



SpacetoGround

1

00:00:05,171 --> 00:00:07,436

Welcome to Space to Ground. I'm Shaneequa Vereen.

2

00:00:07,436 --> 00:00:11,460

Today we're inside the Johnson Space
Center Space Food Systems Laboratory.

3

00:00:13,440 --> 00:00:18,240

Food! It's a part of our everyday lives and it
plays an important role in the holiday season.

4

00:00:19,560 --> 00:00:24,060

Here in the United States we're celebrating the
Thanksgiving holiday, which is a time for friends

5

00:00:24,060 --> 00:00:29,820

and family to gather around the dinner table
and share a feast. But how do you pull off such

6

00:00:29,820 --> 00:00:35,160

a Thanksgiving meal, or any meal for that matter
in space? To guide us through the makings of a

7

00:00:35,160 --> 00:00:40,320

meal on the International Space Station we're
joined by Xulei Wu, the Food Systems Manager

8

00:00:40,320 --> 00:00:45,840

for the International Space Station. Thank you so
much for joining us today Xulei. We do have the

9

00:00:45,840 --> 00:00:51,780

Thanksgiving holiday coming up and I know you guys
have to prepare a little advance and there's no

10

00:00:51,780 --> 00:00:57,060

grocery store in space, so can you tell me a little
bit about the menu and how it gets there to the

11

00:00:57,060 --> 00:01:02,700

International Space Station? Yeah, exactly as you\h mentioned there's no grocery store in space and\h\h

12

00:01:02,700 --> 00:01:08,340

there is no kitchen appliances for crew member\h to cook up a meal from scratch in microgravity,\h\h

13

00:01:08,340 --> 00:01:15,240

therefore here in Food Lab we have to procure,\h process, and package all the food in advance to\h\h

14

00:01:15,240 --> 00:01:21,900

send to our crew members. Here with me I have a few\h selection of food packages like this one. This one\h\h

15

00:01:21,900 --> 00:01:29,460

is a Smoked Turkey. This is the irradiated product\h that is a technology utilizing the gamma radiation\h\h

16

00:01:29,460 --> 00:01:35,940

to make the food shelf stable. The red dot here indicating it received a sufficient amount of

17

00:01:35,940 --> 00:01:42,360

dosage to make the product safe to eat. Another\h example here this one is Candied Yam. This product\h\h

18

00:01:42,360 --> 00:01:48,900

you can see it's made in 2021 and would definitely\h still be good as well. This is thermal stabilized\h\h

19

00:01:48,900 --> 00:01:55,620

package. It's basically just like the canned\h foods you can find in grocery store, Canned Tuna,\h

20

00:01:55,620 --> 00:02:02,040

etc., but we pack them in those flexible pouch so\h that they're lighter in weight and also when crew\h\h

21

00:02:02,040 --> 00:02:07,620

member finish eating they can compact the trash
very easily. And another one here this one is

22

00:02:07,620 --> 00:02:13,560

Spicy Green Beans. They're in those white package
so those products are freeze-dried literally here.

23

00:02:14,700 --> 00:02:21,180

So as you can see spicy green beans dry like a
mummy. Freeze-drying the process to remove all the

24

00:02:21,180 --> 00:02:26,880

water out. You may be surprised all the food we
eat on daily basis most of them are between 80

25

00:02:26,880 --> 00:02:32,460

to 90 percent of water. That's what makes them
spoil so quick. If we take all the water out

26

00:02:32,460 --> 00:02:37,740

then they become very shelf stable. And do you
guys take any special requests for these holiday

27

00:02:37,740 --> 00:02:43,800

meals? Yeah that's actually very important because
whatever food we send up we want to making sure

28

00:02:43,800 --> 00:02:49,440

crew member will be liking the food. If they don't
like the food then we just waste up the payload

29

00:02:49,440 --> 00:02:54,960

going up. So I will reach out to crew member to
see what they would like to have like this year

