



TECHNOLOGY SOLUTION

Environment



Freeze-Resistant Hydration System

Portable drinking bladder designed for rugged, cold, and high-altitude conditions

NASA's Johnson Space Center is offering an innovative freeze-resistant hydration system for licensing. The technology substantially improves on existing hydration systems because it prevents water from freezing in the tubing, container, and mouthpiece, even in the harshest conditions on Earth. This technology is designed to work to minus 40 degrees Celsius and 15-mile-per-hour winds over a 12-hour summit day, and likely well beyond. Field testing was performed at Mt. Everest in May 2009. The device was originally conceived and designed by an astronaut-mountaineer who recognized the great risk of dehydration in high mountains and the lack of sufficient technology to meet this important need.

This NASA Technology is available for your company to license and develop into a commercial product. NASA does not manufacture products for commercial sale.

BENEFITS

- Improved safety: Provides 2-3 liters of liquid beverage for a full summit day
- Lightweight: The system is insulated with lightweight aerogel material
- Flexibility: Uses passive and active subsystems to keep water from freezing



THE TECHNOLOGY

Even when a water conformal fluid reservoir and drink straw are zipped into a down suit, water freezes under extreme conditions. This poses a health hazard, particularly to high-altitude climbers who mouth-breathe, as mouth-breathing causes substantial fluid loss (in exhaled breaths). Climbers of 8,000-meter peaks get only 1 liter or less of fluid on summit days because their drink bottles freeze so quickly.

The High Altitude Hydration System keeps water from freezing in three different ways. First, the system has passive thermal control that uses aerogel insulation on the outside of the conformal fluid reservoir and around the drinking straw to protect the contents from the cold. The container is placed within an inner layer of clothing, and the insulated straw is pulled out from underneath the suit for sips. Second, the system has a braided copper wire placed around the exterior of the drinking straw and another heat-collecting surface about the container wall to transfer body-generated heat to the fluid reservoir and straw during use. Third, the system uses a microcontroller and tape heater powered by a battery to keep the straw warm and free of ice crystals.



Learn more about field testing of this product on Mt. Everest by visiting co-inventor and former NASA Astronaut Scott Parazynskis climbing blog at: <http://www.onorbit.com/everest>

APPLICATIONS

The technology has several potential applications:

- Mountain climbers
- Cross-country skiers
- Snowmobilers
- Law enforcement and rescue personnel
- Defense environments, including underwater and deep sea use
- Downhill skiers
- Winter campers

PUBLICATIONS

Patent No: 8,839,996