International Space Station Major Constituent Analyzer On-orbit Performance

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ABSTRACT:

The Major Constituent Analyzer (MCA) is an integral part of the International Space Station (ISS) Environmental Control and Life Support System (ECLSS). The MCA is a mass spectrometer-based instrument designed to provide critical monitoring of six major atmospheric constituents; nitrogen, oxygen, hydrogen, carbon dioxide, methane, and water vapor. These gases are sampled continuously and automatically in all United States On-Orbit Segment (USOS) modules via the Sample Distribution System (SDS). The MCA is the primary tool for management of atmosphere constituents and is therefore critical for ensuring a habitable ISS environment during both nominal ISS operations and campout EVA preparation in the Airlock. The MCA has been in operation in the US Destiny Laboratory Module for over 10 years, and a second MCA has been delivered to the ISS for Node 3 operation.

This paper discusses the performance of the MCA over the two past year, with particular attention to lessons learned regarding the operational life of critical components. Recent data have helped drive design upgrades for a new set of orbit-replaceable units (ORUs) currently in production. Several ORU upgrades are expected to increase expected lifetimes and reliability.