30

00:02:54,960 --> 00:03:02,100

specifically crew member would like to have a
Charcuterie Board. Ah! Therefore we work with a cargo

31

00:03:02,100 --> 00:03:10,020

integration team, managed to stir up some cheese,\h
real cheese with refrigeration and some dried\h\h

32

00:03:10,020 --> 00:03:16,800

meats that passed micro testing, and some fruits\h
and dried nuts so those gonna be up there for\h\h

33

00:03:16,800 --> 00:03:23,700

this holiday. So how much food does an astronaut\h
need to eat while on station trying to maintain\h\h

34

00:03:23,700 --> 00:03:31,080

muscle mass and bone density and nutritional\h
values to help keep them there? Yeah, so for the\h\h

35

00:03:31,080 --> 00:03:37,440

crew member to maintain a healthy weight they do\h
lots of exercise. More exercise means more calorie\h\h

36

00:03:37,440 --> 00:03:42,420

therefore their calorie requirement is higher\h
than the requirement on ground. So normally on\h\h

37

00:03:42,420 --> 00:03:49,320

average, for a female astronauts probably about\h
2700 calories per day. For male, somewhere about\h\h

38

00:03:49,320 --> 00:03:55,260

3 300 calories per day. Of course that depends\h
on the gender their height and their weight.\h\h

39

00:03:55,860 --> 00:04:02,880

And it's it's specific or you know tailored per\h
astronaut correct? That's correct. Yeah but most of them normally\h\h

40

00:04:02,880 --> 00:04:09,900

structure their male into breakfast, lunch, dinner,\h
with a snack in between. How about cravings? Are\h\h

41

00:04:09,900 --> 00:04:18,060

are there a wide enough variety in menu options
for astronauts if they do have cravings while up

42

00:04:18,060 --> 00:04:25,020

there for however long duration? Yeah, variety is
a buzzword. Variety is a key, because even if you

43

00:04:25,020 --> 00:04:29,760

like smoked turkey, you love smoked turkey but eat
this every day for one week you're gonna hate it

44

00:04:29,760 --> 00:04:37,860

next week. So we try to supply a big variety as big
as possible we, on the standard menu we supply 200

45

00:04:37,860 --> 00:04:43,800

different food and beverage items for crew member
to pick and choose. But 200 may sound a lot to you

46

00:04:43,800 --> 00:04:51,720

but imagine this, our target consumer astronauts
they all have different backgrounds and they're

47

00:04:51,720 --> 00:04:56,700

very diverse in terms of personal preference, so
after you take out things they don't like for

48

00:04:56,700 --> 00:05:01,860

each crew member that shrink significantly, so
with supplement with crew preference containers.

49

00:05:01,860 --> 00:05:07,560

Each crew member for six months stay up there
they get nine containers of those preference food

50

00:05:07,560 --> 00:05:14,040

so those can be food either from our standard menu
because if you really like smoke turkey and your

51

00:05:14,040 --> 00:05:19,260

crewmates also love smoked turkey you better pack
some your own. Because on the standard menu first

52

00:05:19,260 --> 00:05:25,800

come first serve. And they can also request lots
of the commercial off the shelf items as long as

53

00:05:25,800 --> 00:05:31,080

we evaluate and consider their safe for flight, we
will pack those for crew member to add a variety

54

00:05:31,080 --> 00:05:39,240

as well. Also and the third key thing is exchange
remember they do share food ISS with like the

55

00:05:39,240 --> 00:05:45,360

Russian crew members and when you're sharing
you add more variety. The aroma of food. How does

56

00:05:45,360 --> 00:05:49,560

that work in space? Yeah, so there are several
foods to that first of all if you really like

57

00:05:49,560 --> 00:05:56,160

coffee... I love the coffee smell, but this is going
to be the coffee package crew member gonna get and

58

00:05:56,160 --> 00:06:00,900

once they add water back they use this straw to
drink the coffee so they're not going to be able

