shift Simpson and happy holidays from

Mission Control guys

we're ready for your questions whenever

you are sure well I'll have our first

student come up and first rune is Olivia

hi Olivia we're having a hard time

hearing you see you guys need to speak

up a little bit we could see you here as

well but I think we already know what

your question was Olivia just Olivia did

you ask me about their family okay um

it's it's kind of you know it's

challenging for them just imagine if you

were away from your family for a long
periods of time so but we have really
good things in place here at NASA for
them to be able to do video conferences
with them like you're doing with me to
be able to call down and talk to them on
the phone so they're always in contact with their family but you know
no one wants to be away from their family for a long period of time but we make sure that they are able to do that
the really cool thing is that we have so many different ways of communicating
with the crews now on orbit that we have email which is a lot of parents keep in
touch with their kids anyway these days

even when they've grown up and

gone away to college and the like we've

got special sessions where we use

netmeeting kind of like a FaceTime or a

skype where they can talk directly and

see each other and the time that they're

doing that and they have a telephone up

there that is an IP phone where they can

actually call down and talk to their

family members directly so there's all

those different ways that they have

chances to communicate both visually

through writing and through audio means
and so it's a little bit like being away

44
00:02:08,250 --> 00:02:12,060
on a long business trip for the cruise

45
00:02:10,049 --> 00:02:13,260
and so they've missed their families and

46
00:02:12,060 --> 00:02:14,879
their families missed them but they

47
00:02:13,259 --> 00:02:17,149
still have lots of opportunities to stay

48
00:02:14,879 --> 00:02:17,150
close

49
00:02:18,270 --> 00:02:31,090
thank you oh you're welcome we have our

50
00:02:23,348 --> 00:02:32,289
next student Jordan Terry hello I'm

51
00:02:31,090 --> 00:02:34,409
sorry I didn't hear you could you speak

52
00:02:32,289 --> 00:02:34,409
up

53
00:02:39,240 --> 00:02:44,969
and I think she said how does this Mesa

54
00:02:41,310 --> 00:02:48,509
Verde oh wow that's a really loaded

55
00:02:44,969 --> 00:02:51,330
question it hey Kelly do you want to try

56
00:02:48,509 --> 00:02:53,039
to tackle well at the spacesuits we use

57
00:02:51,330 --> 00:02:54,719
for the u.s. there's two different kinds
of spacesuits first of all there's a

u.s. space suit a NASA spacesuit we call
the extra vehicular Mobility unit and

there's a Russian one that we call the
or lon and they're very similar because
essentially what they are is a personal
space ship and they provide all of the
protection from the outside environment
around space that you would need if you
were actually in a spaceship but allows
you to move about and get you use your
arms and to do important tasks that we
need to do to maintain the space station
or they did a lot of it to assemble the
space station in the first place and so

what you've got is you've got inside the

space do you have a liquid cooling

garment because in spite of the fact you

might think spaces is cool actually all

the work that you do and it can build up

a lot of heat we've got really good

insulation in the spacesuit and so one

of the hardest things you have to do is

get rid of all that excess heat and so

there is a look at cooley garment that

has lots of tubing with water and they

can with a little dial on the front of

their space suit they can adjust the
temperature of the spacesuit so if they can stay comfortable and work they've got a little mouth water delivery system so that they can take a drink because they're usually out there for six and a half or more hours and so it's a very important that they be able to stay hydrated they have a multi-layer spacesuit that provides pressure for them and it also provides protection against the thermal environment and to some level tiny pieces of space junk that sort of thing and then the gloves are really important on the spacesuits
because when you're out there doing work

your hands are your most important thing

and engineers here at Johnson Space

you've got a lot of work over the years

to make these gloves protective enough

but also nimble enough that you can do a

lot of the the tight work that you have

to do when you're connecting connectors

for electrical connect

shins or connecting fluid connections or

associated with the cooling systems on

the space station so and and that's

basically how it works you have your

oxygen tanks you have electricity that

powers the systems of the suit and once
you go outside you're in your own little space shoot

okay are there what and Mission Control regular routines fall oppression yes okay yes there are regular routines yes their daily operations they have to get up they have to talk to the flight directors they have meetings and figure out what the tests are for today and they are and then they go through what the plan is for the day the day has already planned out and so the flight control team is working with the crew on board and they're making sure that they
try to stay as close to being on tasks

as possible and so they do follow a
daily routine and it's planned out ahead

of time for the most part yeah

interestingly though we're working on

new ways to keep from having to have

Mission Control be so directly involved

in everything that the crews do on orbit

the crews like to be somewhat autonomous

oh they can choose when they get their

work done and when to work on one thing

versus another thing and and I'll it's

also important that we learn how to do

that without having to have Mission
Control there for everything because as we go farther out into space there are delays in communication that will occur and you don't want to have to wait half an hour when you're at Mars to get an answer from Mission Control before you can go on to the next step and so lately they've been doing some special work earlier this week they did work on the treadmill system onboard the space station and they updated the procedure so that Kevin Ford the commander right now could do it virtually on his own without having to ask Mission Control
questions enlike and so while there is a

