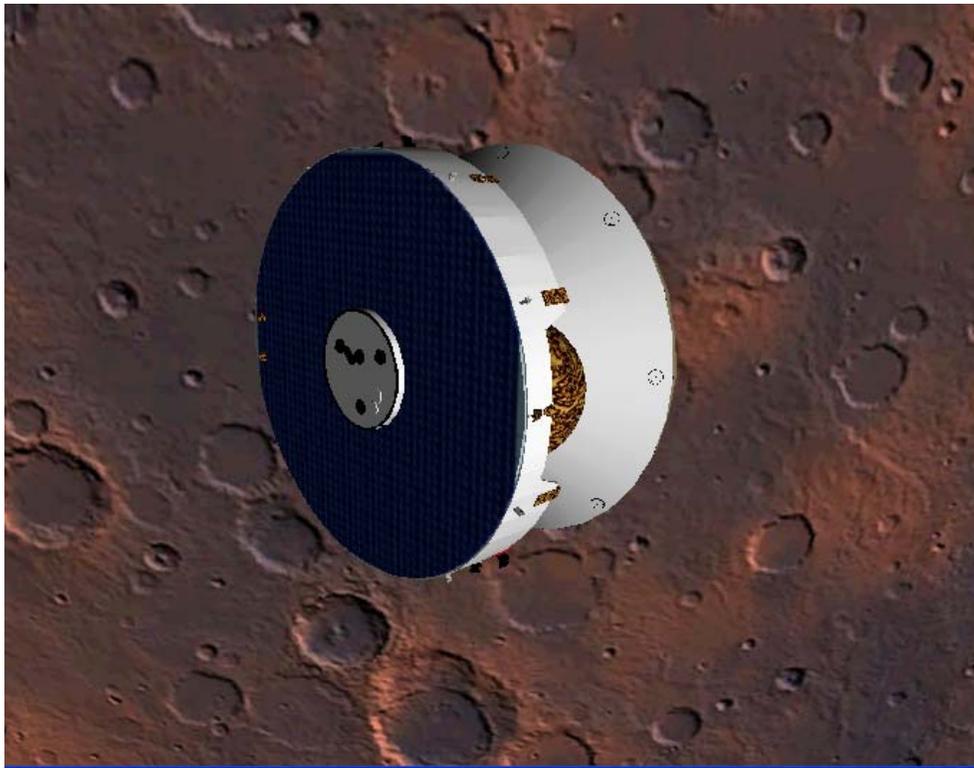




# Mars Exploration Rovers (MER) Version 1.2



**Introduction:** The document explains the Mars Exploration Rover (MER) project as it was developed by SimNASA and the associate files used to recreate these flights.

**Overview:** During the spring of 2003, the SimNASA executive committee committed the resources of SimNASA to recreate, as practical, the pending NASA/JPL missions to Mars. During the month of June 2003 NASA/JPL launch both “Spirit” and “Opportunity” to Mars using a Delta II type 7925. Likewise SimNASA recreated, according to its own timetable, parameters, and simplified flight plans (please see the SimNASA MER Science Package PDF located on the SimNASA MER site for more information [<http://www.simnasa.org/mer>]), these same launches using the Delta II type 7925 HEAVY developed and maintained by SimNASA since early 2000. This launch

vehicle was redeveloped to use the Orbiter Space Flight Simulation program development and maintained by Dr. Martin Schweiger.

On June 16, 2003 at 17:35:21 UT SimNASA launched its MER-A “Spirit” toward Mars. It was followed a few weeks later on July 7, 2003 at 02:43:16 UT by MER-B “Opportunity.”

Spirit arrived on Mars January 24, 2004 and Opportunity arrived January 26, 2004. Scenario snap shots of both Spirit and Opportunity are included.

**Warranty** - None, use at your own risk. User responsible for all damage incurred either real or imaged.

**Installation** - It is assumed that the user has a working knowledge of Vinka’s spacecraft.dll application. No support for this product is given by SimNASA. Please consult the author, the SimNASA forum, Orbiter Forum, or other Orbiter “type” forums, groups, mail lists, etcetera.

