Army's Meals, Ready-to-Eat (MREs).

- A small amount of commercial plastic pudding containers, commercial full-panel pullout aluminum cans, and single-serving commercial condiment pouches are also used for the Shuttle and ISS.

Other packaging materials used for space foods include (from top) retortable pouches, commercial full-panel pullout aluminum cans, and commercial plastic pudding containers

Packaging weight

Food packaging weight and waste are critical issues for NASA. For Shuttle the food package weight is about 0.5 pounds per person, per day. The weight of ISS food packaging waste is greater, because rehydratable and bite-sized foods packaged for Shuttle are overwrapped with an aluminum foil laminate for ISS to increase shelf life. Also, thermostabilized pouches are used more frequently on the ISS, adding additional food package weight.

Drinking straw with clamp

Commercial condiment pouch

Packaging case study: Eggs

Rehydratable, freeze-dried eggs are a common breakfast item on both the Shuttle and ISS. To ensure that they are readily rehydratable, the eggs are freeze dried twice (i.e., freeze dried, rehydrated, and freeze dried again).

As with all freeze-dried foods, eggs are stored in metal cans or foil packages prior to packaging for spaceflight. NASA has used eggs stored in metal cans under nitrogen at 40° F that were well over two years old.

The main complaint astronauts voice about freeze-dried scrambled eggs is that they are too crumbly and difficult to eat in microgravity. Although this may be a result of the packaging process (vacuum packing), the freeze-drying process is predominately to blame.

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NASA FTCSC 2003

Space Food Packaging Facts

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Space Food Packaging Facts

The mission of the NASA Food Technology Commercial Space Center (NASA FTCSC) is to lead a national effort to develop foods and food-processing technologies that enhance space missions and advance commercial food products through cooperative efforts with NASA scientists and technologists, commercial companies, and academic researchers.

NASA has unique food packaging methods and materials that are necessary for ensuring the extended shelf life and safety of space foods for consumption in microgravity.

All space foods are stored under ambient storage conditions and must safely maintain a shelf life of nine months to five years.

- Shuttle foods are required to have a minimum shelf life of nine months.
- International Space Station (ISS) foods require a one year shelf life. All rehydratable and bite-sized foods destined for ISS are overwrapped with an aluminum foil laminate and vacuum sealed to improve barrier properties, increasing shelf life.
- The food system for planetary outposts will require a five year shelf life because of planned mission lengths.

Packaging for rehydratable and bite-sized foods

Many of the foods used for the Shuttle and ISS are freeze dried and packaged into rehydratable containers. NASA packages both rehydratable and bite-sized foods in Combitherm® Paxx packaging materials made by Wolff Walsrode of Burr Ridge, Illinois, a division of Bayer Corporation.

Used for the Shuttle and the International Space Station, these packages are made from a five layer co-extrusion of nylon/ethylene vinyl alcohol/tie layer of polyethylene/linear low density polyethylene.

Packaging rehydratable and bite-sized foods

- Packaging for bite-sized foods is procured from the vendor sealed on three sides. NASA adds the food product and seals the fourth side.
- Rehydratable and bite-sized foods are packaged using modified atmosphere techniques.
- Each package is flushed with nitrogen three times before the final seal at 21 to 29 inches of Hg vacuum.
- The amount of vacuum used varies depending upon the food product (a hard vacuum will destroy the texture of some food products).

Packaging used for bite-sized foods

Rehydratable packages

- Rehydratable packages are procured from the vendor in the shape of a cup and a lid. They are made of a flexible material to aid in trash compression.
- The vendor forms the flexible cup by thermoforming the five layer co-extruded film over a mold.


Top and side view of a rehydratable food package

- The thermoforming process decreases the barrier properties of the original film as the material is stretched thinner to form the cup.
- NASA places the food product in the cup, places the lid on top, and seals the lid.
- The septum adapter is an injected, molded device. The septa is made from silicon rubber and is inserted into the septum adapter with a special tool. The septa provides an entry for a needle to inject water into the package during rehydration.The septum foil laminate seal is pierced by the galley needle when rehydration takes place and seals off when the needle is withdrawn.
- The package is flushed three times with nitrogen and sealed.


Septum adapter with foil laminate seal

Packaging beverages

NASA's beverage package is a modified Capri Sun® package made from a foil laminate. The NASA version is longer than the commercially available package. NASA packages beverages for spaceflight following these steps:

- Dry beverage powder is placed in the package.
- The package is flushed three times with nitrogen.
- The septum is inserted and the beverage package is sealed.

Foil laminate beverage package

Other packaging materials

- Commercial pouches are used for thermostabilized and irradiated food, following the same specifications as the U.S.