time structured routine for the crew on

board there also are looking at new

opportunities where we can minimize that

so that crews can go to the office and

do their job without having have

somebody explain how to do things all
day long you know the other part of that

is that the folks here in Mission

Control

have a schedule we work here in Mission

Control 24 7 365 days a year and so that

means that there are three shift of

flight controllers that work every day

and they cover about an eight hour shift
each one and then they have a handover period so that the folks who are leaving can tell the status of all the systems and things that we have to do to the folks that are coming on and then the then that crew member does the same thing for the oncoming crew and so we keep a rotating crew in it make sure everybody's up to date everybody knows the important items and that everybody's ready to support the crew on orbit you walk out welcome our next questions from Athena I opina oh yeah they would love to get it more
often but they can only get it when there's a vehicle that can bring it to them but as far as the food being on station they have some of the regular stuff that you eat here on earth granola bars mm's things like that and it doesn't require anything special for them to have that type of thing but they do also have food that's freeze-dried that they need to be rehydrated when they're up there and so those have kind of a shelf life of about a year and a half and they really enjoy the food they get to taste it on the ground
before they go up into space actually so

they get to kind of pick out their menus

and decide what they think

they might like to eat for six months

since they're going to be there so it's

kind of fun they get to do food tastings

and kind of pick their own menu a lot of

things that they have on the space

station to ER the same kind of things

that you could go the grocery store and

buy thermo stabilized meals I know there

are some really good ones out there that

you can just buy and you can stick them

in your pantry and you don't have to


refrigerator my fries everything and you

can heat them up in the microwave they

have different ways of heating them on

the space station they don't have a

microwave but they they do have that

capability to eat the same kind of

things you would eat here on the ground

but the the folks here in Mission

Control and in our food laboratory also

do a lot of work to make sure that the

nutritional components of the diet are

really healthy and we're learning more

and more there's a special experiment
called pro k right now where doctors on

the ground are looking at how the
nutritional components of their food

that they eat affect their long-term
health and the reaction to microgravity

we're finding out that some of the
things that you would think might be the
expected behavior such as eating a lot
of protein would be good for you when
really it may end up not being as good
for you and so we're work on how to
fine-tune the diets so that they they
can hate keep good muscle muscle health

and that their bones don't deteriorate

and that goes right along with exercise

which is very important to make sure
they stay healthy and they return to one gravity and be able to be healthy when they come home and I should add that Chris Hadfield has said he's bringing some special treats up to the crew on him you know they're about ready to dock with the space station tomorrow and so whenever a new crew comes up they bring lots of special treats and some of those treats are fresh fruit and special things like chocolate and other things so we don't know exactly what they're bringing but we know that the crew that's on board is going to get some
special holiday surprises yes I'm sure

they'll be maple involved Oh maple

that's right he isn't and right yes oh

wow yes they are because they are able

to speak with their families and and

there's more than one of them on board

at all times you know there's always

constant interaction with one another

they have what's called like a crew

webpage and they're able to select

movies and you know some of their

favorite movies and television shows

that they like to watch here on the

ground they're able to do then read you
know newspapers and they're able to

00:12:02,509 --> 00:12:05,990
still kind of keep up with world events

00:12:04,009 --> 00:12:07,879
and everything so they don't feel you

00:12:05,990 --> 00:12:08,899
know to isolate you don't want them to

00:12:07,879 --> 00:12:10,370
feel like they're completely out of

00:12:08,899 --> 00:12:12,230
touch and so there are ways we have a

00:12:10,370 --> 00:12:13,970
group a whole team of people that their

00:12:12,230 --> 00:12:16,370
job is to make sure that the crew

00:12:13,970 --> 00:12:18,500
doesn't feel lonely or isolated while

00:12:16,370 --> 00:12:21,080
ty they're in space right and they also

00:12:18,500 --> 00:12:22,490
have regular conferences with for

00:12:21,080 --> 00:12:25,700
example their boss here at the graph

00:12:22,490 --> 00:12:27,500
ground ball bacon is the leaf astronaut

00:12:25,700 --> 00:12:31,040
and he has a regular conference with the

00:12:27,500 --> 00:12:33,169
crew and then you know we work in shifts
here in Mission Control but for every expedition there is a lead flight director and Chris Edelen as the lead flight director for expedition 34 right now and he has a weekly tag up with that but he can actually bring friends and colleagues that are particularly close to the crew members in and they do a two-way conversation just like this where they can see and hear each other and do that so in addition to keeping them up together with their families they also have their friends and colleagues that they work with day to
300 00:12:58,850 --> 00:13:01,909
day and opera

