

Section: Spirit (rover)0

Context: Both rovers passed their original mission time of 90 sols many times over and the extended time on the surface, and therefore additional stress on components, resulted in some issues developing. On sol 778 (March 13, 2006), the right front wheel ceased working after having covered 4.2 mi (7 km) on Mars. Engineers began driving the rover backwards, dragging the dead wheel. Although this resulted in changes to driving techniques, the dragging effect became a useful tool, partially clearing away soil on the surface as the rover traveled, thus allowing areas to be imaged that would normally be inaccessible. However, in mid-December 2009, to the surprise of the engineers, the right front wheel showed slight movement in a wheel-test on sol 2113 and clearly rotated with normal resistance on three of four wheel-tests on sol 2117, but stalled on the fourth. On sols 2100-2101 (Nov 29, 2009), the right rear wheel also stalled and remained inoperable for the remainder of the mission. Scientific instruments also experienced degradation as a result of exposure to the harsh Martian environment and use over a far longer period than had been anticipated by the mission planners. Over time, the diamond in the resin grinding surface of the Rock Abrasion Tool wore down, after that the device could only be used to brush targets. All of the other science instruments and engineering cameras continued to function until contact was lost; however, towards the end of Spirit's life, the MIMOS II Mossbauer spectrometer took much longer to produce results than it did earlier in the mission because of the decay of its cobalt-57 gamma ray source that has a half life of 271 days. CANNOTANSWER

STUDENT: **What kind of equipment failures were there?**

TEACHER: \hookrightarrow "" (the right front wheel ceased working)

STUDENT: **What did they do to fix the problem?**

TEACHER: \hookrightarrow "" (Engineers began driving the rover backwards, dragging the dead wheel.)

STUDENT: **Were they able to get it working properly again?**

TEACHER: \hookrightarrow Yes, "" (to the surprise of the engineers, the right front wheel showed slight movement in a wheel-test)

STUDENT: **Were there other problems with equipment wear?**

TEACHER: \hookrightarrow Yes, "" (Scientific instruments also experienced degradation)

STUDENT: **Were there problems gathering data?**

TEACHER: \hookrightarrow Yes, "" (towards the end of Spirit's life, the MIMOS II Mossbauer spectrometer took much longer to produce results than it did earlier in the mission)

STUDENT: **What ultimately happened to Spirit?**

TEACHER: \nrightarrow "" (CANNOTANSWER)

STUDENT: **When was contact lost?**

TEACHER: \nrightarrow "" (Both rovers passed their original mission time of 90 sols many times over)

STUDENT: **So they lasted longer than expected?**

TEACHER: \nrightarrow Yes, "" (the extended time on the surface, and therefore additional stress on components, resulted in some issues developing.)