

Luna 13

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ON THE TWENTY-FOURTH OF DECEMBER, at 21 hours 01 minutes Moscow time, the Soviet Automatic Station Luna 13 made a soft landing on the surface of the moon in the region of the Ocean of Storms. This is the second Soviet station which made a soft lunar landing in 1966; the first which made such a landing was the Soviet station Luna 9.

Between the flights of these two stations, three Soviet-made satellites — lunar automatic stations Luna 10, Luna 11 and Luna 12 — carried out complex scientific investigations and one of them in accord with the program transmitted a series of photographs of the lunar surface, obtained at heights of 100 to 340 km.

The automatic station Luna 13 had a number of differences from the station Luna 9. Working experience with the first station permitted the introduction of improvements in the construction of Luna 13 and the solution of a number of

scientific problems raised in the task of equipping the station with new scientific apparatus.

Inside the airtight body of the automatic lunar station (ALS) frames were placed with two-way radio equipment, electronic program timing equipment, chemical batteries, automatic devices, scientific and telemetric apparatus and also a system for temperature control. On the outer surface of the body of Luna 13 (see Fig. 1) were arranged four petals (1) and four straight antennas (2), television equipment (6), and two outrigger equipments (3). Among the complex of apparatus of ALS were a mechanical soil density meter (4), a density meter (5), and others. Before bringing ALS into the working condition, the petals, linear antennas and also the outrigger mechanisms were folded and held in these positions by special latches. On command from the master* program-time equip-

*The Russian word used here — *bortovogo* — has the meaning "edge, border, flange" in the dictionary I have. I have chosen the word "master" for the use here.

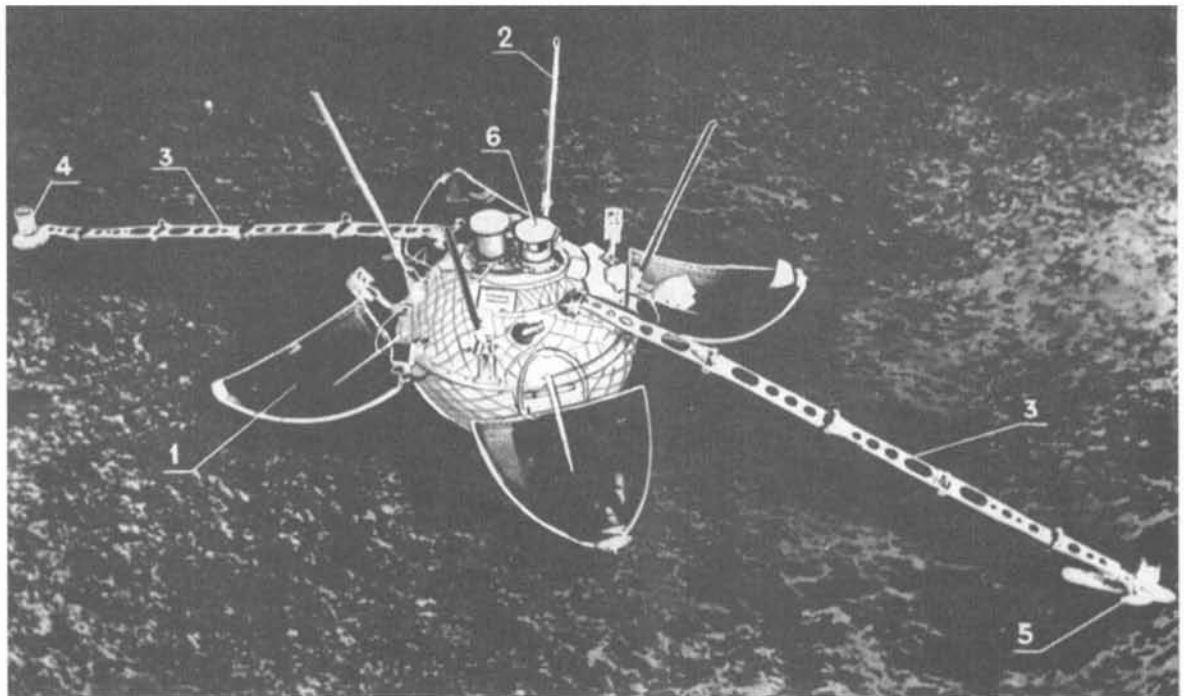


Fig. 1. The Luna 13.