301 00:12:59,690 --> 00:13:03,650
get up there what other thing they have

302 00:13:01,909 --> 00:13:08,439
is they do have access to the internet

303 00:13:03,649 --> 00:13:10,699
directly it is not the fastest of a

304 00:13:08,440 --> 00:13:13,100
communication line that you've ever seen

305 00:13:10,700 --> 00:13:15,650
but they can actually go out and look

306 00:13:13,100 --> 00:13:17,899
online and they could even order flowers

307 00:13:15,649 --> 00:13:20,110
for their wives for their anniversary or

308 00:13:17,899 --> 00:13:22,069
send down a special birthday present

309 00:13:20,110 --> 00:13:31,960
through one of the online ordering

310 00:13:22,070 --> 00:13:34,430
systems to their children you're welcome

311 00:13:31,960 --> 00:13:36,080
okay we're going to have a student speak

312 00:13:34,429 --> 00:13:38,989
a little bit closer to the ER I think

313 00:13:36,080 --> 00:13:41,210
that will help you out a little bit hi
my name is Kristin and my question is how many people working to control oh gosh I know exactly how many generally there are about 20 or 30 people in here during a normal work day shift for the crew the crew wakes up about midnight Houston time and then they go to bed around three thirty in the afternoon Houston time and so from those periods we have a full team of flight controllers here and that's around 20 or 30 people and then there are some additional folks that are in support rooms that are nearby here that provide
specialized input to the team here

that's in what we call the front room

and then we also have an opportunity to

pull in specialists from the research area and principal investigators and

those folks mainly come in through the payload Operations Center in Huntsville

Alabama where NASA has the Marshall Space Flight Center and they coordinate all the research activities so there's lots of different ways that that occurs

hi I'm Matthew what type of experiments are done on the space station there are some you know there at any given time there are between 150 and 200 different
experiments going on the space station

some of them involve crew involvement

some of them are done by investigators

here on the ground working remotely

there are three different laboratories

on the space station there's the NASA

Destiny laboratory there is the European

Space Agency's Columbus laboratory and

there's the Japanese Space Agency's Kibo

laboratory and Kibo means hope in

Japanese and so we have all these

different experiments and there's a an

international space station program

science office that is based here in
Houston and they work with the folks at the Marshall in Huntsville, Alabama to coordinate all the different experiments. Among the experiments they do a lot of biological experiments using the crew members themselves as test subjects. They will do different types of exercise or look at different displays on a laptop computer and have to respond to it. They will record their daily intake of whatever foods they ate and keep journals of their moods and things that they feel, and how they are and so they do all that.
and there's other biological experiments

that involve things like fish and and

mice spiders and butterflies right now

they're working today Kevin Ford was

working with the medaka fish experiment

which is these tiny little fish and

there's a small aquarium onboard the

space station and these little fish have

of course skeletal systems because we

all know if the fish have skeletons just

like humans do they're just a lot

smaller and so but because fish have

faster metabolisms and don't live as

long there the effects of microgravity
on their bones are happens a lot faster

than does for us and so the researchers are looking at those fish bones to find out what longer duration Space Flight for humans how that might affect our skeleton systems because that's one of the things we've noticed is that when you live on board the space station 4 5 6 months you tend to lose bone mass now we're learning that certain types of exercise can really help us keep that from happening and we're actually getting really close to the point where we have zero loss of bone density on the space
station but you can imagine a lot of people have a thing called osteoporosis when you get older enough your grandparents may have any of this yet but but it means your skeleton is a little bit weaker and you tend to have broken bones or a lot of people have broken hips and things like that as they get older and we're working on learning how that affects astronauts because it happens a lot faster rate and we're hoping we could translate that to things that you can help people on the ground now there are plant experiments we were
looking at the difference in the way plants grow on the ground and in space there are experiments as to how fire works and you know fire on a space station since it's an enclosed environment is a very dangerous thing and that's part of the things you train them for is how to put out fires and how to react what's like yeah but it also can help us make engines run more efficiently whether it's car engines or jet engines here on earth there's experiments into how to recycle things I don't know if you know this but the
water that the crew members on the space station drink used to be their urine so they went to the bathroom and then that went through a special filtration system that does essentially what the earth itself does in about five thousand years but it takes about a week or two to recycle yesterday's coffee into tomorrow's coffee as one of our ascots used to say and so we test things like that there are also important things looking at things like bacteria researchers have found out that there is a specific gene in some bacteria that
turns on and off its ability to make you sick and so if we can apply that this particular one with Salmonella which causes food poisoning if we can apply those lessons to treatments here on the ground we could virtually wipeout people getting food poisoning on earth and that would be a really help because a lot of people die or get very very sick every year around the world from that kind of a problem so very different lines of research and I should not I need to also look at astronomy because we have the Alpha Magnetic Spectrometer that is collecting
strange particles as the space station

