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AN INNOVATIVE CONCEPT FOR THE LANDING AND SELF-LEVELING OF A ROBOTIC LANDING PLATFORM

Abstract

One of the most challenging tasks of a successful robotic sample return mission to Mars is the safe and precise landing of a rover or a re-ascent stage on the surface. Besides landing systems with landing legs, different types of airbag systems or the sky crane concept have successfully been used in the past. Airbags can properly attenuate the landing shock but cannot avoid uncontrolled roll over during the touch down phase and do not guarantee a sufficient precision. The sky crane allows the precise delivery of a rover in challenging terrain but requires a highly complex system design and engines with an adjustable thrust level. Landing systems with landing legs have a much simpler design with a great heritage and are able to land with the same precision, but the height of the platform after landing imposes challenges for the rover egress. Within the German national Triple-A study, an alternative robotic concept based on a landing system with landing legs has been developed and tested. During Mars atmospheric entry, the legs are folded at the side of the platform in order to fit in the capsule. During the parachute phase and after heat shield separation, the legs are deployed and latched in their landing position by a robotic deployment arm. After touchdown, this arm allows to lower the platform to the ground for rover egress or to level the platform in the gravitational field in order to provide an adequate launch base for an ascent stage. The paper will give a look inside the achieved results with special focus on the performed breadboarding activities.