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DEVELOPMENT OF THE FLEXIBLE WHEEL FOR THE EXOMARS ROVER

Abstract

The ExoMars rover wheel, part of the Bogie Electromechanical Assembly (BEMA) currently at the Phase C level of development by MDA, leverages the knowledge gained from the DLR Phase B1 wheel design and optimises the cost and performance of the new wheel.

The key requirements for the BEMA wheel design are very challenging; driven by mass, geometry, terrainability, control of impact loads and life. To meet these requirements, a flexible wheel consisting of high-strength stainless steel sheet that forms the tyre and a set of operational springs or spokes coupled with a second set of titanium leaf springs to provide additional impact energy absorption have been designed and tested under challenging quasi-static impact loads and for life due to impacts and rolling under varying radial loads. To meet the design challenge, an early breadboard wheel was developed. This developmental model provided the design team with an adaptable platform to investigate the impact of a number of design features to validate the wheel performance. This was necessary given the highly non-linear behaviour of the wheel design and the associated analytical difficulties. Lessons learned from this early bread-boarding effort were implemented in a next generation wheel test bed in support of the flight model development.

A summary of the design and development of the ExoMars wheel, along with some preliminary test results and problems encountered are provided herein.