The archive package has been organized so that you may uninstalled it in your Orbiter directory, however it is RECOMMENDED that you extract the archive in a temporary directory to ensure each file is copied to the correct location.

As part of the archive package, three scenario files are included that show SimNASA’s Spirit during different periods during its final 8 hours of flight.

*NOTE: The SimNASA Delta II type 7925 HEAVY was not included in this package since the source files are currently in the process of being recreated. All source files for this package were lost during a recent hard drive crash.*

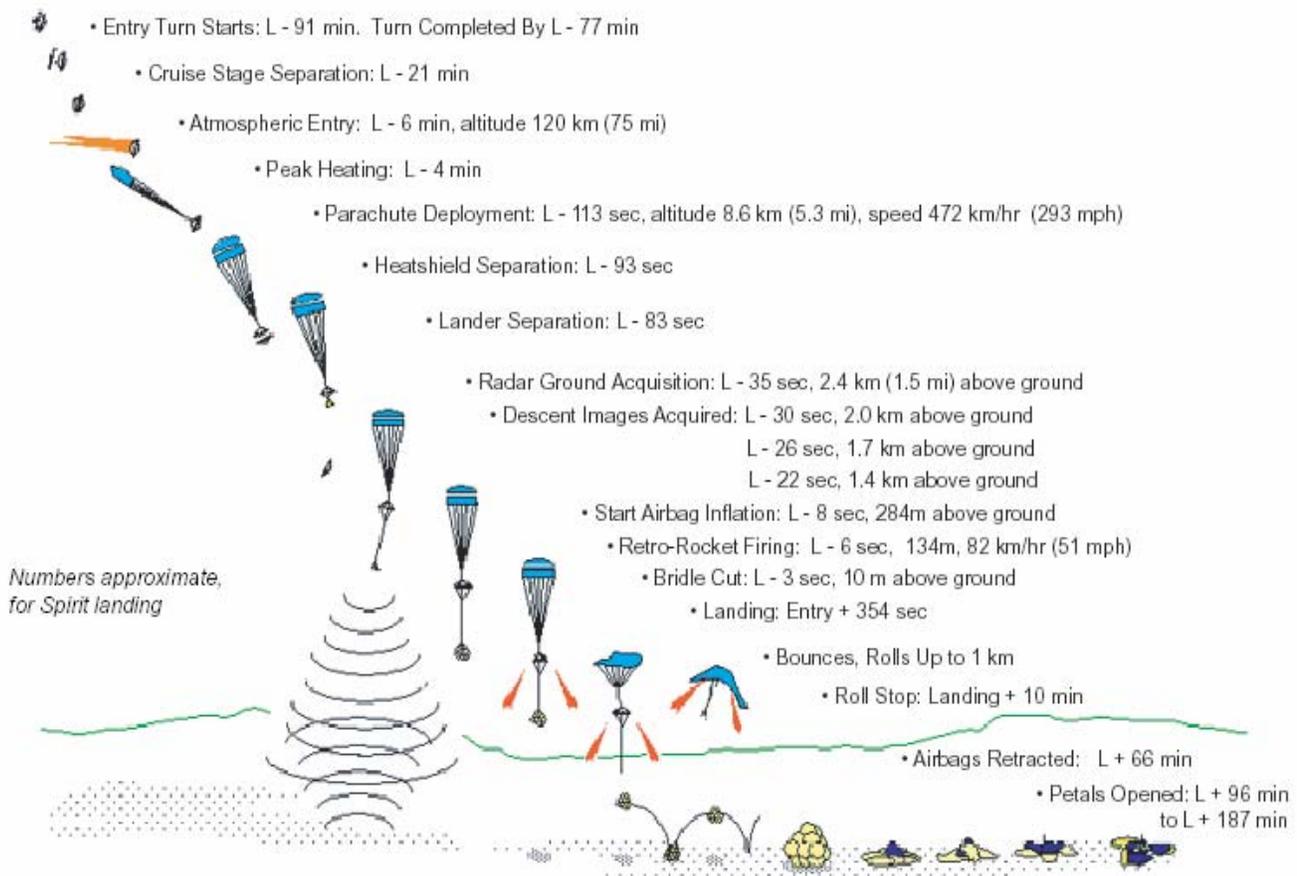
Once the appropriate files have been installed, it should be a simple process of just selecting the appropriate scenario file and launching Orbiter to run the application.

