We’ve all heard that breakfast is the most important meal of the day. That may be, but for the scientists at the Space Food Laboratory, breakfast is also the most challenging meal of the day. Most typical American breakfast foods, such as eggs over easy, pancakes, bacon, sausage, toast, biscuits and gravy, and various other off-the-grill foods, aren’t very good after they have been dehydrated and stored on a shelf for several months.

Breakfast foods not being conducive to dehydration is not the only challenge the food lab folks face. It’s also the astronauts. Like the rest of us, when it comes to breakfast, astronauts have many preferences. Some only want black coffee while others demand full-course “lumberjack” breakfasts drowned in syrup.

Scrambled eggs became one of the first breakfast foods of the space program. Cooked, frozen, and freeze dried, the eggs look a bit like tiny bits of yellow Styrofoam pellets. However, when rehydrated, they look, taste, and almost have the texture of fresh scrambled eggs.

One would think scrambled eggs in space would please everybody. Not so! Some astronauts didn’t even want to taste them. Their appearance reminded flight crews, many who were still active members of one or another military branch, of the dreaded dehydrated eggs served on base. Those that did try them reported they were messy to eat in microgravity. Little egg bits tended to escape meal packages and drift about until they clung to walls, floors, ceilings, hair, and air vents. In spite of
their messiness, freeze-dried scrambled eggs have been a space breakfast food staple for decades.

With eggs, astronauts need bacon. Unfortunately, there just isn’t a good way to prepare bacon in space. Look at what happens to a kitchen range when frying up a rasher or two. The answer? Bacon bars! Bacon bars were used in the Gemini, Apollo, and Skylab programs. They were made by frying bacon, breaking it into pieces, and compressing it into bars. Bacon bars tasted like bacon, but they lacked the crispy texture.

Breakfast rolls were an immediate success in the labs with flight crews. Just about everybody seemed to like them. You could warm them if you wanted, but otherwise, there was no effort involved other than cutting open the package. Of course, there was a hitch. A typical breakfast roll would stay fresh in the package for seven days—not nearly long enough. The rolls had to be purchased, tested, packaged, and shipped to the Kennedy Space Center weeks ahead of the scheduled liftoff. Considering the complexity of launching a rocket, there was always the possibility of delay. That meant that most of the breakfast rolls that ended up in space were well beyond stale by the time they were consumed.

When the space shuttle came along, a fresh food locker for semi-perishable food was added to the food system. The locker could be stowed at L minus 1 (one day before launch) and swapped with a fresh locker if there was a launch delay. To make the rolls last longer, irradiated rolls were used for the first eight space shuttle missions. These were then replaced thanks to the packaged cake and bread company Sara Lee. Sara Lee began marketing vending machine cinnamon rolls. The flavor of the rolls had to hold up for weeks and weeks in the less than ideal storage environment of vending machines. The new rolls turned out to be perfect for NASA’s unique shelf life requirements.

Now, toast was another matter entirely. The options were quite limited. Toast becomes stale very quickly, and the taste goes south. It’s also quite crumbly, even fresh from a toaster. Crumbs make a mess and, in microgravity, easily enter nasal passages. For Gemini and Apollo missions, single bite toasted cubes were created. Nice try! They were more like croutons than toast and were just not popular with the astronauts.

Fresh fruits, another popular breakfast item, create their own problems for space meals. Fruit is carried on the shuttle and the Russian
supply ship Progress for delivery to the ISS. The quantity of fruit is limited, though, because refrigeration is not available on either of these vehicles. Perhaps future space vehicles will have room for an enriched carbon dioxide atmosphere refrigerator system. On Earth, these systems greatly extend fruit shelf life. For the present, only as much fruit as can be consumed in a few days is carried in space (Figure 2.1)

What does that leave us? Cold cereals, the “breakfast of champions,” work pretty well in space. Of course, there are a few choices—with or without sugar and with or without milk. Unfortunately, the milk is powdered. Fresh milk is heavy and doesn’t keep.

Just back from space, many astronauts eagerly reach for a cold glass of fresh milk (with cookies, of course). There have been numerous requests to have a tall glass of cold milk in space. NASA and a number of dairy companies worked on the problem, but success has been minimal. Powdered milks either have storage, rehydration, or flavor problems. The best effort to date is commercially produced non-fat-dry milk. It’s OK, but it doesn’t taste like fresh milk. The ISS

![Shuttle fresh food locker tray with celery, carrots, bananas, and Danish rolls. Note the netting used to hold the food in place in microgravity (NASA photograph).](image)

**FIGURE 2.1** Shuttle fresh food locker tray with celery, carrots, bananas, and Danish rolls. Note the netting used to hold the food in place in microgravity (NASA photograph).
doesn’t have a system to provide cold water for milk rehydration, and the ambient temperature water that has to be used compromises the milk’s taste.

That being said, space cereal, milk, and sugar are combined in a rehydratable package. The astronaut injects the correct amount of water and mixes the contents. The cereal has to be eaten immediately, or the contents become soggy. Thankfully, the moisture in a “bowl” of space cereal provides a bit of stickiness that keeps the cereal from slurping out as it being spooned.

**SPACE FOOD STICKS**

The Pillsbury Company developed a rod-shaped “food stick” to be used inside the *Apollo* space suit. The idea was that it could be inserted through a port in the helmet and into the mouth. The “food stick” was an early attempt to develop a balanced/complete food for emergency use. This eating concept was never fully developed or approved for suit use because the helmet port could not withstand the pressure differentials. NASA did use the space sticks as part of the *Apollo* menu and labeled it “caramel candy.” Pillsbury marketed the item as “space food sticks” and later called them “nutrition sticks,” but neither strategy increased their sales enough to meet expectations.

