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Swingbed Amine Carbon Dioxide Removal Flight Experiment – Feasibility Study and Concept Development for Cost-effective Exploration Technology Maturation on The International Space Station

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The completion of International Space Station Assembly and transition to a full six person crew has created the opportunity to create and implement flight experiments that will drive down the ultimate risks and cost for human space exploration by maturing exploration technologies in realistic space environments that are impossible or incredibly costly to duplicate in terrestrial laboratories. An early opportunity for such a technology maturation experiment was recognized in the amine swingbed technology baselined for carbon dioxide and humidity control on the Orion spacecraft and Constellation Spacesuit System. An experiment concept using an existing high fidelity laboratory swing bed prototype has been evaluated in a feasibility and concept definition study leading to the conclusion that the envisioned flight experiment can be both feasible and of significant value for NASA's space exploration technology development efforts. Based on the results of that study NASA has proceeded with detailed design and implementation for the flight experiment.

The study effort included the evaluation of technology risks, the extent to which ISS provided unique opportunities to understand them, and the implications of the resulting targeted risks for the experiment design and operational parameters. Based on those objectives and characteristics, ISS safety and integration requirements were examined, experiment concepts developed to address them and their feasibility assessed. This paper will describe the analysis effort and conclusions and present the resulting flight experiment concept. The flight experiment, implemented by NASA and launched in two packages in January and August 2011, integrates the swing bed with supporting elements including electrical power and controls, sensors, cooling, heating, fans, air- and water-conserving functionality, and mechanical packaging structure. It is now on board the ISS awaiting installation and activation.