orbits the earth there takes advantage

do.  big solar rays and electricity do

that and we're expecting that to

actually rewrite the astronomy textbooks

here soon if you like to study the stars

because it's going to teach us all about

dark matter and that kind of thing

thank you well unleash I know we're

responsible for 12-15 I don't want I

don't want to take too much more time do

you have time for another question or

two or is to sit we've got time for one

more question we'll give you one last
more question this is from well you know

it's very interesting that you ask that

question because when I was a little

girl I thought I would never be able to

work at NASA because to me I thought it

was unreachable but you know I was

encouraged by my teachers especially and

by my parents that you know never say

that anything is impossible as long as

you try to do your best and I took a

different Avenue I didn't major in

astronomy or anything like that but I

did apply the knowledge that I did

receive in school to what i do now in it
and it's perfect and so I would just

encourage you that don't limit yourself
don't ever think that you know I'm not

really into science or my strong point

might be something else and so therefore

I would wouldn't make it in any

particular field because you have so

many talents inside of you that are just

waiting to come out so for me I thought

I could never do it and here i am and i

would never dream of being anywhere else

i absolutely love being here come on

Alicia have to tell them what you

studied ok so my degree is actually in
criminology so that just goes to show

00:21:33,419 --> 00:21:38,070
you here it is i thought i would be you

00:21:35,249 --> 00:21:39,690
know FBI CIA and instead here i'm

00:21:38,069 --> 00:21:40,829
working with these great crew members

00:21:39,690 --> 00:21:43,919
and flight controllers and flight

00:21:40,829 --> 00:21:45,868
directors so you never know where your

00:21:43,919 --> 00:21:48,388
education will lead you that's right and

00:21:45,869 --> 00:21:51,858
you know i took a different path to i've

00:21:48,388 --> 00:21:54,269
been working at NASA for 26 years now i

00:21:51,858 --> 00:21:56,069
remember getting to stay home from

00:21:54,269 --> 00:21:58,019
kindergarten to watch Alan Shepard

00:21:56,069 --> 00:22:00,509
launch when the very first American went

00:21:58,019 --> 00:22:02,249
into space and I've always had a real

00:22:00,509 --> 00:22:03,778
interest in space but I never thought

00:22:02,249 --> 00:22:06,089
you know I wanted to be an astronaut all
that but I was too tall at the time and

then I got needed to wear glasses of
course we're contacts now and things

like that so I never thought could do it

and I was a reporter and an editor for
10 years before I got an opportunity to

come work at NASA and now I've been here

for 26 years and it's been a real

the rewarding career so my point is that

a just study what you need your you get

a good general education and that will

set you up for just about anything you

want to do in life and if it ends up

being working at NASA remember that not
everybody has to be an astronaut that
there are all kinds of people that support in many different ways there are business people that keep the budgets running for us so that we can do the things we do there are flight controllers that support the crews here on the ground there people like Alicia that help coordinate the training that's so important to them doing their jobs well where people like me that helps share it with people like you and people like Michael hair who's helping us do this telecon today who are useful and
their human resources people that make sure that we have all the right people to do the jobs that need to be done so just remember that you should follow what you like to do because life is too short to be doing something just for the paycheck you should be doing something you enjoy doing and if that ends up being a NASA we would welcome you into our family at alere unleash your thank you so very very much for giving us this time spent with your week we know how hybrid time is and I can't begin to tell you what a thrill it
has been for us here at Christ Kate

557
00:23:43,319 --> 00:23:47,429
school a little time from a Vermont to

558
00:23:45,660 --> 00:23:49,590
to be able to have this opportunity to

559
00:23:47,430 --> 00:23:52,470
speak with people miss control it really

560
00:23:49,589 --> 00:23:54,389
is a very inspiring to all of us thank

561
00:23:52,470 --> 00:23:58,410
you very much skin everybody can be dig

562
00:23:54,390 --> 00:23:59,700
a hole big thank you thank you I've

563
00:23:58,410 --> 00:24:01,920
really enjoyed the time we've spent

564
00:23:59,700 --> 00:24:03,779
together today thanks a bunch to you

565
00:24:01,920 --> 00:24:05,910
guys and to also everybody on the

566
00:24:03,779 --> 00:24:07,920
digital learning network that helps make

567
00:24:05,910 --> 00:24:10,230
these connections possible we love doing

568
00:24:07,920 --> 00:24:14,509
it and we hope you guys have a safe

569
00:24:10,230 --> 00:24:14,509
happy healthy holiday season