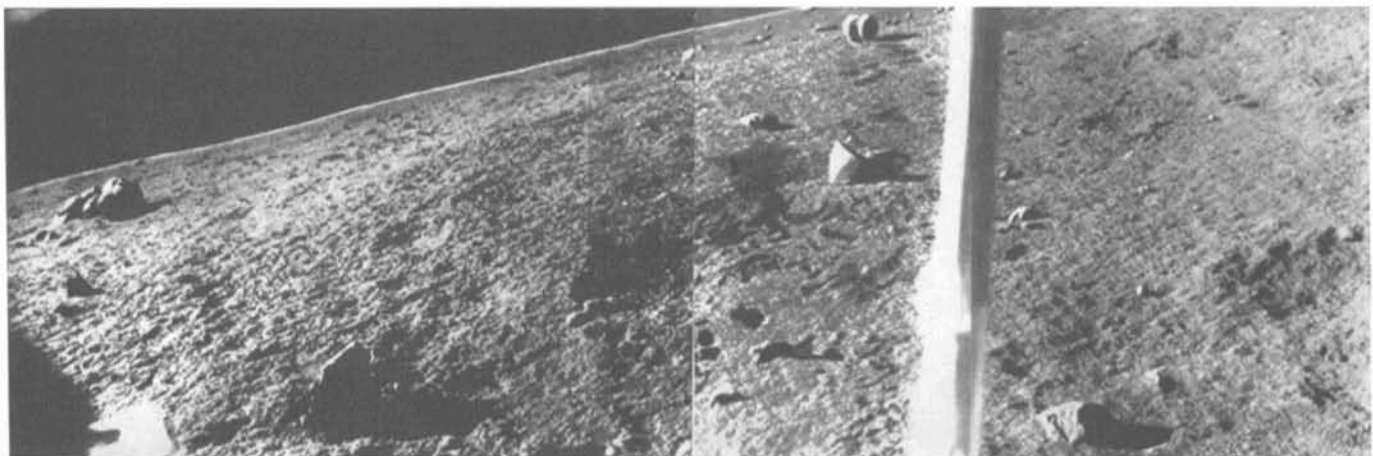


Fig. 2. A lunar landscape photograph by Luna 13.

ment ALS was brought into the working state; by this, with the opening of the latches, the antennas and the outrigger mechanisms were exposed.

The television equipment of Luna 13 has optical mechanical scanning arrangements, close in its design to the equipment of mechanical television or phototelegraphy. It should be noted that the optical-mechanical system meets exacting requirements of weight, size, use of energy and reliability of operation.

The time for full circle coverage of the camera of the TV equipment is about 100 minutes and the depth of sharp field, extending from 1.5 m to infinity, made it possible to resolve detail of 1.5 to 2 mm at a distance of 1.5 m.

In the TV equipment there is automatic adjustment of the amplification factor of the signal in relation to the illumination of the lunar surface. The axis of the TV equipment was inclined approximately 16° to the local vertical. This gave favorable conditions for transmission of images of micro relief.

In approximately four minutes after landing, on command of the master program-time equipment, the station was brought to working condition and it began the first series of radio communications. Telemetry data showed that all systems of the station were working normally and the temperature and pressure within the unit were in the prescribed range.

The photograph (Fig. 2) is a picture of the lunar land-

scape in the southerly direction from the station. It was obtained at the time of the third series of transmissions of images. At the moment of the transmission of the first images of the surrounding region, the altitude of the sun was 6° . At the time of the second period of transmission it was 19° but finally the published fragment of the panorama was obtained with a sun altitude from the horizontal of about 32° . Visibility of detail of the lunar landscape depends to a great degree on the conditions of illumination. This special feature of the reflecting characteristics of the lunar surface has been known for a long time from observations from the earth. The greatest amount of light is scattered by the lunar ground in the direction of the sun. The lower the sun, the more sharply evident is this characteristic, that is, the brightness of the landscape strongly increases if the observation is made from the side of the sun. As a result, in the panoramas transmitted in the second period around the shadow of the station, bright halos appeared.

Preliminary analysis of the pictures obtained shows that the structure of the ground at the landing site of the station Luna 13 is similar in many respects to the structure of the ground for the landing site of station Luna 9 and the American station Surveyor 1 which accomplished a soft landing in the summer of 1966 in the region of the crater Flemstid. Under close inspection the surface is shown strongly pitted with individual unit dimensions of a few millimeters. This again confirms the absence of layers of dust on the moon.