

1960

14)

Pioneer 5

Nation: U.S. (7)

Objective(s): heliocentric orbit

Spacecraft: P-2 / Able 6

Spacecraft Mass: 43.2 kg

Mission Design and Management: NASA GSFC / USAF BMD

Launch Vehicle: Thor-Able IV (no. 4 / Thor no. 219 / DM-1812-6A)

Launch Date and Time: 11 March 1960 / 13:00:07 UT

Launch Site: ETR / launch complex 17A

Scientific Instruments:

- 1) magnetometer
- 2) ionization chamber
- 3) Geiger-Mueller tube
- 4) micrometeoroid momentum spectrometer
- 5) photoelectric cell aspect indicator
- 6) proportional counter telescope

Results: Launched on a direct solar orbit trajectory, Pioneer 5 successfully reached heliocentric orbit between Earth and Venus to demonstrate deep space technologies and to provide the first map of the interplanetary magnetic field. The spacecraft had originally been intended for a Venus flyby, but the mission was switched to a solar flyby. Pioneer 5 carried Telebit, the first digital telemetry system operationally used on a U.S. spacecraft; it was first tested on Explorer 6. The system used a 5-watt or a 150-watt

transmitter, with a 5-watt transmitter acting as driver. Information rates varied from 64 to 8 to 1 bit per second. Controllers maintained contact with Pioneer 5 until 26 June 1960, to a record distance of 36.2 million kilometers from Earth (later surpassed by Mariner 2). The probe, using its 18.1-kilogram suite of scientific instruments, confirmed the existence of previously conjectured interplanetary magnetic fields.

15)

no name / [Luna]

Nation: USSR (8)

Objective(s): lunar farside photography

Spacecraft: Ye-3 (no. 1)

Spacecraft Mass: unknown

Mission Design and Management: OKB-1

Launch Vehicle: 8K72 (no. 11-9)

Launch Date and Time: 15 April 1960 / 15:06:44 UT

Launch Site: NIIP-5 / launch site 1

Scientific Instruments:

- 1) Yenisey-2 photographic-TV imaging system
- 2) micrometeoroid detector
- 3) cosmic-ray detector

Results: After the spectacular success of Luna 3, this spacecraft was launched to return more detailed photos of the lunar far side. The Ye-3 class vehicle was essentially a Ye-2A probe using a modified radio-telemetry system, but with the old Yenisey-2 imaging system. (A more

advanced Ye-3 type with a new imaging system had been abandoned earlier.) During the launch, the probe received insufficient velocity after premature third-stage engine cutoff. The spacecraft reached an altitude of 200,000 kilometers and then fell back to Earth and burned up in Earth's atmosphere, much like some of the early American Pioneer probes.

16)

no name / [Luna]

Nation: USSR (9)

Objective(s): farside lunar photography

Spacecraft: Ye-3 (no. 2)

Spacecraft Mass: unknown

Mission Design and Management: OKB-1

Launch Vehicle: 8K72 (no. II-9a)

Launch Date and Time: 19 April 1960 /
16:07:43 UT

Launch Site: NIIP-5 / launch site 1

Scientific Instruments:

- 1) Yenisey-2 photographic-TV imaging system
- 2) micrometeoroid detector
- 3) cosmic-ray detector

Results: This was the last of the "first-generation" Soviet probes to the Moon. Like its immediate predecessor, it was designed to photograph the far side of the Moon. Unfortunately, the probe never left Earth's atmosphere. Instead, immediately after launch, at T+10 seconds, the launch vehicle began to fall apart. As each strap-on fell away, parts of the booster landed separately over a large area near the launch site. Thundering explosions broke windows in many nearby buildings.

17)

Able VA / "Pioneer"

Nation: U.S. (8)

Objective(s): lunar orbit

Spacecraft: P-30 / Able VA

Spacecraft Mass: 175.5 kg

Mission Design and Management: AFBMD /
NASA

Launch Vehicle: Atlas-Able (no. 2 / Atlas D no.
80)

Launch Date and Time: 25 September 1960 /
15:13 UT

Launch Site: ETR / launch complex 12

Scientific Instruments:

- 1) high-energy radiation counter

- 2) ionization chamber
- 3) Geiger-Mueller tube
- 4) low-energy radiation counter
- 5) two magnetometers
- 6) scintillation spectrometer
- 7) micrometeoroid detector
- 8) plasma probe
- 9) Sun scanner

