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TECHNICAL INFORMATION BULLETIN

Volume 8, Number 9 Goddard Space Flight Center July 23, 1971

APOLLO 15 AIMS AT WIDE-SPREAD OBJECTIVES

Apollo 15 is the first of the Apollo-J missions, a series which is capable of longer stay times on the moon and greater surface mobility.

The mission's four primary objectives are to explore the Hadley-Appennine region, set up and activitate lunar surface scientific experiments, make engineering evaluations of new Apollo equipment, and conduct lunar orbital experiments and photographic tasks.

Exploration and experimentation will be enhanced by the addition of the lunar rover vehicle (LRV) providing astronauts Scott and Irwin a greater travel radius from the LM during their three extra-vehicular activities (EVA's).

The objectives fall into the general categories of lunar science, lunar orbital science, and engineering/operational.

LUNAR SURFACE SCIENCE

As in previous lunar landing missions, a contingency sample of lunar surface material will be the first scientific objective performed during EVA-1. The Apollo 15 landing crew will devote a large portion of this period to deploy the Apollo lunar surface experiment package (ALSEP), the third in a trio of operating ALSEP's (Apollos 12, 14, and 15).

The lunar physical and environmental data these instruments transmit will be correlated with known earth data for further knowledge of the origins of the planet and its satellite.

The following are the seven experiments among the Apollo 15 ALSEP array:

The passive seismic experiment (PSE) will measure moon seismic activity and relay information to earth concerning lunar crust and interior physical properties. The PSE will report seismic data on man-made impacts, natural impacts of meteorities, and moonquakes.

The first man-made impact will be caused by directing the spent S-IVB stage and instrument unit (IU) into the moon. The S-IVB/IU will weigh 30,836 pounds and be traveling about 5,000 nautical-miles-an-hour at impact, at that time providing an energy source equivalent to about 11 tons of TNT.

After use, the LM ascent stage will also be impacted on the lunar surface.

The scientific objective of the lunar surface magnetometer (LSM) experiment is to measure the magnetic field at the lunar surface. Magnetic field values at the moon's surface can be used to deduce information on the moon's electrical properties. In turn, this can be used to better understand the moon's internal temperature, thus yielding information on the satellite 's origin and history.

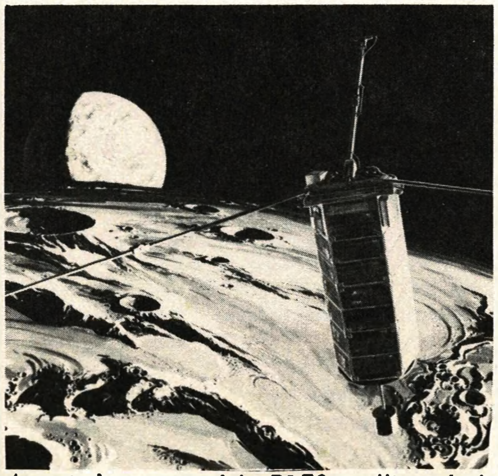
The solar wind spectrometer will measure the strength, velocity, and directions of the electrons and protons of the solar wind that bombard the lunar surface. The spectrometer measurements will help interpret the magnetic field of the moon, the lunar atmosphere, and the analysis of lunar samples.

Further knowledge of the solar wind will help us understand the sun's origin and the physical processes influencing the aurora, ionosphere, and weather on the earth.

The solar wind composition experiment (SWC) will determine the elemental and isotopic composition of the noble gases in the solar wind.

In addition to the solar wind spectrometer, the independent solar wind composition experiment will collect the gases of the solar wind for return to earth for analysis.

The suprathermal ion detector experiment (SIDE) will measure flux, composition, energy and velocity of low- and high-energy positive ions. Combined with the SIDE, the cold cathode gauge experiment (CCGE), will measure the density of the lunar atmosphere and other atmospheric variations.



An artist's concept of the P&FS satellite, which will carry particle detectors and magnetometers to obtain information about the interaction of the earth's magnetic field with the moon. The satellite will be carried in a service module compartment on the Apollo 15 mission.

The lunar heat flow experiment (HFE) will measure the two predicted heat sources on the moon--the original heat at the time of the moon's formation and radioactivity. In addition to temperature, the experiment is capable of measuring the thermal conductivity of the lunar rock material. The combined temperature measurement will enable scientists to build more exact moon models. In this experiment the astronauts will use the Apollo lunar surface drill (ALSD) to make the lined bore hole in the lunar surface. Collected cores of lunar material will enable subsequent analysis of thermal properties.

The lunar dust detector experiment will separate and measure high-energy radiation damage to three solar cells, measure reduction of solar cell output due to dust accumulation, and measure reflected infrared energy and temperatures for computation of lunar surface temperatures.

The laser ranging retro-reflector (LRRR) experiment will permit long-term measurements of the earth-moon distance by acting as a passive target for laser beams directed from observatories on earth. Data gathered from these measurements of the round trip for a laser beam will be used in the study of fluctuations in the earth's rotation rate, wobbling motions of the earth on its axis, the moon's size and orbital shape, and the possibility of a slow decrease in the gravitational constant "G."

The ALSEP central station will serve as a power-distribution and data-handling point for experiments carried out on each version of the ALSEP.

The ALSEP package will be powered by a systems for nuclear auxiliary power (SNAP) - 27 unit. The SNAP program is directed at development of generators and reactors for use in space, on land, and in the sea.

LUNAR ORBITAL SCIENCE

Orbital science experiments are primarily concentrated in an array of instruments and cameras in the scientific instrument module (SIM) bay of the spacecraft service module. Command module pilot Worden will operate these instruments while he is flying the command module (CM) solo and again for two days following the return of astronauts Scott and Irwin from the lunar surface.

