo 18 - 20* missions were eventually cancelled "*As budgets tightened and public support for lunar missions faltered in 1970.*"[3] NASA was then forced to begin cutting its lunar exploration budget in order to fund post-*Apollo* programs which included Sky Lab and the Space Shuttle.

Below are several scanned pages from the Congressional record including the relevant passage (scroll down to highlighted text in yellow) pertaining to TLP seen on the Aristarchus Plateau from the April 30, 1969 Senate testimony by Dr. George E. Mueller, Associate Administrator of NASA's Office of Manned Space Program.[4]

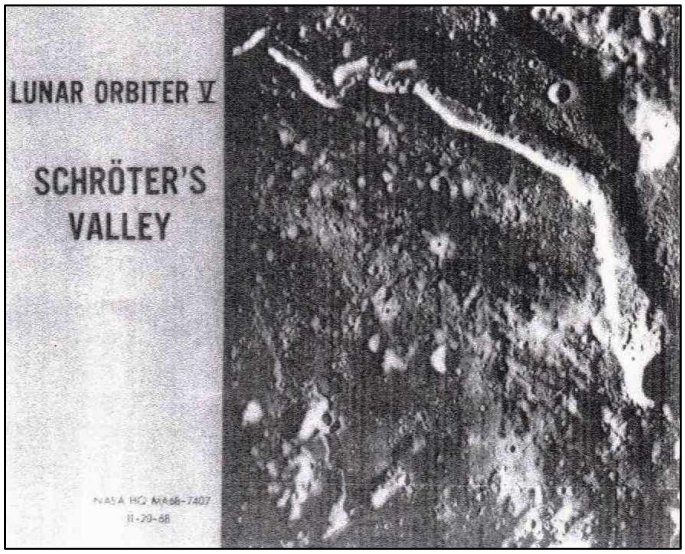

Figure 1. Image of Schröter's Valley and the Cobra Head formation on the Aristarchus Plateau which was included as "*Figure 45*" in the transcript of Dr. Mueller's April 30, 1969 Senate testimony.

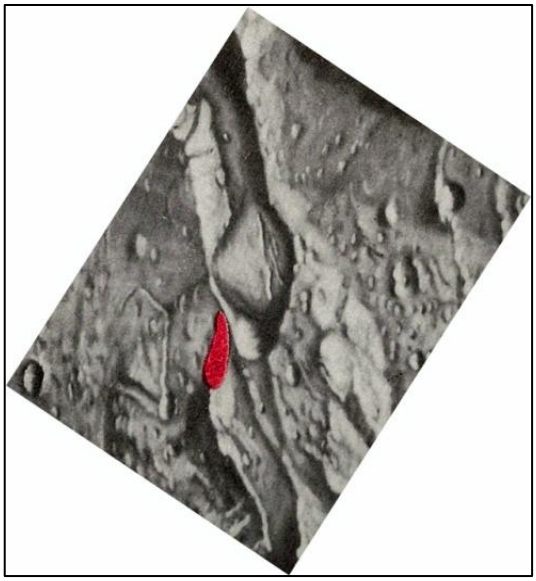

Figure 2. Reddish TLP seen near the Cobra Head formation by USAF lunar cartographer-observers James Greenacre and Edward Barr on October 30, 1963 UT. Cropped portion of full rendering by scientific illustrator Patricia M. Bridges based on personal input from Greenacre and Barr. From USAF, 'Lunar Color Phenomena: Technical Report No. 12', *USAF Aeronautical Chart and Information Center*, Ft Belvoir Defense Technical Information Center, Virginia (1964 May) North up (IAU).

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References

1 O'Connell, R. & Cook, A., 'Revisiting The 1963 Aristarchus Events', J. Brit. Astron. Assoc., **123**(4) pp. 197-208, (2013 August)

2 NASA OMSF, 'Manned Space Flight Weekly Report - July 28, 1969.' See: http://history.nasa.gov/SP-4009/v4p3e.htm#69jul (Accessed 2013-07-09)

3 See 'First Phase of Lunar Exploration Completed: Apollo Assumes its Final Form' at: http://www.hq.nasa.gov/pao/History/SP-4214/ch12-1.html#source1 (Accessed 2013-07-09)

4 'NASA Authorization for Fiscal Year 1970', *Hearings before the Committee on Aeronautical and Space Sciences United States Senate: Ninety-First Congress; First Session on S. 1941* (Washington, D.C.: USPO, 1969 May 28-30). Dr. Muller Testimony page 183.

