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THE STATION "ZOND-6"

L A N D E D

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SPACE "SOUNDINGS" CONTINUE

(TASS)

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THE STATION "ZOND-6"

L A N D E D

SPACE "SOUNDINGS" CONTINUED

Tass Agency
Communiqué and

SUMMARY

This is the official Tass Communiqué about the successful landing of the AS "ZOND-6" on 17 November 1968 at a preassigned spot of Soviet Union. Emphasis is given, both in the communiqué and in the scientific comments that follow, to the applied new and promising method of retrieving spacecrafts from interplanetary trajectories, namely, by guided descent with utilization of aerodynamic lifting force of the descending device.

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Tass Communiqué

On 17 November 1968, station "ZOND-6" landed after a nearly 7-day flight along the space route Earth-Moon-Earth at a preassigned region of the Soviet Union.

In this experiment a more complex and promising method of space stations' return from interplanetary trajectories has been applied and verified for the first time. This is the method of guided descent with the utilization of the craft's aerodynamic lifting force (aerodynamic quality).

In the case of guided descent with the use of aerodynamic quality, the motion trajectory of the spacecraft has, at deceleration, an essentially different shape, as compared to that of the ballistic descent, which allows us to realize the landing at the required point of the ground with smaller overloads and greater accuracy.

The deceleration of the descending craft in the Earth's atmosphere took place along a trajectory with two dips into the atmosphere. During the first one, the second cosmic velocity ($\sim$11 km/sec) was lowered at the expense of the aerodynamic braking to 7.6 km/sec. At the same time the descending device was so oriented with the aid of the onboard guidance system, that upon passing through the dense layers of the atmosphere, it emerged from them, further pursuing its flight along the ballistic trajectory till the second dipping into the Earth's atmosphere.

Over the second portion of the dipping into the atmosphere, the subsequent descent of the apparatus also took place along the trajectory of the guided descent with the utilization of aerodynamic quality assuring its return to Earth at a preassigned spot.

Following were the performances of ZOND-6 during its flight:

- flight around the Moon at a preassigned distance (2,420 km);

- scientific research all along the flight route and in the near-lunar space;

- experimentation and verification in real outer space flight conditions of systems, units and space station's instrumentation;

- the working off of a system of controlled descent during return to Earth with second cosmic velocity and with the utilization of the aerodynamic lift of the descending device.

The projected program of testing and working off the onboard systems, units and apparatus' installations, and also the scientific space investigations by ZOND-6, have all been completed.

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SCIENTIFIC COMMENTS BY TASS

From "Komsomol'skaya Pravda" (Abstracted translation)
Daily Newspaper of 19 November 1968

So far, the most characteristic trait of investigations of the Moon, planets and further outer space consisted in that none of the spacecrafts were returned to Earth.

There is, at present, a round of scientific problems, whose solution could be obtained with much greater accuracy by scientists on the ground, if the information is devoid of distortions caused by telemetric transmission of either direct photographs or spectra. This, in short, is realized by delivery of the scientific data, directly to the ground. The question was therefore to create the means for such a direct delivery.

The main problem consisted here in a series of complex maneuvers so as to appropriately correct the flight trajectories. It was to some extent worked off during the flight of the "LUNA" series of spacecrafts. However, there was the problem of assuring the optimum entry regime of spacecrafts into the atmosphere with second cosmic velocity (11.2 km/sec) and the return to Earth at a preassigned region. Being of extreme technical complexity, this problem exceeded in difficulty by a number of factors that of AES return to Earth with first cosmic velocity (about 8 km/sec). The current problem is thus to assure

the return or a spacecraft from an interplanetary flight with strictly limited overloads and landing at a preassigned point; it requires the fulfilment of very rigorous conditions for atmosphere reentry, which assume the assurance of hitting a very narrow entry corridor, with a specific entry angle.

The noncompliance of entry conditions into the corridor may result in great deflection relative to the calculated landing spot. It may also lead the spacecraft to overshoot the Earth, or else, it may undergo overloads that would exceed the acceptable limits.

The requirements are quite hard: thus, for example, the increase in the entry angle by only one degree during ballistic descent relative to the calculated one results in a threefold increase of overloads, while the difference of the conditional perigee by ±1 km results in the deflection of the point of landing by ±50 km, when the calculated value of the conditional perigee is 35 km. For example, for "ZOND-5" the entry corridor constituted 10 to 13 kilometers.

By comparing all these calculated values of entry corridor parameters with the scale of the route to the Moon and back (the distance to the Moon being about 385,000 km), it is clearly seen to what extent the guidance, orientation and position control of the station must be accurate.

The next problem of apparatus' return from interplanetary flights is the assurance of its thermal regime at entry into the Earth's atmosphere. When it moves in the atmosphere with second cosmic velocity, there sets in a powerful shock wave and the temperature between it and the apparatus attains up to 13,000 degrees. Note that during the return of AES with the first cosmic velocity the temperature reaches 7 to 8,000 degrees. The great complexity of thermal insulation was successfully resolved during the flights of ZOND-5 and ZOND-6 by the choice of appropriate shape of the descending apparatus and the use of appropriate thermal shielding materials.

The interest centers here on the fact that during the flight of ZOND-6 an entirely new solution was worked out for the controlled descent by comparison with the flight of ZOND-5. In the case of ZOND-6 use was made of the so called aerodynamic quality of the descending apparatus, the utilization of which providing the possibility of maneuvering it both in range and in lateral directions and ensuring the accurate return to a preassigned region. It allows, furthermore, to substantially lower the overloads acting upon the device.

In this regard, the stations of the ZOND series constitute a significant step forward in the development of astronautics. The fact is that the ZOND series of stations are a universal tool of men in the matter of study of the Moon, planets and outer space, and, as such, they offer unique possibilities of delivering to scientists, and specifically, to ground laboratories DIRECTLY the results of investigations for their detailed study and full interpretation.

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Translated by ANDRE L. BRICHANT
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