The eight experiments carried in the SIM bay are the following:

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On a 25-foot extendable boom, the gamma-ray spectrometer will measure the chemical composition of the lunar surface in conjunction with X-ray and alpha-particle experiments to gain a compositional map of the lunar surface ground track.

The composition of the lunar surface will be measured from orbit by the X-ray fluorescence spectrometer. It will detect X-ray fluorescence caused by solar X-ray interaction with the moon. The spectrometer will analyze the sunlit portion of the moon and measure the galactic X-ray flux during transearth coast.

The alpha-particle spectrometer experiment will measure mono-energetic alpha-particles emitted from the lunar crust and fissures as products of radon gas isotopes.

The mass spectrometer will measure composition and distribution of the lunar atmosphere, identify active lunar sources of volatiles, and pinpoint lunar atmosphere contamination.

Lunar surface stereo and high-resolution (one meter) photographs will be gathered from orbit by a 24-inch panoramic camera. Working in conjunction with the 3-inch mapping camera and the laser altimeter, the 24-inch camera will gain data to construct a comprehensive map of surface ground track--about 1.6 million square miles, or 8 percent of the lunar surface.

The 3-inch mapping camera will combine simultaneous terrain mapping photography and star field photography. The stellar photos will permit accurate correlation of postflight mapping photography. During dark side passes, this camera will also provide pointing vectors for the laser altimeter, which measures spacecraft altitude above the lunar surface to within one meter.

Photography will also be utilized in the Gegenschein experiment. A Gegenschein is a faint light source covering a 20 degree field of view along the earth-sun line on the opposite side of the earth from the sun (anti-solar axis). A theoretical point, the Moulton Point, is located 940,000 statute miles from the earth along the anti-solar axis where the sum of all gravitational forces is zero. One theory on the origin of Gegenschein is that particles of matter are trapped at the Moulton Point and reflect sunlight. From lunar orbit, the Moulton Point region will be photographed. The photos should show whether Gegenschein results from the Moulton Point theory, stems from zodiacal light, or is from some other source. Simultaneously, photographs of the same regions will be obtained from the earth.

The particles and fields subsatellite (P&FS), which will be housed in a container resembling a rural mailbox and ejected into lunar orbit from the SIM bay, carries three experiments. They are the S-band transponder for gathering data on the lunar gravitational field; the particle shadows/boundary layer for gaining knowledge of the earth's magnetosphere and other celestial physics, including the interaction of plasmas with the moon; and the subsatellite magnetometer for gathering physical and electrical moon data and more information on plasma interaction.

The downlink bistatic radar experiment seeks to measure the lunar surface electromagnetic properties by monitoring that portion of the spacecraft telemetry and communications beacons which are reflected from the moon.

The CM windows will be scanned under pre and postflight high magnification in the Apollo window meteoroid experiment. This experiment may determine if such particle flux is a factor in the degradation of surfaces exposed to space environment.

ENGINEERING/OPERATIONAL

Among the engineering/operational tasks to be carried out by the Apollo 15 crew is the evaluation of LM modifications which were made for carrying a heavier payload and for a lunar stay time of almost three days. Changes to the Apollo spacesuit and to the portable life support system (PLSS) will be evaluated. The performance of the LRV, the lunar communications relay unit (LCRU), and the ground-controlled television assembly (GCTA)--all new J-mission equipment--will also be evaluated.

Summary of Apollo Event Times

Elapsed Time	Greenwich Mean Time		Event
00:00	July 26	13:34	Liftoff.
04:10		17:44	CSM/LM ejection.
11:10	July 27	00:44	UV photography.
78:15	July 29	19:49	Lunar orbit insertion.
84:15	July 30	01:49	SIM experiment starts.
100:15		17:49	CSM/LM undocking.
104:41		22:11	Lunar landing.
106:05		23:39	Subsatellite launched.
108:00	July 31	01:34	CMP performs scientific photography.
119:45		13:19	EVA-1 begins.
120:20		13:54	LRV deployed.
120:35		14:09	LCRU deployed.
123:35		17:09	Crew off-loads ALSEP.
124:30		18:04	Crew deploys surface wind experiment and lunar surface magnetometer.
125:30		19:04	Crew collects samples.
126:40		20:14	EVA-1 ends.
141:10	Aug 1	10:44	EVA-2 begins.
142:20		12:44	Crew at 1st station.
143:30		12:54	Crew at 2nd station; digs trench in crater rim.
144.45		13:59	Crew at 3rd station; collects samples.
145:25		14:24	Crew at 4th station; collects samples.
146:10		15:09	Crew at 5th station; collects samples and digs trench.
146:55		15:54	Crew at 6th station; collects samples and digs trench.
161:50	Aug 2	07:24	EVA-3 begins (provisional).
162:48		07:22	Crew performs penetrometer test and collects samples.
167:45		12:19	EVA-3 ends.
168:30		13:04	Equipment jettisoned.
171:37		16:11	Lunar liftoff.
172:44		18:18	Lunar orbit insertion.
173:28		19:02	Docking, CSM/LM.
177:30		23:04	LM jettisoned.
179:31	Aug 4	01:05	LM impacts moon.
223:45		17:19	Transearth injection.
241:45	Aug 5	05:19	EVA begins.
242:41		06:15	EVA ends.
264:20	Aug 6	13:54	Crew performs lightflash experiments.
293:50	Aug 7	19:24	CM/SM separation.
294:58		20:32	Reentry and blackout.
295:10		20:44	Splashdown.

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