**WHAT IS THE PROGRESS CARGO SHIP?**

The *Progress* cargo ship is an unpiloted Russian spacecraft that is launched from the Baikonur Cosmodrome, Kazakhstan, on a *Soyuz* rocket. Among its many duties, such as refueling the ISS’s attitude control rockets, it hauls pressurized cargo such as oxygen, food, water, and personal items. A *Progress* spacecraft can carry as much as 7,000 lb of cargo into orbit. As the ISS crew empties a *Progress* of fresh supplies, it is refilled with trash. Finally, it undocks and is sent on its way to burn up in the atmosphere over the Pacific Ocean.
In the recipes that follow, the SS stands for “space shuttle/space station.”

**SS SCRAMBLED EGGS**

<table>
<thead>
<tr>
<th>5 Grade A large eggs</th>
<th>1 tsp dehydrated cheese seasoning (DairiConcepts)*</th>
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</thead>
<tbody>
<tr>
<td>Egg white from 1 Grade A large egg</td>
<td>1/4 tsp salt</td>
</tr>
<tr>
<td>1/3 cup 2% milk</td>
<td>1 tbsp unsalted butter</td>
</tr>
<tr>
<td>1 tbsp nonfat dry milk</td>
<td></td>
</tr>
<tr>
<td>2 tsp dried cheddar cheese blend (DairiConcepts)*</td>
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</tbody>
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*These are commercial products; you may substitute your favorite cheese powder or grated cheese. Cheese powder is made commercially by spray drying a cheese slurry, using much the same process as when making powdered milk. You may not be able to get these at a local store, but products like them are available on the Internet.

1. Mix whole eggs and egg whites together using a whisk.
2. Combine the milk and nonfat dry milk.
3. Blend the two cheese powders and salt.
4. Using a blender, thoroughly blend the milk mixture and the dry ingredients.
5. Blend milk and cheese mixture with eggs in a saucepan and cook to a semi-coagulated state.
6. Melt butter and blend into the precooked mixture and continue cooking until fully coagulated.

**Yield:** 6 servings

**Note:** NASA freeze dries the eggs, adds water back, and freeze dries them a second time. This is necessary in order for the eggs to rehydrate when water is added in the space food package. The basic scrambled egg formulation has been around since the Apollo days. Originally a commercial company made them for NASA. When it went out of business the company gave the “secret of the eggs” to NASA to use for space shuttle flights. The “secret” was the second freeze drying. Otherwise, it takes boiling water to rehydrate them, and boiling water is not available on NASA spacecraft.
Variations on the above recipe include:

**SS MEXICON SCRAMBLED EGGS**

1. Prepare a batch of SS Scrambled Eggs (see recipe above).
2. Add minced fresh green onions, red peppers, and cilantro.

NASA makes its Mexican Scrambled Eggs by adding dehydrated minced green onions, red pepper granules, and freeze-dried cilantro to the freeze-dried eggs to make Mexican scrambled eggs.

**SS SEASONED SCRAMBLED EGGS**

1. Prepare a batch of SS Scrambled Eggs (see recipe above).
2. Stir in Cugino’s Veggie Weggie Dipz™ mix.

NASA adds the dip mix to the freeze-dried scrambled eggs. If you can’t find the Cugino’s Veggie Weggie Dipz™ mix, try another soup and dip mix, such as Knorr’s™. You may have to try several batches to find the correct amount of the soup and dip mix to add to your eggs. That’s what the NASA Food Laboratory people do.
**BACON BARS**

1 lb uncooked bacon

1. Fry the bacon until golden brown.
2. Place the warm bacon into a hamburger press.
3. Exert 3,000 lb of pressure for 10 s.
4. Remove the compressed bacon and let cool.

**Yield:** More than you would want.

After sampling the bar—so that you could say that you tried it—give the rest to the family dog. One nibble, and Fido will prance about the house barking (Translation: “It’s BACON!”).

**BREAKFAST CEREAL**

1 cup of your favorite cold cereal*
1/3 cup of powdered milk
2 tsp of sugar or 1 packet artificial sweetener
1/2 cup cold water
1 resealable plastic sandwich bag

*Frosted cereals stay crisper longer than unfrosted cereals.

1. Put all the ingredients in the bag.
2. When ready to eat, add water and reseal the bag.
3. Shake the bag to dissolve the milk and sugar.
4. Open the bag and eat immediately with a spoon.
5. Write a note to yourself to never do that again unless you become an astronaut.

**Yield:** 1 serving
What You’ll Find at Your Supermarket

These breakfast foods eaten by astronauts may be found in the local supermarket. The NASA Food Laboratory staff repackages them in single-serving-sizes in rehydratable pouches.

- Multi-Bran Chex™ by General Mills
- Kelloggs Frosted Corn Flakes™
- Granola or Granola with Raisins™ by Heartland Brands
- Mountain House Granola with Blueberries and Milk™ by Oregon Freeze Dry
- Instant White Hominy Grits™ by Quaker Oats 30 g plus Butter Buds™
- Instant Oatmeal with Maple and Brown Sugar™ by Quaker Oats
- Instant Oatmeal with Raisins and Spice™ by Quaker Oats
- Rice Krispies™ or Frosted Rice Krispies™ by Kelloggs
- Fully Cooked Original Pork Sausage Pattie™ by Jimmy Dean.

These have to be freeze-dried before repackaging.
The Astronaut's Cookbook
Tales, Recipes, and More
Bourland, C.T.; Vogt, G.L.
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