NASA AUTHORIZATION FOR FISCAL YEAR 1970

HEARINGS

BEFORE THE

COMMITTEE ON AERONAUTICAL AND SPACE SCIENCES UNITED STATES SENATE

NINETY-FIRST CONGRESS

FIRST SESSION

ON

S. 1941

A BILL TO AUTHORIZE APPROPRIATIONS TO THE NATIONAL AERONAUTICS AND SPACE ADMINISTRATION FOR RESEARCH AND DEVELOPMENT, CONSTRUCTION OF FACILITIES, AND RESEARCH AND PROGRAM MANAGEMENT, AND FOR OTHER PURPOSES

APRIL 28, 29, AND 30, 1969

PART 1

Printed for the use of the
Committee on Aeronautical and Space Sciences

Thank you very much, gentlemen.

(Thereupon, at 12:20 p.m. the hearing was recessed until the following day, Wednesday, April 30, 1969, at 10 a.m.)

(The comprehensive statement of Dr. Mueller follows:)

COMPREHENSIVE STATEMENT OF GEORGE E. MUELLER, ASSOCIATE ADMINISTRATOR FOR MANNED SPACE FLIGHT

The fiscal year 1970 budget as amended in April 1969 by the new Administration includes funds which will make it possible for the nation to capitalize on its developed space capability through continued and effective exploration of the moon. The budget provides the necessary funds to initiate development and production of required systems and improvements as well as to continue studies of advanced mobility aids designed to extend the astronauts' exploration radius. The Apollo Program was conceived, designed, and developed as a program to achieve for the United States a capability for the manned exploration of space. The capability was to be demonstrated by landing a man on the moon and returning him safetly to earth. In May of 1961, President Kennedy committed the nation to achieving the lunar landing in this decade.

While the recent successful Apollo flights give promise that this objective will be accomplished within the timeframe established by President Kennedy, at least one more complex manned mission must be successfully carried out before a lunar landing is attempted and it is, therefore, not possible to predict with certainty which mission will be the first lunar landing attempt.

Because of the uncertainty regarding the number of developmental flights required before the landing is accomplished, the planning and development of the Apollo capability has included acquisition of a sufficient quantity of hardware items and operational facilities to achieve the program's initial objective with a reasonable allowance for possible contingencies. In other words, NASA is prepared to fly more than one more mission before a lunar landing attempt and more than one attempt if the circumstances warrant. On the other hand, continued success and early accomplishment of the Apollo objective would make available Apollo hardware for continued utilization and development of this nation's capabilities in manned space flight.

Our plans for Saturn V launch vehicles which remain after the initial lunar landing are to use them for continuing lunar exploration, which includes a number of manned landings, the emplacements of experiment packages on the surface of the moon, and other activities to increase not only our operational

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capabilities in space but also to increase our store of scientific data which is so necessary to translate the results of manned space efforts into benefits for all mankind. All the Apollo/Saturn V space vehicles following accomplishment of Mission F (Lunar Mission Development Phase) are configured for lunar landings.

The current Apollo schedule provides for five flights in 1969, the last three of which are being configured to carry out a lunar landing. Assuming a successful manned lunar landing and return on the Apollo 11 mission in the summer of 1969, we plan to reduce the number of Apollo launches in fiscal year 1970 from five to three. Once the national goal has been achieved, the lunar exploration phase will be conducted at a rate of approximately three launches per year.

For several years now, we have been examining the degree to which we should continue to explore the moon; what we might reasonably expect to learn; what the benefits of lunar exploration might be in terms of national, scientific, technological, and economic benefits. We have evaluated how much we can expect to do with the Apollo system as it is presently configured and have identified areas in which we can make incremental improvements to the present equipment to accommodate the initial added requirements of a lunar exploration program. Although we cannot state with certainty when the first lunar landing will be accomplished, we have developed a logical phasing of lunar exploration missions after the first landing.

Let us look first, however, at why lunar exploration is of great importance to our nation. First, the significance of international leadership has been evidenced by the favorable world reaction to the very successful Apollo 7, 8 and 9 missions. This will be the first opportunity for man to carry out exploration of another planet in the solar system and in so doing provide the means for possible true international cooperation on another planet. This could take the form similar to that in the Antarctic when the Russians achieve the capability of carrying out their lunar exploration program. I have already mentioned the fact that the lunar exploration program will provide the basis for capitalizing on our Apollo capability.

Secondly, we will broaden and deepen our base of scientific knowledge through a factual understanding of the origin, evolution, present characteristics, and historical relationships of the moon to the earth and the solar system. Questions such as whether the moon was formed with the earth or captured later, and possible clues to the origin of life might be answered through our planned exploration. To quote the President's Science Advisory Committee, "Answers to these questions may profoundly affect our views of the evolution of the solar system and its place, as well as man's, in the larger scheme of things."

Many planets have moons, but ours is the largest in relation to its planet. This implies that the two bodies may have been formed in the same manner at the same time. If true, the moon may be a book containing the secret of the earth's first billion years of life. This record is lost on the earth which is subjected to the wear and tear of erosion by atmosphere and water.

