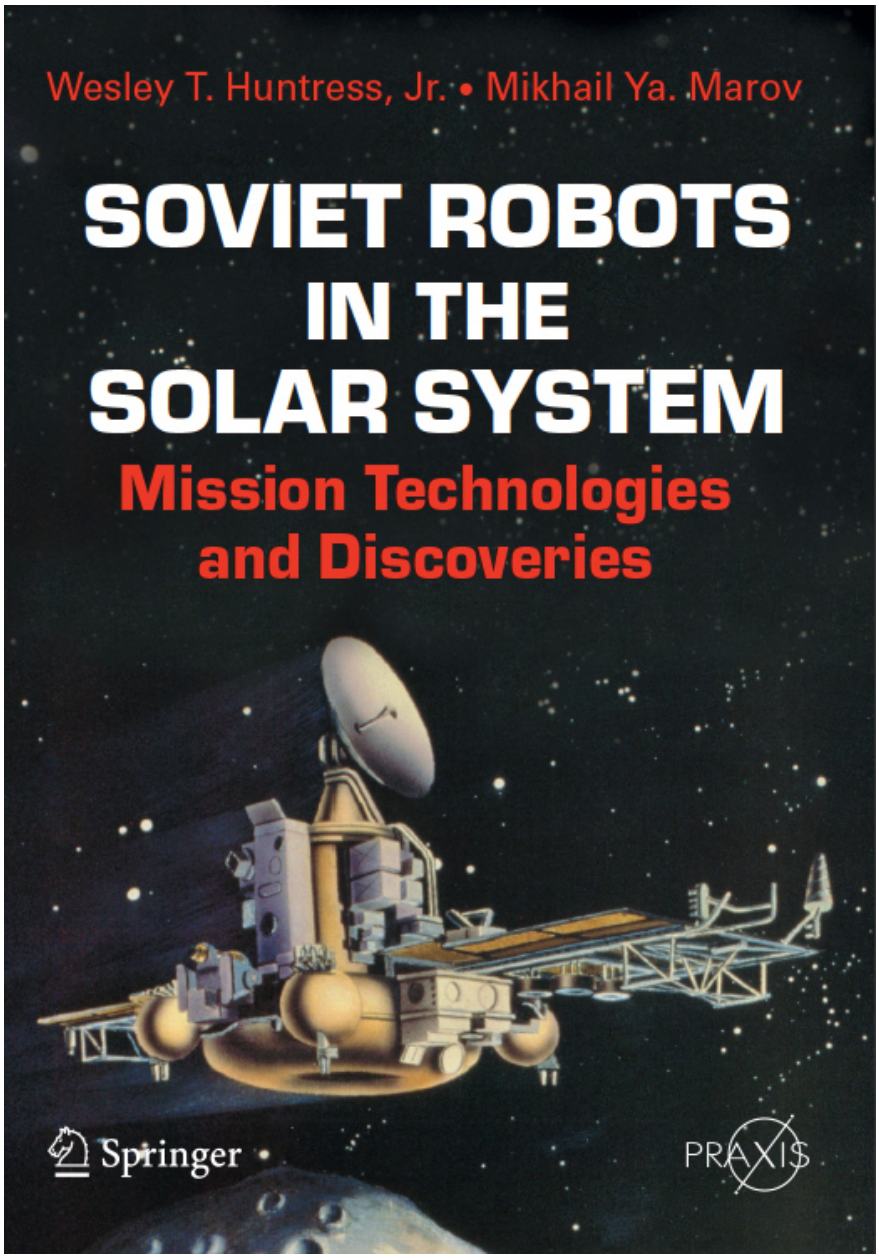
**Soviet Robots in the Solar System**
**Updates and Corrections**




**January 23, 2020**

## Acknowledgments

**Page xx.** James Garry's name is misspelled.

## Chapter 9

**Page 127 and 133.** Recent declassification of Soviet documents and subsequent publications (1,2) have cleared much of the mystery surrounding the early 3MV Zond missions in 1963 and 1964. Any new edition to this book will require replacement text to reflect the following new mission descriptions.

After all the failures of the 2MV vehicles, the new 3MV series was to be introduced with a series of test flights called "object-probes" later known as Zonds. The original plan was for three Zond test launches in 1963 of two different test models - a 3MV-1A Venus probe test spacecraft launched into deep space above the ecliptic to 20 million km with Earth return and lander entry at Earth, and a 3M-4A modified Mars flyby spacecraft on a mission to take pictures of Earth at distances of 40-200 million kilometers and test the spacecraft out to 200-300 million kilometers. Then six operational 3MV spacecraft would be launched in 1964, two landers to Venus and four missions to Mars.

