

The High Resolution Stereo Camera (HRSC) on the Mars Express Orbiter

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Imagery is the major source for our current understanding of the geologic and climatologic evolution of Mars. It has the potential to drastically enhance our knowledge in the future and is an essential prerequisite to detailed surface exploration. Therefore, a prime objective for the orbiter of the European Mars Express mission to be launched in 2003 is the photogeologic analysis of the surface at high resolution and to partly recover the scientific objectives of the lost Mars'96 mission. We have proposed to make use of the existing second flight model of the High Resolution Stereo Camera (HRSC) originally developed for the Mars'96 mission. Only minor modifications of the instrument are required to meet the mission specific constraints. The HRSC and the ground data system were extensively tested (outdoor tests, airborne experiments) demonstrating the resolving power and the radiometric quality of the camera as well as the reliability of the fully operational software. The scientific objectives of the experiment focus on the geoscientific investigation including geodesy and cartography of Mars. The camera is a pushbroom scanning instrument with 9 CCD line detectors mounted in parallel. Its unique feature is the ability to obtain nearly simultaneously imaging data at high resolution, with along-track triple stereo, with four colors, and at five different viewing geometries avoiding any time-dependent variations of the observation conditions. The triple stereo images permit robust stereo reconstruction at a vertical resolution similar to the pixel resolution (12 m/pixel from 300 km). During the nominal mission of 1 martian year, it will be possible to cover ³50% of the martian surface at ²15 m/pixel resolution, in stereo, multicolor, and at multiphase angles. More than 70% can be observed at ²30 m/pixel. Thus, the HRSC on Mars Express will be able to close the existing gap between medium to low-resolution coverage and the very high resolution images of MGS as well as the in-situ observations and measurements by landers.