

Integration and Ruggedization of a Commercially Available Gas Chromatograph and Mass Spectrometer (GCMS) for the Resource Prospector Mission (RPM)

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The Resource Prospector is a mission to prospect for lunar volatiles (primarily water) at one of the two lunar poles, as well as demonstrate In-Situ Resource Utilization (ISRU) on the Moon. The Resource Prospector consists of a lander, a rover, and a rover-borne scientific payload. The Regolith and Environment Science and Oxygen & Lunar Volatile Extraction (RESOLVE) payload, will be able to (1) locate near subsurface volatiles, (2) excavate and analyze samples of the volatile-bearing regolith, and (3) demonstrate the form, extractability and usefulness of the materials. The gas chromatograph mass spectrometer (GCMS) is the primary instrument in the RESOLVE instrumentation suite responsible for identification and quantification of the volatiles evolved from the lunar regolith. Specifically, this instrument must have: a low mass, a low power consumption, be able to perform fast analyses of samples ranging from less than one to greater than ninety nine percent water by mass, be autonomously controlled by the payload's software and avionics platform, and be able to operate in the harsh lunar environment. The RPM's short mission duration is the primary driver of the requirement for a very fast analysis time currently base lined at less than 2 minutes per sample. This presentation will discuss the requirements levied upon the GCMS design, lessons learned from a preliminary field demonstration deployment, the current design, and the path forward.