Development delays of the new 3MV models forced changes to these plans. The first test spacecraft, 3MV-1A no.2 (or no.1), was launched on Nov 11, 1963 on the deep space mission with Earth return. It is not clear if it actually carried an entry probe since the launch weight was only 800 kg. 3MV spacecraft carrying a probe or an instrument compartment for cameras weighed 950-996 kg. The mission failed when the spacecraft was stranded in Earth orbit.

After the failure, plans were reformulated calling for another 800 kg 3MV-1A version on a 4-month flight in the direction of Venus out to 40 million kilometers, and a 996 kg Mars flyby version to rehearse a Mars mission, photograph the Earth from 100-150 thousand kilometers and test communications out to 300 million kilometers.

On February 19, 1964, the second object-probe 3MV-1A no.4A (also no.2) spacecraft was launched on the Venus test mission, but became the victim of a launch vehicle failure. The 1964 Venus launch window in March was now pressing on the program. So without the benefit of engineering test flights, two operational Venus lander spacecraft were hastily prepared, 3MV-1 no.5 and 3MV-1 No.4, and launched on March 27 and April 2 respectively. The first launch failed but the second succeeded, becoming the ill-fated Zond 1 mission.

The 3MV spacecraft problems exposed by the Zond 1 mission led to the delay of the third object-probe flight and to more delays in development work on the 3MV vehicles needed for the Mars launch window coming up in November 1964. Also, new ground-based data on the atmosphere of Mars made it clear that the Mars entry probe would fail as designed and could not be fixed in time. As a result, only one launch was attempted to Mars in November. The third and last of the object-probes, 3MV-4A no.2 weighing 996 kg, was successfully launched carrying an instrument compartment with an imaging system on its originally planned Earth-imaging and long-distance communications test flight. There may have been some idea to impact Mars to upstage the US Mariner 4 mission. Nonetheless, Zond 2 experienced immediate and serious in-flight problems. Controllers struggled to maintain communications and operate the spacecraft, and it went silent before reaching Mars.

**Page 127**. Replace the Mars Spacecraft Test Mission Type in the table on page 127 for the 3MV-1A flight with Deep Space Spacecraft Test Mission. Replace the designation 3MV-4 no.2 for Zond 2 to 3MV-4A no.2.

**Page 130.** The payload list for 3MV-1A No. 2 incorrectly includes an imaging system, nor did the spacecraft carry a flyby instrument compartment with camera. All the other instruments on the list were mounted externally on the spacecraft.

**Page 131.** There remains controversy about the flight of Zond 2, whether control of the spacecraft was lost in December, after which communications became erratic, or lost in February after an unconfirmed mid-course maneuver, or lost after Zond 2 made a second course correction in May 1965. Such a maneuver would have been required if Zond 2 were to have passed by Mars as close as some contemporary Western sources claim, 1500 km, which was the original goal of the mission. Russian sources continue to cite 650,000 km.

**Page 136.** Replace first sentence with "The payload for the 3MV-1A No.4A test flight was probably similar to that of the lost test flight of 3MV-1A No.2 in November 1963.

**Page 140.** Figure 9.11 actually shows an early mock-up of the Venera 4 capsule based on Venera 3 with the radio altimeter added later first carried on Venera 4. There are no images of the Venera 3 capsule available.

**Chapter 11**

**Page 209.** The harsh winter and near-impossible working conditions at Baikonur that year were exacerbated by the N1 explosion in February that blew out windows in buildings, damaging heating systems and creating near freezing living conditions.

**Page 213.** In the original flight scenario, the lander would be deployed 2 days before Mars arrival and use its own solid rocket motor to reach the atmosphere. It was later decided to deploy the lander from orbit. However, as the total mass of the spacecraft increased and time for testing disappeared, it was finally decided to delete the lander entirely.