59

00:06:00,900 --> 00:06:07,440

to smell their coffee. Okay, now what about
these? Yeah for food it says aroma molecules on

60

00:06:07,440 --> 00:06:12,420

Earth normally they're lighter than air that's why
they go up go straight to your nasal pathway. For

61

00:06:12,420 --> 00:06:17,400

crew member one thing they don't smell very well,\h
and also the second thing the aroma molecule in\h\h

62

00:06:17,400 --> 00:06:24,360

the microgravity they go everywhere. So I know\h
on station, condiments are a thing and crew\h\h

63

00:06:24,360 --> 00:06:30,420

members tend to like the the spicier condiments is\h
that is that true is that right? That tend to be\h\h

64

00:06:30,420 --> 00:06:36,720

true for many crew members um because when you're\h
in microgravity environment your body fluids shift\h\h

65

00:06:36,720 --> 00:06:42,540

make you don't you have kind of stuffy nose you\h
don't smell things very well, so crew members tend\h\h

66

00:06:42,540 --> 00:06:49,380

to like the spicy kick in the food that help\h
them open up the nasal pathway and also help\h\h

67

00:06:49,380 --> 00:06:57,000

them taste the food better. That makes sense. Part\h
of tasting is smell. Now, what's in the future for\h\h

68

00:06:57,000 --> 00:07:04,500

the space food system? What are we looking forward\h
to for Moon to Mars missions, for Artemis missions\h\h

69

00:07:04,500 --> 00:07:10,200

going forward. Yeah that's a good question. For the\h
future we do envision the space food system gonna\h\h

70

00:07:10,200 --> 00:07:16,620

be a combination of several technologies. The\h
first one those we consider as a pre-packaged\h\h

71

00:07:16,620 --> 00:07:21,960

food system because crew member all they need to\h
do is just add water or just heat up and open to\h\h

72

00:07:21,960 --> 00:07:27,120

eat those are ready to eat food. We still consider\h
this as part of the future space food system\h\h

73

00:07:27,120 --> 00:07:33,600

because those doesn't require much time from crew\h
members and also if there are any issues to other\h\h

74

00:07:33,600 --> 00:07:40,320

systems they will have this one to lay back on,\h
to fall back on. The second portion we're thinking\h\h

75

00:07:40,320 --> 00:07:46,920

about is like the crop, for crew member to plant\h
crops veggies in space. And there have been some\h\h

76

00:07:46,920 --> 00:07:53,280

testing going on that I remember harvest chili in\h
space and make a chili taco. I do recall that and\h\h

77

00:07:53,280 --> 00:07:58,680

I do recall them eating and testing out the the\h
food that they were growing. I know so far they've\h\h

78

00:07:58,680 --> 00:08:05,940

looked at some leafy greens, some radishes, and like\h
you said the the chilies were very big on station.\h\h

79

00:08:06,660 --> 00:08:13,920

So, can you tell us any new items that you guys\h
are looking into or of recent years are there any\h\h

80

00:08:13,920 --> 00:08:18,900

crew favorites that have recently flown to\h
the International Space Station. Yeah I think\h\h

81

00:08:18,900 --> 00:08:24,780

one great example for that is a Mango Salad.\h
That's a product developed by our Advanced\h\h

82
00:08:24,780 --> 00:08:29,820
Food Technology scientists. They developed this\h
product, they do the shelf life evaluation like\h\h

83
00:08:29,820 --> 00:08:35,100
three years making sure the food is all good,\h
then we added it to the standard menu. And since\h\h

84
00:08:35,100 --> 00:08:40,260
then we have heard just positive, very positive\h
comments from crew members. That's different.\h

85
00:08:40,260 --> 00:08:45,540
Mango Salad. Yes, it's actually pretty good\h
it's a free dry product, but yeah, very fresh.\h\h

86
00:08:46,620 --> 00:08:52,860
Xulei Wu, from the International Space Station Food\h
Laboratory. Thank you so much! You're very welcome\h\h