**Controlling MER/Phases of Flight** - With this package only the Cruise, Approach, Entry, Landing, Descent, and Rover Operations are used. Accent and Injection are not included.

**Cruise** – The cruise phase the most passive of all the phases of flight. Cruise operations end at 3500 kilometers from Mars. During this period all course corrections and alignments are made.

**Approach** – During approach final adjustments are made in the final trajectory of the MER spacecraft. The file portion of this phase is the alignment of the aeroshell for proper entry into the Martian atmosphere. Once aligned the Aeroshell should be separated by pressing the “J” key once.

**Entry, Landing, and Descent** – This has been dubbed by JPL as the “Six minutes of hell” for the MER spacecraft. A typical ELD is shown below:



Each phase should be initiated by discarding the pervious with the “J” key.

<b>Jettison of Cruise Stage</b>	<b>Jettison of Heat Shield and extension of bridle</b>	<b>Retro-Rockets fire to slow decent</b>	<b>Bouncing on MARS!</b>

It is important that the user understand that MER descends quite rapidly and requires some practice in order to initiate each sequence on time.

**Modeling/Design** - A number of sources where used in the modeling of the MER spacecraft. Some craft were simply converted from those already freely available on the Internet. Although every attempt has been made to present proper credit, there may be

some individuals who have been left out or overlooked. This is completely unintentional. If you discover that items you model/designed/developed has been left out, please contact SimNASA at [copyright@simnasa.org](mailto:copyright@simnasa.org). Once notified the appropriate material will be credited with our sincere thanks.

- Bradley W. Hodges Sr. - All Configuration files
- Jack Higgans - MER Cruise mesh - Significant portions reworked/remodel/and added by Bradley W. Hodges Sr.
- Bradley W. Hodges Sr. - MER Aeroshell, Parachutes, Lander, Landing Bags mesh.
- NASA – Mars Rover source file – Stowed Mars Rover files by Bradley W. Hodges Sr. using the NASA file, and conversion of the NASA Mars Rover file to mesh format.
- Aeroshell heat shield – Chris Johnston

In addition our sincere thanks go to the following developer and contributors –

Dr. Martin Schweiger	-	Orbiter Space Flight Simulator.
Vinka	-	Spacecraft.dll/Multistage.dll
Duncan Sharpe	-	TransX v2.0 used throughout the flight.
SimNASA Staff	-	There support and assistance.
My family	-	For their continued support.
My Heavenly Father	-	He helps me each day.

**Updates** - The following updates have been made to this package

Ver 1.2

- Textured landing pad
- Aeroshell heat shield replaced – Thanks Chris Johnston
- Updated documentation

Ver 1.1

- Forgot to include the cruise.msh – now included
- Key translation incorrect (Backwards was Forward, etc...) – corrected
- Stowed pam camera mast incorrect – corrected (Thanks to Orbiter Fan for point this out)
- Updated some configuration files
- Corrected some obvious typographical errors in documentation

**Conclusion** – It is our hope that you enjoy the SimNASA MER project. Recommendations for improvements to this program, as well as oversights, clarifications, offers of help for further develop should be directed to [administrator@simnasa.org](mailto:administrator@simnasa.org)

© 2004 by SimNASA ALL RIGHTS RESERVED. May not be reproduced, distributed without express written permission of the author and SimNASA.  
© 2004 by Bradley W. Hodges Sr. ALL RIGHTS RESERVED.