

## The Spacecraft Atmosphere Monitor (S.A.M.) for ISS and Orion

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The Spacecraft Atmosphere Monitor (S.A.M.) is a highly miniaturized gas chromatograph mass spectrometer (GCMS) for monitoring the atmosphere of crewed spacecraft for both trace organic compounds and the major constituents. The S.A.M. instrument is the next generation of GCMS, building on JPL's Vehicle Cabin Air Monitor (VCAM), which successfully operated on the International Space Station for two years. We report herein on the current status of the S.A.M. instrument and details of the Micro-Electrical Mechanical Systems (MEMS) GC and a miniature version of quadrupole ion trap mass spectrometer (QITMS). S.A.M. is a technology demonstration and takes its accommodation, resources, and major constituents requirements from the planned Multi-Platform Atmosphere Monitor (MPAM) instrument. As such, S.A.M. will continuously measure the concentrations of major air constituents ( $\text{CH}_4$ ,  $\text{H}_2\text{O}$ ,  $\text{N}_2$ ,  $\text{O}_2$  and  $\text{CO}_2$ ) and report results in two-second intervals. It will be able to operate under hi-G loads present during launch events or at sub-atmospheric pressures relevant to extra-vehicular activities. Instrument mass is projected at 9 kg with power consumption estimated at 45 W. The S.A.M. instrument also includes the on-demand trace volatile organic compounds (VOC) mode of operation in which it will detect the ppm to ppb levels of 40+ species relevant for astronaut health. In the current design, the S.A.M. is amenable for use in both the ISS and the Orion environments.

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