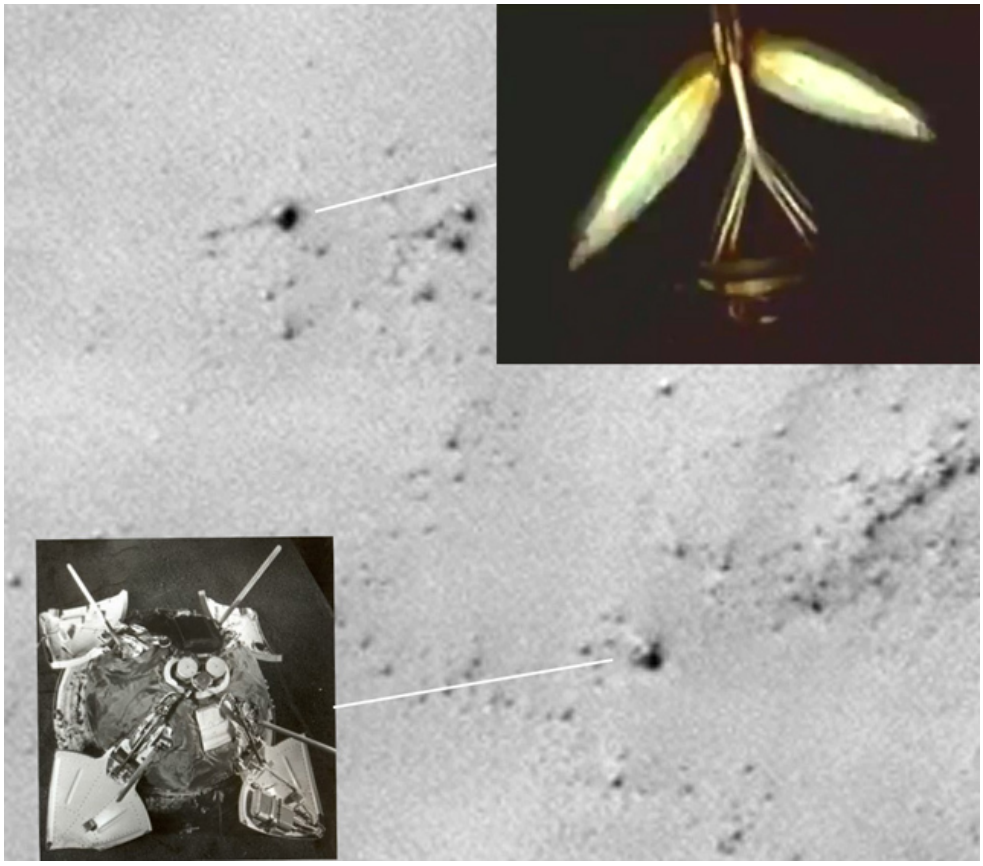
**Chapter 12**

**Page 254.** Figure 12.17 illustrates the terminal landing sequence more properly than does Figure 12.16 on the preceding page.

**Page 259.** Inadequate testing of software is blamed for the engine shutting down 26 seconds too early during the Mars 3 orbit insertion burn. Had the shutdown occurred 7 seconds earlier, the spacecraft would have flown past the planet.

Update the landing coordinates for the Mars 3 lander to 45.045 S, 157.977 W.

Image of the Mars 3 lander on the Mars taken by the US Mars Reconnaissance Orbiter in 2013 (Vitaly Egorov).



**Chapter 13**

**Page 282.** After the first mid-course maneuver, two of the three channels of the computer failed, particularly the one that controlled the main engine. The propulsion system could no longer be used.

**Chapter 20**

**Page 392**. The power and control subsystems of the 1M spacecraft were upgraded to fix the problems experienced with the Phobos 1F spacecraft including the infamous flight software responsible for loss of the spacecraft.

**Page 396.** The Mars 96 Visions of Mars disk was not a compendium of what was known about Mars but a science fiction anthology of what entices us about Mars.

**Page 396, 400.** The book lists 120.5 kg for the small lander and 88 kg for the penetrator. Siddiqi (1) lists 88 kg for the small lander and 123 kg for the penetrator. Zak (2) lists 75 kg for the small lander and 120 kg for the penetrator.

**Page 405.** There are conflicting reports about the re-entry of Mars 96. An alternate scenario than in the book is that the spacecraft re-entered on the 17th somewhere between Easter Island and the coast of Chile while the Block-D fourth stage re-entered the following day over the Southern Pacific at 50.9S 168.1W.

## Chapter 21

After launch on November 8, 2011, the Phobos-Grunt mission failed while in earth parking orbit. The burn to send the spacecraft on to Mars did not occur, and communications with the spacecraft failed.

## Appendices

**Appendix A.** In the 3rd paragraph, first sentence, replace the text in quotations "1A" with simply "A".

**Appendix B.** Move the 3MV-1A No.2 test flight from Mars vehicles to Venus vehicles.

**Appendix D1.** Remove the 3MV-1A No.2 test flight from the launch failures column. Remove Zond 3 from the post-launch mission failures column.

**Appendix E1.** Remove the 3MV-1A No.4A test flight from the launch failures column.

**Appendix G.** Blank the Target column for the 11-Nov 1963 mission. For the 30-Nov 1964 mission replace Zond 2 (3MV-4) no.2 with Zond 2 (3MV-4A) no.2. Remove Mars from the Target column for the 18-Jul 1965 Zond 3 mission.

**Appendix H.** Update Mars 3 lander coordinates to 45.045 S, 157.977 W as determined by Mars Reconnaissance Orbiter Imaging. Correct Vega 1 and 2 surface operations to 20 and 22 minutes respectively.

## References


1) Siddiqi, A., "Beyond Earth: A Chronicle of Deep Space Exploration, 1958-2016", NASA SP-2018-4041 (2018).
2) Zak, A., http://www.russianspaceweb.com