Results: This probe, Able VA, had a slightly different instrument complement from that of its predecessor Able IVB (launched in November 1959), but it had similar mission goals. Able VA was to enter lunar orbit about 62.5 hours after launch with parameters of 4,000 x 2,250 kilometers in a period of 10 hours. During the launch, although the first stage performed without problems, the Able second stage ignited abnormally and shut down early because of an oxidizer system failure. The third stage never fired, and the probe burned up in Earth's atmosphere 17 minutes after launch. Although the mission was a failure, ground controllers fired Able VA's onboard liquid propellant hydrazine rocket engine—the first time that an onboard motor was fired on a space vehicle. Later, on 15 November 1960, NASA announced that two objects from the Able VA payload had been found in Transvaal, South Africa.

18)

no name / [Mars]

Nation: USSR (10)

Objective(s): Mars flyby

Spacecraft: 1M (no. 1)

Spacecraft Mass: 480 kg

Mission Design and Management: OKB-1

Launch Vehicle: 8K78 (no. L1-4M)

Launch Date and Time: 10 October 1960 /
14:27:49 UT

Launch Site: NIIP-5 / launch site 1

Scientific Instruments:

- 1) ultraviolet spectrograph
- 2) radiation detector
- 3) cosmic-ray detector

Results: This was the first of two Soviet Mars spacecraft intended to fly past Mars. It also was the first attempt by humans to send spacecraft to the vicinity of Mars. Although the spacecraft initially included a TV imaging system and a spectroreflectometer (to detect organic life on Mars), mass constraints forced engineers to remove both

instruments a week before launch. The mission profile called for the probe to first enter Earth orbit and then use a new fourth stage (called "Blok L") to gain enough additional velocity to fly to a Mars encounter. During the launch, violent vibrations caused a gyroscope to malfunction. As a result, the booster began to veer from its planned attitude. The guidance system failed at T+309 seconds, and the third-stage engine was shut down after the trajectory deviated to a pitch of greater than 7 degrees. The payload eventually burned up in Earth's atmosphere over eastern Siberia without reaching Earth orbit. The Mars flyby was planned for 13 May 1961.

19)

no name / [Mars]

Nation: USSR (11)

Objective(s): Mars flyby

Spacecraft: 1M (no. 2)

Spacecraft Mass: 480 kg

Mission Design and Management: OKB-1

Launch Vehicle: 8K78 (no. L1-5M)

Launch Date and Time: 14 October 1960 / 13:51:03 UT

Launch Site: NIIP-5 / launch site 1

Scientific Instruments:

- 1) ultraviolet spectrograph
- 2) radiation detector
- 3) cosmic-ray detector

Results: Like its predecessor, this spacecraft never reached Earth orbit. During the launch trajectory, there was a failure in the third-stage engine at T+290 seconds as a result of frozen kerosene in the pipeline feeding its turbopump (which prevented a valve from opening). The third and fourth stages, along with the payload, burned up over Earth's atmosphere over eastern Siberia. The Mars flyby had been planned for 15 May 1961.

20)

Able VB / "Pioneer"

Nation: U.S. (9)

Objective(s): lunar orbit

Spacecraft: P-31 / Able VB

Spacecraft Mass: 176 kg

Mission Design and Management: AFBMD / NASA

Launch Vehicle: Atlas-Able (no. 3 / Atlas D no. 91)

Launch Date and Time: 15 December 1960 / 09:10 UT

Launch Site: ETR / launch complex 12

Scientific Instruments:

- 1) micrometeoroid detector
- 2) high-energy radiation counter
- 3) ionization chamber
- 4) Geiger-Mueller tube
- 5) low-energy radiation counter
- 6) two magnetometers
- 7) Sun scanner
- 8) plasma probe
- 9) scintillation spectrometer
- 10) solid state detector

Results: The mission of Able VB, as with its two unsuccessful predecessors, was to enter lunar orbit. Scientific objectives included studying radiation near the Moon, recording the incidence of micrometeoroids, and detecting a lunar magnetic field. Planned lunar orbital parameters were 4,300 x 2,400 kilometers with a period of 9 to 10 hours. The spacecraft had a slightly different scientific instrument complement from that of its predecessors. This was third and last attempt by NASA to launch a probe to orbit the Moon in the 1959–60 period. Unfortunately, the Atlas-Able booster exploded 68 seconds after launch at an altitude of about 12.2 kilometers. Later investigation indicated that the cause was premature Able stage ignition while the first stage was still firing.