A LAPSE IN THE FILES

The government can delay the publication of a patent —or keep it secret.

The Mars rover *Curiosity* was carefully delivered to the surface of Mars on August 5, 2012, using a new technique. A parachute and thrusters slowed the descent of the sky-crane craft carrying the rover, and then cables were used to lower the rover to the Martian surface. Prior techniques included using landers which touched down on the surface and also rover deliveries via a system of parachutes combined with airbags protecting the vehicle as it hit the surface. A few previous U.S.S.R. and U.S. missions using these techniques failed. With the *Curiosity* rover larger and more complex than any before it, a new touchdown technique was needed.

Except for one design patent (No. D505,015) by Caltech (and sponsored by NASA), I cannot find any NASA, Jet Propulsion Lab, or Caltech patent applications or patents concerning the sky-crane. I can't even find any patents on the old rover deployment methods—landers and surrounding the rover with air bags. Can you find what I could not?

Are the patent filings secret? That's one possibility. The government can delay the publication of a patent application or its issuance in the interest of national security. But, other *Curiosity* mission patent filings were published. One example is No. 2010/0228409 for a method of computing the minimum landing error trajectory. So, secrecy alone does not explain the void here.

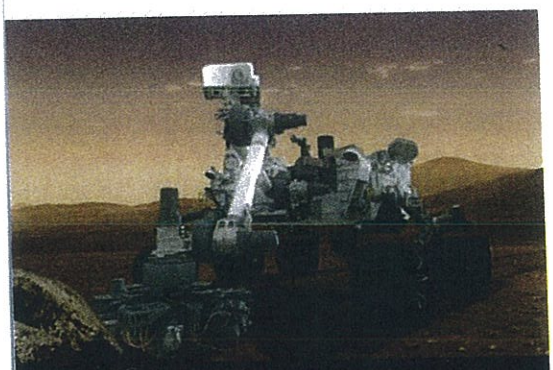
The latest relevant patent application I could find was No. US 2012/0080562 (April 5, 2012) by Astrium, the French satellite company. A brief history of how rovers are deployed is provided including the sky-crane idea for *Curiosity*. Disclosed in this particular patent application is the idea of a descent module or lander carrying the rover. The descent module is slowed by thrusters and has extendable legs for touching down on the Mars surface. Then, the rover is dropped out of or launched by cables from the descent module to the surface. Note the difference between this technique and *Curiosity*: the *Curiosity* sky-crane deposits the rover without touching down (although after that the sky-crane does crash land some distance away from the rover).

A patent by Raytheon, No. 7,967,255 (June 28, 2011), is for a lander which can also see and avoid surface hazards.

Patent No. 8,054,198 (Nov. 8, 2011) by Boeing is for a "rollver"—a beach ball-like rover carrying instrumentation. According to the patent, the rollver "can be deployed to gather information in places that current exploration vehicles are not designed to go. Due to its spherical shape, it can use the energy provided by initial momentum and/or gravity to get to its destination without the need for power for movement. It is also easily packable, because the exterior surface of the rollver rolls along the ground, i.e., the enclosure, is both inflatable and durable."

Patent No. 5,897,156 (April 27, 1999) concerns a protection scheme wherein the rover can deploy a protective cover about itself in harsh weather. *Curiosity*, in turn, uses waste heat from the radioisotope thermoelectric generator to warm itself.

As rovers get even larger and more complex, new landing techniques will be needed. But, in general, I don't see many patents on rovers or rover landing techniques. Curious. ME



CURIOSITY

QUICK FACTS

OPERATOR // NASA: International team

Major contractors // Boeing, Lockheed Martin, MacDonald Dettwiler

Launch date // Nov. 26, 2011 15:02:00.211 UTC (10:02 EST)

Launch vehicle // Atlas V 541 (AV-028)

Launch site // Cape Canaveral LC-41

Mission duration // 668 Martian sols (23 Earth months) primary mission.

As of 01.01.13 // 150 days since landing

KIRK TESKA is the author of *Patent Project Management* (ASME Press) and *Patent Savvy for Managers* (Nolo), is an adjunct law professor at Suffolk University Law School, and is the managing partner of Iandiorio Teska & Coleman, an intellectual property law firm in Waltham, Mass.