Until now natural phenomenon that can effect man could be studied only on earth. Now we believe many things that happen on earth also happen on the moon. By comparing similarities and contrasting differences, man may be able to arrive at a greater understanding of the fundamental processes that affect the earth; for example, the mechanisms that cause earthquakes and volcanic eruptions, and the processes responsible for concentrating ore deposits. The orbits of Apollo 8 and the Lunar Orbiters were disturbed by mass concentrations beneath the circular lunar seas. These may be hugh meteors that struck the moon with such force that they melted and sank into the interior, or they may be iron deposits.

A third reason for continuing lunar exploration is to examine the potential of the moon for possible benefits of man here on earth. For example, we will be able to evaluate the moon's natural resources, assess the moon as a base for future scientific and space operations as well as to evaluate the utility of a lunar base.

The fourth, and a very important reason, is the experience which will be gained in space operations while conducting the missions for exploration of the moon. We will learn about man's capabilities and limitations as a space explorer. Some day man will move on to other planets; the moon is now an accessible and potentially attractive training ground.

It is difficult to look far ahead. We do not have the basic information which early lunar landings will furnish and we can only speculate today about the feasibility of the moon as a base for an observatory or a permanent science station—about exploiting its environment of low gravity and high vacuum—about its potential for natural resources. The eventual goal of a lunar base would bring into focus the steps that must precede it, just as Apollo was important

in establishing the objectives of Mercury, Gemini, Surveyor, and Orbiter. Critical to future consideration of a lunar base goal is information on the lunar environment, location of natural resources and strategic sites that could serve multiple purposes. A long-range goal like the lunar base would direct technological advances, stimulate public interest, and attain subsidiary objectives with earth application such as food synthesis, environmental control, and recovery of useful elements from rock.

To summarize the points I have made, through exploring the moon we hope to make fundamental advances in:

1. This nation's position as an international leader in space exploration and the establishment of a basis for possible international cooperation. Scientific cooperation in unfolding the moon's secrets may show the way toward peaceful coexistence.
2. The base of scientific knowledge pertaining to an improved understanding of the solar system and its origin, including clues to the origin of life.
3. Evaluating potential exploration of the moon for its natural resources and as a base for lunar and other planetary exploration.
4. Experience in space operations such as in logistics support for man on a distant planet, development of greater capability for exploration, i.e., lunar rover, flying vehicles and shelters.

We are not alone in our belief in the value of going to the moon. In 1959, five years before we sent our first spacecraft to the moon, the Russians impacted the first man-made object on the lunar surface. In subsequent years, they took the first picture of the far-side, made the first controlled landing, placed the first orbiter around the moon, and returned the first capsule to earth from lunar orbit. We may assume their future aims are similar to ours.

We have developed a lunar exploration program with planned landings at ten sites, four of which lie essentially in the zones of the initial Apollo lunar landing candidate sites. The first landing, if the launch is on schedule this summer, will be an Eastern Mare region (fig. 40) and the second in another Mare of different characteristics in the western region (fig. 41).

The third flight will be directed to a highland, flat region characterized by the Fra Mauro formation. The fourth landing will be the first attempt to land in the cratered highlands near the Crater Censorius (fig. 42).

The fifth landing mission is planned for the Littrow area which is characterized by dark volcanic material.

The next visit will be to the impacted Crater Tycho (fig. 43) which is the site of the Surveyor VII landing.

This will be followed by a land mission in the Marius Hills area (fig. 44) with its many volcanic domes.

The eighth landing is planned for Schröter's Valley (fig. 45) with the purpose of looking for and examining possible transient events and to learn more about the red flares which have been seen in the area.

Hyginus Rille (fig. 46) will be the site of the ninth landing mission where we will be looking for volcanic craters in the Linear Rille to determine whether or not its origin is volcanic.

The Crater Copernicus (fig. 47) is the site where we will be looking for deep seated material which will have come from deep below the surface by the explosive force which formed the crater.

The sites, which have been discussed briefly, were chosen after discussions with the Science and Technology Committee, our experimentors, and our science advisory groups. This represents the latest thinking on the subject.

Initial steps required, in order to provide a greater capability in the basic Apollo system for lunar exporation, involve the maximum economical improvements in lunar staytime, astronaut mobility and instrumentation. These include (1) improved space suits, (2) improvements to the Portable Life Support System (PLSS) to increase the EVA time on the lunar surface, (3) modifications to the lunar module to provide a minimum of 3 days staytime on the lunar surface, (4) modifications to the Command and Service Module, including added scientific instruments to permit orbital survey of the moon, and (5) the procurement of additional Apollo Lunar Surface Experiment Packages.

Beyond these modifications and additions to the basic Apollo systems, there is a need to continue study and definition of more advanced aids to lunar exploration, such as lunar roving vehicles and flying vehicles to give greater mobility and traverse distance on the lunar surface, shelters to extend the astronaut staytime on the moon and the concept of dual missions to maximize the returns from each exploratory visit to the moon.