IAF HUMAN SPACEFLIGHT SYMPOSIUM (B3)
Interactive Presentations - IAF HUMAN SPACEFLIGHT SYMPOSIUM (IP)

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COTS FOOD IN SPACE: PARABOLIC FLIGHT TESTING OF AN ADAPTER BETWEEN THE ISS POTABLE WATER DISPENSER AND COMMERCIAL-OFF-THE-SHELF DEHYDRATED FOOD PACKAGES

Abstract

Food and beverage pouches used by NASA astronauts have a built-in adapter for the Potable Water Dispenser (PWD) on station. Pouches must therefore be produced in-house as they are not commercially available. This makes the production of space food more resource-intensive in terms of time, personnel, and material. We have developed a modification to the adapter technology that can interface with the large diversity of commercially available dehydrated food items (e.g. camping food, ready-meals, emergency food) so that these foods can be eaten by astronauts on the ISS. This will reduce costs while also increasing menu diversity for the crew which has been shown to influence the crew's psychological wellbeing. To date, we have designed, built, and ground tested a prototype of the technology including analytical and experimental structural testing and performance testing with typical off-the-shelf food packages. The current design meets launch and re-entry load requirements as well as food safety requirements as defined by NASA standards. We have also demonstrated that the adapter works in a microgravity environment through parabolic flight experiments. During the parabolic flight, the adapter was connected to a 60 mL syringe filled with water to mimic the PWD and the operator was asked to attach the adapter to a commercial dehydrated food package. Once attached, the operator pressed the plunger at a rate of 9 mL/s to replicate the injection rate of the PWD on the ISS. We showed that successful attachment of the adapter and rehydration of the food package can be accomplished within the approximate 20 seconds of microgravity after several practice sessions. In summary, we have successfully demonstrated that commercial off-the-shelf packaged foods could potentially be rehydrated by the PWD without requiring any modifications to existing ISS hardware, which could be a cost-effective alternative to the current space food system.