NASA's Mars 2020 Rover Instrument Investigations: Enabling Exploration and Sample Return from Ancient Mars

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Abstract

This presentation describes the payload elements and individual payload investigation goals for the instruments on NASA's Mars 2020 rover, scheduled to launch in July 2020 and land in February 2021. We also discuss the current status of the instrument and rover development, as well as the ways that each investigation supports Mars 2020 mission goals as well as higher-level NASA and Mars Program goals.

1. Introduction

The Mars 2020 Rover will be NASA's next mobile mission to the surface of Mars, launching in July/August 2020 and landing in February 2021. The mission's main goals are to; (1) Determine whether life ever existed on Mars; (2) Characterize the Climate of Mars; (3) Characterize the Geology of Mars; and (4) Prepare for Human Exploration [1]. In addition, a major mission objective is to be the first step (identifying and caching samples) in the Mars robotic sample return campaign identified in the most recent Decadal Survey of Planetary Science [2].

A community process has narrowed the choice of landing sites down to three: Gusev crater (including regions studied by the NASA Spirit rover from 2004-2010), Jezero crater (which contains an ancient delta), and Northeast Syrtis Major (which contains geology and mineralogy consistent with a groundwater system). All of these sites are presumed to contain at least some regions dating back to ancient (Noachian) Mars, a time when conditions may have been most favorable to habitability and life.

2. Mars 2020 Rover Payload

To study the geology of the landing site and to select the ~20-40 samples to be cached for future return, the rover carries a payload (Figure 1) consisting of: (a) Mastcam-Z [3], cameras that acquire multispectral, stereo, and zoom images from the near-field to the horizon; (b) SuperCam [4], active emission (LIBS) and passive reflectance spectroscopy of selected regions; (c) RIMFAX [5,10], a ground-penetrating radar that will provide cm-scale resolution of the subsurface; (d) PIXL [6], an arm-mounted instrument designed to measure and map elemental composition; (e) SHERLOC [7], another arm-mounted instrument designed to search for the presence of organics on small (few cm diameter) surface targets, which also includes a color microscopic imager; (f) MEDA [8], a weather and environmental monitoring station, and (g) 20 other cameras for science and engineering [9]. Additional technology demonstration experiments include an oxygen-generating instrument called MOXIE and a small helicopter designed to demonstrate free-flying scouting capabilities for future missions.

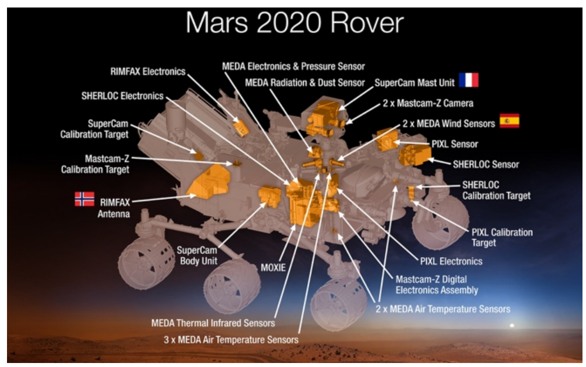

Figure 1: *The Mars 2020 Rover Payload (NASA)* [1].

References

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